QUALITY ASSURANCE PROJECT PLAN

FOR A

CONTROLLED-AIR INCINERATOR TRIAL BURN

LOS ALAMOS NATIONAL LABORATORY

Los Alamos, New Mexico

March 1986

1.0 PROJECT TITLE: LIQUIDS INCINERATION TRIAL BURN

2.0 TABLE OF CONTENTS

3.0 PROJECT DESCRIPTION

Los Alamos National Laboratory will conduct a trial burn on a controlled air incineration (CAI) located in Los Alamos, New Mexico. The primary objective of the trial burn is to provide emissions testing, sampling, analysis, and evaluation directed toward obtaining the required operating permit for the facility. This Quality Assurance (QA) Plan describes the procedures for assuring the quality of data acquired during implementation of the trial burn plan. The incineration system, test waste feeds, incinerator test conditions, and sampling and analysis methods are described in Appendix J of the Los Alamos RCRA Part B permit application.

Four trial burn tests will be conducted, each consisting of three replicate sampling runs. Tests 1 and 3 will be conducted at a final combustion temperature of 1800°F, while Tests 2 and 4 will be conducted at a final combustion temperature of 2000°F. Tests 1 and 2 will be conducted using a mixture of commercial grade fuel oil, an organometallic additive, and carbon tetrachloride (CCl_4), with CCl_4 as the principal organic hazardous constituent (POHC). An organometallic additive will produce entrained particulate to test the particulate removal efficiency of the offgas cleaning system. Tests 3 and 4 will be conducted using a mixture of cellulosic sorbent and CCl_4, with CCl_4 as the POHC.

4.0 PROJECT ORGANIZATION AND RESPONSIBILITY

This project will be conducted by Los Alamos National Laboratory personnel and/or contractor personnel who are experienced in the testing of hazardous waste incinerators.

The project organization and lines of communication and responsibility are shown in Figure 4-1. A Trial Burn Project Manager will be appointed and will be responsible for all aspects of the trial burn. Some of the responsibilities of the Trial Burn Project Manager include:

- planning and implementing the trial burn plan,
- implementing the QA project plan,
- designating individuals to assist in implementing the QA plan,
- coordinating incinerator operations with test activities, and
- directing the test team.

A QA Officer, who reports to Laboratory management, will also be appointed. Some of the responsibilities of the QA Officer include:

- providing independent data review, both operational and analytical,
- making recommendations to the Trial Burn Project Manager and Laboratory management if problems are detected, and
- ensuring that appropriate corrective actions are taken when problems are detected.

A Sampling Coordinator who reports to the Trial Burn Project Manager, with lines of communication to the QAO Officer, will be appointed. Some responsibilities of the Sampling Coordinator include:

- preparing and shipping sampling equipment and containers to the test site,
- assigning and recording sample numbers,
- directing and/or participating in sampling activities,
- overseeing sample preservation in the field,
- documenting sampling activities in a field log book,
- preparing samples and shipping to the laboratory, and
- carrying out assigned QA duties.

A Laboratory Analysis Coordinator, who reports to the Trial Burn Project Manager, with lines of communication to the QAO Officer, will be appointed. Some responsibilities of the Laboratory Analysis Coordinator include:

- receiving, verifying, and documenting that incoming

field samples correspond to the chain of custody,
- maintaining records of incoming samples,
- tracking samples through processing, analysis, and disposal,
- Preparing quality control (QC) samples for analysis during the project,
- verifying that personnel are trained and qualified in specified laboratory QC and analytical procedures,
- verifying that laboratory QC and analytical procedures are being followed as specified in the QA plan,
- reviewing QC and sample data during analysis and determining if repeat samples or analyses are needed,
- submitting certified QC and sample analysis results to the project manager, and
- archive storage of analytical data.

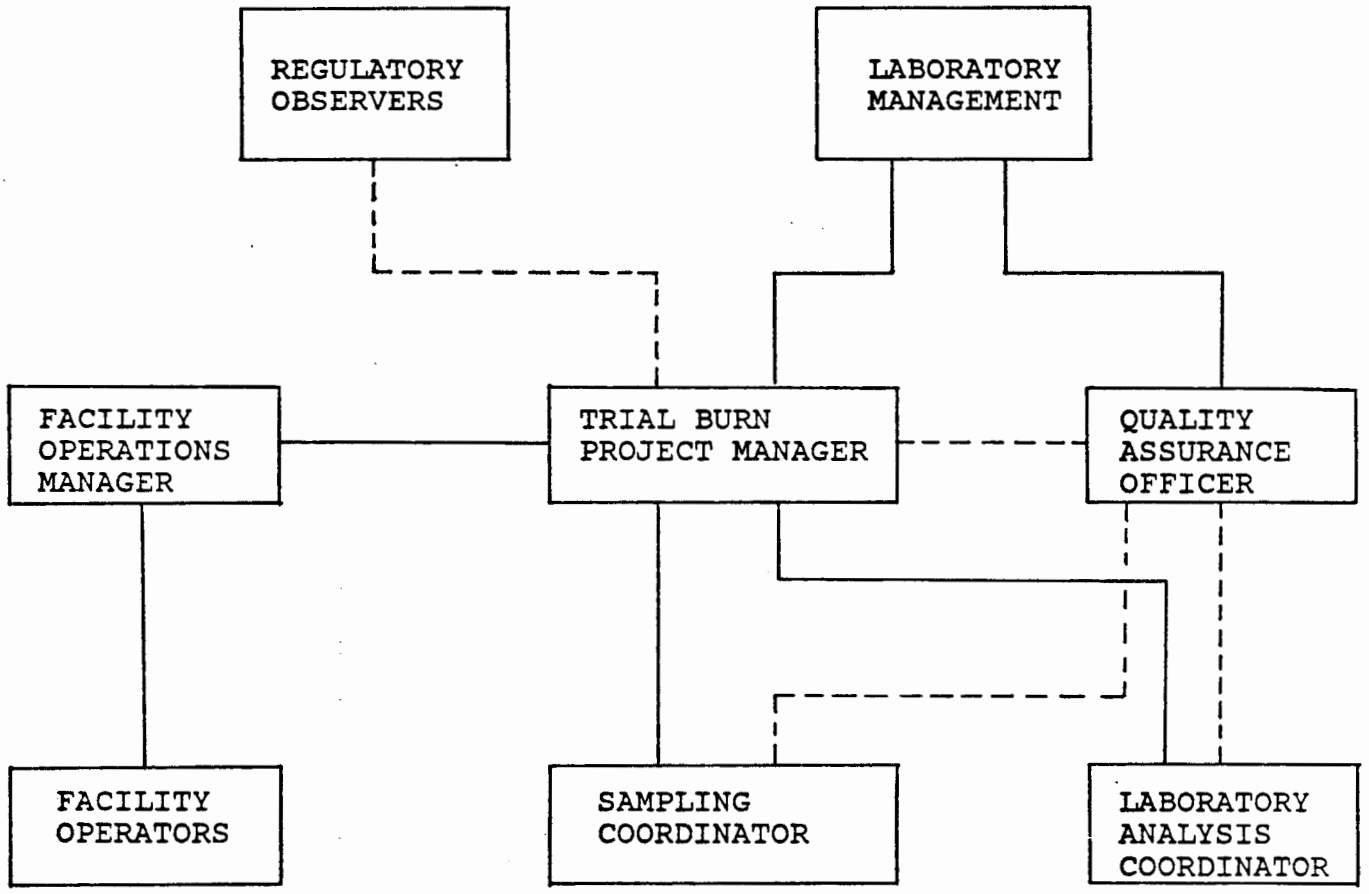

Figure 4-1. Project Organization and Responsibility

5.0 QUALITY ASSURANCE OBJECTIVES

Quality assurance objectives for precision, accuracy, and completion are listed in Table 5-1. Precision, accuracy, and completion equations are defined in Section 14.0 of this document. The objective for all measurements is that at least 90 percent will be valid and meet the criteria set forth in Table 5-1.

In addition, a minimum of 10 percent of all analyses performed will be duplicate QC checks.

Table 5-1. Quality Assurance Objectives[a]

Sample Type	Measurement Parameter (Method)	Experimental Conditions	Precision (%)	Accuracy (%)	Completion (%)
Liquid mixture feed	CCl_4	Natural sample	<±20	>80	90
	Organic Cl	Natural sample	<±20	>80	90
	Density	Natural sample	<±20	>80	90
	Ash content	Natural sample	<±20	>80	90
	Heat value	Natural sample and SRM[b]	<±20	>80	90
Solid mixture feed	CCl_4	Natural sample	<±20	>80	90
	Organic Cl	Natural sample	<±20	>80	90
	Ash content	Natural sample	<±20	>80	90
	Heat value	Natural sample	<±20	>80	90
CCl_4 feed stock	CCl_4	Natural sample	<±20	>80	90
Fuel oil feed stock	CCl_4	Natural sample	<±20	>80	90
Organometallic feed stock	CCl_4	Natural sample	<±20	>80	90
Cellulosic sorbent feed stock	CCl^4	Natural sample	<±20	>80	90
Stack gas	CCl_4	Natural and spiked samples	<±20	>80	90
	Particulates	Natural sample	<±20	>80	90
	HCl	Natural sample	<±20	>80	90
	O_2	Natural sample	<±20	>80	90
	CO_2	Natural sample	<±20	>80	90
	CO	Zero + Span Gas	<±10	>90	
Scrubber discharge liquid	CCl_4	Natural sample	<±20	>80	90
Activated carbon, unused	CCl_4	Natural sample	<±20	>80	90
Activated carbon, spent	CCl_4	Natural sample	<±20	>80	90
HEPA filter medium, unused	CCl_4	Natural sample	<±20	>80	90
HEPA filter medium, spent	CCl_4	Natural sample	<±20	>80	90

[a]For reference methods see Table 4 of the Trial Burn Plan

[b]Standard reference material

6.0 SAMPLING PROCEDURES

Samples of the liquid feed mixture will be taken at 15-minute intervals during each test run as shown in Table 6-1. The liquid hazardous waste will be composited as specified using Method P001. The CCl_4 and fuel oil feed stocks will be sampled upon delivery and composited using Method P001.

Stack gas CO concentration will be monitored continuously using an on-line analyzer. The CO monitor will meet EPA Method 10 criteria. Stack gas velocity will be monitored continuously with an appropriate combustion gas velocity indicator.

An EPA Method 5 sampling train will be used to collect stack gas particulate and HCl samples. The Method 5 procedure includes measurement of the stack gas flow rate and temperature according to EPA Methods 1 and 2. Every 30 minutes, integrated samples of the stack gas will be collected in gas bags for O_2 and CO_2 determinations by an Orsat analyzer according to EPA Method 3. The Orsat sample will be drawn by a separate pump through a tube attached to the Method 5 sample probe. Moisture determinations will be made according to the procedure described in EPA Method 5.

A volatile organic sampling train (VOST) will be used to collect samples for POHC analysis to determine destruction and removal efficiency (DRE). The VOST will be operated at about 17 liters per minute for the duration of each test run (approximately 3 hours). This will result in the collection of approximately 3 M^3 of gas.

The sample containers to be used for retaining samples for shipment to the analytical laboratory are described in Table 6-2. All bottle caps will have Teflon liners.

Those samples requiring low temperature preservation will be placed on ice (~0.4°C) in ice chests for shipment and will be stored at 4°C until analyzed. This will include all samples which contain volatile organics or which will be analyzed for volatiles.

Table B-1. Trial Burn Sampling and Analysis Schedule

Sample	Type	Equipment	Method	Frequency	Preparation	Method	Analysis
Liquid mixture feed	Grab	Amber bottle, VOA vial	SW9, SW-846	Every 30 minutes during run	Composite	POL	Organic Cl, CCl4, density, ash, heat value
Solid mixture feed	Grab	Amber bottle	SW9, SW-846	From each container as delivered	Composite	POL	CCl4
CCl4 feed stock	Grab	Amber bottle	SW9, SW-846	From each container as delivered	Composite	POL	CCl4
Fuel oil feed stock	Grab	Amber bottle	SW9, SW-846	From each container as delivered	Composite	POL	CCl4
Organometallic feed stock	Grab	Amber bottle	SW9, SW-846	From each container as delivered	Composite	POL	CCl4
Cellulosic feed stock	Grab	Amber bottle	SW9, SW-846	From each container as delivered	Composite	POL	CCl4
Stack gas	Integrated	VOST	SW9, SW-846	Continuous/3 hour			CCl4
Stack gas	Integrated	MM5 sampling train	EPA M5	Continuous/3 hour			Particulates, HCl, O2, CO2, moisture
Stack gas	Integrated	Instrument aspirator pump		Continuous			CO
Scrubber discharge liquid	Grab	Amber bottle		End of each run			CCl4
Activated carbon, unused	Grab	Amber bottle		From each container as delivered	Composite	POL	CCl4
Activated carbon, in-service	Grab	Amber bottle		End of each run			CCl4
HEPA filter media, unused	Grab	Amber bottle		From one typical filter			CCl4
HEPA filter media, spent	Grab	Amber bottle		From one filter at end of trial burn			CCl4

Table 6-2. Sample Containers

Sample Type	Container
VOST sorbent traps	Capped VOST cartridges, wrapped in aluminum foil, placed in sealed glass tubes
Method 5 nozzle, probe, and front half filter holder wash	Amber glass bottle[a]
Method 5 filter	Petri dish wrapped in aluminum foil
Method 5 condensate	Amber glass bottle
Liquid mixture feed	Amber glass bottle
CCl_4 feed stock	Amber glass bottle
Solid mixture feed	Amber glass bottle
Fuel oil feed stock	Amber glass bottle
Organometallic feed stock	Amber glass bottle
Cellulosic sorbic feed stock	Amber glass bottle
Scrubber discharge liquid	Amber glass bottle
Activated carbon, unused	Amber glass bottle
Activated carbon, spent	Amber glass bottle
HEPA filter medium, unused	Amber glass bottle
HEPA filter medium, spent	Amber glass bottle
Method 5 O_2 and CO_2	Plastic coated aluminum gas sample bag

[a]All bottle caps have Teflon lined lids.

7.0 SAMPLE CUSTODY

Sample custody will be the responsibility of Los Alamos National Laboratory personnel or contractor personnel from the time of sample collection until the samples are shipped to the analytical laboratory. Thereafter custody will be maintained by the analytical laboratory.

Samples will be kept in appropriate containers labeled so as to uniquely identify each sample. An example Field Sampling and Collection form, shown in Figure 7-1, will provide an inventory and field sampling record of each sample collected during field operations. Figure 7-2 shows an example Chain-of-Custody Record form, which will provide the formal custody record. Figure 7-3 shows an example Record of Analysis Report form, which documents analysis results for each sample.

Samples will be kept on ice as appropriate in an ice chest and will be shipped to the analytical laboratory in a secured chest. Chain-of-custody forms will be handled as follows:

- original form included with sample shipment,
- one copy retained by the sampling team,
- one copy sent separately to the analytical laboratory, and
- one copy sent to the project manager.

The laboratory custodian, after taking inventory of each shipment, will sign and date the original custody form. He will make a note on the custody form of any discrepancy in the samples and will also maintain a log in which all samples are recorded and described. The samples will be maintained in custody until one year after the final report is submitted.

FIELD SAMPLING AND COLLECTION FORM

LEADER	NAME OF SURVEY OR ACTIVITY	SHEET

DESCRIPTION OF SHIPMENT

TYPE OF SAMPLE

TOTAL NUMBER SAMPLE CONTAINERS

CONTENTS OF SHIPMENT

SAMPLE NO.	NO. OF CONTAINERS/FIELD NO.			ANALYSES REQUIRED - CHECK WERE APPROPRIATE							
	ORSAT BAG	GLASS	Blu	FORMIC ACID	DENSITY	ORGANIC Cl	ELEMENTAL COMPOSITION	TOC	ASH	TSS	TDS

PERSONNEL CUSTODY RECORD

RELINQUISHED BY (SAMPLER)	RECEIVED BY	DATE	TIME	REASON
SEALED UNSEALED	SEALED UNSEALED			
RELINQUISHED BY	RECEIVED BY	DATE	TIME	REASON

Figure 7-1. Example Field Sampling and Collection Form

C/C Control No. 0000
R/A Control No. _____

CHAIN-OF-CUSTODY RECORD

PROJECT NAME _____ SAMPLE TEAM MEMBERS _____

PROJECT NUMBER _____ LAB DESTINATION _____

PROJECT MANAGER _____ CARRIER/WAYBILL NO. _____

Sample Number	Sample Location and Description	Date & Time Collected	Sample Type	Container Type	Condition On Receipt (Name & Date)

Special Instructions: _____

Possible Sample Hazards: _____

SIGNATURES: (Name, Company, Date & Time)

1. Relinquished By: _____
   Received By: _____
2. Relinquished By: _____
   Received By: _____
3. Relinquished By: _____
   Received By: _____
4. Relinquished By: _____
   Received By: _____

Authorization for Disposal: _____ Relinquished For Disposal: _____

Container No. _____ Transferred To: _____ Manifest No. _____

Figure 7-2. Example Chain-Of-Custody Record Form

R/A Control No. 0000
C/C Control No. ____

REQUEST FOR ANALYSIS

PROJECT NAME _____
PROJECT NUMBER _____
PROJECT MANAGER _____
BILL TO _____
_____
_____

PURCHASE ORDER NO. _____

DATE SAMPLES SHIPPED _____
LAB DESTINATION _____
LABORATORY CONTACT _____
SEND LAB REPORT TO _____
_____
_____

DATE REPORT REQUIRED _____
PROJECT CONTACT _____
PROJECT CONTACT PHONE NO. _____

Sample No.	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions

TURNAROUND TIME REQUIRED: (Turnaround time must be arranged with lab prior to sample shipment.)

Normal_____ Rush_____ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Non hazardous_____ Flammable_____ Skin Irritant_____ Highly Toxic_____ Other_____
(Please Specify)

SAMPLE DISPOSAL: (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping and disposal.)

Return to Client_____ Disposal by Lab_____

FOR LAB USE ONLY

Received By: _____ Date/Time: _____

Figure 7-3. Example Request for Analysis Form

INTERNATIONAL TECHNOLOGY CORPORATION

ANALYTICAL SERVICES

5815 Middlebrook Pike • Knoxville, Tennessee 37921 • 615-588-6401

CERTIFICATE OF ANALYSIS

TO:

DATE REPORTED
PROJECT CODE
ORDER NUMBER

Sample Description: _____

Parameter	Concentration (units)	Parameter	Concentration (units)

Sworn to and subscribed before me this
day of
My commission expires

Approved by

Notary Public

Title

8.0 CALIBRATION PROCEDURES AND FREQUENCY

Calibration procedures for sampling and analysis instruments used in this project are given in the methods procedures documents that are referred to in the sections on sampling and analysis.

The Method 5 and Volatile Organic Sampling Trains will be calibrated as indicated by EPA's "Quality Assurance Handbook of Air Pollution Measurement Systems" (EPA-600/4-77-0276). The activity matrices for calibrating the equipment and apparatus are shown in Tables 8-1 and 8-2.

The CO monitor will be installed and calibrated in accordance with "Proposed Performance Specification 4, Appendix B, 40 CFR Part 60." The CO monitor will also be calibrated daily using a zero gas and three certified standard gases with different concentrations. The concentrations of the calibration gases used will be close to and will span the expected values in the gas stream. In addition, the CO monitor will have a zero and span calibration before and after each test and as requested during the trial burn by the regulatory representatives. The zero and span calibration will be considered a verification of the quality of data received from the CO monitor. If the zero and span shows a drift greater than 10 percent from the calibration curve, then a full calibration will be performed.

The laboratory analytical apparatus will be calibrated according to instructions in the method description at least once each day that analyses are to be done. In addition, a mid-range calibration standard will be analyzed after every tenth sample analysis.

Table 8-1. Activity Matrix for Calibration of Equipment

Apparatus	Acceptance Limits	Frequency and Method of Measurements	Action if Requirements Are not Met
Wet test meter	Capacity >3.4 m^3/hr (120 ft^3/hr); accuracy with ±1.0%	Calibrate initially, and then yearly by liquid displacement	Adjust until specifications are met, or return to manufacturer
Dry gas meter	Y_i = Y ±0.02 Y	Calibrate vs. wet test meter initially, and when post-test check exceeds Y ±.05 Y	Repair, or place and then recalibrate
Thermometers	Impinger thermometer ±1°C (2°F); dry gas meter thermometer ±3°C (5.4°F) over range; stack temperature sensor ±1.5% of absolute temperature	Calibrate each initially as a separate component against a mercury-in-glass thermometer; then before each field trip compare each as part of the train with the mercury-in-glass thermometer	Adjust; determine a constant correction factor; or reject
Probe heating system	Capable of maintaining 120° ±14°C (248° ±25°F) at a flow rate of 21 L/min (0.71 ft^3/min)	Calibrate component initially by APTD-0576(11), if constructed by APTD-0581(10) or use published calibration curves	Repair, or replace, and then reverify the calibration
Barometer	±2.5 mm (0.1 in.) Hg of mercury-in-glass barometer	Calibrate initially vs. mercury-in-glass barometer; check before and after each field test	Adjust to agree with a certified barometer
Proble nozzle	Averge of three ID measurements of nozzle; difference between high and low <0.1 mm (0.004 in.)	Use a micrometer to measure to nearest 0.025 mm (0.001 in.)	Recalibrate, reshape, and sharpen when nozzle becomes nicked, dented or corroded
Analytical balance	± mg of Class-S weights	Check with Class-S weights upon receipt	Adjust or repair

Source: EPA-600/4-77-027b (23).

Table 8-2. Activity Matrix for Calibration of Apparatus

Apparatus	Acceptance Limits	Frequency and Method of Measurements	Requirements Are not Met
Type S pitot tube and/or probe assembly	All dimension specifications met	Calibrate initially and visually inspect after each field test	Use pitot tubes that meet face opening specifications; repair or replace as required
Stack gas temperature measurement	Capable of measuring within 1.5% of minimum stack temperature	Calibrate initially and after each field test	Adjust to agree with Hg bulb system thermometer, or construct a calibration curve to correct the readings
Barometer	Agrees within 2.5 mm (0.1 in.) Hg of mercury-in-glass barometer	Initially and after every field use, compare to a liquid-in-glass barometer	Adjust, repair, or discard
Differential pressure gauge (does not include inclined manometers)	Agree within ±5% of inclined manometers	Initially and after each field use	Reject test results, or consult administrator if post-test calibration is out of specification

Source: EPA-600/4-77=027b (23)

9.0 ANALYTICAL PROCEDURES

Standard methods will be employed for the analyses of all collected samples. These methods are described in the following documents:

- Sampling and Analysis Methods for Hazardous Waste Incineration, EPA 600/8-84-002,
- American Society for Testing and Materials, Annual Book of ASTM Standards, 1984,
- Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods, EPA Publication NO. SW-846, 1982,
- Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020, and
- New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.

10.0 DATA REDUCTION VALIDATION AND REPORTING

Reduction of data obtained from this trial burn will involve using the sampling and analysis results to calculate DRE according to equations given in 40 CFR 264.343.

The results of sample analysis will be reported in terms of mass/unit volume or total mass per sample and emission rates in mass per hour.

The initial step in the data validation will consist of a thorough check of all calculations involved in reduction of sampling and analysis data. Next, the data will be investigated for consistency of the results within and between tests. For example, comparisons will be made of stack gas flow rates, stack gas temperatures, and sampling system operating conditions. Analytical data will be reviewed to identify variations in composition from sample to sample among replicate runs. Where variations appear significant, calculations will again be checked for errors and the sample collection and analysis procedures will be reviewed to identify any causes for the inconsistencies. Any calculation errors will be corrected and anomalies in the sampling or analysis procedures will be documented and reported in the final project report.

Automatic data processing procedures will be used to calculate emission rates. These procedures will be checked manually at least once for each set of equations.

Treatment of Outlying Data and Measurements Below Detection Limits

All data collected in the study will be considered valid, with the following qualifications, and will be reported. If anomalous results are obtained, every effort will be made to identify any problems in the sample collection, sample preparation, and/or analysis which could have contributed to the anomaly. If any problems occurred, they will be reported, with the results in question, and may serve to qualify the significance of the result(s).

In instances where the analyte concentration in the analyzed sample is below the limit of detection, a "less than" value will be reported for the sample and for the emission level. Detection limits will vary with sample type and the level of interference in the sample.

All data accumulated during the project and final results will be recorded in permanently bound record books.

11.0 INTERNAL QUALITY CONTROL CHECKS

Blanks of all reagents and solvents used will be taken, as well as method blanks to assess possible laboratory contamination. A VOST cartridge will be opened and allowed to remain open as a field blank for the duration of each test. As the Method 5 Sampling Train procedures are inappropriate for field blank samples, none will be taken for the M5 stack gas tests. Process parameter measurements (temperatures, flows, etc.) will consist of reading the appropriate instrument (thermocouple readout, flow meter, etc.), which will be calibrated prior to the test.

Replicate samples are inappropriate for samples being composited before analysis, therefore they will not be taken. Instead, in order to provide quality control, a minimum of 10 percent of the composited samples from each test will have replicate analyses run with the other samples.

All stack gas samples for POHC will be spiked with a surrogate compound before preparation and analysis. The surrogate data will be used to calculate recovery of the surrogate as a measure of the accuracy of the sample preparation and analysis procedures. The surrogate compound will not be CCl_4.

For directed analysis of the POHC in the stack gas samples, one sample from each triplicate set will be spiked at a concentration corresponding to two times the target detection limit of DRE for stack gas samples.

12.0 PERFORMANCE AND SYSTEM AUDITS

Sampling performance audits will be accomplished through observation of the sampling operations by the regulatory agency representative(s), the QA Officer, and the Trial Burn Project Manager.

Analytical performance audits will consist of the replicate analysis and spiked sample procedures outlined in Section 9.0 of this document. If deemed necessary by the Trial Burn Project Manager and QA Officer, standard reference materials will be submitted for analysis as unknowns.

A system audit of laboratory activities involved in this trial burn will be performed by the Trial Burn Project Manager and/or QA Officer before any new experimental procedures are implemented. The audit will consist of an on-site inspection and review of the analytical operations and the associated quality assurance activities being employed. Additionally, the Trial Burn Project Manager and/or QA Officer will frequently review recent data to ensure that all required QC checks are being made and evaluation criteria followed.

13.0 PREVENTIVE MAINTENANCE

Preventive maintenance of sampling and analytical equipment used during the project will be performed according to the procedures and schedules set forth in manufacturers' maintenance manuals and as described in appropriate parts of standard methods.

All preventive maintenance performed will be recorded in a service record log for each instrument. If the performance of the instrument could have been affected by the maintenance procedure calibration, check samples, where appropriate, will be analyzed and the results recorded in the record notebook before any samples are analyzed. Whenever parts are replaced, the serial number (SN) of the new part (if available) or an assigned SN will be logged into the maintenance record notebook.

14.0 PROCEDURES FOR ASSESSING DATA ACCURACY, PRECISION, AND COMPLETENESS

The quality assurance activities implemented in this study will provide a basis for assessing the accuracy and precision of the analytical measurements. Table 5-1 shows the QA activity that will generate the accuracy and precision data for each sample type. The generalized form of the equations that will be used to calculate accuracy and precision are given below:

Accuracy

$$\text{Percent Accuracy} = \frac{(X-T)\ 100}{T} \qquad (14\text{-}1)$$

where X is the experimentally determined value and T is the true or reference value of the species being measured.

Precision

Precision will be calculated as a percent difference from the mean of duplicate measurements according to:

$$\text{Percent relative difference} = \frac{2\ (X_1 - X_2)}{X_1 + X_2} \qquad (14\text{-}2)$$

Where X_1 and X_2 are the results of duplicate measurements.

Completeness

Completeness in meeting the data recovery objectives will be assessed by the following equation:

$$\text{Completeness, \%} = \frac{D_r\ 100}{D_c} \qquad (14\text{-}3)$$

where D_r is the number of samples for which valid results are reported and D_c is the number of samples which are scheduled to be collected and analyzed during the study.

15.0 CORRECTIVE ACTION

The need for corrective action occurs when a circumstance arises that threatens the quality of the data output. In order for corrective action to be initiated, awareness of a problem must exist. In most instances, the personnel conducting the field work and the laboratory analysis are in the best position to recognize problems which will affect data quality. Keen awareness on their part can frequently detect minor instrument changes, drifts or malfunctions, which can be corrected, thus preventing a major breakdown of the system. If major problems arise, they are in the best position to decide upon the proper corrective action and initiate it immediately, thus minimizing data loss. Therefore, the field sampling and laboratory analysis personnel will have a prime responsibility for recognizing the need for corrective action. Decisions on whether to take corrective action and what action(s) to take will be made by the Trial Burn Project Manager, QA Officer, or Analytical Coordinator. Such decisions will be based on action limits discussed later in this section. When a corrective action is taken by any of the field or laboratory operations personnel, they will be responsible for notifying the project QA Officer so that he can, if deemed necessary, intensify QA surveillance of the affected sampling or analysis system.

A second level of recognition of the need for corrective action will be the project QA Officer, who will determine the need for corrective action from the results of the audits described in Section 12.0 and from review of the QA data generated during the study. The QA Officer will be responsible for initiating corrective action by immediately notifying the Trial Burn Project Manager. The Trial Burn Project Manager will then be responsible for instituting the appropriate corrective action.

Establishment of specific operating limits for all sampling and analysis systems beyond which corrective action will be triggered is not practical. Ultimately, the personnel performing and checking the sampling and analysis procedures and results must participate in such decisions. To reach the proper decision, each individual must understand the program objectives and data quality required to meet these objectives. Data quality objectives for this program are presented in Section 5.0. All personnel involved in the project will receive an approved copy of this QA Plan and thus will be informed of these objectives. Each individual will have a responsibility to notify the respective field sampling or laboratory operations supervisor whenever a measurement system is not yielding data within these objectives.

Problems requiring corrective action decisions are most likely to occur in the field during stack sampling tests and in the laboratory during the analysis.

If the situation arises requiring long-term corrective action, the following closed-loop corrective action system will be used:

- define the problem,
- assign responsibility for investigating the problem,
- investigate and determine the cause of the problem,
- determine corrective action course to eliminate the problem,
- assign responsibility for implementing the corrective action,
- determine the effectiveness of the corrective action and implement the correction, and
- verify that the corrective action has eliminated the problem.

16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Trial Burn Project Manager, QA Officer, and key staff responsible for sampling, analysis, and data management will review the Project Quality Assurance Program performance weekly while data are being generated. The results of the QA review will be summarized in a memorandum which will specifically identify any areas that may require corrective action and present the proposed corrective action. In addition, the memorandum will present the results of previous corrective actions. Documented copies of all QA reports will be submitted with the trial burn sampling and analysis results.