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QUALITY ASSURANCE PROJECT PLAN

Supplyside and Forrestal Landfills

Naval Station Great Lakes, Great Lakes, Illinois

Prepared for:

Department of the Navy

Environmental Department

Building 1-A, 201 Decatur Avenue

Great Lakes, Illinois 60088-5600

Prepared By:

TolTest, Inc.

1020 S. Northpoint Boulevard

Waukegan, IL 60085

May 2006

TOLTEST, INC.

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QUALITY ASSURANCE PROJECT PLAN
SUPPLYSIDE AND FORRESTAL LANDFILLS
NAVAL STATION GREAT LAKES
GREAT LAKES, ILLINOIS

PREPARED FOR

DEPARTMENT OF THE NAVY
NAVAL STATION GREAT LAKES
ENVIRONMENTAL DEPARTMENT
BUILDING 1-A, 201 DECATUR AVENUE
GREAT LAKES, ILLINOIS 60088-5600

SUBMITTED
May 2006

BY

1020 S. NORTHPOINT BOULEVARD
WAUKEGAN, IL 60085
(847) 689-0697
FAX (847) 689-0698

TOLTEST PROJECT NO. 73775.01

QUALITY ASSURANCE PROJECT PLAN
SUPPLYSIDE AND FORRESTAL LANDFILLS
NAVAL STATION GREAT LAKES
GREAT LAKES, ILLINOIS

EJOC NO. N68950-00-D-0200
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Submitted by:

TolTest, Inc.
1020 S. Northpoint Boulevard
Waukegan, IL 60085

TolTest, Inc. hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under this contract is complete, accurate, and complies with all requirements of the contract.

Prepared by: _____ Date: 05/01/06
Timothy A. Boos, QC Representative

Reviewed by: _____ Date: 05/01/06
Daniel M. Fleming, Project Manager

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LIST OF ACRONYMS

CLP	Contract Laboratory Program
DQO	Data Quality Objectives
ES	Environmental Specialist
GRO	Groundwater Remediation Objectives
IEPA	Illinois Environmental Protection Agency
Kemron	Kemron Laboratories
MS	Matrix Spikes
MSD	Matrix Spike Duplicate
NSGL	Naval Station Great Lakes
PWC	Public Works Center
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Differences
RSD	Relative Standard Deviations
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedures
SRM	Standard Reference Materials
SRO	Soil Remediation Objectives
TACO	Tiered Approach to Corrective Action Objectives
TolTest	TolTest, Inc.
TCLP	Toxicity Characteristic Leaching Procedure
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the organization, objectives, planned activities, and specific Quality Assurance/Quality Control (QA/QC) procedures associated with the Monitoring Well Installation and associated sampling of groundwater at the Supplyside and Forrestal Landfills located at Naval Station Great Lakes (NSGL), Great Lakes, Illinois. Specific protocols for sampling, sample handling and storage, chain-of-custody, and laboratory analyses will be described. All QA/QC procedures will be structured in accordance with U.S. Environmental Protection Agency's (USEPA) Region IX Preliminary Remediation Goals and Illinois Environmental Protection Agency (IEPA) Tiered Approach to Corrective Action Objectives (TACO) requirements, regulations, guidance, and technical standards. This QAPP was prepared in accordance with USEPA guidance manual entitled, "Region 5 Model RCRA Quality Assurance Project Plan," May 1993 (USEPA, 1993a).

The Forrestal Landfill was the first controlled disposal area used by NSGL. The landfill started operations in 1967 and ceased in 1969. The 4-acre area is located between Superior Street and Skokie Ditch, south of Virginia Court. The site was operated as a trench-type landfill with no burning. The total volume of material disposed of in the Forrestal Landfill as limited by the size of the parcel involved and the fact that the material disposed of there was not burned. In addition, the period during which the site was operated coincided with the period during which responsibility for waste collection from housing switched from Navy personnel to a private contractor, with disposal of Navy property. It is estimated that the site contains approximately 76,000 cubic yards of refuse. No known hazardous wastes were disposed of in this landfill.

Supplyside Landfill is adjacent to the NSGL facility boundary and south of the Supply Department warehouse (Bldg 3503), and extends almost to the westward extension of Alabama Avenue. Supplyside landfill began operations in 1969 and was closed in 1983 and had a cover installed in 1985. The cover, grading, and seeding were performed by the Navy Construction Battalion 401, a tenant command at NSGL during that time period. The landfill surface rises 15-20 feet above the surrounding grade on the east and west. Skokie Ditch drains the surface water from the area and lies adjacent to the landfill on the east. The landfill was operated as a trench-type landfill, with four parallel trenches and covers an area about 400 feet by 1,000 feet. There was no intentional burning of refuse at this site.

Work associated with the QAPP includes installation of 12 groundwater monitoring wells at the Supplyside and Forrestal Landfills to include storage, transportation, and disposal of potentially contaminated soil cuttings and groundwater.

Associated data collection activities and analytical methodologies are summarized in **Table 1**. Kemron Laboratories (Kemron) of Marietta, Ohio will provide analytical services. Kemron's IEPA certification and Laboratory Reporting Limits are provided in **Appendices A** and **B**, respectively. A sampling requirements (e.g. sample containers, preservation requirements, and hold times) table for Groundwater L1 and L2 testing as required by Kemron can be found in **Appendix G**. Since there is a 6-hour testing time for the fecal coliform, it is expected to be performed by the Lake County Public Health laboratory, Deerfield, Illinois

Table 1 - Data Collection Activities

Landfill	*Data Collected*	*Data Use*
Supplyside	Soil • VOCs 1311/8260B, • SVOCs 8270C, • Metals 6010B/7000A • Density, Color, & Order • BTU/lb • Flash Point (cc) 1010/ASTM D92\PH • Reactivity with Acid, Base, & Water • Reactivity Sulfide and cyanide • Phenolics • Polychlorinated Biphenyls 8082 • Paint Filter Test 9095A • Organochlorine Pesticides 8081A • Chlorinated Herbicides 8151A Groundwater • L1 • L2	- determine if specific chemicals in soil and water are present above background levels - characterize the waste for disposal - determine if specific chemicals in the groundwater are impacted by landfill
Forrestal	Soil • VOCs 1311/8260B, • SVOCs 8270C, • Metals 6010B/7000A • Density, Color, & Order • BTU/lb • Flash Point (cc) 1010/ASTM D92\PH • Reactivity with Acid, Base, & Water • Reactivity Sulfide and cyanide • Phenolics • Polychlorinated Biphenyls 8082 • Paint Filter Test 9095A • Organochlorine Pesticides 8081A • Chlorinated Herbicides 8151A Groundwater • L1 • L2	- determine if specific chemicals in soil and water are present above background levels - characterize the waste for disposal - determine if specific chemicals in the groundwater are impacted by landfill

Supplyside and Forrestal Landfills

After the installation of the 12 groundwater monitoring wells, the soil from the borings will be analyzed utilizing the Standard Public Works Center (PWC) Requirements for Toxicity Characteristic Leaching Procedure (TCLP) Analysis in order to characterize the material for proper disposal (**Appendix C**).

After the wells have been initially developed and stabilized, the first of the quarterly groundwater samples from the monitoring wells will be obtained and analyzed. Analytical results of soil and groundwater samples will be compared to Tiered Approach to Corrective Action Cleanup Objectives (TACO), Tier I Soil Remediation Objectives (SROs), Residential and

Industrial/Commercial properties, Groundwater Remediation Objectives for the Groundwater Component of the Groundwater Ingestion Exposure Route, and the Soil Component to Groundwater Ingestion Exposure Route, Class I and Class II GROs, and established background levels.

For the purposes of this DO, quarterly groundwater sampling will occur at all groundwater monitoring wells for one year. Samples will be collected using the procedure outlined in Section 3.2 of the Sampling Analysis Plan (SAP) and tested for the analytes/constituents listed in Tables L1 and L2 by the respective test methods. (**Appendix D**). It is expected that after the initial groundwater monitoring period, one year of quarterly monitoring, and provided there are no exceedances of the groundwater quality standards, sampling frequency could be reduced to semi-annually for two years, then to annually. The duration of annual groundwater monitoring will depend upon the results of the proceeding monitoring points. Should any exceedances be detected, additional monitoring or remedial action may be warranted.

1.1 Data Quality Objectives

Data Quality Objectives (DQOs) are qualitative and quantitative statements specifying the quality of the data required to support decisions made during interim measures, and are based on the end uses of the data to be collected and will be used to facilitate closure of both landfills.

The primary DQOs for sampling described in this QAPP are to produce data of sufficient quality and quantity to characterize and evaluate the method of disposal for the soil cuttings and groundwater fro well development. The additional DQOs are for sampling and analyzing on a quarterly basis for one year, groundwater from 12 monitoring wells installed at the Supplyside and Forrestal Landfills. It is expected that after the initial groundwater monitoring period, one year of quarterly monitoring, and provided there are no exceedances of the groundwater quality standards, sampling frequency could be reduced to semi-annually for two years, then to annually. The duration of annual groundwater monitoring will depend upon the results of the proceeding monitoring points. Should any exceedances be detected, additional monitoring or remedial action may be warranted. The data collected for disposal characterization must be of acceptable quantity and quality to demonstrate compliance with established Resource Conservation and Recovery Act (RCRA) requirements and/or specific disposal facility requirements.

Sampling and analytical methods will be consistent with standard methods outlined by the USEPA and meet Contract Laboratory Program (CLP) Level IV criteria. Laboratory data will be calculated and reported in a manner consistent with USEPA-approved analytical procedures and with other TolTest programs that report similar data. Data acquisition will be amenable to evaluation of precision, accuracy, representativeness, comparability, and completeness as discussed in Section 3.0 of the QAPP.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

2.1 Management Responsibilities

Project management organization and responsibilities are presented in Section 4.0 of the Kemron Laboratories Quality Manual.

2.2 Laboratory Responsibilities

Samples will be shipped to Kemron in Marietta, Ohio, for analysis. Kemron's Navy and IEPA certifications are presented in **Appendix A** to this plan.

Following is the project laboratory organization and responsibilities of key laboratory personnel.

2.2.1 Laboratory Project Manager/Sample Custodian

The Laboratory Project Manager will report directly to the TolTest Project Manager and will be responsible for the following:

- Ensuring all resources of the laboratory are available on an as-required basis; and
- Providing overview of final analytical reports.
- Receiving and inspecting the incoming sample containers;
- Recording the condition of the incoming sample containers;
- Signing appropriate documents;
- Verifying chain-of-custody and its correctness;
- Notifying the Laboratory Operations Manager of sample receipt and inspection;
- Assigning a unique identification number and customer number, and entering each into the sample receiving log;
- Initiating transfer of the samples to appropriate Laboratory sections; and
- Controlling and monitoring access/storage of samples and extracts.

2.2.2 Laboratory Operations Manager

The Laboratory Operations Manager will report to the Laboratory Project Manager and will be responsible for:

- Coordinating laboratory analyses;
- Supervising in-house chain-of-custody;
- Scheduling sample analyses;
- Overseeing data review;
- Overseeing preparation of analytical reports; and

- Approving final analytical reports prior to submission to the U.S. Navy.

2.2.3 Laboratory Quality Assurance Officer

The Laboratory QA Officer has the overall responsibility for data after it leaves the laboratory. The Laboratory QA officer will communicate data issues through the Laboratory Project Manager. In addition, the Laboratory QA officer will:

- Overview laboratory quality assurance;
- Perform internal data validation;
- Overview QA/QC documentation;
- Conduct detailed data review;
- Perform QA audits;
- Determine whether to implement laboratory corrective actions, if required:
- Define appropriate laboratory QA procedures;
- Prepare laboratory Standard Operation procedures; and
- Sign the title page of the QAPP.

2.2.4 Laboratory Technical Staff

The laboratory technical staff will be responsible for sample analysis and identification of corrective actions. The staff will report directly to the Laboratory Operations Manager.

2.3 TolTest's Responsibilities

2.3.1 QA/QC Representative

The QA/QC Representative will implement and manage the analytical QC program for this DO. This individual will remain independent of direct job involvement and day-to-day operations, and will have direct access to corporate executive staff as necessary to resolve any QA dispute. They will be responsible for auditing the implementation of the QA program in conformance with this plan and TolTest's policies.

2.3.2 Data Reviewer

The TolTest Data Reviewer is responsible for the verification and validation of the analytical laboratory data to determine whether sampling and analysis requirements specified in the SAP have been met. In addition, the completeness and correctness of the data reports will be evaluated based on the quality control measures performed by the laboratory. All accumulated data will be verified by reviewing the laboratory data and associated documentation. Upon completion of the data verification, ten percent of the sample data will be validated according to the *USEPA Contract Laboratory Program Laboratory Data Validation Functional Guidelines*

for Evaluating Organic and Inorganic Analysis and/or *NEESA 20.2-047B, Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*. Data validation procedures are discussed in Section 8.0 of this plan.

2.3.3 Field Staff

It will be the responsibility of TolTest's Environmental Specialist (ES) to implement quality control measures in the field and ensure that the procedures for sample collection, equipment decontamination, sample labeling, sample shipping, and chain of custody documentation are performed in accordance with approved Sampling and Analysis Plan requirements. The Site Superintendent will ensure that quality control samples (i.e. blanks and duplicates) are obtained at the required intervals.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

The overall QA objective is to execute the project in a quality manner through the development and implementation of procedures for the following:

- Field activities, including sample collection and handling
- Chain of custody
- Equipment calibration
- Laboratory analyses
- Data validation
- Data assessment and reporting
- Internal quality control checks
- Audits
- Preventative maintenance
- Corrective action

Sufficient data must be collected to monitor the performance of monitoring activities and to ensure that the data is representative of site conditions. Efforts must be taken to reduce sample variability and sample bias. Sampling variability refers to the different values which a given function of the data takes when it is computed for two or more samples drawn from the same population. Sampling variability could be the result of variations in how the samples are taken, the time they are taken, how the sample aliquots are obtained by lab personnel, etc. Bias is a term which refers to how far the average statistic lies from the parameter it is estimating, that is, the error which arises when estimating a quantity. Errors from chance will cancel each other out in the long run, those from bias will not. The QAPP and SAP describes the specific sampling and analytical approach to fulfill the objectives. Specific DQOs include precision, accuracy, representativeness, comparability, and completeness. Sample forms can be found in **Appendix F**. For additional information, please refer to Kemron's Laboratory Quality Assurance Plan, **Appendix E**.

3.1 Precision

Precision is an estimate of variability. It is an estimate of agreement among individual measurements of the same physical or chemical property, under prescribed similar conditions. Precision is expressed either as Relative Standard Deviation (RSD) for greater than two measurements or as Relative Percent Difference (RPD) for two measurements. Precision is determined, in part by analyzing data from LCSs, MS, MSD, and MD.

3.2 Accuracy

Accuracy is defined as the ability to measure a value precisely and with minimal bias from the true value and is generally measured as the percent recovery of the measured or found value versus the known value. Accuracy in the field is assessed through the use of field and trip blanks and through the adherence to all sample handling, preservation and holding times. Laboratory accuracy is assessed through the analysis of matrix spikes (MS) or standard reference materials (SRM) and the determination of percent recoveries. Accuracy control limits are included in the SOPs.

3.3 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, a variation in a physical or chemical property at a sampling point, or an environmental condition. Data representativeness is primarily a function of sampling strategy; therefore, the sampling scheme must be designed to maximize representativeness. Representativeness also relates to ensuring that, through sample homogeneity, the sample analysis result is representative of the constituent concentration in the sample matrix. Data representativeness also documents that proper protocols and procedures have been followed thereby ensuring the accuracy and quality of the data.

3.4 Comparability

Comparability is a measure of the confidence with which one data set can be compared to another. To ensure comparability, all laboratory analysis are required to use uniform procedures (e.g. SOPs) and a uniform set of units and calculations for analyzing and reporting environmental data.

A measure of inter-laboratory comparability is obtained through the laboratory's participation in proficiency testing programs. In addition, a laboratory employs the use of blind standards provided by outside regulatory agencies as a measure of assurance of the comparability of data.

3.5 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount to be obtained under normal conditions. Factors negatively affecting completeness include the following:

- Sample leakage or breakage in transit or during handling;
- Loss of sample during laboratory analysis through accident or improper handling;
- Improper documentation such as traceability is compromised;
- Sample result is rejected due to failure to conform to QC specification.

A completeness objective is greater than 90% of the data specified by the statement of work is the goal established for most projects.

3.6 Level of Quality Control Effort

Field blank, method blank, duplicate, temperature blanks, and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs.

Field blanks (both equipment blanks and trip blanks) consisting of reagent grade water will be submitted to the analytical laboratory to provide the means to assess the quality of the data resulting from the sampling program. Equipment blank samples will be analyzed to check for procedural contamination of the field sampling equipment, which may cause contamination of samples. During the first year, the equipment blank samples will be analyzed and compared against L1/L2 and will be adjusted accordingly after the initial year. One equipment blank will be submitted for every 20 regular samples for each site (Forrestal and Supplyside). Trip blank samples are only analyzed for Volatile Organic Compounds (VOCs) to determine if samples or containers were contaminated during the collection, packaging or transportation process. Trip blanks are sent in every cooler shipped to the laboratory that contains aqueous samples for VOC analysis. No QC samples will be submitted for the waste characterization process.

Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. Duplicate samples are analyzed to check for sampling and analytical reproducibility. The general level of the QC effort will be one field duplicate for approximately every 10 samples.

Matrix spikes (MS) provide information about the effect of the sample matrix on the digestion and measurement methodology. A matrix spike duplicate (MSD) is a second aliquot of a sample that is spiked with the selected target analyte(s) and analyzed with the associated sample and MS sample. The results of the MS and MSD are used together to determine the effect of a matrix on the accuracy and precision of the analytical process. One MS/MSD sample will be collected/designated for every 20 or fewer investigative samples per sample matrix, per site.

Temperature blanks are included in every cooler shipped to the laboratory to check if temperature requirements are being met during shipment.

The number of samples to be collected and the sampling locations have been dictated by contract documents. **Table 2** lists the number of sample and groundwater samples to be taken at each landfill for each sampling event as well as the expected number of quality control samples associated with these samples. Where and when possible, samples will be batched together so that MS/MSD analysis does not become excessive. **Table 2** reflects how the batching process will be performed.

Table 2 - Quality Control Samples

QC Sample/GW Sample	*Supplyside*	*Forrestal*	*Analyte*
Equipment Blank (1 per 20 samples)	1	1	L1/L2
Trip Blank (1 per cooler)	6	6	VOC
Duplicate (1 per 10)	1	1	L1/L2
Temperature Blank (1 per cooler)	6	6	Temp C
MS/MSD (1 per 20 samples)	1	1	L1/L2
GW Sample/Event	6	6	L1/L2

4.0 CUSTODY PROCEDURES

Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence file.

4.1 Field Sample Collection

Custody procedures for field sample collection are discussed in the approved SAP, Section 3.0, Sampling Procedures.

4.2 Laboratory Analysis Custody Procedures

Laboratory custody procedures for sample receiving and log in, sample storage and numbering, tracking during sample preparation and analysis, and storage of data are described in Kemron's Quality Assurance Management Plan. The following sample collecting, handling and custody procedures will be utilized for this project:

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched. As few people as possible should handle the samples.
- All bottles will be identified by use of sample labels with Client name, date and time of collection, sample source, preservative required, name(s) of sampler, analyses requested, and sample identification.
- A properly completed chain of custody form will accompany samples. The sample numbers and locations will be listed on the chain of custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of for the sample from the sampler to the permanent laboratory.
- Samples will be properly packaged on ice at 4º C for shipment and dispatched to the laboratory for analysis with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The preferred procedure includes use of a custody seal attached to the front right and back left of the cooler. The custody seals are covered with clear plastic tape. The cooler is sealed with strapping tape in at least two locations.
- The chain of custody record identifying the contents will accompany all shipments. The original record and yellow copies will accompany the shipment and the pink copies will be retained by the sampler for returning to the project file.
- Samples will be transported by overnight carrier to the laboratory the same day the samples are collected in the field.
- Upon receipt by the laboratory, the sample custodian or designated assistant will receive the incoming samples adhering to the procedures outlined in SOP LOGIN 01. The sample

custodian will verify that the Chain-of-Custody forms and label are accurate and document any discrepancies.

- The sample will be logged into the Laboratory Information Management System (LMIS), signing the Chain-of-Custody and completing the Sample Receipt Form, reporting all inconsistencies, or anything questionable. The samples will then be paced in storage for testing.

4.3 Final Evidence File

The final evidence file will be the central repository for all documents that constitute evidence relevant to sampling and analysis activities as described in this plan. TolTest is the custodian of the evidence file and maintains the contents in a limited access area. The contents of this file include all relevant records, reports, logs, field notebooks, pictures, subcontractor reports and data reviews. At the time the final Interim Measures Report is submitted for approval as a final remedy, the evidence file will then be turned over to the Navy.

5.0 CALIBRATION AND STANDARDIZATION PROCEDURES

Calibration procedures for a specific laboratory instrument will be in accordance with KEMRON laboratories Quality Manual, Section 9.0 and will consist of an initial calibration, initial calibration verification and continuing calibration verification. Five point initial calibration curves are utilized per laboratory SOPs. Three point continuing calibration standards or check standards may be used. All calibration must be met in order to proceed with the analysis. In all cases, the initial calibration will be verified using the same or an independently prepared calibration verification solution.

The laboratory maintains a sample logbook for each instrument that will contain the following information: instrument identification, serial number, date of calibration, analyst, calibration solutions run and the samples associated with these calibrations.

5.1 Field Instrument/Equipment

The following section describes how field measurements will be conducted in the field. **Table 3** lists the identified parameters to be measured in the field and monitoring equipment calibration requirements. Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. **Table 3** also provides a summary of the calibration procedures required for the most common field equipment used during the investigations conducted at the site. Any field equipment provided by subcontractors will be calibrated according to the manufacturer's specifications.

Table 3 - Summary of Field Monitoring Equipment Calibration

Equipment	*Use*	*Units of Measure*	*Calibration Procedures*
pH meter	Each well	Standard units	Daily prior to use
temperature	Each well	° C	Daily prior to use
turbidity	Each well	NTU	Daily prior to use
Specific conductance	Each well	mS/cm	Daily prior to use
Dissolved oxygen	Each well	mg/L	Daily prior to use
ORP	Each well	mV	Daily prior to use
Water level meter	Each well	Foot	None

The satisfactory operating condition of equipment and instrumentation used on-site will be verified before each piece is shipped to the site. All equipment and instrumentation will be calibrated daily before field activities begin and immediately re-calibrated if field personnel suspect that calibration may have been altered (i.e. change of batteries, equipment being dropped or knocked about, or significant changes in temperature or humidity).

5.2 Equipment Calibration and Quality Control

Proper calibration procedures for field equipment will be followed as described in the manufacturer's instrument manuals. Daily, and in some cases more frequent, calibration of equipment will provide QA/QC checks on all equipment used during performance of project activities. All calibration logs will be kept in the equipment logbook that will be maintained for each type of instrument, in the Waukegan TolTest Office. Equipment that consistently falls out of calibration or exceeds manufacturer's critical limits will be serviced according to TolTest equipment procedures.

6.0 ANALYTICAL PROCEDURES

Kemron will implement the project required SOPs. These laboratory SOPs for sample preparation, cleanup and analysis are based on U.S. EPA Test Methods for Evaluating Solid Waste (SW-846) Washington, D.C.; Third Edition (September 1986) and revision update III (December 1996). These SOPs contain the latest promulgated information, provide sufficient details, and are specific to this project.

Samples will be analyzed for the various analytical parameters as listed in **Table 4** below.

Table 4 Analytical Parameters List

Parameter	*Method*
VOCs	8260B/1311
SVOCs	8270C
Pesticides	8081A
PCBs	8082
Metals	6010B/7000A
Organophosphorous Pesticides	8151A
Density, Color, & Order	
Chlorinated Herbicides	8151A
BTU/lb	
Flash Point (cc)	1010/ASTM D92
Reactivity with acid, base, & water	
Reactivity Sulfide & zCyanide	/9012A/9030B
PCBs	8082
Water Content	Karl Fisher
Paint Filter Test	9095A
L1	
L2	

Soil Remediation Objectives (SROs), Groundwater Remediation Objectives (GROs) have been provided by the Navy, in coordination with IEPA. Kemron's laboratory reporting limits and their respective GROs and background levels for all analyses are listed in **Appendix B** to this plan.

If soil sampling reveals constituents above SROs, the Navy will determine the appropriate disposal parameters for detected constituents. If sampling of groundwater sampling reveals constituents above GROs, the Navy will provide a report and recommendations to the IEPA for review and comment.

Samples will be analyzed in the laboratory on standard turnaround time of one to three weeks depending on analytical methodology used.

7.0 INTERNAL QUALITY CONTROL CHECKS

7.1 Field Quality Control Checks

Collection of the samples will be according to the applicable procedures discussed in the approved SAP, Section 3.0.

7.2 Laboratory Quality Control Checks

Kemron has a QC program it uses to ensure the reliability and validity of the analysis done at the laboratory. A copy of Kemron QC Program is located in **Appendix E**. All analytical procedures are documented in writing as SOPs and each SOP includes a QC section that addresses the minimum QC requirements for the procedure. The internal quality control checks might differ slightly for each individual procedure but overall the QC requirements include the following:

Equipment blanks - analyzed to check for procedural contamination of sampling equipment, which may cause contamination of the confirmation samples.

Trip blanks - analyzed to check for contamination of VOC samples during shipment to the laboratory.

Method blanks - Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures.

Reagent/preparation blanks (applicable to inorganic analysis) - Reagent blanks consist only of the reagents used to prepare samples, and they are analyzed the same way as the test samples. They identify and/or correct the signals produced by the reagents or impurities in the reagents.

Instrument blanks - Instrument blanks (system blanks) are solvent or reagent blanks that measure interference or contamination from an analytical instrument.

Matrix spikes/matrix spike duplicates - Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology of organics analysis. Duplicate samples are analyzed to check for sampling and analytical reproducibility.
Analytical spikes (Method Spike, Matrix Spike) - measure the normal level bias due to matrix effects and analytical method errors, including laboratory contamination, calibration errors, etc. Method spikes consist of solvent or reagent blanks spiked with the analytes of interest. Matrix spikes consist of a liquot of the sample spiked with analytes of interest.

Field duplicates - Field duplicate samples are analyzed to check for sampling and analytical reproducibility of field samples.

Laboratory duplicates - Laboratory duplicate samples are analyzed to check for sampling and analytical reproducibility of laboratory samples.

Laboratory control standards (QC check standards) - require certified standards, generally supplied by an outside source. They are used to measure normal level bias originating from procedural or operator errors or contamination from laboratory sources.

All data obtained will be properly recorded. The data package can allow the recipient to reconstruct QC information and compare it with QC criteria. Any samples analyzed in nonconformance with the QC criteria will be reanalyzed by the laboratory, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis when necessary.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

All data generated through field activities or by the laboratory operation will be reduced and validated before reporting. The laboratory will not distribute any data until it has been subjected to these procedures summarized in subsections below:

8.1 Data Reduction

8.1.1 Field Data Reduction Procedures

Field data reduction procedures will be minimal in scope compared with those implemented in the laboratory setting. All information pertinent to the environmental samples, including specific field collection data and laboratory observations will be recorded in permanently bound notebooks. TolTest's contract laboratory also employs a specific information management system to assist in tracking the progress of each sample through the analytical process.

8.1.2 Laboratory Data Reduction Procedures

Laboratory data reduction procedures will be in accordance with Kemron's Laboratory Quality Assurance Plan, Section 12, **Attachment E**. All raw analytical data is recorded into numerically identified laboratory notebooks. These notebooks will be issued by the Laboratory QA Manager. Data is recorded in this notebook along with other pertinent information, such as the sample identification number and the sample label number. Other details will also be recorded in the Laboratory notebook, such as the analytical method used, name of analyst, the date of analysis, matrixes sampled, reagent concentrations, instrument settings, and the raw data. Each page of the notebook will be signed and dated by the analyst. Periodic review of these notebooks by the Laboratory QA Manager takes place before final data reporting. The Laboratory QA Manager maintains records of notebook entry inspections.

Quality control data (e.g., laboratory duplicates, matrix spikes, and matrix spike duplicates) will be compared with the method acceptance criteria. Data considered acceptable will be entered into the laboratory computer system. Data summaries will be sent to the Laboratory QA Manager for review. Once approved, data is logged into the project database format. Unacceptable data will be appropriately qualified in the project report. Case narratives will be prepared which will include information concerning data that fell outside acceptance limits, and any other anomalous conditions encountered during sample analysis. After the Laboratory QA Manager approves these data, they are considered ready for third party data validation.

8.2 Data Validation

Data validation procedures will be performed for both field and laboratory operations as described below. Independent 3rd party date validation of 10% of the data package will be provided for be the Navy under a separate contract.

8.2.1 Procedures Used to Evaluate Field Data

Procedures to evaluate field data for this project primarily include checking for transcription errors and review of field logbooks, by field crewmembers. This task will be the responsibility of the QC Manager.

8.2.2 Procedures to Validate Laboratory Data

USEPA Contract Laboratory Program Laboratory Data Validation Functional Guidelines for Evaluating Organic and Inorganic Analysis will be used as the primary guide to validate laboratory data. Parameters not included in the Functional Guidelines will be validated following the criteria outlined in Section 7 of NEESA 20.2-047B, Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program. Qualifiers will be applied to the data based on results of the validation effort.

Data verification is a preliminary review to ensure that samples are labeled, preserved, shipped, maintained, and analyzed in accordance with the data quality objectives, sample analysis plan, and the work plan. The Data Reviewer will verify all data by reviewing the analytical laboratory data and associated documentation, including chain-of-custody records, sample preservation records, analytical holding times, sample data and reporting requirements. Data will be reviewed for timeliness of the report, chain-of-custody compliance, accurate sample identifications, compliance with extraction and holding times, and quality of analytical data. The Data Reviewer will conduct a systematic review and evaluation of the quality control performed by the laboratory for compliance with established criteria and to address the completeness and correctness of the data report based on the standard and sample spikes, sample duplicates, method blanks, and surrogate spikes. All method detection limits and results of initial and continuing calibration will be reviewed and evaluated.

Checks for entirety of deliverables will be administered on all data reports to decide whether all deliverables specified in this QAPP are present. At a minimum, deliverables will include sample chain-of-custody forms, analytical results, quality control summaries, and supporting raw data from instrument printouts. The reviewer will determine whether all required items are present and request copies of missing deliverables.

Following the data verification, ten percent of the data from each data package will be validated following the accepted criteria defined in the references listed in the first paragraph of this section. The Data Reviewer will identify any out-of-control data points and data omissions and interact with the laboratory to correct any data deficiencies. The Project Manager will decide whether or not to repeat sample collection and analyses based on the extent of the deficiencies and their importance in the overall context of the project.

All data generated will be computerized in a format organized to facilitate data review and evaluation. The computerized data set will include the data flags provided by KEMRON according to the Laboratory Data Validation Functional Guidelines for Evaluating Organic

Analyses (February 1994) and Inorganic Analyses (February 1994), and additional comments of the Data Reviewer. The laboratory-provided data flags will include such items as: 1) estimated concentration due to poor spike recovery, and 2) concentration of chemical also found in laboratory blanks.

The laboratory uses a number of qualification flags that are defined as follows:

Qualifier	Description
B	Present in method blank
C	Confirmed by GC/MS
CG	Confluent growth
D	The analyte was quantified at a secondary dilution factor
DL	Surrogate or spike was diluted out
E	Estimated concentration due to sample matrix interference
FL	Free liquid
I	Semi-quantitative result out of instrument calibration range present below nominal reporting limit
L	Sample reporting limits elevated due to matrix interference
N	Tentatively Identified Compound (TIC)
NA	Not Applicable
ND	Not detected at or above the reporting limit (RL)
NF	Not found
NFL	No Free liquid
NI	Non-ignitable
NS	Not spiked
P	Concentration > 40% difference between the two GC columns
QNS	Quantity not sufficient to perform analysis
RA	Re analysis confirms reported limits
RE	Re analysis confirms sample matrix interference
S	Analyzed by method of standard addition
SMI	Sample matrix interference or surrogate
SP	Reported results are for spike compounds only
U	Analyzed for but not detected
X	Exceeds regulatory limit
+	Correlation coefficient for MSA is less than 0.995
<	Less than
>	Greater than
*****	Sample spike compound out of range

The Data Reviewer will also evaluate completeness of the data package. Completeness checks will be administered on all data to decide whether deliverables specified in the QAPP are present. At a minimum, deliverables will include sample chain-of-custody forms, analytical results, QC summaries, and supporting raw data from instrument printouts if requested. The

reviewer will determine whether all required items are present and request copies of missing deliverables.

8.3 Data Reporting

Data reporting procedures will be carried out for field and laboratory operations as indicated below:

8.3.1 Field Data Reporting

Field data reporting will be conducted principally through the transmission of report sheets containing tabulated results of all measurements made in the field, documentation of all field activities, field activities to include monitoring of well construction and development forms and borehole logs.

8.3.2 Laboratory Data Reporting

The task of reporting laboratory data begins after the validation activity has been concluded. The Laboratory QA Manager must perform a final review of the report summaries and case narratives to decide whether the report meets project requirements. A Data Validation Report will be submitted for the validated data. Besides the record of chain-of-custody, the report format will consist of the following:

A. Case Narrative:
- Date of issuance
- Laboratory analysis performed
- Any deviations from intended analytical strategy
- Laboratory batch number
- Numbers of samples and respective matrices
- Quality control procedures used and references to the acceptance criteria
- Laboratory report contents
- Project name and number
- Condition of samples “as-received”
- Discussion of whether or not sample holding times were met
- Discussion of technical problems or-other observations that may have created analytical difficulties
- Discussion of any laboratory quality control checks which failed to meet project criteria
- Discussion of any corrective actions taken.
- Signature of the Laboratory QA Manager

B. Chemistry Data Package:
- Case narrative for each analyzed batch of samples

- Summary page indicating dates of analyses for samples and laboratory quality control checks
- Cross referencing of laboratory samples to project sample identification numbers
- Data qualifiers to be used should be adequately described
- Sample preparation and analyses for samples
- Sample results
- Raw data for sample results and laboratory quality control samples, including chromatograms
- Results of (dated) initial and continuing calibration checks
- Matrix spike and matrix spike duplicate recoveries, laboratory control samples, method blank results, and surrogates

A Case Narrative and Chemistry Data Package will be organized per analytical type. In each grouping, acceptance criteria will be listed, including a listing of all samples affected and their data qualifiers, and reasoning why this particular data is qualified. The Chemistry Data Package is immediately made available for review.

9.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analyses are performed according to the procedures established in the Work Plan and SAP. The audits of field and laboratory activities include two independent parts: internal and external audits.

9.1 Field Performance and System Audit

Internal audits of field activities including sampling and field measurements may be conducted by the TolTest QC Manager. These audits verify that all established procedures are being followed. Internal field audits may be conducted at the beginning of the site sample collection activities.

The audits include examination of field sampling records, field instrument operating records, sample collection, handling and packaging according to the established procedures, maintenance of QC procedures, chain-of-custody, etc. Follow up audits may be conducted to correct deficiencies, and to verify that QC procedures are maintained throughout the project. The audits involve review of field measurement records, instrumentation calibration records, and sample documentation.

External field audits may be conducted by the Navy or IEPA. External field audits may be conducted at any time during the field operations. These audits may or may not be announced and are at the discretion of the Navy or IEPA. External field audits will be conducted according to the field activity information presented in the QAPP.

9.2 Laboratory Performance and Systems Audits

The internal laboratory audit will be conducted by Kemron's QA staff. The internal Laboratory system audits will be done annually while the internal Laboratory performance audits will be conducted quarterly.

10.0 CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving and implementing measures to counter unacceptable procedures or out of quality control performance that can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation and data assessment. All corrective action proposed and implemented will be documented in the regular quality assurance reports to management. Corrective action should only be carried out after approval by the Project Manager, or his designee. If immediate corrective action is required, approvals secured by telephone from the Project Manager should be documented in an additional memorandum.

For non-compliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem will be responsible for notifying the Project Manager, who in turn will notify the Navy. Implementation of corrective action will be confirmed in writing through the same channels.

Any nonconformance with the established quality control procedures in the QAPP or SAP will be identified and corrected according to the QAPP. Corrective actions will be carried out and documented in the field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be stopped.

10.1 Field Corrective Action

Corrective action in the field can be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the SAP, etc.), or sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. TolTest's Site Superintendent will be responsible for reporting all suspected technical or QA non-conformances or suspected deficiencies to the TolTest Project Manager and the Navy. If appropriate, no additional work that is dependent on the nonconforming activity will be attempted until the corrective actions are completed.

10.2 Laboratory Corrective Action

Corrective action in the laboratory may occur before, during and after initial analyses. A number of conditions such as broken sample containers, multiple phases, low/high pH readings, potentially high concentration samples, may be identified during sample log-in or just before analysis. Following consultation with laboratory analysts and section leaders, approving the start-up of corrective action may be necessary for the Laboratory Quality Assurance Officer. The submitted SOPs specify some conditions during or after analysis that may automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, an additional sample extract cleanup, automatic re-injection/re-analysis when certain quality control criteria are not met, etc.

Corrective actions are required whenever an out-of-control event or potential out-of-control event is noted. The investigative action taken may be dependent on the analysis and the event. Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the warning or acceptable windows for precision and accuracy;
- Blanks contain target analytes above acceptable levels;
- Undesirable trends are detected in spike recoveries or RPD between duplicates;
- Unusual changes in detection limits;
- Deficiencies are detected by the QA department during internal or external audits;
- From the results of performance evaluation samples; or
- Inquiries concerning data quality are received.

Corrective action procedures are often handled at the bench level by the analyst, who reviews the preparation or extraction procedure for possible errors, checks the instrument calibration, spike and calibration mixes, instrument sensitivity, and so on. If the problem persists or cannot be identified, the matter is referred to the laboratory supervisor, manager and/or QA department for further investigation. Once it is resolved, full documentation of the corrective action procedure will be filed with the QA department.

Corrective actions are done before releasing data from the laboratory. The corrective actions will be documented in Kemron's laboratory's corrective action log (signed by analyst, section leader and quality control coordinator), and the narrative data report sent from the laboratory to the TolTest Data Reviewer. If corrective action does not rectify the situation, the laboratory will contact TolTest's Data Reviewer who will notify TolTest's Project Manager.

10.3 Corrective Action during Data Validation and Data Assessment

The need for corrective action may be identified during either data validation or data assessment. Potential types of corrective action may include re-sampling by the field team or re-injection/re-analysis of samples by the laboratory.

These actions are dependent upon the ability to mobilize the field team or whether the data to be collected is necessary to meet the required quality assurance. It is the responsibility of TolTest's Project Manager for approving the start-up of corrective action. If corrective action is required, the Project Manager will notify the Navy.

APPENDIX A

KEMRON LABORATORIES
IEPA CERTIFICATIONS

STATE OF ILLINOIS

ENVIRONMENTAL PROTECTION AGENCY
NELAP- Recognized
ENVIRONMENTAL LABORATORY ACCREDITATION

is hereby granted to

KEMRON ENVIRONMENTAL SERVICES

156 STARLITE DRIVE

MARIETTA, OH 45750

NELAP Accredited

LABORATORY ACCREDITATION NUMBER: 200019

According to the Illinois Administrative Code, Title 35, Subtitle A, Chapter II, Part 186, ACCREDITATION OF ENVIRONMENTAL LABORATORIES, the State of Illinois formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed below.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part 186 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part 186. Please contact the Illinois EPA Environmental Laboratory Accreditation Program (IL ELAP) to verify the laboratory's scope of accreditation and accreditation status. Accreditation by the State of Illinois is not an endorsement or a guarantee of validity of the data generated by the laboratory.

Primary Accrediting Authority: FL Department of Health, Bureau of Laboratories

Ron Turpin
Manager
Environmental Laboratory Accreditation Program

Jim Shaw
Accreditation Officer
Environmental Laboratory Accreditation Program

Certificate No.: 001271
Expiration Date: 04/30/2006
Issued On: 06/17/2005

State of Illinois
Environmental Protection Agency
Awards the Certificate of Approval

Certificate No.:	001271
Expiration Date:	04/30/2006
Issued On:	06/17/2005

Kemron Environmental Services
156 Starlite Drive
Marietta, OH 45750
Laboratory Accreditation Number: 200019

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Hazardous and Solid Waste, Inorganic

1010

Ignitability

1311

TCLP (Organic and Inorganic)

1312

Synthetic Precipitation Leaching Procedure

6010B

Aluminum	Antimony	Arsenic
Barium	Beryllium	Boron
Cadmium	Calcium	Chromium
Cobalt	Copper	Iron
Lead	Lithium	Magnesium
Manganese	Molybdenum	Nickel
Potassium	Selenium	Silica
Silver	Sodium	Strontium
Strontium	Thallium	Tin
Titanium	Vanadium	Zinc

6020

Antimony	Arsenic	Lead
Selenium	Thallium	

7041

Antimony

7060A

Arsenic

7421

Lead

7470A

Mercury

7471A

Mercury

7740

Selenium

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Hazardous and Solid Waste, Inorganic ***7841***

Thallium

9010B

Cyanide

9040B

Hydrogen Ion (pH)

9045C

Hydrogen Ion (pH)

9056

Bromide	Chloride	Fluoride
Nitrate	Nitrite	Sulfate

9060

Total Organic Carbon (TOC)

Chapter 7/9014

Reactive Cyanide

Chapter 7/9034

Reactive Sulfide

Hazardous and Solid Waste, Organic

8011

1,2-Dibromo-3-chloropropane (DBCP)	1,2-Dibromoethane (EDB)

8015B

2-Propanol (Isopropyl alcohol)	Ethanol	Ethylene glycol
Methanol		

8021B

1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene
Benzene	Chlorobenzene	Ethylbenzene
MTBE (Methyl-t-butyl ether)	Toluene	Total Xylenes

8081A

4,4'-DDD	4,4'-DDE	4,4'-DDT
Aldrin	alpha-BHC	alpha-Chlordane
beta-BHC	Chlordane - not otherwise specified	delta-BHC
Dieldrin	Endosulfan I	Endosulfan II
Endosulfan sulfate	Endrin	Endrin aldehyde
Endrin ketone	gamma-BHC (Lindane)	gamma-Chlordane
Heptachlor	Heptachlor epoxide	Methoxychlor
Toxaphene		

8082

PCB-1016	PCB-1221	PCB-1232
PCB-1242	PCB-1248	PCB-1254
PCB-1260		

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Hazardous and Solid Waste, Organic

8151A

2,4,5-T	2,4,5-TP (Silvex)	2,4-D
2,4-DB	Dalapon	Dicamba
Dichloroprop	Dinoseb	MCPA
MCPP	Pentachlorophenol	

8260B

1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene
1,1-Dichloropropene	1,2,3-Trichlorobenzene	1,2,3-Trichloropropane
1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,2-Dibromo-3-chloropropane (DBCP)
1,2-Dibromoethane (EDB)	1,2-Dichlorobenzene	1,2-Dichloroethane
1,2-Dichloropropane	1,3,5-Trimethylbenzene	1,3-Dichlorobenzene
1,3-Dichloropropane	1,4-Dichlorobenzene	1,4-Dioxane
2,2-Dichloropropane	2-Butanone (Methyl ethyl ketone, MEK)	2-Chloroethyl vinyl ether
2-Chlorotoluene	2-Hexanone	2-Nitropropane
4-Chlorotoluene	4-Methyl-2-pentanone (Methyl isobutyl ketone, I	Acetone
Acetonitrile	Acrolein (Propenal)	Acrylonitrile
Benzene	Bromobenzene	Bromochloromethane
Bromodichloromethane	Bromoform	Bromomethane
Carbon disulfide	Carbon tetrachloride	Chlorobenzene
Chlorodibromomethane (Dibromochloromethan	Chloroethane	Chloroform
Chloromethane	Chloroprene	cis-1,2-Dichloroethene
cis-1,3-Dichloropropene	Dibromofluoromethane	Dibromomethane
Dichlorodifluoromethane	Dichloromethane (Methylene chloride)	Diethyl ether
Ethyl methacrylate	Ethylbenzene	Hexachlorobutadiene
Isopropylbenzene	Methacrylonitrile	Methyl acrylate
Methyl ethyl ketone	Methyl iodide (Iodmethane)	Methyl isobutyl ketone
Methyl methacrylate	Methyl-t-butyl ether	Naphthalene
n-Butylbenzene	n-Propylbenzene	p-Isopropyltoluene
sec-Butylbenzene	Styrene	t-Butyl alcohol
tert-Butylbenzene	Tetrachloroethene	Toluene
trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	trans-1,4-Dichloro-2-butene
Trichloroethene	Trichlorofluoromethane	Vinyl acetate
Vinyl chloride	Xylenes (Total)	

8270C

1,2,4,5-Tetrachlorobenzene	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene
1,2-Diphenylhydrazine	1,3,5-Trinitrobenzene (1,3,5-TNB)	1,3-Dichlorobenzene
1,3-Dinitrobenzene (1,3-DNB)	1,4-Dichlorobenzene	1,4-Naphthoquinone
1,4-Phenylenediamine	1-Naphthylamine	2,3,4,6-Tetrachlorophenol
2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol
2,4-Dimethylphenol	2,4-Dinitrophenol	2,4-Dinitrotoluene (2,4-DNT)
2,6-Dichlorophenol	2,6-Dinitrotoluene (2,6-DNT)	2-Acetylaminofluorene
2-Chloronaphthalene	2-Chlorophenol	2-Methylnaphthalene
2-Methylphenol (o-Cresol)	2-Methylpyridine (2-Picoline)	2-Nitroaniline

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Hazardous and Solid Waste, Organic

8270C

3,3'-Dichlorobenzidine
3-Nitroaniline
4-Bromophenyl phenyl ether
4-Chlorophenyl phenyl ether
4-Nitrophenol
Acenaphthene
alpha,alpha-Dimethylphenethylamine
Aramite
Benzo(a)pyrene
Benzo(k)fluoranthene
Bis(2-chloroethoxy) methane
Bis(2-ethylhexyl) phthalate
Chrysene
Dibenzofuran
Dimethyl phthalate
Diphenylamine
Famphur
Hexachlorobenzene
Hexachloroethane
Indeno(1,2,3-cd) pyrene
Isosafrole
Methyl methanesulfonate
Nitrobenzene
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
N-Nitrosopiperidine
o-Toluidine
Pentachloronitrobenzene
Phenanthrene
Pronamide
Safrole
3,3'-Dimethylbenzidine
4,6-Dinitro-2-methylphenol
4-Chloro-3-methylphenol
4-Methylphenol (p-Cresol)
5-Nitro-o-toluidine
Acenaphthylene
Aniline
Benzidine
Benzo(b)fluoranthene
Benzoic acid
Bis(2-chloroethyl) ether
Butyl benzyl phthalate
Diallate
Diethyl phthalate
Di-n-butyl phthalate
Disulfoton
Fluoranthene
Hexachlorobutadiene
Hexachlorophene
Isodrin
Kepone
Methyl parathion
Nitroquinoline-1-oxide
N-Nitrosodi-n-butylamine (N-Nitrosodibutylamin
N-Nitrosomethylethylamine
N-Nitrosopyrrolidine
Parathion
Pentachlorophenol
Phenol
Pyrene
Thionazine (Zinophos)
2-Nitrophenol
3-Methylcholanthrene
4-Aminobiphenyl
4-Chloroaniline
4-Nitroaniline
7,12-Dimethylbenz(a)anthracene
Acetophenone
Anthracene
Benzo(a)anthracene
Benzo(g,h,i)perlyene
Benzyl alcohol
Bis(2-chloroisopropyl) ether
Carbazole
Dibenz(a,h)anthracene
Dimethoate
Di-n-octyl phthalate
Ethyl methanesulfonate
Fluorene
Hexachlorocyclopentadiene
Hexachloropropene
Isophorone
Methapyrilene
Naphthalene
N-Nitrosodiethylamine
N-Nitrosodi-n-propylamine
N-Nitrosomorpholine
O,O,O-Triethyl phosphorothioate
Pentachlorobenzene
Phenacetin
Phorate
Pyridine

8310

Acenaphthene
Benzo(a)anthracene
Benzo(g,h,i)perylene
Fluoranthene
Indeno(1,2,3-cd) pyrene
Acenaphthylene
Benzo(a)pyrene
Chrysene
Fluoranthene
Naphthalene
Anthracene
Benzo(b)fluoranthene
Dibenz(a,h)anthracene
Fluorene
Phenanthrene

8330

1,3,5-Trinitrobenzene (1,3,5-TBN)
2,4-Dinitrotoluene (2,4-DNT)
4-Amino-2,6-dinitrotoluene (4-Am-DNT)
m-Nitrotoluene (3-Nitrotoluene, 3-NT)
o-Nitrotoluene (2-Nitrotoluene, 2-NT)
1,3-Dinitrobenzene (1,3-DNB)
2,6-Dinitrotoluene (2,6-DNT)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
Nitrobenzene
p-Nitrotoluene (4-Nitrotoluene, 4-NT)
2,4,6-Trinitrotoluene (2,4,6-TNT)
2-Amino-4,6-dinitrotoluene (2-Am-DNT)
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

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Wastewater, Inorganic

HACH8000

Chemical Oxygen Demand (COD)

SM2320B,18Ed

Alkalinity

SM2340B,18Ed

Hardness

SM3500 Cr-D

Chromium VI

SM4500F-B,C18Ed

Fluoride

SM5210B,18Ed

Biochemical Oxygen Demand (BOD) — Carbonaceous Biochemical Oxygen Demand (C

USEPA110.2

Color

USEPA120.1

Specific Conductance

USEPA130.2

Hardness

USEPA150.1

Hydrogen Ion (pH)

USEPA160.1

Residue (TDS)

USEPA160.2

Residue (TSS)

USEPA160.3

Residue (Total)

USEPA160.4

Residue (Volatile)

USEPA160.5

Residue (Settable solids)

USEPA1664R4_95

Oil and grease — Total Petroleum Hydrocarbons

USEPA1664RA

Oil and Grease

USEPA180.1

Turbidity

USEPA200.7

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Wastewater, Inorganic

USEPA200.7

		Aluminum
Antimony	Arsenic	Barium
Beryllium	Boron	Cadmium
Calcium	Chromium	Cobalt
Copper	Iron	Lead
Magnesium	Manganese	Molybdenum
Nickel	Potassium	Selenium
Silica	Silver	Sodium
Thallium	Tin	Titanium
Vanadium	Zinc	

USEPA200.8R5.4

Antimony	Arsenic	Selenium
Thallium		

USEPA204.2

Antimony

USEPA206.2

Arsenic

USEPA239.2

Lead

USEPA245.1

Mercury

USEPA270.2

Selenium

USEPA279.2

Thallium

USEPA300.0R2.1

Bromide	Chloride	Fluoride
Nitrate	Nitrate-Nitrite (sum)	Nitrite
Orthophosphate (as P)	Sulfate	

USEPA305.1

Acidity

USEPA310.1

Alkalinity

USEPA320.1

Bromide

USEPA325.2

Chloride

USEPA335.1

Cyanide, Amenable

USEPA335.2

State of Illinois
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Kemron Environmental Services
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Wastewater, Inorganic

USEPA335.2
Cyanide

USEPA340.2
Fluoride

USEPA350.1
Ammonia

USEPA351.2
Total Kjeldahl Nitrogen

USEPA353.2
Nitrate (total)
Nitrate-Nitrite (sum)

USEPA354.1
Nitrite

USEPA365.2
Orthophosphate
Orthophosphate (as P)

USEPA365.4
Phosphorus

USEPA370.1
Silica

USEPA375.4
Sulfate

USEPA376.1
Sulfide

USEPA405.1
Biochemical Oxygen Demand (BOD)

USEPA410.4
Chemical Oxygen Demand (COD)

USEPA413.1
Oil and Grease

USEPA415.1
Total Organic Carbon (TOC)

USEPA420.1
Phenolics

USEPA425.1
Surfactants

Wastewater, Organic

USEPA602
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Benzene
Chlorobenzene
Ethylbenzene
Toluene

State of Illinois
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Wastewater, Organic

USEPA608

4,4'-DDD	4,4'-DDE	4,4'-DDT
Aldrin	alpha-BHC	beta-BHC
Chlordane	delta-BHC	Dieldrin
Endosulfan I	Endosulfan II	Endosulfan sulfate
Endrin	Endrin aldehyde	gamma-BHC (Lindane)
Heptachlor	Heptachlor epoxide	PCB-1016
PCB-1221	PCB-1232	PCB-1242
PCB-1248	PCB-1254	PCB-1260
Toxaphene		

USEPA624

1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane
1,1-Dichloroethane	1,1-Dichloroethene	1,2-Dichlorobenzene
1,2-Dichloroethane	1,2-Dichloropropane	1,3-Dichlorobenzene
1,4-Dichlorobenzene	2-Chloroethylvinyl ether	Acrolein (Propenal)
Acrylonitrile	Benzene	Bromodichloromethane
Bromoform	Bromomethane	Carbon tetrachloride
Chlorobenzene	Chloroethane	Chloroform
Chloromethane	cis-1,3-Dichloropropene	Dibromochloromethane
Dichloromethane (Methylene chloride)	Ethylbenzene	Tetrachloroethene
Toluene	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene
Trichloroethene	Trichlorofluoromethane	Vinyl chloride
Xylenes (total)		

USEPA625

1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene
1,4-Dichlorobenzene	2,4,6-Trichlorophenol	2,4-Dichlorophenol
2,4-Dimethylphenol	2,4-Dinitrophenol	2,4-Dinitrotoluene (2,4-DNT)
2,6-Dinitrotoluene (2,6-DNT)	2-Chloronaphthalene	2-Chlorophenol
2-Methyl-4,6-dinitrophenol	2-Nitrophenol	3,3'-Dichlorobenzidine
4-Bromophenyl phenyl ether	4-Chloro-3-methylphenol	4-Chlorophenyl phenyl ether
4-Nitrophenol	Acenaphthene	Acenaphthylene
Anthracene	Benzidine	Benzo(a)anthracene
Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene
Benzo(k)fluoranthene	Benzyl butyl phthalate	Bis(2-chloroethoxy) methane
Bis(2-chloroethyl) ether	Bis(2-ethylhexyl) phthalate	Chrysene
Dibenz(a,h)anthracene	Diethyl phthalate	Dimethyl phthalate
Di-n-butyl phthalate	Di-n-octyl phthalate	Fluoranthene
Fluorene	Hexachlorobenzene	Hexachlorobutadiene
Hexachlorocyclopentadiene	Hexachloroethane	Indeno(1,2,3-cd) pyrene
Isophorone	Naphthalene	Nitrobenzene
N-Nitrosodimethylamine	N-Nitrosodi-n-propylamine	N-Nitrosodiphenylamine
Pentachlorophenol	Phenanthrene	Phenol
Pyrene		

APPENDIX B

KEMRON LABORATORIES
LABORATORY REPORT LIMITS

KEMRON LABORATORY REPORT LIMITS

8260-Target Compound List

Compound	Units	MDL	RDL	LCL	UCL	GRO Class I	GRO Class II
1,1,1,2-Tetrachloroethane	ug/L	0.25	1	80	130	210	1,050
1,1,1-Trichloroethane	ug/L	0.25	1	80	134	200	1,000
1,1,2,2-Tetrachloroethane	ug/L	0.125	1	79	125	420	420
1,1,2-Trichloroethane	ug/L	0.25	1	80	125	5.0	50
1,1-Dichloroethane	ug/L	0.125	1	80	125	700	3,500
1,1-Dichloroethene	ug/L	0.5	1	80	138	7	35
1,1-Dichloropropene	ug/L	0.25	1	74	139	NV	NV
1,2,3-Trichlorobenzene	ug/L	0.125	1	62	140	70	70
1,2-Dichloropropane	ug/L	0.125	1	80	120	5.0	25
4-Methyl-2-pentanone	ug/L	2.5	5	64	140	NV	NV
2-Hexanone	ug/L	2.5	5	56	136	280	280
2-Butanone	ug/L	2.5	5	58	149	NV	NV
2,2-Dichloropropane	ug/L	0.25	1	80	133	NV	NV
1,4-Dichlorobenzene	ug/L	0.125	1	80	120	75	375
1,3-Dichloropropane	ug/L	0.2	1	80	120	5	25
1,3-Dichlorobenzene	ug/L	0.25	1	80	120	6.3	31.5
1,3,5-Trimethylbenzene	ug/L	0.25	1	80	127	350	1,750
1,2,3-Trichloropropane	ug/L	0.75	1	80	126	1.0	1.0
Dichlorodifluoromethane	ug/L	0.25	1	50	133	1,400	7,000
Dibromochloromethane	ug/L	0.25	1	80	127	140	140
cis-1,3-Dichloropropene	ug/L	0.25	1	80	132	Note #7	Note #7
cis-1,2-Dichloroethene	ug/L	0.25	1	80	121	70	200
Methyl chloride	ug/L	0.25	1	60	130	5.0	50
Chloroform	ug/L	0.125	1	80	125	0.2	1.0
Chloroethane	ug/L	0.5	1	77	133	2,800	14,000
Chlorobenzene	ug/L	0.125	1	80	120	100	500
Carbon tetrachloride	ug/L	0.25	1	80	137	5.0	25
Trichlorofluoromethane	ug/L	0.25	1	62	151	2,100	10,500
Trichloroethene	ug/L	0.25	1	80	125	5	25
trans-1,3-Dichloropropene	ug/L	0.5	1	80	130	Note #7	Note #7
trans-1,2-Dichloroethene	ug/L	0.25	1	80	127	100	500
Toluene	ug/L	0.25	1	80	128	1000	2500
Tetrachloroethene	ug/L	0.25	1	80	124	5.0	25
tert-Butylbenzene	ug/L	0.25	1	80	126	70	350
Styrene	ug/L	0.125	1	80	123	100	500
sec-Butylbenzene	ug/L	0.25	1	80	127	70	350
m-,p-Xylene	ug/L	0.5	1	80	122	Note #8	Note #8
o-Xylene	ug/L	0.25	1	80	122	Note #8	Note #8
Tetrahydrofuran	ug/L	25	50	60	140	1400	1400

KEMRON LABORATORY REPORT LIMITS

8260-Target Compound List

Compound	Units	MDL	RDL	LCL	UCL	GRO Class I	GRO Class II
4-Chlorotoluene	ug/L	0.25	1	80	126	NV	NV
2-Chlorotoluene	ug/L	0.125	1	80	127	140	700
Trans-1,4-dichloro-2-butene	ug/L	1	5			NV	NV
Ethyl acetate	ug/L	13.55	50			6,300	6,300
1,2-Dibromo-3-chloropropane	ug/L	1	5	65	129	0.2	0.2
Dibromomethane	ug/L	0.25	1	80	126	70	70
2-Chloroethyl vinyl ether	ug/L	2	10	10	211	NV	NV
Bromomethane	ug/L	0.5	1	61	151	9.8	49
Acrylonitrile	ug/L	2.5	100			5.0	5.0
Vinyl chloride	ug/L	0.25	1	65	140	2.0	10
Vinyl acetate	ug/L	2.5	5	10	285	7,000	7,000
p-Isopropyltoluene	ug/L	0.25	1	80	122	NV	NV
n-Propylbenzene	ug/L	0.125	1	80	129	70	350
n-Butylbenzene	ug/L	0.25	1	80	131	70	350
Methylene chloride	ug/L	0.25	2	80	123	5.0	50
Methyl methacrylate	ug/L	2.5	5			NV	NV
Isopropylbenzene	ug/L	0.25	1	80	122	700	3500
Methyl Iodide	ug/L	0.5	5	10	308	NV	NV
Ethyl benzene	ug/L	0.25	1	80	122	700	1,000
Carbon disulfide	ug/L	0.5	1	58	138	700	3,500
Bromoform	ug/L	0.54	1	74	130	1.0	1.0
Bromodichloromethane	ug/L	0.25	1	80	131	0.2	0.2
Bromochloromethane	ug/L	0.2	1	80	124	NV	NV
Bromobenzene	ug/L	0.125	1	80	120	NV	NV
Benzene	ug/L	0.125	1	80	123	5.0	25
Acrolein	ug/L	5	10			3.5	3.5
Acetone	ug/L	2.5	5	40	142	700	700
1,2,4-Trichlorobenzene	ug/L	0.2	1	77	131	70	700
1,2,4-Trimethylbenzene	ug/L	0.25	1	80	125	350	1,750
1,2-Dibromoethane	ug/L	0.25	1	80	125	0.05	0.5
1,2-Dichlorobenzene	ug/L	0.125	1	80	125	600	1,500
1,2-Dichloroethane	ug/L	0.25	1	80	129	5	25
1,4-Dichlorobenzene-d4				0	0	NV	NV
Chlorobenzene-d5				0	0	NV	NV
Fluorobenzene				0	0	NA	NA
1,2-Dichloroethane-d4	% Recovery			80	120		
Toluene-d8	% Recovery			88	110		
Dibromofluoromethane	% Recovery			86	118		
p-Bromofluorobenzene	% Recovery			86	115		

KEMRON LABORATORY REPORT LIMITS

8260-Target Compound List

Compound	Units	MDL	RDL	LCL	UCL	GRO Class I	GRO Class II
Note #7: The sum of the concentrations of *cis*- and *trans*- 1,3-Dichloropropene should be compared to the							
GWROs of 0.001 mg/L for Class I and 0.005 mg/L for Class II.							
Note #8: The sum of o-, m-, and p-Xylene should be compared to the GWROs of 10.0 mg/L for Class I and							
Class II.							
Notes:							
1. ug/L is micrograms per liter							
2. MDL is Method Detection Limit							
3. RDL is Reporting Detection Limit							
4. LCL is Lower Control limits							
5. UCL is Upper Control Limits							
6. GRO is Groundwater Remediation Objective							

APPENDIX C

STANDARD PWC REQUIREMENTS FOR TOXICITY CHARACTERISTIC LEACHING PROCEDURES (TCLP) ANALYSIS

Standard PWC Requirements for
Toxicity Characteristic Leaching Procedures (TCLP) Analysis

- RCRA Metals (As,Ba,Cd,Cr,Hg,Pb,Se,Ag) 6010
- Volatile Organic Compounds (VOC's) 8260
  w/ extraction for Volatiles (ZHE)
- Semi-Volatile Organic Compounds (SVOC's) 8270
- Density, Color, and Odor
- BTU/Lb
- Flash Point (cc) 1010
- pH
- Reactive with Acid, Base, and Water 7.3.1
- Reactive Sulfide and Cyanide 7.3.2
- Phenolics (Low Level Detection)
- Polychlorinated Biphenyls (PCB's) 8080
- Water Content (Karl Fisher)
- Paint Filter Test 9095
- Organochlorine Pesticides 8080
- Chlorinated Herbicides 8150

APPENDIX D

L1 & L2 SAMPLING PROTOCOL

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
GROUNDWATER – LIST L1

TEST PARAMETERS	*METHODS*
RCRA Metals: As, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Ag, An by ICP	200.7
Pb by GFAA	239.2
Cyanide	335.2
Oils	413.1/413.2
TDS	160.1
NH3 – Ammonia	350.1/350.2
BOD	405.1
Phosphorus	365.1/365.2
Cr-Hex	218.4/218.5
Fluoride	413A
Phenols	420.1
TSS	160.2
Bacterial – Fecal Coliform	909C
Hg – Mercury	245.1/245.2/245.5
COD	410.1/410.2

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
GROUNDWATER – LIST L2

TEST PARAMETERS	*METHOD*
VOC 8260	8260
SVOC 8270 w/PNA SIM	8270
Herbicides 8151	8151
Chlorinated Pesticides 8081	8081
PCB's 8082	8082
N/P Pesticides 507	507
Carbamates Pesticides 531.1 (Subbed out)	531.1
23 TAL Metals (TACO Limits) 6010-7841-7471	6010/7841/7471
NH3 – Ammonia	350.1/350.2
Bacterial – Fecal Coliform	909C
COD	410.1/410.2
Chloride	325.2/325.3
Cyanide	335.2
Fluoride	413A
Nitrate	352.1
Oil, Hexane Soluble	1664
Phenols	420.1
Phosphorus	365.1/365.2
Sulfate	375.4
TDS	160.1
TOC	415.1
TSS	160.2

APPENDIX E

KEMRON LABORATORIES QUALITY ASSURANCE PROJECT PLAN

KEMRON
ENVIRONMENTAL SERVICES

LABORATORY QUALITY ASSURANCE PLAN

Prepared by:

KEMRON Environmental Services, Inc.

156 Starlite Drive
Marietta, OH 45750

Issue Date: 15 February 2005
Revision 6

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KEMRON
ENVIRONMENTAL SERVICES

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KEMRON Environmental Services
LABORATORY QUALITY ASSURANCE PLAN
Ohio Valley Laboratory

Revision 6

Issue/Implementation Date: 15 February 2005

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Prepared by:

KEMRON Environmental Services, Inc.
156 Starlite Drive
Marietta, Ohio 45750
(740) 373-4071

David L. Bumgarner, Quality Assurance Officer — Date: 2/8/05

David E. Vandenberg, Vice President/Laboratory Director — Date: 2/11/05

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KEMRON
ENVIRONMENTAL SERVICES

Laboratory Quality Assurance Plan

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Laboratory Quality Assurance Plan

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3.0 STATEMENT OF POLICY

This Quality Manual summarizes the policies and operational procedures of KEMRON Environmental Services, located at 156 Starlite Drive in Marietta, Ohio. Specific protocols for sample handling and storage, chain-of-custody, laboratory analyses, data reduction, correction action, and reporting are described. All policies and procedures have been structured in accordance with the NELAC standards adopted in July 1999 (current as of the date of this publication) and applicable EPA requirements, regulations, guidance, and technical standards. This manual has been prepared in accordance with the guidance documents listed in Section 16. Further details on these policies and procedures are contained in SOPs and related documents. This Quality Manual, SOPs, and related documentation describe the quality system for KEMRON Environmental Services.

KEMRON's management commitment to providing quality services, data results and information to our clients is embodied in KEMRON's corporate policy on quality assurance. Every level of management, the laboratory staff, and project scientists are committed to the quality assurance (QA) program described in this Quality Manual and as such ensure that the appropriate facilities and resources are available before producing any analytical results.

KEMRON performs chemical analyses for inorganic and organic constituents in water, solid, and hazardous waste. KEMRON's goal's are as follows:

- to protect our clients' interests by providing them with fully documented, legally defensible data useable for sound environmental decisions;
- ensure our client's confidentiality through safeguards related to data reporting by telephone, facsimile, modem, diskette, mail or other means;
- shelter our company's two most important resources, our people and our reputation, by maintaining an environment that fosters excellence and;
- guard against and correct performance shortcomings which could erode data or technical quality

All of our work will be performed in an absolutely professional manner, and all data will be scientifically valid, legally defensible, of known precision and accuracy, and of known and fully documented quality in accordance with standards developed by the National Environmental Laboratory Accreditation

Conference (NELAC) and any applicable state or EPA regulations or requirements. A Certification Statement (see Appendix A) has been recorded to this effect.

This program will be revised as needed to address special client or project requirements and to keep pace with developing technologies, good laboratory practices and total management of testing services.

KEMRON analyzes Proficiency Test (PT) samples at least two times per year from a NIST-approved PT provider for the analytes established by EPA for water and NELAC samples. The specific analytes analyzed are based on the current scope of the laboratory services.

All new employees are educated and trained in their ethical and legal responsibilities including the potential punishments and penalties for improper, unethical or illegal actions. Our written policy for ethical standards of behavior exists in a separate document entitled "Ethics Policy". In the unlikely event that departures from documented policies and procedures (either technical or non-technical) becomes necessary, only the Laboratory Director or Quality Assurance Officer have the authority to approve such deviations.

4.0 ORGANIZATION AND RESPONSIBILITY

KEMRON Environmental Services, Inc. has its corporate headquarters in Vienna, Virginia. The corporate organizational chart for KEMRON Environmental Services, Inc. is given in Figure 4-1. KEMRON's laboratory in Marietta, Ohio (Ohio Valley Laboratory) is a full service environmental laboratory facility for analysis of groundwater, municipal and industrial waste water, soil and solid waste. The Ohio Valley Laboratory's organizational chart is presented in Figure 4-2 along with a laboratory floor plan, which is provided in Figure 4-3. KEMRON's Analytical Statement of Qualifications provides the qualifications and experience summaries for key professionals within KEMRON. The duties and responsibilities of all key positions at the Ohio Valley facility are provided below.

4.1 Key Personnel

Laboratory Director, Vice President - The Vice President of Analytical Services serves as the Laboratory Director, reports to the President, and has general responsibility for business development and operations. Included are strategic planning, business development, resource allocation and profit and loss for the analytical division as a whole. It is the Vice President's responsibility to obtain and develop both financial and personnel resources in an effort to maintain quality services and to match resources with the market demands. Primary responsibilities include proposal development and review, production management, and quality control of all analytical services. Other duties include oversight of the laboratory safety and waste management programs, certifying that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited, monitoring standards of performance in quality control and quality assurance, and ensuring that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory. The director has the authority to stop production if a quality problem is confirmed.

Quality Assurance Officer (QAO) - The QAO reports to the Vice President and is independent of production responsibilities. The responsibilities of the QAO include monitoring the day-to-day quality of all data produced by the laboratory, ensure and document the reliability of this data and to stop production of any data of suspect quality. Other duties include internal auditing to ensure compliance with the laboratory protocols, reviewing record keeping and ancillary documents, maintaining updated SOPs, and monitors the status of all laboratory certification including NELAP. The QAO is responsible for

introduction of all external PT samples to the laboratory, preparation of all performance evaluation reports and additionally reviews and submits corrective action reports for all unacceptable scores. The QAO is responsible for coordinating external audits and submitting corrective action reports for any deficiencies, which are identified. The QAO organizes and prepares the annual QA/QC plan revision and is responsible for monitoring of all control charting activities and review of the control limits, which are generated from these activities. The QAO has overall responsibility for the MIS Group. The QAO also has authority to stop work if a specific QC problem is confirmed.

Metals Laboratory Supervisor - The Supervisor reports to the Laboratory Director. This person coordinates the production and quality control of all work involving digestion and analysis of samples by AA and ICP methods in accordance with company policies and Standard Operating Procedures (SOP). General duties include implementation of laboratory safety program in the metals department, implementation of the laboratory quality control program for metals analyzed in accordance with company SOPs and prudent laboratory practices, scheduling, production of routine and non-routine work, supervising all technicians/analysts involved in standard preparation, and instrumental analyses. Other duties include the scheduling of routine maintenance and emergency service for departmental instrumentation, preparing daily work schedules for full and part-time employees, monitoring departmental backlogs, turnaround time, priority analysis deadlines, reviewing and approving data generated by the metals department.

Conventionals / Wet Chemistry - The supervisor reports to the Laboratory Director. This person coordinates the production and quality control of all work involving preparation and analysis of samples by wet chemical methods in accordance with company policies and Standard Operating Procedures (SOP). General duties include implementation of laboratory safety program in the Wet Chemistry department, implementation of the laboratory quality control program for wet chemical analysis in accordance with company SOPs and prudent laboratory practices, scheduling production of routine and non-routine work, supervising all technicians/analysts involved in sample preparation, standard preparation, and instrumental analyses.

Volatile Organics Supervisor - The supervisor reports to the Laboratory Director. This person coordinates the production and quality control of all work involving preparation and analysis of samples for volatile organics analysis (VOA) by GC/PID/FID/TCD and GC/MS methods in accordance with company policies, client QAPPs, and Standard Operating Procedures (SOP). Specific

duties include, but are not limited to, implementation of laboratory safety program in the department, implementation of the laboratory quality control program for volatile organics analyzed in accordance with company SOPs, scheduling production of routine and non-routine work, supervising all technicians/analysts, instrumental analyses, scheduling routine maintenance and emergency service for departmental instrumentation, preparing daily work schedules for employees, monitoring departmental backlogs, turnaround time, and priority analysis deadlines and reviewing approving data generated by the department.

Semivolatile Organics Supervisor - The supervisor reports to the Laboratory Director. This person coordinates the production and quality control of all work involving instrumental analysis of samples by HPLC, GC/FID, GC/ECD, and GC/MS employing semivolatile methods in accordance with company policies and Standard Operating Procedures (SOP). General duties include implementation of laboratory safety program in the department, implementation of the laboratory quality control program for semivolatile organics analyzed in accordance with company SOPs and prudent laboratory practices. Other duties include scheduling production of routine and non-routine work, supervising technicians/analysts involved in standard preparation and instrumental analyses, scheduling routine maintenance and emergency service for departmental instrumentation, preparing daily work schedules of full and part-time employees, monitoring departmental backlogs, turnaround time, and priority analysis deadlines and reviewing and approving data generated by the department.

Organic Sample Preparation Supervisor - The supervisor reports directly to the Laboratory Director, and has responsibility for all organic extractions. He ensures that all samples for inorganic and organics analysis are prepared in accordance with the appropriate USEPA methods, that appropriate QC samples are prepared, and that all samples are prepared within the appropriate regulatory holding times. Other responsibilities include preparation of samples for extractable organic analysis, methods development for unusual matrices and preparation of standards, sample cleanup as required, TCLP extraction procedures, ordering of supplies and standards for extraction laboratory, and maintenance of extraction lab documentation.

MIS Manager - The MIS Manager reports to the QAO and is responsible for the local area network (LAN) hardware and software. General duties include maintenance of the hardware for the network, programming and maintenance of the Laboratory Information Management System (LIMS), and other

office/laboratory software applications. The MIS department is responsible for application programming, system troubleshooting, hardware repair, training, internal consultation for systems problems and special projects, the development and testing of electronic data deliverables (EDD), and special programs to improve the efficiency and productivity of the network and LIMS. A staff of systems and applications programmers assists the MIS Manager.

Sales and Service Teams - To address the increasingly customized needs of our diversified clientele, KEMRON has reorganized into Sales and Service Teams. These teams are dedicated to a discrete list of clients and are fully trained across internal administrative processes and client/project-specific criteria. Each team consists of a Team Leader, a Team Chemist/Data Specialist and a Team Client Services Specialist. Through rigorous cross training, team representatives hold both primary and back-up responsibility for a variety of elements in the process chain, matching skill sets and experience to each role. The following is an overview of each team member's primary responsibilities:

Team Leaders – Team Leaders have comprehensive managerial responsibilities for the performance of their team. As departmental managers, they perform a supervisory role, although team members are largely self-directed. Additionally the Team Leaders are responsible for all sales and marketing activities associated with their current clients and new prospects. Included in that role are all typical selling functions, plus quotation/proposal preparations, on-site presentations, contract review/negotiation, creation of marketing materials, attendance at trade shows and credit/collection monitoring. Team Leaders also are an integral part of continuing process and product refinements. As the laboratory's critical link to their respective clients, team leaders canvas for and recommend new service areas and improvements across the entire process chain.

Team Chemists/Data Specialist - The Team Chemist/Data Specialists (TCDS) perform important functions at the beginning and end of the process chain. At project inception, they critically review all data quality objectives, EDD specifications, and regulatory/program requirements and customize instructions to the laboratory and MIS staff accordingly. Method builds, new regulatory/field applications and other non-routine requests are researched and processed by the TCDS, with the support of senior management. All finalized data packages, including electronic data deliverables, are routed back to the TCDS for a final review of completeness, accuracy and assured compliance to client specification. Post delivery, the TCDS fields all technical questions associated

with the data package, its validation and integration. Depending on the scale and scope of a project, the TCDS may be assigned complete project management responsibilities. As project manager, they coordinate all facets of supporting services and are the client's primary contact for the duration of the project. In this role, the TCDS initiates electronic reporting in a variety of media and configurations, including portal uploads and electronic data verifications.

Team Client Services Specialist Team Client Services Specialists(TCSS) perform a wide variety of supporting functions within their team. Their routine customer service functions include creation of order entry documents to generate custom kit requests, courier instructions, login instructions, special lab instructions and routing of final deliverables. All new client setups, credit approvals, and credit card transactions are handled by the TCSS. For routine/repeat projects, the TCSS functions as project manager, coordinating all facets of supporting services and is the client's primary contact. In this role, they assemble all resources required to activate field activity, review all samples received, reconcile discrepancies, notify clients and receive instructions to proceed, track and expedite sample delivery with lab supervisors, provide status updates on request, print reports when completed and invoice per contractual requirement. The TCSS also maintains all team files, including contracts/purchase orders, individual client pricing, and quotations/proposals, QAPs, marketing database and correspondence. All invoicing is performed by the TCSS, including customized invoice formats and required attendant documentation for payment. The TCSS also provides analysis of corporate-generated credit/collection reports, reconciles discrepancies and disseminates follow-up letters as needed.

Support Services Supervisor - The Support Services Supervisor reports to the QAO, and is primarily responsible for the non-analytical operations of the laboratory. General duties include coordinating and supervising all activities associated with sample containers and kit preparation, sample disposal, and the KEMRON courier services. Other responsibilities include supervision of shipping/receiving, assisting with logging, temperature blanks and coordination of the laboratory waste management system.

4.2 Coverage for Temporary Absence of Key Personnel

KEMRON has sufficient staff redundancy and level of experience to cover for extended absence of all personnel described above. The production and report review duties of the Laboratory Director are covered by the Technical Director / QAO. The duties of the QAO are delegated to a senior staff QC chemist with

oversight from the Laboratory Director. Responsibilities of departmental supervisors are delegated to the senior chemist or analyst in the department, with oversight from the Laboratory Director. A senior programmer is assigned the duties of the MIS Manager in his absence. All key personnel have an average of over ten years experience and are cross-trained for multiple positions.

Figure 4-1
KEMRON Environmental Services
Corporate Organizational Chart
15 February 2005

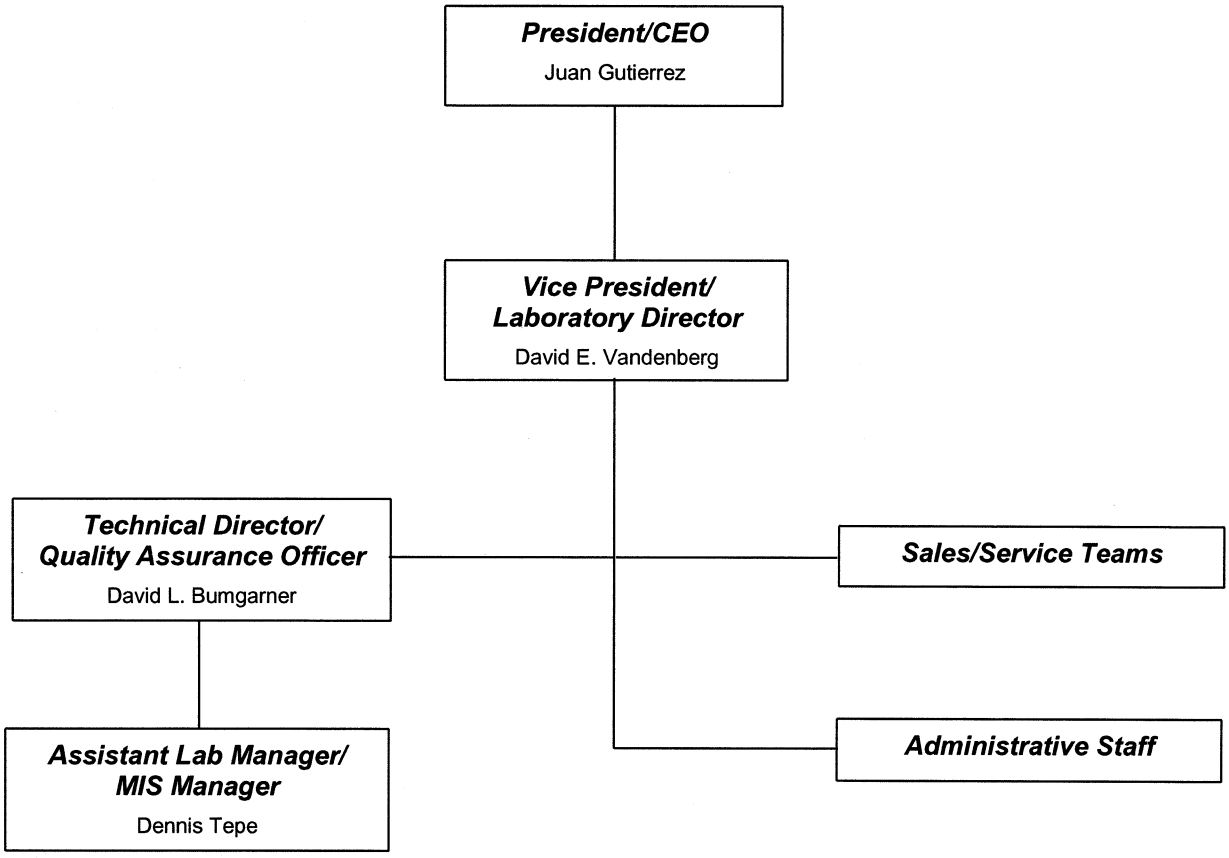

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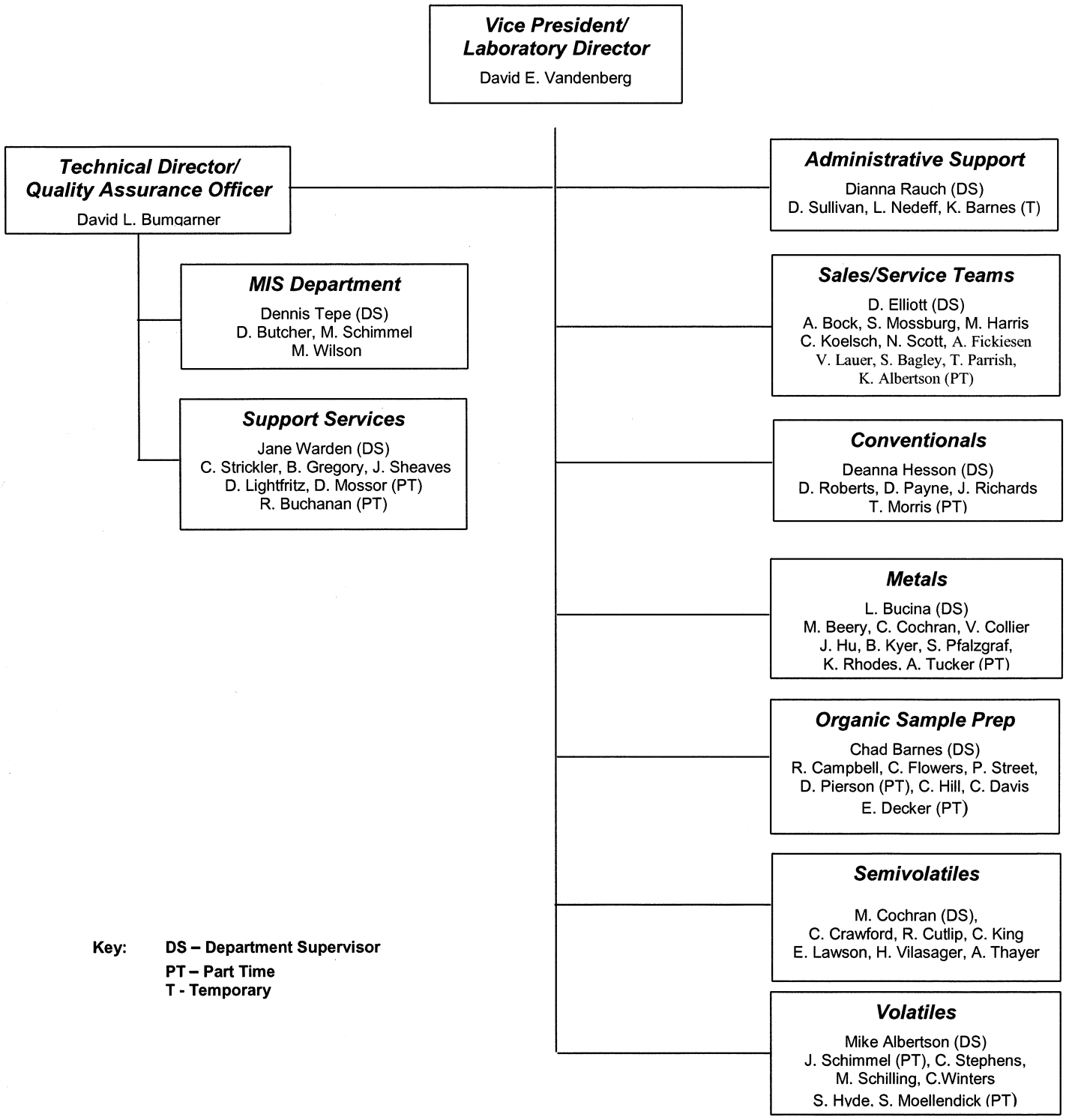
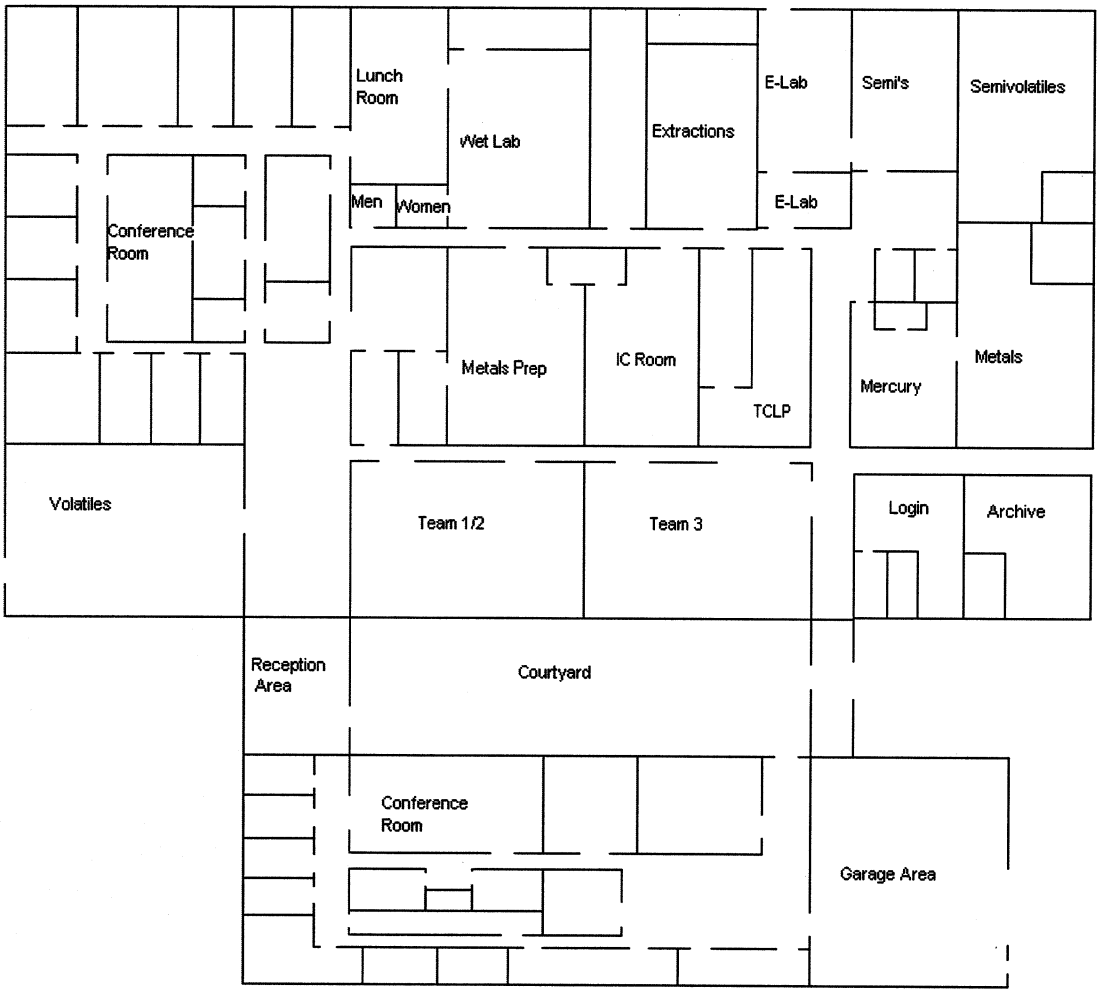
Figure 4-2
KEMRON Environmental Services Ohio Valley Office Organizational Chart
15 February 2005



Key: **DS – Department Supervisor**
PT – Part Time
T - Temporary

Figure 4-3
KEMRON Environmental Services
Ohio Valley Laboratory Floor Plan



5.0 GENERAL POLICIES AND PROCEDURES

5.1 NELAC Policy Statement

This quality manual, also known as the Laboratory Quality Assurance Plan (LQAP), addresses the elements defined in Section 5.5.2 of the National Environmental Laboratory Accreditation Conference (NELAC). A list of NELAP approved test methods and analytes is presented in Appendix C to this manual. KEMRON will comply with all NELAC requirements for all laboratory work covered by our NELAP accreditation.

5.2 Employee Protection from Undue Pressure

It is the policy of this company to protect laboratory employees from undue outside pressures from commercial, financial, or other sources originating from management or clients. This protection is afforded through the implementation of related policies for capacity evaluation, ethics training, and an "open door" policy from upper management. All employees are encouraged to discuss their concerns about such pressures with management.

5.3 Ethics Training

The laboratory requires all new employees to participate in formal training sessions on professional laboratory ethics. Refresher training is also provided to all employees on an annual basis. All employees are educated and trained in their ethical and legal responsibilities including the potential punishments and penalties for improper, unethical, or illegal actions. All training is documented in accordance with the policy "Ethical Conduct and Data Integrity Agreement". The Ethics Policy is presented in SOP ETH01. KEMRON Environmental Services has an "Employee Handbook" that specifies requirements for ethical behavior and general performance expectations. The handbook provides formal policies for disciplinary action and consequences of unethical behavior and other general policy violations.

5.4 Departures from Documented Policies and Procedures

All workload performed under our NELAP certification will be in accordance with this quality manual and all supporting standard operating procedures and policies. In the unlikely event that departures from documented policies and procedures (either technical or non-technical) becomes necessary, only the Vice President or Technical Director have the authority to approve such deviations.

5.5 Reviewing New Work and Capacity Evaluation

The laboratory adheres to the following mechanism to evaluate new work. The first step is the evaluation of method capability, which includes an initial review of the procedure supplied by the client requesting the work. Management then assesses the laboratory's ability to perform the work with existing apparatus, instrumentation, facilities, and personnel. If management determines that the capability exists, or may be developed, it then evaluates the financial feasibility of performing the new work. The laboratory director has the sole authority for approval of new work after the above evaluation is completed. All new method development is performed in accordance with SOP 45 – ***Method Validation Procedures***.

Laboratory capacity is periodically evaluated in conjunction with scheduling and forecasting tools, status updates on outstanding proposals, and the current backlog. The laboratory requires client notification of all sample shipments and clients are advised when large shipments may tax the laboratory ability to meet holding times or delivery dates. It is the policy of laboratory management to evaluate production capacity prior to acceptance of all major delivery orders.

5.6 Complaints

KEMRON Environmental Services is committed to complete satisfaction of customers and other interested parties. If for any reason a party believes we have not complied with agreed upon specifications or policies, then the following procedures will be implemented:

5.6.1 Documentation of Complaint

The appropriate service representative or manager will document in writing the nature of the complaint. The contact form displayed as Figure 5-1 will be used and all appropriate correspondence and records shall be attached.

5.6.2 Investigation of Complaint

The problem will be investigated to verify the validity of the complaint or concern. If the issue is one of quality control, or breach of policy or procedure, an internal audit will be conducted. If KEMRON is found negligent in meeting the written specifications or policies, or if our data is judged to be invalid or unusable for any reason, the problem is referred to the Technical Director/QAO, or other authorized laboratory representative, for a resolution. If the proposed course of

action is not acceptable, the problem is referred to the Vice President. In cases of laboratory negligence the following courses of action are offered:

- Offer to perform services/analyses again at no charge; or
- refund or credit for specific services.
- Assist client in dealing with the consequences, i.e. consultation with agency, letter of explanation, re-sampling assistance; and
- seek a resolution that is acceptable to all involved parties.

Written documentation of problem and resolution is maintained in the central file located in the QAO's or Personnel office, whichever is applicable, with an additional copy in the master project (report) file. Summary reports are generated periodically outlining complaints for a specified period of time. These are discussed in management and laboratory staff meetings to verify trends and to establish preventive measures.

5.7 Document Control and Maintenance

5.7.1 Scope and Application

This section describes the policies and procedures for the definition, development, distribution and control of official laboratory documents. Laboratory documents may include any laboratory notebook, record book, laboratory report, standard operating procedure, quality assurance plan or hardcopy record which is maintained for any extended period of time. A controlled document is one in which there is a limited and documented distribution with recourse maintained as outlined in the following sections. Controlled documents at KEMRON include, but are not limited to, the following document types:

- Laboratory Quality Assurance Plans (LQAP)
- Analytical Standard Operating Procedures (SOP)
- Extraction and Preparation Logbooks
- Analytical Run Logbooks
- Balance Logbooks
- Temperature Logbooks

5.7.2 Document Control Procedure

After final approval of a QAP or SOP the QAO assigns a control number to the original and this becomes the official file copy. A permanent logbook is

maintained which records the control number, document name, recipient, and date for each controlled document (See Figure 5-2). The document control number is stamped in red ink on the document's cover page and on the document control record form, which serves as an acknowledgment of receipt. This record is also used to document the staff training on the latest version of the QAP or SOP. When agencies or clients request copies of SOPs or the laboratory QAP, it is our policy to send "UNCONTROLLED" documents, unless requested otherwise. If a controlled document is required, the document control record (Figure 5-3) must accompany the shipment. The QAO maintains copies of all document control records.

5.7.3 Document Inventory

The QAO is responsible for maintaining an inventory of all controlled documents which shall include the Laboratory Quality Assurance Plan (LQAP) and all laboratory standard operating procedures (SOP). The inventories are maintained in PC spreadsheet and hardcopy which lists one record for each controlled document.

5.7.4 Archiving

The QAO is responsible for maintaining an archive copy of each controlled document. The archive files are maintained in electronic pdf format on a special QC folder on the network fileserver. Archive copies will be retained for ten years.

5.8 Records Retention

The laboratory has established a policy to retain all records for five years, or as specified by contract, whichever is longer, up to a maximum of ten years. These records shall include all electronic and/or hard copy, raw and reduced forms of data generated from sample receipt to final report. Electronic data shall consist of either magnetic tape or CD ROM. The disposition or transfer of all records will be negotiated with individual clients upon any change in business status. The Ohio Voluntary Action Program requires notification prior to disposal of any records.

5.9 Analyst Training and Demonstration of Capability

All analysts must go through a formal training program that includes initial and annual Demonstration(s) of Capability (DOC) for each procedure they perform. These demonstrations are performed in accordance with the requirements of

NELAC Section 5.0 Appendix C, and details are presented in SOP 47 - Employee Training. Alternatively, the laboratory uses the following option to assess Demonstration of Capability when the method is not amenable to Proficiency Testing evaluation, or standard measures of precision and accuracy:

- Four consecutive samples are analyzed with direct observation from another certified analyst, or;
- Results of four analyses are compared to those performed by another certified analyst.

5.10 Protecting Confidentiality and Proprietary Rights

Two factors must be observed regardless of the method chosen to convey information and data to a client. These are client confidentiality and accurate record keeping. The need to preserve the clients' confidentiality should never prevent recording of the date, time, person contacted and subject of the communication. Data capture software allows entire case files/final reports to be captured and put into a file format. This then can be put on disk, or sent by email to a client. This has great value for providing preliminary data to clients on quick turn projects.

5.10.1 Confidentiality Agreements

Protecting the confidentiality of client information and data is of the utmost importance to KEMRON. All KEMRON employees, as a condition of employment, must sign the Employee Confidential Information and Non-compete Agreement, which was developed to protect the proprietary records and data of KEMRON and all of our clients. Upon request from OEPA, KEMRON will provide access to OEPA data and documents or information related to Ohio Voluntary Action Program.

5.10.2 Client Data

The following standard operating procedures provide methods for ensuring that, where clients require transmission of test results by telephone, facsimile or other electronic or electromagnetic means, confidentiality is preserved.

5.10.2.1 Telephone Communications

In cases where analytical results must be communicated by telephone, a Technical Service Representative (TSR) calls the contact person/client whose name has been provided by the client at telephone number also supplied by the client. Verbal results are not released to any other person unless explicit instructions are received from the relevant client. The date and time of the client contact is recorded in the TSR telephone log.

5.10.2.2 Facsimile Transmissions

Analytical results are transmitted by facsimile to the attention of the contact person/client whose name has been provided by the client at a fax number also provided by the client. Following each fax transmission, a fax return sheet is printed automatically by the fax machine. This sheet is carefully checked against the originals. The confirmation sheet should be added to the client case file along with a copy of materials faxed. If this is not possible, the TSR will maintain a fax folder.

5.10.2.3 Electronic (Modem) Deliverables

All modem transmissions are done on direct lines to the client and are set up through our modem system using our dedicated lines. The client, where applicable, supplies telephone numbers and passwords.

5.10.2.4 Data Diskette and CD ROM Deliverables

Diskette deliverables are shipped to the client or designated contact person accompanying the hard copy report to which they apply. The client supplies the address and attention name.

5.10.2.5 Email

Where possible, email will be used to transmit information and data to a client. Care must be taken to insure the client receives the email and that the sender at KEMRON maintains a record of the transmission. This can be done with our current email system by maintaining a sent file directory.

5.10.2.6 SOP's

Care must also be taken to protect client confidentiality in Standard Operating Procedures because they are often read by clients that may be considered a competitor of the client mentioned in the SOP. The utmost care must be taken to not identify specific or specialized procedures as belonging to any one client if possible. If it is necessary to name a client in an SOP then the information naming the client will have to be sanitized or removed before the SOP is given to any other potential or current client for review.

5.11 Identification of Approved Signatories

The Vice President has the authority to sign contracts, approve new company policies and procedures (SOP's) and certify (sign) laboratory reports. The Technical Director / QAO has the authority to approve laboratory policies and procedures (SOP's) and to certify laboratory reports. The Vice President may grant authority to other qualified personnel to certify laboratory reports or other official documents for special projects, or in case of emergency.

5.12 Monitoring and Controlling System Time

The system date and time reported by our LIMS (and all networked data systems) is synchronized to the data/time of the mail server, which is further synchronized with the internet using network time protocol. Hourly adjustments in time are made automatically, and laboratory staff are not authorized to make manual changes. Unauthorized changes in data system date or times may be considered a violation of the laboratory ethics policy (see also section 5.3).

Figure 5-1
General Complaint and Corrective Action Form

GENERAL COMPLAINT AND CORRECTIVE ACTION FORM

Date of Complaint: _____

Originator:

_____
_____
_____
_____
_____

Summary of Complaint:

_____
_____
_____
_____
_____
_____

Corrective Action Determined:

_____
_____
_____
_____
_____
_____

Date of implementation: _____

Date originator notified: _____

Notified by: _____

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Figure 5-2
DOCUMENT CONTROL

Date	***Department***	*Document*	**Rev No.**	**Doc. Control No.**	**Signature**

Figure 5-3
CONTROLLED DOCUMENT RECORD

DOCUMENT CONTROL NO.:_____ DATE:_____

Note: This number should appear in RED on enclosed document.

DOCUMENT NAME:_____

RECEIVER NAME:_____

COMPANY: _____

ADDRESS:_____

TELEPHONE:_____ FAX:_____

RECEIPT ACKNOWLEDGMENT:

Name_____

Signature_____Date_____

6.0 SAMPLING PROCEDURES

KEMRON functions as an environmental analytical facility and as such is not directly responsible for the sampling events. However, KEMRON does utilize independent field personnel. Below are sampling guidelines that were developed to outline the primary objective of any external sampling event. The objective is the collection of samples which, when analyzed, will consistently generate accurate, precise and representative data. By developing comprehensive standard sampling procedures and training personnel in the procedures, this objective can be met. These sampling procedures are offered as guidance to field project managers to assure sample integrity. Following the sampling procedures promotes sample integrity and the highest degree of quality control throughout the sampling event.

6.1 General Sampling Guidelines

Standard Operating Procedures (SOPs) should be utilized by all field project managers for potential sample sources. The SOPs should be based on State and USEPA guidance documents. SOPs should be available to and reviewed by all field personnel. Following are general guidelines to be used in the collection of environmental samples:

6.1.1 Sample containers which are prepared in the laboratory may contain measured volumes of preservative. Such containers should not be rinsed prior to filling with sample.

6.1.2 Sample containers for volatile organic analyses (VOA), pH, and TOX must be completely filled with no headspace. All other sample analyte containers should be filled to approximately 95% capacity.

6.1.3 VOA samples must be collected in a manner which minimizes disturbance of the sample and potential for volatilization. Fill vials until a convex meniscus forms then carefully place the septum cap on the vial. Invert the vial and check for the presence of air bubbles.

6.1.4 Field sampling equipment must always be appropriately decontaminated before and after use.

6.1.5 During the collection of all environmental samples, appropriate personal protective gear must be worn. Gloves and safety glasses are the minimum acceptable level of PPE to be worn when samples are collected.

6.1.6 Use pre-cleaned laboratory prepared glassware for the collection of samples whenever possible.

6.2 KEMRON Sampling Containers

The measurement of trace constituents in environmental samples demands methods capable of maximum precision and sensitivity. The selection and proper care of laboratory glassware and sample containers is an important part of the quality control program to eliminate errors due to contamination from improper cleaning procedures.

Laboratory supplied containers constructed of materials which are both compatible and non-reactive with the material to be sampled will be used. KEMRON uses commercial sample containers which are certified pre-cleaned to EPA standards. These containers are shipped in sealed boxes with custody seals. Glassware is certified cleaned according to Protocol A, B, or C described below. Sample containers used by KEMRON follow washing procedures equivalent to these protocols.

Table 6-1
Glassware Cleaning Protocol

Protocol A	Protocol B	Protocol C
Laboratory-grade detergent wash and rinse	Laboratory-grade detergent wash and rinse	Laboratory-grade detergent wash and rinse
Acid, deionized water, and solvent rinse	Multiple deionized water rinses	Acid rinse Multiple deionized water rinses
Oven drying, capping, and packing under quality control conditions	Oven drying, capping, and packing under quality control conditions	Oven drying, capping, and packing under quality control conditions

Table 6-2 lists the container type and volume required for each sample type.

6.3 Sample Preservation

Use of cooling, pH control, and chemicals to retard biological activity or to stabilize the chemical species of a sample is known as preservation. Sample kits prepared by the laboratory include sample containers prepared with the appropriate type and volume of preservative for the analyte of interest. Addition of preservative to samples in the field is not normally required when using the prepared kits. This procedure minimizes the potential for incorrect or

inadequate sample preservation. The most common form of preservation is cooling the sample to 4° C using ice or refrigeration. Other common preservatives used include:

- Hydrochloric acid - dilute 1:1
- Nitric acid - dilute 1:1
- Sulfuric acid - dilute 1:1
- Sodium hydroxide - 50% solution
- Sodium thiosulfate - for dechlorination

Table 6-2 lists the preservation techniques employed by KEMRON for each sample type.

6.4 Sample Documentation

6.4.1 Sample labels

When using laboratory prepared sample kits, pre-labeled and preserved sample containers are provided. Each sample collected by KEMRON is clearly labeled using waterproof ink with the following information:

- Client name
- Date and time of collection
- Sample source
- Preservative required
- Name(s) of sampler
- Analyses requested
- Sample identification

6.4.2 Field records

Sampling personnel must maintain complete and accurate records of all field activities. Bound field notebooks and/or field logs specific to the media sampled should be completed during each sampling project. All pertinent information on the sampling event is included in the field record.

6.4.3 Chain-of-Custody

All samples must be accompanied by a completed chain-of-custody form when shipped or hand delivered to the laboratory. Information required on the chain-of-custody includes:

- Sample date and time
- Name(s) of sampler(s)
- Sample ID
- Project name and number
- Analyses requested
- Number of sample containers
- Signature and date of all individuals who have custody of the samples

6.5 Sampling Equipment Decontamination

All field sampling equipment should be appropriately pre-cleaned prior to leaving the base of operations. Use phosphate-free detergent, hot tap water, and analyte free rinse water for this cleaning following the procedure specified for analytes of interest. Cleaned equipment should be wrapped or enclosed to maintain cleanliness during transport to the field for use. Adequate quantities of sampling equipment should be provided for each event to minimize the need for field decontamination.

Decontamination procedures for sampling equipment may include:

- Phosphate-free detergent and tap water wash
- Rinse with tap water

For equipment to be used for trace metals sampling, rinse with 1:1 reagent grade nitric acid solution. **Do not rinse stainless steel sampling equipment with nitric acid**.

- Rinse thoroughly with deionized water
- Rinse with isopropanol or methanol
- Thoroughly rinse with analyte-free water (if available)
- Air dry
- Wrap securely to prevent contamination if equipment is to be stored

Information on specific decontamination procedures are provided in each sampling SOP. Special decontamination procedures will be implemented as necessary, based upon contaminant encountered.

Equipment which is heavily soiled may require steam cleaning and/or high pressure washing. Drilling equipment and other heavy equipment used in field sampling activities will likely require this type of cleaning. If equipment cannot be adequately decontaminated, it will be discarded.

6.6 Field Waste Disposal Practices

Field generated waste should be disposed as required by project specifications and in accordance with applicable local, state, and federal requirements. Wastes commonly generated include drill cuttings, drilling fluids, well development water, well purge water, decontamination fluids, and contaminated personal protective equipment.

Based upon site and project specific requirements, liquid wastes should be containerized for characterization and disposal or discharged directly to an appropriate discharge location. Solid wastes should be containerized and left on-site for disposal or, if appropriate, disposed as general refuse.

Prior to initiating any sampling activity the waste handling requirements should be determined to ensure timely disposal in compliance with regulatory requirements.

6.7 Laboratory Sub-Sampling Procedures

KEMRON employs the following procedures for taking soil subsamples for metals and semivolatile organic analyses:

a) Remove sample bottle contents and place in tray lined with wax paper (metals lab) or aluminum foil (organics extraction lab).
b) Mix sample with an inert rod or scoop and break up lump. Remove all large stones, sticks, leaves, etc. Do not over mix the sample.
c) Obtain representative sample either by random removal of 3-10 portions of the sample from the pan or by using a "standard" scoop designed to retrieve a linear cross-section of the pan contents.
d) The analyst will not attempt to target an exact weight once a method specified minimum amount is weighed.
e) The remaining sample will be returned to the sample container.

Note: These procedures do not apply to samples for volatile organics analysis, except the requirement not to target a specific mass of sample

6.8 Sample Dilutions

The laboratory must dilute samples prior to analysis for the following reasons:

- A previous analysis yielded a result above the upper calibration range for the method.
- The sample contains a target, or non-target analyte, at sufficient concentration to damage sensitive instrumentation.
- Sample matrix interference, confirmed by poor surrogate or spike recoveries, prevents accurate analysis without dilution.

In each case the laboratory will document the sample dilution by reporting the dilution factor, adjusting the reporting and detection limits by that factor. The report narrative will provide additional detail as needed. If dilution analysis is not performed, the laboratory will assign appropriate qualifiers to any results reported above the upper calibration range.

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Table 6-2
Sample Containers, Preservation and Hold Times
CONVENTIONALS - WATER

PARAMETER	MINIMUM VOLUME	CONTAINER TYPE	PRESERVATIVE	HOLD TIME
Acidity	100	P, G	Cool, 4° C	14 Days
Alkalinity	100	P, G	Cool, 4° C	14 Days
Total Solids	50	P, G	Cool, 4° C	7 Days
Ash Content @ 750° C	25	P, G	Cool, 4° C	---
Biochemical Oxygen Demand	500	P, G	Cool, 4° C	48 Hours
Boron	20	P	Cool, 4° C	6 Months
Bromide	1000	P, G	Cool, 4° C	28 Days
BTU	10	P, G	Cool, 4° C	---
Formaldehyde	20	G	Cool, 4° C	7 Days
Chloride	25	P, G	Cool, 4° C	28 Days
Chloride, Total Residual	100	P, G	Cool, 4° C	6 Hours
Cyanide (midi)	50	P, G	Cool, 4° C, NaOH, pH>12	14 Days
Cyanide, Amenable to Chlorination (midi)	100	P,G	Cool, 4° C, NaOH, pH>12	14 Days
Chemical Oxygen Demand	25	G	Cool, 4° C, H_2SO_4, pH<2	28 Days
Color, Platinum-Cobalt	50	P, G	Cool, 4° C	48 Hours
Coliform, Fecal	120	P, G	Cool, 4° C, $Na_2S_2O_3$	6 Hours
Fecal Streptococcus	100	P, G	Cool, 4° C, $Na_2S_2O_3$	6 Hours
Coliform, Total	100	P, G	Cool, 4° C, $Na_2S_2O_3$	6 Hours
Specific Conductance	100	P, G	Cool, 4° C	28 Days
Corrosivity	500	P, G	Cool, 4° C	---
Corrosivity (pH)	40	P, G	Cool, 4° C	---
Chromium, Trivalent	200	P, G	Cool, 4° C	---
Chromium, Hexavalent	150	P, G	Cool, 4° C	24 Hours
Dissolved Oxygen	300	G	Cool, 4° C	6 Hours
Fluoride	25	P, G	Cool, 4° C	28 Days
Ignitability	75	P, G	Cool, 4° C	---
Fluoride, Total (Distilled/Non-Distilled)	200	P, G	Cool, 4° C	28 Days
Hardness	100	P, G	Cool, 4° C, HNO3, pH<2	6 Months
Iodide	400	P, G	Cool, 4° C	24 Hours
Surfactants (MBAS)	100	P, G	Cool, 4° C	48 Hours
Coliform Fecal (MPN)	100	P, G	$Na_2S_2O_3$	6 Hours
Nitrogen, Ammonia (Distilled/Non-Distilled)	100	P, G	Cool, 4° C, H_2SO_4, pH<2	28 Days
Nitrogen, Nitrite	50	P, G	Cool, 4° C	48 Hours
Nitrogen, Nitrate	75	P, G	Cool, 4° C	48 Hours
Nitrogen, Nitrate-Nitrite	25	P, G	Cool, 4° C, H_2SO_4, pH<2	28 Days
Nitrogen, Organic	100	P, G	Cool, 4° C, H_2SO_4, pH<2	28 Days
Threshold Odor	1000	G	Cool, 4° C	48 Hours
Oil and Grease	1000	G	Cool, 4° C, H_2SO_4, pH<2	28 Days
Petroleum Hydrocarbons	1000	G	Cool, 4° C, H_2SO_4, pH<2	28 Days
Percent Moisture	25 g	P, G	Cool, 4° C	---
Percent Solids	25 g	P, G	Cool, 4° C	---
Paint Filter Liquids Test	100 g	P, G	Cool, 4° C	---

1. P = Polyethylene (preferred when acceptable)
2. G = Borosilicate glass with Teflon lined cap

Table 6-2 (continued)
Sample Containers, Preservation and Hold Times
CONVENTIONALS - WATER

PARAMETER	MINIMUM VOLUME	CONTAINER TYPE	PRESERVATIVE	HOLD TIME
Phenolics, Total	100	Amber, G	Cool, 4° C, H_2SO_4, pH< 2	28 Days
Phosphorus, Total	50	P, G	Cool, 4° C, H_2SO_4, pH< 2	28 Days
pH Lab	40	P , G	Cool, 4° C	6 Hours
Orthophosphate	50	P, G	Cool, 4° C	48 Hours
Reactivity, Cyanide	10	P, G	Cool, 4° C	---
Reactivity, Sulfide	10	P, G	Cool, 4° C	---
Sulfite	50	P, G	Cool, 4° C	24 Hours
Settleable Solids	1000	P, G	Cool, 4° C	48 Hours
Silica, Dissolved	100	P	Cool, 4° C	28 Days
Sulfate	100	P, G	Cool, 4° C	28 Days
Specific Gravity	50	P, G	Cool, 4° C	---
Total (Organic) Sulfur	10	P, G	Cool, 4° C	---
Sulfide	200	P, G	Cool, 4° C, Zinc Acetate, NaOH, pH> 9	7 Days
Total Dissolved Solids	50	P, G	Cool, 4° C	7 Days
Total Suspended Solids	200	P, G	Cool, 4° C	7 Days
Turbidity	50	P, G	Cool, 4° C	48 Hours
Volatile Dissolved Solids	50	P, G	Cool, 4° C	7 Days
Total Volatile Solids	50	P, G	Cool, 4° C	7 Days
Volatile Suspended Solids	200	P, G	Cool, 4° C	7 Days

VOLATILE ORGANICS (VOA) - WATER

PARAMETER	MINIMUM VOLUME	CONTAINER TYPE	PRESERVATIVE	HOLD TIME
Gasoline Range Organics	40 mL	G, Septa Caps	Cool, 4° C, HCl, pH< 2	14 Days
Volatile Aromatics	40 mL	G, Septa Caps	Cool, 4° C, HCl, pH< 2	14 Days
Volatile Organics (VOA)	40 mL	G, Septa Caps	Cool, 4° C, HCl, pH< 2	14 Days
VOA – Method 624	40 mL	G, Septa Caps	Cool, 4° C, $Na_2S_2O_3$	7 Days

Table 6-2 (continued)
Sample Containers and Preservation
SEMIVOLATILE ORGANICS - WATER

PARAMETER	MINIMUM VOLUME	CONTAINER TYPE	PRESERVATIVE	HOLD TIME
Diesel Range Organics	1000 mL	G	Cool, 4° C	7 Days
Pesticides/PCBs	1000 mL	G	Cool, 4° C	7 Days
Polyaromatic Hydrocarbons	1000 mL	G	Cool, 4° C	7 Days
Herbicides	1000 mL	G	Cool, 4° C	7 Days
Semivolatile Organics	1000 mL	G	Cool, 4° C	7 Days

1. P = Polyethylene (preferred when acceptable)

2. G = Borosilicate glass with Teflon lined cap

METALS - WATER

PARAMETER	MINIMUM VOLUME	CONTAINER TYPE	PRESERVATIVE	HOLD TIME
All Metals (26)	500 mL	P, G	HNO_3, pH< 2	6 Months*
Mercury	50 mL	P, G	HNO_3, pH< 2, 4°C	28 Days
Furnace Metals	100 mL	P, G	HNO_3, pH< 2	6 Months

TCLP - WATER

PARAMETER	MINIMUM VOLUME	CONTAINER TYPE	PRESERVATIVE	HOLD TIME
TCLP Volatiles	100 mL	G	Cool, 4° C	14 Days
TCLP Semi-Volatiles	100 mL	G	Cool, 4° C	14 Days
TCLP Pesticides	100 mL	G	Cool, 4° C	14 Days
TCLP Herbicides	100 mL	G	Cool, 4° C	14 Days
TCLP Metals	100 mL	P, G	Cool, 4° C	6 Months*

* For (1) TCLP parameter 100 mL required; for full TCLP (2) 1000g
* Mercury is 28 days

Notes:

1. P = Polyethylene (preferred when acceptable)

2. G = Borosilicate glass with Teflon lined cap

3. Triple the volumes above for MS/MSD samples

Table 6-2 (continued)
Soil Hold Time

METHOD	MINIMUM VOLUME	CONTAINER TYPE	PRESERVATIVE	HOLD TIME
Coliform Fecal	1g	G	Cool, 4° C	6 Hours
Chromium, Hexavalent	50g	G	Cool, 4° C	24 Hours
5035	5 g	P, G	Cool, 4° C	48 Hours
TCLP-VOA	105g	G	Cool, 4° C	14 Days
TCLP-SV	105g	G	Cool, 4° C	14 Days
TCLP-Pest/Herb	105g	G	Cool, 4° C	14 Days
TCLP-Metals	105g	G	Cool, 4° C	6 Months *
Total Metals (except Hg)	3g	G	Cool, 4° C	6 Months
Hg	2g	G	Cool, 4° C	28 Days
TPH	30g	G	Cool, 4° C	28 Days
Semi-Volatiles	30g	G	Cool, 4° C	14 Days
Herbicides	50g	G	Cool, 4° C	14 Days
Volatiles	1g	G	Cool, 4° C	14 Days
Conventionals (where applicable)	1g – 100g	G	Cool, 4° C	14 Days

* Mercury is 28 days
** All soils stored at 4° C

7.0 SAMPLE CUSTODY

In recognition of the critical nature of sample custody protocols, KEMRON Environmental Services has implemented stringent standard operating procedures, designed to ensure sample integrity and thorough documentation. This section provides a clear description of sample traceability from sampling kit to final sample disposition.

7.1 Sampling Kits

KEMRON Environmental Services, Inc., at the client's request, will provide sampling kits to the client. Additional information on sampling kits can be found under Section 6 of this document and in KEMRON SOP KP01.

7.2 Field Custody (Also see Section 6.1)

A vital component of KEMRON's quality assurance program is to ensure that a clear and detailed record is kept of all samples and sampling activity. Chain-of-custody forms (Figure 7-1) are submitted with all samples. These are kept in the appropriate project files. Water-proof ink is used to label samples as protection against loss of information due to accidental erasure. KEMRON's sample custody protocol requires that the following information be recorded.

7.2.1 Date and Time of Sample Collection

7.2.2 Specific description of sample location. This may include a monitoring well number in the case of groundwater sampling. For soil sampling, sample points may be sketched on a site map and confirmed via surveying. For surface water and sediment sampling, the drum number, (if labeled), drum location, suspected contents and phase of drum materials (liquid, solid, or sludge) may be noted, as well as, which layer or layers within the drum were sampled.

7.2.3 Name(s) of sampler(s) will be identified.

7.2.4 A description of weather conditions and general site conditions (disturbed soils, standing water, ongoing activities, etc.) may be provided.

7.2.5 A description of the sampling equipment used, including method for purging monitoring wells may be indicated.

7.2.6 The specific field ID number for a sample may be recorded. The sample sequence number is the order in which a particular sample was taken with respect to all other samples retrieved at the site. The sample sequence number may also be recorded.

7.2.7 Components or constituents of sample to be analyzed are to be noted.

7.2.8 Signature(s) of sampler(s) will be provided.

7.2.9 Types of preservatives and, if necessary, the results of field check (pH, etc.) may be recorded.

7.2.10 Field measurement data (such as VOA reading, pH, specific conductance) may be recorded.

7.3 Sample Transport

Samples are transported to KEMRON's laboratory by one of three modes:

7.3.1 On many projects, KEMRON will have responsibility for preparation of sample bottles, sample kit assembly and delivery of sample kits to the project site. KEMRON will also pick up the samples at the project site and transport them to the laboratory. KEMRON drivers will follow these established protocols:

- They will carry proper KEMRON identification, which they will be prepared to display before entering project sites;
- They will sign the Chain-of-Custody forms (Figure 7-1) when picking up the samples;
- They are responsible for the integrity and security of samples while in their custody;
- They must secure the vehicle at all times when it is necessary to stop and be away from the vehicle for any reason during the transportation of samples to the laboratory.

All samples collected or picked up by KEMRON personnel are delivered immediately to the Sample custodian in the sample logging station. The Shipping and Receiving entrance is to be used for such deliveries. If delivery is made after hours, the driver will take the cooler temperature, fill out the appropriate form for the sample custodian and store the cooler in a locked sample storage unit.

7.3.2 UPS, FEDEX, or Other Common Carrier - Transporters are directed to the Shipping and Receiving entrance and the samples are delivered to the Sample custodian.

7.3.3 Client Deliveries - Clients may deliver samples in person via the designated Receiving entrance but must be escorted while within the facility.

7.4 Laboratory Custody Procedures

The National Enforcement Investigations Center (NEIC) of EPA defines custody of evidence in the following manner:

- It is in your possession, or;
- It is in your view after being in your possession, or;
- It was in your possession and then you locked or sealed it to prevent tampering,

or;

- It is in a secure area.

7.4.1 Normal Custody Procedures

For the purpose of sample custody, KEMRON Environmental Services maintains that the laboratory in its entirety is a secure area and all samples received and logged into the laboratory remain in the custody of the Sample custodian, Supervisor or Analyst, until time of disposal. Refrigerators, freezers and other designated sample storage areas will be securely maintained or locked. Only the designated Sample custodian or supervisory personnel will have keys to locked sample storage units until removed for sample preparation or analysis. The following minimum custody procedures are followed for all samples:

- All samples are received and inspected in accordance with section 7.5.
- The sample custodian signs and dates the chain-of-custody form provided by the client.
- The samples are stored in the appropriate storage unit. (The storage unit is also designated in the LIMS when the samples are logged in.)

- Several laboratory documents are used to document which laboratory personnel handled the samples, including bench sheets, sample preparation logbooks, and instrument run logbooks.

- The original copy of the chain-of-custody form is included in the laboratory report to the client and a copy is maintained in the laboratory files.

7.4.2 Internal Laboratory Custody (ICOC)

In order to satisfy more stringent chain-of-custody requirements, the following standard operating procedures can be implemented by KEMRON Environmental Services, Inc. upon the request of the client:

The work request prepared by the SERVICES REPRESENTATIVE will specify which projects require extended internal laboratory custody. All sample bottles designated for ICOC are identified with a color coded label on the cap for easy identification.

After the samples are logged into the LIMS, a unique container number and barcode is generated and printed on the bottle label. Each laboratory staff member is also assigned a badge and barcode in order to quickly record all exchanges.

Samples will remain in secure sample storage units until removed for sample preparation or analysis. All transfers of samples into and out of storage will be posted to the LIMS using a standard barcode reader.

Removal of samples from storage requires a barcode scanning procedure that produces an electronic record of the transaction in the LIMS.

After a sample container has been removed from storage, the analyst is responsible for the custody and integrity of the sample. While the samples are in the custody of the laboratory, they must be locked in the storage units if not in immediate custody of the analyst.

Samples returned to the storage units must be scanned to document the transfer from analyst back to the custodian.

The custodian will scan each container at the time of disposal of the sample container. (Transfer of sample extracts and digests are documented on the laboratory preparation benchsheets.)

A special report from the LIMS is used to produce a Sample Control Record (See Figure 7-4). These records are in included in the final report to the client as well as the signed original copy of the field COC record (Figure 7-1).

7.5 Sample Receipt and Inspection

The sample custodian or designated assistant will receive all incoming samples. The following procedures are outlined in SOP LOGIN 01. The following information is documented on the Sample Receipt Form (Figure 7-2). The custodian will frisk the cooler for radioactivity if required by the project QAPP. The custodian will open the shipping containers and note the presence/absence of Chain-of-Custody forms (Figure 7-1) and seals, airbills, or bills-of-lading. The sample temperature is then read. The custodian will examine the shipping container to verify the integrity of the sample(s) and examine the sample documentation and identification to assure it is correct and the proper preservative has been used. The preservatives are checked by the sample custodian. If inspection indicates samples were damaged in transit, the shipping container will be moved to the hood in Log-in, assessments of the damage will be made and the appropriate services representative will be notified. The client will be immediately contacted and determination of the degree of hazard will be made. If damage is minimal and the client requests it, an attempt to salvage the sample(s) will be made if it can be done safely. In the event of damaged hazardous samples, KEMRON's Spill Response Team will be notified per the Chemical Hygiene Plan.

Samples received after hours, when the sample custodian is absent, will be placed in the walk-in refrigerator. The person receiving the shipping container will sign for the container, take the cooler temperature if appropriate and place the dated forms on the Custodian's desk. The sample custodian will log in the samples on the next business day. The LIMS system will indicate the actual date and time received and the original receipt documentation will be included with the Chain-of-Custody form.

The sample custodian will compare the Chain-of-Custody forms and labels to verify agreement of information contained therein. If major discrepancies are found, they will be documented on the Sample Discrepancy Form (Figure 7-3) and the services representative will be immediately notified. Written documentation of all problem resolutions will be placed in the project/case file. If there are no problems with the samples received, the sample custodian files the signed Chain-of-Custody form and Sample Discrepancy Form in the project/case file. After the sample is logged in, it will be immediately stored under the proper conditions.

Sample labels or other sample documents that appear to be contaminated due to sample breakage or other problems will be dried under a fume hood and be

separately sealed in plastic bags, if necessary, prior to being placed in case files. The services representative must also be notified.

7.6 Sample Logging Procedures

The following procedures are outlined in SOP LOGIN 01. The sample custodian is responsible for logging all samples into the Laboratory Information Management System (LIMS), signing the Chain-of-Custody (Figure 7-1), completing the Sample Receipt Form (Figure 7-2), reporting all problems, inconsistencies, or anything questionable to the services representative, placing all samples in storage, monitoring conditions in sample storage areas, and maintaining records for laboratory Chain-of-Custody.

As a new login number is initiated in the LIMS, the sample custodian generates and/or enters the following information about the project shipment:

- KEMRON Login Number
- Client Project Identification
- Mode of Transportation
- Date and Time Received/Date Due
- Matrix/Sample ID
- Date and Time of Sample Collection
- Storage Location/Container Size/Type/Preservative
- List of Analyses
- Notation of Problems/Special Instructions

In order to maintain sample identity, each sample received will be assigned a unique sample I.D. number. The LIMS will assign the unique nine-digit KEMRON Sample Number at the time of log-in, as shown in the following example:

EXAMPLE: L0104001-01

The first eight digits identify a group of related samples and becomes the login number and report number. The two-digit number after the dash identifies a specific sample in the order. These numbers are used by KEMRON for continuous identification of the sample from receipt to completion of analysis. In the event of multiple samples for a single analysis, such as 2 vials for volatile organic compounds, letter designations will be added to the end of the identification number. Sample containers will be clearly identified with the appropriate sample number. The sample labeling process is accomplished by

the LIMS system which prints the required number of computer labels (Figure 7-5). Extract vial numbers and metal digests will correspond to the KEMRON sample number from which they originated. These numbers will also be recorded on sample tracking documentation.

7.7 Sample Storage

Samples and extracts will be stored in uniquely identified refrigerators which are in secure areas of the laboratory. The sample custodian or designated assistant will check the temperature of each refrigerator in the log-in area, twice daily (once on weekends and holidays) and maintain a record book. This record book will be reviewed on a monthly basis by the Support Services Supervisor to note any trends or inconsistencies. The acceptable range for sample storage is 4° C ± 2°. The sample custodian will notify the Support Services Supervisor of any refrigerator temperature problem which cannot be corrected by simple thermostat adjustment. A list of emergency repair numbers for the refrigeration units is attached to the walk-in refrigerator's exterior.

7.8 Sample Distribution and Tracking

Both the preparation and the analysis of samples will be documented using special forms (logbooks). Once analysis is complete, the analyst will return the unused sample to the sample custodian area for return to the main cooler or to the Sample Archive Room, whichever is appropriate. Figure 7-4 provides a sample of the KEMRON sample control record form. Samples will be returned to their original storage units after completion of analyses. Samples which have exceeded their regulated holding period will be placed in the Sample Archive Room. They are routinely stored in this area for a minimum of 14 days after the due date for the analytical report. They are then disposed per protocol listed in KEMRON's "Waste Management SOP". Extended archive beyond 14 days with refrigeration is available for specific projects or as required by contract.

It is important to note that samples received for analysis of volatile organic compounds (VOA) are segregated from other samples. Standards are also segregated from all samples in designated storage units.

7.9 Sample Security

All sample storage refrigerators are equipped with a lock. The units are monitored by the sample custodian during business hours. After business

hours, the unit is kept locked and only selected personnel have access (by key) to the sample storage unit. All samples, extracts and digests will be stored in segregated areas.

7.10 Laboratory Building Security

All access doors to the building, with the exception of the main entrance to the reception area and the employee entrance, remain locked. Only select KEMRON employees have keys to the access doors to the building. The main entrance and the employee entrance is unlocked only on business days between the hours of 8:00 AM and 5:00 PM. The facility is also equipped with an electronic alarm system and employees are assigned unique pass codes for entry.

7.10.1 Employee Access

All employees must enter the building through the employee entrance. Keys are required except during normal business hours. Employees may exit through the employee entrance when it is locked without the use of a key, but keys are required for re-entry.

7.10.2 Visitors, Vendors and Deliveries

All visitors to the office or laboratory must enter the main lobby through the main entrance and sign in with the receptionist. Visitors must be escorted at all times and in all areas of the facility. Vendors and delivery personnel are directed to use the door to the Shipping and Receiving area. Access to this door is controlled by the KEMRON employee on duty, and upon entrance, the visitor must be escorted at all times.

7.11 Sample Subcontracting/Shipping

For certain projects, it may be necessary for KEMRON to subcontract some analyses. Samples to be analyzed will be shipped to the contracted laboratory using the KEMRON sample kit. To prevent sample breakage, only EPA-approved sample containers will be used. Freezer packs will be included in each sample kit to serve as a separation divider for the samples and to increase the cooling capacity.

In order to maintain the temperature of samples at 4° C ± 2°, wet ice will be supplied by the client when required. Each shipping kit will contain the following:

- Partitions to hold sample bottles;
- Freezer pack(s) (if ice is not used);
- Chain-of-Custody form/Log-out form;

The sample kit will be packed in a hardside cooler. The sample kit will be sealed with KEMRON Chain-of-Custody seals.

7.12 Electronic Data Security

Data integrity is insured through LIMS multi-level security. Access to the specific user privileges can be individually controlled. Each user has their own user name and password which allows certain privileges. Hard copy data, which contains all of the data regarding a group of samples, are kept in a master file, labeled with the login numbers. KEMRON provides electronic data deliverables (EDD) in client specified formats. Both e-mail and CD-ROM are commonly used for electronic transfer of data.

Figure 7-1
KEMRON CHAIN-OF-CUSTODY RECORD

COC No. A 44731

156 Starlite Drive
Marietta, OH 45750

KEMRON ENVIRONMENTAL SERVICES
CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Fax: 740-373-4835

Company Name:

Project Contact: | Contact Phone #:

Turn Around Requirements: | Location:

Project #: | Project Name:

Sampler (print): | Signature:

Program
- ☐ NPDES
- ☐ AFCEE
- ☐ RCRA
- ☐ USAGE
- ☐ Other _____

ADDITIONAL REQUIREMENTS

Sample I.D. No.	Comp*	Grab	Date	Time	Protocol CWA	Protocol SW846	NUMBER OF CONTAINERS	Hold														

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Cooler Temp in °C	Remarks:

*Homogenize all composite samples prior to analysis

Page _____ of _____

KEMRON
ENVIRONMENTAL SERVICES

Figure 7-2
Sample Receipt Form

SAMPLE RECEIPT FORM

KEMRON
ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OH
45750
(740) 373-4071

Date:_____ Client:_____

Shipped By: ( ) Fed-Ex ( ) UPS ( )Airborne ( ) KEMRON ( ) Client ( ) Other

Opened By:_____

Logged By:_____ Login #: L03_____

IR Temp Gun: ( ) D ( ) F

COOLER INFORMATION

Number	Cooler ID	Temp °C	Airbill#	COC#	Other
1					
2					
3					
4					
5					
6					

Were all coolers sealed?	Y	N	N/A
Were custody seals used on all coolers?	Y	N	N/A
Were custody seals intact?	Y	N	N/A
Was visible ice present?	Y	N	N/A
Were all coolers in the temperature range of 2-6C? (>6C*)	Y	N	N/A
Were the samples frozen?*	Y	N	N/A
Were COC papers provided?	Y	N	N/A
Were all sample containers intact?*	Y	N	N/A
Were all sample labels intact?	Y	N	N/A
Were all sample labels legible?*	Y	N	N/A
Did all sample labels match the COC?*	Y	N	N/A
Was the label information complete?*	Y	N	N/A
Were the correct containers used?*	Y	N	N/A
Were the correct preservatives added to water samples?*	Y	N	N/A
Was the pH tested on preserved water samples?	Y	N	N/A
Were pH ranges acceptable?*	Y	N	N/A
Was sufficient amount of sample provided?*	Y	N	N/A
Were bubbles present in VOA samples?*	Y	N	N/A
Were COC's signed and dated?	Y	N	N/A
Did samples arrive before hold time expired?*	Y	N	N/A
Are discrepancy forms attached?	Y	N	N/A

Requires a discrepancy form

Comments:_____

CRF #1
Revised 8/22/03

Figure 7-3
Sample Discrepancy Form

KEMRON ENVIRONMENTAL SERVICES

CRF#4

Sample Discrepancy Form

Client: _____ Project: _____

Date Received: _____

_____ Cooler temperature > than 6 degrees Celsius

Reason _____

_____ Samples received not on chain of custody

_____ Samples on chain of custody not received

_____ Information on sample containers different from chain of custody

_____ Sample containers received broken, leaking or not sealed (List sample ID)

_____ pH out (List sample ID, which container, pH prior to adjusting, amount of acid, preservative)

_____ Insufficient sample volume

_____ Air bubbles present in VOA vials (List sample ID)

_____ Hold time expired (List sample ID)

Service Representative:
Was client notified regarding information: **YES** **NO**
Name of Person contacted: _____ Company: _____
Service Representative: _____ Date: _____

Last Revised 08/22/03

KEMRON ENVIRONMENTAL SERVICES

Figure 7-4
KEMRON INTERNAL SAMPLE CUSTODY FORM

KEMRON Environmental Services
Internal Chain of Custody Report
Login: L0411350
Account:
Project:
Samples: 2
Due Date: 01-DEC-2004

Samplenum	Container ID	Products
L0411350-01	108732	8081

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish
1	LOGIN			10-JAN-2005 08:58	CLS	
2	PREP	W1	EXT	10-JAN-2005 09:14	CSH	BRG
3	STORE	EXT	A1	10-JAN-2005 09:16	BRG	CSH

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish
1	LOGIN			10-JAN-2005 08:58	CLS	

Figure 7-5
KEMRON BOTTLE LABEL

L0411350-04 B
Bottle 4 of 4
Client:
Client ID:
Collected: 16-Nov-04 00:00
Products for this Sample, Listed by Matrix:

: 8270

1087352

8.0 ANALYTICAL PROCEDURES, STANDARDS, AND REAGENTS

This section provides information about the method selection process and provides general analytical policies and procedures which are common to all methods in use in the laboratory. The process for method selection is described along with our policy on multiple versions of the same method, and addresses method validation and project specific criteria. Procedures are outlined for selection and cleaning of laboratory glassware, the requirements for Class A glassware, and the preparation and documentation for reagents and analytical standards. Also included are procedures for logbooks, proper container labeling, and requirements for storage and disposal. This information is addressed in more detail for each analytical method in the specific SOPs which are listed in Appendix B.

8.1 Analytical Methods - Selection

Methods which are used for compliance with local, state, US-EPA or other regulatory authorities must meet minimum performance criteria. Methods for which KEMRON maintains performance criteria are listed in the SOP list found in Appendix B. Other methods exist that can be used for screening, or for estimating concentrations, or may not have defined performance specifications. Such methods are used for limited applications, or when written approval is granted by the client or agency. In general, analytical methods that are selected for implementation by KEMRON must meet one of the following criteria:

- It is a promulgated version of an EPA approved method;
- It is an earlier version of an EPA method that is specified in writing by the client or the project specific QAPP;
- It is a modified EPA method, or a standard method other than EPA which has been specified by the client or in the project specific QAPP. Examples include ASTM, NIOSH, or a client written method for which an official authorization has been given for use.

8.2 Method References

It is our policy to document with each laboratory deliverable the method that was used in the analysis. The current version and official source of method is also referenced in the active version of the analytical SOP. Unless directed otherwise, KEMRON will use the latest version of a method for which a validation study and SOP exists. It is our goal to implement the latest promulgated version of a method within the deadlines established by the agency or project specific

QAPP. It is necessary to maintain multiple versions of the same method due to project specific QAPPs which are often several years old. Project management tools are used by the client Team Chemist/Data Specialist (TSDS) to assure proper versions are used. Additional information on this process may be found in KEMRON SOP 44.

Documentation of Methods:

- Run Logs
- SOPs
- MDL Studies

8.3 Method Validation

The procedures employed for method validation are found in SOP 45. The basic requirements include meeting all the reference method criteria for sample preparation, calibration and linearity checks, analytical precision and accuracy, method detection limit (MDL), method blank, surrogates, and the development and approval of the method SOP. Complete records of each validation study are maintained on file.

8.4 Project or Client Specific Criteria

The performance criteria established in the tables found in KEMRON's Method Performance Criteria represent laboratory generated statistics often from multiple analysts and instruments. The reporting limits (RL), for example do not necessarily represent the lowest analyte concentrations that can be achieved by the method, nor are they guaranteed for every sample. In other cases, these basic laboratory statistics are superseded by client or project specific requirements for MDL, RL, acceptable control limits, or other special requirements. These situations will require the use of project specific QAPPs and/or SOPs. These are separate documents that are reproduced and distributed in project "kick-off" meetings in which specific project requirements are communicated to the QC and production staff. In most cases, project specific analysis codes (products) are programmed into the LIMS which specify the required RLs and control limits.

8.5 Glassware - Selection

The measurement of trace constituents in water, demands methods capable of maximum precision and sensitivity. Since the very sensitive analytical systems

are subject to errors from improper choice of apparatus, as well as, the contamination effects due to improper cleaning procedures, the selection and proper care of laboratory glassware and sample containers play an important role in our quality control program. Laboratory vessels serve three functions: storage of reagents and samples, measurement of solution volumes, and confinement of reactions. Listed below are some guidelines for the proper selection of laboratory glassware: Borosilicate glass, i.e., "Pyrex" or "Kimax," is the mainstay of the laboratory. Other special types of glass are generally not required for the analyses given in "Methods for Chemical Analysis of Water and Wastes". The analytical method usually states whether or not borosilicate type glassware is acceptable. A notable example is the analysis of boron, where the reactions are carried out in Vycor dishes.

8.6 Requirement for Volumetric Glassware

The precision of volumetric work depends in part, on the precision with which volumes of samples and other reagents can be measured. By common usage, accurately calibrated glassware for precise measurement of volume has become known as volumetric glassware. Glassware that meets Federal Specification for Volumetric Glassware is designated as Class A. Except for NIST certified glassware, Class A is the most precise grade and is available in burettes, volumetric flasks, and volumetric pipettes. Class A glassware must be used in the following laboratory procedures:

- Preparation of all primary standards require Class A volumetric flasks and pipettes;
- Preparation and dilution of stock standards require Class A flasks and Class A pipettes;
- All titrimetic standardizations require the use of Class A burette, volumetric flasks and pipettes;
- Class A glassware will be used at all times as specified in the standard analytical method.

8.7 Glassware Cleaning Requirements

Table 8-1 summarizes the general cleaning procedures to be used for all laboratory glassware and reusable sample bottles (glass). All glassware must be scrupulously cleaned in order to remove any possibility of contamination of the sample. (NOTE: Under no circumstances are sample containers for trace level inorganic or organic analyses ever cleaned and reused).

TABLE 8-1
LAB GLASSWARE CLEANING PROCEDURES

Analysis/Parameter	Cleaning Procedure (in order specified)
Extractable Organics (including Pesticides and Herbicides)	1-3, 8, 4, 7, 10, 12, 13
Purgeable Organics	Use either disposable glassware or steps 2, 3, 4, 7
Trace Metals - glass	1-6
Plastic	1-4, 15, 6
Nutrients	1-4, 12
Minerals, COD, BOD, Radiochemistry, Cyanide, Phenols	1-4, 12
Residues	1-4, 9 or 10, 12
MBAS	1-4, 14, 12
Petroleum Hydrocarbons	1-4, 7, 14, 13
Oil & Grease	1-4, 7, 14, 9

Cleaning Procedures (bottles and septa):

1. Remove all labels using sponge or acetone.
2. Wash with hot tap water and a brush to scrub inside of glassware, stopcocks, and other small pieces, if possible, using a suitable laboratory-grade detergent.
   - Organics - Liquinox, Alconox or equivalent
   - Inorganic anions - Liquinox or equivalent
   - Inorganic cations - Liquinox, Alconox, Micro or equivalent
   - Bacteriologicals - must pass an inhibitory residue test
3. Rinse thoroughly with hot tap water.
4. Rinse thoroughly with deionized water.
5. Rinse or soak with 10% Nitric Acid.
6. Rinse 3 times with deionized water.
7. Rinse thoroughly with pesticide grade Methanol.
8. Rinse with 25% sulfuric acid.
9. Bake at 105°C for 3-4 hours.
10. Bake at 180°C for 3-4 hours (prior to use as per method).
11. After use, rinse with last solvent used.
12. Store inverted or capped with suitable material or suitable container stopper.
13. Last step (prior to use) should be a rinse with the solvent used in analysis.
14. Rinse thoroughly with acetone.
15. Rinse or soak with 1:1 HCl (Hydrochloric Acid).

8.8 Reagents and Solvents

8.8.1 Raw Materials

The raw materials which are used in the laboratory must be of a grade which meets or exceeds the method specifications. Inorganic reagents must be ACS reagent grade or better. Acids used for preservatives or digestion for metals methods must be of a grade specified for trace metals. Solvents which are used to prepare standards, reagents and to extract samples must be of the highest grade available for the applicable method. Each lot of solvents or acids must be tested prior to use in the laboratory by using the analysis of a solvent (or reagent) blank which is concentrated to the same level as the sample extracts. Analysis by the method must confirm the absence of interfering substances before the lot is introduced for client sample analysis. Reagents which are used in the digestion/extraction/analysis process are certified as an ultra pure grade by the manufacturer with certification papers kept on file. All chemicals and reagents are labeled with the date received, date opened and date of expiration.

8.8.2 Preparation

The preparation of reagents is done in accordance with requirements of Section 8.1 and the method specific SOP. Each reagent has a detailed recipe which is maintained within the departments logbook for analytical reagents.

8.8.3 Logbooks

Logbooks are maintained which document the preparation details for every batch of reagent. Required content and format for the logbooks are outlined below and illustrated more completely as Figure 8-1:

- Recipe - lists the preparation details
- Reagent name
- Preparer's initials
- Date prepared
- Expiration Date
- Disposal Date
- Concentrations of constituents
- Units
- Reviewer's initials

The preparation date and expiration date should be the same for all reagents prepared fresh daily. The department supervisor is required to perform a periodic review of the logbooks.

8.8.4 Labeling

Labeling of laboratory reagents must contain the following minimum content:

- Reagent name
- Concentration and units
- Initials of preparer
- Date prepared (mm-dd-yy)
- Expiration Date (mm-dd-yy)
- Reagent number

The reagent number provides traceability to the logbook records for the preparation described in section 8.3.3. The number shall be in the following format:

DR-V-P-L where;

D = the department code (E,C,M,V,S)
R = constant R for "reagent"
V = volume or logbook number
P = page number
L = line number, if applicable

8.8.5 Storage

All reagent storage at KEMRON is done in such a way that safety is always considered first. All flammable compounds are stored in a flammable cabinet. Volatile reagents are always stored and used in a well-ventilated area. Table 8-2 gives a complete list of reagents used at KEMRON and the method with which they are stored. Unless otherwise stated, borosilicate glass or polyethylene bottles are acceptable for storage of reagents used in inorganic analyses.

8.8.6 Waste Disposal

Since all laboratory work with chemicals eventually produces waste, we are aware of our moral and regulatory obligations to utilize sound waste management policies and procedures. Therefore, the disposal of reagent

waste at our facility is an issue of great importance and one which has been given much attention. The specifics of KEMRON's waste management system are included in the " Waste Management SOP", a copy of which may be reviewed upon request. The Table of Contents for this SOP may be found in Appendix B.

8.8.7 Reagent Water

Reagent water produced at KEMRON meets the standards of ASTM Type II Water (for the electrical conductivity and resistivity requirements). Reagent water is produced by an IonPure System maintained by US Filter and consists of a series of 5 filter beds:

- Carbon bed (removes chlorine and organics)
- Cation bed (removes heavy metals)
- Anion bed (removes negatively charged ions)
- Mixed bed (removes remaining negatively and positively charged ions)
- Mixed bed (removes remaining negatively and positively charged ions)

The electrical resistivity is checked daily (7 days a week) by means of a remote sensor electrical resisitivity meter and recorded by login department personnel. The finished reagent water must have a minimum electrical resistivity of 1 MΩ·cm at 25° C for control limits and 17 MΩ·cm at 25° C for warning limits to meet acceptance criteria. This remote sensor is located in-line, immediately following the filter beds.

When the electrical conductivity of the reagent water exiting mixed bed #4 exceeds 5 umho/cm at 25° C, a green indicator light turns to red. At this time US Filter is called and service requested. Mixed bed #5 continues to service the laboratory during this period of time and the indicator lights on this tank and the electrical resisitivity meter are checked twice a day until the tanks are changed. After the tanks are changed, the lines are flushed and the electrical resisitivity is rechecked. If the resistivity is >17.0 MΩ·cm) the laboratory is notified and reagent water usage is resumed.

The electrical conductivity is checked daily (Monday – Friday) by means of a electrical conductivity meter and recorded by conventional laboratory personnel. The finished reagent water must have a maximum electrical conductivity of 1.0 umho/cm at 25° C to meet acceptance criteria. This reading is taken on water from the deionized water tap in the conventionals laboratory. This is the furthest point-of-use tap from the filter beds. Additional UV polishing

systems are used in the volatile laboratory to eliminate any trace organics and an ion polishing system is used in the metals laboratory.

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ENVIRONMENTAL SERVICES

TABLE 8-2
REAGENT STORAGE

REAGENT	METHOD OF STORAGE
Hydrochloric Acid (HCl)	Stored in original containers in a vented cabinet designed for acid storage.
Sulfuric Acid (H_2SO_4)	Stored in original containers in a vented cabinet designed for acid storage.
Nitric Acid (HNO_3)	Stored in original containers in a vented cabinet designed for acid storage.
Acetic Acid ($C_2H_4O_2$)	Stored in original containers in a vented cabinet designed for acid storage.
Phosphoric Acid (H_3PO_4)	Stored in original containers in a vented cabinet designed for acid storage.
Ammonium Hydroxide (NH_4OH)	Stored in original containers in a vented cabinet designed for base storage.
Acetone (C_3H_6O)	Stored in original containers in a vented cabinet designed for flammable materials.
Chloroform ($CHCl_3$)	Stored in original containers in a vented cabinet designed for volatile organics storage.
Methanol (CH_3OH)	Stored in original containers in a vented cabinet designed for flammable materials.
Methylene Chloride (CH_2Cl_2)	Stored in original containers in a vented cabinet designed for volatile organics storage.
Ethyl Ether ($C_4H_{10}O$)	Stored in original containers in a vented cabinet designed for volatile organics storage.
Hexane (C_6H_{14})	Stored in original containers in a vented cabinet designed for volatile organics storage.
Propyl Alcohol (C_3H_8O)	Stored in original containers in a vented cabinet designed for flammable materials.
Isopropyl Alcohol (C_3H_8O)	Stored in original containers in a vented cabinet designed for flammable materials.
Pyridine (C_5H_5N)	Stored in original containers in a vented cabinet designed for flammable materials.
Ethyl Acetone ($C_4H_8O_2$)	Stored in original containers in a vented cabinet designed for flammable materials.
Freon-113	Stored in original containers in a vented corner of the liquid-liquid continuous extraction sample prep area.

8.9 Analytical Standards

This section describes all of the procedures required to document the preparation and use of calibration and quality control standards. Policies covered include source material selection, receipt, traceability, preparation and labeling of stock, intermediate, and working standards, logbooks, labeling, storage, and disposal.

8.9.1 Standard Sources and Preparation

The accuracy of data produced from analytical instrumentation depends primarily on the quality of calibration standards. KEMRON uses fully documented procedures to assure that calibration and quality control standards are prepared to the highest level of accuracy available for a particular analyte. Concentrated stocks are prepared only with the highest purity standards available. Only standards that are certified traceable to NIST or are A2LA certified will be used.

8.9.2 Standard Receipt and Traceability

Once purchased standards are received, they are immediately brought to the area in which they are to be used. At this point, the supervisor or analyst will place the standard in its proper storage area. Volatile standards are stored in a freezer. Semi-volatile standards which are purchased neat are stored at room temperature. Stock standards purchased commercially are stored according to the following:

- Water or methanol based standards are stored at 4° C.
- Methylene chloride or hexane based standards are stored in a freezer.
- Standards of compounds which easily precipitate are stored at room temperature.
- PCB spiking standards are stored at room temperature.

All standards will be stored separately from samples. Material Safety Data Sheets (MSDS) provided with all standards, will be stored in a notebook and will be freely available to any analyst. Other certification sheets will be kept on file within each lab division and stored for future reference. Since much of the important information is provided on the label, (manufacturer, lot number, concentration, purity, formula, compound name and health information), it also serves as a good source of information.

8.9.3 Primary Standards

Primary standards are used in the classical chemistry laboratory to standardize selected titrants. These chemicals must specify "primary standard grade" to be acceptable for this purpose. The laboratory maintains primary standards for potassium hydrogen phthalate (KHP) and potassium dichromate, which can be used to standardize a wide variety of acid/base and redox titrants, if necessary. The department supervisor is responsible for the custody of these and other standard reference materials.

8.9.4 Neat Standard Materials

Most calibration and quality control standards are purchased as a concentrated stock solution from a reputable vendor, however high purity neat standards must be used in some custom applications. Only materials of a known, certified purity are chosen for this purpose. Certificates of analysis for each of these neat materials are archived in each department to provide complete documentation and traceability.

8.9.5 Stock Solutions

A record of the preparation of concentrated stock standards will be maintained for each parameter. When a primary standard or concentrated stock standard is prepared, a number is assigned to that standard, along with the date, analyst, compound, Lot Number, purity net weight, weight adjusted for purity, dilution volume and actual concentration are recorded. When a standard solution is prepared from a neat compound, if the entire sample is used the label is removed from the container and attached to the standards form.

Each laboratory department has its own standard preparation log which is kept in a bound form. These forms include all the data listed above as well as space for other information (i.e., disposal date, signature and witness) where necessary. As each standard log book becomes full, it is the job of the Quality Assurance Officer to provide a new one. The area supervisor is also responsible for assuring the log forms are filled out properly, that new personnel have been instructed in the proper procedure for filling out the standards forms, and that the log books are maintained properly.

When the parent stock is purchased through a commercially prepared source, these standards (i.e., 1000 ppm metal standards for atomic absorption) will have the vendor, concentration, expiration date and lot number of this stock

recorded into the standard logbook. Often commercially prepared mixes are purchased.

8.9.6 Intermediate Standards

Once the stock standards are prepared, they are then diluted to prepare intermediate-level standards and/or final working standards using volumetric pipettes and glassware. The choice of the correct apparatus is very important (see Section 8.0). It is in the intermediate stage that more than one parameter is mixed in the right concentration for the final mix. This dilution must also be documented in the same manner as the concentrated stocks.

Table 8-3 gives a list of the standard sources and preparation for the different instruments operated at KEMRON. Figures 8-1 to 8-7 are copies of the different standards preparation forms used at KEMRON by various groups within the laboratory.

8.9.7 Working Standards

These are the final dilutions that are used in the calibration or analysis stage of the method. The same procedures and logbooks that were described for intermediate standards also apply to the working solutions.

8.9.8 Logbooks

Logbooks for the preparation and documentation of calibration and quality control standards are maintained. The forms presented in Figures 8-1 - 8-7 are bound and numbered for this purpose. Each entry is reviewed by the department supervisor who then signs the page. Each stock, intermediate, and working standard has a unique number that references the logbook and provides traceability.

The number shall be in the following format:

DX-V-P-L where:

D = the department code (E,C,M,V,S)
X = S (stock), I (intermediate), or W (working)
V = volume or logbook number
P = page number
L = line number, if applicable

8.9.9 Labeling

Labeling of calibration and quality control standards should contain the following minimum content:

- Standard name
- Concentration and units
- Initials of preparer
- Date prepared
- Expiration date
- Standard number (unique logbook reference)

Due to the very small size of standard containers employed in gas chromatographic analyses, space may not allow for all of the above information.

8.9.10 Storage

Analytical and quality control standards are stored in the individual laboratories. The conventionals, extraction, semivolatile organic, and volatile organic have refrigerators which are dedicated to reagents and standards. Samples and standards must never be stored in the same refrigerator. Standards for organic methods are stored in borosilicate glass containers with a Teflon lined cap which have been cleaned and solvent rinsed. Standards used in the conventionals laboratory are stored in containers compatible with the analyte and solvent i.e., of the same composition as the required sampling container. Metals standards are stored at room temperature and placed in a storage cabinet. Storage of standards used in atomic absorption analyses should be in a polyethylene container, except where noted in the method, i.e., silver. Standards which have expired must be immediately removed from the storage unit and taken to the support services supervisor for proper disposal.

8.9.11 Disposal

The disposal of all standards is done in accordance with procedures outlined in the KEMRON "Waste Management SOP" referenced previously.

TABLE 8-3

STANDARD SOURCES AND PREPARATION

Instrument Group	Concentration	Storage	Preparation from Source	Standard Expiration
Volatile Gas Chromatography/Mass Spectrometry (GC/MS)	primary stock mixture is at variable concentrations	Freezer	primary stock mixtures are commercially prepared solution mixes	6 months or manufacturer recommended expiration date
	intermediate standards are at variable concentrations	Freezer	intermediate standards are prepared from commercially purchased stock mixes	6 months
	working concentration	Used immediately	working standards are prepared from intermediates	prepared fresh daily
Semi-volatile Gas Chromatography (GC)	primary stock mixture is at variable concentrations	Freezer	primary stock mixtures are commercially prepared solution mixes	6 months or manufacturer recommended expiration date
	intermediate standards are at variable concentrations	Freezer	intermediate standards are prepared from commercially purchased stock mixes	6 months
	working concentration	Used immediately	working standards are prepared from intermediates	prepared fresh daily
Gas Chromatography/Mass Spectrometry (GC/MS)	primary stock mixture is at variable concentrations	Freezer	primary stock mixtures are commercially prepared solution mixes	6 months or manufacturer recommended expiration date
	intermediate standards are at variable concentrations	Freezer	intermediate standards are prepared from commercially purchased stock mixes	6 months
	working concentration	Freezer	working standards are prepared from intermediates	1 months
HPLC	primary stock mixture is at variable concentrations ≤ 100 ppm	Freezer	primary stock mixtures are commercially prepared solution mixes	6 months (8310) 1 month (8330) or manufacturer recommended expiration date
	working concentration	Freezer	working standards are prepared from commercial stocks	24 hours
Atomic Absorption furnace and cold vapor	primary stock mixture is at variable concentrations ≥ 1000 ppm	Room temperature	primary stock mixtures are commercially prepared solution mixes	12 months or manufacturer recommended expiration date
	intermediate standards are at variable concentrations ≥ 10 ppm (high standard)	Room temperature	intermediate standards are prepared from commercially purchased stock mixes	6 months
	working concentration	Room temperature	working standards are prepared from intermediates	24 hours

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TABLE 8-3 (continued)
STANDARD SOURCES AND PREPARATION

Instrument Group	Concentration	Storage	Preparation from Source	Standard Expiration
Inductively Coupled Plasma	primary stock mixture is at variable concentrations ≥ 1000 mg/L	room temperature	primary stock mixtures are commercially prepared solution mixes	12 months or manufacturer recommended expiration date
	intermediate standards are at variable concentrations ≥ 10 mg/L (high standard)	room temperature	intermediate standards are prepared from commercially purchased stock mixes	1 month
	Working concentration	room temperature	working standards are prepared from intermediates	prepared fresh daily
Total Organic Carbon (TOC)	primary stock 1000 mg/L solution	room temperature	primary stock is a commercially prepared solution	6 months or manufacturer recommended expiration date
	Working concentration	used immediately	working standards are prepared from intermediate	prepared fresh daily
pH Meters	pH = 4,7,10 Premixed	room temperature	used as received commercial stocks	fresh daily
Turbidimeters	Pre-mixed 4 Gelex Standards NTU 0-1 NTU 1-10 NTU 10-100 NTU 100-1000 scale Check Standard Primary (Formazin)	room temperature	used as received commercial stocks prepared from 4000 NTU Stock	restandardized quarterly manufacturer recommended expiration date
Specific Conductivity Meter	Neat	room temperature.	stock: 14,130 umho/cm working Standard:	6 months
	Working concentration	4° C	1413 umho/cm	24 hours

TABLE 8-3 (continued)
STANDARD SOURCES AND PREPARATION

Instrument Group	Concentration	Storage	Preparation from Source	Standard Expiration
TRAACS				
Ammonia	primary stock = 1000 mg/L	room temperature	used as received commercially prepared	Manufacturer recommended expiration date
	working standards are at variable concentrations	room temperature	working standards are prepared from commercially prepared primary stock	1 month
Chloride	primary stock = 1000 mg/L	room temperature	used as received commercially prepared	manufacturer recommended expiration date
	working standards are at variable concentrations	room temperature	working standards are prepared from commercially prepared primary stock	1 month
Nitrate	primary stock = 100 mg/L	room temperature	used as received commercially prepared	manufacturer recommended expiration date
	working standards are at variable concentrations	room temperature	working standards are prepared from commercially prepared primary stock	1 month
Alkalinity	primary stock = 1000 mg/L	room temperature	prepared by KEMRON from sodium carbonate	6 months
	working standards are at variable concentrations	room temperature	working standards are prepared from KEMRON's prepared primary stock	1 month
Phosphorus	primary stock = 200 mg/L	room temperature	prepared by KEMRON from KH_2PO_4	6 months
	working standards are at variable concentrations	room temperature	working standards are prepared from KEMRON's prepared primary stock	1 month
Total Kjeldahl Nitrogen	primary stock =200 mg/L	room temperature	prepared by KEMRON from $(NH_4)_2SO_4$	6 months
	working standards are at variable concentrations	room temperature	working standards are prepared from KEMRON's prepared primary stock	1 month

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Figure 8-1
Standards Form for the Inorganic/Wet Lab

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STANDARDS LOGBOOK

Q/S	Identification Number	ADT	Parameter	Manufacturer/ Parent	Chemical	Lot Number	Weight or Volume	Total Volume	Concentration	Expiration Date	Disposal Date

Reviewed By: _____

Figure 8-2
Standards Form for the Metals Group
(ICP/AA-Stock Solutions)

Book No: MS-1
Page No: 1

KEMRON Environmental Services
Purchased Stock Solutions
ICP / AA

Line #	Analyst / Date / Time	Stock Solution Name	Manufacturer and Lot #	Dilution Solvent	ppm Concentration *	Expiration Date
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

* multi = Multielement solution - see certificate of analysis for individual metal concentrations

Reviewed By: _____

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Figure 8-3
Standards Form for the Metals Group
(ICP/AA-Intermediate Solutions)

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KEMRON Environmental Services
Intermediate Solutions
ICP / AA

Solution Name: _____ Solution #: _____ Solution Expiration: _____
Dilution Acid Name/Volume: _____ Acid Manufacturer: _____ Acid Lot #: _____
Dilution Acid Name/Volume: _____ Acid Manufacturer: _____ Acid Lot #: _____

Solution A

Parent Solution Name	Parent Solution Number	Parent Solution Expiration	Parent Solution Concentration ppm*	Aliquot Volume ml	Final Volume ml	Final Concentration ppm*

* multi = Multielement solution - see certificate of analysis for individual element concentrations
Comments: _____

Prepared by: _____ Date: _____
Witnessed by: _____ Date: _____

Solution Name: _____ Solution #: _____ Solution Expiration: _____
Dilution Acid Name/Volume: _____ Acid Manufacturer: _____ Acid Lot #: _____
Dilution Acid Name/Volume: _____ Acid Manufacturer: _____ Acid Lot #: _____

Solution B

Parent Solution Name	Parent Solution Number	Parent Solution Expiration	Parent Solution Concentration ppm*	Aliquot Volume ml	Final Volume ml	Final Concentration ppm*

* multi = Multielement solution - see certificate of analysis for individual element concentrations
Comments: _____

Prepared by: _____ Date: _____
Witnessed by: _____ Date: _____

Figure 8-4
Standards Form for the Metals Group
(ICP/AA-Working Solutions)

Volume: MW-1
Page No: 1

KEMRON Environmental Services
Daily Working Standards
AA

Parent Solution Name: _____ Parent Solution #: _____ Parent Solution Expiration: _____ *Solution Conc. PPM: _____

Line #	Analyst / Date / Time	Solution Name	Solution Number	Parent Aliquot Volume ml	Final Volume ml	Final Concentration ppb*
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						

* multi = Multielement solution - see certificate of analysis for individual element concentrations

Reviewed by: _____ Date: _____

KEMRON ENVIRONMENTAL SERVICES

Figure 8-5
Neat Compound Standards Form for the Volatile Organic GC and GC/MS Group

KEMRON ENVIRONMENTAL SERVICES

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KEMRON
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Neat Compound Standards
Volatile Organic GC & GC/MS

(S=Stock)
(I=Intermediate)
(W=Working)

Solution: _____ Solution #: _____ Solution Expiration: _____ Solution Type: _____
Dilution Solvent: _____ Solvent Manufacturer: _____ Solvent Lot #: _____
Parent Solution Expiration: _____ Parent Solution Lot #: _____

Parent Compound	Parents Lot Number	Purity of Parent Compound (%)	Parent Compound Weight (mg)	Dilution Volume (ml)	Final Concentration (ug/ml)

Comments: _____
_____
Prepared by: _____ Date: _____
Reviewed by: _____ Date: _____

Figure 8-6
Working Standards Form for the Volatile Organic GC and GC/MS Group

KEMRON ENVIRONMENTAL SERVICES

Document Control No.: SV0136 Page 1 of 50

KEMRON
Environmental Service

Solution Standards
Volatile Organic GC & GC/MS

(S=Stock)
(I=Intermediate)
(W=Working)

Solution: _____ Solution #: _____ Solution Expiration: _____ Solution Type: _____
Dilution Solvent: _____ Solvent Manufacturer: _____ Solvent Lot #: _____
Parent Solution Expiration: _____ Parent Solution Lot #: _____

Parent Compound	Parent's Lot Number	Concentration of Parent Solution (ug/mL)	Aliquot Volume (uL)	Final Volume (mL)	Final Concentration (ug/mL)

Comments: _____
_____
_____

Prepared by: _____ Date: _____

Reviewed by: _____ Date: _____

KEMRON ENVIRONMENTAL SERVICES

Figure 8-7
Neat Compound Standards Form for the Semivolatile Organic GC and GC/MS Group

Volume No.: 0019
Page: 1

KEMRON
Environmental Service

Neat Compound Standards
Semi-Volatile Organic GC & GC/MS

(S=Stock)
(I=Intermediate)
(W=Working)

Solution: _____ Solution #: _____ Solution Expiration: _____ Solution Type: _____
Dilution Solvent: _____ Solvent Manufacturer: _____ Solvent Lot #: _____
Parent Compound Expiration: _____ Parent Compound Lot #: _____

Parent Compound	Parent's Compound Number	Purity of Parent Compound (%)	Parent Compound Weight (mg)	Dilution Volume (mL)	Final Concentration (ug/mL)

* Corrected for purity if compound is less than 95% pure.

Comments:

_____

Prepared by: _____ Date: _____
Reviewed by: _____ Date: _____

Figure 8-8
Working Standards Form for the Semivolatile Organic GC and GC/MS Group

KEMRON ENVIRONMENTAL SERVICES

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KEMRON
Environmental Service

Solution Standards
Semi-Volatile Organic GC & GC/MS

(S=Stock)
(I=Intermediate)
(W=Working)

Solution: _____ Solution #: _____ Solution Expiration: _____ Solution Type: _____
Dilution Solvent: _____ Solvent Manufacturer: _____ Solvent Lot #: _____
Parent Solution Expiration: _____ Parent Solution Lot #: _____

Parent Solution	Parent's Solution Number	Concentration of Parent Solution (ug/mL)	Aliquot Volume (uL)	Final Volume (mL)	Final Concentration (ug/mL)

Comments: _____
_____

Prepared by: _____ Date: _____
Reviewed by: _____ Date: _____

8.10 Standardization of Titrating Solutions

Table 8-4 gives a listing of the reagents used as titrants. All solutions are purchased pre-standardized by the manufacturer. The manufacturer's certificate of analysis provides the following information:

- Nominal Concentration (Normality)
- Concentration Limits
- Lot Number
- Primary Standard (Certified traceable to NIST)

As a daily quality control check on the commercial solutions, the laboratory verifies the certified values through the analyses of a laboratory control sample. The standardization is checked monthly using the primary standard. If the results of this analysis indicates a problem, i.e. an out of control situation, then re-standardization against primary standards is required. Alternatively, the out-of-specification solutions are discarded and fresh solutions are obtained as replacements.

TABLE 8-4
STANDARDIZATION OF TITRATING SOLUTIONS

Parameter	Titrating Solution	Primary Standard	Frequency of Standardization
Acidity	NaOH	KHP NIST traceable	Prestandardized by the manufacturer checked monthly
Alkalinity	H_2SO_4	Sodium Carbonate Standard Solution NIST traceable	Prestandardized by the manufacturer checked monthly
Hardness	EDTA	Calcium carbonate as $CaCl_2$ NIST traceable	Prestandardized by the manufacturer checked monthly

Note all titration solutions are purchased pre-standardized.

8.11 Certificate of Analysis

The laboratory will maintain a system for identifying and filing certificates of analysis (COA) for all purchased standards. The analyst will log the COA into the LIMS, which assigns a unique serial COA number. The laboratory will file electronic (pdf) copies of each COA in the COA folder of the network. The filename is in the format <COA#.pdf>.

9.0 CALIBRATION PROCEDURES AND FREQUENCY

9.1 Instrumentation

Since the modern analytical laboratory depends heavily upon instrumentation, their calibration, operation and maintenance must be a primary concern in the production of satisfactory data. Below is a list of the instruments commonly used by KEMRON in the analysis of various sample matrices.

Table 9-1
Laboratory Equipment

Location*	Instrument Name	Date Acquired	Condition	Serial Number
31	ASE200 Accelerated Solvent Extractor	5/99 1/03	New New	99040590 02110605
31-TCLP	PE 1600 Series FTIR Infrared Spectrometer	9/93	New	N017-0043
31-Digest	Mars 5 Microwave	7/98	New	S414
31-Digest	CEM MDS 2000 Microwave	11/96	Reconditioned	YR6444
32	HP16 - Gas Chromatograph/FID/TCD with RSK auto- sampler	11/04	New	GC-CN10429033 AS-IT00428012
32	HPMS 11 5973 - 6890 w Varian Archon Gas Chromatograph Mass Spec, Tekmar sample concentrator	8/00	New	GC-US00036002 MS-US94260126
32	HPMS 8 5973 - 6890 w Varian Archon Gas Chromatograph Mass Spec, Tekmar sample concentrator	1/98	New	GC-US0010116 MS-US72821183
32	HPMS 6 5973 - 6890 w Varian Archon Gas Chromatograph Mass Spec	12/96	New	GC-Us00006300 MS-US63810266
32	HPMS 9 5973 - 6890 w Varian Archon Gas Chromatograph Mass Spec, Tekmar sample concentrator	10/98	New	GC-US00022637 MS-US82321660
32-GC	HP 11 5890 w Varian Archon Gas Chromatograph PID/FID, Tekmar sample concentrator	5/97	New	3336A58572
32	HPMS 10 5973 – 6890 w Varian Archon Gas Chromatograph, Tekmar sample concentrator	8/99	New	GC-US0029166 MS-US91922575
32-GC	HP 13 5890 Gas Chromatograph – FID	3/90	Used	2950A27527

Table 9-1
Laboratory Equipment (continued)

Location*	Instrument Name	Date Acquired	Condition	Serial Number
32-GC	HP 12 5890 Gas Chromatograph – PID Tekmar sample concentrator	5/97	New	3336A51041
32-GC	HP 3 5890 w Varian Archon Gas Chromatograph PID/FID, Teckmar sample concentrator	9/90	New	3203A41712
32-GC	HP 5 5890 w Varian Archon Gas Chromatograph PID/FID, Tekmar sample concentrator	7/92	New	2950A27655
33	HP15 AG 6890N Gas Chromatograph – ECD	9/04	New	CN10428037
33	HPMS 7 5973 – 6890 Gas Chromatograph Mass Spec	4/97	New	GC-US00007949 MS-US70820650
33	HPMS 4 5973 – 6890 Gas Chromatograph Mass Spec	5/99	New	GC-US00026408 MS-US82322192
33	HPMS 5 5973 – 6890 Gas Chromatograph Mass Spec	9/96	New	GC-US00004989 MS-US62510073
33	HP 9 6890 Gas Chromatograph – ECD	5/98	New	US00021274
33	HP 4 5890 Gas Chromatograph- ECD	11/90	Used	2950A26244
33	HP 1 5890 Gas Chromatograph – ECD	11/88	Used	2643A11618
33	HP 14 AG 6890 Gas Chromatograph - FID	11/02	New	US10207074
33	HPMS 12 AG 5973 – 6890 Gas Chromatograph/Mass Spec	5/03	New	US10249164
33	HPMS 13 AG 59730 – 6890 Gas Chromatograph/Mass Spec	8/03	New	US30965929
33	VWR Ultrasonic Cleaner	10/03	New	01TS37915
33-HPLC	HP 2 5890 w EZFlash Gas Chromatograph – FID	12/88	New	2843A19859
33-HPLC	HP 8 5890 Gas Chromatograph – FID	5/94	New	2728A13203
33-HPLC	HPLC 3 1100 Liquid Chromatograph	12/97	New	US72102126
33-HPLC	HPLC 2 1050 Liquid Chromatograph	6/96	New	VWD3323J02394

Table 9-1
Laboratory Equipment (continued)

Location*	Instrument Name	Date Acquired	Condition	Serial Number
33-HPLC	HPLC 4 1100 Liquid Chromatograph	11/99	New	DE91605474
34	Perkin Elmer SIMAA 6100 GF-AES	3/03	New	B3123015
34	Perkin Elmer Optima 3000 DV ICP-AES	9/93	New	069N6021601
34	TJA Iris Advantage ICP-AES	7/98	New	7006
34	Perkin Elmer Sciex ELAN 6100 ICP-MS	1/00	New	1129909
34	Perkin Elmer Optima 4300 ICP-AES	1/04	New	930S4010403
34-Mercury	Leeman PS202 CV-AAS	5/99	New	HG9013 112-00031-1
34-Mercury	Leeman Hydra AA CV_AAS	4/03	New	2054 112-0064-1
35	Westco Easy Distillation	8/99	New	1061
35	CN – Easy Dist Universal Distallation System	12/02	New	483-W001-01
35	Sargent-Welch 10w/PH 8400 pH Ion Meter	1990	New	88290100
35	Orion pH/ISE 710A	1/98	New	24083
35	Orion pH/ISE Model 710A pH Ion Meter	4/95	New	002576
35	Shimadzu UV-1201V Spectrophotometer	8/99	New	A108036800041
35	Shimadzu UV-120-0Z Spectrophotometer	1992	New	1265924
35	TOC Shimadzu	12/02	New	39624467
35	Bran-Luebbe TRACCS 800 Auto Analyzer	12/91	New	91/0389
35	COD Reactor (HACH) I Block Digester	1987	New	930100008493
35	COD Reactor (HACH) II	6/99	New	990600019097

Table 9-1
Laboratory Equipment (continued)

Location*	Instrument Name	Date Acquired	Condition	Serial Number
35	Horizon SPE-DEX 4750 Oil and Grease Extractor	12/98	New	98-373
35	YSI Model 32 Conductivity Meter	8/93	New	93G07466
35	VWR Turbidity Meter	3/01	New	800 1682
35	HACH Turbidity Meter	1987	New	4922
35	IC1 Dionex 500 Ion Chromatograph	12/98	New	98080641
35	IC2 Ion Chromatograph	8/01	New	01080138
35	SmartChem Automated Chemistry Analyzer	04/04	New	W0402048

*Location Key:	Balances
31 - Extraction Lab	Mettler AE 160
32 - Volatile Lab	Mettler PJ3660
33 - Semivolatile Lab	Mettler PE600
34 - Metal Lab	OHAS TS6005
35 - Conventionals Lab	Sartorius 1402

9.2 General Calibration Requirements

All laboratory instrumentation must be properly calibrated before it is put into official use. Some general policies and guidelines are provided in the following sections, but complete details are found in the KEMRON SOP for the particular method. Specific program or project requirements may be provided in the project QAPP or the sampling and analysis plan (SAP) and may supercede the method and KEMRON's SOP.

9.2.1 Initial Calibration

The initial calibration (ICAL) must meet the minimum requirements for the method in use. The calibration must contain the minimum number of points and the curve must pass the method criteria. If more than the minimum number of calibration points are analyzed for initial calibration, it is acceptable to eliminate points only at the top or bottom of the range, in order to get the curve to pass

ICAL criteria. Points may not be eliminated from the middle portion of curve unless the entire ICAL is repeated.

9.2.2 Second Source Verification

It is the general policy of KEMRON to verify the initial calibration with the analysis of a standard from a second source (different vendor). Acceptance criteria for the second source initial calibration verification (ICV) may be found in the specific SOP or the project QAPP or SAP. Any problems with the ICV that can not be resolved by corrective action must be noted in the report narrative and the data properly qualified.

9.2.3 Continuing Calibration Verification

Continuing calibration verification (CCV) must be performed at the method specified frequency and meet the method SOP, QAPP, or SAP requirements. When required by the method, all samples must be bracketed by passing CCVs. Samples not bracketed by passing CCVs must be reanalyzed. Any problems with the CCV that cannot be resolved by corrective action must be noted in the report narrative and the data properly qualified.

9.3 Gas Chromatography

- ECD (Pesticides/PCBs/Herbicides)
- FID (Polynuclear Aromatic)
- Hydrocarbons/DRO/8030/GRO
- PID (Aromatic Volatile Organics)
- ELCD (Halogenated Volatile Organics)

Initial calibration is at least a 5-point standard curve of all target compounds, (concentrations are in detector linear range) performed on failure of two continuing calibration standards. The lowest calibration standard has a concentration that is equal to or less than the Reporting Limit. Curves are checked by calculating the %RSD for all compounds.

Initial calibration and run sequence:

1. Initial calibration
2. ICV
3. Analyze 10 samples (includes reagent blanks, LCS, spikes and duplicates)
4. Run check standard

5. Continue with steps 3 and 4 for entire run

Daily continuing calibration and run sequence:

1. CCV
2. Analyze 10 samples (includes reagent blanks, LCS, spikes and duplicates)
3. Analyze check standard
4. Continue with analysis steps 2 and 3 for entire run

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, all affected samples must be rerun. Exceptions will be noted on corrective action forms and approved by management.

9.4 Gas Chromatography/Mass Spectrometry

- Volatile Organic Analysis
- Semivolatile Organic Analysis

Initial calibration is at least at a minimum 5 point standard curve of target compounds (concentrations are in detector linear range) performed on failure of two continuing calibration standards. The lowest calibration standard has a concentration that is equal to, or less than, the Reporting Limit. Method 624 requires a minimum of a 3 point standard curve.

Curves are checked by calculating the %RSD for the CCC compounds. The SPCC compounds must meet method specific requirements.

Initial calibration and run sequence:

1. Run BFB or DFTPP. Achieve acceptance criteria based on Key Ion and Abundance Tables 9-2 and 9-3.
2. Initial calibration
3. CV
4. Analyze samples (including blanks, LCS, spikes and duplicates) within the specified tune time for BFB or DFTPP.

Daily continuing calibration and run sequence:

1. Run BFB or DFTPP. Achieve acceptance criteria based on Key Ion and Abundance Tables 9-2 and 9-3.
2. CCV

3. Check to see if CC meets criteria. If not, make necessary corrections in GC/MS system and run CCV again.
4. If standard passes, run samples (including blanks, LCS, spikes, and duplicates) for 12 hours from the time BFB or DFTPP was run.
5. At the end of the method specified tune time, repeat steps 1 - 5.

TABLE 9-2
KEY IONS AND ABUNDANCE CRITERIA FOR BFB

Mass	Ion Abundance Criteria
40	15 to 40% of m/z 95
75	30 to 60% of m/z 95
95	base peak - 100% relative abundance
96	5 to 9% of m/z 95
173	less than 2% of m/z 174
174	greater than 50% of m/z 95
175	5 to 9% of m/z 174
176	greater than 95% but less than 101% of m/z 174
177	5 to 9% of m/z 176

TABLE 9-3
KEY IONS AND ABUNDANCE CRITERIA FOR DFTPP

Mass	Ion Abundance Criteria
51	30 to 60% of m/z 198
68	less than 2% of m/z 69
70	less than 2% of m/z 69
127	40 to 60% of m/z 198
197	less than 1% of m/z 198
198	base peak 100% relative abundance
199	5 to 9% of m/z 198
275	10 to 30% of m/z 198
365	greater than 1% of m/z 198
441	present, but less than m/z 443
442	greater than 40% of m/z 198
443	17 to 23% of m/z 442

9.5 HPLC - VWD/FD (PNA and Explosives)

The initial calibration is a 6 point standard curve of all target analytes. The lowest calibration standard has a concentration equal to or less than the Reporting Limit. The curves are checked by calculating the %RSD for all analytes. The %RSD must be ≤ 20%.

Initial Calibration and Run Sequence:

1. Initial Calibration
2. ICV
3. Analyze 10 samples
4. CCV
5. Continue steps 3 & 4 for entire run

Daily Continuing Calibration and Run Sequence:

1. CCV
2. Analyze 10 samples (includes reagent blanks, LCS, spikes and duplicates)
3. Analyze check standard
4. Continue with analysis steps 2 and 3 for entire run

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, all affected samples must be rerun. Exceptions will be noted on corrective action forms and approved by management.

9.6 IC - Conductivity Detector (Anions)

The initial calibration is a linear or quadratic regression based on six points for all seven analytes plus a blank. The initial calibration verification requires that the response not vary by more than ± 10%. Initial Calibration and Run Sequence:

1. Initial Calibration
2. ICV
3. Analyze 10 samples
4. Analyze one in every ten samples in duplicate
5. CCV
6. Continue steps 3, 4 & 5 for entire run

Daily Continuing Calibration and Run Sequence:

1. Run the mid-range calibration standard - response must not vary more than 10%
2. Analyze 10 samples
3. Analyze one in every 10 samples in duplicate
4. Run a mid-range calibration standard which must not vary more than 5%
5. Continue steps 2, 3 and 4 for entire run

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, an initial calibration must be run and all affected samples rerun. Exceptions will be noted on corrective action forms and approved by management.

9.7 Atomic Absorption – Graphite Furnace, Cold Vapor

Initial calibration is a minimum of four standards and a blank and must be within the linear part of the calibration curve. The lowest calibration standard has a concentration that is equal to the Reporting Detection Limit. Calculation is by computer software using linear regression.

Initial Calibration and Run Sequence:

1. Initial Calibration
2. ICV
3. ICB
4. CCV
5. CCB
6. Analyze 10 or less samples, including all batch related QA/QC (LCS, Method Blank, MS/MSD).
7. CCV
8. CCB
9. Continue running samples in groups of 10 or less followed by the CCV and CCB.

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, an initial calibration must be run and all affected samples must be rerun. Exceptions will be noted on corrective action forms and approved by management.

9.8 ICP-AES, MS

Initial calibration is a minimum of 3 standards and a blank. Calculation is by computer software using linear regression.

Initial Calibration and Run Sequence:

1. Initial calibration
2. Rerun high std
3. ICV
4. ICB
5. Run Interference check samples
6. Analyze 10 or less samples, including all batch related QA/QC (LCS, Method Blank, MS/MSD)
7. CCV
8. CCB
9. Continue running samples in groups of 10 or less followed by the CCV and CCB
10. Run interference check samples at end of analytical run

Samples must be bracketed by passing CCVs. If the CCV does not meet criteria, all affected samples must be rerun. Exceptions will be noted on corrective action forms and approved by management.

9.9 Support Equipment

9.9.1 pH Meter

The pH meter is recalibrated before each use or after 2 hours of use.

9.9.2 Turbidimeter

The Turbidimeter is calibrated before each use.

9.9.3 Thermometers

Each thermometer in use in the laboratory is identified with an unique I.D. number which is printed on an attached tag. When a thermometer is put into use, it is checked against an NIST certified reference thermometer and documented in the thermometer calibration logbook. Any variation from the reference thermometer is indicated on the I.D. tag. If no adjustment is necessary, it is indicated by writing “No Correction Necessary” or “NCN” in the book and “NCN” on the tag. If temperature correction is required, it is added to

or subtracted from the actual thermometer reading. KEMRON records only the corrected temperature. Each thermometer is rechecked annually against the reference thermometer using the procedures outlined in KEMRON SOP K0002 and documented in the thermometer logbook. The reference thermometer is replaced or sent to an A2LA accredited calibration company every five years for recalibration to NIST traceablity.

9.9.4 Mechanical Pipets and Syringes

The laboratory will verify mechanical pipets and syringes employing the procedures found in SOP K0002. Mechanical pipets of 100 uL or larger are verified daily and syringes (100uL or larger) are checked annually. All data shall be maintained in a controlled document.

9.9.5 Balances

The most important piece of equipment in any laboratory is the analytical balance. The accuracy of data related to weight-prepared standards can be no better than that of the analytical balance. For this reason, proper care and use of the analytical balance must be of highest priority. The following section describes the standard operating requirements at KEMRON for the calibration and care of analytical balances:

- Analytical balances are mounted on a heavy, shock-proof table, constructed of either marble or concrete, and placed in an area of low traffic. The balance level is checked daily and adjusted when necessary.

- Balances must be protected from extreme temperature and humidity change. A beaker of silica gel desiccant should be placed in the balance and changed frequently.

- All spills on the pan or inside the balance must be avoided, and the balance must be kept scrupulously clean at all times.

- Balances will be checked and adjusted at least twice a year by a professional service or balance specialist. A service contract and maintenance schedule is also recommended.

Table 9-4
Calibration:

Class 1 weights (traceable to NIST) are used by an outside calibration agency to calibrate the analytical balance and the top loader balances quarterly. The analytical balance and top loading balances are checked daily with weights in the appropriate range in which they are being used. Acceptance criteria is as follows:

Weight (grams)	Analytical Balance (grams)	Top Loading Balance (grams)
0.1	± 0.0002 W ± 0.0003 C	
0.2	± 0.0002 W ± 0.0003 C	
0.5	± 0.0005	
1.0	± 0.0005	± 0.05
5.0	± 0.001	± 0.05
10.0	± 0.001	± 0.05
50.0	± 0.001	± 0.05
100.0	± 0.001	± 0.05

W = Warning Limits ***C = Control Limits***

The Balance Logbook:

Maintenance and service records should be entered in the logbook. The daily calibration records should include the date, time, the initials of the operator, and the weights for the standard checks using the procedure described earlier.

9.10 Logbooks

Logbooks are kept for each analytical instruments, balances, refrigerators, and incubators in the laboratory. All logbooks are bound controlled documents with numbered pages.

9.10.1 Balances

Each balance has a logbook to record daily calibrations checks. Each balance is checked with class 1 weights which are at or near the weight of samples routinely weighed on each balance. Acceptance criteria is outlined in 9.2.11.

9.10.2 Refrigerators

Each refrigerator has a logbook to record its daily temperature checks. Each refrigerator has a calibrated thermometer inserted in a container of water. This thermometer is read daily and more often if necessary. The temperature is recorded in the logbook to document the proper temperature and stability of each refrigerator.

9.10.3 Ovens and Incubators

Each oven and incubator has a logbook to record its daily operating temperatures. Each oven and incubator has a calibrated thermometer which is read during its operation. The operating temperatures are recorded in the logbook to document that the proper operating temperature has been utilized.

9.10.4 Instrument Logbooks

Each analytical instrument in the laboratory has a logbook. Daily operational notes, problems, routine maintenance procedures and repairs are kept in the instrument maintenance logbook. Calibrations, QC samples, and sample run information is documented in the instrument runlog.

10.0 PREVENTIVE MAINTENANCE

10.1 Routine Maintenance Activities

All of KEMRON's instruments undergo routine maintenance, cleaning, and inspection on a daily, weekly, or monthly basis, according to the manufacturer's recommendation, and/or the requirements of the standard methods employed. Maintenance logs and instrument maintenance checklists are kept, noting problems and the steps taken to correct them. Records are kept on repairs requiring non-KEMRON service repairmen. Table 10-1 provides a complete list of the preventive maintenance for all major laboratory instrumentation. Each instrument has its own log book, which contains a record of any maintenance or repairs performed.

10.2 Contingency Plan

In the event of a major instrument failure, most of KEMRON's instrumentation has a back-up. There are multiple volatile and semivolatile GC/MS's, as well as, multiple ECD's, ELCD's, FID's and PID's. In the inorganic laboratory there are multiple pH meters, spectrophotometers, an AAS and an ICP-MS (for low-level analyses) and ICP-AES's (3). This instrumentation is listed in Section 9, Table 9-1, pages 1-3 of 12. In the event that no backup is available and the sample has holding time left, the sample will be held until repairs have been completed. If the sample is getting close to the end of its holding time, the sample will be subcontracted out to another certified laboratory, or a new sample will be requested from the client. This decision will be left up to the client. KEMRON, under no circumstance, will analyze samples out of holding time or subcontract to another laboratory, without client notification.

TABLE 10-1
LABORATORY INSTRUMENTATION PREVENTIVE MAINTENANCE

EQUIPMENT	ACTIVITY
Gas Chromatographs Semivolatile Organics	change septum change liners check carrier gas change carrier gas change in-line filters remove first foot of capillary column replace ECD replenish Electrolytic Conductivity Detector Solvents change ion exchange resin replace nickel tubing bake out column at completion of sample batch run check system for gas leaks at each column change sylonize injection port liners every liner
Gas Chromatographs Volatile Organics	check gases change gases clip chromatographic column clean PID Lamp clean FID Lamp change Trap bake out column
Gas Chromatograph/ Mass Spectrometers Semivolatile Organics	clean mass spectrometer source change septum change liners check carrier gas change carrier gas change in-line filters remove first foot of capillary column replace nickel tubing bake out column check system for gas leaks sylonize injection port liners
Gas Chromatograph/ Mass Spectrometers Volatile Organics	clean mass spectrometer check helium change helium change trap clip column change Purge and Trap ferrules bake out column

TABLE 10-1 (continued)
LABORATORY INSTRUMENTATION PREVENTIVE MAINTENANCE

EQUIPMENT	ACTIVITY
HPLC - VWD/FD	monitor system pressure change guard cartridges reverse column filter samples @ 0.45 microns filter eluents @ 0.20 microns if needed monitor eluent reservoir content
IC - Conductivity Detector	monitor system pressure monitor baseline detector output change guard column filter samples @ 0.45 microns filter eluents @ 0.20 micron if needed degas eluent monitor eluent volume monitor waste volume
GF-AAS	clean furnace windows check plumbing connections check graphite tube check gases check optics
CV-AAS(mercury)	change tubing check optics check gases check rinse change drying tube
ICP	clean nebulizer check torch check gases change tubing check optics
TRAACS 800	clean flowcell change tubing
pH Meters	clean probe
TOC Meter	clean detector
Specific Conductivity Meters	clean probe check cell constant replenish/replace probe redetermine cell constant
DO Meter	clean probe check membrane change membrane
Analytical Balance	check pans and compartment check alignment and balance cleaning/calibration/service
Ovens	temperature monitoring
Refrigerators	temperature monitoring
Incubators	temperature monitoring

11.0 QUALITY CONTROL CHECKS, ROUTINES TO ASSESS PRECISION, ACCURACY, AND CALCULATION OF METHOD DETECTION LIMIT

This section describes the basic techniques of laboratory quality control and quality assessment normally used to evaluate analytical proficiency. General concepts are defined and discussed as measurement tools for evaluation of data quality. Topics addressed include analytical methods, the concept of batch control, specific types of quality control samples, routines to assess accuracy and precision, statistical control, method detection limits and reporting limits, and internal and external performance evaluation samples. For additional information on related subjects, the reader is referred to Section 9 for instrument calibration procedures and to Section 13 for corrective action criteria.

11.1 Analytical Methods

An important element in KEMRON's QA/QC program is strict adherence to the referenced analytical methods. Whenever possible, KEMRON will use only methods that are US-EPA approved and promulgated for analytical investigations. The quality control samples described in Section 11.4 are designed to meet requirements of SW-846, Chapter 1, as well as, the specific method QA/QC criteria. However if program or project A/QC requirements are more stringent, KEMRON will comply with the specific project requirements or document the individual variances.

11.2 The Batch Concept

The basic unit for laboratory production and quality control is the **batch**. Samples are most effectively handled and processed in related groups. Examples of batches and their corresponding laboratory identifiers are discussed briefly below. The Sample Delivery Group (SDG) is a group of samples received in one shipment for a specific project and client and become a login batch. They are assigned a unique login number by the LIMS at the time of login. The login number also is the unit for the **laboratory reporting batch.**

The **preparation batch** is a group of twenty or less samples of the same matrix type that are prepared for analysis by a unique analytical procedure (SOP). Examples include extraction batches for semivolatile organics and digestion of samples prior to analysis for metals. A preparation batch employs the same analysts, reagents, equipment, method (SOP), clean up, and concentration

procedures. Each preparation batch has associated with it the appropriate quality control samples required by the method and usually includes the preparation blank (method blank), the laboratory control sample, matrix spike, sample duplicate or matrix spike duplicate. Each preparation batch is assigned a unique LIMS tracking number referred to as **workgroup**.

The **analytical batch** refers to a group of samples analyzed by a specific analytical method, technique, or instrument, and is the analysis prior to data reduction and reporting. The analytical batch can be identical in sample makeup to the preparation batch, but can include parts of preparation batches, or multiple preparation batches. They include samples that are analyzed together within the same time period by the same analyst and/or instrument. They are always associated with the required method instrument quality control samples such as GC/MS tunes, instrument blanks, initial calibrations and/or continuing calibration verifications. A separate workgroup number is assigned to the analytical batch for the purposes of scheduling and tracking.

The **data entry batch** refers to a group of client and laboratory QC samples for which the analytical results are entered and verified in the LIMS. A unique identifier referred to as the run ID is assigned to this data entry batch.

11.3 Batch Quality Control Samples

Each preparation and analytical batch is assigned a unique number by the LIMS called a workgroup. For analyses such as wet chemical procedures and purge and trap methods for volatile organics, the preparation batch and analytical batch are one and the same. Other methods require a separate extraction or digestion prior to analysis by the instrument and separate preparation workgroups are applicable. The following analytical quality control samples will be associated with each workgroup if the control procedure is applicable to the analysis. Data tabulation and control charting procedures for these quality control samples are described in more detail in Section 11.

Acceptance criteria and corrective action measures are presented in the specific laboratory SOP.

11.3.1 Method blank

A **method blank (MB), or preparation blank (PB),** is analyzed with each preparation batch as a check on analytical system contamination. A sample consisting of laboratory reagent water or analyte free laboratory sand is processed through the entire analytical method including all sample preparation

procedures such as extraction, digestion, and filtration. As a quality control sample, the results are used in conjunction with other control data to validate overall system performance and data quality. Client samples are associated with the method blank by sharing a common preparation workgroup number.

11.3.2 Laboratory Control Samples

The **laboratory control sample (LCS)** is used to assess the general performance of the analytical procedure. The LCS is a quality control sample, similar in composition to the method blank, spiked with the analytes of concern at a known concentration, and are processed through the entire analytical procedure. The purpose of these samples is to monitor analysis control and to assess the accuracy of the procedure in the absence of matrix interference. The results of the LCS are charted or tabulated and must meet the criteria established by the project data quality objectives or the laboratory derived statistical control limits. The LCS is normally used to verify system control, but evaluation must take into consideration several factors including the number of spiked analytes, their performance characteristics, and the severity of the non-compliance. It is standard policy to include as many analytes as possible in the LCS spike mixture and this normally involves most of the common target analytes. When the spike list is extensive, there exists a high probability of having a few analytes outside the acceptance limits. If the spiking concentrations are not specified in the project QAPP, an attempt is made to spike a level near the mid-range for the method. Client samples are associated with a specific LCS by sharing a common preparation workgroup number.

11.3.3 Laboratory Control Samples Duplicate (LCSD)

An LCSD is prepared with the LCS for those batches that do not not have another measure of precision, such as a sample duplicate, or matrix spike/ matrix spike duplicate (MS/MSD).The LCSD must meet the same acceptance requirements for accuracy (%recovery) as the LCS and the same precision requirements (RPD) as the sample duplicate (or MS/MSD).

11.3.4 Matrix Spikes

Matrix Spikes (MS) are analyzed with each batch of samples of a similar matrix. They consist of a field sample that is spiked with the same analytes as the LCS and normally at the same concentration. The matrix spike is used to assess the performance of the method in client's sample matrix. The percent recoveries are tabulated in a summary report and the results are used to

assess bias or other matrix effects. The matrix spike analyses are not used to establish laboratory control, but can be used to properly qualify data.

If sufficient sample quantity is available, the laboratory will select samples for matrix spiking based on the following approach:

- All client specified MS, MSD or duplicate samples are logged into the LIMS and reported to the client.
- If no client specified samples have been submitted, the laboratory will randomly select a sample for the MS/MSD or duplicates based on sample availability and client approval requirements.
- If there is insufficient sample volume to perform MS/MSD or duplicate analysis the laboratory will perform an LCS and LCS duplicate in order to provide a measure of precision and accuracy for the analytical batch.

11.3.5 Duplicates and Matrix Spike Duplicates

Duplicate samples or matrix spike duplicates (MSD) are analyzed with each batch of samples of a similar matrix to monitor the method precision. The results in relative percent difference (RPD) are tabulated as outlined in Section 11.7. This data may be used to evaluate the precision of the method in real sample matrices. For analytical methods for which spiking is inappropriate, sample duplicates are used to assess precision.

11.4 Quality Assurance Summary Reports

Quality assurance summary reports are prepared for each analytical workgroup. Whenever samples are analyzed, the batch quality control sample results described in Section 11.4 are entered into the laboratory database. Reports are generated by workgroup for review by department supervisors, QA/QC personnel, and general management. Copies of the quality assurance summary reports are provided to the client upon request. They are included in all laboratory reports designated as Level 2, or higher, as described in section 12.

11.5 Measuring Precision, Accuracy and Method Detection Limits

This section discusses method performance parameters and how they are related to data quality objectives (DQO). Definitions are given for precision, accuracy, representativeness, completeness, comparability (PARCC), method

detection limit (MDL) and laboratory reporting limit (RL). Tables which provide current statistics for methods including MDLs, RLs, precision and accuracy are updated annually and are available in the individual method SOPs (listed in Appendix B). The following definitions that are used establish baseline data quality objectives for all analytical projects. The PARCC parameters and MDL/RL data are a useful template for development of sampling and analysis plans (SAP) and quality assurance project plans (QAPP) for a wide scope of programs.

11.5.1 Precision (%RPD)

The laboratory objective is to equal or exceed the precision data generated by the applicable method validation studies on similar matrices. Relative percent difference (% RPD) as derived from duplicate matrix spike results (or duplicate sample results for metals) will be used to evaluate precision. With each analysis of a duplicate sample, or matrix spike/matrix spike duplicate, the RPD is calculated from the following formula:

$$RPD = \left[\frac{|C_1 - C_2|}{(C_1 + C_2)/2} \right] 100$$

where:

C_1 = Concentration of the first sample
C_2 = Concentration of the second sample

Method precision can be evaluated through the analysis of duplicate samples or matrix spike duplicates. For most inorganic methods, the results of duplicate analyses are used to calculate advisory limits, but the upper limit for the RPD is usually set at 20%. Another measure of precision is the method standard deviation. The standard deviation determined from the analysis of laboratory control samples can also be used to estimate the upper control limit for the RPD. The later procedure, which is taken from Method 1020B (Standard Methods – 18th Edition), is used for organic methods having long lists of analytes. However, for most projects the advisory upper limit for the RPD of organic analytes is set at 40%.

11.5.2 Accuracy (% recovery)

The laboratory objective is to equal or exceed the accuracy data generated by the applicable method validation studies on similar matrices. Percent recovery, as derived from the analysis of Laboratory Control Samples (LCS) will be used to evaluate accuracy. The Laboratory Control Sample (LCS) contains all of the analytes of interest at the concentration of interest, either at the midrange of the method, or as specifically defined in the Quality Assurance Project Plan (QAPP).

Accuracy statements (ranges) are derived from statistical analysis of the percent recoveries for the laboratory control samples (LCS) for the applicable media. Criteria are established at three standard deviations from the mean LCS recoveries. The ranges for accuracy are generally used as control limits, however, projects DQO's, laboratory policies, or performance method requirements may dictate exceptions. Recovery is defined mathematically as follows:

For a laboratory control samples:

$$\%R = \left(\frac{C_x}{C_t}\right)100$$

where:

C_x = the measured concentration of the analyte in the LCS
C_t = the theoretical spike concentration.
%R = percent recovery

Calculating recovery for matrix spikes (MS/MSD):

$$\%R = \left[\frac{(C_{spk} - C_x)}{C_t}\right]100$$

where:

C_{spk} = the concentration of the analyte in the spiked sample
C_x = the concentration of the analyte in the reference (parent)

sample

C_t = the theoretical spike concentration.
%R = percent recovery

11.5.3 Representativeness

Representativeness ensures that a set of data accurately depicts the distinguishing characteristics of the sample source. This is usually achieved through sample collection in accordance with statistically defined bounds of the population mean and variance, and by following existing sampling protocols.

11.5.4 Comparability

To achieve a performance level in terms of accuracy and precision for sample parameters in similar matrices, so that one set of data is comparable to another in terms of quality of measurement on a consistent basis. This assures that all KEMRON analyses fall within an acceptable range.

11.5.5 Completeness

Refers to the percentage of measurements made which are judged to be valid. The completeness goals for most methods are 95% on all water analyses and 90% on all soil analyses.

11.6 Statistical Evaluation of Data

KEMRON has established its statistical approach to quality control based on the following standards:

Handbook for Analytical Quality Control in Water and Wastewater Laboratories, EPA-60014-79-019, March 1979.

Standard Methods for the Examination of Water and Wastewater, 18th Edition, APHA/AWWA/WEF, Methods 1010, 1020, 1030.

Test Methods for Evaluating Solid Waste - Physical/ Chemical Methods, SW-846, 3rd Edition, Chapter 1.

Effective August 1, 2003, KEMRON will initiate the following procedures for statistical review of laboratory control sample data. This evaluation applies to all methods and matrices for which we hold US-ACE approved status.

11.6.1 Quarterly Evaluation

The laboratory departments will generate a quarterly LCS summary report from the LIMS menu system. The summary report will display the individual LCS results for the three month period in concentration and percent recovery, computing the mean, standard deviation, and limits at +/- 3 sigma. The laboratory supervisory will review the data for method bias, trends, and shifts, and forward the data package to the QAO. The QAO will review, approve, and /or initiate investigations based on the data.

The LIMS report is found in menu system: Reports, Others, LCS Limits

11.6.2 Annual Evaluation

The laboratory will also generate an annual LCS summary report from the LIMS menu system. The summary report will display the individual LCS results for the past year in concentration and percent recovery, computing the mean, standard deviation, and limits at +/- 3 sigma. This evaluation will occur concurrently with the annual SOP review. The supervisor and QAO will compare the statistics to the existing default control limits, to determine if these limits are supported by the new statistic. The laboratory will update the LIMS QC tables and the appropriate SOP tables as necessary. The laboratory supervisory will review the data for method bias, trends, and shifts, and forward the data package to the QAO. The QAO will review, approve, and /or initiate investigations based on the data.

11.7 General Control Charting Procedure

After sufficient data become available for a parameter, control charts and control limits are developed for laboratory control samples. In constructing an initial control chart, twenty or more consecutive data points are necessary. The time required to generate such a chart will vary with the frequency of the analysis (daily, weekly, monthly, etc.). Once these twenty data points are gathered, two control charts may be constructed:

- Accuracy Control Chart (X-Chart)
- Precision Control Chart (R-Chart)

The second phase in the control charting process involves gathering additional data points. This data is charted using the limits established by the previous evaluation period. This is done not only to monitor system control and to evaluate accuracy and precision, but also checks for general trends. Each analyst is trained to interpret and identify problems such as shifts, trends and biases. This method ensures continued evaluation of laboratory and personnel performance. X-Charts are constructed for all inorganic LCS analytes and a representative group of organic analytes from each method. R-Charts are constructed for results of duplicate analyses in the inorganic methods and spreadsheet tabulation is used to evaluate organic MS/MSD results. KEMRON control charts are presented in Figures 11-1 and 11-2 at the end of this section.

11.8 Method Detection Limits

The method detection limit (MDL) is defined as the minimum concentration of an analyte that can be determined with 99 percent confidence to be greater than zero. All MDL determinations provided by KEMRON are made in accordance with KEMRON SOP 45, which is derived from the US-EPA procedures outlined in 40 CFR part 136, Appendix B. MDL's are updated or verified annually. Verification consists of analyzing a detectability check standard (DCS), which is a fortified blank spiked at a concentration near the concentration of the laboratory MDL. This check confirms that the laboratory MDL, which is derived from multiple instruments and analysts, is routinely achievable on a specific instrument and method over the course of time.

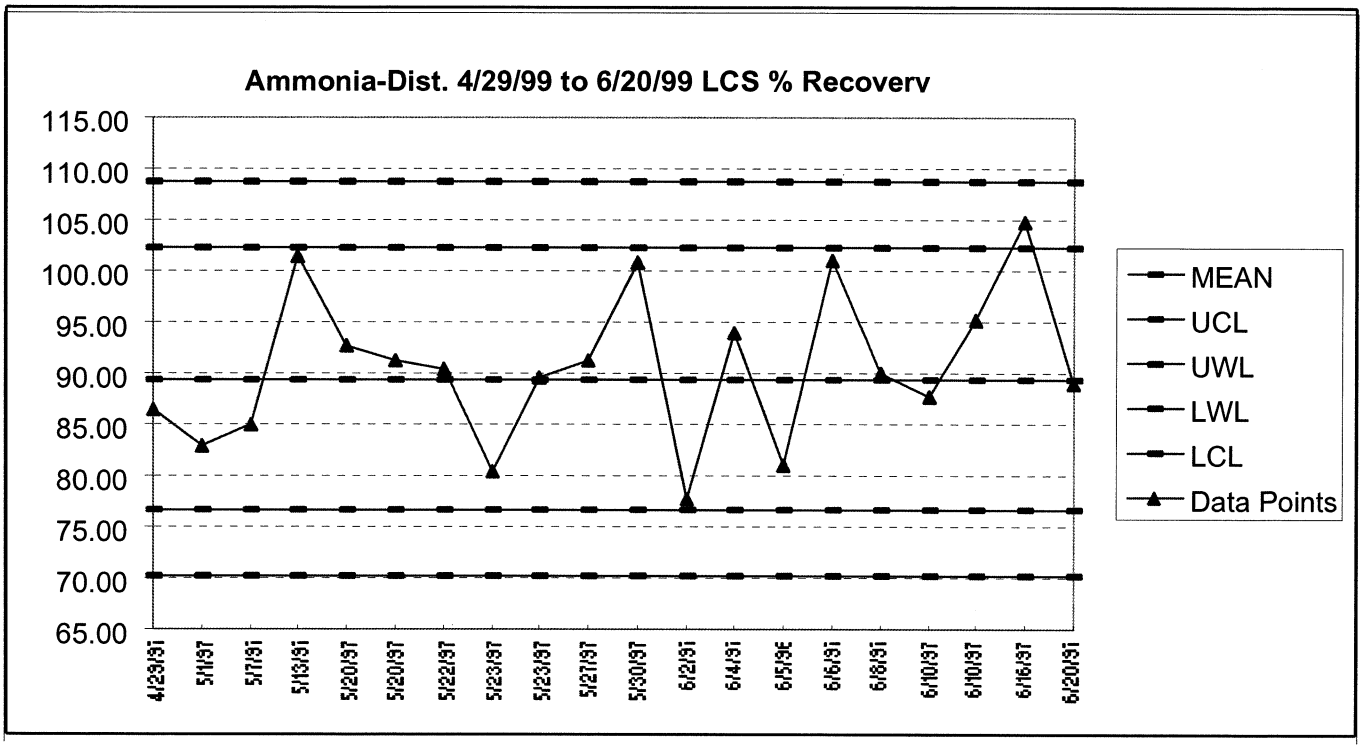
11.9 Quantitation Limits and Reporting Limits

Practical Quantitation Limits (PQL) and Estimated Quantitation Limits (EQL) are defined as the smallest concentration of analyte that can be reported to a known level of accuracy. The PQL is sometimes defined as 3-10 times the MDL, but KEMRON normally estimates the PQL as the concentration of the lowest standard in the initial calibration curve for the method. Laboratory reporting limits (RL) are often used in place of the PQL, since they are generally accepted by the environmental industry. They can be adjusted for specific projects requirements but are independent of instrument variation and statistics. At KEMRON, the RL is usually at least two times the laboratory observed MDL for that analyte, and is normally equivalent to the concentration of the lowest standard on the calibration curve. For some programs such as DOD, it is necessary to report both the MDL and the RL. The standard laboratory reporting limits may be found in the applicable SOP and the LIMS.

11.10 Proficiency Testing Studies (PT)

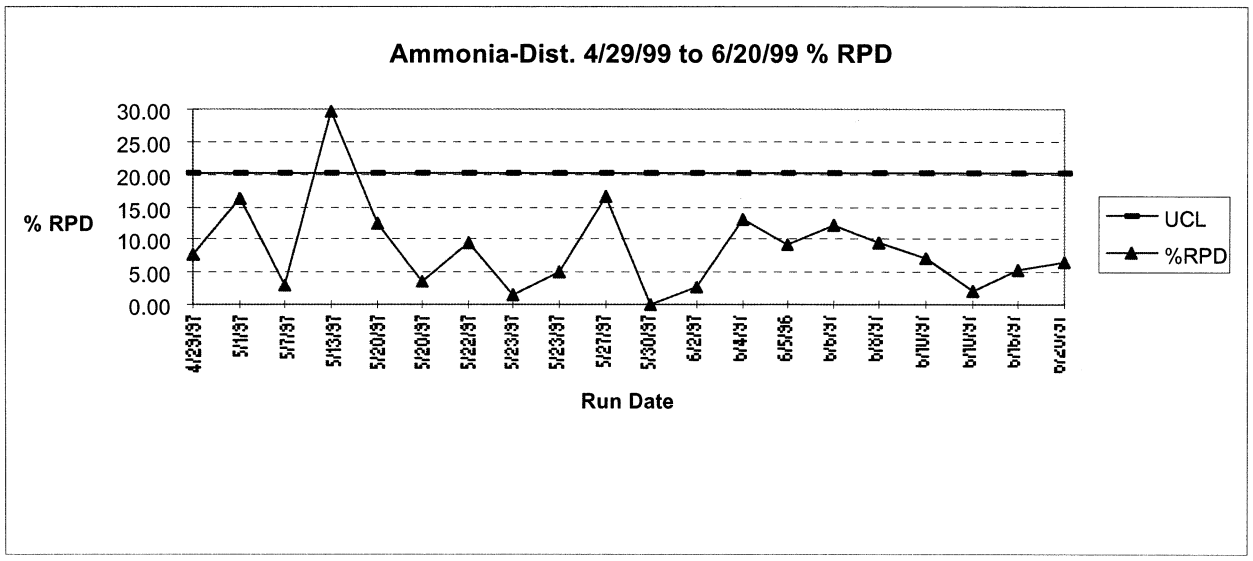
KEMRON currently participates in several government administered and private sector single blind PT studies. For each of these programs, it is our internal policy to evaluate each department's performance and prepare corrective action plans for all unacceptable results. All performance summaries and our corrective action plans are made available to clients and state agencies upon request. See also Figure 13-3 and Section 14.2.

Figure 11-1
X-CHART
LABORATORY CONTROL SAMPLE



Kemron
ENVIRONMENTAL SERVICES

Figure 11-2
R-CHART
DUPLICATE %RPD



12.0 DATA REDUCTION, REVIEW, VERIFICATION, AND REPORTING

This section describes the process of data reduction, data review, data validation, data entry, and editing that begins with the raw data generated at the bench level in the laboratory and culminates with a useful collection of information in the form of summary laboratory reports and data deliverables packages.

12.1 Data Reduction

Data reduction is the conversion of raw data from instrument readings to reportable results. The raw data is converted into reportable values by instrument hardware and software or by other manual procedures suggested in the required reference method.

12.1.1 General Analyst Duties

It is the responsibility of the primary analyst to perform the data reduction procedures. These general duties are common to all departments and all analytical methods.

- Recording and maintaining accurate laboratory records including sample identifications, weights or volumes, dilution factors, analysis date and method, analyst's initials, and maintaining the computer record file identification system.
- Performing the proper instrument and method calibrations and verifying calibration integrity.
- Following established laboratory QA/QC protocol.
- Confirming results of the analytical sequence or batch, including QA/QC verification.
- Converting raw data to final form by applying proper procedures for calculations, rounding, and significant figures.
- Transcribing sample results from the instrument report onto the results data sheet.
- Maintaining internal chain-of-custody records as described in Section 7.

12.1.2 Preparation Analysts

Preparation analysts are responsible for recording accurate data used in final calculations. This includes maintaining extraction and digest logbooks, bench sheets and chemist's notebooks which contain sample weights or volumes, final extract volumes, surrogate and spike amounts, standard reference numbers, etc.

12.1.3 Wet Chemistry Analysts

Wet chemistry analyst duties include recording results from direct readout instruments such as pH meters, turbidimeters, and thermometers onto a data sheet. Selected wet chemistry parameters require that the analyst enter the results into a computer spreadsheet for reduction. Final results are recorded on a data sheet and then entered into the LIMS.

12.1.4 Instrument Analysts

All instrument analysts are responsible for verifying calculations, analyte identifications, all related QA/QC calculations, and generation of the sample results. This includes calculation of surrogate spike recoveries, laboratory control sample (LCS) recoveries, precision for sample duplicates and matrix spikes, and results for method and matrix specific blanks. Lab results are recorded by the analyst onto a data sheet and the associated QA/QC data sheet. Parameters utilizing computer/integrator reduction include volatile and semivolatile GC and GC/MS, graphite furnace metals, ICP metals, mercury and some wet chemistry parameters. The results are reported from instrument reports generated by the instrument data system. The raw data are reduced (calculated) into reportable values and the sample components are identified by the instrument data systems. A quantitation report is generated by the instrument and sample results are calculated, either by computer integration, spreadsheet or manual calculation, taking into account dilution factors. Sample results are either uploaded into the LIMS or transcribed by the instrument analyst onto the sample results sheet.

12.1.5 Record Keeping

Bench sheets for sample extraction, digestion, and analysis by wet chemistry are maintained in laboratory notebooks issued and numbered by the document control officer. The document number and page number are printed in red on each page of the laboratory notebook. Data from each notebook are scanned and archived on CD-ROM. Chromatographic data records and documentation

include extraction logs, bench sheets, instrument logs, instrument tune reports, quantitation reports and instrument printouts, including chromatograms and mass spectra. Inorganic data documentation records include analyst notebooks, digestion logs, instrument runlogs and instrument printouts. Logs are kept of sample preparation prior to analysis. Records for instrument analyses are recorded in run logbooks. The run log has an entry for injection of every standard, quality control sample, and client sample. The unused portion of the daily run log page is crossed out and initialed. Each instrument also has a respective maintenance log. Chain of custody records and forms are always maintained in accordance with Section 7.

12.2 Laboratory Data Review

Each laboratory department is responsible for the validity of the data produced. The major part of validation responsibilities lies with the department supervisors and the senior peer review staff. Internal laboratory verification is performed with data review. This process should not be confused with third-party validation, which is performed by contractors independent of KEMRON. Guidelines for data validation and qualification are derived from the official reference method, EPA documents such as "National Functional Guidelines for Organic Data Review" (US EPA, 2/94) and the "National Functional Guidelines for Inorganic Data Review" (US EPA, 2/94), and the project specific QAPP if applicable.

Data flow starts with the generation of data by the analyst and continues through a multi-level review and validation process. Data is sequentially passed through a tiered review consisting of the primary analyst, secondary or peer review, and a project level administrative review. The laboratory report is then certified by the laboratory manager, or designee. Each step in the review process is performed to assure the integrity and validity of the data generated by the laboratory. The key elements of the laboratory data review procedures are as follows:

- Holding times
- Calibration requirements
- Batch quality control
- Raw data
- Information for report narrative
- Check for reasonableness and general acceptability

12.2.1 Primary Review

The analyst performing the analysis has the primary responsibility to verify the completeness, accuracy, and general acceptability of the data. Using a data review checklist, the analyst checks all data for accuracy, conformance with the standard operating procedures, and method compliance. The analyst reviews all raw data in the run, including tune, calibration, internal standards, and batch related quality control samples. See also Section 12.2 – 12.4 and the method SOPs. An example of these checklists are found in the SOPs.

12.2.2 Secondary Review

A secondary reviewer is the department supervisor, an analyst certified in the same type of analysis, or a senior staff member who specializes in data review. At the secondary review level, all of the elements of review performed by the primary analyst are re-checked and this secondary review is also documented on the checklists. All chromatographic manual integrations are reviewed and approved in accordance with SOP41.

12.2.3 Data Entry and Verification

Data that has been through the review and validation process is then entered into the Laboratory Information Management System (LIMS). The LIMS has been programmed to retrieve data directly from instrumentation using a datafile uploading process. Other data must be manually entered by a data specialist or technician. Data verification is a check on the data that is entered into the LIMS. This is performed by experienced staff which are independent of the data entry functions. This step and any required editing is performed prior to generation of the final draft of the laboratory report. Data is entered by the analyst or a clerical staff assistant and is checked for accuracy by the department supervisor or a designated peer reviewer. Data printouts and reports are checked for correct entry of results, units of measure, detection limits, analysis dates, analyst initials and any other information to be included on the final reports. Incorrect entries are immediately corrected. Obvious anomalies (i.e.: detection limits larger than reported result, analysis date before prep date, etc.) are brought to the attention of the departmental supervisor for verification before correction. Electronic Data Deliverables (EDD) are generated by MIS personnel. Electronic files are verified by either the MIS staff or the TCDS before being sent to the client by mail, or electronically.

12.3 Report Content and Levels

KEMRON provides four levels of laboratory reports in order to match the documentation level required by specific projects. A summary of the four levels of data reporting follows:

Level 1 - Standard Laboratory Report

- Cover page with signature
- Results of analysis
- Reporting units
- Reporting/detection limits
- Analysts and analysis dates
- Method references
- Chain-of-custody form
- Surrogate recovery

Level 2 - Standard Report with QA/QC Summary of method blanks, laboratory control samples (LCS), matrix spikes (MS/MSD), and duplicate results.

Level 3 - A Level 2 report with additional summary forms and no raw data.

Level 4 - CLP-Like report with summary forms and raw data.

Reporting level requirements are logged into the LIMS system with the sample set. Level 1 and 2 data packages are assembled upon printout of the final report by the data entry staff. Copies of the raw analytical data for level and data packages are turned in by the analysts upon completion of analysis. Data summary forms are printed from specialized software packages by the analysts in each laboratory. For a list of standard KEMRON data qualifiers see Figure 12-1. Customized "Level – X" reports are available for special projects.

12.4 Data Package Review

Analytical project management, in light of a complicated regulatory and technical environment, requires thorough organization, planning, documentation as well as client specific requirements and certification specifications. KEMRON recognizes the importance of strict compliance with client-defined, project/program-specific protocols, and has created Sales/Service teams to address their inherent diversity. Each Sales/Service team is responsible for all

facets of their projects from inception to invoice, insuring in-depth, aggregate understanding of the client's requirements. Each team consists of a Team Leader, a Team Chemist/Data Specialist and a Client Services Specialist, all reporting to the VP. Collectively, the Team performs all pre-production and post-production administrative, logistical and technical functions, as follows:

- Project Requirement Review
- Project Implementation
- Communication
- Review of Each Login (Sample Delivery Group)
- Status and Progress Reports
- Review of Final Reports and Deliverables
- Invoicing

Additional details may be found in SOP 44.

12.4.1 Administrative Review

The laboratory project management team is responsible for an administrative review of the final data package. The purpose of this review is to assure that all project specific requirements are met and that all discrepancies are fully documented in the report narrative. This review is documented on the report cover with signature and date.

12.4.2 Quality Assurance Review

The team project chemists are responsible for a quality assurance review of at least 10% of the final data packages. The purpose of this review is to assess technical compliances with program, project, and method requirements. Such review shall be documented and any problems or discrepancies will be reported to the Quality Assurance Officer.

12.5 Data Integrity, Storage and Archive

Insuring data integrity is one of KEMRON's main objectives. QA controls, as well as, Good Laboratory Practice are instituted by KEMRON to achieve this objective. In the daily flow of data, laboratory personnel initial and date any corrections introduced into the data. Unused areas of the daily bench sheets and instrument logs are crossed out, initialed and dated by the corresponding analyst or technician. Controlled benchsheets and log books are required to maintain data integrity. Each sample delivery group is assigned a unique login

number when initially logged into the LIMS system. The report master files are stored in order of the login number and can be easily retrieved using this system. Hardcopies of each login are maintained in filing cabinets in the filing room for six to eight months and then removed to CD-ROM archive storage for a period of five to ten years depending on contractual agreements. Ohio Voluntary Action Program requires notification prior to disposal of any records.

Computer records from the KEMRON LIMS are maintained on the system for one year and are then archived on magnetic tape. Two backup copies of the system are maintained on magnetic tape at all times. The backup and archive tapes are stored in a fireproof safe at the laboratory indefinitely. Extraction lab logbooks and bench sheets are maintained chronologically and stored in the laboratory for five years. Inorganics raw data, including analyst notebooks, bench sheets, computer printouts and instrument logs, are stored by parameter in the individual laboratories or in the archive area for a period of five years. Gas Chromatography (GC) data is stored as hardcopy in the individual master files. GC/MS data is stored as hardcopy for three-five years in the workorder files, and on magnetic tape for at least one year. GC/MS Data stored on magnetic tape can be retrieved by the file numbers assigned to them at the time of analysis.

12.6 Policy on Significant Figures

The following policies relate to the use of significant figures for reporting analytical data apply in general to all departments and methods except as noted in the individual method SOPs. All analytical results which are taken from bench sheets, instrument quantitation reports, or other raw data shall be rounded to three (3) significant figures as per Section 12.7 and entered without adjustment into the LIMS. The LIMS shall be programmed to generate the final analytical report with the appropriate number of significant figures based on the project requirements.

- All results for performance evaluation samples will be reported with three (3) significant figures using the rounding rules specified in Section 12.7.
- All quality control sample results will be reported with three (3) significant figures.
- All results for surrogate compound recovery will be reported with three (3) significant figures.

- All results for client (real world) samples will be reported with three (3) significant figures (except as noted below).

- Project specific requirements may override these general guidelines and the LIMS products and data entry screens will be modified accordingly.

12.7 Rules for Rounding

For rounding off numbers to the appropriate level of precision (significant figures), the laboratory staff shall follow these rules:

- If the figure following the digit to be retained is less than five (5), drop it (round down).

- If the figure following the digit to be rounded is greater or equal to five, round up.

Examples:

Three significant figures:	Two significant figures:	One significant figure:
6.014 rounds to 6.01	0.0511 rounds to 0.051	0.015 rounds to 0.02
6.016 rounds to 6.02	0.0519 rounds to 0.052	0.016 rounds to 0.02
6.015 rounds to 6.02	0.0515 rounds to 0.052	1.9 rounds to 2
		25 rounds to 30
		26 rounds to 30
		24 rounds to 20

Figure 12-1

KEMRON Environmental Services, Inc.
List of Valid Qualifiers
August 5, 2002

Standard Qualifiers

These are KEMRON's Standard Report Qualifiers

B	Present in the method blank
C	Confirmed by GC/MS
CG	Confluent growth
D	The analyte was quantified at a secondary dilution factor
DL	Surrogate or spike was diluted out
E	Estimated concentration due to sample matrix interference
FL	Free liquid
I	Semi-quantitative result, out of instrument calibration range Present below nominal reporting limit
L	Sample reporting limits elevated due to matrix interference
N	Tentatively Identified Compound (TIC)
NA	Not applicable
ND	Not detected at or above the reporting limit (RL)
NF	Not found
NFL	No free liquid
NI	Non-ignitable
NS	Not spiked
P	Concentration >40% difference between The two GC columns
QNS	Quantity not sufficient to perform analysis
RA	Re analysis confirms reported results
RE	Re analysis confirms sample matrix interference
S	Analyzed by method of standard addition
SMI	Sample matrix interference on surrogate
SP	Reported results are for spike compounds only
TNTC	Too numerous to count
U	Analyzed for but not detected
W	Post-digestion spike for furnace AA out o f control limits
X	Exceeds regulatory limit
Z	Can not be resolved from isomer.***
+	Correlation coefficient for the MSA is less than 0.995
<	Less than
>	Greater than
*	Surrogate or spike compound out of range

***** Special Notes for Organic Analytes**

1. Acrolein and acrylonitrile by method 624 are semi-quantitative screens only
2. 1,2-Diphenylhydrazine is unstable and is reported as azobenzene
3. N-nitrosodiphenylamine cannot be separated from diphenylamine
4. 3-Methyphenol and 4-Methyphenol are unresolvable compounds
5. m-Xylene and p-Xylene are unresolvable compounds
6. The reporting limits for Appendix II/IX compounds by method 8270 are based on EPA estimated PQLs referenced in 40 CFR Part 264, Appendix IX. They are not always achievable for every compound and are matrix dependent.

AFCEE Qualifiers
These are KEMRON's AFCEE Report Qualifiers

J	The analyte was positively identified, the quantitation is an estimation
U	The analyte was analyzed for, but not detected. The associated numerical value is at or below the MDL
F	The analyte was positively identified but the associated numerical value is below the RL
R	The data is unusable due to deficiencies in the ability to analyze the sample and meet QC criteria
B	The analyte was found in an associated blank, as well as in the sample
M	The matrix effect was present
S	To be applied to all field screening data
T	Tentatively identified compound (using GC/MS)

13.0 CORRECTIVE ACTION

13.1 Field Activities

Although KEMRON's laboratory is not directly involved in field or sampling activities, it will utilize internal corrective action protocols to investigate and resolve any quality control problems related to field sampling procedures, sample custody, and sample analysis such as identification of contaminated field or laboratory trip blanks, or field-measured pH and conductivity data beyond the precision and accuracy limits for duplicate samples. Corrective action may also be initiated as a result of data comparison studies and/or system or performance audits.

In the event of a QA problem, KEMRON will review the sampling procedures utilized in the field to determine if the sample integrity was compromised. The investigation would include interviews with the site geologist and other site personnel, review of field notes, and examination of chain-of-custody documents. Corrective actions will include notification to all personnel involved with the project.

Corrective action for field activities might include resampling of one or more wells in question with a senior individual who oversees sampling procedures. If a field-induced problem is suspected, the procedures used for field analyses, field sampling, field or office decontamination, sample labeling, and packing and shipping may require modification. If the necessary modifications appear to have solved the problem, then additional corrective action will not be taken.

The Field Project Manager will work with the team leader, staff chemist, or QAO when an incident of questionable analytical results of internal QC data occurs. An example would be if a field blank or trip blank showed significant levels of constituents or if a sample duplicate was out of control. The QAO will work with the laboratory staff to resolve any problems and implement appropriate corrective action.

13.2 Sample Integrity and Hold Times

If problems are encountered during sample receipt or during login, the problem or discrepancy is noted on the cooler receipt form and the project Team Chemist/Data Specialist (TCDS) contacts the client project manager. The report/case narrative is used to document the problems and the effects on the data.

KEMRON makes every possible effort to analyze samples within US-EPA established holding times. However, there are times when samples are received too late to meet the holding times. If sample holding times cannot be met for any reason, the laboratory will notify the client immediately. A decision will be made to either re-sample or proceed with the analyses on the existing samples. In the later case, the laboratory report will document the collection and analysis dates and the data appropriately flagged. The report narrative, or cover letter, will document the process.

13.3 Laboratory - General Requirements

Analysts have the primary responsibility for assessing method compliance and evaluating the acceptability of the batch quality control samples. Laboratory criteria that must be met and the resultant corrective actions are addressed in detail in the individual SOPs. An example of the contents is outlined in Tables 13-1. Some methods have additional control criteria such as surrogates, ICVs, CCVs etc. An out-of-control situation exists if a blank, calibration standard, laboratory control sample, sample replicate, or spike recovery analyses fail to meet the quality control criteria outlined in the SOPs. An investigation to find the cause of the problem is undertaken by the analyst and department supervisor and a Corrective Action Report (Figure 13-1 to 13-2) is initiated. This form is used to document the problem, its resolution and to provide the means to inform management (including the QAO) of chronic quality problems and non-compliant systems. Corrective action must be approved by the QAO who will ensure implementation and documentation of the corrective action. More specific discussion of the various laboratory corrective actions are discussed in the sections that follow.

13.4 Calibration Requirements

Instrument calibration is fundamental to all quantitative chemical analysis. Each US-EPA or other reference analytical method has specified calibration criteria that must be met in order for the data to be fully useable. Proper initial calibration must be performed in accordance with the method specifications for number, source and level of calibration standards, as well as, meet the linearity requirements. Each initial calibration must be verified at the specified frequencies and meet acceptance limits. Repeated failure of continuing calibration verification (CCV) standards necessitates that the analysis be stopped, the instrument evaluated, and the initial calibrations repeated. Data for

problematic analytes that do not pass the method specification must be qualified appropriately in the final laboratory summary reports and narratives.

13.5 Method Blanks

Method blanks are used to evaluate the analytical system for contamination. For most analytes the upper limit for blank contamination is the reporting limit, however, it is our policy to evaluate the efforts of any contamination greater than two times the MDL.

The criteria used to determine the acceptability of method blanks varies with the particular analyte. Factors such as the level of analyte in the sample and the existence of established regulatory limits, or action limits, must be taken into consideration. No corrective action other than documentation is required when the levels of analyte in the samples are at least ten times the level in the blank. Laboratory corrective action involving blank contamination would include an investigation documented by a corrective action report and one of the following actions:

- re-preparation and re-analysis of the affected samples
- B-flagging of the data
- documentation of the problem in the report narrative along with the effects on data quality, if any

13.6 Laboratory Control Samples

The data from the Laboratory Control Sample (LCS) is crucial to assessing the usability of the data from samples in the same batch. Normally, the LCS is approached from the stand point of pass/fail. If the LCS is out-of-control, the samples in the associated batch are re-analyzed, starting from the preparation step. This is the standard laboratory policy for single analyte methods such as wet chemistry or metals. For multi-analyte methods such as volatile and semivolatile organics, both the number and severity of LCS outliers must be evaluated. A certain amount of professional judgment is required of the laboratory management as to what constitutes an out-of-control LCS. If the number of failing analytes is excessive (i.e. > 10% the analytes spiked), indicating a general system failure, then corrective action shall include the re-preparation and re-analysis of the entire batch. When the outliers are out high, there is no corrective action required if the samples do not contain reportable levels of these analytes. Furthermore, if the analytes are out low, but only marginally, this also might not indicate a method problem. The results of the LCS are included in the QC Summary Report and all outliers are appropriately

identified. The report narrative will discuss any problems with non-compliant LCS data, and the proper flags used to qualify the analytical results.

13.7 Matrix Spikes and Duplicates

Evaluating the data from matrix spikes (MS), matrix spike duplicates (MSD), and duplicate samples is more complex than for method blanks and LCSs. In general, KEMRON does not base batch control on the results of these analyses due to matrix effects and the issues of heterogeneity and sampling. The control limits for the LCS will be used to assess the acceptability of the MS/MSD data for the purposes of data flagging only.

13.8 Corrective Action Reports

Corrective Action Reports (CAR's) are used to document any departure from documented policies, procedures and quality control. These reports are typically generated by the analyst or individual who has encountered the out-of-control situation. This individual would be responsible for generating the corrective action form by describing the non-conformance issue and recommending or describing the corrective action taken. After the corrective action is performed, it is noted whether return to control was achieved and if additional action is required. The corrective action form is reviewed and signed by the department supervisor and the QAO. If the non-conformance is extreme or unusual, the laboratory manager or director may also review and sign the corrective action form.

13.8.1 Analytical Corrective Action Reports

Specific protocols for QC acceptance criteria and run conditions are provided in the individual method SOPs. Quality Control Criteria Tables in the individual SOPs contain various control items (calibration, ICV, CCV, blanks, LCS, MS/MSDs, surrogates, etc.) and the frequency in which they are run. It also lists the acceptance criteria for these control items and the appropriate corrective action to be taken when any of these items fails to meet the acceptance criteria. When corrective action is taken in relation to sample analysis, it is documented by the use of the Analytical Corrective Action Report (Table 13-2).

13.8.2 General Corrective Action Reports

There are various other non-technical issues which may affect data quality and laboratory operations such as chemical spills, air conditioning and heating issues, inoperable fume hoods, etc. When these non-technical issues occur,

they are documented by the use of the General Correction Action Report (Table 13-1).

13.8.3 Performance Audit Corrective Action Reports

KEMRON participates in various performance evaluation programs both internal and external. If the laboratory fails any parameter in either of these categories, an investigation will be conducted to determine the cause and a corrective action will be taken. Figure 13-3 is a sample of the Performance Audit Corrective Action Form. The QAO will notify the laboratory of the missed parameter using the form. The laboratory will, in turn, complete the corrective action and submit the form to the QAO for review. KEMRON endeavors to comply with all agency or private recommended corrective action procedures that may be initiated as a result of any system or performance audits by either of these agencies.

Table 13-1
Quality Control Criteria Example
Volatile GC/MS Analysis
Method 8260B

CONTROL ITEM	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION
Mass spectral ion intensities (BFB criteria)	Every 12 hours prior to ICAL, ICV or CCV	See Table	Retune instrument and repeat BFB check
Initial Calibration (ICAL)	When Continuing Calibration is out of control or when system conditions have been altered.	≤30% RSD for CCC compounds, <15% RSD for all target compounds, if >15% RSD, then linea regression, if r is <0.995, then quadratic regression, SPCC minimum RF	Evaluate cause; repeat calibration; or qualify data and discuss in narrative (1)
Second source calibration verification (ICV)	After each initial calibration	≤25% drift for each analyte or project specific criteria	Re-analyze ICV; upon second failure, repeat initial calibration (1)
Continuing calibration verification (CCV)	Each 12 hours	SPCC minimum RF, CCC percent drift ≤20%; other target analytes ≤20%	Re-analyze CCV; upon second failure, repeat initial calibration (1)
Internal standard (IS)	Every sample, standard, and quality control sample	Retention time within 30 seconds of IS retention time in ICAL midpoint STD and area within –50% t +100% of IS midpoint area	Check for MS malfunctions or interference; re-analyze sample
Method Blank (MB)	One per matrix/batch; maximum of 20 samples per batch	< ½ RL	Notify supervisor and initiate CAR; investigate; re-analyze samples
Laboratory Control Sample/ Laboratory Control Sample Duplicate (LCS/LCSD)	One per matrix/batch; maximum of 20 samples per batch	Target compounds within the designated ranges; use project QAPP or standard control criteria (1,2)	Notify supervisor and initiate CAR; investigate; re-analyze samples
Matrix Spikes/ Matrix Spike Duplicate (MS/MSD) Sample/Sample Duplicate	One per matrix/batch; maximum of 20 samples per batch	Target compounds within the designated range (1,2)	Qualify data and/or address in the report narrative

(1) Evaluation criteria is often project specific, generally ≤ 0.99 is a sufficient co-efficient of correlation
(2) Acceptance criteria are analyte specific
(3) Control limits set at three standard deviations from the mean recovery
(4) Advisory limits only; same as for LCS
(5) The decision to re-analyze or to qualify data is based on the number and severity of the outliers

KEMRON ENVIRONMENTAL SERVICES

Figure 13-1
GENERAL CORRECTIVE ACTION REPORT

KEMRON Environmental Services
General Corrective Action Report

Date:_____ **Department:**_____ **Employee:**_____

I. Description of Non-Conformance:

_____
_____
_____
_____
_____

II. Action Taken:

_____
_____
_____
_____
_____
_____
_____

III. Return to Control?:	Not Applicable _____	Yes _____	No _____

IV. Further Action Required?: (required if no checked in III.)

_____
_____
_____
_____
_____

Approvals:
Department Supervisor: _____ Date: _____
QA/QC Supervisor: _____ Date: _____
Director/Manager: _____ Date: _____

Form NC01

Figure 13-2
ANALYTICAL CORRECTIVE ACTION REPORT

KEMRON Environmental Services
Analytical Corrective Action Report

Date:_____ **Department:**_____ **Employee:**_____

Prep WG#_____ **Preparation Date:**_____ **Parameter:**_____

I. Description of Non-Conformance:

Sample ID(s) _____

☐ Surrogate(s) <10% _____

☐ Multiple Surrogate(s) _____

☐ Method Blank _____

☐ LCS Failures _____analytes out _____

☐ CCV Failures _____

☐ Other _____

_____

_____

II. Action Taken:

☐ Reprep affected samples only _____

☐ Reprep entire workgroup _____

☐ Reanalyze affected samples only _____

☐ Report data with qualifiers _____

☐ Other _____

_____

_____

III. Return to Control?:	Not Applicable	Yes _____	No _____

IV. Further Action Required?: (required if no checked in III.)

_____

_____

_____

_____

Approvals:
Department Supervisor: _____ Date: _____
QA/QC Supervisor: _____ Date: _____
Director/Manager: _____ Date: _____

KEMRON ENVIRONMENTAL SERVICES

Figure 13-3
KEMRON PERFORMANCE AUDIT CORRECTIVE ACTION FORM

KEMRON PERFORMANCE AUDIT CORRECTIVE ACTION FORM

PE PROGRAM: _____ Login Number: _____

Analyte: _____ Method: _____

Analyst: _____ Instrument: _____

		Acceptable Range
Result (Level 1):	_____	_____
Result (Level 2):	_____	_____

Reason for Error: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Corrective Action: _____

_____

_____

_____

_____

Supervisor Approval: _____ Date: _____

QAO Approval: _____ Date: _____

14.0 PERFORMANCE AND SYSTEMS AUDITS

14.1 External Audits

KEMRON actively participates in several Federal and State performance evaluation testing programs and system audits. External systems audits of the KEMRON facility occur on a regular basis. These include audits by the West Virginia Department of Natural Resources (WVDNR), the Ohio Environmental Protection Agency (OEPA), and the Florida Department of Health (FLDOH) (NELAC Primary Accreditor). Additionally, audits are conducted every 2 - 3 years by the California Department of Health Services, the Florida Department of Health, the New Jersey Department of Environmental Protection, Wisconsin Department of Natural Resources, and the US Army Corps of Engineers.

14.2 Performance Audits and Proficiency Testing:

Performance audits are required for numerous state and federal programs. These certifications include the submittal of single blind analytical proficiency testing (PT) samples from NIST certified providers KEMRON formally participates in the following performance evaluation programs:

- NELAP/WP/Soil (Environmental Resource Associates) – Semiannually
- WV-DEP (Analytical Products Group) – Annually
- Ohio VAP (Analytical Products Group) – Semiannually

If problems are identified in any of these programs, the QAO will submit internal PT samples to verify the effectiveness of our corrective actions.

14.3 Internal Audits

The QAO will perform an annual internal audit of the laboratory operations to assure continued adherence to the LQAP (Quality Manual), including the referenced methods and SOPs. The QAO may conduct the audit over the course of the year, with assistance from other technical directors or supervisors. The results of the audit shall be documented using the checklist in Figure 14-1, or an equivalent form, and the results are presented in a report to the Vice President. The QAO may perform additional internal audits based on results of internal and external performance feedback. If the laboratory receives a customer complaint, an audit will be used to investigate the appropriate areas. The laboratory will perform corrective actions and notify the

client(s) if any data are affected by findings resulting from an internal or external audit.

14.4 Management Review Procedures (Vice President)

Senior Management annually conducts a Quality Systems Review. This review goes beyond traditional laboratory QA/QC programs and evaluates all systems from proposal generation through client satisfaction. This review includes but is not limited to:

- Laboratory Quality System
- Report Generation/Content (Hard Copy & EDD)
- Laboratory Data QA/QC
- LIMS development and improvement
- Sales/Marketing Function/System
- Proposal/Quotation generation
- Project Management/Technical Service
- Production efficiencies
- Volume of work
- Internal audit reports
- Performance evaluation studies
- Client satisfaction
- Client feedback

Each system is reviewed for client responsiveness, overall efficiency, value towards quality and economic value. Human resources and equipment needs are evaluated. With the summation of the review, changes are made (corrective action) as appropriate, equipment is purchased and overall business strategy is adjusted.

Figure 14-1
KEMRON INTERNAL SYSTEM AUDIT FORM

KEMRON Environmental Services
Internal Audit Checklist

Auditor Name: _____
Date: _____

I. Sample Receipt and Storage Area

ITEM	YES	NO	COMMENTS
Are written Standard Operating Procedures (SOP) developed for receipt and storage of samples?			
Is the appropriate portion of the SOP available to the analyst at the sample receipt/storage area?			
Has SOP been reviewed in the last 12 months?			
Are samples that require preservation stored in such a way as to maintain their preservation?			
Are volatile samples stored separately from semi-volatile samples?			
Are refrigerator blanks used for volatile storage?			
Are adequate facilities provided for storage of samples, including cold storage?			
Is the temperature of the cold storage recorded daily in a logbook?			
Does the cold storage temperature logbook contain acceptance criteria?			
Are the sample receipt/storage and temperature logbooks maintained in a manner consistent with GLP?			
Is the sample pH measured and recorded by the sample custodian?			
Does the supervisor periodically examine and review all notebooks, logbooks, etc. and sign his/her name therein, together with the date and appropriate comments as to whether or not the notebook is being maintained in an appropriate manner?			
Are proper records kept of standards preparation?			
Are materials properly labeled with concentrations, date of preparation, and the identity of the person preparing the sample?			

Additional Comments:

KEMRON ENVIRONMENTAL SERVICES

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

II. Inorganics Sample Preparation Area

Item	Yes	No	Comments
Is the laboratory maintained in a clean and organized manner?			
Are contamination-free areas provided for trace level analytical work?			
Are exhaust hoods provided to allow contamination-free work with volatile materials?			
Is the air flow of the hoods periodically checked and recorded?			
Does the laboratory have a source of distilled/demineralized water?			
Can the laboratory supervisor document that trace-free water is available for preparation of standards and blanks?			
Is the analytical balance away from draft and area subject to rapid temperature changes?			
Has the balance been calibrated within one year by a certified technician?			
Is the balance routinely checked with class 1 weights before each use and the results recorded in a logbook?			
Does the balance logbook contain acceptance criteria?			
Is the appropriate portion of the SOP available to the analyst at the sample preparation area?			
Are reagent grade or higher purity chemicals used to prepare standards?			
Are fresh analytical standards prepared at a frequency consistent with good QA?			
Are reference materials properly labeled with identity of materials, concentrations, date of preparation, and the identity of the person preparing the sample?			
Is a standards preparation and tracking logbook maintained?			
Do the analysts record bench data in a neat and accurate manner?			
Are standards stored separately from sample extracts?			
Is the temperature of the refrigerator/freezer recorded daily?			
Does the temperature logbook contain acceptance criteria?			

Additional Comments:

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

III. Organics Sample Preparation Area

Item	Yes	No	Comments
Is the laboratory maintained in a clean and organized manner?			
Are contamination-free areas provided for trace level analytical work?			
Are exhaust hoods provided to allow contamination-free work with volatile materials?			
Is the air flow of the hoods periodically checked and recorded?			
Does the laboratory have a source of distilled/demineralized water?			
Can the laboratory supervisor document that trace-free water is available for preparation of standards and blanks?			
Is the analytical balance away from draft and area subject to rapid temperature changes?			
Has the balance been calibrated within one year by a certified technician?			
Is the balance routinely checked with class 1 weights before each use and the results recorded in a logbook?			
Does the balance logbook contain acceptance criteria?			
Is the appropriate portion of the SOP available to the analyst at the sample preparation area?			
Are reagent grade or higher purity chemicals used to prepare standards?			
Are fresh analytical standards prepared at a frequency consistent with good QA?			
Are reference materials properly labeled with identity of materials, concentrations, date of preparation, and the identity of the person preparing the sample?			
Is a standards preparation and tracking logbook maintained?			
Do the analysts record bench data in a neat and accurate manner?			
Are standards stored separately from sample extracts?			
Is the temperature of the refrigerator/freezer recorded daily?			
Does the temperature logbook contain acceptance criteria?			

Additional Comments:

KEMRON ENVIRONMENTAL SERVICES

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

IV. VOA GC Instrumentation

ITEM	YES	NO	COMMENTS
Are written Standard Operating Procedures (SOP) developed for all methods used in this area?			
Is the appropriate portion of the SOP available to the analyst at the various instruments?			
Is the laboratory maintained in a clean and organized manner?			
Are contamination-free areas provided for trace level analytical work?			
Are exhaust hoods provided to allow contamination-free work with volatile materials?			
Is the air flow of the hoods periodically checked and recorded?			
Does the laboratory have a source of distilled/demineralized water?			
Can the laboratory supervisor document that trace-free water is available for preparation of standards and blanks?			
Are fresh analytical standards prepared at a frequency consistent with good QA?			
Are reference materials properly labeled with identity of materials, concentrations, date of preparation, and the identity of the person preparing the sample?			
Is a standards preparation and tracking logbook maintained?			
Are standards stored separately from sample extracts?			
Is the temperature of the refrigerator/freezer recorded daily?			
Is there a calibration protocol in use by the operator?			
Are calibration results kept in a permanent record?			
Do the analysts record bench data in a neat and accurate manner?			
Is preventive maintenance applied?			
Is a permanent service record maintained in a logbook?			
Is an electronic data storage service available?			
Is there evidence that at least one GC or GC/MS system can be reasonably expected to be operating acceptably at any given time?			
Are refrigerator blanks analyzed to monitor contamination free sample storage?			
Is a balance logbook maintained?			
Is the balance routinely checked with Class 1 weights before each use and results recorded in the balance logbook?			
Have expired standards been disposed of?			
Are instrument run logbooks maintained?			
Are system blanks analyzed to check for carryover contamination?			
Are solvent bottles (e.g. methanol for VOA) labeled with receipt date, open date, and initials?			
Do the analysts maintain statistical process control charts for each method?			
Do the analysts use control charts to monitor method performance?			
Are analysts familiar with applicable QA/QC method requirements?			
Is positive pressure maintained in rooms where volatile organic samples are analyzed?			

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

V. VOA GCMS Instrumentation

ITEM	YES	NO	COMMENTS
Are written Standard Operating Procedures (SOP) developed for all methods used in this area?			
Is the appropriate portion of the SOP available to the analyst at the various instruments?			
Is the laboratory maintained in a clean and organized manner?			
Are contamination-free areas provided for trace level analytical work?			
Are exhaust hoods provided to allow contamination-free work with volatile materials?			
Is the air flow of the hoods periodically checked and recorded?			
Does the laboratory have a source of distilled/demineralized water?			
Can the laboratory supervisor document that trace-free water is available for preparation of standards and blanks?			
Are fresh analytical standards prepared at a frequency consistent with good QA?			
Are reference materials properly labeled with identity of materials, concentrations, date of preparation, and the identity of the person preparing the sample?			
Is a standards preparation and tracking logbook maintained?			
Are standards stored separately from sample extracts?			
Is the temperature of the refrigerator/freezer recorded daily?			
Is there a calibration protocol in use by the operator?			
Are calibration results kept in a permanent record?			
Do the analysts record bench data in a neat and accurate manner?			
Is preventive maintenance applied?			
Is a permanent service record maintained in a logbook?			
Is an electronic data storage service available?			
Is there evidence that at least one GC or GC/MS system can be reasonably expected to be operating acceptably at any given time?			
Are refrigerator blanks analyzed to monitor contamination free sample storage?			
Is a balance logbook maintained?			
Is the balance routinely checked with Class 1 weights before each use and results recorded in the balance logbook?			
Have expired standards been disposed of?			
Are instrument run logbooks maintained?			
Are system blanks analyzed to check for carryover contamination?			
Are solvent bottles (e.g. methanol for VOA) labeled with receipt date, open date, and initials?			
Do the analysts maintain statistical process control charts for each method and matrix?			
Do the analysts use control charts to monitor method performance?			
Are analysts familiar with applicable QA/QC method requirements?			
Is positive pressure maintained in rooms where volatile organic samples are analyzed?			

KEMRON ENVIRONMENTAL SERVICES

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

VI. SEMI-VOA GC Instrumentation

ITEM	YES	NO	COMMENTS
Are written Standard Operating Procedures (SOP) developed for all methods used in this area?			
Is the appropriate portion of the SOP available to the analyst at the various instruments?			
Is the laboratory maintained in a clean and organized manner?			
Are contamination-free areas provided for trace level analytical work?			
Are exhaust hoods provided to allow contamination-free work with volatile materials?			
Is the air flow of the hoods periodically checked and recorded?			
Does the laboratory have a source of distilled/demineralized water?			
Can the laboratory supervisor document that trace-free water is available for preparation of standards and blanks?			
Are fresh analytical standards prepared at a frequency consistent with good QA?			
Are reference materials properly labeled with identity of materials, concentrations, date of preparation, and the identity of the person preparing the sample?			
Is a standards preparation and tracking logbook maintained?			
Are standards stored separately from sample extracts?			
Is the temperature of the refrigerator/freezer recorded daily?			
Is there a calibration protocol in use by the operator?			
Are calibration results kept in a permanent record?			
Do the analysts record bench data in a neat and accurate manner?			
Is preventive maintenance applied?			
Is a permanent service record maintained in a logbook?			
Is an electronic data storage service available?			
Is there evidence that at least one GC or GC/MS system can be reasonably expected to be operating acceptably at any given time?			
Have expired standards been disposed of?			
Are instrument run logbooks maintained?			
Are system blanks analyzed to check for carryover contamination?			
Are solvent bottles (e.g. methanol for VOA) labeled with receipt date, open date, and initials?			
Do the analysts maintain statistical process control charts for each method?			
Do the analysts use control charts to monitor method performance?			
Are analysts familiar with applicable QA/QC method requirements?			
Is positive pressure maintained in rooms where volatile organic samples are analyzed?			

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

VII. SEMI-VOA GCMS Instrumentation

ITEM	YES	NO	COMMENTS
Are written Standard Operating Procedures (SOP) developed for all methods used in this area?			
Is the appropriate portion of the SOP available to the analyst at the various instruments?			
Is the laboratory maintained in a clean and organized manner?			
Are contamination-free areas provided for trace level analytical work?			
Are exhaust hoods provided to allow contamination-free work with volatile materials?			
Is the air flow of the hoods periodically checked and recorded?			
Does the laboratory have a source of distilled/demineralized water?			
Can the laboratory supervisor document that trace-free water is available for preparation of standards and blanks?			
Are fresh analytical standards prepared at a frequency consistent with good QA?			
Are reference materials properly labeled with identity of materials, concentrations, date of preparation, and the identity of the person preparing the sample?			
Is a standards preparation and tracking logbook maintained?			
Are standards stored separately from sample extracts?			
Is the temperature of the refrigerator/freezer recorded daily?			
Is there a calibration protocol in use by the operator?			
Are calibration results kept in a permanent record?			
Do the analysts record bench data in a neat and accurate manner?			
Is preventive maintenance applied?			
Is a permanent service record maintained in a logbook?			
Is an electronic data storage service available?			
Is there evidence that at least one GC or GC/MS system can be reasonably expected to be operating acceptably at any given time?			
Have expired standards been disposed of?			
Are instrument run logbooks maintained?			
Are system blanks analyzed to check for carryover contamination?			
Are solvent bottles (e.g. methanol for VOA) labeled with receipt date, open date, and initials?			
Do the analysts maintain statistical process control charts for each method?			
Do the analysts use control charts to monitor method performance?			
Are analysts familiar with applicable QA/QC method requirements?			
Is positive pressure maintained in rooms where volatile organic samples are analyzed?			

KEMRON ENVIRONMENTAL SERVICES

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

VIII. AA/ICP Instrumentation

ITEM	YES	NO	COMMENTS
Are written Standard Operating Procedures (SOP) developed for all methods used in this area?			
Is the appropriate portion of the SOP available to the analyst at the various instruments?			
Are contamination-free areas provided for trace level analytical work?			
Are exhaust hoods provided to allow contamination-free work with corrosive materials?			
Is the air flow of the hoods periodically checked and recorded?			
Does the laboratory have a source of distilled/ demineralized water?			
Can the laboratory supervisor document that trace-free water is available for preparation of standards and blanks?			
Are fresh analytical standards prepared at a frequency consistent with good QA?			
Are reference materials properly labeled with concentrations, date of preparation, and the identity of the person preparing the sample?			
Is the standards preparation and tracking logbook maintained?			
Are standards stored separately from sample extracts?			
Is the laboratory maintained in a clean and organized manner?			
Is there a calibration protocol in use by the operator?			
Are calibration results kept in a permanent record?			
Is preventive maintenance applied?			
Is a permanent service record maintained in a logbook?			
Is there evidence that at least one AA/ICP system can be reasonably expected to be operating acceptably at any given time?			

Additional Comments:

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

IX. Data Handling and Review/QC

ITEM	YES	NO	COMMENTS
Are written Standard Operating Procedures (SOP) developed for data review?			
Is the appropriate portion of the SOP available to data review personnel?			
Are data calculations spot-checked by a second person?			
Do records indicate corrective action that has been taken on rejected data?			
Have standard curves been adequately documented?			
Are in-house quality control charts maintained for analysis (i.e. internal standard control charts)?			
Do QC records show corrective action when analytical results fail to meet QC criteria?			
Do supervisory personnel review the data and QC results?			

Additional Comments:

KEMRON ENVIRONMENTAL SERVICES

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

X. Purchasing

ITEM	YES	NO	COMMENTS
Does the laboratory have a formal purchase or requisition system for purchasing equipment, supplies and chemicals?			
Do purchases have to be approved by management?			
Are the proper grades of chemicals purchased for the intended use?			
Are only ACS grade or better chemicals used n the laboratory?			
Does the laboratory have a system to track lots for the following categories of supplies:			
a) Acids for preservation?			
b) Acids for metal digestion?			
c) Solvents for extraction?			
d) Sample bottles?			
Does the laboratory maintain certificates for standards, reagents, and sample bottles?			
Is an inventory system used to reserve specific lot numbers of extraction solvents and other critical reagents?			

Additional Comments:

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

XI. Training

ITEM	YES	NO	COMMENTS
Does the laboratory have a formal training program and documentation files?			
Are the files current in the following departments?			
a) Wet Chemistry?			
b) Metals?			
c) Extraction?			
d) Volatile Organics?			
e) Semivolatile Organics?			
Does documentation exist that each analyst has performed a proficiency demonstration for each method for which they are certified in the following departments?			
a) Wet Chemistry?			
b) Metals?			
c) Extraction?			
d) Volatile Organics?			
e) Semivolatile Organics?			
Are the analyst's certificates up to date?			

Additional Comments:

KEMRON ENVIRONMENTAL SERVICES

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

XII. Document Control

ITEM	YES	NO	COMMENTS
Is the document control system outlined in SOP 46 of the LQAP in use in each department?			
Are controlled copies of the laboratory SOPs available in each department?			
Have "unofficial" or uncontrolled copies of SOPs been removed from the laboratory?			
Does the document control system provide a means to identify out-of-date SOPs and documents?			
Does the system requiring acknowledgment of receipt of control copies appear to be working?			

Additional Comments:

Figure 14-1 (continued)
KEMRON INTERNAL SYSTEM AUDIT FORM

XIII. Project Management and Reporting

ITEM	YES	NO	COMMENTS
Are "kick-off" meeting for new projects used effectively to communicate specifications to the laboratory staff?			
Are written work orders being used?			
Are the TSRs performing a review of 100% of each project or sample delivery group (login number)?			
Are data in the LIMS being checked at each of the following stages:			
a) Analyst review?			
b) Peer review?			
c) Supervisory/QC review?			
d) Data entry?			
e) Data verification and editing?			
f) Final report review?			
Does each report have a certification and signature by the laboratory manager or appropriate designee?			

Additional Comments:

15.0 QUALITY ASSURANCE REPORTS

The Quality Assurance Officer (QAO) and other laboratory technical directors perform an annual review of the quality system. This review includes all of the following elements:

- Results of internal audits
- Results of external audits
- Results of Proficiency Testing (PT) studies
- Summary of review of Corrective Action Reports
- Reports and deliverables
- Electronic Data Deliverables (EDD)
- Annual revision of the Quality Assurance Manual

15.1 Laboratory Quality Assurance Reports:

The QAO presents a written annual report to the Laboratory Director/Vice President that summarizes the annual system review activities. Any significant quality assurance or quality control problems along with the recommended solutions for the problems will be listed.

15.2 Quality System Review Report

The Quality System Review is conducted annually (see Section 14.3) and a report of this review is issued to the president of the company. This report is included in the Annual Business Plan with the recommendations, observations, and adjustments incorporated in the business plan/strategy for the following year.

15.3 Special Reports

The Quality Assurance Officer shall prepare special quality assurance reports as necessary to document special concerns and problems. These reports may indicate the discussion of chronic PT performance problems, evaluation of Corrective Action Reports, results of storage blanks, follow-up from internal and external audits, customer complaints, and any trends determined from periodic evaluation of statistical data.

16.0 REFERENCES

16.1 NELAC Standards, June 2000.

16.2 Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80, December 29, 1980, Office of Monitoring Systems and Quality Assurance, ORD, U.S. EPA, Washington, DC 20460.

16.3 RCRA QAPP Instructions, U.S. EPA Region 5, Revision: April 1998.

16.4 ASTM D-5283-92. Generation of Environmental Data Related to Waste Management Activities: Quality Assurance and Quality Control Planning and Implementation.

16.5 "American National Standards Specification and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs (ANSI/ASQC E-4)", 1994.

16.6 EPA 2185 – Good Automated Laboratory Practices, 1995.

16.7 ISO/IEC Guide 25: 1990. General requirements for the competence of calibration and testing laboratories.

16.8 QA/R-2: EPA Requirements for Quality Management Plans, August 1994.

16.9 QA/G-4: Guidance for the Data Quality Objectives Process EPA/600/R-96/055, September, 1994.

16.10 QA/R-5: EPA Requirements for Quality Assurance Project Plans Draft – November 1997.

16.11 QA/G-5: Guidance on Quality Assurance Project Plans EPA/600/R-98/018, February, 1998.

16.12 QA/G-6: Guidance for the Preparation of Standard Operating Procedures for Quality-Related Operations EPA/600/R-96/027, November, 1995.

16.13 QA/G-9: Guidance for the Data Quality Assessment: Practical Methods for Data Analysis EPA/600/R-96/084, January, 1998.

16.14 Manual for the Certification of Laboratories Analyzing Drinking Water EPA/570/9-90/008.

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APPENDIX A
DEFINITIONS

The following definitions are used in the production of this Comprehensive Quality Assurance Plan.

Analytical Batch:

The basic unit for analytical quality control. The analytical batch is defined as samples which are analyzed (or sampled together) with the same method sequence, the same lots of reagents, and with the same treatment common to all samples. The samples must have been analyzed (or collected) within the same specified time period or in continuous sequential time periods. Samples in each batch should be of similar composition.

Audits:

A systematic check to determine the quality of operation of some function or activity.

Performance Audits:

Quantitative data are independently obtained for comparison with routinely obtained data in a measurement system. Examples of these audits are EPA performance evaluation programs, commercial performance evaluation programs, split sampling programs involving at least two laboratories, and blind spike samples.

Systems Audit:

These are qualitative in nature and consist of an on-site review and evaluation of a laboratory or field operation quality assurance system and physical facilities for sampling, calibration and measurements.

Calibration:

Process by which the correlation between instrument response and actual value of a measured parameter is determined.

Calibration Curve:

A curve which plots the concentration of known analyte standards against the instrument response to the analyte. Also known as a Standard Curve.

Calibration Standard:

Solutions or dilutions of a substance or material with a verifiable accuracy which are used to evaluate the sample property of an unknown sample. In analytical terms, these standards are used to establish a calibration curve or standard instrument response factors.

Continuing Calibration Standard:

Standards that are analyzed during an analytical set to verify the accuracy of the calibration curve.

Internal Standard:

A compound having similar chemical characteristics to the compounds of interest, but which is not normally found in the environment or does not interfere with the compounds of interest. A known and specified concentration of the standard is added to each sample prior to analysis. The concentration in the sample is based on the response of the internal standard relative to that of the calibration standard and the compound in the standard.

Confidence Level:

The statistical probability associated with an interval of precision (or accuracy) values in a QC chart. The values of confidence intervals are generally expressed as percent probability. It is a commonly accepted convention that the result being tested is significant if the calculated probability is greater than 99 percent.

Data Quality:

The totality of features and characteristics of data that bears on its ability to satisfy a given purpose. The characteristics of major importance are accuracy, precision, completeness, representativeness, and comparability. These characteristics are defined as follows:

Accuracy:

The degree of agreement of a measurement X (or an average of measurements of the same thing), with an accepted reference or true value, T, usually expressed as the difference between the two values, X-T, or the difference as a percentage of the percentage of the reference or true value, 100 (X/T)/T, and sometimes expressed as a ratio, X/T. Accuracy is a measure of the bias in a system.

Precision:

A measure of mutual agreement among individual measurements of the same property, usually prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist, depending upon the "prescribed similar conditions."

Representativeness:

Expresses the degree to which data accurately and precisely represents, a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Comparability:

Expresses the confidence with which one data set can be compared to another.

Completeness:

Completeness refers to the percentage of measurements made which are judged to be valid. The completeness goal is the same for all data uses: that we achieve 95% completeness on our first analysis. Subsequently our goal is to achieve 100% completeness by resampling or doing additional analysis.

Data Quality Objectives:

A set of specifications that the environmental data must meet in order to be acceptable for its intended use in a program area. DQO's are commonly established for limits of detection and quality of data (precision, accuracy, representativeness and comparability).

Detection Limits (DL):

The smallest concentration/amount of an analyte of interest that can be measured with a stated probability of significance.

Method Detection Limit (MDL):

The smallest concentration of an analyte of interest that can be measured and reported with 99 percent confidence that the concentration is greater than zero. The MDL's are determined from the analysis of a sample in a given matrix containing the analyte at a specified level. Determination of MDL's must be done by procedures determined in Appendix B of 40 CFR, Part 136. Equivalent procedures to determine MDL's must be approved by DER.

Practical Quantitation Limit (PQL):

The smallest concentration of an analyte of interest that can be reported with a specific degree of confidence. PQL's shall be determined in the same way as MDL's by using the procedures outlined in Appendix B of 40 CFR, Part 136. The standard deviation (sd) derived from the procedure will be used to calculate the PQL: PQL = 10sd, which corresponds to an uncertainty of ± 30 percent in the measures value at the 99 percent confidence level.

Instrument Detection Limit (IDL):

The smallest amount of an analyte of interest that generates an instrument response (signal) under prescribed conditions, so that the magnitude of the signal is larger than the absolute uncertainty (error) associated with it.

Environmental Sample:

Means any sample from a natural source or source that reasonably may be expected to contribute pollution to or receive pollution from groundwaters or surface waters of the State. This includes, but is not limited to: receiving waters; waters used to define natural background conditions; soils; sediments; industrial, domestic or municipal discharge effluents; chemical storage or handling facilities; waste disposal facilities or areas; industrial or agricultural chemical handling or application areas; surface water run-off; and facilities for the handling or applying of chemicals for weed or insect control.

Parameter Group:

Is defined as a group of samples that have been preserved in the same manner, prepared by similar protocols and analyzed using instruments of similar technology (also known as analyte group). Examples of parameter groups are:

- Volatiles (EPA methods 601, 602, and 624)
- Pesticides (EPA methods 608, 614, and 622)
- Trace Metals (All metals except mercury)
- Nutrients (Total Kjeldahl Nitrogen, Nitrate-Nitrite, Total Phosphorus)

Performance Evaluation Samples:

A sample submitted for analysis whose composition and concentration are known to the submitter but unknown to the analyst. Also known as a Blind Sample.

Quality Assurance:

A system of activities whose purpose is to provide the producer or user of environmental data the assurance that it meets defined standards of quality with a stated level of confidence.

Quality Assurance Plans (QAP):

An orderly assembly of detailed and specific procedures which delineates how data of a known and accepted quality is produced.

Comprehensive Quality Assurance Plan (COMQAP):

A QA plan that outlines all the capabilities of the specified organization, the routinely-used quality control measures, the routine QA targets for precision and accuracy, and documentation, calibration and maintenance activities necessary to produce data of a known and acceptable quality.

Quality Assurance Project Plans (QAPP):

A QA plan that is written for a specific project outlining specific QA targets and data quality objectives as well as protocols and QC measures needed to meet the project specific objectives.

Research Quality Assurance Plans (RQAP):

A special type of Quality Assurance Project Plan which is generally written as a requirement of a direct contract with a State or Federal Government Branch.

Quality Control:

The overall system of activities whose purpose is to document and control the quality of environmental data so that it meets the needs of the users.

Quality Control Measures:

1. Blanks:

An artificial sample of an analytical matrix designed to monitor the introduction of artifact into the system.

a) Field Quality Control Blanks

- Field Blanks: Blanks of analyte-free water prepared on-site by filling the pre-preserved sample containers with the water, sealing the containers, and completing the documentation. These blanks should be prepared during the middle to end of a sampling event by filling sample containers with water from the equipment decontamination water transport containers. They are to be treated, stored, transported, and analyzed in the same manner as the sample group for which it was intended. These blanks may be submitted for all water parameter groups.

- Equipment Blanks: Blanks of analyte-free water that are prepared on-site by pouring the equipment decontamination water through decontaminated field equipment. Appropriate pre-preserved sample containers for each analyte group must be used, and documentation must be completed. These blanks are to be stored, transported and analyzed with the intended parameter groups. At least one equipment blank is required for each water and solid matrix analytical group, and must be collected at the beginning of the sampling episode. If field decontamination is performed on-site, additional equipment blanks must be submitted for all water and solid matrix analytical groups.

- Trip Blanks: These blanks are required for volatile organic compound (VOC) water samples only. Blanks of volatile organic-free water are prepared by the organization providing the sample containers. These are transported to the site with the empty VOC sample containers, and shipped to the analyzing laboratory in the same containers. They remain unopened for the entire trip. Proper labeling and documentation must be completed. One trip blank for VOC sent per project unless client requests more.

(b) Laboratory

- Method Blank: A blank of an analyte-free matrix that is processed (digested, extracted, etc.) and analyzed with a specified sample set.

- Reagent Blank: An aliquot of analyte-free water or solvent that is analyzed with a sample set.

2. Spiked Samples:

These are samples fortified to a known and validated concentration of analyte. Percent recoveries are calculated for each compound in the spike.

a) Field

- An environmental sample fortified to a known and validated concentration in the field. These may be submitted as blind spike (laboratory does not know they are spiked) or as identified field spikes.

b) Laboratory

- LCS (Laboratory Control Sample): Samples of an analyte-free matrix (deionized water, sand, soil, etc.) that are fortified to a known and validated concentration of analyte(s) before sample preparation.

- Sample (Matrix Spikes): Environmental sample selected from a set (not blanks) that is fortified to a known and validated concentration of analyte(s) before sample preparation. The concentration of each analyte in the spiking solution should be approximately 3-5 times the level expected in the sample.

- Surrogate Spikes: A compound having similar chemical characteristics to the compounds of interest, but which is not normally found in environmental samples. Known concentrations of these compounds are added to all samples in the set before sample preparation.

3. Replicate Sample:

Samples that have been collected at the same time from the same source (field replicates) or aliquots of the sample that are prepared and analyzed at the same time (laboratory replicates).

a) Duplicate samples: Samples that are one type of a replicate sample. The analytical results from replicates are used to determine the precision of a system. If the concentration of analytes in the sample is below detectable limits, Duplicate Spike Samples may be used to determine precision.

b) Blind Replicates (Duplicates): Samples that are replicates that have been collected (field replicate) or prepared (laboratory replicate) and are submitted and analyzed as separate samples (analyst does not know they are replicates).

4) Quality Control Checks:

Standards or samples from an independent source that are analyzed at a specific frequency.

a) Quality Control Check Standards: Standard solutions from a source other than normal calibration standards that are certified and traceable. These standards are used to check the accuracy of a calibration curve.

b) Quality Control Check Samples: (also known as Reference Materials): Samples obtained from an independent source for which the level(s) of analytes have been validated. These samples are prepared and analyzed with a sample set of

similar matrix. If these samples have been obtained from the National Institute of Standards and testing (formerly National Bureau of Standards), they are referred to as Standard Reference Materials.

5) Split Samples:

Replicate of the same sample that is given to two independent laboratories for analysis.

Sample Custody:

All record and documentation required to trace a sample from point of origin to disposal after analysis. These records must include, but are not limited to:

a) Field notebooks;
b) Field sample ID tags
c) Laboratory transmittal forms (if applicable);
d) Laboratory sample receipt logs;
e) Sample extraction/preparation logs or worksheets;
f) Analytical (instrument) logs or worksheets;
g) Calibration and quality control data associated with a sample set;
h) Instrument maintenance logs;
i) Sample disposition logs; and
j) Final reports.

Legal Chain of Custody is a special type of sample custody in which all events associated with a specific sample must be documented in writing. In addition to the records described above, chain of custody records must include the following:

a) Sample transmittal forms or tags that have adequate spaces for the dated, original signatures of all individuals who handle the sample (or cleaned sample containers if obtained for a contracted laboratory) from time of collection (or container receipt) to laboratory delivery.

b) Laboratory sample storage logs that identify date, time, and individuals who remove samples from storage.

3) Secure, limited access storage areas.

Sample Matrix:

This means that characteristic of an environmental laboratory sample, associated with its physical and chemical properties, which defines how such a sample is handled when subjected to the intended analytical process. The following samples matrices (major

matrix groups), defined below should be used in QA plans whenever specifying data quality objectives:

Reagent Water:

A sample of water which conforms to ASTM TYPE II, III, IV.

Drinking Water:

Includes finished (treated) or raw source water designated as potable water. Such resources may be from surface or ground water.

Surface Water:

Includes fresh or saline waters from streams, canals, rivers, lakes, ponds, bays and estuaries (natural or manmade).

Groundwater:

Includes all waters found below ground in confined or unconfined aquifers.

Wastewater:

Includes any influent or effluent associated with domestic or industrial waste treatment facilities.

Chemical Waste:

Includes sludges and residuals from domestic or industrial wastewater processing, and liquid or solid chemicals no longer used for their intended purpose.

Soil/Sediment:

Surface or subsurface soils and sediments of fresh or salt water origin.

Biological Tissue:

Includes tissue of plant or animal origin. The most common of these are shellfish, finfish, and aquatic plants.

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APPENDIX B
SOP TABLE OF CONTENTS

Wet Chemistry
Table of Contents

KEMRON SOP #	Parameter
IC01	Anions
IC02	Perchlorate
K0001	Glassware Washing
K0002	Calibration Techniques
K0003	Percent Solids (Percent Moisture)
K0005	Extraction of Soils and Sludges
K0006	Formaldehyde
K0100	Fecal Coliforms
K0101	Total Coliforms
K0102	Fecal Streptococcus
K0103	Most Probable Number of Fecal Coliforms
K0104	Heterotropic Plate Count
K1010	Flashpoint (Pensky-Martins Closed Cup Method)
K1102	Color (Colorimetric-Platinum-Cobalt)
K1110	Corrosivity
K1140	Particle Size
K1201	Conductance
K1302	Total Hardness
K1501	pH (Electrometric)
K1601	TDS (Filterable Residue)

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Wet Chemistry (continued)
Table of Contents

KEMRON SOP #	Parameter
K1602	TSS (Non-Filterable Residue)
K1603	TS (Total Residue)
K1604	Volatile Solids
K1605	Settleable Solids
K1664	Hexane Extractable Material
K1801	Turbidity
K2186	Hexavalent Chromium
K2382	British Thermal Units (BTU / Heat of Combustion)
K2710	Specific Gravity
K3051	Acidity (Titrimetric, H_2O_2)
K3052	Acidity (Titrimetric)
K3101	Alkalinity (Titrimetric, pH 4.5)
K3102	Alkalinity (Automated Methyl Orange)
K3201	Bromide (Titrimetric)
K3252	Chloride (Automated, Ferric Nitrate)
K3253	Chloride (Titrimetric, Mercuric Nitrate)
K3354	Cyanide, Total (Midi-Distillation)
K3401	Fluoride (Preliminary Distillation)
K3402	Fluoride (Potentiometric, Ion Selective Electrode)
K3451	Iodide (Titrimetric)

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Wet Chemistry (continued)
Table of Contents

KEMRON SOP #	Parameter
K3500	Ferrous Iron
K3501	Ammonia Nitrogen (Automated Phenate)
K3502	Ammonia Nitrogen (Preliminary Distillation, Titrimetric)
K3512	(TKN) Total Nitrogen Kjeldahl (Semi-block Digester / Automated)
K3532	Nitrate-Nitrite Nitrogen (Automated Cadmium Reduction)
K3541	Nitrite Nitrogen (Spectrophotometric
K3601	Dissolved Oxygen
K3652	Phosphorus, Total (Colorimetric, Ascorbic Acid Single Reagent)
K3653	Orthophosphate
K3654	Phosphorus, Total (Semi-automated Block Digestor / Automated)
K3701	Silica, Dissolved
K3754	Sulfate, Total (Turbidimetric)
K3758	Sulfur (In Organic Compounds)
K3761	Sulfide (Titrimetric, Iodine)
K3771	Sulfite (Titrimetric)
K4051	Biochemical Oxygen Demand
K4105	Chemical Oxygen Demand
K4131	Oil and Grease & Petroleum Hydrocarbons
K4151	(TOC) Total Organic Carbon
K4201	Phenolics, Total Recoverable
K4251	(MBAS) Methylene Blue Active Substances

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Wet Chemistry (continued)
Table of Contents

KEMRON SOP #	Parameter
K4829	Ash (At 775°C)
K5050	(TX) Total Halides
K5310	TOC in Soil
K7332	Reactivity (Cyanide and Sulfide)
K9030	Acid Insoluble Sulfide
K9075	Total Residual Chlorine
K9095	Paint Filter Liquid Test

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Metals Preparation
Table of Contents

KEMRON SOP #	Parameter
ME201	Cleaning Procedure of Glassware
ME401	Acid Digestion of Aqueous Matrices for ICP Spectroscopy
ME402	Acid Digestion of Aqueous Matrices for GFAA Spectroscopy
ME403	Acid Digestion of Solid Matrices for GFAA Spectroscopy
ME404	Method 7470A/245.1 Mercury in Aqueous Matrices
ME405	Method 7471A Mercury in Solid Matrices
ME406	Microwave Digestion for Solid Matrices
ME407	Microwave Digestion for Aqueous Matrices
ME410	Acid Digestion of Aqueous Matrices for GFAA Spectroscopy (Arsenic and Selenium)
ME411	Acid Digestion of Aqueous Matrices for ICP Spectroscopy

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Metals Analysis
Table of Contents

KEMRON SOP #	Parameter
ME404	Method 7470A/245.1 Mercury in Aqueous Matrices
ME405	Method 7471A Mercury in Solid Matrices
ME510	Method SW846 706A / 206.2 As, Se, Pb, Sb, Tl / Graphite Furnace
ME600E	Method 6010B Metals by Perkin Elmer ICP Spectroscopy (Trace)
ME600F	Method 6010B Metals by TJA Iris ICP Spectroscopy
ME700	Method 6020 Perkin Elmer

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Organic Extractions
Table of Contents

KEMRON SOP #	Parameter
ASE01	Method 3545 Accelerated Solvent Extractor
EXA01	Method 3510C Separatory Funnel Extraction of PAHs
EXA02	Method 3550B Sonication Extraction of PAHs
EXA03	Preparation of a PAH Spiking Solution
EXA04	Preparation of a PAH Surrogate Spiking Solution
EXB01	Method 3520C Continuous Liquid-Liquid Extraction of BNAs
EXB02	Method 3550B Sonication Extraction of BNAs
EXB03	Method 3580A Waste Dilution of Organic Matrix for BNAs
EXB08	Method 3510C Separatory Funnel Extraction of BNAs
EXD01	Extraction of Diesel Range Organics
EXD02	Preparation of a DRO/PRO Surrogate Spiking Solution
EXD03	Preparation of a DRO Spiking Solution
EXH01	Method 8151A Continuous Liquid-Liquid Extraction of Herbicides
EXH02	Method 8151A Soil Extraction of Herbicides
EXH03	Method 8150B Waste Dilution of Organic Matrix for Herbicides
EXH04	Preparation of a Herbicide Spiking Solution
EXH06	Preparation of a Herbicide Surrogate Solution
EXHEMS	HEM for Soils
EXHPLC01	Method 8310/3510C Separatory Funnel Extraction of PAHs for HPLC
EXHPLC02	Method 8310/3550B Sonication Extraction of PAHs for HPLC
EXP01	Method 3510C /3500B/608 Separatory Funnel Extraction of Pesticides and PCBs

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Organic Extractions (continued)
Table of Contents

KEMRON SOP #	Parameter
EXP02	Method 3550B/3500B Sonication Extraction of Pesticides and PCBs
EXP03	Method 3580A Waste Dilution of Organic Matrix for PCBs
EXP04	Preparation of a Pesticide Spiking Solution
EXP05	Preparation of a PCB Spiking Solution
EXP06	Preparation of a Pesticide / PCB Spiking Solution
EXP08	Extraction Procedure for PCB Wipes
EXP11	Soxhlet Extraction Procedure for Pesticides and PCBs
EXPRO	Extraction of Petroleum Range Organics
EXT01	Method 9071A / 418.1 Infrared Analysis of Total Petroleum Hydrocarbons
EXT05	Viscosity
EXTNT01	Method 8330 Liquid Extraction Nitroaromatic and Nitramines
EXTNT02	Method 8330 Solid Extraction of Nitroaromatic and Nitramines
EXWET01	California Waste Extraction Test (WET)
K3987	ASTM Shake Test
KNITRO-C-S	Nitrocellulose in Soil
KNITRO-W-S	Nitrocellulose in Water
SOP 37	Extraction Glassware Washing
TCLP01	Method 1311/1312 Toxicity Characteristic Leaching Procedure

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Volatile Organics
Table of Contents

KEMRON SOP #	Parameter
GCV01	Method 8021B Purgeable BETX
GCV05	Method 8015B Modified Gasoline Range Organics
GCV09	Method 602 Purgeable Aromatic Hydrocarbons
MSV01	Method 8260B Volatile Organic Compounds by GC/MS
MSV10	Method 624 Volatile Organic Compounds by GC/MS
PAT01	Method 5030B Purge and Trap for Volatile Organics
PAT02	Method 5035 Purge and Trap for Volatile Organics
RSK01	Method RSK 175 Dissolved Methane Ethane and Ethylene in ground water
SOP 41	Manual Integration of Chromatographic Peaks
VGW01	Cleaning Glassware in Organic Analyses

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Semivolatile
Table of Contents

KEMRON SOP #	Parameter
GCS04	Method 8151A Chlorinated Herbicides
GCS05	Method T1005 TNRCC Method for Total Petroleum Hydrocarbons
GCS07	Method 8011 EDB and EDCP
GCS08	Method 608 Pesticides & PCBs
GCS09	Method 8081A Pesticides
GCS10	Method 8082 PCBs
MSS01	Method 8270C Base / Neutral / Acid Compounds
MSS02	Method 625 Base / Neutral / Acid Compounds
MSS03	Method 8270 C Modified Low Level PAH
SOP41	Manual Integration of Chromatographic Peak

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HPLC / FID
Table of Contents

KEMRON SOP #	Parameter
GCS02	Method 8015B Modified Diesel Range Organics
GCS03	Method 8015M Petroleum Range Organics
GCS11	Method 8015B Modified Gylcols
GCS12	Method 8015B Modified Alcohols
HPLC01	Method 8310 Polynuclear Aromatic Hydrocarbons
HPLC02	Method 8330 Nitroaromatics and Nitramines
HPLC03	Method 830MBA Metabolic Acids

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General Policies and Procedures
Table of Contents

KEMRON SOP #	Parameter
CHP04	Chemical Hygiene Plan
CRC01	Ensuring Confidentiality of Client Results
DU01	Data Upload Procedures
ETH01	Ethics Policy
KAFCEE	KEMRON AFCEE Project Guide
KP01	KEMKIT Preparation
LOGIN01	Sample Receiving and Login
LQAP	Laboratory Quality Assurance Plan
MISDATA01	Data Entry and Reporting
MISEDD01	Electronic Deliverable
PAR01	Purchase and Receipt of Consumables
SOP 33	Laboratory Waste Management
SOP 36	Emergency Response
SOP 40	Cooler Temperature Determined by IR Gun
SOP 41	Manual Integration of Chromatographic Peak
SOP 42	Laboratory Waste Minimization Plan
SOP 43	Writing and Maintaining Standard Operating Procedures
SOP 44	Project Management, Technical Service and Subcontracting
SOP 45	Method Validation Procedures
SOP 46	Document Control
SOP 47	Employee Training
SVC01	Software Version Control

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APPENDIX C

List of NELAP Approved Parameters

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FLORIDA DEPARTMENT OF HEALTH

State of Florida
Department of Health, Bureau of Laboratories

This is to certify that

E87551

KEMRON Environmental Services, Inc.

156 Starlite Park

Marietta, OH 45750

has complied with Florida Administrative Code 64E-1, for the examination of Environmental samples in the following categories:

Non-Potable Water

Extractable Organics, General Chemistry, Metals, Pesticides-Herbicides-PCB's, Volatile Organics

Solid and Chemical Materials

Extractable Organics, General Chemistry, Metals, Pesticides-Herbicides-PCB's, Volatile Organics

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

EFFECTIVE JULY 1, 2004 **THROUGH JUNE 30, 2005**

Ming S. Chan, Ph.D.
Bureau Chief, Bureau of Laboratories
Florida Department of Health
DH Form 1697, 7/03
NON-TRANSFERABLE 06/15/2004-E87551

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Jeb Bush
Governor

FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

Laboratory Scope of Accreditation

THIS LISTING OF ACCREDITED ANALYTES SHOULD BE USED ONLY WHEN ASSOCIATED WITH A VALID CERTIFICATE

State Laboratory ID: E87551 **EPA Lab Code:** OH00218 (740) 373-4071

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,1-Trichloroethane	EPA 624	Volatile Organics	NELAP	5/16/2003
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2,2-Tetrachloroethane	EPA 624	Volatile Organics	NELAP	5/16/2003
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1,2-Trichloroethane	EPA 624	Volatile Organics	NELAP	5/16/2003
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethane	EPA 624	Volatile Organics	NELAP	5/16/2003
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloroethylene	EPA 624	Volatile Organics	NELAP	5/16/2003
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4-Trichlorobenzene	EPA 625	Extractable Organics	NELAP	5/16/2003
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 602	Volatile Organics	NELAP	5/16/2003
1,2-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	5/16/2003
1,2-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	5/16/2003
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,2-Dichloroethane	EPA 624	Volatile Organics	NELAP	5/16/2003
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,2-Dichloropropane	EPA 624	Volatile Organics	NELAP	5/16/2003
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 602	Volatile Organics	NELAP	5/16/2003
1,3-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	5/16/2003
1,3-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	5/16/2003
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003

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Governor

FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

Laboratory Scope of Accreditation

THIS LISTING OF ACCREDITED ANALYTES SHOULD BE USED ONLY WHEN ASSOCIATED WITH A VALID CERTIFICATE

State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,4-Dichlorobenzene	EPA 602	Volatile Organics	NELAP	5/16/2003
1,4-Dichlorobenzene	EPA 624	Volatile Organics	NELAP	5/16/2003
1,4-Dichlorobenzene	EPA 625	Extractable Organics	NELAP	5/16/2003
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260	Volatile Organics	NELAP	7/1/2003
1-Chlorohexane	EPA 8260	Volatile Organics	NELAP	7/1/2003
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4,6-Trichlorophenol	EPA 625	Extractable Organics	NELAP	5/16/2003
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
2,4-Dichlorophenol	EPA 625	Extractable Organics	NELAP	5/16/2003
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dimethylphenol	EPA 625	Extractable Organics	NELAP	5/16/2003
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrophenol	EPA 625	Extractable Organics	NELAP	5/16/2003
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 625	Extractable Organics	NELAP	5/16/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 625	Extractable Organics	NELAP	5/16/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chloroethyl vinyl ether	EPA 624	Volatile Organics	NELAP	5/16/2003
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Chloronaphthalene	EPA 625	Extractable Organics	NELAP	5/16/2003
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorophenol	EPA 625	Extractable Organics	NELAP	5/16/2003
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Hexanone	EPA 8260	Volatile Organics	NELAP	7/1/2003
2-Methyl-4,6-dinitrophenol	EPA 625	Extractable Organics	NELAP	5/16/2003
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003

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FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

Laboratory Scope of Accreditation

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State Laboratory ID: E87551 **EPA Lab Code:** OH00218 (740) 373-4071

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitrophenol	EPA 625	Extractable Organics	NELAP	5/16/2003
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
2-Nitropropane	EPA 8260	Volatile Organics	NELAP	7/1/2003
3,3'-Dichlorobenzidine	EPA 625	Extractable Organics	NELAP	5/16/2003
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	7/1/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4,4'-DDD	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDE	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4,4'-DDT	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
4-Bromophenyl phenyl ether	EPA 625	Extractable Organics	NELAP	5/16/2003
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chloro-3-methylphenol	EPA 625	Extractable Organics	NELAP	5/16/2003
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorophenyl phenylether	EPA 625	Extractable Organics	NELAP	5/16/2003
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	7/1/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
4-Nitrophenol	EPA 625	Extractable Organics	NELAP	5/16/2003
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthene	EPA 625	Extractable Organics	NELAP	5/16/2003
Acenaphthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acenaphthylene	EPA 625	Extractable Organics	NELAP	5/16/2003
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Acetone	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acetonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acidity, as CaCO3	EPA 305.1	General Chemistry	NELAP	5/16/2003
Acrolein (Propenal)	EPA 624	Volatile Organics	NELAP	5/16/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Acrylonitrile	EPA 624	Volatile Organics	NELAP	5/16/2003

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E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	7/1/2003
Aldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Alkalinity as CaCO3	EPA 310.2	General Chemistry	NELAP	5/16/2003
Alkalinity as CaCO3	SM 2320 B	General Chemistry	NELAP	5/16/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aluminum	EPA 200.7	Metals	NELAP	5/16/2003
Aluminum	EPA 6010	Metals	NELAP	7/1/2003
Amenable cyanide	EPA 335.1	General Chemistry	NELAP	5/16/2003
Ammonia as N	EPA 350.1	General Chemistry	NELAP	5/16/2003
Aniline	EPA 8270	Extractable Organics	NELAP	7/1/2003
Anthracene	EPA 625	Extractable Organics	NELAP	5/16/2003
Anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Antimony	EPA 200.7	Metals	NELAP	5/16/2003
Antimony	EPA 200.8	Metals	NELAP	5/16/2003
Antimony	EPA 204.2	Metals	NELAP	5/16/2003
Antimony	EPA 6010	Metals	NELAP	7/1/2003
Antimony	EPA 6020	Metals	NELAP	7/1/2003
Antimony	EPA 7041	Metals	NELAP	7/1/2003
Aroclor-1016 (PCB-1016)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1221 (PCB-1221)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1232 (PCB-1232)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1242 (PCB-1242)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1248 (PCB-1248)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1254 (PCB-1254)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Aroclor-1260 (PCB-1260)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Arsenic	EPA 200.7	Metals	NELAP	5/16/2003
Arsenic	EPA 200.8	Metals	NELAP	5/16/2003

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State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Arsenic	EPA 206.2	Metals	NELAP	5/16/2003
Arsenic	EPA 6010	Metals	STATE	7/1/2000
Arsenic	EPA 6020	Metals	NELAP	7/1/2003
Arsenic	EPA 7060	Metals	STATE	7/1/2000
Barium	EPA 200.7	Metals	NELAP	5/16/2003
Barium	EPA 6010	Metals	NELAP	7/1/2003
Benzene	EPA 602	Volatile Organics	NELAP	5/16/2003
Benzene	EPA 624	Volatile Organics	NELAP	5/16/2003
Benzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Benzidine	EPA 625	Extractable Organics	NELAP	5/16/2003
Benzo(a)anthracene	EPA 625	Extractable Organics	NELAP	5/16/2003
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(a)pyrene	EPA 625	Extractable Organics	NELAP	5/16/2003
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(b)fluoranthene	EPA 625	Extractable Organics	NELAP	5/16/2003
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(g,h,i)perylene	EPA 625	Extractable Organics	NELAP	5/16/2003
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzo(k)fluoranthene	EPA 625	Extractable Organics	NELAP	5/16/2003
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	7/1/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Beryllium	EPA 200.7	Metals	NELAP	5/16/2003
Beryllium	EPA 6010	Metals	NELAP	7/1/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Biochemical oxygen demand	EPA 405.1	General Chemistry	NELAP	5/16/2003
Biochemical oxygen demand	SM 5210 B	General Chemistry	NELAP	5/16/2003
bis(2-Chloroethoxy)methane	EPA 625	Extractable Organics	NELAP	5/16/2003
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroethyl) ether	EPA 625	Extractable Organics	NELAP	5/16/2003
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Chloroisopropyl) ether	EPA 625	Extractable Organics	NELAP	5/16/2003
bis(2-Chloroisopropyl) ether	EPA 8270	Extractable Organics	NELAP	7/1/2003
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 625	Extractable Organics	NELAP	5/16/2003
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	7/1/2003

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E87551
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156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Boron	EPA 200.7	Metals	NELAP	5/16/2003
Boron	EPA 6010	Metals	NELAP	7/1/2003
Bromide	EPA 300.0	General Chemistry	NELAP	5/16/2003
Bromide	EPA 320.1	General Chemistry	NELAP	5/16/2003
Bromobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromodichloromethane	EPA 624	Volatile Organics	NELAP	5/16/2003
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Bromoform	EPA 624	Volatile Organics	NELAP	5/16/2003
Bromoform	EPA 8260	Volatile Organics	NELAP	7/1/2003
Butyl benzyl phthalate	EPA 625	Extractable Organics	NELAP	5/16/2003
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Cadmium	EPA 200.7	Metals	NELAP	5/16/2003
Cadmium	EPA 6010	Metals	NELAP	7/1/2003
Cadmium	EPA 7131	Metals	NELAP	5/16/2003
Calcium	EPA 200.7	Metals	NELAP	5/16/2003
Calcium	EPA 6010	Metals	NELAP	7/1/2003
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	7/1/2003
Carbon tetrachloride	EPA 624	Volatile Organics	NELAP	5/16/2003
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Carbonaceous BOD (CBOD)	SM 5210 B	General Chemistry	NELAP	5/16/2003
Chemical oxygen demand	EPA 410.4	General Chemistry	NELAP	5/16/2003
Chemical oxygen demand	OTHER HACH 8000	General Chemistry	NELAP	5/16/2003
Chlordane (tech.)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Chloride	EPA 300.0	General Chemistry	NELAP	5/16/2003
Chloride	EPA 325.2	General Chemistry	NELAP	5/16/2003
Chlorobenzene	EPA 602	Volatile Organics	NELAP	5/16/2003
Chlorobenzene	EPA 624	Volatile Organics	NELAP	5/16/2003
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chloroethane	EPA 624	Volatile Organics	NELAP	5/16/2003
Chloroethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chloroform	EPA 624	Volatile Organics	NELAP	5/16/2003
Chloroform	EPA 8260	Volatile Organics	NELAP	7/1/2003
Chromium	EPA 200.7	Metals	NELAP	5/16/2003
Chromium	EPA 6010	Metals	NELAP	7/1/2003

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Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Chromium VI	SM 3500-Cr D	Metals	NELAP	5/16/2003
Chrysene	EPA 625	Extractable Organics	NELAP	5/16/2003
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
cis-1,3-Dichloropropene	EPA 624	Volatile Organics	NELAP	5/16/2003
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Cobalt	EPA 200.7	Metals	NELAP	5/16/2003
Cobalt	EPA 6010	Metals	NELAP	7/1/2003
Color	EPA 110.2	General Chemistry	NELAP	5/16/2003
Conductivity	EPA 120.1	General Chemistry	NELAP	5/16/2003
Copper	EPA 200.7	Metals	NELAP	5/16/2003
Copper	EPA 6010	Metals	NELAP	7/1/2003
Cyanide	EPA 335.2	General Chemistry	NELAP	5/16/2003
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
delta-BHC	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dibenz(a,h) anthracene	EPA 625	Extractable Organics	NELAP	5/16/2003
Dibenz(a,h) anthracene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dibromochloromethane	EPA 624	Volatile Organics	NELAP	5/16/2003
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dibromofluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dibromomethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Dieldrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Diethyl phthalate	EPA 625	Extractable Organics	NELAP	5/16/2003
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dimethyl phthalate	EPA 625	Extractable Organics	NELAP	5/16/2003
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-butyl phthalate	EPA 625	Extractable Organics	NELAP	5/16/2003
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Di-n-octyl phthalate	EPA 625	Extractable Organics	NELAP	5/16/2003
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	7/1/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003

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156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Endosulfan I	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan II	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endosulfan sulfate	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin aldehyde	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Ethylbenzene	EPA 602	Volatile Organics	NELAP	5/16/2003
Ethylbenzene	EPA 624	Volatile Organics	NELAP	5/16/2003
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Fluoranthene	EPA 625	Extractable Organics	NELAP	5/16/2003
Fluoranthene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluorene	EPA 625	Extractable Organics	NELAP	5/16/2003
Fluorene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Fluoride	EPA 300.0	General Chemistry	NELAP	5/16/2003
Fluoride	EPA 340.2	General Chemistry	NELAP	5/16/2003
Fluoride	SM 4500 F-C	General Chemistry	NELAP	5/16/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Hardness	EPA 130.2	General Chemistry	NELAP	5/16/2003
Hardness	SM 2340 B	General Chemistry	NELAP	5/16/2003
Heptachlor	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Heptachlor epoxide	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Hexachlorobenzene	EPA 625	Extractable Organics	NELAP	5/16/2003
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 625	Extractable Organics	NELAP	5/16/2003
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Hexachlorocyclopentadiene	EPA 625	Extractable Organics	NELAP	5/16/2003
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	7/1/2003

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KEMRON
ENVIRONMENTAL SERVICES

Jeb Bush
Governor

FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

Laboratory Scope of Accreditation

THIS LISTING OF ACCREDITED ANALYTES SHOULD BE USED ONLY WHEN ASSOCIATED WITH A VALID CERTIFICATE

State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Hexachloroethane	EPA 625	Extractable Organics	NELAP	5/16/2003
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	7/1/2003
Ignitability	EPA 1010	General Chemistry	NELAP	7/1/2003
Indeno(1,2,3-cd)pyrene	EPA 625	Extractable Organics	NELAP	5/16/2003
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Iron	EPA 200.7	Metals	NELAP	5/16/2003
Iron	EPA 6010	Metals	NELAP	7/1/2003
Isophorone	EPA 625	Extractable Organics	NELAP	5/16/2003
Isophorone	EPA 8270	Extractable Organics	NELAP	7/1/2003
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Kjeldahl nitrogen - total	EPA 351.2	General Chemistry	NELAP	5/16/2003
Lead	EPA 200.7	Metals	NELAP	5/16/2003
Lead	EPA 200.8	Metals	NELAP	5/16/2003
Lead	EPA 239.2	Metals	NELAP	5/16/2003
Lead	EPA 6010	Metals	STATE	7/1/2000
Lead	EPA 6020	Metals	NELAP	7/1/2003
Lead	EPA 7421	Metals	NELAP	5/16/2003
Lithium	EPA 6010	Metals	NELAP	7/1/2003
Magnesium	EPA 200.7	Metals	NELAP	5/16/2003
Magnesium	EPA 6010	Metals	NELAP	7/1/2003
Manganese	EPA 200.7	Metals	NELAP	5/16/2003
Manganese	EPA 6010	Metals	NELAP	7/1/2003
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Mercury	EPA 245.1	Metals	NELAP	5/16/2003
Mercury	EPA 7470	Metals	NELAP	5/16/2003
Mercury	EPA 7471	Metals	NELAP	5/16/2003
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Methyl bromide (Bromomethane)	EPA 624	Volatile Organics	NELAP	5/16/2003
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methyl chloride (Chloromethane)	EPA 624	Volatile Organics	NELAP	5/16/2003
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Methylene chloride	EPA 624	Volatile Organics	NELAP	5/16/2003
Methylene chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Molybdenum	EPA 200.7	Metals	NELAP	5/16/2003
Molybdenum	EPA 6010	Metals	STATE	7/1/2000

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State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Naphthalene	EPA 625	Extractable Organics	NELAP	5/16/2003
Naphthalene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Naphthalene	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Nickel	EPA 200.7	Metals	NELAP	5/16/2003
Nickel	EPA 6010	Metals	STATE	7/1/2000
Nitrate as N	EPA 300.0	General Chemistry	NELAP	5/16/2003
Nitrate as N	EPA 353.2	General Chemistry	NELAP	5/16/2003
Nitrate-nitrite	EPA 353.2	General Chemistry	NELAP	5/16/2003
Nitrite as N	EPA 300.0	General Chemistry	NELAP	5/16/2003
Nitrite as N	EPA 354.1	General Chemistry	NELAP	5/16/2003
Nitrobenzene	EPA 625	Extractable Organics	NELAP	5/16/2003
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodimethylamine	EPA 625	Extractable Organics	NELAP	5/16/2003
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodi-n-propylamine	EPA 625	Extractable Organics	NELAP	5/16/2003
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Nitrosodiphenylamine	EPA 625	Extractable Organics	NELAP	5/16/2003
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	7/1/2003
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Oil & Grease	EPA 1664	General Chemistry	NELAP	5/16/2003
Oil & Grease	EPA 413.1	General Chemistry	NELAP	5/16/2003
Organic nitrogen	TKN minus AMMONIA	General Chemistry	NELAP	5/16/2003
Orthophosphate as P	EPA 300.0	General Chemistry	NELAP	5/16/2003
Orthophosphate as P	EPA 365.2	General Chemistry	NELAP	5/16/2003
Pentachlorophenol	EPA 625	Extractable Organics	NELAP	5/16/2003
Pentachlorophenol	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
pH	EPA 150.1	General Chemistry	NELAP	5/16/2003
Phenanthrene	EPA 625	Extractable Organics	NELAP	5/16/2003
Phenanthrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phenol	EPA 625	Extractable Organics	NELAP	5/16/2003
Phenol	EPA 8270	Extractable Organics	NELAP	7/1/2003
Phosphorus, total	EPA 365.2	General Chemistry	NELAP	5/16/2003
Phosphorus, total	EPA 365.4	General Chemistry	NELAP	5/16/2003
p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	7/1/2003

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KEMRON
ENVIRONMENTAL SERVICES

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FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

Laboratory Scope of Accreditation

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State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Potassium	EPA 200.7	Metals	NELAP	5/16/2003
Potassium	EPA 6010	Metals	NELAP	7/1/2003
Pyrene	EPA 625	Extractable Organics	NELAP	5/16/2003
Pyrene	EPA 8270	Extractable Organics	NELAP	7/1/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	7/1/2003
Residue-filterable (TDS)	EPA 160.1	General Chemistry	NELAP	5/16/2003
Residue-nonfilterable (TSS)	EPA 160.2	General Chemistry	NELAP	5/16/2003
Residue-settleable	EPA 160.5	General Chemistry	NELAP	5/16/2003
Residue-total	EPA 160.3	General Chemistry	NELAP	5/16/2003
Residue-volatile	EPA 160.4	General Chemistry	NELAP	5/16/2003
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Selenium	EPA 200.7	Metals	NELAP	5/16/2003
Selenium	EPA 200.8	Metals	NELAP	5/16/2003
Selenium	EPA 270.2	Metals	NELAP	5/16/2003
Selenium	EPA 6010	Metals	STATE	7/1/2000
Selenium	EPA 6020	Metals	NELAP	5/16/2003
Selenium	EPA 7740	Metals	NELAP	5/16/2003
Silica as SiO2	EPA 6010	Metals	NELAP	7/1/2003
Silica-dissolved	EPA 200.7	General Chemistry	NELAP	5/16/2003
Silica-dissolved	EPA 370.1	General Chemistry	NELAP	5/16/2003
Silicon	EPA 200.7	Metals	NELAP	5/16/2003
Silicon	EPA 6010	Metals	NELAP	7/1/2003
Silver	EPA 200.7	Metals	NELAP	5/16/2003
Silver	EPA 6010	Metals	NELAP	7/1/2003
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
Sodium	EPA 200.7	Metals	NELAP	5/16/2003
Sodium	EPA 6010	Metals	NELAP	7/1/2003
Strontium	EPA 6010	Metals	NELAP	7/1/2003
Styrene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Sulfate	EPA 300.0	General Chemistry	NELAP	5/16/2003
Sulfate	EPA 375.4	General Chemistry	NELAP	5/16/2003
Sulfide	EPA 376.1	General Chemistry	NELAP	5/16/2003
Surfactants - MBAS	EPA 425.1	General Chemistry	NELAP	5/16/2003
tert-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	7/1/2003
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Tetrachloroethylene (Perchloroethylene)	EPA 624	Volatile Organics	NELAP	5/16/2003

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State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Thallium	EPA 200.7	Metals	NELAP	5/16/2003
Thallium	EPA 200.8	Metals	NELAP	5/16/2003
Thallium	EPA 279.2	Metals	NELAP	5/16/2003
Thallium	EPA 6010	Metals	NELAP	7/1/2003
Thallium	EPA 6020	Metals	NELAP	7/1/2003
Thallium	EPA 7841	Metals	NELAP	7/1/2003
Tin	EPA 200.7	Metals	NELAP	5/16/2003
Tin	EPA 6010	Metals	NELAP	7/1/2003
Titanium	EPA 200.7	Metals	NELAP	5/16/2003
Toluene	EPA 602	Volatile Organics	NELAP	5/16/2003
Toluene	EPA 624	Volatile Organics	NELAP	5/16/2003
Toluene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Total cyanide	EPA 9010	General Chemistry	NELAP	7/1/2003
Total organic carbon	EPA 415.1	General Chemistry	NELAP	5/16/2003
Total Petroleum Hydrocarbons (TPH)	EPA 1664	General Chemistry	NELAP	5/16/2003
Total phenolics	EPA 420.1	General Chemistry	NELAP	5/16/2003
Total recoverable petroleum hydrocarbons (TRPH)	EPA 418.1	General Chemistry	NELAP	5/16/2003
Toxaphene (Chlorinated camphene)	EPA 608	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	7/1/2003
trans-1,2-Dichloroethylene	EPA 624	Volatile Organics	NELAP	5/16/2003
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
trans-1,3-Dichloropropylene	EPA 624	Volatile Organics	NELAP	5/16/2003
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichloroethene (Trichloroethylene)	EPA 624	Volatile Organics	NELAP	5/16/2003
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Trichlorofluoromethane	EPA 624	Volatile Organics	NELAP	5/16/2003
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	7/1/2003
Turbidity	EPA 180.1	General Chemistry	NELAP	5/16/2003
Vanadium	EPA 200.7	Metals	NELAP	5/16/2003
Vanadium	EPA 6010	Metals	NELAP	7/1/2003
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	7/1/2003
Vinyl chloride	EPA 624	Volatile Organics	NELAP	5/16/2003
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	7/1/2003
Xylene (total)	EPA 602	Volatile Organics	NELAP	5/16/2003
Xylene (total)	EPA 624	Volatile Organics	NELAP	5/16/2003

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Kemron
ENVIRONMENTAL SERVICES

Jeb Bush
Governor

FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

Laboratory Scope of Accreditation

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State Laboratory ID: E87551 **EPA Lab Code:** OH00218 (740) 373-4071

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Non-Potable Water

Analyte	Method/Tech	Category	Certification Type	Effective Date
Xylene (total)	EPA 8260	Volatile Organics	NELAP	7/1/2003
Zinc	EPA 200.7	Metals	NELAP	5/16/2003
Zinc	EPA 6010	Metals	STATE	7/1/2000

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ENVIRONMENTAL SERVICES

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FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

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State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,1,1,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,1,1-Trichloroethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,1,2,2-Tetrachloroethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,1,2-Trichloroethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,1-Dichloroethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,1-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,1-Dichloropropene	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2,3-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2,3-Trichloropropane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2,4,5-Tetrachlorobenzene	EPA 8270	Extractable Organics	NELAP	5/16/2003
1,2,4-Trichlorobenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2,4-Trichlorobenzene	EPA 8270	Extractable Organics	NELAP	5/16/2003
1,2,4-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8011	Volatile Organics	NELAP	5/16/2003
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011	Volatile Organics	NELAP	5/16/2003
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2-Dichlorobenzene	EPA 8021	Volatile Organics	NELAP	5/16/2003
1,2-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	5/16/2003
1,2-Dichloroethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,2-Diphenylhydrazine	EPA 8270	Extractable Organics	NELAP	5/16/2003
1,3,5-Trimethylbenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270	Extractable Organics	NELAP	5/16/2003
1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8330	Extractable Organics	NELAP	5/16/2003
1,3-Dichlorobenzene	EPA 8021	Volatile Organics	NELAP	5/16/2003
1,3-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,3-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	5/16/2003
1,3-Dichloropropane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8270	Extractable Organics	NELAP	5/16/2003
1,3-Dinitrobenzene (1,3-DNB)	EPA 8330	Extractable Organics	NELAP	5/16/2003
1,4-Dichlorobenzene	EPA 8021	Volatile Organics	NELAP	5/16/2003
1,4-Dichlorobenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
1,4-Dichlorobenzene	EPA 8270	Extractable Organics	NELAP	5/16/2003
1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260	Volatile Organics	NELAP	5/16/2003

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State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
1,4-Naphthoquinone	EPA 8270	Extractable Organics	NELAP	5/16/2003
1,4-Phenylenediamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
1-Chlorohexane	EPA 8260	Volatile Organics	NELAP	5/16/2003
1-Naphthylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,2-Dichloropropane	EPA 8260	Volatile Organics	NELAP	5/16/2003
2,3,4,6-Tetrachlorophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,4,5-T	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
2,4,5-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,4,6-Trichlorophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,4,6-Trinitrotoluene (2,4,6-TNT)	EPA 8330	Extractable Organics	NELAP	5/16/2003
2,4-D	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
2,4-DB	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
2,4-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,4-Dimethylphenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,4-Dinitrophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,4-Dinitrotoluene (2,4-DNT)	EPA 8330	Extractable Organics	NELAP	5/16/2003
2,6-Dichlorophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270	Extractable Organics	NELAP	5/16/2003
2,6-Dinitrotoluene (2,6-DNT)	EPA 8330	Extractable Organics	NELAP	5/16/2003
2-Acetylaminofluorene	EPA 8270	Extractable Organics	NELAP	5/16/2003
2-Amino-4,6-dinitrotoluene (2-am-dnt)	EPA 8330	Extractable Organics	NELAP	5/16/2003
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260	Volatile Organics	NELAP	5/16/2003
2-Chloroethyl vinyl ether	EPA 8260	Volatile Organics	NELAP	5/16/2003
2-Chloronaphthalene	EPA 8270	Extractable Organics	NELAP	5/16/2003
2-Chlorophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	5/16/2003
2-Hexanone	EPA 8260	Volatile Organics	NELAP	5/16/2003
2-Methyl-4,6-dinitrophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2-Methylnaphthalene	EPA 8270	Extractable Organics	NELAP	5/16/2003
2-Methylphenol (o-Cresol)	EPA 8270	Extractable Organics	NELAP	5/16/2003
2-Nitroaniline	EPA 8270	Extractable Organics	NELAP	5/16/2003
2-Nitrophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
2-Nitropropane	EPA 8260	Volatile Organics	NELAP	5/16/2003
2-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	5/16/2003
2-Picoline (2-Methylpyridine)	EPA 8270	Extractable Organics	NELAP	5/16/2003

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State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
2-Sec-butyl-4,6-dinitrophenol (DNBP, Dinoseb)	EPA 8270	Extractable Organics	NELAP	5/16/2003
3,3'-Dichlorobenzidine	EPA 8270	Extractable Organics	NELAP	5/16/2003
3,3'-Dimethylbenzidine	EPA 8270	Extractable Organics	NELAP	5/16/2003
3-Methylcholanthrene	EPA 8270	Extractable Organics	NELAP	5/16/2003
3-Nitroaniline	EPA 8270	Extractable Organics	NELAP	5/16/2003
3-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	5/16/2003
4,4'-DDD	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
4,4'-DDE	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
4,4'-DDT	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
4-Amino-2,6-dinitrotoluene (4-am-dnt)	EPA 8330	Extractable Organics	NELAP	5/16/2003
4-Aminobiphenyl	EPA 8270	Extractable Organics	NELAP	5/16/2003
4-Bromophenyl phenyl ether	EPA 8270	Extractable Organics	NELAP	5/16/2003
4-Chloro-3-methylphenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
4-Chloroaniline	EPA 8270	Extractable Organics	NELAP	5/16/2003
4-Chlorophenyl phenylether	EPA 8270	Extractable Organics	NELAP	5/16/2003
4-Chlorotoluene	EPA 8260	Volatile Organics	NELAP	5/16/2003
4-Methyl-2-pentanone (MIBK)	EPA 8260	Volatile Organics	NELAP	5/16/2003
4-Methylphenol (p-Cresol)	EPA 8270	Extractable Organics	NELAP	5/16/2003
4-Nitroaniline	EPA 8270	Extractable Organics	NELAP	5/16/2003
4-Nitrophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
4-Nitrotoluene	EPA 8330	Extractable Organics	NELAP	5/16/2003
5-Nitro-o-toluidine	EPA 8270	Extractable Organics	NELAP	5/16/2003
7,12-Dimethylbenz(a) anthracene	EPA 8270	Extractable Organics	NELAP	5/16/2003
a-a-Dimethylphenethylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
Acenaphthene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Acenaphthene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Acenaphthylene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Acenaphthylene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Acetone	EPA 8260	Volatile Organics	NELAP	5/16/2003
Acetonitrile	EPA 8260	Volatile Organics	NELAP	5/16/2003
Acetophenone	EPA 8270	Extractable Organics	NELAP	5/16/2003
Acrolein (Propenal)	EPA 8260	Volatile Organics	NELAP	5/16/2003
Acrylonitrile	EPA 8260	Volatile Organics	NELAP	5/16/2003
Aldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
alpha-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003

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Governor

FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

Laboratory Scope of Accreditation

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State Laboratory ID: E87551 **EPA Lab Code: OH00218** **(740) 373-4071**

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Aluminum	EPA 6010	Metals	NELAP	5/16/2003
Aniline	EPA 8270	Extractable Organics	NELAP	5/16/2003
Anthracene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Anthracene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Antimony	EPA 6010	Metals	NELAP	5/16/2003
Antimony	EPA 6020	Metals	NELAP	5/16/2003
Antimony	EPA 7041	Metals	NELAP	5/16/2003
Aramite	EPA 8270	Extractable Organics	NELAP	5/16/2003
Aroclor-1016 (PCB-1016)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1221 (PCB-1221)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1232 (PCB-1232)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1242 (PCB-1242)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1248 (PCB-1248)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1254 (PCB-1254)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Aroclor-1260 (PCB-1260)	EPA 8082	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Arsenic	EPA 6010	Metals	NELAP	5/16/2003
Arsenic	EPA 6020	Metals	NELAP	5/16/2003
Arsenic	EPA 7060	Metals	NELAP	5/16/2003
Barium	EPA 6010	Metals	NELAP	5/16/2003
Benzene	EPA 8021	Volatile Organics	NELAP	5/16/2003
Benzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Benzidine	EPA 8270	Extractable Organics	NELAP	5/16/2003
Benzo(a)anthracene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Benzo(a)anthracene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Benzo(a)pyrene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Benzo(a)pyrene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Benzo(b)fluoranthene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Benzo(b)fluoranthene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Benzo(g,h,i)perylene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Benzo(g,h,i)perylene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Benzo(k)fluoranthene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Benzoic acid	EPA 8270	Extractable Organics	NELAP	5/16/2003
Benzyl alcohol	EPA 8270	Extractable Organics	NELAP	5/16/2003
Beryllium	EPA 6010	Metals	NELAP	5/16/2003
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
beta-Naphthylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003

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E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
bis(2-Chloroethoxy)methane	EPA 8270	Extractable Organics	NELAP	5/16/2003
bis(2-Chloroethyl) ether	EPA 8270	Extractable Organics	NELAP	5/16/2003
bis(2-Chloroisopropyl) ether	EPA 8270	Extractable Organics	NELAP	5/16/2003
bis(2-Ethylhexyl) phthalate (DEHP)	EPA 8270	Extractable Organics	NELAP	5/16/2003
Boron	EPA 6010	Metals	NELAP	5/16/2003
Bromide	EPA 9056	General Chemistry	NELAP	5/16/2003
Bromobenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Bromochloromethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
Bromodichloromethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
Bromoform	EPA 8260	Volatile Organics	NELAP	5/16/2003
Butyl benzyl phthalate	EPA 8270	Extractable Organics	NELAP	5/16/2003
Cadmium	EPA 6010	Metals	NELAP	5/16/2003
Calcium	EPA 6010	Metals	NELAP	5/16/2003
Carbazole	EPA 8270	Extractable Organics	NELAP	5/16/2003
Carbon disulfide	EPA 8260	Volatile Organics	NELAP	5/16/2003
Carbon tetrachloride	EPA 8260	Volatile Organics	NELAP	5/16/2003
Chlordane (tech.)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Chloride	EPA 9056	General Chemistry	NELAP	5/16/2003
Chlorobenzene	EPA 8021	Volatile Organics	NELAP	5/16/2003
Chlorobenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Chloroethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
Chloroform	EPA 8260	Volatile Organics	NELAP	5/16/2003
Chloroprene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Chromium	EPA 6010	Metals	NELAP	5/16/2003
Chrysene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Chrysene	EPA 8310	Extractable Organics	NELAP	5/16/2003
cis-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	5/16/2003
cis-1,3-Dichloropropene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Cobalt	EPA 6010	Metals	NELAP	5/16/2003
Copper	EPA 6010	Metals	NELAP	5/16/2003
Corrosivity (pH)	EPA 9040	General Chemistry	NELAP	5/16/2003
Dalapon	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
delta-BHC	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Diallate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Dibenz(a,h) anthracene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Dibenz(a,h) anthracene	EPA 8310	Extractable Organics	NELAP	5/16/2003

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E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Dibenzofuran	EPA 8270	Extractable Organics	NELAP	5/16/2003
Dibromochloromethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
Dibromofluoromethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
Dibromomethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
Dicamba	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Dichlorodifluoromethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
Dichloroprop (Dichlorprop)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Dieldrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Diesel range organics (DRO)	CA-LUFT	Extractable Organics	NELAP	5/16/2003
Diethyl ether	EPA 8260	Volatile Organics	NELAP	5/16/2003
Diethyl phthalate	EPA 8270	Extractable Organics	NELAP	5/16/2003
Dimethoate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Dimethyl phthalate	EPA 8270	Extractable Organics	NELAP	5/16/2003
Di-n-butyl phthalate	EPA 8270	Extractable Organics	NELAP	5/16/2003
Di-n-octyl phthalate	EPA 8270	Extractable Organics	NELAP	5/16/2003
Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Diphenylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
Disulfoton	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endosulfan I	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endosulfan II	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endosulfan sulfate	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endrin	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endrin aldehyde	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Endrin ketone	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Ethanol	EPA 8015	Volatile Organics	NELAP	5/16/2003
Ethyl methacrylate	EPA 8260	Volatile Organics	NELAP	5/16/2003
Ethyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	5/16/2003
Ethylbenzene	EPA 8021	Volatile Organics	NELAP	5/16/2003
Ethylbenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Ethylene glycol	EPA 8015	Volatile Organics	NELAP	5/16/2003
Famphur	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Fluoranthene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Fluoranthene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Fluorene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Fluorene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Fluoride	EPA 9056	General Chemistry	NELAP	5/16/2003

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KEMRON
ENVIRONMENTAL SERVICES

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Secretary

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E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Formaldehyde	EPA 8315	Extractable Organics	NELAP	5/16/2003
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
gamma-Chlordane	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Gasoline range organics (GRO)	CA-LUFT	Extractable Organics	NELAP	5/16/2003
Heptachlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Heptachlor epoxide	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Hexachlorobenzene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Hexachlorobutadiene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Hexachlorobutadiene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Hexachlorocyclopentadiene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Hexachloroethane	EPA 8270	Extractable Organics	NELAP	5/16/2003
Hexachlorophene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Hexachloropropene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Ignitability	EPA 1010	General Chemistry	NELAP	5/16/2003
Indeno(1,2,3-cd)pyrene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Indeno(1,2,3-cd)pyrene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Iodomethane (Methyl iodide)	EPA 8260	Volatile Organics	NELAP	5/16/2003
Iron	EPA 6010	Metals	NELAP	5/16/2003
Isodrin	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Isophorone	EPA 8270	Extractable Organics	NELAP	5/16/2003
Isopropyl alcohol (2-Propanol)	EPA 8015	Volatile Organics	NELAP	5/16/2003
Isopropylbenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Isosafrole	EPA 8270	Extractable Organics	NELAP	5/16/2003
Kepone	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Lead	EPA 6010	Metals	NELAP	5/16/2003
Lead	EPA 6020	Metals	NELAP	5/16/2003
Lead	EPA 7421	Metals	NELAP	5/16/2003
Lithium	EPA 6010	Metals	NELAP	5/16/2003
Magnesium	EPA 6010	Metals	NELAP	5/16/2003
Manganese	EPA 6010	Metals	NELAP	5/16/2003
MCPA	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
MCPP	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Mercury	EPA 7470	Metals	NELAP	5/16/2003
Mercury	EPA 7471		NELAP	2/6/2004
Methacrylonitrile	EPA 8260	Volatile Organics	NELAP	5/16/2003
Methanol	EPA 8015	Volatile Organics	NELAP	5/16/2003

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E87551
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156 Starlite Park
Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Methapyrilene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Methoxychlor	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Methyl bromide (Bromomethane)	EPA 8260	Volatile Organics	NELAP	5/16/2003
Methyl chloride (Chloromethane)	EPA 8260	Volatile Organics	NELAP	5/16/2003
Methyl methacrylate	EPA 8260	Volatile Organics	NELAP	5/16/2003
Methyl methanesulfonate	EPA 8270	Extractable Organics	NELAP	5/16/2003
Methyl parathion (Parathion, methyl)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Methyl tert-butyl ether (MTBE)	EPA 8021	Volatile Organics	NELAP	5/16/2003
Methyl tert-butyl ether (MTBE)	EPA 8260	Volatile Organics	NELAP	5/16/2003
Methylene chloride	EPA 8260	Volatile Organics	NELAP	5/16/2003
Molybdenum	EPA 6010	Metals	NELAP	5/16/2003
Naphthalene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Naphthalene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Naphthalene	EPA 8310	Extractable Organics	NELAP	5/16/2003
n-Butylbenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Nickel	EPA 6010	Metals	NELAP	5/16/2003
Nitrate	EPA 9056	General Chemistry	NELAP	5/16/2003
Nitrite	EPA 9056	General Chemistry	NELAP	5/16/2003
Nitrobenzene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Nitrobenzene	EPA 8330	Extractable Organics	NELAP	5/16/2003
Nitroquinoline-1-oxide	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Nitrosodiethylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Nitrosodimethylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Nitroso-di-n-butylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Nitrosodi-n-propylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Nitrosodiphenylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Nitrosomethylethylamine	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Nitrosomorpholine	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Nitrosopiperidine	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Nitrosopyrrolidine	EPA 8270	Extractable Organics	NELAP	5/16/2003
n-Propylbenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
o,o,o-Triethyl phosphorothioate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330	Extractable Organics	NELAP	5/16/2003
Orthophosphate as P	EPA 9056	General Chemistry	NELAP	5/16/2003
o-Toluidine	EPA 8270	Extractable Organics	NELAP	5/16/2003
Paint Filter Liquids Test	EPA 9095	General Chemistry	NELAP	5/16/2003

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KEMRON
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Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Parathion, ethyl	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Pentachlorobenzene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Pentachloronitrobenzene	EPA 8270	Extractable Organics,Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Pentachlorophenol	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Pentachlorophenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
pH	EPA 9040		NELAP	2/6/2004
pH	EPA 9045		NELAP	2/6/2004
Phenacetin	EPA 8270	Extractable Organics	NELAP	5/16/2003
Phenanthrene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Phenanthrene	EPA 8310	Extractable Organics	NELAP	5/16/2003
Phenol	EPA 8270	Extractable Organics	NELAP	5/16/2003
Phorate	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
p-Isopropyltoluene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Potassium	EPA 6010	Metals	NELAP	5/16/2003
Pronamide (Kerb)	EPA 8270	Extractable Organics	NELAP	5/16/2003
Pyrene	EPA 8270	Extractable Organics	NELAP	5/16/2003
Pyridine	EPA 8270	Extractable Organics	NELAP	5/16/2003
RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)	EPA 8330	Extractable Organics	NELAP	5/16/2003
Reactive cyanide	Sec. 7.3 SW-846	General Chemistry	NELAP	5/16/2003
Reactive sulfide	Sec. 7.3 SW-846	General Chemistry	NELAP	5/16/2003
Safrole	EPA 8270	Extractable Organics	NELAP	5/16/2003
sec-Butylbenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Selenium	EPA 6010	Metals	NELAP	5/16/2003
Selenium	EPA 6020	Metals	NELAP	11/7/2003
Selenium	EPA 7740	Metals	NELAP	5/16/2003
Silica as SiO2	EPA 6010	Metals	NELAP	5/16/2003
Silicon	EPA 6010	Metals	NELAP	5/16/2003
Silver	EPA 6010	Metals	NELAP	5/16/2003
Silvex (2,4,5-TP)	EPA 8151	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Sodium	EPA 6010	Metals	NELAP	5/16/2003
Strontium	EPA 6010	Metals	NELAP	5/16/2003
Styrene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Sulfate	EPA 9056	General Chemistry	NELAP	5/16/2003
Sulfide	EPA 9030/9034	General Chemistry	NELAP	5/16/2003
Sulfotepp	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003

"STATE" indicates certification for the analyte by the method specified. "NELAP" further indicates certification compliant with the NELAC Standards.

Jeb Bush
Governor

FLORIDA DEPARTMENT OF HEALTH

John O. Agwunobi, M.D., M.B.A.
Secretary

Laboratory Scope of Accreditation

THIS LISTING OF ACCREDITED ANALYTES SHOULD BE USED ONLY WHEN ASSOCIATED WITH A VALID CERTIFICATE

State Laboratory ID: E87551 **EPA Lab Code:** OH00218 (740) 373-4071

E87551
KEMRON Environmental Services, Inc.
156 Starlite Park
Marietta, OH 45750

Matrix: Solid and Chemical Materials

Analyte	Method/Tech	Category	Certification Type	Effective Date
Synthetic Precipitation Leaching Procedure	EPA 1312	General Chemistry	NELAP	5/16/2003
tert-Butyl alcohol	EPA 8260	Volatile Organics	NELAP	5/16/2003
tert-Butylbenzene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Tetrachloroethylene (Perchloroethylene)	EPA 8260	Volatile Organics	NELAP	5/16/2003
Tetryl (methyl-2,4,6-trinitrophenylnitramine)	EPA 8330	Extractable Organics	NELAP	5/16/2003
Thallium	EPA 6010	Metals	NELAP	5/16/2003
Thallium	EPA 6020	Metals	NELAP	5/16/2003
Thallium	EPA 7841	Metals	NELAP	5/16/2003
Thionazin (Zinophos)	EPA 8270	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Tin	EPA 6010	Metals	NELAP	5/16/2003
Toluene	EPA 8021	Volatile Organics	NELAP	5/16/2003
Toluene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Total cyanide	EPA 9010	General Chemistry	NELAP	5/16/2003
Total nitrate-nitrite	EPA 9056	General Chemistry	NELAP	5/16/2003
Total organic carbon	EPA 9060		NELAP	2/6/2004
Total Petroleum Hydrocarbons (TPH)	FL-PRO	Extractable Organics	NELAP	5/16/2003
Toxaphene (Chlorinated camphene)	EPA 8081	Pesticides-Herbicides-PCB's	NELAP	5/16/2003
Toxicity Characteristic Leaching Procedure	EPA 1311	General Chemistry	NELAP	5/16/2003
trans-1,2-Dichloroethylene	EPA 8260	Volatile Organics	NELAP	5/16/2003
trans-1,3-Dichloropropylene	EPA 8260	Volatile Organics	NELAP	5/16/2003
trans-1,4-Dichloro-2-butene	EPA 8260	Volatile Organics	NELAP	5/16/2003
Trichloroethene (Trichloroethylene)	EPA 8260	Volatile Organics	NELAP	5/16/2003
Trichlorofluoromethane	EPA 8260	Volatile Organics	NELAP	5/16/2003
Vanadium	EPA 6010	Metals	NELAP	5/16/2003
Vinyl acetate	EPA 8260	Volatile Organics	NELAP	5/16/2003
Vinyl chloride	EPA 8260	Volatile Organics	NELAP	5/16/2003
Xylene (total)	EPA 8021	Volatile Organics	NELAP	5/16/2003
Xylene (total)	EPA 8260	Volatile Organics	NELAP	5/16/2003
Zinc	EPA 6010	Metals	NELAP	5/16/2003

"STATE" indicates certification for the analyte by the method specified. "NELAP" further indicates certification compliant with the NELAC Standards.

APPENDIX F

SAMPLE FORMS

TOLTEST, INC.

PROJECT NUMBER:

SOIL BORING LOG OF _____

Page __ of __

CLIENT:	LOCATION:
DATE: GEOLOGIST:	SURFACE ELEVATION (ft.):
TOTAL DEPTH (ft):	CASING ELEVATION (ft.):
DRILLING METHOD:	DEPTH TO WATER (ft.)/DATE:
DRILLING COMPANY:	DEPTH TO WATER (ft.)/DATE:

DEPTH (feet)	SAMPLE TYPE AND NUMBER	SPT BLOWS PER 0.5 feet	RECOVERY (feet)	PENETROMETER READING (TSF)	PID READING (ppm) TYPE: ____	STRAT CHANGE DEPTH (feet)	GEOLOGIC DESCRIPTION

Soil Descriptors

Cohesive Soils (clays and silts)		
Term	**Blows per Foot**	**Penetrometer**
Very Soft	0 - 2	<0.25
Soft	3 - 4	0.25 - 0.50
Medium Stiff	5 - 8	0.50 - 1.0
Stiff	9 - 16	1.0 - 2.0
Very Stiff	17 - 32	2.0 - 4.0
Hard	over 32	>4.0

Note: Typically blow counts for the 2nd and 3rd 0.5′ intervals should be summed to determine the blows per foot.

Granular Soils (sands)	
Term	**Blows per Foot**
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	over 50

Content	
Term	**%**
Trace	0 - 10
Little (Few)	10 - 20
Some	20 - 35
And (With)	35 - 50

Field Tests	
Soil Type	**Test**
Clay	rolls into ribbons when moist (>1" long); content identified by streaking paper
Silty Clay	rolls into ribbons when moist (<1" long), particles not evident to naked eye
Silt	particles only evident under magnification; does not roll into ribbons easily
Sand	sand grains evident with naked eye; feels gritty when rubbed between fingers
Sandy Clay	rolls into ribbons when moist (<1" long), sand grains evident to naked eye; may feel gritty

Sample Type	
Sampling Method	**Sample Symbol**
Auger Cuttings	A
Air Rotary Cuttings	AR
Split Spoon	S
Shelby Tube	ST

Grain Size (Wentworth Scale)		
Particle Size (mm)	**Particle Term**	**Rock Term**
>256	Boulder	Boulder Conglomerate
64 - 256	Cobble	Cobble Conglomerate
4 - 64	Pebble	Pebble Conglomerate
2 - 4	Granule	Granule
1 - 2	V. coarse gr. sand	Conglomerate
0.5 - 1	Coarse gr. sand	Sandstone
0.25 - 0.5	Medium gr. sand	Sandstone
0.125 - 0.25	Fine grained sand	Sandstone
0.0625 - 0.125	Very Fine gr. sand	Sandstone
0.004 - 0.0625	Silt	Siltstone or Silty Shale
<0.004	Clay	Claystone or Shale

Mottling	
Abundance Term	**%**
None	0
Few	<2
Common	2 - 20
Many	>20
Contrast Term	**Description**
Faint	indistinct
Distinct	easily seen
Prominent	outstanding

Bedding	
Term	**Thickness**
Very Thickly Bedded	thicker than 1 m (3.3′)
Thickly Bedded	30 - 100 cm (1′-3.3′)
Medium Bedded	10 - 30 cm (4" - 1′)
Thinly Bedded	3 - 10 cm (1" - 4")
Very Thinly Bedded	1 - 3 cm (0.4" - 1")
Thickly Laminated	0.3-1 cm (0.12"-0.4")
Thinly Laminated	<0.3 cm (<0.12")

Descriptive Terms	
Lens	Zone equal to or less that 1-inch (2.5 cm) in thickness
Layer	Zone greater than 1-inch (2.5 cm) in thickness
Interbedded	Alternating lenses and/or layers of different media types
Slickensided	Materials having inclined planes of weakness, glossy in appearance
Pockets	Inclusion of one media type in a matrix of another media

Moisture		
Term	**% (Cohesive)**	**% (Granular)**
Dry	<5	<5
Damp	5 - 12	5 - 10
Moist	12 - 25	10 - 20
Wet	>25	>20

Standard TolTest Description Format

density, color, CLASSIFICATION, additional descriptors, moisture

next NEW CLASSIFICATION

Use dashed line between CLASSIFICATIONS if actual contact depth is not known. Do not use lines (solid or dashed) unless CLASSIFICATION changes (not for color, density, etc.).

[1] If evidence exists that soil is not natural (i.e., mixed with plastic, bricks, red dog, etc.) use FILL as the classification but describe all components.

Example:

	0.5′	ASPHALT AND SUBBASE
S-1		– loose, brown FILL, predominantly silty clay, some bricks, damp [1]
	3.0′	– stiff, brown and gray SILTY CLAY, mottled, trace fine-grained sand, moist
S-2		
		– becomes orange, hard at 5′
	7.7′	– loose, gray SAND AND GRAVEL, medium to coarse-grained, little silt, wet
*S-3		
		– becomes medium dense at 9′

BOTTOM OF BORING AT 14.5′ *indicates sample submitted for analysis

Well Installation Information

Parameter	*Depth (feet)*	*Type*
Bottom of Sand		
Bottom of Bentonite		
Bottom of Grout		
Bottom of Cement		
Bottom of Screen		
Bottom of Riser		
Top of Riser		
Well Cover		

Additional Information

Ground Water Purge Log

Project Location: Naval Station Great Lakes **Delivery Order No.:102**

Project No.:73775.01

Time	L Removed	Purge Rate (mL/min)	OPR (mv)	Temp (C)	pH (s.u.)	COND (mS/cm)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft btoc)	Comments

Well Purge Record	
Project Name: Naval Station Great Lakes	Delivery Order No.:102
Project No.: 73775.01	Project Location:Landfills

Page _____ of _____

Time:_____

Date:_____/_____/_____

Well Number and Location:_____

Purge Crew:_____

_____

Date and Time: Begin:_____/_____ Completed:_____/_____

Purge Method(s): _____

_____

Total Quantity of Water Removed:_____(L)

FIELD MEASUREMENT	SERIAL NUMBER	DATE OF LAST CALIBRATION
Temperature		
Specific Conductivity		
pH		
Dissolved Oxygen		
ORP		
Water Level		
Turbidity		

Recorded by:_____ QA Check by:_____

Figure 7-1
KEMRON CHAIN-OF-CUSTODY RECORD

COC No. A 44731

156 Starlite Drive
Marietta, OH 45750

KEMRON ENVIRONMENTAL SERVICES
CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Fax: 740-373-4835

Company Name:	
Project Contact:	Contact Phone #:
Turn Around Requirements:	Location:
Project #:	Project Name:
Sampler (print):	Signature:

Program
- ☐ NPDES
- ☐ AFCEE
- ☐ RCRA
- ☐ USAGE
- ☐ Other _____

Sample I.D. No.	Comp*	Grab	Date	Time	Protocol CWA	Protocol SW846	NUMBER OF CONTAINERS	Hold														ADDITIONAL REQUIREMENTS

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)	
Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Cooler Temp in °C	Remarks:	

*Homogenize all composite samples prior to analysis

Page _____ of _____

KEMRON ENVIRONMENTAL SERVICES

Figure 7-2
Sample Receipt Form

SAMPLE RECEIPT FORM

KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OH
45750
(740) 373-4071

Date:_____ Client:_____

Shipped By: ( ) Fed-Ex ( ) UPS ( )Airborne ( ) KEMRON ( ) Client ( ) Other

Opened By:_____

Logged By:_____ Login #: L03_____

IR Temp Gun: ( ) D ( ) F

COOLER INFORMATION

Number	Cooler ID	Temp °C	Airbill#	COC#	Other
1					
2					
3					
4					
5					
6					

Were all coolers sealed?	Y	N	N/A
Were custody seals used on all coolers?	Y	N	N/A
Were custody seals intact?	Y	N	N/A
Was visible ice present?	Y	N	N/A
Were all coolers in the temperature range of 2-6C? (>6C*)	Y	N	N/A
Were the samples frozen?*	Y	N	N/A
Were COC papers provided?	Y	N	N/A
Were all sample containers intact?*	Y	N	N/A
Were all sample labels intact?	Y	N	N/A
Were all sample labels legible?*	Y	N	N/A
Did all sample labels match the COC?*	Y	N	N/A
Was the label information complete?*	Y	N	N/A
Were the correct containers used?*	Y	N	N/A
Were the correct preservatives added to water samples?*	Y	N	N/A
Was the pH tested on preserved water samples?	Y	N	N/A
Were pH ranges acceptable?*	Y	N	N/A
Was sufficient amount of sample provided?*	Y	N	N/A
Were bubbles present in VOA samples?*	Y	N	N/A
Were COC's signed and dated?	Y	N	N/A
Did samples arrive before hold time expired?*	Y	N	N/A
Are discrepancy forms attached?	Y	N	N/A

Requires a discrepancy form

Comments:_____

CRF #1
Revised 8/22/03

Figure 7-3
Sample Discrepancy Form

Kemron ENVIRONMENTAL SERVICES

CRF#4

Sample Discrepancy Form

Client: _____ Project: _____

Date Received: _____

_____ Cooler temperature > than 6 degrees Celsius

Reason _____

_____ Samples received not on chain of custody

_____ Samples on chain of custody not received

_____ Information on sample containers different from chain of custody

_____ Sample containers received broken, leaking or not sealed (List sample ID)

_____ pH out (List sample ID, which container, pH prior to adjusting, amount of acid, preservative)

_____ Insufficient sample volume

_____ Air bubbles present in VOA vials (List sample ID)

_____ Hold time expired (List sample ID)

Service Representative:
Was client notified regarding information: YES NO
Name of Person contacted: _____ Company: _____
Service Representative: _____ Date: _____

Last Revised 08/22/03

KEMRON ENVIRONMENTAL SERVICES

Figure 7-4
KEMRON INTERNAL SAMPLE CUSTODY FORM

KEMRON Environmental Services
Internal Chain of Custody Report
Login: L0411350
Account:
Project:
Samples: 2
Due Date: 01-DEC-2004

Samplenum	Container ID	Products
L0411350-01	108732	8081

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish
1	LOGIN			10-JAN-2005 08:58	CLS	
2	PREP	W1	EXT	10-JAN-2005 09:14	CSH	BRG
3	STORE	EXT	A1	10-JAN-2005 09:16	BRG	CSH

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish
1	LOGIN			10-JAN-2005 08:58	CLS	

Figure 7-5
KEMRON BOTTLE LABEL

L0411350-04 B
Bottle 4 of 4
Client:
Client ID:
Collected: 16-Nov-04 00:00
Products for this Sample, Listed by Matrix:

: 8270

1087352

Figure 5-3
CONTROLLED DOCUMENT RECORD

DOCUMENT CONTROL NO.:_____ DATE:_____

Note: This number should appear in RED on enclosed document.

DOCUMENT NAME:_____

RECEIVER NAME:_____

COMPANY: _____

ADDRESS:_____

TELEPHONE:_____ FAX:_____

RECEIPT ACKNOWLEDGMENT:

Name_____

Signature_____Date_____

APPENDIX G

SAMPLING REQUIREMENTS TABLES

KEMRON ENVIRONMENTAL SERVICES
SAMPLE CONTAINERS, PRESERVATION AND HOLD TIMES
Groundwater – List L1

PARAMETER	Minimum Volume	Container Type	Preservative	Hold Time
RCRA Metals (As, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Ag, An) Method 200.7 by ICP	500 ml	P, G	HNO_3, pH< 2	6 months
RCRA Metal (Pb) Method 239.2 by GFAA	500 ml	P, G	HNO_3, pH< 2	6 months
Cyanide Method 335.2	100	P, G	Cool, 4ºC, NaOH, pH>12	14 days
Oils Method 413.1/413.2	1000	G	Cool, 4ºC, H_2SO_4, pH< 2	28 days
TDS Method 160.1	50	P, G	Cool, 4ºC	7 days
NH_3 – Ammonia Method 350.1/350.2	100	P, G	Cool, 4ºC, H_2SO_4, pH< 2	28 days
BOD Method 405.1	500	P, G	Cool, 4ºC	48 Hours
Phosphorus Method 365.1/365.2	50	P, G	Cool, 4ºC, H_2SO_4, pH< 2	28 days
Cr-Hex Method 218.4/218.5	150	P, G	Cool, 4ºC	24 Hours
Fluoride Method 413A	25	P, G	Cool, 4ºC	28 days
Phenols Method 420.1	100	Amber, G	Cool, 4ºC, H_2SO_4, pH< 2	28 days
TSS Method 160.2	200	P, G	Cool, 4ºC	7 days
Bacterial – Fecal Coliform Method 909C	120	P, G	Cool, 4ºC, $Na_2S_2O_3$	6 hours
Hg – Mercury Method 245.1/245.2/245.5	50 mL	P, G	HNO_3, pH< 2m, 4ºC	6 months
COD Method 410.1/410.2	25	G	Cool, 4ºC, H_2SO_4, pH< 2	28 days

1. P= Polyethylene (preferred when acceptable)
2. G= Borosillicate glass with Teflon lined cap

KEMRON ENVIRONMENTAL SERVICES
SAMPLE CONTAINERS, PRESERVATION AND HOLD TIMES
Groundwater – List L2

Parameter	Minimum Volume	Container Type	Preservative	Hold Time
VOC Method 8260	40 mL	G, Septa Caps	Cool, 4º C HCl, pH, 2	14 days
VOC extended list Method 8260	40 mL	G, Septa Caps	Cool, 4º C HCl, pH, 2	14 days
SVOC Method 8270 with PNA SIM	1000 mL	G	Cool, 4º C	7 days
Herbicides Method 8151	1000 mL	G	Cool, 4º C	7 days
Chlorinated Pesticides Method 8081	1000 mL	G	Cool, 4º C	7 days
PCB's Method 8082	1000 mL	G	Cool, 4º C	7 days
N/P Pesticides Method 507	1000 mL	G	Cool, 4º C	7 days
Carbamates Pesticides Method 531.1	1000 mL	G	Cool, 4º C	7 days
23 TAL Metals (Taco Limits) Method 6010/7841/7471	500 ml	P, G	HNO_3, pH< 2	6 months
NH_3 - Ammonia Method 350.1/350.2	100	P, G	Cool, 4ºC, H_2SO_4, pH< 2	28 days
Bacterial – Fecal Coliform Method 909C	120	P, G	Cool, 4ºC, $Na_2S_2O_3$	6 hours
COD Method 410.1/410.2	25	G	Cool, 4ºC, H_2SO_4, pH< 2	28 days
Chloride Method 325.2/325.3	100	P, G	Cool, 4º C	6 hours
Cyanide Method 335.2	100	P, G	Cool, 4ºC, NaOH, pH>12	14 days
Fluoride Method 413A	25	P, G	Cool, 4ºC	28 days
Nitrate Method 352.1	75	P, G	Cool, 4º C	48 hours
Oil, Hexane Soluble Method 1664	1000	G	Cool, 4ºC, H_2SO_4, pH< 2	28 days
Phenols Method 420.1	100	Amber, G	Cool, 4ºC, H_2SO_4, pH< 2	28 days
Phosphorus Methods 365.1/365.2	50	P, G	Cool, 4ºC, H_2SO_4, pH< 2	28 days
Sulfate Method 375.4	50	P, G	Cool, 4º C	24 hours
TDS Method 160.1	50	P, G	Cool, 4ºC	7 days
TOC Method 415.1	10	P, G	Cool, 4º C	-----
TSS Method 160.2	200	P, G	Cool, 4º C	7 days

1. P= Polyethylene (preferred when acceptable)
2. G= Borosillicate glass with Teflon lined cap