APPENDIX B
QUALITY ASSURANCE PROJECT PLAN

REMEDIAL INVESTIGATION WORK PLAN
Capital Industries, Inc.
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Seattle, Washington

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QUALITY ASSURANCE PROJECT PLAN

APPENDIX B OF THE REMEDIAL INVESTIGATION WORK PLAN

CAPITAL INDUSTRIES, INC.
5801 THIRD AVENUE SOUTH
SEATTLE, WASHINGTON

AGREED ORDER NO. DE 5348

Submitted by:
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For:
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September 16, 2008

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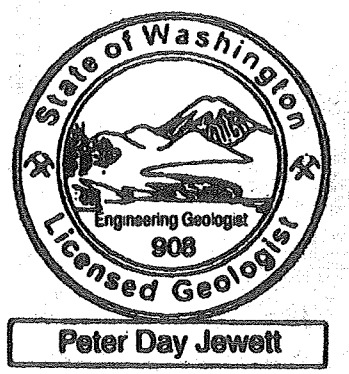

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) has been prepared by Farallon Consulting, L.L.C. (Farallon) on behalf of Capital Industries, Inc. (Capital) to provide specific requirements for quality assurance and quality control (QA/QC) procedures for the Remedial Investigation (RI) to be conducted at the Capital Area of Investigation. The Capital Area of Investigation is defined as the area south of South Mead Street, north of South Front Street, east of 1st Avenue South, and west of 4th Avenue South. In accordance with Exhibit A of the Agreed Order No. DE 5348 entered into by Capital and the Washington State Department of Ecology (Ecology) on January 24, 2008 (Agreed Order) and with Section 200 of Chapter 173-340 of the Washington Administrative Code (WAC 173-340-200), the Capital Site will be defined as the area where concentrations of constituents of concern (COCs) released from the Capital Property at 5801 3rd Avenue South in Seattle, Washington (Capital Property) exceed regulatory cleanup levels.

The QAPP has been prepared in accordance with the Washington State Model Toxics Control Act Cleanup Regulation (MTCA), as established in WAC 173-340-350. As stated in the Ecology document *Guidelines for Preparation of Quality Assurance Project Plans for Environmental Studies* dated February 2001 (Ecology Publication No. 01-03-003), the purpose of the QAPP is to:

- Assist the Project Manager and project team to focus on factors affecting data quality during the planning stage of the project;
- Facilitate communication among field, laboratory, and management staff as the project progresses;
- Document the planning, implementation, and assessment procedures for QA/QC activities for the RI;
- Ensure that the data quality objectives (DQOs) are achieved; and
- Provide a record of the project to facilitate final report preparation.

Both qualitative and quantitative DQOs have been established for the RI at the Capital Area of Investigation to define the appropriate types of data and to specify the tolerable levels of potential decision errors that will be used as a basis for establishing the quality and quantity of data needed to support the RI. The QAPP details both the qualitative and quantitative aspects of sample collection and analysis, including analytical methods, QA/QC procedures, and data quality reviews, to ensure that the DQOs are achieved.

1.1 PROJECT OBJECTIVES

The objectives of the RI are to identify the nature and extent of the constituents of potential concern (COPCs) above screening levels in the media of concern, as defined in the RI Work Plan, evaluate the impact to human health and the environment, and collect and evaluate sufficient information to enable selection of a cleanup action for the Capital Site.

2.0 PROJECT ORGANIZATION

The project organization for conducting the RI, including identification of key personnel and their responsibilities, is presented below.

2.1 KEY PERSONNEL

Farallon has been contracted by Capital to plan and implement the RI. The Project Contact for Capital is:

Mr. Ron Taylor
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5801 3rd Avenue South
Seattle, Washington 98108
Telephone: (206) 292-2608
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The Project Manager for Ecology is:

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3190 160th Avenue Southeast
Bellevue, Washington 98008-5452
Telephone: (425) 649-7000
Fax: (425) 649-7098

2.2 KEY PERSONNEL RESPONSIBILITIES

The responsibilities of the key personnel involved in the RI are described below.

2.2.1 Project Manager

The Project Manager has overall responsibility for developing the QAPP, monitoring the quality of the technical and managerial aspects of the project, and implementing the QAPP and corresponding corrective measures where necessary.

2.2.2 Project QA/QC Officer

The Project QA/QC Officer is responsible for ensuring that personnel assigned to the project meet the training requirements of the QA/QC program, monitoring the project work, and verifying that project work is performed in accordance with the Reconnaissance Sampling and Analysis Plan (SAP) prepared for the RI Work Plan and with other established procedures. Additional responsibilities include reviewing and verifying the disposition of nonconformance and corrective action reports. The QA/QC Officer also has the responsibility to assess the effectiveness of the QA/QC program and to recommend modifications to the program as appropriate.

2.2.3 Project Staff

Members of the project staff are responsible for understanding and implementing the QA/QC program as it relates to the RI project objectives.

2.2.4 Regulatory Agency

The RI is being conducted in accordance with the Agreed Order; MTCA, as established in WAC 173-340-350; and the RI Work Plan prepared by Farallon and dated September 11, 2008,

with Ecology serving as the lead regulatory agency. Prior work conducted at the Capital Property was performed as an independent remedial action.

3.0 DATA QUALITY OBJECTIVES

The DQOs for this project will be used to develop and implement procedures to ensure that the data collected are of sufficient quality to adequately address the objectives of the RI at the Capital Site as defined in the RI Work Plan Reconnaissance Sampling and Analysis Plan. All observations and measurements will be made and recorded in a manner so as to yield results representative of the media and conditions observed and/or measured. Goals for representativeness will be met by ensuring that sampling locations are selected properly, a sufficient number of samples are collected, and field screening and laboratory analyses are conducted properly. The media, constituents of concern, monitored natural attenuation parameters, and laboratory test methods as discussed in the Reconnaissance Sampling and Analysis Plan are summarized in Table 1.

The quality of the laboratory data will be assessed according to the parameters of precision, accuracy, representativeness, completeness, and comparability. The definitions of these parameters and the applicable quality control (QC) procedures are presented in Sections 3.2 through 3.6. Quantitative DQOs for the parameters precision, accuracy, and completeness are provided following each definition. Laboratory DQOs have been established by the analytical laboratory.

3.1 QUANTITATION LIMITS AND QUALITY CONTROL CRITERIA

The laboratory practical quantitation limits (PQLs) for the analytes required for the RI are compared to the screening levels for soil and groundwater in Table 2. The actual detection or reporting limits for samples may be higher, depending on the sample matrix, matrix interferences, and laboratory dilution factors. Project-specific quality control criteria for laboratory analyses are summarized in Tables 3 through 5.

3.2 PRECISION

Precision is defined as the degree of agreement between or among independent, similar, or repeated measures and is expressed in terms of analytical variability. For this project, analytical variability will be measured as the relative percent difference (RPD) or coefficient of variation between analytical laboratory duplicates and between the matrix spike (MS) and matrix spike duplicate (MSD) analyses. Monitoring and sampling variability will be measured by analysis of blind field replicate samples.

Precision will be calculated as the RPD as follows:

$$RPD = \frac{|S-D|}{(S+D)/2} \times 100$$

where:

RPD = Relative percent difference for compound

S = Analyte concentration in original sample

D = Analyte concentration in duplicate sample

The tolerance limit for percent differences between laboratory duplicates will be ± 20 percent, and deviations from these criteria will be reported. If the QAPP criteria are not met, the laboratory will provide an explanation of why the limits were exceeded, and will implement appropriate corrective actions for laboratory control samples (LCSs)/LCS duplicates only. RPDs will be evaluated during data review and validation. The independent data reviewer will note deviations from the specified limits and will comment on the effect of the deviations on reported data. If precision limit exceedances are linked to field sampling, those field sampling procedures will be reviewed and any problems identified. Resampling and analysis may be required.

There are no specific RPD criteria for organic chemical analyses. Quantitative RPD criteria for organic analyses will be based on laboratory-derived control limits.

3.2.1 Duplicate Samples

Field duplicate samples will be collected during sampling to analyze for COCs to assess the precision of laboratory analytical and field sampling methods. Field duplicate groundwater samples for all parameters will be collected at a frequency of 10 percent of the primary samples. Field duplicate soil samples for non-volatile constituents will be collected at a frequency of 10 percent of primary samples. Field duplicate soil sample for volatile constituents will not be collected.

3.3 ACCURACY

Accuracy (bias) is a statistical measurement of correctness and includes components of random error (i.e., variability due to imprecision) and systematic error. It therefore reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ excessively from the known concentration of the spike or standard.

Accuracy measures the bias in a measurement system and is difficult to measure for the entire data collection activity. Sources of error include the sampling process, field contamination, preservative handling, sample matrix effects, and sample preparation and analysis techniques. To confirm that the samples collected are not contaminated, laboratory method blank samples will be analyzed.

Accuracy will be calculated as percent recovery of analytes as follows:

$R_i = (Y_i / X_i) \times 100$

where:

R_i = percent recovery for compound i

Y_i = measured analyte concentration of compound i in sample i (measured minus original sample concentration)

X_i = known analyte concentration of compound i in sample i

Laboratory matrix spikes and surrogates will be carried out at the analytical laboratory in accordance with U.S. Environmental Protection Agency (EPA) SW-846 requirements for organic chemical analyses. The frequency for both matrix spikes and matrix spike duplicates will be one per batch of 20 samples, or less. Quantitative percent recovery criteria for organic analyses will be based on laboratory-derived control limits for surrogate recovery and matrix spike results.

The resultant percent recovery will be compared to the acceptance criteria defined in the QAPP, and deviations from specified limits will be reported. If the objective criteria are not met, the laboratory will provide an explanation of why acceptability limits were exceeded and will implement appropriate corrective actions. Percent recoveries will be reviewed during data validation, and deviations from the specified limits will be noted. The data reviewer will comment on the effect of the deviations on reported data.

3.3.1 Laboratory Method Blanks

The laboratory will run method blanks at a minimum frequency of 5 percent (or one per batch) to assess potential contamination of the sample in the laboratory.

3.3.2 Trip Blanks

Laboratory-supplied trip blanks will accompany groundwater and soil samples collected during sampling events. The trip blank will be analyzed for volatile COCs by EPA Method 8260B (for tetrachloroethene, trichloroethene, and vinyl chloride) to assess the integrity of the sample containers during transport.

3.4 REPRESENTATIVENESS

Representativeness is a qualitative assessment of how closely the measured results reflect the actual concentration or distribution of the constituent concentrations in the matrix sampled. The sampling plan design, sample collection techniques, sample handling protocols, sample analysis methods, and data review procedures have been developed to ensure that the results obtained are representative of Capital Site conditions. These issues are addressed in detail in Section 4, Data Collection Approach, and in the Reconnaissance Sampling and Analysis Plan. Representativeness also will be determined by evaluating holding time, sample preservation, and blank contamination. Samples with expired holding times, improper preservation, or blank contamination may not be representative.

3.5 COMPLETENESS

Completeness is defined as the percentage of measurements judged to be valid. Valid and invalid data (i.e., data qualified with an R-Flag as rejected) will be identified during independent data review. Validation as described in Section 6.5, Data Reduction and Analysis. Completeness is calculated as follows:

$$C = \frac{(Number\ of\ Valid\ Measurements)}{(Total\ Number\ of\ Measurements)} x\ 100$$

The objectives for completeness of samples are expressed as a percentage, and refer to the minimum acceptable percentage of samples received at the laboratory in good condition and acceptable for analysis. Objectives for completeness are based in part on the subsequent uses of the data: the more critical the use, the greater the completeness objective. The objective of completeness is 95 percent of the samples. This objective will be met though the use of proper sample containers, proper sample packaging procedures to prevent breakage during shipment, proper sample preservation, and proper labeling and chain-of-custody procedures. A loss of 5 to 10 percent of intended samples due to refusal or poor sample recovery is common. When feasible, the amount of sample collected will be sufficient to re-analyze the sample should the initial results not meet QC requirements. The goals set for the RI project are considered to be sufficient for intended data uses.

The objectives for completeness of chemical analyses refer to the percentages of analytical requests for which usable analytical data are produced, and also are expressed as a percentage. The initial objective for completeness of chemical analyses in the laboratory is 95 percent.

Sampling and analysis data critical to achieving the objectives for completeness are as follows:

- Groundwater data that define the vertical and lateral extent of COCs above screening levels released from the Capital property;
- Soil data that define the lateral extent of COCs above screening levels released from the Capital property;
- Total organic carbon (TOC) data collected from a representative selection of borings to derive an accurate approximation of transport retardation parameters; and
- Natural attenuation parameters data collected from the groundwater monitoring well network.

If overall completeness is less than the stated goal of 95 percent, Capital will assess the reason for lack of completeness, which may include DQOs based on poor assumptions or a work plan that may have been poorly implemented or difficult to carry out. If DQOs are achieved despite lack of completeness, no further work will be performed. If DQOs are not achieved, further sample collection may be necessary and will be carried out under advisement from Ecology.

3.6 COMPARABILITY

Comparability is the degree to which data from one study can be compared with data from historical studies at the same location, other similar studies, reference values (such as background), reference materials, and screening values.

The following approach will be used to review historical data and data generated by other potentially liable parties to ensure sufficient quality for use during the RI:

- Standard sampling techniques were used during field investigation activities;
- The analytical laboratory was certified by Ecology and the National Environmental Laboratory Accreditation Program;
- Methods approved by EPA and Ecology were used. QC samples and standard operating procedures were used by the laboratory to ensure that reporting standards were maintained in accordance with the Laboratory Quality Assurance Plan;
- The laboratory provided data reports similar to those developed as part of the EPA Contract Laboratory Program for all analyses requiring definitive data. The complete data report and corresponding documentation was sufficient to perform an appropriate level of data validation; and
- Data quality review and validation were performed on the analytical data according to the procedures specified in this QAPP.

4.0 DATA COLLECTION APPROACH

Procedures that will be used to collect, preserve, transport, and store samples during the RI are described in the RI Work Plan Reconnaissance Sampling and Analysis Plan. All sampling protocols will be performed in accordance with generally accepted environmental practices, and will meet or exceed current regulatory standards and guidelines. Sampling procedures may be modified, if necessary, to satisfy amendments to current regulations, methods, or guidelines. The data collection approach for key elements of the RI field program to ensure that project DQOs are met or exceeded includes the following practices:

- Reconnaissance groundwater samples will be collected using EPA Method 5035B preservative protocols for groundwater samples anticipated to contain halogenated volatile organic compounds (HVOCs) at low concentrations. Reconnaissance and monitoring well groundwater samples will be collected in accordance with standard EPA low-flow groundwater sampling procedures to minimize volatilization;
- Reconnaissance groundwater samples will be collected at multiple depths from the borings advanced in the Water Table Zone, Shallow Zone, and Intermediate Zone;
- Reconnaissance groundwater samples will be submitted for laboratory analysis of HVOCs in accordance with the RI Work Plan;
- COCs will be analyzed using low-level sampling procedures to minimize volatilization during the collection of groundwater samples;
- Groundwater samples will be submitted for laboratory analysis of COCs and natural attenuation parameters in accordance with the RI Work Plan; and
- Select soil samples will be collected from reconnaissance borings and analysis of the samples for TOC.

Sample containers, preservation methods, and holding times are presented in Table 6. A sample summary by media, including duplicates and laboratory quality control samples, is presented in Table 7.

5.0 ANALYTICAL PROCEDURES

OnSite Environmental Inc. (OnSite) has been selected as the laboratory to conduct the VOC, manganese, iron, and monitored natural attenuation (MNA) parameter analyses of the samples collected for the RI. OnSite is certified by Ecology, and meets the QA/QC requirements of both Ecology and EPA. The contact for OnSite is:

Mr. David Baumeister
OnSite Environmental Inc.
14648 Northeast 95th Street
Redmond, Washington 98052
Telephone: (425) 883-3881

TestAmerica, Inc. has been selected as the laboratory to conduct the analysis of the 1,4-dioxane samples collected for the RI. TestAmerica, Inc. is certified by Ecology and meets the QA/QC requirements of both Ecology and EPA. The contact for TestAmerica, Inc. is:

Ms. Sandra Yakimavich
TestAmerica, Inc.
11720 North Creek Parkway North, Suite 400
Bothell, Washington 98011
Telephone: (425) 420-9200

Copies of the Laboratory Quality Assurance Manuals from OnSite and TestAmerica, Inc. are included on compact disc as Attachment A, and will be followed throughout the RI. Ecology will have access to laboratory personnel, equipment, and records pertaining to samples, collection, transportation, and analysis.

Select soil samples collected from reconnaissance borings will be analyzed for TOC. The process for selecting samples for analysis is described in the RI Work Plan Reconnaissance Sampling and Analysis Plan.

6.0 DATA MANAGEMENT AND REPORTING

This section outlines the procedures to be followed for the inventory, control, storage, and retrieval of data collected during the RI. The procedures contained in the QAPP are designed to ensure that the integrity of the collected data is maintained for subsequent use. In addition, project tracking data such as schedules and progress reports will be maintained to monitor, manage, and document the progress of the RI.

6.1 DATA TYPES

A variety of data will be generated during the RI, including sampling and analytical data. Examples of data types include electronically reported laboratory data and manually recorded field data such as soil descriptions. Laboratory analytical data will be transmitted to Farallon both as an electronic file and as a hard copy laboratory data report. This format will facilitate validation and analysis of these data while avoiding transcription errors that may occur with computer data entry.

6.2 DATA TRANSFER

Procedures controlling the receipt and distribution of incoming data packages to Farallon and the transmittal of outgoing data reports from Farallon are outlined below.

6.2.1 Receipt of Data and Reports

Incoming documents will be date-stamped and filed. Correspondence and transmittal letters for reports, maps, and data will be filed chronologically. Data packages such as those from field personnel and laboratories (e.g., groundwater analytical data, hydrogeologic observations) and surveyors (e.g., well head location and elevation data) will be filed by project task, subject heading, and date. If distribution of a document is required, the number of needed copies will be made and distributed to the appropriate persons or agencies, and recorded on a document tracking form.

6.2.2 Outgoing Data and Reports

A transmittal sheet will be attached to all project data and reports sent out by Farallon. A copy of each transmittal sheet will be kept in the administrative file and in the project file. The Project Manager or the Project QA/QC Officer will review outgoing reports and maps.

6.3 DATA INVENTORY

Procedures for the filing, storage, and retrieval of project data and reports are discussed below.

6.3.1 Document Filing and Storage

Project files and raw data files will be maintained at the Farallon office. Files will be organized by project task or subject heading, and maintained by the Document Control Clerk. Electronic files will be maintained in a project directory and backed up daily, weekly, and monthly. The

electronic files will be stored on password-protected Microsoft servers with secure firewall protection. In accordance with WAC 173-340-850, the hard copy and electronic project files will be archived for a minimum of 10 years after completion of compliance monitoring or as long as any institutional controls remain in effect.

6.3.2 Access to Project Files

Access to project files will be controlled, and limited to Capital and their authorized representatives, Ecology, and Farallon personnel. When a hard-copy file is removed for use, a sign-out procedure will be used to track document custody. If a document is to be used for an extended period, a copy will be made and the original will be returned to the project file. The final version of reports, tables, and figures in electronic format will be write-protected in the project directory.

6.4 INDEPENDENT DATA QUALITY REVIEW

Data quality review will be performed where applicable using *Uniform Federal Policy for Quality Assurance Project Plans; Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs; Part 1: UFP-QAPP Manual* dated March 2005 (EPA Publication No. EPA-505-B-04-900A), the EPA Contract Laboratory Program *National Functional Guidelines for Organic Data Quality Review* dated October 1999 (EPA Document Number PB 99-963506), and the EPA Contract Laboratory Program *National Functional Guidelines for Inorganic Data Review* dated October 2004 (EPA Document Number EPA 540-R-04-004). All laboratory data will be independently verified by an independent third party, Sayler Data Solutions, Inc. of Bothell, Washington. The following types of QC information will be reviewed, as appropriate:

- Method deviations;
- Sample extraction and holding times;
- Method reporting limits;
- Blank samples (equipment rinsate and laboratory method);
- Duplicate samples;
- Matrix spike/matrix spike duplicate samples (accuracy);
- Surrogate recoveries;
- Percent completeness and RPDs (precision); and
- Final analytical data packages for samples collected during the subsurface investigation.

Laboratory quality control limits are presented in Tables 3, 4, and 5. Quality control limits may vary as a result of matrix interference and changes in laboratory control limits at the time of sample analysis.

6.5 DATA REDUCTION AND ANALYSIS

The Project Manager and Project QA/QC Officer are responsible for data review and validation in adherence to the parameters outlined in Section 3, Data Quality Objectives. The type of

analyses and presentation methods selected for any given data set will depend on the type, quantity, quality, and prospective use of those data. Analysis of project data will require data reduction for the preparation of tables, charts, and maps. To ensure that data are accurately transferred during the reduction process, two data reviews will be performed prior to the issuing of the documents: one by the Project QA/QC Officer or Project Manager, and the second by the Project Principal. Any incorrect transfers of data will be highlighted and corrected.

6.5.1 Data Reporting Formats

Physical and chemical characterization information developed in connection with the RI will be presented in the final report in the format described below.

6.5.1.1 Summary Tables and Plots

To facilitate assimilation and presentation, laboratory reports will be sorted according to various parameters to summarize the information contained. Groundwater sampling and analytical data will be sorted several ways, including by sample point number, constituent, and date of sample collection. The parameters chosen for sorting will depend on the requirements for the most appropriate format and the utility of that format in demonstrating the physical and chemical characteristics of interest. Summary tables, including well construction data, groundwater levels, and aquifer test data, also will be generated. Aquifer test data generated using modeling software will be presented as plots.

6.5.1.2 Maps

Plan maps needed to illustrate results of the RI will be assembled or prepared. These maps may include but are not limited to plan maps of the Site showing confirmed and suspected sources, sampling locations, chemical concentrations for individual chemicals and groups of chemicals, potentiometric surface maps, Capital Site features and potential preferential pathways (e.g., sewer lines), and cross-section locations.

6.5.1.3 Cross-Sections

Vertical profiles, or cross-sections, may be generated from field data to display Capital Site stratigraphy or other aspects of the RI.

6.6 QUALITY CONTROL SUMMARY REPORT

A Quality Control Summary Report will be prepared by Farallon based on the QC summary data provided by the laboratory and the validation report provided by the independent data validator.

7.0 QUALITY CONTROL PROCEDURES

This section provides a description of the QC procedures pertaining to both field activities and laboratory analysis. The QC procedures for field activities include standard operating procedures for sample collection and handling, equipment calibration, and field QC samples.

7.1 FIELD QUALITY CONTROL

Field QC samples (e.g., field duplicate samples) will be collected during the RI project as described in the Reconnaissance Sampling and Analysis Plan. The purpose of these samples is discussed in Section 3, Data Quality Objectives. In addition, standard operating procedures will be implemented during field-screening activities. The procedural basis for these field data collection activities will be documented on Field Report forms as described in the RI Work Plan Reconnaissance Sampling and Analysis Plan. Any deviation from established protocols will be documented on the Field Report forms.

7.2 LABORATORY QUALITY CONTROL

Analytical laboratory QA/QC procedures are described in the Laboratory Quality Assurance Manual for both OnSite and TestAmerica, Inc. These manuals are included in Attachment A.

7.3 DATA QUALITY CONTROL

The laboratory will perform in-house analytical data reduction under the direction of the Analytical Laboratory QA Manager. The laboratory data reduction procedures will be those specified in EPA- and Ecology-approved methods and those described in the laboratory procedures delineated in the Laboratory Quality Assurance Plan, provided on compact disc in Attachment A as an accompaniment to this QAPP. The data reduction steps will be documented, signed, and dated by the laboratory. Data reduction will be conducted as follows:

- Raw data produced will be processed and reviewed for compliance with the QC criteria established in this QAPP. The raw data will also be reviewed for overall reasonableness and for transcription or calculation errors.
- After the data have been entered into the Laboratory Information Management System, a computerized report will be generated and sent to the Analytical Laboratory QA Manager.
- The need for any sample re-analysis will be assessed. Upon discovery that an analysis fails to meet the required data quality criteria, the Project QA/QC Officer will be contacted to discuss noncompliant data sets. If corrective actions have been taken and data still do not meet project QA requirements, the Project Manager will be notified.
- Upon acceptance of the preliminary data reports by the analytical laboratory, final analytical reports will be generated. Final data reports will be available within approximately 30 calendar days of sample submittal.

7.3.1 Step II: Validation

The activities to be undertaken to validate the laboratory analytical data generated during the RI are described below.

7.3.1.1 Compliance

The laboratory will assign QC qualifiers (as described and defined in the Laboratory Quality Assurance Plan) if any of the following occurs:

- The concentration of the chemical is below the required reporting limit or above calibration limits;
- The concentration of the chemical is below the required reporting limit but above the method detection limit;
- The chemical is found also in the laboratory blank;
- Spiking analyte recoveries (bias) are outside project-specified control limits (inorganic analyses only);
- Laboratory duplicate precision is outside project-specified control limits (inorganic analyses only); or
- Surrogate recoveries and laboratory duplicate precision are out of control limits for organic analyses.

Other sample-specific qualifiers will be added to describe QC conditions as necessary. The laboratory will maintain detailed procedures for laboratory record-keeping that support the validity of the analytical work completed. Each data report package submitted will contain the laboratory's written certification that the requested analytical method was run and that all QA/QC checks were performed.

The analytical laboratory has the initial responsibility for verifying the correctness and completeness of the data, based on an established set of guidelines and project QC criteria. The following QC elements will be verified:

- Documentation of sampling receipt and handling is complete;
- Sample preparation information is correct and complete;
- Analysis information is correct and complete;
- Raw data, including manual integrations, have been interpreted correctly;
- Appropriate preparation and analysis procedures have been followed;
- Special sample preparation and analytical requirements specific to the Site or project have been met;
- Analytical results have been calculated correctly and are complete;
- QC sample results are within project QC limits;

- Laboratory blanks are within project QC limits; and
- Documentation is complete. All anomalies in preparation and analysis have been documented, holding times have been documented, and all data (including data generated before and after corrective actions or cleanup has been conducted) are included in the laboratory data report.

Qualified laboratory personnel other than the original laboratory analyst will provide an independent peer review of the analytical data package to ensure the following QC elements:

- Appropriate laboratory standard operating procedures have been referenced;
- Calibration data are scientifically sound and appropriate to the method;
- QC sample data are within project-specific limits;
- Qualitative and quantitative results are correct;
- Raw data, including manual interpretations, have been correctly interpreted; and
- Documentation is correct and complete.

7.3.1.2 Comparison

One hundred percent of all laboratory data will receive summary level validation by an independent third part reviewer, Sayler Data Solutions of Bothell, Washington. Data review for this process involves the following steps:

- Assessment of data reliability based on QC sample results;
- Verification that requirements set forth in the project planning documents have been met; and
- Assessment of data usability.

Data review will include evaluation of laboratory summary data for precision, accuracy, representativeness, comparability, and completeness, and a summary of qualified data. Data review will not include review of raw data or recalculation of reported results. The data review summary will provide a list of all samples reviewed, a narrative summarizing each review topic (e.g., calibration, holding times), qualified results, worksheets, and any data resubmitted by the laboratory at the request of the reviewer, including chromatographs.

The data validation process for this project will follow the procedures specified in the EPA (1999, 2004) National Functional Guidelines, modified for the methods used and for project-specific criteria. The review will include verification of the following:

- Compliance with the QAPP;
- Proper sample preservation and handling procedures;

- Holding times;
- Method detection limit and method reporting limit;
- QC results (e.g., surrogate, MS/MSD, and LCS recoveries; MS/MSD, field duplicate, and laboratory duplicate RPDs; serial dilutions);
- Laboratory blank and trip blank analyses;
- Data completeness and format; and
- Data qualifiers assigned by the laboratory.

Qualifiers will be added to data during review as necessary. Qualifiers applied to data as a result of the review will be limited to the following designations:

U = The analyte was analyzed for, but was not detected above the sample-specific reporting limit.

J = The analyte was positively identified, and the associated numerical value is an estimate of the concentration of the analyte in the sample.

UJ = The analyte was not detected above the sample reporting limit. However, the reporting limit is approximate and may or may not represent the actual limit of quantitation.

R = The analyte results are rejected due to serious deficiencies in the ability to analyze the sample and meet QC criteria. The presence or absence of the analyte cannot be verified.

Results of the data review will be included in a data quality review report that will provide a basis for meaningful interpretation of the data quality and will evaluate the need for corrective action and/or comprehensive data validation.

7.3.2 Field Data Verification

Farallon will review field records and results of field observations and measurements to ensure that procedures were properly performed and documented. The review of field procedures will include the following factors:

- Completeness and legibility of field logs;
- Preparation and frequency of field QC samples;
- Equipment calibration and maintenance; and
- Chain of Custody forms.

Corrective actions for procedure violations are described in Section 10, Corrective Action.

7.4 DATA ASSESSMENT PROCEDURES

The Project Manager and Project QA/QC Officer are responsible for data review and validation. Upon receipt of each data package from the laboratory, calculations for precision, accuracy, and completeness will be performed using the equations presented in Section 3, Data Quality Objectives. Results will be compared to quantitative DQOs where established, or to qualitative DQOs. The data validation parameters are outlined in Section 3, Data Quality Objectives.

7.5 QUALITY CONTROL SUMMARY REPORT

A Quality Control Summary Report will be prepared by Farallon based on the QC summary data provided by the laboratory.

8.0 PERFORMANCE AND SYSTEM AUDITS

Performance audits will be conducted for both sampling and analysis work. Field performance will be monitored through regular review of field notebooks, field measurements, and Chain of Custody forms. The Project Manager and/or the Project QA/QC Officer also may perform periodic on-site review of work in progress.

Ecology accreditation of the analytical laboratory for each type of analysis performed demonstrates the laboratory's ability to properly perform the requested methods. Therefore, a system audit of the analytical laboratories will not be conducted during the course of this project.

The Project Manager and/or Project QA/QC Officer will oversee communication with the analytical laboratories frequently while samples are being processed and analyzed at the laboratories. This oversight will allow Farallon to assess progress toward the DQOs and to take corrective measures, if necessary.

The analytical laboratories are responsible for identifying (and correcting, as appropriate) any deviation from performance standards, as discussed in the Laboratory Quality Assurance Manual. The laboratories will communicate to the Project Manager or the Project QA/QC Officer any deviation from the performance standards and the appropriate corrective measures taken during sample analysis. Corrective actions are discussed in Section 10, Corrective Action.

9.0 PREVENTIVE MAINTENANCE

Operation and maintenance manuals will accompany all field parameter analysis and measurement equipment. Included in these manuals will be procedures for calibration, operation, and troubleshooting. Maintenance activities will be documented in the project Field Report forms and/or equipment logbooks. A schedule of preventive maintenance activities will be maintained. In addition, spare parts and tools will be included in each equipment storage case to minimize equipment downtime.

10.0 CORRECTIVE ACTION

Corrective actions will be the joint responsibility of the Project Manager and the Project QA/QC Officer. Corrective procedures may include:

- Identifying the source of the violation;
- Reanalyzing samples if holding time criteria permit;
- Resampling and analyzing;
- Remeasuring the parameter;
- Evaluating and amending sampling and analytical procedures; and/or
- Qualifying data to indicate the level of uncertainty.

During field sampling operations, the Project Manager and field team members will be responsible for identifying and correcting protocols that may compromise the quality of the data. All corrective actions taken will be documented in the field notes.

11.0 QUALITY ASSURANCE REPORTS

Following completion of the summary level data validation, a usability assessment will be performed by the Project QA/QC Officer to ascertain the overall usability of the data. The usability assessment will include a discussion of the analytical program and the QC activities implemented during the field activities.

11.1 DATA LIMITATIONS AND USABILITY ASSESSMENT ACTIONS

The usability assessment will include a review of analytical and field procedures to ascertain the usability of the data, based on the five data quality indicators (i.e., precision, accuracy, representativeness, comparability, and completeness,). If deficiencies are identified during the usability assessment, project personnel will ascertain if data are usable, or if re-sampling or re-analysis is required to meet project goals.

11.2 ACTIVITIES

A variety of parameters will be used to ascertain whether project data are usable. Parameters include but are not limited to deviations in sampling locations, chain of custody, holding times, damaged samples, and QC samples. Deviations from the QAPP and their effect on DQOs will be documented in the RI Report.

Farallon will verify that the historical data has been validated in accordance with the protocols presented in this QAPP. If it is not certain that the historical data has been validated, then the data will be reviewed by the independent third party reviewer.

TABLES

QUALITY ASSURANCE PROJECT PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

Table 1
Summary of Laboratory Analyses by Media and Test Method
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-006

Groundwater - Reconnaissance Sampling - Tier 1 and Tier 2		
Halogenated Volatile Organic Carbons (HVOCs)	Tetrachloroethene	EPA 8260B
	Trichloroethylene	
	cis-1,2-Dichloroethene	
	trans-1,2-Dichloroethene	
	Vinyl Chloride	
Groundwater - Monitoring Well Sampling		
HVOCs	Tetrachloroethene	EPA 8260B
	Trichloroethylene	
	cis-1,2-Dichloroethene	
	trans-1,2-Dichloroethene	
	Vinyl Chloride	
	1,4-Dioxane	EPA 8270C modified
	Manganese	EPA 6010B
	Iron	
Monitored Natural Attenuation Parameters	Alkalinity	EPA 310.2
	Sulfate	EPA 375.4
	Sulfide	EPA 376.1
	Nitrate	EPA 353.2
	Nitrite	
	Total Organic Carbon	EPA 415.1
	Ferrous and Ferric Iron	SM3500-FeB, 6010B
	Methane	Gas Chromatograph/Flame Ionization Detection
	Ethane	
	Ethene	
Soil - Reconnaissance Sampling - Tier 1		
HVOCs	Tetrachloroethene	EPA 8260B
	Trichloroethylene	
	cis-1,2-Dichloroethene	
	trans-1,2-Dichloroethene	
	Vinyl Chloride	
	TOC (includes Tier 1 and Tier 2)	EPA 415.1 - Plumb 1981

NOTES:

EPA = U.S. Environmental Protection Agency

Table 2
Laboratory Reporting Limits and Cleanup Levels
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Analyte	Analytical Method	Laboratory Soil PQL (mg/kg)	Laboratory Water PQL (µg/l)	Screening Levels for Soil [1] (mg/kg)	Screening Levels for Water [1] (µg/l)		
					Water Table Zone	Shallow Zone	Intermediate Zone
Tetrachloroethene	EPA 8260B	0.001	0.20	0.0031	0.17	0.17	0.17
Trichloroethene	EPA 8260B	0.001	0.20	0.0028	0.404	0.654	0.654
cis-1,2-Dichloroethene	EPA 8260B	0.001	0.20	0.00993	72.7	137	137
trans-1,2-Dichloroethene	EPA 8260B	0.001	0.20	0.00969	65.3	1,403	1,403
Vinyl Chloride	EPA 8260B	0.001	0.20	0.005	1.28	1.69	1.69
1,4-Dioxane	EPA 8270C Modified	--	1	--	78.7	78.7	78.7
Manganese	EPA 6010B	--	11	--	100	100	100
Iron	EPA 6010B	--	110	--	1,000	1,000	1,000
Alkalinity	EPA 310.2	--	20,000	--	--	--	--
Sulfate	EPA 375.4	--	5,000	--	--	--	--
Nitrate	EPA 353.2	--	50	--	--	--	--
Nitrite	EPA 353.2	--	50	--	--	--	--
Total Organic Carbon	Plumb 1981 - EPA 415.1	200	1500	--	--	--	--
Ferrous and Ferric Iron	SM3500-FeB, 6010B	--	0.04	--	--	--	--
Methane	GC/FID	--	0.50	--	--	--	--
Ethane	GC/FID	--	0.50	--	--	--	--
Ethene	GC/FID	--	0.50	--	--	--	--

NOTES:

[1] The basis for screening levels for soil and water are are presented in the Remedial Investigation Work Plan.
EPA = U.S. Environmental Protection Agency
GC/FID = gas chromatograph/flame ionization detection
mg/kg = milligrams per kilogram
µg/l = micrograms per liter
PQL = practical quantitation limit

Table 3
Laboratory Quality Assurance/Quality Control Limits for Surrogates
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

	Water		Soil	
Analyte	**Lower Control Limit Percent**	**Upper Control Limit Percent**	**Lower Control Limit Percent**	**Upper Control Limit Percent**
Volatile Organic Compounds				
Dibromofluoromethane	71	116	70	118
4-Bromofluorobenzene	70	123	70	130
Toluene-d_8	76	116	70	121
1,4-Dioxane				
1,4 Dioxane-d_8	20	125	--	--

NOTES:
Only surrogates applicable to the analyte list will be quantitated for a given sample.

Table 4
Laboratory Control Standard Limits
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

		Reconnaissance and Monitoring Well Groundwater			Soil		
Analyte	**Analytical Method**	**Lower Control Limit Percent**	**Upper Control Limit Percent**	**Relative Percent Difference**	**Lower Control Limit Percent**	**Upper Control Limit Percent**	**Relative Percent Difference**
Benzene	EPA 8260B	70	130	16	70	128	12
Trichloroethene		70	116	16	73	121	17
Toluene		76	119	15	74	122	14
Chlorobenzene		77	112	15	76	115	13
1,4-Dioxane	EPA 8270C Modified	75	125	20	--	--	--
Manganese	EPA 6010B	80	120	20	--	--	--
Iron		80	1120	20	--	--	--
Alkalinity	EPA 310.2	70	130	8	--	--	--
Sulfate	EPA 375.4	92	116	10	--	--	--
Nitrate	EPA 353.2	86	114	28	--	--	--
Nitrite		79	128	13	--	--	--
Total Organic Carbon	EPA 415.1 - Plumb 1981	75	125	20	75	125	--
Ferrous and Ferric Iron	SM3500-FeB, 6010B	75	125	20	--	--	--
Methane	GC/FID	70	130	25	--	--	--
Ethane		70	130	25	--	--	--
Ethene		70	130	25	--	--	--

NOTES:
EPA = U.S. Environmental Protection Agency
GC/FID = gas chromatograph/flame ionization detection

Table 5
Matrix Spike/Matrix Spike Duplicate Control Limits
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

		Reconnaissance and Monitoring Well Groundwater			Soil		
Analyte	**Analytical Method**	**Lower Control Limit Percent**	**Upper Control Limit Percent**	**Relative Percent Difference**	**Lower Control Limit Percent**	**Upper Control Limit Percent**	**Relative Percent Difference**
Benzene	EPA 8260B	70	130	11	70	130	17
Trichloroethene	EPA 8260B	77	114	10	70	124	11
Toluene	EPA 8260B	79	121	11	70	130	16
Chlorobenzene	EPA 8260B	77	108	10	72	127	15
1,4-Dioxane	EPA 8270C Modified	75	127	25	--	--	--
Manganese	EPA 6010B	75	125	20	--	--	--
Iron	EPA 6010B	75	125	20	--	--	--
Alkalinity	EPA 310.2	70	130	8	--	--	--
Sulfate	EPA 375.4	88	111	10	--	--	--
Nitrate	EPA 353.2	81	119	28	--	--	--
Nitrite	EPA 353.2	78	131	13	--	--	--
Total Organic Carbon	EPA 415.1 - Plumb 1981	75	125	20	75	125	20
Ferrous and Ferric Iron	SM3500-FeB - 6010B	75	125	20	--	--	--
Methane	GC/FID	--	--	--	--	--	--
Ethane	GC/FID	--	--	--	--	--	--
Ethene	GC/FID	--	--	--	--	--	--

NOTES:
Highlighted cells contain relative percent difference values for duplicate samples.

Table 6
Container, Preservation and Holding Time Requirements
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Reconnaissance and Monitoring Well Groundwater					
Analyte	**Method**	**Container[1]**	**Number of Containers**	**Preservation Requirements**	**Holding Time**
Tetrachloroethene	EPA Method 8260B	40 ml VOA vial	3	4°C, HCl to pH<2, no head space	14 days
Trichloroethene					
cis-1,2-Dichloroethene					
trans-1,2-Dichloroethene					
Vinyl Chloride					
1,4-Dioxane	EPA Method 8270C Modified	1 liter amber	2	4°C	7days/40 days
Manganese	EPA Method 6010B	500 ml HDPE	1	4°C, nitric acid to pH<2	6 months
Iron					
Alkalinity	EPA Method 310.2	500 ml HDPE	1	4°C	14 days
Nitrate	EPA Method 353.2				48 hours
Nitrite	EPA Method 353.2				48 hours
Sulfide	EPA Method 376.1	500 ml HDPE	1	2N zinc acetate; NaOH to pH>9	7 days
Total Organic Carbon	EPA Method 415.1	250 ml HDPE	1	4°C, sulfuric acid to pH<2	28 days
Ferrous and Ferric Iron	SM 3500-FEB/6010B	250 ml amber/500 ml HDPE	1/1	4°C, HCl/nitric acid to pH<2	0/180
Methane	Gas Chromatograph/Flame Ionization Detection	40 ml VOA vial	3	4°C, HCl to pH<2, no head space	14 days
Ethane					
Ethene					
Soil					
Tetrachloroethene	EPA Methods 5035A, 8260B	4 oz clear wide mouth	1	4°C	14 days; 5035A vials - 48 hours to preserve or freeze
Trichloroethene					
cis-1,2-Dichloroethene		5035A VOA vial	1		
trans-1,2-Dichloroethene					
1,1-Dichloroethene		5035A VOA vial with stir bar	2		
Vinyl Chloride					
TOC	EPA 415.1 - Plumb 1981	4 oz. clear wide mouth	1	4°C	28 days

NOTES:
[1]All glass sample containers will have Teflon-lined lids
°C = degrees Celsius
EPA = U.S. Environmental Protection Agency
HCl = hydrochloric acid
HDPE = high density polyethylene
ml = milliliter
oz = ounce
TOC = total organic carbon
VOA = volatile organic analysis

Table 7
Sample Summary by Media
Quality Assurance Project Plan
Capital Industries
Seattle, Washington
Farallon PN: 457-004

Sampling Media	Analytical Group	Number of Samples (identify field duplicates)			Laboratory Quality Control Samples		
		Primary	Duplicate	Trip Blank	Matrix Spike	Matrix Duplicate	Rinsate Blank
Reconnaissance Soil	HVOCs - Tier 1	9	NA	1 trip blank per cooler . Analyze 10 %	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less
	TOC - Tier 1	12	1	1 trip blank per cooler . Analyze 10 %	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less
	TOC - Tier 2	6	1	1 trip blank per cooler . Analyze 10 %	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less
Reconnaissance Groundwater	HVOCs - Tier 1	192	20	1 trip blank per cooler . Analyze 10 %	10 - 1 per batch of 20 samples or less	10 - 1 per batch of 20 samples or less	10 - 1 per batch of 20 samples or less
	HVOCs - Tier 2	96	10	1 trip blank per cooler . Analyze 10 %	5- 1 per batch of 20 samples or less	5- 1 per batch of 20 samples or less	5 - 1 per batch of 20 samples or less
Monitoring Well Installation Soil	HVOCs	To be determined	10% of samples of primary samples	1 trip blank per cooler . Analyze 10 %	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less	1 - 1 per batch of 20 samples or less
Monitoring Well Groundwater	HVOCs, 1,4-Dioxane, Manganese, Iron, Monitored Natural Attenuation Parameters	To be determined	10% of samples of primary samples	1 trip blank per cooler . Analyze 10 %	1 per batch of 20 samples or less	1 per batch of 20 samples or less	1 per batch of 20 samples or less

NOTES:

HVOCs = halogenated volatile organic carbon NA = not applicable TOC = total organic carbon

ATTACHMENT A
LABORATORY QUALITY ASSURANCE MANUALS
ONSITE ENVIRONMENTAL, INC.
TESTAMERICA, INC.

QUALITY ASSURANCE PROJECT PLAN
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-004

QUALITY ASSURANCE MANUAL

Revision No. 9.1
January 28, 2004

OnSite Environmental Inc.
14648 NE 95th Street
Redmond, Washington 98052
(425) 883-3881

Approved By: _____

Kelley Wilt
Laboratory QA/QC Officer

Date

Approved By: _____

Karl Hornyik
Laboratory Manager

Date

Approved By: _____

Robert Wallace
President/Technical Director

Date

Copy No.: _____

Issued To: _____

Date Issued: _____

Revision History

Origination Date: **Unknown**

Revisions 1.0 through 8.0
The status of the electronic files and originals of these versions is unknown.

Revision 8.1 (February 26, 2002)
A copy of this revision is filed in the QA/QC files. The electronic copy is on the server and has been backed up.

Revision 9.0 (August 28, 2003)
The Quality Assurance Manual underwent significant major upgrade in response to an EPA review, which noted many deficiencies in the document. The NELAC Manual was used to insure the Quality Assurance Manual more fully addressed the issues that regulators and clients would be looking for in our Quality Assurance Manual and to anticipate possibly getting accredited under NELAC in the near future.

Revision 9.1 (January 28, 2004)
The Quality Assurance Manual underwent the annual review. The organization chart, instrument list, and SOP list were updated to reflect changes since the last revision.

Table of Contents

Appendices

1.0 Quality Assurance Policy and Objectives

1.1 Mission Statement

OnSite Environmental Inc. provides high quality and timely chemical analyses to primarily environmental, engineering and industrial clients.

1.2 Core Values

At OnSite Environmental Inc. we hold the following principles and values to be the most important, and we consider these values in making decisions in our business:

- Honesty
- Safety of our employees and community
- Good science
- Fairness, and
- Quality

1.3 Ethics Policy

Ethics is a set of moral principles, a code of right and wrong, or behavior that conforms to accepted professional practices.

Fraud is an intentional act of deceit that may result in legal prosecution. Unethical actions become fraudulent when a law is violated. For example, it is unethical to change the acquisition date of a file for a chromatogram to meet holding times. It becomes fraud when the results are mailed or faxed to the client (wire fraud or mail fraud).

All employees at all times shall conduct themselves in an honest and ethical manner. Compliance with this policy will be strictly enforced. Unethical behavior is grounds for immediate termination.

Examples of unethical behavior include, but are not limited to the following:

- Artificially fabricating results
- Misrepresenting data such as peak integration, calibration, tuning, or system suitability
- Improper clock settings to meet holding times
- Intentional deletion of non-compliant data
- Improper manipulation of data or software
- Improper handling of data errors, non-compliant data, or QC outliers
- Lack of reporting unethical behavior by others

An employee must report any suspected unethical behavior or fraudulent activities to one of the following management representatives: Robert Wallace, Technical Director; Karl Hornyik, Laboratory Manager; or Kelley Wilt, Laboratory QA/QC Officer. If an employee wishes to remain anonymous, they may choose to describe the situation in an unsigned note to one of the above representatives. If the facts of the case are not clear after an investigation, a committee of senior employees may be asked to investigate the situation further and offer an opinion to the owners of the corporation.

1.4 Standards of Conduct

Our standards are those generally expected of employees in any professional business organization. Employees engaged in any of the following activities, or others deemed equally serious, will forfeit all benefits of employment:

- Theft or embezzlement
- Willful violation of safety or security regulations
- Conviction of a felony
- Working for a competitor
- Establishing a competing business
- Being intoxicated or under the influence of drugs or alcohol while at work
- Possession of drugs on the job
- Falsification of records
- Abuse, destruction, waste or unauthorized use of equipment, facilities or materials
- Gambling while on premises
- Chronic tardiness or absenteeism
- Breech of company or client confidentiality

This list of offenses is to highlight general company expectations and standards and does not include all possible offenses or types of conduct that will result in discipline or discharge. Management reserves the absolute right to determine the appropriate degree of discipline, including discharge, warranted in individual cases.

There may be no alcoholic beverages on the company premises, other than at times designated as company functions. At such times, non-alcoholic beverages will be provided as well.

Company policy requires employees to have no relationships or engage in any activities that might impair their independence or judgement. Employees must not accept gifts, benefits or hospitality that might tend to influence them in the performance of their duties. It is expected that there will be no employment by any competing company, nor any employment by any outside interest or engaging in any outside activity that might impair an employee's ability to render full time service to OnSite Environmental Inc.

1.5 Confidentiality

During the course of business, employees are privy to data or information considered confidential or proprietary by our clients. This information includes, but is not limited to, test results, origin of samples, business relationship with client, any procedures and processes that they conduct or investigate, information about their business, our own laboratory procedures, and clients. All such information is kept strictly confidential and discussed only with corporate officers for the client's company. **The information will not be discussed with anyone**, even those within the client's company not designated as a contact, without prior permission from the client.

We are often contacted by government agencies or consultants hired by our clients. Without express permission, we only discuss the test methods or QC limits, and then solely if it is obvious from the conversation that the caller has a copy of the original report. Any discussion of the information listed in the above paragraph requires written permission from the designated contact. Permission by the designated contact may be granted by phone and should be followed in writing.

1.6 Complaint Resolution

Anytime a serious complaint is received, it is recorded in a permanent record so it can be tracked to insure resolution and brought to the attention of management.

A serious complaint is one that questions the validity of our results. Standard Operating Procedure 1.13 addresses the steps taken to document and resolve the complaint. In general, the nature of the complaint is documented and then given to the President or Technical Director. Someone is assigned to resolve the issues. The progress of the complaint is tracked during weekly staff meetings. Finally, after resolution, the complaint is fully documented and kept in the Laboratory QA/QC Officer's files for future reference.

1.7 Objectives

The overall objective of the quality assurance program for OnSite Environmental Inc. is to provide legally defensible analytical data that meet or exceed customer and regulatory requirements. To accomplish this, the following are done.

- Maintain appropriate chain of custody of samples submitted to the laboratory.
- Maintain an effective, on-going quality control program to measure and verify laboratory performance.
- Monitor daily operational performance of the laboratory and provide timely corrective action for out of control events.
- Track corrective actions for resolution and appropriateness.
- Meet data requirements for accuracy, precision and completeness.
- Maintain traceability of measurements.
- Maintain complete records of data and reports generated by the laboratory.
- Provide sufficient flexibility to allow controlled changes in routine methods and Standard Operating Procedures to meet specific client data quality objectives.
- Maintain a data review process.
- Train employees in good analytical technique and in requirements of Standard Operating Procedures they are responsible to perform.

In order to facilitate these objectives, OnSite Environmental Inc. uses four controlled types of documents to establish the steps necessary to achieve these objectives.

Quality Assurance Manual (QAM) -- The primary Quality Control/Quality Assurance document for the laboratory is the Quality Assurance Manual. This manual provides an overview of the entire quality assurance program for OnSite Environmental Inc. The President/Technical Director, Laboratory Manager and Laboratory QA/QC Officer must approve the Quality Assurance Manual. The Quality Assurance Manual will be reviewed and revised, if necessary, at least annually.

Standard Operating Procedures (SOP) – Standard Operating Procedures document in sufficient detail the steps necessary to reproduce specific tasks within the laboratory. They are written to insure consistency from employee to employee and from day to day. They also serve as excellent training and reference documents for new employees. The author of the SOP, the Laboratory Manager and the Laboratory QA/QC Officer must approve Standard Operating Procedures. Each SOP will be reviewed and revised, if necessary, at least annually.

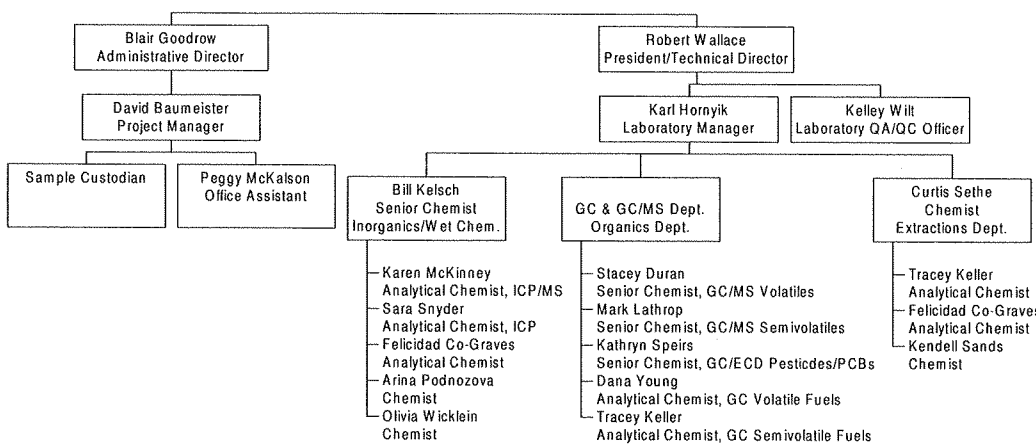
Laboratory Notebooks – Laboratory notebooks are used to document critical measurements and information such as sample weights, sample volumes, extract final volumes, dilutions, standard preparations, instrument maintenance, refrigerator, pipette and balance calibration and verification activities etc. These bound notebooks are controlled documents that are tracked by the Laboratory QA/QC Officer. The procedure for controlling, maintaining and reviewing Laboratory Notebooks can be found in Standard Operating Procedure 1.01.

Quality Assurance Project Plans (QAPP) – These documents are typically created and provided by our clients. These documents may detail specific data quality objectives that are to be met for a specific client project. Since these data quality objectives may differ from what is internally defined by OnSite Environmental's QA/QC program, it is absolutely required that the QAPP be submitted to OnSite Environmental Inc. for approval before work is started at the laboratory so that we can determine if the data quality objectives can be met and what, if any, changes need to be made in our Standard Operating Procedures, QA/QC program or reporting process to achieve these data quality objectives. OnSite Environmental Inc. will not be responsible for external data quality objectives that are not achieved unless we have approved a written QAPP prior to the beginning of the project. **Clients that submit work to us without an approved written QAPP specifically agree to the data quality objectives specified by OnSite Environmental's internal QA/QC program.**

2.0 Organization and Personnel

2.1 Organization

The organization of the laboratory personnel is organized in the following manner:



2.2 Job Descriptions and Quality Assurance Responsibilities

The following positions are presently defined at OnSite Environmental Inc. Resumes of the key management positions can be found in Appendix A. Although the minimum requirements are desirable, equivalent education, experience or demonstrated transferable skills may be substituted for the requirements at the discretion of the Technical Director.

President/Technical Director

Requires a minimum of a BA or BS in chemistry or related scientific field and at least eight years of laboratory experience. Management experience is highly desirable.

The Technical Director is ultimately responsible for the entire laboratory and the implementation of the quality assurance program.

The Technical Director shall certify that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited. Such information shall be documented.

Administrative Director

Requires a minimum of a BA or BS, preferably in chemistry or other scientific field, and at least three years of management experience.

The Administrative Director is responsible for the front office activities, which include:

- Client services
- Payroll
- Personnel
- Purchasing
- Accounts payable
- Accounts receivable
- Contract administration.

Laboratory Manager

Requires a minimum of a BA or BS in chemistry or related scientific field and at least five years of laboratory experience at the analyst level. Management experience is highly desirable. The Laboratory Manager reports directly to the President/Technical Director.

The Laboratory Manager is responsible for:

- Manage and help laboratory staff with production issues such as work schedules, workloads, instrument troubleshooting, and reporting of data.
- Implement and supervise the quality assurance program.
- Supervise and maintain the data review processes.
- Perform Tier II data reviews.
- Train staff.

Laboratory QA/QC Officer

Requires a minimum of a BA or BS in chemistry or related scientific field and at least four years of laboratory experience at the analyst level. Experience in data validation, statistics or previous QA/QC experience is highly desirable. The Laboratory QA/QC Officer reports directly to the President/Technical Director.

The Laboratory QA/QC Officer shall:

- Serve as the focal point for QA/QC and be responsible for the oversight and review of quality control data.

- Have functions independent from laboratory operations for which one has quality assurance oversight.
- Be able to evaluate data objectively and perform assessments without outside (e.g., managerial) influence.
- Have documented training and experience in QA/QC procedures.
- Have a general knowledge of the analytical test methods for which data review is performed.
- Arrange internal laboratory audits at least annually.
- Arrange for performance evaluations and maintaining accreditations.
- Notify laboratory management of deficiencies in the quality assurance program and monitor corrective action.
- Maintain QA/QC documents and reports.
- Monitor complaints and corrective actions for resolution.
- Assist Laboratory Manager with Tier II data reviews.

Project Manager

Requires a minimum of a BA or BS, preferably in chemistry or other scientific field, and at least one year of laboratory experience at the analyst level. The Project Manager reports directly to the Administrative Director except for technical issues, which should be directed to the Technical Director, Laboratory Manager and/or Laboratory QA/QC Officer as appropriate.

Typical duties of the Project Manager include:

- Work with clients on establishing the analytical scope of each client project.
- Review client data quality objectives to make sure we can meet them.
- Initiate specialized work plans for projects under QAPP guidance.
- Supervise the purchasing, preservation and shipment of bottles and containers for client projects.
- Supervise the Sample Custodian in receiving and maintaining proper chain of custody procedures of incoming samples.
- Coordinate sample testing within holding time and turn around time restrictions within the laboratory.
- Coordinate subcontracting of analytical work to other laboratories.
- Perform Tier III data reviews.
- Coordinate preparation of preliminary and final reports and electronic data deliverables.

Senior Chemist

Requires a minimum of a BA or BS, preferably in chemistry or other scientific field, and at least three years of laboratory experience at the analyst level. Experience and training may be substituted for educational requirements. Senior Chemists report directly to the department supervisor or the Laboratory Manager.

Senior Chemists duties include:

- Help extract or digest samples.
- Maintain and calibrate instruments.
- Prepare and analyze samples.
- Process and report data.
- Document non-conformances.
- Perform Tier I and Tier II data reviews.

- Troubleshoot and repair analytical equipment.
- Develop new methods.

Analytical Chemist

Requires a minimum of a BA or BS, preferably in chemistry or other scientific field, and at least one year of laboratory experience. Experience and training may be substituted for educational requirements. Analytical Chemists report to their department supervisor or to the Laboratory Manager in the absence of a department supervisor.

Analytical Chemists duties include:

- Help extract or digest samples.
- Maintain and calibrate instruments.
- Prepare and analyze samples.
- Process and report data.
- Perform Tier I data reviews.
- Document non-conformances.

Chemist

Requires a minimum of a high school diploma and preferably at least one year of college chemistry. Chemists report to the department supervisor or to the Laboratory Manager in absence of a department supervisor.

Chemist duties typically include:

- Extract or digest samples.
- Maintain and calibrate instruments.
- Prepare and analyze samples.
- Process and report data.
- Perform Tier I data reviews.
- Document non-conformances.

Sample Custodian

Requires a minimum of a high school diploma. The Project Manager supervises the Sample Custodian.

Sample Custodian duties include:

- Log in samples maintaining proper chain of custody protocols.
- Document non-conformances.
- Maintain sample storage facilities.
- Coordinate sample disposal.
- Pack and ship sample containers to clients.
- Assist Project Manager and Administrative Director in their duties.

Office Assistant

Requires a minimum of a high school diploma. The Project Manager supervises the Office Assistant.

Office Assistant duties include:

- Create reports from submitted sample data.
- Assist Project Manager and Administrative Director in their duties.

2.3 Personnel Training

OnSite Environmental Inc. has a formal training program covered in Standard Operating Procedure 1.06. In general, employees are familiarized with the Quality Assurance Manual, the Health and Safety Manual, the Employee Manual, and the Standard Operating Procedures they are expected to perform. A tour of the laboratory is given with attention given to the safety features of the laboratory such as fire extinguishers, first aid kits, eye wash stations, spill kits, fire escapes, etc.

Training in first aid and CPR is offered to the employees occasionally to make sure most employees have current certifications.

A training record is kept for each employee documenting when and what training has been received by the employee and by whom the training was given.

Each chemist must also pass a Demonstration of Capability procedure to document that they can achieve acceptable precision and accuracy from their technique with each of the technical Standard Operating Procedures they perform.

Employees are encouraged to attend external training courses to further their knowledge of analytical chemistry. Employees should contact the Technical Director for what steps they need to take to coordinate time off and reimbursement if the suggestion is approved.

2.4 Quality Assurance Document Control, Distribution and Revision

The Quality Assurance Manual, Standard Operating Procedures and Laboratory Notebooks are controlled documents. The revision history and distribution of these documents must be recorded using the Standard Operating Procedure 1.07 used to control documents. The Laboratory QA/QC Officer is responsible for document control.

Uncontrolled versions of these documents are acceptable but the distribution and revision distributed must also be documented as discussed in SOP 1.07. Only the Technical Director, Laboratory Manager and Laboratory QA/QC Officer may authorize the release of controlled documents.

Standard Operating Procedure 1.00 details the process required to create, review, revise, promulgate, retire and archive Standard Operating Procedures.

Standard Operating Procedure 1.01 details the process required to create, promulgate and archive Laboratory Notebooks and to do a QA/QC review of their contents.

The Quality Assurance Manual and appropriate Standard Operating Procedures are distributed by the Laboratory QA/QC Officer to each department for access by all employees.

2.5 Quality Assurance Assessments

2.5.1 Internal Audits

The Laboratory QA/QC Officer manages internal audits at two levels. A monthly audit is performed using Standard Operating Procedure 1.14 and an annual audit is performed using Standard Operating Procedure 1.15.

In general, the monthly audit consists of a random 10% QA/QC review of the reports generated from the previous month. Spot checks on these reports generally focus on issues related to the normal production procedures associated with the processing of samples within the laboratory such as:

- Check in and acceptance of sample into laboratory
- Storage temperature and location of client samples
- Sample extraction SOPs followed correctly
- Samples analyzed using correct SOP procedures
- Initial Calibration, Initial Calibration Verification and Continuing Calibration Verifications performed properly
- Quality Control limits met for precision and accuracy
- Non-conformances documented properly
- Corrective actions on non-conformances appropriate
- Data review process followed
- Raw and electronic data properly documented, gathered and archived
- Report generated correctly and without transcription errors
- Case narrative included and adequately addresses any issues with data

A report of any deficiencies and issues found during the audits will be submitted to the Technical Director, Administrative Director, Laboratory Manager and Project Manager. A copy of the report will be maintained in the Laboratory QA/QC Officer's files. The Laboratory Manager is required to address any deficiencies and document their resolution.

The annual audit is a more thorough look at all QA/QC operations for the laboratory. This audit is to occur in January of each year following Standard Operating Procedure 1.15. Following the audit, the Laboratory QA/QC Officer shall prepare a report summarizing the results of the annual audit and the monthly audits from the previous year. The report will be presented to management for the management review process.

2.5.2 Managerial Review

In February of each year, the Technical Director, Administrative Director, Laboratory Manager, Laboratory QA/QC Officer and Project Manager will hold a meeting to conduct a review of its quality system and its testing and calibration activities to ensure its continuing suitability and effectiveness and to introduce any necessary changes or improvements in the quality system and laboratory operations. The review shall take account the outcome of recent internal audits, performance audits, any changes in the volume and type of work undertaken, feedback from clients, corrective actions and other relevant factors. This procedure is covered in more detail in Standard Operating Procedure 1.16. The results from this meeting shall be documented and a copy of the report shall be kept in the Laboratory QA/QC Officer's files. The Laboratory Manager is required to address and document the resolution of any deficiencies.

2.5.3 Performance Audit

Performance audits are typically performed as part of the accreditation process. The audit can include three different activities including performance evaluation samples, reviews of QA/QC documents such as the Quality Assurance Manual and Standard Operating Procedures and onsite audits by the accrediting authority. The Technical Director, Laboratory Manager or Laboratory QA/QC Officer may also order a single blind or double blind performance evaluation if they feel it would be helpful in identifying QA/QC problems within the laboratory. The performance audit process is covered in Standard Operating Procedure 1.17. The report of any performance audits shall be kept in the QA/QC Officer's files and the Laboratory Manager is required to address and document the resolution of any deficiencies.

2.5.4 Audit Review/Corrective Actions

The review and corrective action process is included as part of the Internal Audit, Management Review and Performance Audit Standard Operating Procedures 1.15, 1.16 and 1.17. Standard Operating Procedure 1.18 details the process for documenting non-conformances and the associated corrective action.

3.0 Facilities and Equipment

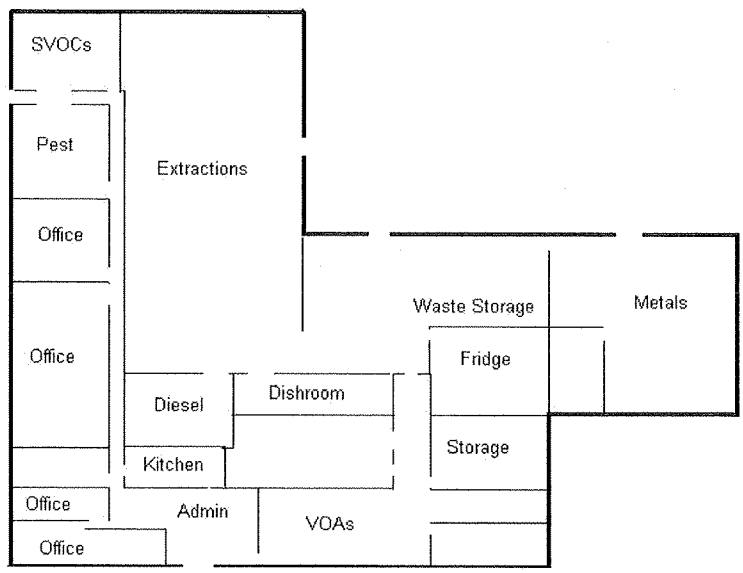
3.1 Facility Description

OnSite Environmental Inc. is located at 14648 NE 95th Street, Redmond, Washington 98052. This facility supports all normal laboratory operations.

The volatiles department has its own HVAC system that is independent from the extractions lab, semivolatiles labs and inorganic lab.

Zoned heating and air-conditioning maintain temperature within the laboratory. Temperature is generally set for employee comfort at normal room temperature of 68-72 °F. If a specific test method requires a controlled temperature, humidity or other environmental control, such controls can be found in the individual test Standard Operating Procedure.

Floorplan



3.2 Instrumentation and backup alternatives

All GC and GC/MS departments have back-up instrumentation. The metals department uses the ICP/MS to backup all functions of the ICP. The ICP can partially backup the ICP/MS; however, it cannot achieve the ultra low detection limits of this instrument.

GC Volatiles

Daryl:
GC Serial #3235A46317
Hewlett Packard 5890 Series II GC/PID/FID
Tekmar/Hewlett Packard 2032 Automatic Liquid Sampler
Tekmar Liquid Sample Concentrator 2000

Hope:
GC Serial #3203A40474
Hewlett Packard 5890A Series II GC/PID/FID
Varian Archon Autosampler
Tekmar Liquid Sample Concentrator 2000

GC/MS Volatiles

Albert:
GC Serial #3336A57367
MS Serial #3440A02022
Hewlett Packard 5890 Series II plus Gas Chromatograph
Hewlett Packard 5972A Mass Spectrometer
Varian Archon Autosampler
Hewlett Packard Liquid Sample Concentrator

Jessie:
GC Serial #US00033566
MS Serial #US94260049
Hewlett Packard 6890A Gas Chromatograph
Hewlett Packard 5973N Mass Spectrometer

Varian Archon Autosampler
Tekmar/Dohrmann Liquid Sample Concentrator 3100

GC Semivolatiles

Lucy: GC Serial #3235A45841
Hewlett Packard 5890 Series II GC/FID/FID
Dual Hewlett Packard Autosamplers

Isaac: GC Serial #2728A13937
Hewlett Packard 5890 GC/FID/FID
Dual Hewlett Packard Autosamplers

GC/MS Semivolatiles

Ralph: GC Serial #3336A55281
MS Serial #3434A01677
Hewlett Packard 5890 Series II plus Gas Chromatograph
Hewlett Packard 5972 Mass Spectrometer
Hewlett Packard Autosampler

Corey: GC Serial #US00007773
MS Serial #US82321650
Hewlett Packard 6890 Gas Chromatograph
Hewlett Packard 5973 Mass Spectrometer
Hewlett Packard Autosampler

GC/ECD

George: GC Serial #3140A39359
Hewlett Packard 5890 Series II Gas GC/ECD/ECD
Hewlett Packard Autosampler

Frank: GC Serial #US92305459
Hewlett Packard 6890 plus GC/ECD/ECD
Hewlett Packard Autosampler

Inorganics/Wet Chemistry

Phoenix (ICP) ICP Serial #ELO3068480
Varian Vista-MPX
Varian SPS-5 Autosampler

Elan (ICP/MS): ICP/MS Serial #0779906
Perkin Elmer Elan 6100 ICP/MS
Perkin Elmer AS90/91 Autosampler

Grandma (CVAA): AA Serial #128132
Perkin Elmer 2380 Atomic Absorption Spectrophotometer

Aquamate UV/VIS Spectrophotometer Serial #AQA 113606
Thermo Spectronic Helios Aquamate

3.3 Maintenance Activities

Preventative maintenance is an important part of a Quality Assurance Program. Maintenance activities are all described in their respective Standard Operating

Procedures for the following equipment:

Refrigerator Maintenance	8.01
Pipette Calibration	8.03
Thermometer Calibration	8.04
Balance Calibration	8.05
Sonicator Calibration	8.08
Microwave Calibration	8.09
DI Water System Maintenance	8.10
Laboratory Maintenance	8.13
Glassware Cleaning and Washing	8.14
Oven Maintenance	8.15

4.0 Sample Processing

4.1 Sample Receiving and Storage

When samples arrive in the laboratory, the Sample Custodian logs the samples into the laboratory using Standard Operating Procedure 1.02. The Sample Custodian works closely with the Project Manager to make sure the analysis plan meets the customer requirements and that any special requirements detailed in a client quality assurance project plan are met and conveyed to the rest of the laboratory. This procedure includes the following steps:

- Verify samples for damage and proper preservation and temperature
- Verify samples arrived within acceptable holding time
- Verify the sample labels match the chain of custody
- Verify that the samples meet the acceptance policy of the laboratory
- Assign a project number to the sample group
- Assign a sample identification number to each sample and labels each sample
- Log the required information into a sample notebook for record keeping
- Complete and sign the chain of custody and creates a project file
- Document any non-conformances found
- Store samples in the proper refrigerators
- Complete and distribute the paperwork required for each testing protocol
- Prepare documents and shipments of samples to be subcontracted

Evidence of collection, shipment, receipt and laboratory custody until disposal must be documented. Documentation is accomplished by means of a chain of custody record that records each sample and the individuals responsible for sample collection, shipment and receipt. A sample is considered to be in custody if it is:

- In a person's actual possession
- In view after being in a person's actual possession
- Locked or sealed to prevent tampering
- In a secured area accessible only to authorized personnel

OnSite Environmental Inc. refrigerators and laboratory space are considered a secured area thus chain of custody is considered to be maintained the entire time they are stored and processed while at our facility. This procedure is adequate and acceptable for the vast majority of our clients.

Some quality assurance project plans require a much stricter custody procedure. In such cases, the samples will be stored in locked refrigerators maintained by assigned sample custodians. Employees will have to obtain the samples from the sample custodian and sign for the samples. The employee will return the sample to the sample custodian immediately after using the sample unless it is to be consumed in analysis. Sample extracts will also be kept in locked refrigerators and the sample custodian will release them to the chemist when they are ready to analyze the sample extract. This procedure is detailed in Standard Operating Procedure 1.03.

4.2 Sample Preparation

The actual sample preparation steps are provided in the Standard Operating Procedure for each analytical method. The extraction and digestion departments also are careful to document proper chain of custody and non-conformances as the samples are being processed. The organic extraction and inorganic digestion departments maintain the following Standard Operating Procedures to maintain consistency in the actual practices they use to prepare samples:

Organic Extraction Department

♦ Separatory Funnel Water Extractions	Method 3510C	SOP 3.08
♦ Ultrasonic Soil Extractions	Method 3550B	SOP 3.07
♦ Waste Dilution	Method 3580A	SOP 3.06
♦ Acid Cleanup	Method 3665A	SOP 3.00
♦ Silica Gel Cleanup	Method 3630C	SOP 3.03
♦ Florisil Cleanup	Method 3620B	SOP 3.01
♦ Alumina Cleanup	Method 3611B	SOP 3.02
♦ Sulfur Cleanup		SOP 3.04
♦ Sonicator Calibration		SOP 8.08
♦ Diazomethane Generation		SOP 3.09
♦ Glassware Washing and Cleaning		SOP 8.14

Inorganic Digestion Department

♦ Dissolved Metals Water Preparation	Method 3005A	SOP 6.02
♦ Hotplate Water Digestion	Method 3010A	SOP 6.03
♦ Hotplate Soil Digestion	Method 3050B	SOP 6.06
♦ Microwave Assisted Water Digestion	Method 3015	SOP 6.04
♦ Microwave Assisted Soil Digestion	Method 3051	SOP 6.07
♦ Calibration of Microwave		SOP 8.09
♦ TCLP Preparation	Method 1311	SOP 6.00
♦ SPLP Preparation	Method 1312	SOP 6.01
♦ Glassware Washing and Cleaning		SOP 8.14

4.3 Sample Analysis & Data Generation

The sample analysis and data generation procedures for sample holding time, sample preparation, instrument tuning and calibration, quality control requirements and data reduction e.g. are detailed in the Standard Operating Procedure for each method. See Appendix B for a list of tests and the associated Standard Operating Procedure number for which OnSite Environmental Inc. currently maintains accreditation.

4.3.1 Manual Integrations

The initials of the analyst and the date of any manual integrations are required on all raw data. Standard Operating Procedure 1.12 gives examples of proper and

improper integrations for different situations and how to document any manual integrations that are done to correct for improper auto-integration.

4.3.2 Traceability of Standards and Calibrations

It is important to be able to trace and document the standards we purchase, prepare and use to calibrate and verify the calibration of our instruments. Standards and neat chemicals used to make analytical standards and spiking solutions internally are tracked by lot number and are assigned internal identification numbers as they are recorded in laboratory notebooks upon receipt from the vendor. Calibration standards and spiking solutions prepared from these materials are also tracked in laboratory notebooks and assigned identification numbers so they can be tracked during sample preparation and sample analysis. Standard Operating Procedure 1.11 details this procedure.

4.3.3 Initial Calibration Verification

It is OnSite Environmental Inc. policy that all initial calibrations for SW-846 methods must be verified with an initial calibration verification (ICV) standard. This standard should be near the midpoint of the calibration curve and is typically the same concentration as the continuing calibration verification standard. The ICV should be from a different manufacturer unless this is not feasible. In this case, a standard with a different lot number may be selected from the same manufacturer.

The ICV requirement can be useful to identify the following issues:

- Manufacturer incorrectly made the standard
- Standard has degraded and needs to be replaced
- Errors in standard preparation by the analyst
- Identifying poor (non-linear) calibration curves.

4.4 Data Review

OnSite Environmental Inc. employs a three-tiered data review process. Checklists are used to document each level of review. In general, the chemist performs the Tier I review. The chemist then submits the data to a senior chemist, the Laboratory Manager, the Laboratory QA/QC Officer, or the Technical Director for a Tier II review. If corrections need to be made after the Tier II review, then the data is given back to the chemist to correct and resubmit to the Tier II process. Otherwise, the data is submitted to the Project Manager who coordinates the generation of the report and performs the final Tier III review before signing off on the data and submitting it to the client. Any changes in the data found during a Tier III review need technical agreement by the Technical Director, Laboratory Manager or Laboratory QA/QC Officer. Preliminary data submitted to the client must pass through the Tier II level and be clearly marked as preliminary data. The data can then be reviewed again at a later time before the final report is submitted to the client. This review procedure is detailed in Standard Operating Procedure 1.04.

In addition to this three-tiered data review process, a random 10% of all final reports generated each month undergo an audit by the Laboratory QA/QC Officer as outlined in Standard Operating Procedure 1.14.

4.5 Data Reporting and Electronic Data Deliverables

The Administrative Director and Project Manager coordinate report generation with assistance from the Office Assistant. The reporting requirements and the

process to generate reports are described in Standard Operating Procedure 1.19. OnSite Environmental Inc. makes a concerted effort, whenever possible, to reduce the amount of hand entering of data to avoid transcription errors. Results from the instruments are electronically processed into a report using software or macros (typically Microsoft Excel). The results are then cut and pasted into the final report (Microsoft Word) with the help of macros so that data that is entered by hand is minimized.

The Laboratory Manager coordinates electronic Data Deliverables (EDDs). Since each client requires their own format, Standard Operating Procedure 1.19 only addresses how to verify the EDD to insure its accuracy and agreement with the final report.

4.6 Back up of Electronic Data and Archiving of Data

The file server is backed up once a month. The data backed up includes all analytical data files, final reports and any other documents generated by the front office. A redundant back up copy is also made and stored at an off-site location.

The hardcopy of all the raw data and reports are kept on file for several months so staff has easy access to the data or reports. When the files begin to get full, the excess data is archived into file boxes, labeled and sent to a secure, third party, off-site archival company where the data can be accessed upon request. Data is maintained for a minimum of five years.

The back up and archival procedures are detailed in Standard Operating Procedure 1.05.

4.7 Sample and Waste Disposal

It is OnSite Environmental Inc. policy to store samples for 30 days following analysis for follow-up analyses and to give the client time to request that the samples be archived, returned or disposed. Clients are typically not charged for sample disposal unless the material is extremely hazardous and could not be disposed of in our normal waste streams. If the client wishes us to return the samples, the client can either pick them up at the laboratory or pay for us to ship them back under chain of custody. If the client selects to archive the samples, a small fee per sample per month is assessed. The procedures for sample return, archival and disposal are addressed in Standard Operating Procedure 1.08.

Organic sample extracts are kept, at a minimum, until the holding time specified by the method expires (typically 45 days or less). Inorganic sample digests are kept, at a minimum, for 30 days.

When samples are scheduled for disposal, employees follow Standard Operating Procedure 1.08, which specifies that the samples be segregated into the following waste streams:

- Solid wastes (predominately hydrocarbon contaminated soils)
- Acidified aqueous wastes (predominately hydrochloric, nitric & sulfuric acid)
- Solvent wastes (predominately hexane, methylene chloride and acetone)
- PCB contaminated oils

Samples that do not fit these waste streams are set aside and handled on a case by case basis.

5.0 Quality Control

5.1 Definition of a Batch

Samples from different projects and clients may be batched together for quality control purposes unless a quality assurance project plan specifies that the quality control samples must be selected from that particular project. A batch can consist of up to twenty client samples in addition to any quality control samples that are required. The samples must be extracted, digested or otherwise prepared for analysis within a twelve-hour window. If more than twenty samples are to be extracted, a second batch of quality control samples must be generated. The types of quality control samples can differ depending on the method. Accuracy is assessed with any surrogates that are used and the spike blank and any matrix spike samples that are required by the method. Precision is assessed by any sample duplicates or matrix spike duplicates that are required by the method.

5.2 Method Blanks

Method blanks are used to make sure that the extraction and analysis procedures did not contribute contamination to the analysis.

5.3 Spike Blanks

Spike blanks are used to make sure that the analytes of interest can be accurately recovered from a blank matrix.

5.4 Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike samples are used to make sure the analytes of interest can be accurately recovered from the sample matrix. The matrix spike duplicate is also used to make sure the analytes can be repeatedly recovered in an accurate and precise manner.

5.5 Duplicate Samples

Duplicate samples are used to make sure that sample results can be reproduced in a precise manner.

5.6 Surrogates

Surrogate compounds are compounds similar to the analytes of interest that are added to the sample at known concentration in order to track the accuracy of the sample extraction and analysis.

5.7 Standard Reference Materials

Standard Reference Materials are typically soil or sediment samples obtained from third party sources that have been extensively tested and have certified concentrations or concentration ranges of analytes of interest. Some quality assurance project plans require us to process a standard reference material while processing their samples as an accuracy check on our extraction and analysis procedures. OnSite Environmental Inc. currently analyzes standard reference material only if required by a client's quality assurance project plan.

Clients are responsible for the cost of purchasing or providing standard reference materials if required by their project.

5.8 Trip and Storage Blanks

Trip and storage blanks are useful in tracking potential contamination issues with sample shipping and storage. These types of blanks are analyzed only if

specified or submitted by the client or quality assurance project plan. Clients are typically charged for these samples.

5.9 Method Detection Limit Studies

Method detection limit studies are conducted annually for all accredited test methods. Standard Operating Procedure 1.20 specifies how this procedure is to be handled.

5.10 Demonstration of Capability

New methods must undergo a Demonstration of Capability (initial precision and accuracy study) to verify that the method is performing adequately. Standard Operating Procedure 1.21 specifies how this test is to be done. Each sample preparation technician and chemist as part of our training program also conducts these studies.

5.11 Solvent and Chemical Lot Checks

Each new lot of solvents, acids and bulk chemicals used to extract or digest samples is checked for interferences and contamination before it is used in the laboratory. Standard Operating Procedure 1.10 details how this is done.

6.0 Quality Assurance

6.1 Accuracy

Accuracy is generally expressed as percent recovery, which is calculated as:

$$\text{Percent Recovery (\%R)} = \frac{X_s}{C_t} * 100$$

Where: X_s is the observed concentration of the analyte.
C_t is the true concentration of the analyte.

The acceptable range for accuracy is determined by the method or by control charting of actual laboratory samples. The analyst is responsible for verifying that the surrogate, spike blank and MS/MSD percent recoveries meet the quality control limits. A non-conformance memo and corrective action must be initiated if the analyte does not fall within the appropriate quality control limits.

6.2 Precision

Precision is generally expressed as relative percent difference, which is calculated as:

$$\text{Relative Percent Difference (RPD)} = \frac{|X_1 - X_2|}{\left[\frac{X_1 + X_2}{2}\right]} * 100$$

Where: X_1 is the concentration from the first replicate sample.
X_2 is the concentration from the second replicate sample.

The acceptable range for precision is determined by the method or by control charting of actual laboratory samples. The analyst is responsible for verifying that the duplicate or MS/MSD recoveries meet the quality control limits. A non-

conformance memo and corrective action must be initiated if the analyte does not fall within the appropriate quality control limits.

6.3 Completeness

Completeness is expressed as the percentage of data quality objectives that are expected to be met by OnSite Environmental Inc. This requirement is generally specified as part of a quality assurance project plan. Although OnSite does not track this information routinely or have a specific limit that we internally specify must be met, we strive to achieve 100% at all times.

6.4 Representativeness

In order that the reported results are representative of the sample received, OnSite Environmental Inc. makes a reasonable effort to assure that the samples are adequately homogenized prior to sampling for analysis. OnSite Environmental Inc. cannot control factors in the field affecting sample representativeness; thus, it is ultimately the client's responsibility to insure that the sample submitted is well homogenized prior to submitting it to the laboratory.

6.5 Control Charting & Control Limits

OnSite Environmental Inc. routinely tracks and control charts surrogate percent recoveries, spike blank percent recoveries, MS/MSD percent recoveries and the relative percent difference of MS/MSD samples for all methods that require these quality control samples. The chemist is responsible for recording this information.

Control limits are derived from the control charts and are updated at least once a year. The control limit is established as three standard deviations from the mean of the data set. Standard Operating Procedure 1.22 provides additional guidance on generating and maintaining control charts and quality control limits.

6.6 Non-conformances & Corrective Action

Non-conformances are generated throughout the laboratory by sample receiving, the extractions/digestion departments, the different analytical groups, the Tier I/II/III review process, the front office, and from monthly and yearly audits. In order to make sure that each non-conformance is documented and that a resolution was implemented, the non-conformance procedure is governed under Standard Operating Procedure 1.18.

The non-conformances and corrective actions that are generated during 3rd party audits, internal audits, monthly and yearly audits, management reviews and through non-conformance forms are summarized each month in the monthly audit as part of SOP 1.14. The progress for each item is tracked in the following monthly audits until the item is finally resolved.

Appendix A

Resumes

President/Technical Director
Robert Wallace

Education:

Southwest Texas State University
San Marcos, Texas
Master of Science in Chemistry, 1982

Midwestern State University,
Wichita Falls, Texas
Bachelor of Science in Chemistry, 1981

Key Qualifications:

- Over eighteen years experience in environmental chemistry.
- Experienced in analytical support of projects involving UST management services, remediation of contaminated sites, site assessments, groundwater monitoring, and waste characterization.

Employment:

OnSite Environmental, Inc., Redmond, Washington
President/Technical Director, 1992 - present
Technical Director of environmental analytical laboratory. Responsible for client relations and overall laboratory operations.

Analytical Services, Inc., Kirkland, Washington
Laboratory Manager, 1989 - 1992
Helped start and then managed a twelve person environmental analytical laboratory. Responsible for quality control, review of data, and client contact.

Farr, Friedman & Bruya, Seattle, Washington
Chemist, 1986 - 1989
Performed analytical testing of soil, water and air matrices using gas chromatographic and infrared techniques of analyses. Worked as an on-site chemist at various locations in the Western United States.

National Marine Fisheries Services (NOAA), Seattle, Washington
Chemist, 1983 -1986
Performed various gas chromatographic and HPLC analyses in the study of pollution in the Puget Sound Region.

Project Experience:

Port of Seattle: Provided analytical chemistry support for the Lockheed Environmental Cleanup Project. Mr. Wallace assumed responsibility for the analytical support of this project, when the original laboratory could not keep up with the quick turnaround of analyses. The project involved the cleanup of PAHs and metals contamination.

Port of Seattle: Managed the environmental chemistry support for the Southwest Harbor Island Cleanup and Redevelopment Project. Project involved a remedial investigation of a site with contaminated soil and groundwater. Contaminates of concern were metals, pesticides and PCBs, volatile and semi-volatile organics, and petroleum hydrocarbons.

U.S. Army Corps of Engineers: Lead chemist for the laboratory support of the UST Management Services Contract for Eastern Washington. This involved the removal of underground storage tanks and the cleanup of contaminated soil and groundwater at over 20 sites in eastern Washington. Responsibilities included the development of a QA/QC plan, which was submitted and approved by the Army Corps of Engineers, and final review of all analytical data.

U.S. Army Corps of Engineers, Fort Lewis: Managed the analytical support of a project that involved the hazardous waste characterization of soil and sludge from over 60 oil/water separators at the army base. Worked with the Army Corps of Engineers and the Department of Ecology to coordinate and help better define the analytical methodologies to be used.

Administrative Director
Blair Goodrow

Education:

Certified Public Accountant, 1986

San Jose State University
San Jose, California
Post Graduate Studies in Accounting, 1982

University of California
Santa Barbara, California
Bachelor of Arts in Business-Economics, 1980

Employment:

OnSite Environmental, Inc., Redmond, Washington
Administrative Director, 1992 - present
Responsible for the marketing, financial and administrative functions of the company.

Analytical Services, Inc., Kirkland, Washington
Controller, 1989 - 1992
Responsible for all financial, banking, and administrative functions of the company. Set-up and maintained a computerized accounting system. Prepared monthly financial statements and all required tax reports.

Clothier & Head, PS
Senior Accountant, 1983 -1989
Reviewed and compiled financial statements and projections. Prepared and reviewed corporate, partnership and individual tax returns. Supervised and trained staff accountants.

Laboratory Manager
Karl Hornyik

Education:

University of Oregon
Eugene, Oregon
Bachelor of Science in Pre-Medicine, 1990

Key Qualifications:

- Over ten years experience in environmental chemistry.
- Experienced in analytical support of projects involving UST management services, remediation of contaminated sites, site assessments, groundwater monitoring, and waste characterization.

Employment:

OnSite Environmental, Inc., Redmond, Washington
Laboratory Manager, 1993 - present
Supervise all areas of laboratory operations, including extractions and analyses. Coordinate staffing and scheduling of employees of the laboratory. Responsible for the implementation of the quality assurance program of the laboratory.

Laucks Testing Laboratories, Inc., Seattle, Washington
GC Chemist, 1991-1993
Extracted and analyzed soil, water and waste samples for volatiles and semi-volatiles constituents.

Project Experience:

Tulalip Landfill Superfund Site, Washington
Project involved analytical testing of pre-construction fill prior to the principal remedial action. Contaminants of concern were volatile organics, semivolatile organics, PCBs, pesticides, herbicides, and metals.

EPA Superfund Technical Assessment and Response Team (START), Washington
Projects typically involve analytical testing of hazardous materials for characterization prior to determining remedial actions. Contaminants that are typically analyzed for are volatile organics, semivolatile organics, PCBs, pesticides, herbicides, and metals.

Port of Seattle, Environmental Services Group, Seattle, Washington
Environmental Analytical Laboratory Services Contract. Project involves analytical testing in support of Phase II Environmental Assessments. Contaminants of concern are total petroleum hydrocarbons (TPH), volatile organics, semivolatile organics, PCBs, pesticides, herbicides, and metals.

Laboratory QA/QC Officer
Kelley Wilt

Education:

Whitman College
Walla Walla, Washington
Bachelor of Arts in Chemistry, 1991

Key Qualifications:

- Over ten years experience in environmental chemistry.
- Experienced in analytical support of projects involving UST management services, remediation of contaminated sites, site assessments, groundwater monitoring, and waste characterization.

Employment:

OnSite Environmental, Inc., Redmond, Washington
Laboratory Quality Assurance/Quality Control Officer, 2001 – present
Responsible for the implementation and improvement of the laboratory's quality assurance/quality control program.

EcoChem, Inc., Seattle, Washington
Quality Assurance/Quality Control Chemist, 1998 – 2000
Validated GC, GC/MS, HPLC, AA, ICP and ICP/MS data from environmental laboratories using CLP, EPA Regional, USACE, and AFCEE guidelines. Authored technical reports summarizing validation findings.

Laucks Testing Laboratories, Inc., Seattle, Washington
GC/MS Chemist, 1997 – 1998
Analyzed environmental samples by CLP and EPA SW-846 methodologies using GC, GC/MS and HPLC instrumentation. Prepared data packages for validation. Assisted in sample extraction and cleanup of water, soil, air, and tissue matrices.

Friedman & Bruya, Inc., Seattle, Washington
Project Manager/Chemistry Consultant, 1993 – 1997
Planned and implemented clients' projects to provide analytical services to meet or exceed the data quality objectives. Analyzed environmental samples by GC and GC/MS. Provided litigation support (deposition and expert witness testimony) on chemistry issues. Provided age dating and identification services for petroleum hydrocarbons.

Alden Analytical Laboratories, Inc., Seattle, Washington
Extractions Supervisor 1991
GC/MS Chemist 1992 – 1993
Scheduled samples for extraction. Extracted air, water, soil, and tissue samples by SW-846 and other methodologies. Analyzed environmental samples by GC and GC/MS protocols (Methods 8010, 8020, 8240, 8260, and 8270).

Project Manager
David Baumeister

Education:

Emory University
Atlanta, Georgia
Bachelor of Arts in Biology, 1990

Key Qualifications:

- Over ten years experience in environmental chemistry and environmental regulations.
- Experienced in project management of projects involving UST management services, remediation of contaminated sites, site assessments, groundwater monitoring, and waste characterization.

Employment:

OnSite Environmental, Inc., Redmond, Washington
Project Manager, 1999 – present
Coordinate and manage analytical projects from inception to completion. Serve as a liaison between the laboratory and clients.

Analytical Chemist-Extractions Supervisor, 1994 – 1998
Analyzed environmental samples by GC methods. Supervised extraction of all organic laboratory samples.

Alden Analytical Laboratories, Inc., Seattle, Washington
Extractions Supervisor, 1993 – 1994
Supervised staff of chemists performing extractions of all laboratory samples. Coordinated daily operations of group. Developed methods as needed.

Analytical Technologies, Inc., Renton, Washington
Extractions Technician 1992 – 1993
Performed extractions of laboratory samples. Responsible for chemical inventory.

Weyerhaeuser
Physical Chemist, 1991 -- 1992
Analyzed paper products for quality control. Established QA/QC guidelines for various products.

Relevant Experience:

King County Department of Health. Soils investigation involving the support and development of a database of environmental information regarding the extent of contamination from the Tacoma metal smelter.

Appendix B

Table of Standard Operating Procedures

1.00	Standard Operating Procedures
1.01	Format and Control of Laboratory Notebooks
1.02	Sample Receipt & COC Procedures
1.03	Sample and Extract Internal Custody
1.04	Data Review Procedure
1.05	Data Back-up
1.06	Laboratory Training & Documentation
1.07	Document Control
1.08	Waste Management
1.09	Chemical Receipt
1.10	Bulk Chemical Lot Checks
1.11	Traceability of Standards
1.12	Manual Integrations
1.13	Complaints
1.14	Monthly Audit
1.15	Yearly Audit
1.16	Management Review
1.17	Performance Evaluations
1.18	Nonconformances and Corrective Actions
1.19	Report Generation
1.20	Method Detection Limit Studies
1.21	Demonstration of Capability
1.22	Establishing Method Control Limits
2.00	Turbidity - Method 180.1
2.01	Total Solids - Method 160.3
2.02	Flashpoint - Method 1010
2.03	Never issued
2.04	pH Soils (9045C)
2.05	Retired
2.06	Paint Filter Test
2.07	pH Waters (9040)
2.08	Sulfate (Turbidimetric) – Method 375.4
2.09	Nitrogen, Nitrate+Nitrite – Method 353.3
2.10	Phosphorous – Method 365.3
2.11	Alkalinity – Method 310.1
2.12	Total Suspended Solids – Method 160.2
2.13	Total Dissolved Solids – Method 160.1
2.14	Nitrogen, Ammonia – Method 350.3
2.15	Settleable Solids – Method 160.5
3.00	Acid Clean-up of Semivolatile Extracts
3.01	Florisil Clean-up of Pesticide Extracts – Method 3620B
3.02	Alumina Clean-up for PAHs – Method 3611B
3.03	Silica Gel Clean-up – Method 3630
3.04	Never issued
3.05	Sulfur Clean-up Procedure for Organic Extracts
3.06	Waste Dilution - Method 3580A
3.07	Ultrasonic Extraction – Method 3550
3.08	Separatory Funnel Extraction – Method 3510
3.09	Diazomethane Generation
4.00	Herbicides by GC/ECD – Method 8151
4.01	Organochlorine Pesticides by GC/ECD – Method 8081

4.02	Polychlorinated Biphenyls (PCBs) by GC/ECD – Method 8082
4.03	Semivolatile Organic Compounds by GC/MS – Method 8270
4.04	Retired
4.05	Retired
4.06	Semivolatile Petroleum Products by GC/FID – Method NWTPH-Dx
4.07	Hydrocarbon Identification by GC/FID – Method NWTPH-HCID
4.08	Washington EPH
4.09	Diesel Range Organics by GC/FID – Method AK102
4.10	Never issued
4.11	PAHs in Water by Selective Ion Monitoring (GC/MS-SIM) – Method 8270-SIM
4.12	Residual Range Organics by GC/FID – Method AK103
4.13	EDB and DBCP by GC/ECD – Method 8011
4.14	Retired
4.15	Hexane Extractable Material – Method 1664
5.00	Gasoline by GC/FID – Method NWTPH-Gx
5.01	Volatile Organics by GC/MS – Method 8260
5.02	Gasoline Range Organics – Method AK101
5.03	Washington VPH
5.04	BTEX by GC/PID – Method 8021B
5.05	Retired
6.00	TCLP – Method 1311
6.01	SPLP – Method 1312
6.02	Dissolved Metals in Water – Method 3005
6.03	Hotplate Digestion for Water – Method 3010A
6.04	Microwave Digestion for Water – Method 3015
6.05	Retired
6.06	Hotplate Digestion for Soils – Method 3050B
6.07	Microwave Digestion for Soils – Method 3051
6.08	Water Extraction for Hexavalent Chrome
6.09	Alkaline Digestion for Hexavalent Chrome
7.00	Retired
7.01	Retired
7.02	Metals by ICP – Method 6010
7.03	Metals by ICP/MS – Method 200.8
7.04	Mercury in Soil – Method 7471A
7.05	Mercury in Water – Method 7470A
7.06	Hexavalent Chrome – Method 7196
7.07	Metals by ICP/MS – Method 6020
8.00	Method Detection Limits and Instrument Detection Limits
8.01	QA/QC & Maintenance for Refrigerators & Freezers
8.02	Never issued
8.03	Calibration of Volumetric Pipettes
8.04	Thermometer Calibration
8.05	Balance Calibration
8.06	Never issued
8.07	Never issued
8.08	Sonicator Calibration
8.09	Microwave Calibration
8.10	Maintenance and Use of High Purity Water System
8.11	Never issued
8.12	Never issued
8.13	Instrument Maintenance
8.14	Glassware Cleaning & Washing
8.15	Oven Maintenance