Statement of Work for the Faro Mine Complex Hazardous Waste Characterization Analytical Laboratory

Prepared for

Government of Yukon and Government of Canada as represented by Aboriginal Affairs and Northern Development Canada

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The document contained herein should be considered Final as approved by the Government of Yukon on August 27, 2014 with no changes made since the draft submission.

Contents

Acronyms and Abbreviations

CH2M HILL	CH2M HILL Canada Limited
COC	chain-of-custody
FMC	Faro Mine Complex
QA	quality assurance
QC	quality control

Statement of Work for the Faro Mine Complex Hazardous Waste Characterization Analytical Laboratory

Introduction

The Government of Yukon has retained CH2M HILL Canada Limited (CH2M HILL) to develop a statement of work for use during the procurement of an appropriate laboratory to analyze hazardous waste materials sampled at the Faro Mine Complex (FMC), according to the Faro Hazardous Waste Management Plan.

Site Description and Background

The FMC is located approximately 25 kilometres northwest of the Town of Faro, in Yukon. It comprises three main areas: (1) the Faro Mine Area, (2) the Rose Creek Tailings Area, and (3) the Vangorda/ Grum Mine Area. The FMC operated from approximately 1960 until 1998. Using extracted ore, mining operations produced lead and zinc concentrates.

Approximately 735 steel and plastic drums, a 1,000-litre steel tote, and a small quantity of 4-litre containers have been identified for management under this plan. These materials were described to be an immediate concern (Level 1 priority category), as they would impact human health or the environment in case of direct contact. Therefore, it is a priority to manage the disposal of these materials.

Number of Samples and Types of Matrices

The approximate numbers of samples to be collected and required analyses are summarized in Table 1. The sample quantities are based on current plans and projections and are subject to change. Therefore, no minimum number of samples is guaranteed.

Samples will be shipped to the laboratory on the day of collection. If the field team is unable to ship sample coolers on the day of collection, the lab will be notified of the delay. Advanced notification will be provided by the field team in the event that the laboratory will be receiving samples beyond regular business hours.

Modifications to the analytical program will be relayed to the laboratory by way of a Change Order to amend this statement of work.

Sampling Schedule

Laboratory analysis performed under this statement of work is expected to take place beginning July 25 and ending August 13, 2014.

Required Parameters and Reporting Limits

Field samples and selected quality control (QC) samples will be collected for the analyses as listed in Table 1. The required reporting limits are listed in Table 2.

The laboratory should respond with any list or limit requirements that cannot be met. Nominal quantitation limits shall be, at a minimum, in accordance with the concentration values shown on the tables. Method detection limits must be less than one-half of the minimum reporting limits.

Methodology

All laboratory deviations from these protocols shall be submitted in writing for approval by the CH2M HILL Project Manager.

The required analyses include the following:

- Pensky Martens Closed Cup Flashpoint of liquids.
- Basic sediments and water content of liquids.
- Extractable organic halides of liquids.
- Flashpoint of solids.
- 1:1 extract pH of solids.
- UN N.4 self-heating analysis of solids.

Certification

Laboratory must be certified by Canadian Association of Laboratory Accreditation and, where appropriate, Standard Council of Canada or Provincial certification/licensing for any parameters/methods that the laboratory performs.

Sample Containers

The types of containers, sample quantities required for analysis, and the sample preservation required for each analysis are summarized in Table 3. The laboratory shall provide all sample containers, preservatives, shipping coolers, packing material, and absorbent necessary to properly collect and ship the samples to the laboratory.

Sample containers shall be the I-CHEM Series 200 type, or equivalent. The laboratory shall follow the "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers", OSWER Directive #9240.0-05 (rev. 6/90). If requested, the laboratory shall have available information concerning the quality assurance (QA)/QC program for sample bottles and lot numbers for the supplied sample containers.

Costs for field sampling kits, raw data packages, electronic data, and sample disposal shall be considered incidental and payment shall be as part of the appropriate unit prices stated in the contract.

Sample Custody during Shipment

Completion of sample custody forms and sample packaging for shipments are performed by the field personnel. Designated field and/or sample control staff will complete and verify chain-of-custody (COC) forms and pack samples for shipment at the end of each sampling day. When shipping or transferring samples, the shipping containers will have at least one custody seal affixed in a manner that would indicate if the container had been opened during transit.

Sample transfer between supplier staff or between supplier staff and such entities as courier or laboratory will be documented by signing and dating “Relinquished By” and “Received By” blocks whenever sample possession changes. Samples will be released for shipment by overnight couriers by noting the waybill number on the COCs.

Sample Receipt

During sample log-in, the pH must be checked for all preserved containers. Adjustments made by the laboratory will be documented on appropriate sample receipt forms and noted in the case narrative under receipt exceptions. The temperature, condition of the samples received from the field, and any discrepancy noted on the COC forms must be documented and provided with an acknowledgment email of sample receipt. The laboratory tracking identification will be documented on the COC.

The laboratory shall immediately contact CH2M HILL to resolve problems with the samples (e.g., mixed media, broken or leaking containers, or missing sample documentation).

The laboratory must respond within 3 days to requests for additional information or explanations that result from inspection activities.

Specify any limitations pertaining to sample receipt (e.g., Saturday delivery). The laboratory must be able to receive samples on Saturdays.

Sample Acknowledgement

Upon completion of sample log-in, the laboratory shall provide a copy of the COC, the sample acknowledgement email, and any sample receipt exceptions, to the Project Chemist, within 24 hours of sample receipt. The acknowledgment letter or email will describe the following:

- The number of samples received by the laboratory
- The identity of the field sample
- The corresponding laboratory identification
- Receipt Exceptions/Problems noted during sample log-in
- Any questions regarding articles such as analysis or parameter list
- The date on which CH2M HILL can expect complete data results and packages

Holding Times

Table 3 summarizes the requirements for extraction and analysis times. All extracts will be preserved in the appropriate containers and stored at appropriate temperatures.

The laboratory will be required to retain the sample for a minimum of 90 days and sample extracts for a minimum of 60 days after submission, pending the need for re-analysis.

Quality Control Samples

The field team will collect typical QC samples such as field duplicates, trip blanks, and matrix spike/matrix spike duplicate. QC samples such as field blanks will be clearly identified on the COC. These samples are not to be used for spiking purposes.

A laboratory control sample will be prepared and analyzed with each analytical batch. The laboratory control sample is used to evaluate each analytical batch and to determine if the method is in control. The laboratory control sample cannot be used as the continuing calibration verification.

Calibration

Follow the method calibration requirements.

Re-extraction/Reanalysis

In the case where the results from multiple runs are reported because of reruns or re-extractions and then reanalysis, the first analysis will be considered the “original” sample. The rerun or re-extraction and re-analysis will be considered the “second” sample analysis. When re-extractions or re-analysis is required, the laboratory is expected to perform the additional analytical run at no additional cost to the project.

Dilutions

Dilutions are part of performing an analysis. When dilutions are necessary, the laboratory is expected to perform the additional analytical run at no additional cost to the project. In the event of multiple serial dilutions, the laboratory should contact the CH2M HILL Project Chemist, to evaluate possible options.

For data reporting, if the laboratory performs more than one analytical run, all valid analytical runs (valid means those runs meeting internal laboratory QC criteria) will be reported electronically. For the organic analyses only, when target parameters exceed the calibration range, the results will be flagged with an “E” qualifier. All sample results that are a result of a dilution must be flagged with a “D” qualifier.

In the case where the results from multiple runs are reported because of dilutions, the analysis performed at the lowest dilution will be considered the “original” sample, and the analysis with a greater dilution will be considered the “diluted” sample. The sample ID and laboratory sample ID for the “diluted” run will be modified with the suffix “DL”. If there are subsequent dilutions, the sample ID and laboratory sample ID will have the next numeric suffix (i.e., “DL2”, “DL3”, etc.).

Quality Assurance, Data Verification, and Reporting

The generated analytical data should be checked and reviewed at the laboratory by the analyst generating the data and an experienced data reviewer before its release to CH2M HILL.

The laboratory is only required to submit the data package as requested. However, at a later date, the project may request the laboratory to provide the associated raw data, instrument printouts, logbook pages, etc. Therefore, the data for this project shall be collected and documented in such a manner that will allow the generation of data packages that can be used by an external data auditor to reconstruct the analytical process.

Results

Laboratory ID and client sample ID should be included as part of the results.

Any results that are “preliminary” and are subject to change in the final report should be clearly designated “preliminary”.

All data should be properly reviewed by qualified laboratory personnel (see Quality Assurance, Data Verification, and Reporting section). The reviewer will initial the sample result report signifying that the data has been reviewed. Errors in reported data attributed to laboratory error may be subject to reduction of payment.

Failure to meet these reporting requirements may result in laboratory reissuing data package and possible reduction of payment because of delays caused to the project.

Period of Performance

Samples are scheduled from July 25 to August 13, 2014. This schedule is subject to change, and CH2M HILL will make every effort to keep the laboratory appraised of the current schedule.

Turn-Around-Times

All electronic data packages, electronic data deliverables, and a copy of the invoice must be submitted within 14 calendar days starting from the date of receipt of each daily shipment of samples by the laboratory. For samples received at the laboratory after 10:00 AM, Day 1 for determining the turn-around-time will begin on the next calendar day.

CH2M HILL shall be notified immediately of any problems or laboratory conditions that affect the timeliness of analysis and data reporting.

Data Package

The Project will require the data package as a PDF.

A summary of data package deliverables, by CH2M HILL QC level, is provided in Table 4. All data for the sampling events will be delivered as Level 3 data packages.

Case narratives must include explanations of any sample exceptions or anomalies observed during the analytical process.

In cases where multiple analytical runs were performed on a given sample (such as dilutions or re-extractions), the laboratory will report all data from all runs in the PDF.

All applicable corrective action reports will be included in the laboratory data package.

The data for this project shall be collected and documented in such a manner that will allow the generation of data packages that can be used by an external data auditor to reconstruct the analytical process.

The data provided by the laboratory must be legible and properly labeled.

The recipients of the data packages will be listed on the COC.

Sample results must include laboratory ID and client sample ID.

Electronic Data Deliverables

Electronic data deliverable files are not included in this statement of work.

Data Management

The laboratory shall store all data records associated with the receipt, preparation, analysis, and reporting of all samples for a minimum of 10 years.

Corrective Action

Problems requiring corrective action in the laboratory will be documented by the use of a corrective action report. The QA coordinator or any other laboratory member can initiate the corrective action request in the event QC results exceed acceptability limits, or upon identification of some other laboratory problem. Corrective actions can include reanalysis of the sample or samples affected, re-sampling and analysis, or a change in procedures, depending upon the severity of the problem.

A copy of all applicable corrective action reports will be included in the final data package.

Sample Disposal

The proper disposal of unused portions of samples will be the responsibility of the laboratory. Sample bottle labels shall be scraped off or otherwise destroyed such that the labels provide no legible information. Unused portions shall not be returned to CH2M HILL without prior written authorization.

Subcontracting

The laboratory will indicate whether all analyses are performed in the lab or will be sub-contracted to an outside laboratory. The subcontracted laboratory must have current applicable certification for the requested analyses.

Samples may not be sent to another laboratory without prior written approval of the CH2M HILL Project Chemist or Project Manager.

Laboratory Compensation for Services

Correct invoices for laboratory services will be approved, once the data has been validated by CH2M HILL Project Chemist. CH2M HILL has the right to reduce or refuse payment for services that were not performed or services that were performed that do not meet the criteria specified in this statement of work. The right to reduce or refuse payment for services performed by laboratory may be a result of the following:

- Samples that do not meet specified holding time
- Samples that do not meet specified turn-around-time
- Samples that were analyzed using an unauthorized method
- Samples with QA/QC deficiencies as defined by the referenced methods that occurred as a result of laboratory performance

- Samples that do not meet minimum detection limits as a result of laboratory performance
- Samples that are judged to be invalid, unusable, or both that occurred as a result of laboratory performance
- Incomplete data package

Nonperformance

Nonperformance is defined as the failure to meet one or more of the contractual agreements as stated in this statement of work. Both the project and laboratory teams are agreeing to execute the work according to the requirements of this document.

Nonperformance includes any potential problem that will either delay the project schedule or cause the data to be qualified or rejected for reasons other than matrix interferences and related to laboratory nonperformance. The laboratory is required to communicate any potential causes of nonperformance within 24 hours of problem identification. Potential causes of nonperformance identified after 4 PM Eastern Time on Friday, must be communicated to the CH2M HILL Project Chemist and Project Manager by 10 AM Eastern Time the following Monday. Initial communication can be verbal and may include voicemail messages; however, a written summary of the problem and potential solutions may be requested and will be provided by the laboratory.

If a deliverable package (e.g., PDF) does not comply with the analytical method, reporting format, or quality control criteria established in this detailed statement of work, liquidated damages approximately proportional to the loss of usefulness of the results will be assessed. Some instances of noncompliance do not affect data quality and, consequently, the usefulness of the results is maintained. In those cases, a penalty may not be assessed. In other cases, noncompliance may render the results useless. Damages may include the cost of resampling or analysis by another laboratory.

For deliverables that are more than 25 calendar days late, no payment to the laboratory for the affected invoice will be made by CH2M HILL and the laboratory will be responsible for all costs associated with resampling, if necessary, unless other arrangements have been agreed upon with CH2M HILL.

If the laboratory is prevented or delayed by any unforeseeable cause, existing or future, that is beyond their reasonable control and without fault or negligence of the laboratory, the laboratory must, within 24 hours of such delay, provide the CH2M HILL Project Chemist with written notice thereof and within 7 calendar days of commencement of such delay provide the CH2M HILL Project Chemist with an estimate of the anticipated impact of the delay on the performance of the affected work.

Shortages of manpower or material, lost or broken samples or internal laboratory scheduling conflicts are not cause for excusable delay. Additional reasons for delay will be subject to negotiation with CH2M HILL.

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Tables

TABLE 1
Estimated Sample Counts
Faro Mine Complex Hazardous Waste Management Plan

Analytical Parameters	Samples	Field Duplicates	Equipment Blanks	Total
Liquid Waste Samples				
Basic Sediments and Water	57	0	0	57
Extractable Organic Halides	57	6 [a]	3 [b]	66
Flashpoint	57	0	0	57
Solid Waste Samples				
1:1 extract pH	15	1 [c]	0	16
Flashpoint	15	0	0	15
Self-heating by UN Method N.4	15	0	0	15

Notes:

[a] One field duplicate sample collected for approximately 10 percent of samples collected from each liquid waste stream

[b] One equipment blank sample collected for each liquid waste stream

[c] One field duplicate sample collected for approximately 10 percent of samples collected from the solid waste stream

UN = United Nations

TABLE 2
Required Reporting Limits
Faro Mine Complex Hazardous Waste Management Plan

Parameter	Reporting Limit
Liquid Waste Samples	
Basic Sediments and Water	0.05 %
Extractable Organic Halides	40 µg/g
Flashpoint	30 °C to 70 °C
Solid Waste Samples	
1:1 extract pH	0.1 pH units
Flashpoint	30 °C
Self-heating by UN method N.4	NA

Notes:
% = percent by weight
µg/g = microgram per gram concentration
°C = degrees Celsius
NA = not applicable
UN = United Nations

TABLE 3

Required Analytical Methods, Sample Containers, Preservation, and Holding Times

Faro Mine Complex Hazardous Waste Management Plan

Analyses	Code	Sample Matrix [a]	Container [b]	Qty	Preservative [c]	Holding Time [d]
Liquid Waste Samples						
Basic Sediments and Water	SPECIAL REQUEST-MT	W	250 mL amber glass jar	1	Cool to ≤4°C	14 days
Extractable Organic Halides	SPECIAL REQUEST-HO	W	1 L amber glass jar	1	Nitric acid; sodium thiosulfate; cool to ≤4°C	6 months
Flashpoint	FLASH-PMCC-AUTO-ED	W	250 mL amber glass jar	1	Cool to ≤4°C	14 days
Solid Waste Samples						
1:1 extract pH	PH-CORROSIVITY-WP	S	125 mL soil jar	1	Cool to ≤4°C	14 days
Flashpoint	FLASH-PMCC-AUTO-ED	S	125 mL soil jar; no headspace	1	Cool to ≤4°C	14 days
Self-heating by UN method N.4	NA	S	125 mL soil jar; no headspace	1	Cool to ≤4°C	NA

Notes:

Sample container, and volume requirements will be specified by the analytical laboratory performing the tests.

[a] Sample matrix: W = water, S = soil

[b] All vials will be sealed with Teflon®-lined screw caps

[c] All samples will be stored promptly in an insulated chest

[d] Holding times are from the time of sample collection

≤ = less than or equal to
ºC = degrees Celsius
L = liter
mL = milliliter
NA = not applicable
UN = United Nations

TABLE 4
Data Package Deliverables
Faro Mine Complex Hazardous Waste Management Plan

All Analytical Fractions	
Case Narrative – A detailed case narrative per analytical fraction is required and will include explanation of any non-compliance and/or exceptions and corrective action. Exceptions will be noted for receipt, holding times, methods, preparation, calibration, blanks, spikes, surrogates (if applicable), and sample exceptions.	•
Sample ID Cross Reference Sheet (Lab IDs and Client IDs)	•
Completed Chain of Custody and any sample receipt information	•
Sample preparation (extraction/digestion) logs	•
Copies of non-conformance memos and corrective actions	•

Form *	GC/MS Organic Fractions	Level II	Level III	Level IV
1	Sample results	•	•	• + raw
2	Surrogate Recovery Summary (w/ applicable control limits)	•	•	•
3	MS/MSD Accuracy & Precision Summary **	•	•	• + raw
3	LCS Accuracy Summary	•	•	• + raw
4	Method Blank Summary	•	•	• + raw
5	Instrument Tuning Summary (including tuning summary for applicable initial calibrations)		•	•
6	Initial Calibration Summary (including concentration levels of standards)		•	• + raw
7	Continuing Calibration Summary		•	• + raw
8	Internal Standard Summary (including applicable initial calibrations)		•	•

Form *	GC/HPLC Organic Fractions	Level II	Level III	Level IV
1	Sample results	•	• ***	• + raw
2	Surrogate Recovery Summary (w/ applicable control limits)	•	•	•
3	MS/MSD Accuracy & Precision Summary **	•	•	• + raw
3	LCS Accuracy Summary	•	•	• + raw
4	Method Blank Summary	•	•	• + raw
6	Initial Calibration Summary (including concentration levels of standards) ***		•	• + raw
7	Continuing Calibration Summary ***		•	• + raw
7	Degradation Summary (Organochlorine Pesticides only) ***		•	• + raw
8	Analytical Sequence (including internal standard area performance where applicable) ***		•	•
10	Compound Identification Summary (where confirmation required) ***		•	•

* CLP Form or summary form with equivalent information

** with RPD calculated according to method specifications

*** including deliverables for primary and confirmation analysis (where applicable)

CLP = contract laboratory form
GC/MS = gas chromatography/ mass spectrometry
GC/HPLC = gas chromatography/ high performance liquid chromatography
LCS = laboratory control sample
MS = matrix spike
MSD = matrix spike duplicate
RPD = relative percent difference