Appendix 5.1.3.2B
AMEC Laboratory Quality Assurance/Control Program

AMEC Environment & Infrastructure

Statement of Qualifications

Edmonton, Alberta

Laboratory

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1.0 AMEC ENVIRONMENT & INFRASTRUCTURE OVERVIEW

1.1 AMEC Environment & Infrastructure

AMEC Environment & Infrastructure is an environmental sciences, geotechnical and material services company offering professional engineering, scientific and contracting services to industry, investors, financial institutions and governments in all national and international markets. The company is a division of AMEC Americas and is diversified into engineering, construction, environmental services, and waste management.

The AMEC Group provides a wide range of integrated engineering and professional management services in the environment; geological, geotechnical, materials and earthquake engineering; applied chemistry and biology; and air, water and earth resource management for industry and government. These services have been successfully used in the energy, mining, transportation, construction, environment, water and sanitation, forestry, agriculture, food, tourism and recreation industry sectors.

The Group is dedicated to providing quality services to clients, integrating technology and innovation with recommendations aimed at practical and sustainable solutions that maintain an appropriate balance between socio-economic development, the environment, and the rational exploitation of the earth's limited natural resources. Clients include industry, investors, International Financial Institutions, and government related to the sustainable development, industry and human settlements.

1.2 Laboratory Services

AMEC Environment & Infrastructure has one environmental laboratory, located in Edmonton, Alberta. The lab is housed in a modern facility equipped with the latest analytical instrumentation to analyze numerous matrices for a large number of physical and chemical parameters. The laboratory takes great pride in providing exceptional service to all clients.

The Edmonton lab analyzes air, asbestos, cement, metals, and soil, sludge, and water samples for a large number of parameters. These parameters include BTEX, petroleum hydrocarbons (gasoline, diesel, heavy oil), glycols, PCBs, trace organics (GC/MS) (including PAH's, Chlorinated Phenols, and Organo-chlorines), metals (by cold vapour, ICP-AES and ICP-MS), water potability parameters, soil salinity and leachability, metal weld composition, chloride in cement, alkalies in flyash, and more.

The lab also provides quick turn-around, quantitative screening tests for hydrocarbons in soil and water samples based on either volatile or semi-volatile components in soil. The volatile components (carbon range C6-C10) are determined by Purge & Trap or Headspace, and gas chromatography which may be related to BTEX concentration. Semi-volatile components (C10-C50) are determined by gas chromatography (GC/FID) or an infrared instrument. Procedures are based on U.S. EPA, CCME (Canadian Council of the Ministers of the Environment) or British Columbia Environment ministry protocols.

To assure precise and accurate data, the lab is certified, and accredited for ISO 17025 Standard and has an extensive Quality Assurance and Quality Control (QA/QC) program. Steps within this QA/QC program include: 1) appropriate containers and preservatives for field sampling protocol; 2) trip and field blanks; 3) chain of custody forms; 4) sample temperature control; 5) use of references, standards and duplicates with each batch of samples analyzed; 6) control charts to record progress; 7) review of reports by Quality Assurance Compliance officer and Lab Manager, and 8) client liaison officer. All data generated by the lab is the sole property of the client and strict confidentiality is maintained.

2.0 EXPERIENCE

AMEC Edmonton Chemistry analyzes thousands of water and soil samples yearly. Parameters range from pH, ICP metals to GC/MS for trace organics. Other matrices analyzed by the laboratory include air for industrial hygiene and source emission surveys, ground and surface waters, effluents, cements, concrete, metals, etc. Samples have been received from within the Prairie Provinces, BC, Ontario, North West Territories, and internationally from Russia, Ecuador, Libya, Japan, Panama and Peru.

The Edmonton Chemistry Lab provided analytical services for the Komi Arctic oil spill containment in Northern Russia, and AMEC Environment & Infrastructure was awarded the 1996 Emerald Award for their efforts in this project. Edmonton Chemistry was classified as a preferred laboratory in the Exxon Mobil system in 2011. In addition to providing services to the private sector, the laboratory performs analyses for local and provincial governments.

Our laboratory staff has extensive experience in environmental analysis. Professional experience ranges from 5 to 20 years combined with academic backgrounds ranging from Chemical Technology Diplomas to Bachelor of Science Degrees in Chemistry. Several staff members have provided seminars on environmental chemistry issues on a national and international basis in Canada and Pakistan regarding gas chromatography techniques, and Laboratory Quality Assurance programs.

3.0 GENERAL ANALYTICAL METHODOLOGY

AMEC Environment & Infrastructure follows accepted methodologies from various sources. These sources include United States Environmental Protection agency, American Public Health Association (APHA), American Society for Testing and Materials (ASTM); National Institute for Occupational Safety and Health (NIOSH), Alberta Environment, British Columbia Environment, Canadian Council of Ministers of the Environment (CCME) and Canadian Society of Soil Sciences (CSSS).

Analytical Methods are written in standard form as part of a set of Standard Operating Procedures (SOP). These procedures include, in part, a discussion of potential interferences, calibration methodology, calculations, acceptable ranges of check standards, and a detailed description of the methods.

4.0 QA/QC OVERVIEW

4.1 Quality Assurance Management

Laboratory analytical reports contain pertinent information regarding the sample(s) submitted for analyses. This information includes the date the sample was collected and received by the lab, date of analysis, technician's initials, parameters, methodology, method reference, method detection limit and results. The report is reviewed by the lab Quality Assurance / Quality Control Manager and Laboratory Manager for completeness and accuracy. All documentation associated with the analysis including raw data, chromatograms, calibration curves, calculations, etc. are stored on site in a numerical file for a period of 7years.

4.2 Elements of QA/QC

4.2.1 Quality Policy (or Mission)

AMEC Environment & Infrastructure is an international professional services company dedicated to the consistent achievement of industry-leading standards of excellence in engineering, construction, environment and technology. We are committed to innovation and the highest standards of business practice in all our endeavors for our customers, employees, shareholders, society and environment.

4.2.2 Quality Objectives

- To ensure a quality system that is documented, communicated, understood, implemented and incorporates adequate review, audit and internal quality control.
- To ensure personnel are adequately supervised and are proficient to carry out assigned activities.
- To ensure test methods and operating procedures are validated and incorporate adequate quality control.
- To ensure all equipment, supplies and services are functioning properly and/or meet required specifications.
- To ensure facilities are adequate to carry out the testing activity.
- To ensure that test results are supported by a traceable system of measurement and accorded uncertainties appropriate to requirements.
- To ensure sample management that incorporates adequate procedures for the security, receipt, identification, checking, routing, storage and disposal of all samples.
- To ensure data management that incorporates adequate procedures for the security, recording, calculation, validation, authorization, transmittal, storage and disposal of all test data and related records.
- To ensure workload management that incorporates acceptable turnaround time and verification of resource availability prior to the receipt of additional testing.
- To ensure that all planned changes to the quality system are adequately communicated to personnel to maintain quality management system integrity.
- To continuously improve the effectiveness of the management system, the quality management system and the overall productivity of the Laboratory.
- To maintain a high level of client satisfaction.

4.3 Sample Containers and Preservatives

The lab utilizes the list of recommended containers, preservation techniques and holding times published by USEPA, CCME, BCME, and APHA to guide project managers and clients in making the correct choices for particular samples. All sample containers used by the chemistry laboratory are purchased as pre-cleaned according to EPA protocol. The laboratory provides support to field sampling crews by recommending and supplying the necessary Class 1 US EPA pre cleaned sampling containers with the required preservatives and sampling instructions, and transportation coolers including refrigerants. All samples submitted to the lab are kept at 4°C until the time of analysis and they are analyzed within the maximum holding time.

4.4 Chain of Custody

It is necessary for each sample or group of samples to be accompanied by a chain-of-custody record from the time of sampling in order to trace possession. The record should contain the following information:

- Name of client
- Project name or sampling address
- Sample ID
- Date and time of collection
- Size of sample containers
- Analysis required
- Signature of all individuals involved in the chain of possession
- Inclusive dates of possession

4.5 Sample Hold Time

United States Environmental Protection Agency and many other regulatory agencies have established holding times for most analytical parameters. Quality data requires that analyses be performed within the specified holding times. AMEC will notify the project manager of any expired holding times prior to proceeding with the analysis.

4.6 Trip Blanks

Trip blanks are a required quality control element for sampling and analysis, and provided to the client with bottle orders for specific analyses. Trip blanks should be regarded as one of the most critical aspects of the sampling regime. Processed accurately, a trip blank becomes a guarantee that primary samples were not contaminated during transportation.

A trip blank is a sample of analyte free media collected in the same type of container that is required for the analytical test, taken from the laboratory to the sampling site and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures.

Blank correction are not performed rather the Trip blank values above method detection limit are noted and reported in the report.

4.7 Field Blanks

A field blank is similar to a trip blank; collected in the same type of container that is required for the analytical test. Capped and clean containers are taken from the laboratory to the sampling site and processed along with site samples. A field blank is used to identify errors or contamination in sample collection and analysis. Consultants are reminded to supply the lab with appropriate field blanks so any contamination from the air can be measured and accounted for. Distilled and de-ionized water for field blanks are provided upon request.

Blank corrections are not performed, but the blank values above the detection limit are noted and reported in the report.

4.8 Surrogate Standards and Internal Standards

Surrogates are compounds which are similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. Surrogate spike recoveries are used to determine the accuracy of the method recovery, and monitor analysis for unusual matrix effects. The surrogate recovery results are used in a manner similar to check samples including control charts of expected recoveries. Any analyses with values outside the action limits are re-analyzed and checks are made for calculation and preparation errors.

4.9 Instrument Calibrations

Instruments are calibrated prior to analyses using a series of high-purity standards that cover the working range of the instrument. Instrument responses are collated in an appropriate quality control sheet and this data is plotted regularly to monitor for inappropriate changes.

4.10 Calibration Check Standards & Drift Control Standards

When the instrument is not running continuously, a check calibration standard is analyzed at the end of an analytical run. A check calibration standard is a mid-range standard that is analyzed as an unknown. The calibration check standard is reviewed and its response is compared with the response for the beginning standards. If the response for the check calibration standard differs from the response for the beginning standards by more than 15 % corrective action will be taken.

4.11 Field Duplicates

Field Duplicates are independent samples collected as close as possible to the same point in space and time; taken from the same source, stored in separate containers, and analyzed independently. The purpose of field duplicate sampling is to monitor the precision of the sampling process. Field duplicates should be included by the field samplers at a rate of 10% of the number of samples.

4.12 Laboratory Duplicate

Duplicate analysis is performed on every 15-20 samples submitted to the lab. Projects, with a large number of samples submitted as one lot, are automatically assigned laboratory duplicates at a rate of 1 in 20 samples (5%). The results from lab duplicate analyses are reported along with sample results.

4.13 Standard Reference Material (SRM) and Matrix Spikes

Standard reference materials (SRM's), if available, are analyzed concurrently with sample analyses. The laboratory purchases SRM's from Environmental Resources Associates, USA, for water and soil matrices. An in-house soil standard evaluated internally and externally, is used for salinity analysis. A QC report accompanies the reports providing details of lab results versus the SRM certified value and advisory ranges.

Matrix spikes are analyzed to determine the effect of the sample matrix on the analyte of interest. Spikes are usually performed on the same sample analyzed in duplicate when required. They are performed when the analyst suspects potential matrix interference or when specifically requested by the client.

4.14 Method Blanks

With every batch of samples, a method blank is prepared with deionized water and/or extraction solvent and is analyzed to verify the absence of interferences or contaminants associated with storage, preparation and instrumental analyses.

4.15 Control Charts

Analysts report the results from the SRM's onto control charts. The control charts are used to document the statistical control of the measurement process and to determine the limits of acceptable data. Control charts are prepared from surrogate standard values and spike values on an ongoing basis but entered daily. A minimum of 20 points are used in preparing each control chart. It is the responsibility of the analyst to prepare the control charts pertaining to his/her analyses and to refer to those charts regularly. Warning limits are set at +2 and -2 standard deviations from the mean and action limits are set at +3 and -3 deviations from the mean. The charts are reviewed regularly by the Director of QA/QC.

4.16 Inter-laboratory Comparisons

The laboratory is in good standing with the following groups: Canadian Association for Laboratory Accreditation (CALA) Inc., Western Enviro-Agricultural Laboratory Association (WEALA), and the Cement and Concrete Reference Laboratory (CCRL).

4.17 Certifications

The laboratory is a recognized participant in the Proficiency Testing program operated by the Canadian Association for Laboratory Accreditation (CALA) Inc. for a number of trace organic and inorganic parameters. CALA's Proficiency Testing Program is accredited to ILAC:G13 International Laboratory Accreditation Cooperative), and ISO Guide 43. A list of Proficiency Testing parameters for the Edmonton lab can be found in the directory of labs at http://www.CALA.ca lab membership # 2349.

4.18 Accreditations

The Edmonton Chemistry Laboratory is accredited by the Canadian Association for Laboratory Accreditation (CALA) Inc. to ISO/IEC 17025 for specific environmental tests listed in the scope of accreditation by CALA. A list of the Edmonton Lab accredited tests can be found at http://www.CALA.ca lab membership # 2349.