



Public Works and  
Government Services  
Canada

Travaux publics et  
Services gouvernementaux  
Canada

## RETURN BIDS TO:

## RETOURNER LES SOUMISSIONS À:

Public Works and Government Services Canada

ATB Place North Tower

10025 Jasper Avenue

Edmonton

Alberta

T5J 1S6

Bid Fax: (780) 497-3510

## INVITATION TO TENDER

## APPEL D'OFFRES

**Tender To: Public Works and Government Services  
Canada**

We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the goods, services, and construction listed herein and on any attached sheets at the price(s) set out therefor.

### Soumission aux: Travaux Publics et Services Gouvernementaux Canada

Nous offrons par la présente de vendre à Sa Majesté la Reine du chef du Canada, aux conditions énoncées ou incluses par référence dans la présente et aux annexes ci-jointes, les biens, services et construction énumérés ici et sur toute feuille ci-annexée, au(x) prix indiqué(s).

### Comments - Commentaires

### Vendor/Firm Name and Address

Raison sociale et adresse du

fournisseur/de l'entrepreneur

### Issuing Office - Bureau de distribution

Public Works and Government Services Canada

Northern Contaminated Site Program

ATB Place North Tower

10025 Jasper Avenue

Edmonton

Alberta

T5J 1S6

<b>Title - Sujet</b> AOMC Land Treatment	
<b>Solicitation No. - N° de l'invitation</b> EW699-181490/A	<b>Date</b> 2017-10-06
<b>Client Reference No. - N° de référence du client</b> PSPC-EW699-181490	<b>GETS Ref. No. - N° de réf. de SEAG</b> PW-\$NCS-014-11198
<b>File No. - N° de dossier</b> NCS-7-40140 (014)	<b>CCC No./N° CCC - FMS No./N° VME</b>
<b>Solicitation Closes - L'invitation prend fin</b> <b>at - à 02:00 PM</b> <b>on - le 2017-10-16</b>	
<b>Time Zone</b> <b>Fuseau horaire</b> Mountain Daylight Saving Time MDT	
<b>F.O.B. - F.A.B.</b> <b>Plant-Usine:</b> <input type="checkbox"/> <b>Destination:</b> <input checked="" type="checkbox"/> <b>Other-Autre:</b> <input type="checkbox"/>	
<b>Address Enquiries to: - Adresser toutes questions à:</b> Giguere, Mario	<b>Buyer Id - Id de l'acheteur</b> ncs014
<b>Telephone No. - N° de téléphone</b> (780) 246-0393 ( )	<b>FAX No. - N° de FAX</b> (780) 497-3510
<b>Destination - of Goods, Services, and Construction:</b> <b>Destination - des biens, services et construction:</b> DEPARTMENT OF PUBLIC WORKS AND GOVERNMENT SERVICES CANADA ATB PLACE, NORTH TOWER 10025 JASPER AVE EDMONTON Alberta T5J1S6 Canada	

**Instructions: See Herein**

**Instructions: Voir aux présentes**

<b>Delivery Required - Livraison exigée</b> See Herein	<b>Delivery Offered - Livraison proposée</b>
<b>Vendor/Firm Name and Address</b> <b>Raison sociale et adresse du fournisseur/de l'entrepreneur</b>	
<b>Telephone No. - N° de téléphone</b> <b>Facsimile No. - N° de télécopieur</b>	
<b>Name and title of person authorized to sign on behalf of Vendor/Firm</b> <b>(type or print)</b> <b>Nom et titre de la personne autorisée à signer au nom du fournisseur/</b> <b>de l'entrepreneur (taper ou écrire en caractères d'imprimerie)</b>	
<b>Signature</b>	<b>Date</b>

**RETURN BIDS TO:**  
**Public Services and Procurement Canada**  
**5<sup>th</sup> Floor, 10025 Jasper Ave NW**  
**Edmonton, Alberta T5J 1S6**

*Firms intending to submit bids on this project should obtain bid documents through the GETS service provider on the Government of Canada Web site at <http://buyandsell.gc.ca/procurement-data/tenders>.*

*Firms that obtain bid documents from a source other than the official site run the risk of not receiving a complete package.*

## INVITATION TO TENDER

Air Operations Maintenance Centre Land Treatment Unit Decommissioning  
Edmonton International Airport, Edmonton, Alberta

### IMPORTANT NOTICE TO BIDDERS

#### PROMPT PAYMENT IN THE CONSTRUCTION INDUSTRY

##### Prompt Payment Principles

Public Services and Procurement Canada advocates that construction-related payments should follow these three principles:

- **Promptness:** The department will review and process invoices promptly. If disputes arise, Public Services and Procurement Canada will pay for items not in dispute, while working to resolve the disputed amount quickly and fairly
- **Transparency:** The department will make construction payment information such as payment dates, company names, contract and project numbers, publicly available; likewise, contractors are expected to share this information with their lower tiers
- **Shared responsibility:** Payers and payees are responsible for fulfilling their contract terms including their obligations to make and receive payment, and to adhere to industry best practices

For more information: <http://www.tpsgc-pwgsc.gc.ca/biens-property/divulgate-disclosure/psdic-ppci-eng.html>

#### SUPPORT THE USE OF APPRENTICES

The Government of Canada proposes to support the employment of apprentices in federal construction and maintenance projects. To support this initiative, a voluntary certification signaling the Bidder's commitment to hire and train apprentices is available on Appendix 4.

#### PWGSC UPDATE ON ASBESTOS USE

Effective April 1, 2016, all Public Works and Government Services Canada (PWGSC) contracts for new construction and major rehabilitation will prohibit the use of asbestos-containing materials. Further information can be found at <http://www.tpsgc-pwgsc.gc.ca/comm/vedette-features/2016-04-19-00-eng.html>

#### ADDITION OF TERMINOLOGY

Take note of the additional paragraph included in clause R2810D identified in SC03.

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### R2710T GENERAL INSTRUCTIONS - CONSTRUCTION SERVICES - BID SECURITY REQUIREMENTS (GI) (2017-09-21)

The following GI's are included by reference and are available at the following Web Site

<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/5/R>

GI01	Integrity Provisions - Bid
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## **SPECIAL INSTRUCTIONS TO BIDDERS (SI)**

### **SI01 BID DOCUMENTS**

1. The following are the Bid Documents:
  - a. Invitation to Tender - Page 1;
  - b. Special Instructions to Bidders;
  - c. General Instructions - Construction Services - Bid Security Requirements R2710T (2017-09-21)
  - d. Clauses & Conditions identified in "Contract Documents";
  - e. Drawings and Specifications;
  - f. Bid and Acceptance Form and related Appendix(s); and
  - g. Any amendment issued prior to solicitation closing.

Submission of a bid constitutes acknowledgement that the Bidder has read and agrees to be bound by these documents.

2. General Instructions - Construction Services - Bid Security Requirements R2710T is incorporated by reference and is set out in the Standard Acquisition Clauses and Conditions (SACC) Manual, issued by Public Works and Government Services Canada (PWGSC). The SACC Manual is available on the PWGSC Web site:  
<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/5/R>

### **SI02 ENQUIRIES DURING THE SOLICITATION PERIOD**

Enquiries regarding this bid must be submitted in writing to the Contracting Authority named on the Invitation to Tender - Page 1 at [mario.giguere@pwgsc-tpsgc.gc.ca](mailto:mario.giguere@pwgsc-tpsgc.gc.ca) Except for the approval of alternative materials as described in G115 of R2710T, enquiries should be received no later than five (5) calendar days prior to the date set for solicitation closing to allow sufficient time to provide a response. Enquiries received after that time may result in an answer NOT being provided.

2. To ensure consistency and quality of the information provided to Bidders, PWGSC will examine the content of the enquiry and will decide whether or not to issue an amendment.
3. All enquiries and other communications related to this bid sent throughout the solicitation period must be directed ONLY to the Contracting Authority named in paragraph 1. above. Failure to comply with this requirement may result in the bid being declared non-compliant.

### **SI03 SITE VISIT**

1. There will not be a site visit.

### **SI04 REVISION OF BID**

A bid may be revised by letter or facsimile in accordance with G110 of R2710T. The facsimile number for receipt of revisions is 780-497-3510.

### **SI05 BID RESULTS**

1. A public bid opening will be held in the office designated on the Front Page "Invitation to Tender" (top left corner) for the receipt of bids shortly after the time set for solicitation closing.
2. The responsive bid carrying the lowest price will be recommended for contract award.
3. Following solicitation closing, bid results may be obtained by calling at number 780-256-0393 or faxing at 780-497-3510.

## **SI06 INSUFFICIENT FUNDING**

In the event that the lowest compliant bid exceeds the amount of funding allocated for the Work, Canada in its sole discretion may

- a. cancel the solicitation; or
- b. obtain additional funding and award the Contract to the Bidder submitting the lowest compliant bid.

## **SI07 BID VALIDITY PERIOD**

1. Canada reserves the right to seek an extension to the bid validity period prescribed in BA04 of the Bid and Acceptance Form. Upon notification in writing from Canada, Bidders will have the option to either accept or reject the proposed extension.
2. If the extension referred to in paragraph 1. above is accepted, in writing, by all those who submitted bids, then Canada will continue immediately with the evaluation of the bids and its approvals processes.
3. If the extension referred to in paragraph 1. above is not accepted in writing by all those who submitted bids then Canada will, at its sole discretion, either
  - a. continue to evaluate the bids of those who have accepted the proposed extension and seek the necessary approvals; or
  - b. cancel the invitation to tender.
4. The provisions expressed herein do not in any manner limit Canada's rights in law or under GI11 of R2710T.

## **SI08 CONSTRUCTION DOCUMENTS**

The successful Contractor will be provided with one electronic copy of the sealed and signed drawings, the specifications and the amendments upon acceptance of the offer.

## **SI09 WCB AND SAFETY PROGRAM**

1. The recommended Bidder shall provide to the Contracting Authority, prior to Contract award:
  - 1.1 a Workers' Compensation Board Premium Rate Statement – Alberta, or equivalent documentation from another jurisdiction;
  - 1.2 a Workers' Compensation Board letter of good standing, also listing covered Directors, Principals, Proprietor(s) or Partners who will be or who are anticipated to be present on the work site(s), or equivalent documentation from another jurisdiction; and
  - 1.3 a Certificate of Recognition (COR) or Registered Safety Plan (RSP). A health and safety policy and program, as required by other provincial/territorial Occupational Health and Safety Acts, will be acceptable in lieu of a COR or RSP.
2. The recommended Bidder shall deliver all of the above documents to the Contracting Authority on or before the date stated (usually 3-5 days after notification) by the Contracting Authority. Failure to comply with the request may result in the bid being declared non-compliant.

## **SI10 WEB SITES**

The connection to some of the Web sites in the solicitation documents is established by the use of hyperlinks. The following is a list of the addresses of the Web sites:

Treasury Board Appendix L, Acceptable Bonding Companies  
<http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=14494&section=text#appl>

Buy and Sell  
<https://www.achatsetventes-buyandsell.gc.ca>

Canadian economic sanctions  
<http://www.international.gc.ca/sanctions/index.aspx?lang=eng>

Contractor Performance Evaluation Report (Form PWGSC-TPSGC 2913)  
<http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/2913.pdf>

Bid Bond (form PWGSC-TPSGC 504)  
<http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/504.pdf>

Performance Bond (form PWGSC-TPSGC 505)  
[http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/505\\_eng.pdf](http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/505_eng.pdf)

Labour and Material Payment Bond (form PWGSC-TPSGC 506)  
<http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/documents/506.pdf>

Standard Acquisition Clauses and Conditions (SACC) Manual  
<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/5/R>

PWGSC, Industrial Security Services  
<http://ssi-iss.tpsgc-pwgsc.gc.ca/index-eng.html>

PWGSC, Code of Conduct and Certifications  
<http://www.tpsgc-pwgsc.gc.ca/app-acq/cndt-cndct/contexte-context-eng.html>

Construction and Consultant Services Contract Administration Forms Real Property Contracting  
<http://www.tpsgc-pwgsc.gc.ca/app-acq/forms/formulaires-forms-eng.html>

Declaration Form  
<http://www.tpsgc-pwgsc.gc.ca/ci-if/formulaire-form-eng.html>

Trade agreements  
<https://buyandsell.gc.ca/policy-and-guidelines/Policy-and-Legal-Framework/Trade-Agreements>

## CONTRACT DOCUMENTS (CD)

1. The following are the Contract Documents:
  - a. Contract Page when signed by Canada;
  - b. Duly completed Bid and Acceptance Form and any Appendices attached thereto;
  - c. Drawings and Specifications;
  - d. General Conditions and clauses

GC1	General Provisions – Construction Services	R2810D	(2017-08-17);
GC2	Administration of the Contract	R2820D	(2016-01-28);
GC3	Execution and Control of the Work	R2830D	(2015-02-25);
GC4	Protective Measures	R2840D	(2008-05-12);
GC5	Terms of Payment	R2850D	(2016-01-28);
GC6	Delays and Changes in the Work	R2860D	(2016-01-28);
GC7	Default, Suspension or Termination of Contract	R2870D	(2008-05-12);
GC8	Dispute Resolution	R2880D	(2016-01-28);
GC9	Contract Security	R2890D	(2014-06-26);
GC10	Insurance	R2900D	(2008-05-12);
	Allowable Costs for Contract Changes Under GC6.4.1	R2950D	(2015-02-25);
	Supplementary Conditions		
  - e. Any amendment issued or any allowable bid revision received before the date and time set for solicitation closing;
  - f. Any amendment incorporated by mutual agreement between Canada and the Contractor before acceptance of the bid; and
  - g. Any amendment or variation of the contract documents that is made in accordance with the General Conditions.
2. The documents identified by title, number and date above are incorporated by reference and are set out in the Standard Acquisition Clauses and Conditions (SACC) Manual, issued by Public Works and Government Services Canada (PWGSC). The SACC Manual is available on the PWGSC Web site:  
<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>
3. The language of the contract documents is the language of the Bid and Acceptance Form submitted.

## **SUPPLEMENTARY CONDITIONS (SC)**

### **SC01 INDUSTRIAL SECURITY RELATED REQUIREMENTS, DOCUMENT SAFEGUARDING**

There is no document security requirement applicable to this Contract.

### **SC02 INSURANCE TERMS**

#### **1) Insurance Contracts**

- (a) The Contractor must, at the Contractor's expense, obtain and maintain insurance contracts in accordance with the requirements of the Certificate of Insurance. Coverage must be placed with an Insurer licensed to carry out business in Canada.
- (b) Compliance with the insurance requirements does not release the Contractor from or reduce its liability under the Contract. The Contractor is responsible for deciding if additional insurance coverage is necessary to fulfill its obligation under the Contract and to ensure compliance with any applicable law. Any additional insurance coverage is at the Contractor's expense, and for its own benefit and protection.

#### **2) Period of Insurance**

- (a) The policies required in the Certificate of Insurance must be in force from the date of contract award and be maintained throughout the duration of the Contract.
- (b) The Contractor must be responsible to provide and maintain coverage for Products/Completed Operations hazards on its Commercial General Liability insurance policy, for a period of six (6) years beyond the date of the Certificate of Substantial Performance.

#### **3) Proof of Insurance**

- (a) Before commencement of the Work, and no later than thirty (30) days after contract award, the Contractor must deposit with Canada a Certificate of Insurance on the form attached herein.
- (b) Upon request by Canada, the Contractor must provide originals or certified true copies of all contracts of insurance maintained by the Contractor pursuant to the Certificate of Insurance.

#### **4) Insurance Proceeds**

In the event of a claim, the Contractor must, without delay, do such things and execute such documents as are necessary to effect payment of the proceeds.

#### **5) Deductible**

The payment of monies up to the deductible amount made in satisfaction of a claim must be borne by the Contractor.

### **SC03 INTERPRETATION**

R2810D General Condition GC1.1.2 Terminology is modified to include the following,

#### **“Architectural and Engineering Services”:**

Mean's services to provide a range of investigation and recommendation reports, planning, design, preparation, or supervision of the construction, repair, renovation or restoration of a work and includes contract administration services, for real property projects.

#### **“Construction Services”:**

Means construction, repair, renovation or restoration of any work except a vessel and includes; the supply and erection of a prefabricated structure; dredging; demolition; environmental services related to a real property; or, the hire of equipment to be used in or incidentally to the execution of any construction services referred to above.

**“Facility Maintenance Services”:**

Means services related to activities normally associated with the maintenance of a facility and keeping spaces, structures and infrastructure in proper operating condition in a routine, scheduled, or anticipated fashion to prevent failure and/or degradation including inspection, testing, servicing, classification as to serviceability, repairs, rebuilding and reclamation, as well as cleaning, waste removal, snow removal, lawn care, replacement of flooring, lighting or plumbing fixtures, painting and other minor works.

**SC04 WORKPLACE SAFETY AND HEALTH**

**1. EMPLOYER/PRIME CONTRACTOR**

1.1 The Contractor shall, for the purposes of the Occupational Health and Safety Act, Alberta, and for the duration of the Work:

- 1.1.1 act as the Employer, where there is only one employer on the work site, in accordance with the Authority Having Jurisdiction;
- 1.1.2 accept the role of Prime Contractor, where there are two or more employers involved in work at the same time and space at the work site, in accordance with the Authority Having Jurisdiction; and
- 1.1.3 agree, in the event of two or more Contractors working at the same time and space at the work site, without limiting the General Conditions, to Canada's order \* to:
  - 1.1.3.1 accept, as the Prime Contractor, the responsibility for Canada's other Contractor(s); or
  - 1.1.3.2 accept that Canada's other Contractor is Prime Contractor and conform to that Contractor's Site Specific Health and Safety Plan.

\* “order” definition: *after contract award, Contractor is ordered by a Change Order*

**2. SUBMITTALS**

2.1 The Contractor shall provide to Canada:

- 2.1.1 prior to the pre-construction meeting, a transmittal and copy of a completed Notice of Project form PWGSC - TPSGC 458 (form will be provided to the proposed contractor prior to award), as sent to the Authority Having Jurisdiction (AHJ); and
- 2.1.2 prior to commencement of work and without limiting the terms of the General Conditions:
  - 2.1.2.1 copies of all other necessary permits, notifications and related documents as called for in the scope of work/specifications and/or by the AHJ; and
  - 2.1.2.2 a site specific Health and Safety Plan as requested.

*NOTE: Please do not include any forms that include personal 3rd party information such as the names of the contractor's employees and their related claims information.*

3. LABOUR AUTHORITY CONTACT:

*The contact below represents the Labour Authority in the jurisdiction (AHJ). They are not representatives of the Workers Compensation.*

Do not contact the people referenced below for issues pertaining to WCB or WCB Clearances. Those queries must be directed specifically to the WCB, and where the WCB has both a Labour and Compensation component, WCB issues must be directed to the Compensation/Employer Services sections.

**ALBERTA North**

Alberta Human Resources and Employment  
Workplace Health and Safety  
10th Floor, 7th Street Plaza  
10030-107 Street  
Edmonton, Alberta, T5J 3E4

Telephone: 1(866) 415-8690  
Facsimile: (780) 427-0999

All submissions are to be scanned and emailed to  
[whs@gov.ab.ca](mailto:whs@gov.ab.ca)

## **BID AND ACCEPTANCE FORM (BA)**

### **BA01 IDENTIFICATION**

Air Operations Maintenance Centre Land Treatment Unit Decommissioning  
Edmonton International Airport, Edmonton, Alberta  
R.083110.001

### **BA02 BUSINESS NAME AND ADDRESS OF BIDDER**

Name: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone: \_\_\_\_\_ Fax: \_\_\_\_\_ PBN: \_\_\_\_\_

E-mail address: \_\_\_\_\_

### **BA03 THE OFFER**

The Bidder offers to Canada to perform and complete the Work for the above named project in accordance with the Bid Documents for the **TOTAL BID AMOUNT INDICATED IN APPENDIX 1**.

### **BA04 BID VALIDITY PERIOD**

The bid must not be withdrawn for a period of thirty (30) days following the date of solicitation closing.

### **BA05 ACCEPTANCE AND CONTRACT**

Upon acceptance of the Bidder's offer by Canada, a binding Contract will be formed between Canada and the Bidder. The documents forming the Contract will be the Contract Documents identified in "Contract Documents (CD)" section.

### **BA06 CONSTRUCTION TIME**

The Contractor must perform and complete the Work within two (2) weeks from the date of notification of acceptance of the offer.

### **BA07 BID SECURITY**

The Bidder must enclose bid security with its bid in accordance with GI08 - Bid Security Requirements of R2710T - General Instructions - Construction Services - Bid Security Requirements.

### **BA08 SIGNATURE**

\_\_\_\_\_  
Name and title of person authorized to sign on behalf of Bidder (Type or print)

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

## APPENDIX 1 - COMBINED PRICE FORM

- 1) The prices per unit will govern in establishing the Total Extended Amount. Any arithmetical errors in this Appendix will be corrected by Canada.
- 2) Canada may reject the bid if any of the prices submitted do not reasonably reflect the cost of performing the part of the work to which that price applies.

### LUMP SUM

The Lump Sum Amount designates Work to which a Lump Sum Arrangement applies.

- (a) Work included in the Lump Sum Amount represents all work not included in the unit price table.

<b>TOTAL LUMP SUM AMOUNT (LSA)</b> Excluding applicable tax(s)	\$ _____
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### UNIT PRICE TABLE

The Unit Price Table designates Work to which a Unit Price Arrangement applies.

- (a) Work included in each item is as described in the referenced specification section.
- (b) The Price per Unit shall not include any amounts for Work that is not included in that unit price Item.

Specification Reference	Class of Labour, Plant or Material	Unit of Measurement	Estimated Quantity (EQ)	Price per Unit applicable tax(s) extra (PU)	Extended amount (EQ x PU) applicable tax(s) extra
02 55 13-1	Excavation, loading, hauling and disposal of impacted soil.	m <sup>3</sup>	1,000	\$ _____/m <sup>3</sup>	\$ _____
<b>TOTAL EXTENDED AMOUNT (TEA)</b> Excluding applicable tax(s)					\$ _____

<b>TOTAL BID AMOUNT (LSA +TEA)</b> Excluding applicable tax(s)	\$ _____
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**APPENDIX 1A – COST BREAKDOWN TABLE**

The table below is for information purposes only.

Prior to contract award the assessed best value proponent will be required to complete the following table. The total evaluated price must equal the bid submission per the bid price form total submitted at the time of solicitation closing.

Item #	Description	Unit	Total
BOPC-1	Balance of Project Costs including but not limited to: - Any variable indirect costs for overhead and admin. - Costs for Expeditors, - Closeout submittals - CGL Insurance, - All Risk Insurance, - WCB costs, - Business Expenses, - Ancillary Equipment, - Service Vehicles, - Supervision, - Equipment repairs and parts supply & transport.		\$ _____
01 31 19-1	Pre-mobilization site visit	Lump sum	\$ _____
01 31 19-2	Project meetings	Lump sum	\$ _____
01 33 00-1	Project photographs	Lump sum	\$ _____
01 33 00-2	Project documents	Lump sum	\$ _____
01 35 13.43	Dewatering	Lump sum	\$ _____
01 35 29.06	Site specific health and safety plan	Lump sum	\$ _____
01 53 00-1	Mobilization	Lump sum	\$ _____
01 53 00-2	Demobilization	Lump sum	\$ _____
	<b>Total for Lump Sum Amount Breakdown:</b> This dollar amount shall equal the amount provided for the Lump Sum Amount (LSA) in Appendix 1 – Combined Price Form		\$ _____





### APPENDIX 3 - LISTING OF SUBCONTRACTORS

- 1) In accordance with GI07 - Listing of Subcontractors and Suppliers of R2710T- General Instructions - Construction Services - Bid Security Requirements, the Bidder should provide a list of Subcontractors with his Bid.
- 2) The Bidder should submit the list of Subcontractors and for any portion of the Work valued at 20% or greater of the submitted Bid Price.

	Subcontractor	Division	Estimated value of work
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

## APPENDIX 4 - VOLUNTARY CERTIFICATION TO SUPPORT THE USE OF APPRENTICES

### PUBLIC WORKS AND GOVERNMENT SERVICES CANADA APPRENTICE PROCUREMENT INITIATIVE

1. To encourage employers to participate in apprenticeship training, Bidders, bidding on construction and maintenance contracts by Public Works and Government Services Canada (PWGSC) are being asked to sign a voluntary certification, signaling their commitment to hire and train apprentices.
2. Canada is facing skills shortages across various sectors and regions, especially in the skilled trades. Equipping Canadians with skills and training is a shared responsibility. The Government of Canada made a commitment to support the use of apprentices in federal construction and maintenance contracts. Contractors have an important role in supporting apprentices through hiring and training and are encouraged to certify that they are providing opportunities to apprentices as part of doing business with the Government of Canada.
3. The Government of Canada is encouraging apprenticeships and careers in the skilled trades. In addition, the government offers a tax credit to employers to encourage them to hire apprentices. Information on this tax measure administered by the Canada Revenue Agency can be found at: [www.cra-arc.gc.ca](http://www.cra-arc.gc.ca). Employers are also encouraged to find out what additional information and supports are available from their respective provincial or territorial jurisdiction.
4. Signed certifications on page 2 of 2 will be used to better understand contractor use of apprentices on Government of Canada maintenance and construction contracts and may inform future policy and program development.
5. The Contractor hereby certifies the following:

In order to help meet demand for skilled trades people, the Contractor agrees to use, and require its subcontractors to use, reasonable commercial efforts to hire and train registered apprentices, to strive to fully utilize allowable apprenticeship ratios \* and to respect any hiring requirements prescribed by provincial or territorial statutes

The Contractor hereby consents to this information being collected and held by PWGSC, and Employment and Social Development Canada to support work to gather data on the hiring and training of apprentices in federal construction and maintenance contracts.

To support this initiative, a voluntary certification signaling the Contractor's commitment to hire and train apprentices is available at page 2 of 2.

If you accept fill out and sign page 2 of 2.

*\* The journey person-apprentice ratio is defined as the number of qualified/certified journeypersons that an employer must employ in a designated trade or occupation in order to be eligible to register an apprentice as determined by provincial/territorial (P/T) legislation, regulation, policy directive or by law issued by the responsible authority or agency.*

## Voluntary Certification

*Note: The contractor will be asked to fill out a report every six months or at project completion as per sample  
"Voluntary Reports for Apprentices Employed during the Contract" provided at Annex C*

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Company Name: \_\_\_\_\_

Company Legal Name: \_\_\_\_\_

Solicitation Number: \_\_\_\_\_

Number of company employees: \_\_\_\_\_

Number of apprentices planned to be working on this contract: \_\_\_\_\_

Trades of those apprentices:

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## ANNEX A - CERTIFICATE OF INSURANCE (Not required at solicitation closing)

### CERTIFICATE OF INSURANCE

Description and Location of Work	Contract No.
	Project No.

Name of Insurer, Broker or Agent	Address (No., Street)	City	Province	Postal Code
Name of Insured (Contractor)	Address (No., Street)	City	Province	Postal Code
Additional Insured				
<i>Her Majesty the Queen in Right of Canada as represented by the Minister of Public Works and Government Services</i>				

Type of Insurance	Insurer Name and Policy Number	Inception Date D / M / Y	Expiry Date D / M / Y	Limits of Liability		
<b>Commercial General Liability</b> <b>Umbrella/Excess Liability</b>				Per Occurrence	Annual General Aggregate	Completed Operations Aggregate
				\$	\$	\$
				\$	\$	\$

I certify that the above policies were issued by insurers in the course of their Insurance business in Canada, are currently in force and include the applicable insurance coverage's stated on page 2 of this Certificate of Insurance, including advance notice of cancellation / reduction in coverage.

Name of person authorized to sign on behalf of Insurer(s) (Officer, Agent, Broker)

Telephone number

Signature

Date D / M / Y

CERTIFICATE OF INSURANCE Page 2 of 2

General

The insurance policies required on page 1 of the Certificate of Insurance must be in force and must include the insurance coverage listed under the corresponding type of insurance on this page.

The policies must insure the Contractor and must include Her Majesty the Queen in Right of Canada as represented by the Minister of Public Works and Government Services as an additional Insured.

The Policy shall be endorsed to provide the Owner with not less than 30 days' notice in writing in advance of any cancellation or change or amendment restricting coverage.

Without increasing the limit of liability, the policies must protect all insured parties to the full extent of coverage provided. Further, the policies must apply to each Insured in the same manner and to the same extent as if a separate policy had been issued to each.

Commercial General Liability

The insurance coverage provided must not be substantially less than that provided by the latest edition of IBC Form 2100.

The policy must either include or be endorsed to include coverage for the following exposures or hazards if the Work is subject thereto:

- (a) Blasting.
- (b) Pile driving and caisson work.
- (c) Underpinning.
- (d) Removal or weakening of support of any structure or land whether such support be natural or otherwise if the work is performed by the insured contractor.

The policy must have the following minimum limits:

- (a) **\$5,000,000** Each Occurrence Limit;
- (b) **\$10,000,000** General Aggregate Limit per policy year if the policy contains a General Aggregate; and
- (c) **\$5,000,000** Products/Completed Operations Aggregate Limit.

Umbrella or excess liability insurance may be used to achieve the required limits.

## **ANNEX B - VOLUNTARY REPORT FOR APPRENTICES EMPLOYED DURING THE CONTRACT** **(Sample)**

*(This report is not required at bid deposit)*

The Contractor should compile and maintain records on the number of apprentices and their trade that were hired to work on the contract.

The Contractor should provide this data in accordance with the format below. If no apprentices were hired during the contract period, the Contractor should still provide a "nil" report.

The data should be submitted to the Contracting Authority either six months after contract award or at the end of the contract, whichever comes first.

<b>Number of apprentices hired</b>	<b>Trade</b>

## **ANNEX C – TERMS OF REFERENCE**

See attached.

## Terms of Reference

Land Treatment Unit South Cell Decommissioning

Edmonton International Airport

Edmonton, AB

September 2017

## Introduction

The Air Operations Maintenance Centre Building, located at the Edmonton International Airport (EIA) in Edmonton, Alberta, was the subject of remediation that included excavation of hydrocarbon impacted soils from the subsurface. The impacted soils were interred at a Land Treatment Unit (LTU) located on lands at the Edmonton International Airport, divided between two treatment cells. The soils located in the North cell were transferred to the South cell during FY 2016-17 and the North cell infrastructure decommissioned. Sampling during July/August of 2017 indicated the South cell can now be decommissioned as the majority of the impacted soils are below applicable criteria and may be spread on site. A small quantity, estimated between 500 and 1000 m<sup>3</sup>, remains impacted and will require excavation and disposal at an accepting facility.

## Scope of Work

The objectives of the LTU decommissioning will include the following:

1. Dewatering and appropriate disposal of accumulated sump water via vacuum truck
2. Removal and off-site disposal at an appropriate accepting facility of soil exceeding CCME guidelines
3. Removal and off-site disposal at an appropriate accepting facility of all sump gravel, sump culvert, and LTU liner material
4. Excavation, temporary stockpiling, and on-site spreading to appropriate rough grade of LTU soils meeting CCME guidelines
5. Leveling and admixing of berm soils with other spread soils
6. Appropriate dust control and repairs of any transport/equipment impacts to access roadways as necessary

All appropriate and required permits for conducting this work will be obtained prior to field deployment by the Contractor. Contractor will be responsible for submitting a Health and Safety plan to the PSPC PM prior to deployment. The Contractor will coordinate as necessary with the PSPC on-site representative as they collect confirmatory and other necessary samples. All waybills and receipts from the accepting facility will be provided to the PSPC on-site representative for confirmation and invoice recommendation.

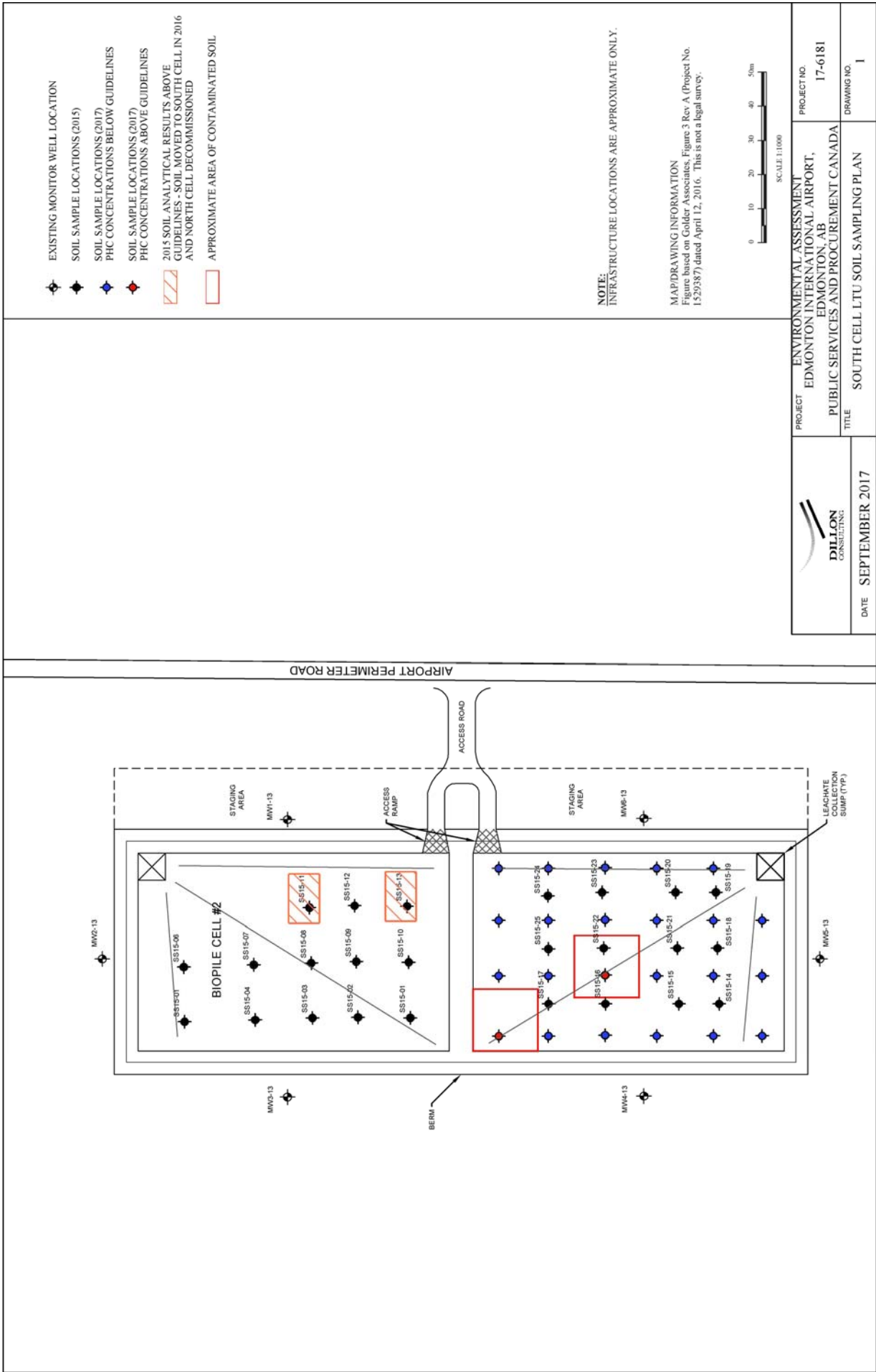
The estimated quantity of soils interred in the LTU is 5200 m<sup>3</sup> (+/-). The estimated quantity of soil composing the berm is 1800 m<sup>3</sup> (+/-).

It is anticipated that the LTU impacted soils will be excavated and disposed of prior to the remaining soils being excavated and stock piled. The on-site representative will conduct their confirmatory sampling and will require 24 hours for analysis results. For the purposes of proposal, it is assumed that the quantity of impacted soils above CCME criteria is 1000 m<sup>3</sup>. The Contractor will provide a unit rate for excavation/disposal per m<sup>3</sup> for quantity above that amount.

The remaining soil will be excavated and stockpiled adjacent to the LTU cell so that the liner may be removed and disposed of. These soils will then be admixed with the berm soils and spread to appropriate rough grade over the North and South LTU footprints to meet current landscape drainage performance and site aesthetics.

## Schedule

The Contractor will endeavour to complete the field work prior to November 08, 2017. A kickoff meeting will be held on-site within 5 working days, or sooner as possible, of the PSPC Buy/Sell process completion and notice of award.



## **ANNEX D – SPECIFICATIONS**

See attached.

Edmonton International Airport  
Air Operations Maintenance Building  
South Land Treatment Unit  
Decommissioning Specifications

Edmonton International Airport  
Nisku, Alberta

ISSUED FOR TENDER

Prepared for

Public Works and Government Services Canada

Contract No.

Project: R.083110.001

	<b>Pages</b>
<b>Division 01 – General</b>	
Section 00 11 21 – Summary of Work.....	4
Section 01 31 19 – Project Meetings.....	3
Section 01 33 00 – Submittal Procedures .....	3
Section 01 33 00_1 – Submittal Schedule Table.....	1
Section 01 35 00.06 – Special Procedures for Traffic Control .....	2
Section 01 35 13.43 – Special Procedures for Contaminated Sites .....	5
Section 01 35 29.06 – Health and Safety Requirements .....	5
Section 01 35 43 – Environmental Procedures .....	2
Section 01 53 00 – Mobilization/Demobilization .....	2
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Section 01 77 00 – Closeout Procedures .....	2
<b>Division 02 – Existing Conditions</b>	
Section 02 55 13 – Contaminated Soil .....	3
<b>Division 31 – Earthworks</b>	
Section 31 00 00 – Earthwork.....	3

### **Drawings**

Figure 1: Land Treatment Unit (LTU) Diagram (Dillon, September 2017).

### **Appendix**

#### Appendix A

Airside Operations and Maintenance Centre, 2016 Post Remediation Monitoring and LTF Decommissioning, Edmonton International Airport (Golder, November 2016).

**Part 1            General**

**.1        Definition**

- The project shall be known as Edmonton International Airport Air Operations Maintenance Centre Land Treatment Unit Decommissioning and it is to include the decommissioning of the South cell of the Land Treatment Unit (LTU). The site is located at the Edmonton International Airport, Nisku, Alberta.
- Departmental Representative's Authorized Personnel (DRAP): within the context of these Specifications, the term Departmental Representative's Authorized Personnel refers to personnel appointed by Departmental Representative or authorized on-site by Departmental Representative. Departmental Representative's Authorized Personnel provide recommendations/technical guidance to Departmental Representative's, as required, for the enforcement of these specifications.
- Contractor: The contractor procured to undertake the site management, decommissioning and restoration is defined, within the context of these specifications, as the Contractor.
- Owner: within the context of these specifications, the term Owner refers to the airport authority that operates the Site.
- Site: Area of ground on which the location of the work will be undertaken.
- The LTU is located east of the Air Operations Maintenance Building (AOMC), adjacent to Airport Perimeter Road. Airport Perimeter Road is a gravel road with access via Highway 2 and Airport Road, and Highway 19.
- The scope of work for this project includes, but is not limited to:
  - Excavation of approximately 1000 m<sup>3</sup> of hydrocarbon impacted soils from the LTU, transport of the impacted soils to and final disposal at an licensed facility
  - Excavation and spreading of approximately 4100 m<sup>3</sup> non-impacted soils within the footprint of the North and South LTU cells
  - Removal and disposal of the HDPE liner located within the LTU at a licensed facility
  - Dewatering of sump and disposal of water, and appropriate disposal, excavation and disposal of sump infrastructure (gravel, galvanized culvert, fencing) at appropriate licensed facilities,
  - Backfilling of sump excavation with non-impacted soils sourced from the LTU berm material
  - Grading of remaining berm soil and other non-impacted soil to similar drainage performance and aesthetics of surrounding lands.
- The LTU location is shown on provided drawings (Figure 1).

### **Supporting Documents**

- Supporting documents include but are not limited to:
  - Airside Operations Maintenance Building Post Remediation Monitoring and LTF Decommissioning, Edmonton International Airport (Golder, Dec 2016).
  - EIA South Cell LTU Decommissioning Site Diagram (Dillon, Sept 2017).

### **DESCRIPTION OF WORK**

- The required work to be undertaken by the Contractor for the project will include but not be limited to the following activities:
  - Preparation of a site specific Health and Safety Plan. During the completion of the site work the Contractor is responsible for site health and safety and shall designate an on-site safety coordinator.
  - Preparation of a Plan of Decommissioning Operations.
  - Mobilization of equipment and materials, and project kick-off meeting.
  - Obtaining all necessary permits to undertake the project.
  - Provision of all necessary items and equipment, including but not limited to fencing, signage to maintain site security and safety.
  - Confirmation that no on-site utility services exist at the site.
  - Excavating, loading, hauling and disposal at a licensed facility of hydrocarbon impacted soils from the South LTU cell. Area of excavation is as shown on Figure 1 and as directed by Departmental Representative Authorized Personnel.
  - Dewatering of excavations as necessary for safety/access where groundwater is encountered or surface water infiltrates.
  - Dewatering of the sump area prior to excavation and disposal of sump infrastructure, with disposal of sump water as appropriate.
  - Excavated areas at the LTU shall be backfilled/compacted, and LTU and berm soils distributed to match surrounding topography, as possible, with site grading to allow drainage performance similar to surrounding landscape.
  - Demobilization of equipment, materials and hoarding including disposal of all waste materials generated during the site decommissioning.
- The above list must be completed in accordance with these Tender Documents.

### **WORK SEQUENCE**

- |        |  |
|--------|--|
| Part 1 | Co-ordinate Work/Progress Schedule and on site activities during decommissioning with Owner. |
|--------|--|

- All work to be completed by November 30, 2017.

### **CONTRACTOR USE OF PREMISES**

- Limit use of premises to what is required for Work, storage, and access.

- Co-operate with other Contractors in carrying out their respective works in the LTU and carry out instructions from Departmental Representative's Authorized Personnel.
- Co-ordinate use of premises under direction of Departmental Representative.

#### **CONTRACTOR RESPONSIBILITIES**

- Contractor Responsibilities:
  - Contractor to submit all submittals as described in Section 01 33 00 – Submittal Procedures
  - Review all submittals. Submit to Departmental Representative, notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.

#### **EXISTING SERVICES**

- Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative's Authorized Personnel of findings. There are currently no known or identified services at the work site.
- Where unknown services are encountered, immediately advise Departmental Representative's Authorized Personnel and confirm findings in writing.
- Protect, relocate or maintain existing active services if encountered. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction. Authorities having jurisdiction would be a Governmental agency or sub-agency that regulates the codes and standards that are to be met during this Work.
- Record locations of maintained, re-routed and abandoned service lines.

#### **DOCUMENTS REQUIRED**

- Maintain at job site, one copy each document as follows:
  - Notice of Project.
  - Contract Drawings.
  - Specifications.
  - Addenda.
  - Change Orders.
  - Other Modifications to Contract.
  - Field Test Reports.
  - Approved Work Schedule.
  - Site Specific Health and Safety Plan and Other Safety Related Documents.
  - Other documents as specified.

#### **Measurement of Payment**

- Work under this contract will be paid as follows:

- Lump sum payment items will be paid at the lump sum price tendered for each lump sum item listed in the Basis of Pricing Schedule. Percentage of payment will be relative to percentage of completion of activity indicated on the tender form.
  - Unit price items will be paid at the unit price tendered for each unit price item listed in the Basis of Pricing Schedule.
  - Indirect Project Costs will be paid at the lump sum price tendered for "Balance of Project Costs" (BOPC) on the Basis of Pricing Form BOPC-1.
- Unit price and lump sum pay items will be paid under the Basis of Pricing which will form the Basis of Payment of the proposed contract. All other items, whether specifically defined in the specific sections of the Specifications or not, will be paid under item BOPC-1, Balance of Project Costs, in the Basis of Pricing Schedule BOPC-1.
- Direct costs include all costs directly attributable to a particular pay item including equipment, operators, materials, equipment maintenance and depreciation, etc. All direct costs for lump sum and unit price are to be included in the appropriate price item in the Basis of Pricing Schedule
- Indirect costs include all costs not directly attributable to the pay items including profit, supervision, overhead, administration, Insurance, Worker's Compensation Board, Contractor's allowance for equipment repairs and depreciation, and any other relevant costs. All indirect costs associated with specific unit price or lump sum items will be included in Item BOPC-1, Balance of Project Costs, in the Basis of Pricing Schedule BOPC-1.
- Include costs for work, goods or services required in this section that are not covered by appropriate payment clauses in other sections in Item BOPC-1, Balance of Project Costs, in the Basis of Pricing Schedule BOPC-1.
- Except as indicated above, work under this section will not be measured. Include all costs in Item 00 11 21 of BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

**Products  
NOT USED**

- Not used.

**Execution  
NOT USED**

- Not used.

END OF SECTION

**Part 1            General**

**1.1            ADMINISTRATIVE**

- .1    Schedule and administer project meetings throughout the progress of the Work at the call of Departmental Representative (DR) or Departmental Representative's Authorized Personnel (DRAP).
- .2    Review agenda for meetings as prepared by DRAP.
- .3    Distribute written notice of each meeting three (3) days in advance of meeting date to Departmental Representative.
- .4    Coordinate physical space and arrangements for meetings with DR or DRAP.
- .5    Attend all required meetings.
- .6    Review and approve the meeting minutes as provided by DRAP. Significant proceedings and decisions will be included and required actions by parties will be identified.
- .7    Representatives attending meetings will be qualified and authorized to act on behalf of party represented.

**1.2            PRE-MOBILIZATION SITE VISIT**

- .1    Prior to mobilization, the Contractor will perform a Pre-Mobilization site visit to check field conditions and obtain actual conditions required to ensure correct execution of the Work. Notify DR and DRAP in writing upon completion of the pre-mobilization site visit, of all matters which could prejudice proper execution of the Work. This may be coordinated with Project Start-Up/Preconstruction Meeting.
- .2    Provide a minimum of three (3) day's notice to DR and DRAP prior to conducting pre-mobilization site visit. DR and DRAP will attend site visit.

**1.3            PROJECT START-UP/PRECONSTRUCTION MEETINGS**

- .1    Within three (3) days after award of Contract, request a teleconference meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2    DR, DRAP, Contractor, major Subcontractors as applicable, Contractor field inspectors as applicable, and Contractor supervisors will be in attendance.
- .3    Establish time and location of meeting and notify parties concerned.
- .4    Agenda to include:
  - .1    Appointment of official representatives of participants in the Work.
  - .2    Requirements for temporary control measures, site sign, safety measures.
  - .3    Delivery schedule of specified Work.

- .4 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .5 Payment claim(s), administrative procedures, photographs, hold backs.
- .6 Appointment of inspection and testing agencies or firms.
- .7 Insurances, transcript of policies.

#### **1.4 DAILY PROJECT MEETINGS**

- .1 Contractor, major Subcontractors involved in Work, and DRAP are to be in attendance. Agenda to include the following:
  - .1 Review and approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Health and Safety and/or Environmental Protection issues.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.
- .2 Worker Orientation Meeting
  - .1 Prior to start of work, conduct a worker orientation meeting for all work site personnel. This meeting is intended to describe the remediation activities at the site, and provide instruction for the applicable health, safety and environmental policies and regulations related to the site Work activities.
    - .1 The Contractor shall submit the worker orientation meeting agenda to the DRAP for review and comment.
    - .2 The DRAP may be in attendance.
  - .2 Submit a copy of the worker orientation agenda items covered and attendance sheet prior to commencing work or upon request of the DRAP. Each attendee is required to sign a record of attendance upon completion of the meeting.

#### **1.5 MEASURE OF PAYMENT**

- .1 All direct costs for Pre-mobilization site visit will be measured for payment by the lump sum amount under item 01 31 19-1 – Pre-Mobilization Site Visit, as indicated in the Basis of Pricing Schedule.
- .2 All direct costs for Project meetings will be measured for payment by the lump sum amount under item 01 31 19-2 – Project Meetings, as indicated in the Basis of Pricing Schedule. Project meetings include Project Start-up Teleconference Meetings, daily project meetings and worker orientation.

- .3 Except as indicated above, work under this section will not be measured. Include all costs in Item 00 11 21 of BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

TABLE 01 33 00-1 CONTRACTOR SUBMITTAL SCHEDULE		
Specification Section	Description	Date
01 31 19	Request for Project Start up Meeting	Three (3) contract days after award
01 31 19	Project Meeting Minutes	3 days after meeting
01 31 19	Preliminary Project Schedule	Seven (7) contract days after award
01 31 19	Pre-mobilization site visit report	Three (3) days after site visit
01 31 19	Worker Orientation meeting agenda and attendance sheet	Prior to commencing Work
01 33 00	Progress Photographs	With weekly progress report
01 33 00	Final Photographs	Prior to final progress payment request
01 35 29.06	Site Specific Health and Safety Plan	5 days after contract award
01 35 29.06	Employee Hazardous Materials training certificates	Prior to work activities
01 35 29.06	Proof of PPE Certification	Prior to work activities
01 35 29.06	Incident /Accident Report	Verbal report immediately followed by written report in 24 hours
01 35 29.06	Work site Health and Safety Weekly inspection report	With weekly Progress Report
01 35 29.06	Copies of Reports/Directions by Federal or Provincial and Safety Inspectors	Verbal report immediately followed by written report in 24 hours
01 35 29.06	On-site Contingency and Emergency Response Plan	With Health and Safety Plan
01 35 29.06	Correction Action report for non compliance Health and Safety issue	as required
01 35 29.06	Report corrective action for observed environmental non-compliance	as required
01 35 43	Copies of Environmental Approvals (Where applicable)	Prior to commencing Work or as required
01 53 00	Mobilization and Demobilization Plan	Five (5) days after Contract Award
01 77 00	Request for Final Inspection	As required

**END OF SECTION**

**Part 1 General**

**1.1 ADMINISTRATIVE**

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Review submittals prior to submission to Departmental Representative via Departmental Representative Authorized Personnel (DRAP). This review indicates necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .4 Notify DRAP, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .5 Verify field measurements and Work are co-ordinated.
- .6 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .7 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .8 Keep one (1) reviewed copy of each submission on site.

**1.2 PROJECT SCHEDULE**

- .1 Develop a detailed Project Schedule.
- .2 Ensure detailed Project Schedule includes as minimum, milestone and activity types as follows:
  - .1 Award.
  - .2 Submittals.
  - .3 Permits required by Contractor.
  - .4 Mobilization.
  - .5 Site Activities (expand as required to suit Contractor's task breakdown).
  - .6 Demobilization.
  - .7 Closeout Submittals.
  - .8 Final Certificate of Completion.
- .3 After review, revise and resubmit Schedule to comply with revised Project Schedule, as necessary.

- .4 During progress of Work revise, update and resubmit the Project Schedule as directed by Departmental Representative.

### **1.3 FINAL REPORTING**

- .1 Final reports should be issued in both .doc and .pdf formats with relevant supporting documentation, site drawings and diagrams, and photographs included in the report.
- .2 Printed Hard Copies of the reporting is not required.
- .3 Site photographs of all Site activities are required, with a sufficient number of photographs provided that adequately show the work carried out. A minimum of two photographs from two different viewpoints of each work element should be provided on a CD – organized by the tasks carried out during the project. Folders on CD should be split into 1) pre-construction photos, 2) site progress photos, and 3) final site closure photos. All photos should be in the .jpeg supported format.
- .4 Three (3) separate electronic copies of reports should be provided to the Departmental Representative upon completion of Work.

### **1.4 SUBMITTAL PROCEDURES TABLE**

- .1 The Contractor must adhere to the following submittal items and proposed deadlines identified in table 01 33 00-1, unless discussed with the Departmental Representative and agreed in writing.

### **1.5 Measure of Payment**

- .1 All direct costs for project photographs are to included in the lump sum price for item 01 33 00-1, as indicated in the Basis of Payment Schedule.
- .2 All direct costs for submitted project documents not already identified in other sections of the specifications are to be included in the lump sum price for item 01 33 00-2, as indicated in the Basis of Payment Schedule.
- .3 This section will not be measured. Include all costs in Item 00 11 21 of BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Breakdown specified in this Section.

## **Part 2 Products**

### **2.1 NOT USED**

- .1 Not Used.

<b>Part 3</b>	<b>Execution</b>
<b>3.1</b>	<b>NOT USED</b>
.1	Not Used.

**Part 1 General**

**1.1 PROTECTION OF PUBLIC TRAFFIC**

- .1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .2 When working on travelled way:
  - .1 Place equipment in position to present minimum interference and hazards to travelling public.
  - .2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
  - .3 Do not leave equipment on travelled way overnight.
- .3 Provide and maintain road access and egress to property fronting along Work under Contract and in other areas as indicated, unless other means of road access exist that meet approval of Departmental Representative.

**1.2 INFORMATIONAL AND WARNING DEVICES**

- .1 Provide and maintain signs, and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.
- .2 Where transportation of excavated soils is being carried out, utilize flaggers as necessary for travelling public safety.
- .3 Continually maintain traffic control devices in use by:
  - .1 Checking signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
  - .2 Removing or covering signs which do not apply to conditions existing from day to day.

**1.3 OPERATIONAL REQUIREMENTS**

- .1 Maintain existing conditions for traffic crossing right-of-way.
- .2 Maintain existing conditions for traffic crossing right-of-way except when required for construction, with approval of Departmental Representative's Authorized Personnel.

**1.4 MEASURE OF PAYMENT**

- .1 Except as otherwise indicated, work under this section will not be measured. Include all costs in Item 00 11 21 BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canadian Council of Ministers of the Environment (CCME) Documentation

**1.2 REGULATORY REQUIREMENTS**

- .1 Comply with federal, provincial, and local anti-pollution laws, ordinances, codes, and regulations when disposing of waste materials, debris, and rubbish.
- .2 Work to meet or exceed minimum requirements established by federal, territorial, and local laws and regulations which are applicable.
  - .1 Contractor: responsible for complying with amendments as they become effective.

**1.3 SOIL STOCKPILING FACILITIES**

- .1 Temporary stockpiling of contaminated soil is not permitted.
  - .1 Excavated contaminated soil to be hauled directly to the receiving facility.

**1.4 VEHICULAR ACCESS AND PARKING**

- .1 Maintenance and Use:
  - .1 Prevent contamination of access roads. Immediately scrape up debris or material on access roads which is suspected to be contaminated as determined by Departmental Representative's Authorized Personnel and transport and place with materials to be disposed of at accepting facility.
  - .2 Departmental Representative's Authorized Personnel may collect soil samples for chemical analyses from traveling surfaces of constructed and existing access routes prior to, during, and upon completion of Work. Excavate and dispose of clean soil contaminated by Contractor's activities at no additional cost to Departmental Representative.

**1.5 DUST AND PARTICULATE CONTROL**

- .1 Execute Work by methods to minimize raising dust from construction operations.
- .2 Implement and maintain dust and particulate control measures as determined necessary by Departmental Representative's Authorized Personnel during construction and in accordance with Alberta regulations. Contractor will be required, as deemed necessary by the Departmental Representative's Authorized Personnel, to provide road sweeper/cleaning facilities at the Site and access roads during the transportation of excavated soils from the LTU area.

**1.6 POLLUTION CONTROL**

- .1 Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious toxic substances and pollutants produced by construction operations.

- .2 Be prepared to intercept, clean up, and dispose of spills or releases that may occur whether on land or water. Maintain materials and equipment required for clean-up of spills or releases readily accessible on site.
- .3 Promptly report spills and releases potentially causing damage to environment to:
  - .1 Authorities having jurisdiction including conservation authority, water supply authorities, drainage authority, road authority, and fire department.
  - .2 Owner of pollutant, if known.
  - .3 Person having control over pollutant, if known.
  - .4 Departmental Representative and Departmental Representative's Personnel.
- .4 As necessary, Contact manufacturer of pollutant if known and ascertain hazards involved, precautions required, and measures used in clean-up or mitigating action.
- .5 Take immediate action using available resources to contain and mitigate effects on environment and persons from spill or release.
- .6 Provide spill response materials including, containers, adsorbent, shovels, and personal protective equipment. Make spill response materials available at all times in which hazardous materials or wastes. Spill response materials shall be compatible with type of material being handled.

#### **1.7 EQUIPMENT DECONTAMINATION**

- .1 Commence Work involving equipment contact with potentially contaminated material only after Equipment Decontamination procedures and facility/equipment is operational.
- .2 Decontaminate equipment after working in potentially contaminated work areas and prior to subsequent work or travel on clean areas. Contractor must keep decontamination equipment close to excavation areas.
- .3 At minimum, perform following steps during equipment decontamination:
  - .1 Mechanically remove packed dirt, grit, and debris by scraping and brushing without using steam or high-pressure water to reduce amount of water needed and to reduce amount of contaminated rinsate generated.
  - .2 Use high-pressure, low-volume, hot water or steam supplemented by detergents or solvents as appropriate and approved by Departmental Representative's Authorized Personnel. Pay particular attention to tire treads, equipment tracks, springs, joints, sprockets, and undercarriages.
  - .3 As necessary, scrub surfaces with long handle scrub brushes and cleaning agent. Rinse off and collect cleaning agent. Air dry equipment in clean zone before removing from site or travelling on clean areas. Perform assessment as directed by Departmental Representative's Authorized Personnel to determine effectiveness of decontamination.

#### **1.8 WATER CONTROL**

- .1 Maintain excavations free of water as possible.

- .2 Protect site from puddling, ponding or running water. Grade site to drain to municipal roadway.
- .3 Prevent surface water runoff from entering excavation areas as possible.
- .4 Do not discharge decontamination water, or surface water runoff, or groundwater which may have come in contact with potentially contaminated material, off the site.
- .5 Direct surface waters that have not contacted potentially contaminated materials to existing surface drainage systems (away from the work area).
- .6 Dispose of water in manner not injurious to public health or safety, to property, or to any part of Work completed or under construction in accordance with applicable regulation.
- .7 Provide, operate, and maintain necessary equipment appropriately sized to keep excavations, staging pads, and other Work areas free from water.

#### **1.9 DEWATERING**

- .1 Dewater various parts of Work including, without limitation, sumps, excavations, structures, and work areas.
- .2 Employ construction methods, plant procedures, and precautions that ensure Work, including excavations, are stable, free from disturbance, and dry.
- .3 Dewatering Methods: includes sheeting and shoring; groundwater control systems; surface or free water control systems employing ditches, diversions, drains, pipes and/or pumps; and other measures necessary to enable Work to be carried out in dry conditions.
- .4 Provide sufficient and appropriate labour, plant, and equipment necessary to keep Work free of water including standby equipment necessary to ensure continuous operation of dewatering system.
- .5 DRAP will sample and analyze water generated from dewatering activities. Contractor is to dispose of water by landspreading or disposal at a licensed facility, as determined by the DRAP
- .6 Water generated from dewatering is to be stored in appropriate vessel for volume. Water generated from dewatering is not to be disposed of unless directed to do so by the DRAP.

#### **1.10 PROGRESS CLEANING**

- .1 Maintain cleanliness of Work and surrounding site to comply with federal, territorial, and local fire and safety laws, ordinances, codes, and regulations.
- .2 Co-ordinate cleaning operations with disposal operations to prevent accumulation of dust, dirt, debris, rubbish, and waste materials.

**1.11 FINAL DECONTAMINATION**

- .1 Perform final decontamination of construction facilities, equipment, and materials which may have come in contact with potentially contaminated materials prior to removal from Site.
- .2 Perform decontamination as specified to satisfaction of Departmental Representative. Departmental Representative will direct Contractor to perform additional decontamination if required.

**1.12 REMOVAL AND DISPOSAL**

- .1 Remove surplus materials and temporary facilities from Site.
- .2 Dispose of non-contaminated waste materials, litter, debris, and rubbish off-site.
- .3 Do not burn or bury rubbish and waste materials on-site.
- .4 Do not discharge wastes into streams or waterways.
- .5 Dispose of following materials at appropriate off-site facility identified by Contractor and approved by Departmental Representative's Authorized Personnel:
  - .1 Debris including excess construction material.
  - .2 Non-contaminated litter and rubbish.
  - .3 Disposable PPE worn during final cleaning.
  - .4 Metal sump culvert and sump fencing, reusing/recycling fencing as appropriate

**1.13 TESTING**

- .1 Contractor will make available all necessary soil and water for sampling by DRAP.

**1.14 RECORD KEEPING**

- .1 Maintain adequate records to support information provided to Departmental Representative.

**1.15 MEASUREMENT OF PAYMENT**

- .1 The Dewatering activity will be measured for payment by the lump sum price for Dewatering under item 01 35 13.43, as indicated in the Basis of Pricing Schedule.
- .2 Except as otherwise indicated, work under this section will not be measured. Include all costs in Item 00 11 21 of the BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule BOPC-1. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

**Part 2            Product**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Occupational Health and Safety Act, R.S.N. [1990].
- .3 Alberta
  - .1 Construction Occupational Health and Safety Act (Most Recent in Force).

**1.2 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Site-specific Health and Safety Plan: Submit within five (5) days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site-specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation.
  - .3 Precautions that will be taken to minimize hazards.
  - .4 Medical emergency procedures that will be followed in case of accident requiring medical attention, including a contact list of hospitals, fire department.
  - .5 A Fire Safety Plan.
- .3 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .4 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within three (3) days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within two (2) days after receipt of comments from Departmental Representative.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

**1.3 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

**1.4 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative Authorized Personnel prior to commencement of Work.

**1.5 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project site conditions as represented in supplementary information.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
- .3 All personnel entering the site area shall be equipped with steel-toed work boots, hard hats, hearing protection, high visibility clothing, and safety glasses as required by the Occupational Health and Safety ACR and used on site at all times.
- .4 Workers shall be equipped with appropriate personal protective equipment. All workers on site must use or wear such equipment as to limit exposure to hazardous materials if they are encountered.
- .5 High visibility safety vests shall be worn by all site workers.
- .6 Avoid skin contact and inhalation of hydrocarbon products.
- .7 All hydrocarbon contaminated clothing should be properly disposed of.
- .8 Shore and brace excavated slopes and banks according to applicable regulations.
- .9 Ensure no personnel enter excavated area(s) without appropriate shoring, bracing, and access/egress systems in place.

**1.6 FIRE AND EXPLOSION PREVENTION**

- .1 All workers must take precautions to eliminate all potential sources of ignition from the site area including non-explosion-proof electrical and internal combustion equipment.
- .2 Fires and burning of waste or materials are not permitted on-site.
- .3 Prevent accumulation of vapours at ground level.
- .4 Report fires immediately by fastest means possible, report all fires incidents to the Departmental Representative and local fire facilities.

- .5 Maintain fire extinguishers in sufficient quantity to protect all site workers.
- .6 Smoking is not permitted on work site.

#### **1.7 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

#### **1.8 COMPLIANCE REQUIREMENTS**

- .1 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

#### **1.9 UNFORSEEN HAZARDS**

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations having jurisdiction and advise Departmental Representative verbally immediately and in writing within one (1) day.

#### **1.10 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience specific to activities associated with hydrocarbon contaminated soil.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work.

**1.11 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations having jurisdiction, and in consultation with Departmental Representative.

**1.12 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative or Departmental Representative's Authorized Personnel may stop Work if non-compliance of health and safety regulations is not corrected.

**1.13 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 The contractor is assigned the responsibility and obligation to stop and start Work when, at the health and safety coordinator's discretion, it is necessary or advisable for reasons of health and safety. The Departmental Representative or Departmental Representative's Authorized Personnel may also stop Work for health and safety considerations.

**1.14 MEASUREMENT OF PAYMENT**

- .1 All direct costs for the site specific health and safety plan are to included in the lump sum price for item 01 35 29.06, as indicated in the Basis of Payment Schedule.
- .2 Except as otherwise indicated, work under this section will not be measured. Include all costs in Item 00 11 21 of BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

**Part 2 Products**

**2.1 NOT USED**

- .1 Not used.

- Part 3            Execution**
- 3.1                NOT USED**
- .1        Not used.

**END OF SECTION**

**Part 1 General**

.1 Definitions:

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

**1.3 FIRES**

- .1 Fires and burning of rubbish on-site not permitted.

**1.4 SITE CLEARING AND PLANT PROTECTION**

- .1 Minimize impact to topsoil and vegetation of adjacent lands.

**1.5 POLLUTION CONTROL**

- .1 Control emissions from equipment to local authorities' emission requirements.
- .2 Wet down dry materials to prevent blowing dust and debris as possible. Provide dust control for roads utilized for site access as directed by Departmental Representative Authorized Personnel.

**1.6 NOTIFICATION**

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Territorial or Municipal environmental laws or regulations, permits.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
  - .1 Do not take action until after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

#### **1.7 HAZARDOUS MATERIAL DISCOVERY**

- .1 Stop Work immediately and notify Departmental Representative upon discovery of following materials during course of Work:
  - .1 Unknown and/or potentially hazardous substances.
- .2 Work at site may involve contact with:
  - .1 PHC (petroleum hydrocarbon) impacted soils.
  - .2 Hazardous liquids and petroleum based liquids.

#### **1.8 OTHER ITEMS OF DISCOVERY**

- .1 Stop Work immediately and notify Departmental Representative upon discovery of following items during course of Work:
  - .1 Items that may have archaeological, cultural or scientific significance.

#### **1.9 MEASUREMENT OF PAYMENT**

- .1 Except as indicated above, work under this section will not be measured. Include all costs in Item 00 11 21 of BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

#### **Part 2 Products**

##### **2.1 NOT USED**

- .1 Not Used.

#### **Part 3 Execution**

- .1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 GENERAL**

- .1 Provide all labour, equipment and materials, and performance of all Work necessary for mobilization to, and demobilization from site.
- .2 Mobilization to include transportation to site of Contractor's labour, equipment, materials, and assembling, erecting, and preparing site in readiness to start Work, all in accordance with Contractor's Schedule.
- .3 Demobilization to include dismantling and removal from site, of all Contractor's equipment, facilities and materials, waste resulting from cleanup of site and transportation of labour from site.
- .4 Decontaminate and clean all equipment used on the Project prior to demobilization.
- .5 Do not mobilize to the site without written authorization from the Departmental Representative.
- .6 Summarize the proposed mode, route, equipment, labour and all other requirements for the mobilization and demobilization of all required equipment, materials, waste and personnel to complete the remediation of the project, as indicated in these specifications, in a Mobilization and Demobilization Plan. Submit the Mobilization and Demobilization Plan to the Departmental Representative a maximum of five (5) days after contract award.
- .7 All mobilization and demobilization methods to comply with the requirements of all applicable codes, standards, guidelines and permits, approvals and/or authorizations.
- .8 A Post-Demobilization site visit will be required as part of the Post-Demobilization Inspection. Once demobilization is completed, Departmental representative will request a Post-Demobilization inspection of Work by Departmental Representative Authorized Personnel and Contractor. If Work is deemed incomplete, complete outstanding items and request re-inspection.

**1.2 SUBMITTALS**

- .1 Submit Mobilization and Demobilization Plan in accordance with Section 01 33 00 – Submittal Procedure for review by Departmental Representative.
- .2 Submit to Departmental Representative, one (1) electronic copy of the Mobilization and Demobilization Plan, five (5) days after contract award.

**1.3 MEASURE OF PAYMENT**

- .1 All costs for Mobilization to site of all equipment and materials, including the submission of the Mobilization and Demobilization Plan, are to be included in the Lump Sum price for Mobilization Item 01 53 00-1, as indicated in the Basis of

Pricing Schedule. The lump sum price for mobilization is to include all labour, equipment, materials, meals, accommodation, flights and any other costs necessary to undertake work required.

.2 All costs for Demobilization from site of all equipment, facilities, materials and waste are to be included in the Demobilization Item 01 53 00-2 , as indicated in the Basis of Pricing Schedule..

.3 Except as otherwise indicated, work under this section will not be measured. Include all costs in Item 00 11 21 BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

**1.4 NOT USED**

.1 Not Used.

**Part 2 Execution**

.1 Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 INSTALLATION AND REMOVAL**

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such temporary controls after use.

**1.2 GUARD RAILS AND BARRICADES**

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts.

**1.3 ACCESS TO SITE**

- .1 Provide and maintain access roads, ramps and construction runways as may be required for access to Work.

**1.4 PUBLIC TRAFFIC FLOW**

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

**1.5 FIRE ROUTES**

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.6 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

**1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling as possible/applicable.

**1.8 MEASUREMENT OF PAYMENT**

- .1 Except as otherwise indicated, work under this section will not be measured. Include all costs in Item 00 11 21 BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

**Part 2            Products**

**2.1                NOT USED**

.1            Not Used.

**Part 3            Execution**

**3.1                NOT USED**

.1            Not Used.

**END OF SECTION**

**Part 1 General**

**1.1 ADMINISTRATIVE REQUIREMENTS**

- .1 Acceptance of Work Procedures:
  - .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
    - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
    - .2 Notify Departmental Representative at least three (3) days in advance of inspection.
  - .2 Departmental Representative Inspection:
    - .1 Departmental Representative, Departmental Representative's Authorized Personnel, and Contractor to inspect Work and identify defects and deficiencies. Complete a closeout inspection form for signage by all in attendance.
    - .2 Contractor to correct Work as directed.
  - .3 Substantial Completion Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.
  - .4 Substantial Completion: Submit written certificates that tasks have been performed as follows:
    - .1 Work: completed and inspected for compliance with Contract Documents.
    - .2 Defects: corrected and deficiencies completed.
    - .3 Work is completed and ready for Final Inspection.
  - .5 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by the Departmental Representative, complete outstanding items and request re-inspection.
  - .6 Post-Demobilization Inspection: once demobilization is completed, Departmental representative will request a Post-Demobilization inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by the Departmental Representative, complete outstanding items and request re-inspection.
  - .7 Declaration of Final Completion: when Departmental Representative consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Final Completion.
  - .8 Submit Close out report

**1.2 FINAL CLEANING**

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**1.3 MEASURE OF PAYMENT**

- .1 Except as otherwise indicated, work under this section will not be measured. Include all costs in Item 00 11 21 of BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

**Part 2 Products**

**2.1 NOT USED**

**Part 3 Execution**

**3.1 NOT USED**

**END OF SECTION**

**Part 1            General**

**1.1               Definitions**

- .1       Hydrocarbon impacted soil is defined as soils containing concentrations exceeding the Canadian Council Minister of the Environment (CCME) Agricultural Land (AL) guidelines of any or all of the contaminants listed as follows:
- Benzene, ethylbenzene, and hydrocarbon fractions in soils
- .2       Contaminated Soil is defined as hydrocarbon impacted soil areas at the LTU area as identified on the Drawings.

**1.2               Quality Assurance**

- .1       Qualifications
- .1       Be thoroughly familiar with and knowledgeable about existing site conditions, scope of work and requirements of the Specification.
- .2       Contractor's personnel trained as described in this Section are to instruct and direct all workers with respect to the waste management procedures and labour and safety practices to be followed in carrying out the work.
- .3       Provide workers, Department Representative and Department Representative's staff when required with protection appropriate to the potential type and level of exposure. Establish specific safety protocols in the Site Specific Health and Safety Plan.

**1.3               Site Conditions**

- .1       Suspend all work on site whenever weather conditions become unacceptable for the safe decommissioning of the LTU, soil excavation or backfilling, or otherwise performing the Work to conform with this specification.
- .2       Prior to the commencement of the Work, make sure to remove all hazardous debris, snow, ice, standing water from the excavation areas.
- .3       Prior and during excavation of contaminated soil, make sure the excavation is stable and maintained in this manner, and allow for the dewatering of shallow groundwater areas or surficial water ingress to the excavation, as directed by the Departmental Representative's Authorized Personnel.

**1.4               Protection**

- .1       All Work performed must be in accordance with the environmental protection measures specified in Section 01 35 43.
- .2       Any discharging of water resulting from the dewatering of excavation areas must be in accordance with Section 01 35 43 Environmental Procedures and Section 01 35 13.43 Special Project Procedures for Contaminated Sites.

## **1.5 Measure of Payment**

- .1 The excavation of contaminated soil from the LTU Area will be measured for payment by the cubic metre (m3) of contaminated soil as determined from waybill-confirmed measurements upon disposal and provided for review/approval. Cost for this specification includes all items associated with excavation, loading, hauling and disposal at an accepting facility of impacted soil from the LTU Item 02 55 13 -1 of the Basis of Pricing Schedule.
- .2 No extra payment will be made for soil removed from beyond the specified limits of excavation, unless such removal has been specifically directed by the Departmental Representative or Departmental Representative's Authorized Personnel. The volume of contaminated soil excavation beyond the specified limits that have been approved by Departmental Representative will be determined by disposal waybill method.
- .3 Except as otherwise indicated, work under this section will not be measured. Include all costs in Item 00 11 22 BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

## **Part 2 Products**

### **2.1 ENVIRONMENTAL PROTECTION SUPPLIES**

- .1 Environmental Protection Supplies: as per Section 01 35 43 – Environmental Procedures.

## **Part 3 Execution**

### **3.1 CONTAMINATED SOIL EXCAVATION**

- .1 A description of the soil conditions at the estimated excavation locations for the LTU are described as a mixture of sandy and silty clays, and glacial tills. This description is for general information purposes only and may not represent all the soil conditions that will be encountered during excavation.
- .2 The area for soil excavation will be generally located on the north-west corner and middle of the LTU. (See Figure 1).
- .3 Previous studies as provided in the "Supplementary Information" have identified at the LTU Area benzene, ethylbenzene, and hydrocarbon fractions in soils exceeding the criteria set out in the Canadian Council Minister of the Environment (CCME) Agricultural Land (AL) guidelines. The Contractor shall review all of the Supplementary Information. The Contractor's price for soil excavation and disposal must include an estimated 1000 m3 of contaminated soils.
- .4 The Contractor is responsible to ensure that all contaminated soil identified by the Departmental Representative Authorized Personnel within the LTU Area above CCME Agricultural Land guidelines is excavated and disposed of at an accepting facility. When the excavation approaches the suspected boundary where

concentrations of regulated parameters are less than CCME Agricultural Land guidelines, verification samples will be collected by the Departmental Representative's Authorized Personnel for analytical testing. It is proposed to perform the verification sampling in sequential stages around the perimeter and base of the excavation such that standby time is minimized. The Departmental Representative is responsible for all costs associated with sample collection and analytical testing and written reporting of verification testing results.

- .1 The Contractor shall allow for two (2) days for rush analysis results of confirmation of closeout samples.

**END OF SECTION**

**Part 1            General**

**1.1                SUBMITTALS**

- .1        Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

**1.2                REQUIREMENTS**

- .1        Shore and brace excavations, protect slopes and banks and perform work in accordance with applicable regulations.
- .2        Health and Safety Requirements: construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.3                PROTECTION**

- .1        Prevent damage to benchmarks, existing buildings, surface or underground service or utility lines which are to remain. Immediately repair any damage to the above or replace the above in the event of damage, at no cost to Departmental Representative.
- .2        Protect natural and man-made features required to remain undisturbed as indicated by Departmental Representative or Authorized Personnel.
- .3        Environmental protection measures are to be in accordance with the requirements specified in Section 01 35 43 - Environmental Procedures.

**1.4                MEASURE OF PAYMENT**

- .1        Except as otherwise indicated, work under this section will not be measured. Include all costs in Item 00 11 21 of BOPC-1, Balance of Project Costs in the Basis of Pricing Schedule. Indicate the cost of this work as a separate line item in the Cost Work Breakdown Structure as specified in Section 01 33 00 – Submittal Procedures.

**Part 2            Products**

**2.1                MATERIALS**

- .1        Fill Materials for the LTU excavation is to consist of non-contaminated soil materials with same approximate physical properties as excavated soil materials. Fill will be sourced from within the LTU existing footprint.
- .2        Typical soil conditions encountered during the Work will be silty and sandy clays, mixed loam and glacial till, as described in the Tender Package supporting documents.

**Part 3            Execution**

**3.1                PREPARATION**

- .1        Keep excavations clean, free of standing water, and loose soil.

**3.2                CLEARING AND GRUBBING**

- .1        Remove exposed boulders and debris.
- .2        Pile boulders in a common area, as determined acceptable by the Departmental Representative's Authorized Personnel, which will not impede future access/function of the site.
- .3        Dispose of cleared non-organic debris off site at an appropriate accepting facility.
- .4        Organic grubbed plant material will be integrated into the soils to be spread within the LTU footprint.

**3.3                EXCAVATION OF NON-IMPACTED SOILS and LINER REMOVAL**

- .1        Establish lines and levels, locate and lay out, by instrumentation.
- .2        Strip those soils that meet applicable CCME Agricultural criteria as determined by Departmental Representative Authorized Personnel, from the LTU.
  - .1        Stockpile stripped soils within the former North LTU footprint for later spreading within entire North and South LTU footprint or for backfilling use on site.
- .3        Excavate LTU berms to level surface.
- .4        Excavate soil as required to carry out LTU HDPE Liner and Sump infrastructure removal work.
  - .1        As possible, do not disturb soil or rock below LTU liner.
  - .2        Remove HDPE LTU Liner and dispose of at a licensed accepting facility as appropriate.
  - .3        Excavate sump gravel as possible and dispose of at licensed accepting facility as appropriate.
  - .4        Notify Departmental Representative or Departmental Representative's Authorized Personnel when excavations are complete.
- .5        Stake LTU footprint for grading elevation for performance/aesthetics equal to surrounding landscape.

**3.4                BACKFILLING OF SUMP AREA**

- .1        Backfilling of the LTU Sump area shall be completed in a manner which restores the site surface to similar topographical and drainage performance of adjacent land, with the addition of surplus material to approximately 300 mm above conforming surrounding elevations to allow for future settlement.

- .2 Placing:
  - .1 Place soil backfill, for the LTU Sump area, in 300 mm lifts: Each lift shall be packed with on-site excavator bucket prior to placement of the next lift.
  - .2 Compact each layer to maximum field density.
  - .3 Do not compact final lift used to achieve approximate 300mm elevation above surrounding elevation.

### **3.5 GRADING**

- .1 Grade the excavated non-impacted soils and berm soils within the LTU footprint so as to have the new elevations conform to similar topographical and drainage performance, as approved by the Departmental Representative's Authorized Personnel.
  - .1 Grade to be gradual and aesthetically conform to the surrounding landscape.
  - .2 Grading for the LTU will conform to pre-existing drainage performance.
  - .3 Grading elevations to be staked by instrumentation.

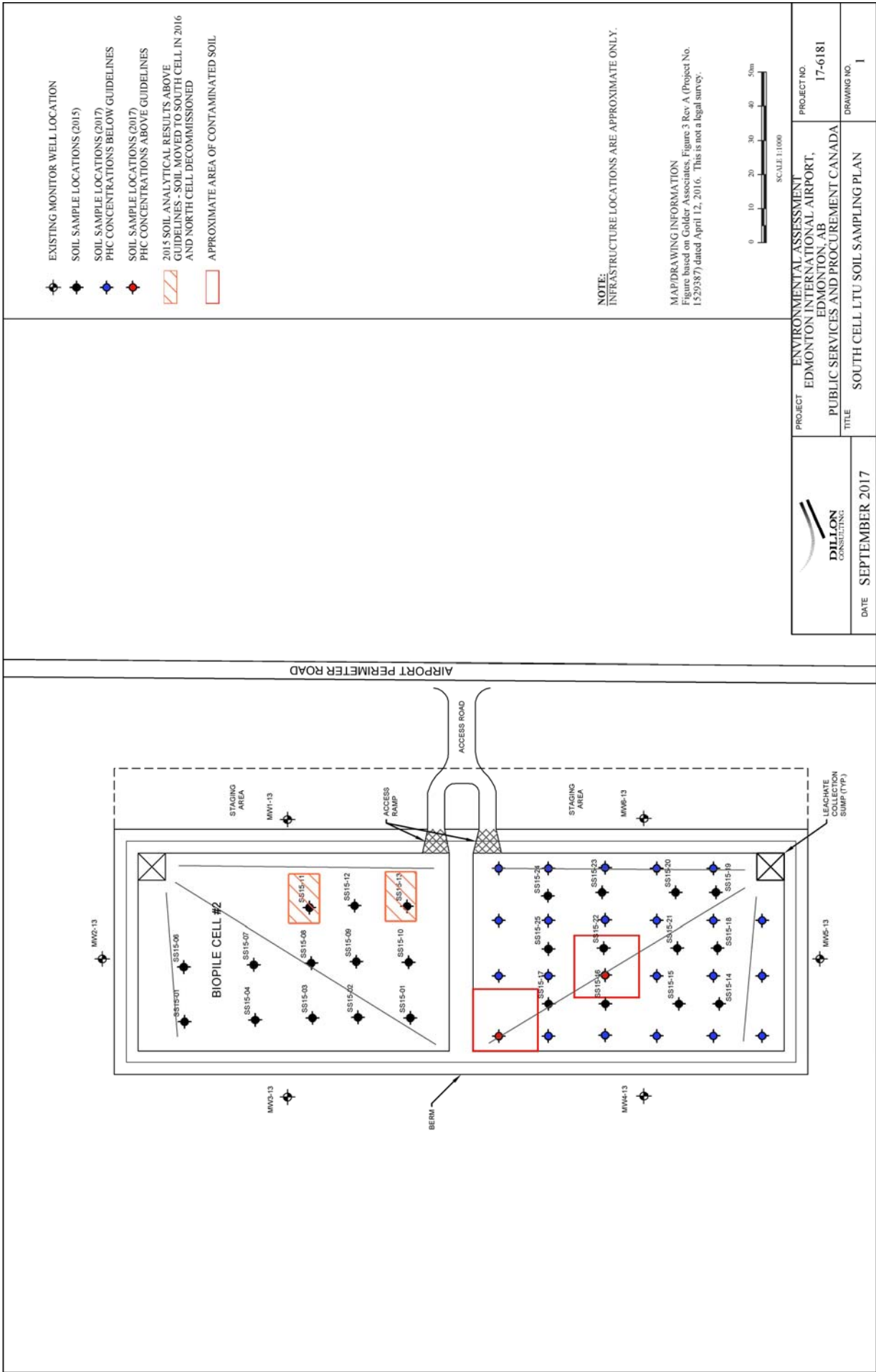
### **3.6 CLEANING**

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

## **ANNEX E – SITE DIAGRAM**

See attached.



## **ANNEX F – POST REMEDIATION MONITORING REPORT**

See attached.



**December 2016**

## **REPORT ON**

# **Airside Operations and Maintenance Centre, 2016 Post Remediation Monitoring and LTF Decommissioning, Edmonton International Airport**

**Submitted to:**

Mr. Michael Brownlee  
Public Services and Procurement Canada  
ATB Place, North Tower  
5th Floor, 10025 Jasper Avenue  
Edmonton, AB T5J 1S6

**REPORT**



**Report Number:** 1657760

**Distribution:**

One Copy: Public Services and Procurement  
Canada, Edmonton, Alberta

One Copy: Golder Associates Ltd., Edmonton,  
Alberta





## Executive Summary

Golder Associates Ltd. (Golder) was retained by Public Services and Procurement Canada (PSPC) in September 2016 to provide environmental services associated with the remediation of petroleum hydrocarbon (PHC) affected soils from the former underground storage tank (UST) area adjacent to the Airside Operations and Maintenance Centre (AOMC) at the Edmonton International Airport (EIA) (hereafter referred to as “the Site”).

Golder was initially retained in 2012 to complete remedial works at the Site. These remedial works included the excavation of 5,200 m<sup>3</sup> of PHC impacted soil from the former UST area. The impacted soil was placed in a land treatment facility (LTF) on Site in order to reduce the PHC concentrations. Following land treatment, these soils would be disposed off Site at a Class II non-hazardous landfill.

As outlined in the remedial action plan (RAP) prepared by Pottinger Gaherty Environmental Consultants Ltd. (PGL) in February 2010, it was recommended that a post-remediation monitoring plan be implemented at the Site. The purpose of this report is to document the results of the 2016 post remediation monitoring program and the partial decommissioning of the LTF and the Soil Vapour Extraction (SVE) unit.

The scope of work for the 2016 post remediation monitoring was developed by Golder in consultation with PSPC and was outlined in our revised proposal dated September 16, 2016. In summary the scope of work included the following:

- Maintenance of the LTF including treatment and discharge of the runoff collecting in the sumps;
- Decommission the north cell of the LTF; and
- Decommission the SVE unit.

In addition, one groundwater sampling event was completed at the Site in May 2016 as part of the post remediation monitoring program. The results of this groundwater sampling event are also included herein.

The results of the 2016 post remediation monitoring and partial LTF / SVE unit decommissioning are summarized below:

- Based on the groundwater elevations measured, the interpreted direction of groundwater flow at the Site is towards the north-northwest. No free phase product was encountered during the sampling event.
- Reported concentrations of BTEX and PHC Fractions F1 and F2 at the AOMC building were below the applicable guidelines for groundwater samples submitted in May 2016, with the exception of monitoring wells BH32, BH50M, MW71-14, MW75-14 and MW76-14.
- Reported concentrations of benzene at monitoring wells BH35 and MW82-15 historically exceeded the applicable guideline in January 2016; however concentrations reduced to below the applicable guideline in May 2016.
- The available groundwater data indicates that natural attenuation processes are active and have resulted in stable and/or decreases in PHC concentrations. Based on the long-term nature of the PHC impacts, it is inferred that the groundwater PHC plume is stable under current conditions.



## AOMC 2016 POST REMEDIATION MONITORING AND LTF DECOMMISSIONING, EDMONTON INTERNATIONAL AIRPORT

- Approximately 360,350 L of runoff was treated and discharged from the LTF.
- The north cell of the LTF was decommissioned. Impacted soil, including sump gravel, from the north cell was transferred to the south cell. All liner material was removed and disposed of at an appropriate off Site facility. The north cell was backfilled and graded using the fill materials from the north cell berms.
- The aboveground header-line piping and power to the SVE unit was disconnected in preparation for the removal of the SVE unit from the Site.

Based upon the results of the 2016 post remediation monitoring, the following summaries and recommendations are provided below:

- Residual PHC impacts are present within soil and groundwater at the Site. According to the RAP prepared by PGL in February 2010, the volume of impacted soil at the Site was originally approximately 47,000 m<sup>3</sup>. The source zone excavation completed in 2012 resulted in the removal of approximately 5,200 m<sup>3</sup> of PHC impacted soil, leaving approximately 41,800 m<sup>3</sup> of PHC impacted soil at the Site. However it should be noted that the remaining impacts at the Site extend beneath the AOMC building footprint and into the utility corridor to the west of the Site, parallel to 36th Street East, which contains an ATCO Pipelines high pressure natural gas pipeline. As a result, there is significant uncertainty in the volume of PHC impacted soil remaining at the Site.
- The anticipated coarse-grained material surrounding the ATCO Pipelines high pressure natural gas pipeline is likely acting as a preferential pathway for contaminant transport; however, groundwater monitoring completed to date indicates that these impacts have been delineated to the north and have not impacted soil and groundwater quality on the west side of 36th Street East. Due to the presence of the utility corridor and the AOMC building, it is not anticipated that additional remedial excavation be undertaken prior to future Site redevelopment. As a result, it is recommended that a monitored natural attenuation (MNA) strategy continue to be considered for the Site. Based upon the results from the MNA sampling completed to date, biodegradation processes are active at the Site and the groundwater PHC plume is stable under current conditions. It is recommended that bi-annual groundwater monitoring and sampling be completed to monitor the PHC concentrations and to monitor MNA parameters (i.e., nitrate, sulphate, dissolved iron, dissolved manganese, methane) as part of the MNA strategy. It is also recommended that an updated elevation survey of the monitoring wells at the Site be completed, due to the numerous repairs completed over the past few years.
- In order to aid the MNA strategy, natural bioremediation processes can be enhanced through the addition of amendments such as nutrients (e.g., phosphorous) and electron acceptors (e.g., oxygen, nitrate, iron, sulphate), referred to herein as an enhanced in situ bioremediation (EISB) approach. Biodegradation of PHCs occurs most rapidly under aerobic conditions (i.e., adding oxygen); however, at mature sites it is often beneficial to instead promote anaerobic conditions (e.g., adding nitrate or sulphate). The degree of success of EISB relies in large part on the effective delivery of amendments to the subsurface. Delivery approaches range from passive approaches (e.g., Waterloo Emitter) to more active delivery (e.g., groundwater injection/extraction recirculation systems). Alternatively, time to reach "closure concentrations" can be reduced by addressing source areas or high concentration areas, for example, using in-situ chemical oxidation via direction injection (e.g., Fenton's reagent). However, before an enhanced MNA approach can



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be selected, further investigation would be required to determine the updated Site conditions and the appropriate remediation goals.

- The north cell of the LTF has been decommissioned and impacted soil from the north cell has been transferred to the south cell. Based on the sampling completed in June 2015, PHC impacts remain in the soil located within the LTF with reported exceedances of benzene (0.40 mg/kg), ethylbenzene (2.7 mg/kg), and PHC Fractions F1 (280 mg/kg) and F2 (470 mg/kg). However, the concentrations have reduced to allow the impacted soil to be classified as non-hazardous. As a result, it is recommended that the soil located in the south cell be disposed of at an Alberta Class II non-hazardous landfill and the south cell of the LTF be decommissioned. It is also recommended that the runoff collecting in the LTF sump be treated and discharged prior to decommissioning the LTF. As a proactive measure during this work, it is recommended that the monitoring wells installed around the perimeter of the LTF be monitored and sampled after the decommissioning work is completed. In addition, it is recommended that the monitoring wells be decommissioned after groundwater quality results have been confirmed.
- Preliminary costs to complete the recommended future work are estimated to be between approximately \$550,000 and \$600,000 CDN (excluding GST). The preliminary cost estimate is based on the additional work required to monitor the residual PHC impacts present within soil and groundwater at the Site and to decommission the remaining portion of the LTF.



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### List of Acronyms

Acronyms	Description
AEP	Alberta Environment and Parks
AOMC	Airside Operations and Maintenance Centre
ASL	Above Sea Level
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CCME	Canadian Council of Ministers of the Environment
CDWQ	Canadian Drinking Water Quality
DO	Dissolved Oxygen
DUA	Domestic Use Aquifer
EC	Electrical Conductivity
EIA	Edmonton International Airport
ERAA	Edmonton Regional Airport Authority
ESA	Environmental Site Assessment
FAP	Facility Alteration Permit
FCSAP	Federal Contaminated Sites Action Plan
FWAL	Freshwater Aquatic Life
GPS	Global Positioning System
ha	Hectares
HDPE	High Density Polyethylene
km	Kilometers
LTF	Land Treatment Facility
m <sup>3</sup>	Cubic Meters
m bgs	Meters Below Ground Surface
m/s	Meters/Second
MNA	Monitored Natural Attenuation
mm	Millimeter
mg/L	Milligrams/ Litre
m <sup>2</sup>	Square Meters
PGL	Pottinger Gaherty Environmental Consultants Ltd.
PHC	Petroleum Hydrocarbons
ppm	Parts Per Million
PSPC	Public Services and Procurement Canada
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance and Quality Control
RAP	Remedial Action Plan
RPD	Relative Percent Difference
RDL	Reported Detection Limit
SVE	Soil Vapour Extraction
UST	Underground Storage Tank



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Table 1: LTF Runoff Water Chemistry Results

Table 2: Summary of Groundwater Elevations

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Table 4: AOMC Building Groundwater Chemistry Results - MNA Parameters

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Figure 1: Site Location Plan

Figure 2: AOMC Building Monitoring Well Location Plan and Groundwater Exceedances

Figure 3: Land Treatment Facility (LTF) Location Plan

Figure 4: Soil Vapour Extraction (SVE) Unit Layout

### APPENDICES

#### APPENDIX A

Health and Safety Plan

#### APPENDIX B

Facility Alteration Permits (FAP)

#### APPENDIX C

Site Photographs

#### APPENDIX D

Laboratory Certificates of Analysis

#### APPENDIX E

Mann-Kendall Trend Analyses



### 1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by Public Services and Procurement Canada (PSPC) in September 2016 to provide environmental services associated with the remediation of petroleum hydrocarbon (PHC) affected soils from a former underground storage tank (UST) area adjacent to the Airside Operations and Maintenance Centre (AOMC) at the Edmonton International Airport (EIA) (hereafter referred to as “the Site”). The Site location is presented on Figure 1.

Golder was initially retained in 2012 to complete remedial works at the Site. These remedial works included the excavation of 5,200 m<sup>3</sup> of PHC impacted soil from the former UST area. The impacted soil was placed in a land treatment facility (LTF) on Site in order to reduce the PHC concentrations. Following land treatment, these soils would be disposed off Site at a Class II non-hazardous landfill

As outlined in the remedial action plan (RAP), it was recommended that a post-remediation monitoring plan be implemented at the Site. The purpose of this report is to document the results of the 2016 post remediation monitoring program and the partial decommissioning of the LTF and the Soil Vapour Extraction (SVE) unit.

### 2.0 BACKGROUND

The Site is located at the EIA, approximately 10 km south of Edmonton, Alberta. The Site is located in the northern portion of the EIA to the east of 36<sup>th</sup> Street East at a latitude of 53° 19' 12.7" North and a longitude of 113° 34' 10.7" West. The legal land description of the Site is Block A Plan 902 2386 in the northeast quarter section of 15-50-25-W4M.

The Site is completely fenced with an access gate along 36<sup>th</sup> Street East, which runs to the northwest of the Site. The AOMC building is situated within the central portion of the Site and occupies approximately 16% of the total Site area (19.7 ha). The remainder of the Site is paved except for some landscaped areas to the southeast of the building. The surrounding land uses include a parking lot to the northeast, undeveloped agricultural/marshland to the southeast and southwest, and 36<sup>th</sup> Street East followed by a parking lot and airline facilities to the northwest. The nearest waterbodies are the water hazards located at the RedTail Landing Golf Club, located approximately 1 km east of the Site.

The AOMC building was constructed in the 1960s. In 1998, a staff office space expansion was constructed on the southeast portion of the building. The Site has been used for equipment maintenance and fuelling since its construction. Prior to development, the Site was used for agricultural purposes.

Two steel gasoline and diesel USTs were installed at the Site during the original development in the 1960s. These USTs were decommissioned in 1980 by Transport Canada and were replaced by three fibreglass USTs and an associated pump island. In February 1998, during the installation of a new utility trench to the AOMC building, soil vapours beneath the asphalt surface ignited. In 2000, a Phase II Environmental Site Assessment (ESA) was completed at the Site to assess soil and groundwater quality in the vicinity of the original steel USTs<sup>1</sup>. Exceedances of benzene, toluene, ethylbenzene, and xylenes (BTEX) were reported in soil and groundwater. The Phase II ESA also indicated that an explosive atmosphere may exist beneath the AOMC building. Additional environmental

<sup>1</sup> Reid Crowther & Partners Ltd., 2000. *Environmental Site Assessment, Airside Operations & Maintenance Centre, Edmonton International Airport*. July 2000.



## AOMC 2016 POST REMEDIATION MONITORING AND LTF DECOMMISSIONING, EDMONTON INTERNATIONAL AIRPORT

investigation of these impacts was completed at the Site in 2001<sup>2</sup>, 2002<sup>3</sup>, and 2009<sup>4</sup>. Approximately 47,000 m<sup>3</sup> of PHC impacted soil was estimated to be present on Site. PHC impacted groundwater was also identified within the area of soil impacts. Groundwater impacts were estimated to cover an area of approximately 5,500 m<sup>2</sup>.

The results of these investigations were used by Pottinger Gaherty Environmental Consultants Ltd. (PGL) to develop a RAP<sup>5</sup> for the Site. As the EIA was considering replacement and relocation of the fuel USTs and associated infrastructure, remedial excavation and ex-situ treatment of heavily impacted contaminated soil was selected as a viable option. It was noted that at the completion of the remedial excavation, soil and groundwater contamination would remain at the Site. The objective of remediating the “source zone” was to minimize the potential for migration of contaminants off-Site. Excavation of the heavily impacted contaminated soil would increase the potential for remaining impacts to naturally degrade and reduce the potential for further off-Site migration of contaminants.

The LTF was constructed in the winter of 2010<sup>6</sup>. The LTF is located approximately 500 m east-southeast of the Site, parallel to Airport Perimeter Road within an agricultural field. The LTF consisted of two biopile cells with the dimensions of 91.5 m by 65 m. Perimeter berms were constructed around the cells to a height of 1.5 m and the entire LTF was lined with a geotextile fabric and geomembrane liner. An 8 m by 8 m sump, designed to collect runoff, was installed in each biopile cell to a depth of 2.0 metres below ground surface (m bgs).

As the PHC impacts identified at the Site extend beneath the AOMC building, a SVE unit was installed at the Site in March 2012<sup>7</sup>. The purpose of the SVE unit is to reduce the risk of migration of PHC vapours into the building and prevent PHC vapours from impacting workers inside the building. A significant decrease in discharge vapours has occurred since the installation of the SVE unit and the completion of the source zone excavation in 2012.

The source zone excavation was completed in autumn 2012, with approximately 5,200 m<sup>3</sup> of PHC impacted soil being excavated, transported, and placed into the LTF. The excavation was completed to a depth of 6.0 m bgs and the excavation was lined with a 30-mil smooth high density polyethylene (HDPE) geomembrane and backfilled with clean fill. Results of the 2012 source zone excavation are presented under a separate cover<sup>8</sup>.

In January 2013, Golder advanced six boreholes, completed as groundwater monitoring wells, around the perimeter of the LTF to establish baseline soil conditions. Results of this investigation are presented under a separate cover<sup>9</sup>.

<sup>2</sup> Earth Tech Canada Inc., 2001. *Delineation Investigation, Airside Operations & Maintenance Centre, Edmonton International Airport*. January 2001.

<sup>3</sup> Earth Tech Canada Inc., 2002. *Delineation Investigation, Airside Operations & Maintenance Centre, Edmonton International Airport*. May 2002.

<sup>4</sup> Pottinger Gaherty Environmental Consultants Ltd., 2010. *Phase III Environmental Site Assessment Airside Operations and Maintenance Centre Edmonton International Airport Leduc County, AB*. February 2010.

<sup>5</sup> Pottinger Gaherty Environmental Consultants Ltd., 2010. *Remedial Action Plan Airside Operations and Maintenance Centre Edmonton International Airport Leduc County, AB*. February 2010.

<sup>6</sup> DST Consulting Engineers Inc., 2011. *EIA Land Treatment Facility 2010 Construction As-Built Report Edmonton International Airport Leduc County, AB*. March 2011.

<sup>7</sup> Franz Environmental Inc., 2012. *System Installation at the AOMC Building, Edmonton International Airport, Leduc, Alberta*. April 2012.

<sup>8</sup> Golder Associates Ltd., 2013. *Final Report on Airside Operations and Maintenance Centre (AOMC) Remedial Excavation Edmonton International Airport, Leduc County, Alberta*. February 2013.

<sup>9</sup> Golder Associates Ltd., 2013. *Report on Airside Operations and Maintenance Centre Additional Investigation Edmonton International Airport, Leduc County, Alberta*. May 2013.



Golder completed post remediation investigation and monitoring events in 2013<sup>10</sup>, 2014<sup>11</sup>, and 2015<sup>12</sup> which concluded that residual PHC impacts are present at the Site beneath the AOMC building footprint and extend northwest, west and southwest of the remedial excavation. It is likely that these impacts have entered the utility corridor to the west of the Site, parallel to 36<sup>th</sup> Street East, which contains an ATCO Pipelines high pressure natural gas pipeline. The anticipated coarse-grained material surrounding this pipeline is likely acting as a preferential pathway for contaminant transport; however, groundwater monitoring completed to date indicates that these impacts have been delineated to the north and have not impacted soil and groundwater quality on the west side of the roadway. Due to the presence of the utility corridor and the AOMC building, it is not anticipated that additional remedial excavation may occur prior to future Site redevelopment. As a result, it was recommended that a monitored natural attenuation (MNA) strategy be considered for the Site. Based upon the results from the MNA sampling completed to date, biodegradation processes are active at the Site and the groundwater PHC plume is stable under current conditions.

In 2015, a shallow soil sampling program was completed to assess the environmental quality of the soil placed in the LTF. Results indicated that PHC impacts remain in the soil located within the LTF with reported exceedances of benzene (0.40 mg/kg), ethylbenzene (2.7 mg/kg), and PHC Fractions F1 (280 mg/kg) and F2 (470 mg/kg). However, the concentrations have reduced to allow the impacted soil to be classified as non-hazardous. As a result, it was determined that the soil in the LTF could be disposed of at an Alberta Class II non-hazardous landfill and the LTF could be decommissioned.

### 3.0 SCOPE OF WORK

The scope of work for the 2016 post remediation monitoring was developed by Golder in consultation with PSPC and was outlined in our revised proposal dated September 16, 2016. In summary the scope of work included the following:

- Maintenance of the LTF including treatment and discharge of the runoff collecting in the sumps;
- Decommission the north cell of the LTF; and
- Decommission the SVE unit.

In addition, one groundwater sampling event was completed at the Site in May 2016 as part of the post remediation monitoring program. The results of this groundwater sampling event are also included herein.

### 4.0 APPLICABLE SOIL AND GROUNDWATER QUALITY GUIDELINES

As the EIA is located on federal land, the environmental quality of soil and groundwater at the Site falls under federal jurisdiction. The Canadian Council of Ministers of the Environment (CCME) and Federal Contaminated Sites Action Plan (FCSAP) guidelines were selected to evaluate the analytical results. These generic, risk-based guidelines account for risks to applicable receptors based on land use and soil type. The following sections outline the relevant federal guidelines and the rationale for selecting those guidelines.

<sup>10</sup> Golder Associates Ltd., 2014. *Report on Airside Operations and Maintenance Centre Post Remediation Investigation Edmonton International Airport, Leduc County, Alberta*. June 2014.

<sup>11</sup> Golder Associates Ltd., 2015. *Report On Airside Operations and Maintenance Centre 2014 Post Remediation Monitoring Edmonton International Airport, Leduc County, Alberta*. March 2015.

<sup>12</sup> Golder Associates Ltd., 2016. *Report on Airside Operations and Maintenance Centre 2015 Post Remediation Monitoring Edmonton International Airport, Leduc County, Alberta*. April 2016.



## **4.1 Canadian Council of Ministers of the Environment**

The CCME “*Canadian Environmental Quality Guidelines*” (CCME Guidelines<sup>13</sup>), provide soil, surface water, and sediment quality criteria for the assessment of federal sites impacted with contaminants.

## **4.2 Federal Contaminated Sites Action Plan**

The FCSAP Guidelines<sup>14</sup> are to be used in connection with groundwater investigation and remediation activities at federal contaminated sites. The FCSAP Guidelines follow a tiered framework, consistent with the Canadian Soil Quality Guidelines developed through the CCME. The tiers are:

- Tier 1: direct application of the generic numerical guidelines; specifically, application of the lowest guideline for any pathway.
- Tier 2: allows for the development of site-specific remediation objectives through the consideration of site-specific conditions, by modifying (within limits) the numerical guidelines based on site-specific conditions and focusing on exposure pathways and receptors that are applicable to the site.
- Tier 3: use of site-specific risk assessment to develop Site-Specific Remediation Objectives.

## **4.3 Canadian Drinking Water Guidelines**

The guidelines for Canadian Drinking Water Quality (CDWQ Guidelines) were established by the Federal-Provincial-Territorial Committee on Drinking Water and published by Health Canada in October 2014<sup>15</sup>. Each guideline was established from current, published scientific research related to health effects, aesthetic effects, and operational considerations.

## **4.4 Rationale for Selection of Criteria**

### **4.4.1 AOMC Building**

The following rationale is provided to demonstrate the appropriate generic criteria selection for the Site:

- The Site is currently used as an airport equipment maintenance and fuelling center. Based on the land descriptions provided in the CCME Guidelines, the Site is classified as industrial land use.
- Based on the data collected during previous investigations the domestic use aquifer (DUA) pathway cannot be eliminated; however the freshwater aquatic life (FWAL) pathway can be eliminated.

Grain size analysis has been historically completed on representative soil samples collected from the Site. Based on the results, the soil at the Site predominantly consists of fine-grained silty clay underlain by coarse-grained sand. As the coarse-grained guidelines are typically more conservative, the coarse-grained criteria has been selected for the Site.

Based on soil grain size and applicable exposure pathways, the following guidelines were selected to assess groundwater quality at the Site:

<sup>13</sup> Canadian Council of Ministers of the Environment (CCME), 1999. *Canadian Environmental Quality Guidelines*.

<sup>14</sup> Federal Contaminated Sites Action Plan (FCSAP), 2015. *Guidance Document on Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites*. November 2015.

<sup>15</sup> Health Canada, 2014. *Guidelines for Canadian Drinking Water Quality – Summary Table*. October 2014.



- Groundwater analytical results were compared to the *FCSAP Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites* Tier 2 groundwater guidelines for coarse-grained soils and industrial land use, excluding the FWAL pathway (FCSAP Guidelines) and the *Health Canada Guidelines for Canadian Drinking Water Quality* (CDWQ Guidelines).

### 4.4.2 Land Treatment Facility

The following rationale is provided to demonstrate the appropriate generic criteria selection for the LTF:

- The LTF is located within an agricultural field. The agricultural land is used for growing crops and livestock does not access the land. Based on the land descriptions provided in the CCME Guidelines, the LTF is classified as agricultural land use for the protection of irrigation water.
- The LTF is underlain by predominantly fine-grained soil.

Grain size analysis has been historically completed on representative soil samples collected from the LTF. Based on the results, the soil at the LTF is predominantly classified as fine-grained, defined as soil with grain size less than 75 micrometres ( $\mu\text{m}$ ). Therefore, the fine-grained criterion has been selected for the LTF.

Based on soil grain size and applicable exposure pathways, the following guidelines were selected to assess surface water quality at the LTF:

- Surface water analytical results were compared to the *CCME Canadian Water Quality Guidelines for the Protection Agricultural Water Uses* for Irrigation Water (CCME Surface Water Guidelines).

## 5.0 FIELD METHODOLOGY AND INVESTIGATION RESULTS

The following sections describe the field methodologies and investigation results for the completion of each task outlined in Section 3.0. A copy of the Health and Safety Plan is provided in Appendix A.

### 5.1 Facility Alteration Permits

The EIA is managed by the Edmonton Regional Airport Authority (ERAA). The ERAA utilizes an internal construction and development permitting process to ensure that any proposed work does not negatively impact airport operations or infrastructure. Therefore, prior to initiation of the decommissioning work at the LTF and SVE unit, Golder completed Facility Alteration Permit (FAP) applications. The FAP applications included a brief summary of the work to be completed and drawings showing the work area. The FAP application for the LTF decommissioning activities was submitted to the ERAA on September 1, 2016 and approval was received on September 7, 2016. The FAP application for the SVE decommissioning activities was submitted to the ERAA on September 21, 2016 and approval was received on September 26, 2016. A readily available copy of each approved FAP was kept on-Site by Golder at all times. A copy of the approved FAPs have been provided in Appendix B.

### 5.2 Land Treatment Facility Maintenance and Decommissioning

#### 5.2.1 Runoff Treatment and Discharge

The LTF is located approximately 500 m east-southeast of the Site, parallel to Airport Perimeter Road within an agricultural field (refer to Figure 3). The LTF consisted of two biopile cells with the dimensions of 91.5 m by 65 m. Perimeter berms were constructed around the cells to a height of 1.5 m and the entire LTF was lined with a geotextile fabric and geomembrane liner. An 8 m by 8 m sump, designed to collect runoff, was installed in each



biopile cell to a depth of 2.0 m bgs. Approximately 5,200 m<sup>3</sup> of PHC impacted soil was placed into the LTF as part of the remedial excavation. In September 2013, a silt fence was placed around the perimeter of the LTF to restrict small wildlife from accessing the LTF. In addition, in February 2014, a vertical 12" diameter slotted steel corrugated culvert was placed within the centre of each sump and backfilled with wash rock. A custom steel lockable cap was secured as a lid for each culvert and temporary fencing was placed around the sumps.

The placement of the impacted soil within the LTF necessitated the development of a water management plan. The runoff collecting in the sumps would require treatment and discharge due to the runoff potentially being affected by PHC impacted soil in the LTF. It was recognized that the surface water would require treatment and discharge on a regular basis depending on the amount of precipitation accrual at the LTF. Golder completed one runoff treatment and discharge event in September 2016. Golder retained Quantum Murray (QM Environmental) of Edmonton, Alberta to complete the water treatment and discharge event. QM Environmental used activated carbon filters to remove sediments and organic contaminants from the runoff prior to discharge. Photographs taken during field activities are presented in Appendix C.

As the treated runoff was to be discharged into the agricultural field in which the LTF is located, Golder collected a sample of the treated runoff (SW16-01) prior to the treatment and discharge event. Golder collected the treated runoff sample directly from the discharge hose and submitted the sample to Maxxam for laboratory analysis of BTEX, PHC Fractions F1 and F2, total metals, and routine chemistry parameters. Treated runoff water analytical results for the LTF are summarized in Table 1 and the laboratory certificates of analysis are provided in Appendix D. The reported concentrations of BTEX, PHC Fractions F1 and F2, total metals, and routine chemistry parameters were below the applicable guidelines and the treated runoff was determined to be suitable for discharge into the agricultural field.

The treatment and discharge event commenced on September 22, 2016 and ceased on September 26, 2016. Approximately 360,350 L of runoff was treated and discharged by QM Environmental during the treatment and discharge event.

### 5.2.2 LTF North Cell Decommissioning

The decommissioning of the LTF north cell occurred between September 22<sup>nd</sup> and October 4<sup>th</sup>, 2016. Upon removal of water from the north LTF sump, impacted soil and sump gravel from the north cell was transferred to the south cell using a CAT 328D excavator and a CAT 730 rock truck operated by QM Environmental. Impacted soil was spread evenly throughout the south cell and sloped to ensure runoff would collect in the sump.

All liner material was removed and disposed of at the MCL Waste Systems and Environmental Inc. (MCL) Leduc and District Regional Landfill. Each of the three liner layers was removed separately using a CAT 322C excavator to confirm that residual impacted soil was collected and transferred to the south cell. Following the removal of soil and liner material, Golder completed a visual assessment of the footprint of the north cell to identify any areas of staining and/or PHC odours. No areas of staining and/or PHC odours were identified and as a result, the north cell area was backfilled and roughly graded using fill materials from the north cell berms.



### **5.3 Soil Vapour Extraction Unit Decommissioning**

The SVE unit is located within a 60 m long shipping container located adjacent to the northeast corner of the AOMC building and was installed by Franz Environmental Inc. (Franz) in March 2012. The SVE unit is divided into two sections: (i) the process room, which contains the mechanical equipment; and (ii) the mechanical control centre room, which contains the electrical panel and control system. Sub-slab vapours are drawn into the SVE unit by a sparge compressor (C-2201) through the sub-slab SVE inlet located on the southern wall of the SVE unit. Vapours travel through a vapour liquid separator (VLS-401) and a SVE blower (B-401) before passing through two vapour phase activated carbon drums (VPC-1601 and VPC-1602) prior to being discharged through the roof of the SVE unit. A detailed plan of the SVE unit is provided as Figure 4.

A significant decrease in discharge vapours has occurred since the installation of the SVE unit and the completion of the source zone excavation in 2012, as discharge vapours have decreased from 150 ppm upon initiation of the SVE unit in March 2012 to a maximum of 0.5 ppm in January 2015.

Based on the limited operation of the SVE unit during the autumn and winter months and the significant decrease in discharge vapours, it was requested that the SVE unit be decommissioned in order to allow it to be removed from the Site. The SVE decommissioning activities occurred on September 28, 2016. Golder retained QM Environmental to complete this work. QM Environmental retained a certified electrician from Commercial Industries Ltd. to disconnect the power to the SVE unit. QM Environmental disconnected the aboveground header-line piping at the base of the SVE unit, leaving the remaining piping attached to the AOMC building. It is understood that PSPC will be arranging for the removal of the SVE unit from the Site in the near future.

### **5.4 MNA Groundwater Monitoring and Sampling**

Based on the groundwater monitoring and sampling data collected to date, Golder recommended that a MNA strategy be considered for on-going management of the remaining PHC impacts located at the Site. Natural attenuation comprises a number of subsurface processes whereby the mass, toxicity, mobility, volume, or concentration of the target chemical(s) is reduced without human intervention<sup>16</sup>. The most important of the natural attenuation processes for dissolved-phase PHCs is typically intrinsic biodegradation as it results in the in-situ destruction of PHCs (i.e., it actually reduces the mass of contaminants) via microbial processes rather than attenuation via dilution or phase transfer (to soil or soil gas). The recommended MNA strategy consists of groundwater sampling for PHCs and MNA indicator parameters at a limited number of key monitoring well locations to assess evidence of active biodegradation processes.

Golder completed a groundwater monitoring and sampling event at the Site on May 25 and 26, 2016. Groundwater samples were collected at twenty-two monitoring wells at the Site for PHCs (refer to Figure 2). Each monitoring well was monitored for combustible headspace vapour concentrations, depth to water, and thickness of free phase product, if present. Measurement of combustible vapour concentrations within each monitoring well was completed using a RKI Eagle combustible gas detector calibrated to hexane reference gas.

Following the monitoring activities, each monitoring well was purged of three well volumes or until dry using dedicated PVC tubing and a peristaltic pump. Electrical conductivity (EC), pH, temperature, dissolved oxygen (DO), and redox measurements of the purged water were recorded periodically during the purging process to

<sup>16</sup> Alvarez, P. and W. A. Illman, 2006. Bioremediation and Natural Attenuation: Process Fundamentals and Mathematical Models, John Wiley & Sons.



determine that representative formation groundwater was sampled. Purge water from purging the monitoring wells was placed in clearly labelled drums and removed from Site for disposal by G&R Envirocore (G&R) of Lacombe, Alberta. Photographs taken during field activities are presented in Appendix C.

Groundwater samples were collected from each monitoring well in clean dedicated bottles provided by Maxxam Analytics Inc. (Maxxam) as per laboratory instructions (e.g., addition of appropriate preservatives and sample bottles for volatiles and semi-volatiles with no headspace). Groundwater samples were labelled, placed in a cooler with ice, and submitted to Maxxam for chemical analysis.

### 5.4.1 Groundwater Conditions at AOMC Building

Depth to groundwater at the Site ranged from 731.92 m above sea level (ASL) (BH62M) to 736.34 m ASL (BH48M). A summary of groundwater elevations is provided in Table 2. Based on the groundwater elevations measured, the interpreted direction of groundwater flow at the Site is towards the north-northwest. No free phase product was encountered.

### 5.4.2 PHC Groundwater Analytical Results at AOMC Building

Groundwater analytical results for the May 2016 sampling event are summarized in Table 3 and the laboratory certificates of analysis are provided in Appendix D. Groundwater samples during the May 2016 sampling event were collected from twenty-two monitoring wells at the Site, along with two blind duplicate samples for quality assurance/quality control (QA/QC) purposes, and submitted for chemical analysis of BTEX and PHC Fractions F1 and F2. Reported concentrations of all parameters analyzed in May 2016 were below the applicable guidelines for all groundwater samples submitted with the exception of the following:

- Concentrations of benzene exceeded the applicable guideline of 0.005 milligrams per litre (mg/L) in groundwater samples collected from monitoring wells BH32, BH50M, MW71-14, MW75-14, and MW76-14.
- Concentrations of toluene exceeded the applicable guideline of 0.06 mg/L in groundwater samples collected from monitoring wells MW75-14 and MW76-14.
- Concentrations of ethylbenzene exceeded the applicable guideline of 0.14 mg/L in groundwater samples collected from monitoring wells MW71-14, MW75-14 and MW76-14.
- Concentrations of xylenes exceeded the applicable guideline of 0.09 mg/L in groundwater samples collected from monitoring wells MW75-14 and MW76-14.

Based on these results, residual PHC impacts remain in groundwater at the Site along the northwest boundary of the Site at monitoring well MW71-14, along the western boundary of the Site at monitoring wells BH32, BH50M, and MW76-14, and along the southwest boundary of the historic excavation limits at monitoring well MW75-14.

### 5.4.3 Historical MNA Parameter Groundwater Analytical Results at AOMC Building

From March 2014 through January 2016, Golder completed six groundwater sampling events for MNA parameters including dissolved metals, total manganese, ferrous iron, chemical oxygen demand, total phosphorus, dissolved methane, and routine potability (including nitrate, sulphate, carbonate, sodium, chloride, pH, alkalinity, and total dissolved solids). Reported concentrations of all parameters historically analyzed were below the applicable guidelines for all groundwater samples submitted with the exception of the following:



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- Concentration of dissolved aluminum exceeded the applicable guideline of 0.1 mg/L in groundwater sample MW75-14.
- Concentrations of dissolved arsenic exceeded the applicable guideline of 0.010 mg/L in groundwater samples collected from monitoring wells MW75-14 and MW76-14.
- Concentrations of dissolved barium exceeded the applicable guideline of 1.0 mg/L in groundwater samples collected from monitoring wells BH50M, MW75-14, MW76-14 and MW82-15.
- Concentrations of dissolved iron exceeded the applicable guideline of 0.3 mg/L in groundwater samples collected from monitoring wells BH32, BH35, BH50M, MW71-14, MW72-14, MW73-14, MW74-14, MW75-14, MW76-14, MW82-15, and MW83-15.
- Concentrations of dissolved manganese exceeded the applicable guideline of 0.05 mg/L in groundwater samples collected from monitoring wells BH32, BH35, BH50M, BH55M, MW71-14, MW72-14, MW73-14, MW74-14, MW75-14, MW76-14, MW82-15, and MW83-15.
- Concentrations of dissolved sodium exceed the applicable guideline of 200 mg/L in groundwater samples collected from monitoring wells BH35 and BH50M.
- Concentrations of dissolved uranium exceeded the applicable guideline of 0.02 mg/L in groundwater samples collected from monitoring wells BH35, MW72-14, and MW83-15.
- Concentrations of total dissolved solids (TDS) exceeded the applicable guideline of 500 mg/L in groundwater samples collected from monitoring wells BH32, BH35, BH50M, BH55M, MW71-14, MW72-14, MW73-14, MW74-14, MW75-14, MW76-14, MW82-15, and MW83-15.
- Concentrations of dissolved chloride exceeded the applicable guideline of 250 mg/L in groundwater samples collected from monitoring wells BH35, MW74-14, MW75-14, MW82-15 and MW83-15.

Concentrations of dissolved aluminum, dissolved arsenic, dissolved uranium, and TDS are often naturally elevated in the Edmonton region and are consistent with background soil conditions at the Site. In addition, dissolved barium is typically naturally occurring in soils containing sedimentary rocks or coal<sup>17</sup>. Trace coal was observed in the soil stratigraphy at the Site; therefore, it is anticipated that the dissolved barium exceedances reported at the Site are related to the soil conditions at the Site. Finally, the elevated concentrations of dissolved iron and dissolved manganese are likely associated with the degrading PHC concentrations at the Site (refer to Section 5.4.4). Therefore, these parameter exceedances do not represent an environmental concern for the Site.

The elevated concentrations of dissolved sodium and chloride observed historically in monitoring wells BH35, BH50M, MW74-14, MW75-14, MW82-15 and MW83-15 at the Site are likely related to de-icing processes during the winter. It is likely that these monitoring wells are acting as a preferential pathway to the subsurface. As a result, these parameters should continue to be monitored during future MNA parameter sampling events.

<sup>17</sup> Canadian Council of Ministers of the Environment. 2013. Canadian soil quality guidelines for the protection of environmental and human health: Barium. In: Canadian environmental quality guidelines, Canadian Council of Ministers of the Environment, Winnipeg.



#### **5.4.4 MNA Assessment**

Multiple lines of evidence are typically used to assess biodegradation processes related to natural attenuation, including:

- Observed reduction in PHC concentrations over time at key monitoring wells.
- Overall stable/decreasing plume geometry and/or a lesser plume extent than would be expected given site hydrogeology.
- Patterns of geochemical indicator parameters which are indicative of microbially mediated reactions responsible for the biodegradation of PHCs.

Dissolved-phase PHC trends (BTEX and PHC Fractions F1 and F2) generally indicated either stable or “no-trend” determination based on Mann-Kendall analyses (refer to Appendix E). At monitoring well MW71-14, located immediately downgradient of the historical excavation limit, decreasing trends were noted for toluene. At monitoring well BH50M, located near the southwestern perimeter of the historical excavation limits, decreasing trends were noted for PHC Fraction F2 and at monitoring well BH35, located along the western boundary of the Site, decreasing trends were noted for ethylbenzene.

The microbially mediated reactions which convert PHCs to less harmful compounds involve the consumption of PHCs and other compounds (referred to as electron acceptors). Favoured electron acceptors, in order of consumption, are oxygen, nitrate ( $\text{NO}_3^-$ ), manganese ( $\text{Mn}^{4+}$ ), ferric iron ( $\text{Fe}^{3+}$ ), sulphate ( $\text{SO}_4^{2-}$ ), and carbon dioxide ( $\text{CO}_2$ ). Based on consumption of these electron acceptors, geochemical parameters can be used to assess whether biodegradation processes are active and which are dominant (spatially and temporally). Direct evidence (e.g., depressed levels of dissolved oxygen, nitrate and sulphate; elevated dissolved manganese ( $\text{Mn}^{2+}$ ), ferrous iron ( $\text{Fe}^{2+}$ ) and methane) and/or indirect evidence (e.g., low oxidation reduction potential values) can be used to make this assessment via comparison to background locations.

Geochemical parameters were not analyzed during the 2016 sampling event; however, historical groundwater data, provided in Table 4, indicates that biological degradation of PHCs is likely occurring at the Site. The strongest evidence of intrinsic biodegradation of PHCs is the depressed concentrations of dissolved nitrate and elevated concentrations of manganese and ferrous iron (dissolved iron and HCL preserved  $\text{Fe}^{2+}$ ). As a result, the dominant microbial processes appear to include the reduction of nitrate, manganese and iron. Although the relatively low sulphate concentrations (less than 10 mg/L) and elevated methane concentrations (greater than 0.5 mg/L) indicate that the sequential reduction processes have progressed to sulphate reduction and methanogenesis at some locations (e.g., BH32, BH50M, and MW76-14).

The available groundwater data indicates that natural attenuation processes are active and have resulted in stable and/or decreases in PHC concentrations. Based on the long-term nature of PHC-impacts (over 37 years), it is inferred that the groundwater PHC plume is stable under current conditions.

As a result, it is anticipated that conditions at the Site are favourable for an MNA remedial approach based on the remedial activities completed to date, the absence of free phase product at the Site (i.e., no evidence of sheen or in-well free product accumulations), and the active biodegradation processes discussed above. Future groundwater monitoring and sampling events would be required to substantiate that biodegradation of PHC is actually occurring as evidenced by decreases in PHC concentrations and/or a stable or decreasing dissolved-phase PHC plume.



## **6.0 QUALITY ASSURANCE / QUALITY CONTROL**

Samples were collected using appropriate handling protocols and were placed in sample containers provided by Maxxam. All field tasks were completed in accordance with Golder's Field Technical Procedures. All field equipment involved in the sampling of groundwater was decontaminated between each sampling location in accordance with Golder's Technical Procedures. In addition, Golder also reviewed the summary of laboratory QA/QC data provided by Maxxam for surrogate spikes, matrix spikes and method blanks. The laboratory QA/QC data proved satisfactory and met all the QA/QC requirements. The laboratory certificates of analysis are provided in Appendix D and include a summary of the laboratory QA/QC.

The measure of the reproducibility or precision of the data was quantified by calculating the Relative Percent Difference (RPD). The RPD was calculated as follows:

$$RPD\% = \frac{[S - D]}{\frac{1}{2} (S + D)} \times 100$$

Where: RPD = Relative Percent Difference  
S = sample value  
D = duplicate or replicate value

Theoretically, the samples should have identical chemical concentrations (i.e., RPD = 0). However, due to factors such as sample matrix heterogeneity, natural variations or variations in sample collection, handling or analysis, a minor variation in chemical concentration may occur (i.e., RPD >0). Moreover, the reproducibility of replicate analyses at concentrations near the reported detection limit (RDL) can be poor, resulting in RPD values of greater than the allowable limits. Therefore, for duplicate concentrations greater than five times the detection limit, a relative percent difference value of +/- 30% is considered acceptable. For duplicate concentrations less than five times the detection limit, a value of +/- 2 detection limits is considered acceptable. RPD values greater than the project objectives suggest variability had been introduced through sample collection, sample handling, or sample analysis.

Two duplicate samples were collected during the groundwater monitoring event at the AOMC building. The blind duplicate groundwater samples were collected at the discretion of Golder field staff from monitoring wells with sufficient volumes of groundwater. The results of the duplicate analysis are provided in Table 5. The results indicate that for concentrations above five times the RDL, the relative percent differences were less than 30% for all parameters analyzed.



## **7.0 CONCLUSIONS AND RECOMMENDATIONS**

The results of the 2016 post remediation monitoring and partial LTF / SVE unit decommissioning are summarized below:

- Based on the groundwater elevations measured, the interpreted direction of groundwater flow at the Site is towards the north-northwest. No free phase product was encountered during the sampling event.
- Reported concentrations of BTEX and PHC Fractions F1 and F2 at the AOMC building were below the applicable guidelines for groundwater samples submitted, with the exception of monitoring wells BH32, BH50M, MW71-14, MW75-14 and MW76-14.
- Reported concentrations of benzene at monitoring wells BH35 and MW82-15 historically exceeded the applicable guideline in January 2016; however concentrations reduced to below the applicable guideline in May 2016.
- The available groundwater data indicates that natural attenuation processes are active and have resulted in stable and/or decreases in PHC concentrations. Based on the long-term nature of the PHC impacts, it is inferred that the groundwater PHC plume is stable under current conditions.
- Approximately 360,350 L of runoff was treated and discharged from the LTF.
- The north cell of the LTF was decommissioned. Impacted soil including sump gravel from the north LTF cell was transferred to the south cell. All liner material was removed and disposed of at an appropriate off Site facility. The north cell was backfilled and graded using fill materials from the north cell berms.
- The aboveground header-line piping and power to the SVE unit was disconnected in preparation for the removal of the SVE unit.

Based upon the results of the 2016 post remediation monitoring, the following summaries and recommendations are provided below:

- Residual PHC impacts are present within soil and groundwater at the Site. According to the RAP prepared by PGL in February 2010, the volume of impacted soil at the Site was originally approximately 47,000 m<sup>3</sup>. The source zone excavation completed in 2012 resulted in the removal of approximately 5,200 m<sup>3</sup> of PHC impacted soil, leaving approximately 41,800 m<sup>3</sup> of PHC impacted soil at the Site. However it should be noted that the remaining impacts at the Site extend beneath the AOMC building footprint and into the utility corridor to the west of the Site, parallel to 36th Street East, which contains an ATCO Pipelines high pressure natural gas pipeline. As a result, there is significant uncertainty in the volume of PHC impacted soil remaining at the Site.
- The anticipated coarse-grained material surrounding the ATCO Pipelines high pressure natural gas pipeline is likely acting as a preferential pathway for contaminant transport; however, groundwater monitoring completed to date indicates that these impacts have been delineated to the north and have not impacted soil and groundwater quality on the west side of 36<sup>th</sup> Street East. Due to the presence of the utility corridor and the AOMC building, it is not anticipated that additional remedial excavation be undertaken prior to future Site redevelopment. As a result, it is recommended that a MNA strategy continue to be considered for the Site. Based upon the results from the MNA sampling completed to date, biodegradation processes are active at



the Site and the groundwater PHC plume is stable under current conditions. It is recommended that bi-annual groundwater monitoring and sampling be completed to monitor the PHC concentrations and to monitor MNA parameters (i.e., nitrate, sulphate, dissolved iron, dissolved manganese, methane) as part of the MNA strategy. It is also recommended that an updated elevation survey of the monitoring wells at the Site be completed, due to the numerous repairs completed over the past few years.

- In order to aid the MNA strategy, natural bioremediation processes can be enhanced through the addition of amendments such as nutrients (e.g., phosphorous) and electron acceptors (e.g., oxygen, nitrate, iron, sulphate), referred to herein as an enhanced in situ bioremediation (EISB) approach. Biodegradation of PHCs occurs most rapidly under aerobic conditions (i.e., adding oxygen); however, at mature sites it is often beneficial to instead promote anaerobic conditions (e.g., adding nitrate or sulphate). The degree of success of EISB relies in large part on the effective delivery of amendments to the subsurface. Delivery approaches range from passive approaches (e.g., Waterloo Emitter) to more active delivery (e.g., groundwater injection/extraction recirculation systems). Alternatively, time to reach “closure concentrations” can be reduced by addressing source areas or high concentration areas, for example, using in-situ chemical oxidation via direction injection (e.g., Fenton’s reagent). However, before an enhanced MNA approach can be selected, further investigation would be required to determine the updated Site conditions and the appropriate remediation goals.
- The north cell of the LTF has been decommissioned and impacted soil from the north cell has been transferred to the south cell. Based on the sampling completed in June 2015, PHC impacts remain in the soil located within the LTF with reported exceedances of benzene (0.40 mg/kg), ethylbenzene (2.7 mg/kg), and PHC Fractions F1 (280 mg/kg) and F2 (470 mg/kg). However, the concentrations have reduced to allow the impacted soil to be classified as non-hazardous. As a result, it is recommended that the soil located in the south cell be disposed of at an Alberta Class II non-hazardous landfill and the south cell of the LTF be decommissioned. It is also recommended that the runoff collecting in the LTF sump be treated and discharged prior to decommissioning the LTF. As a proactive measure during this work, it is recommended that the monitoring wells installed around the perimeter of the LTF be monitored and sampled after the decommissioning work is completed. In addition, it is recommended that the monitoring wells be decommissioned after groundwater quality results have been confirmed.



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The following table provides a preliminary cost estimate based on the recommended work required to monitor the residual PHC impacts present within soil and groundwater at the Site and decommission the remaining portion of the LTF in 2017. Preliminary costs to complete the recommended future work are estimated to be between approximately \$550,000 and \$600,000 CDN (excluding GST).

Task	Professional Fees	Contractor Costs	Analytical Costs	Disbursements	Totals
MNA Groundwater Monitoring and Sampling	\$7,000	\$4,000	\$12,000	\$5,000	\$28,000
LTF Decommissioning					
Runoff Treatment and Discharge	\$4,000	\$30,000	\$1,000	\$1,000	\$36,000
Soil Removal and Disposal	\$9,000	\$430,000	\$1,000	\$2,000	\$442,000
Liner and Sump Removal	\$3,000	\$31,000	-	\$1,000	\$35,000
Berm Removal and Site Grading	\$3,000	\$13,000	-	\$1,000	\$17,000
LTF Groundwater Sampling and Well Decommissioning	\$2,000	\$4,000	\$1,000	\$1,000	\$8,000
Reporting	\$9,000	-	-	\$1,000	\$10,000
<b>Totals</b>	<b>\$37,000</b>	<b>\$512,000</b>	<b>\$15,000</b>	<b>\$12,000</b>	<b>\$576,000</b>

Notes:

1. The above costs are intended to represent an estimate of costs for planning purposes.
2. The above costs are based on present value 2016 cost data.
3. Costs provided above do not include GST.
4. MNA Groundwater Monitoring and Sampling includes two sampling events and an elevation survey of the monitoring well.

## 8.0 LIMITATIONS

This report was prepared for the exclusive use of Public Services and Procurement Canada. The report, which specifically includes all tables, figures, and appendices, is based on data and information collected during the Site activities conducted by Golder Associates Ltd. and is based solely on the conditions of the property at the time of the Site field program and data obtained by Golder Associates Ltd. as described in this report.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The content of this report is based on information collected during our assessment, our present understanding of the Site conditions, and our professional judgement in light of such information at the time of this report. This report provides a professional opinion and therefore no warranty is either expressed, implied, or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change. The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered in future work, including excavations, borings, or other studies, Golder Associates Ltd. should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.



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### CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional details, please contact the undersigned.

Sincerely,

**GOLDER ASSOCIATES LTD.**

**APEGA Permit to Practice #05122**

Prepared By:

Rebecca Boyce, Dipl. Tech.  
Environmental Technologist

Reviewed By:



14 Dec 16.

Arthur Cole, P.Eng.  
Principal, Senior Environmental Engineer

Steven Fiddler, B.Sc.  
Environmental Scientist

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# TABLES

**Table 1**  
**LTF Runoff Water Chemistry Results**  
**Public Services and Procurement Canada**  
**AOMC Building, Edmonton International Airport**

Sample Identification			LTF-WS16-01	CCME Guidelines <sup>1</sup>
Sample Collection Date			September 19, 2016	
Parameter	Units	RDL		
<b>BTEX Parameters</b>				
Benzene	mg/L	0.0004	<0.0004	NG
Toluene	mg/L	0.0004	<0.0004	NG
Ethylbenzene	mg/L	0.0004	<0.0004	NG
Xylenes (Total)	mg/L	0.0008	<0.0008	NG
<b>Hydrocarbon Fractions</b>				
PHC F1 (C6-C10) - BTEX	mg/L	0.10	<0.10	NG
PHC F2 (C10-C16)	mg/L	0.10	<0.10	NG
<b>Total Metals</b>				
Total Aluminum (Al)	mg/L	0.003	0.042	5
Total Antimony (Sb)	mg/L	0.0006	0.0024	NG
Total Arsenic (As)	mg/L	0.0002	0.040	0.1
Total Barium (Ba)	mg/L	0.01	0.046	NG
Total Beryllium (Be)	mg/L	0.001	<0.0010	0.1
Total Boron (B)	mg/L	0.02	0.11	0.5
Total Cadmium (Cd)	mg/L	0.00002	<0.000020	0.0051
Total Calcium (Ca)	mg/L	0.3	15	NG
Total Chromium (Cr)	mg/L	0.001	<0.0010	NG
Total Cobalt (Co)	mg/L	0.0003	<0.00030	0.05
Total Copper (Cu)	mg/L	0.0002	0.0023	0.2
Total Iron (Fe)	mg/L	0.06	0.073	5
Total Lead (Pb)	mg/L	0.0002	<0.00020	0.2
Total Lithium (Li)	mg/L	0.02	<0.020	2.5
Total Magnesium (Mg)	mg/L	0.2	7.9	NG
Total Manganese (Mn)	mg/L	0.004	0.0048	0.2
Total Molybdenum (Mo)	mg/L	0.0002	0.0033	0.01
Total Nickel (Ni)	mg/L	0.0005	0.0013	0.2
Total Phosphorus (P)	mg/L	0.1	<0.10	NG
Total Potassium (K)	mg/L	0.3	4.1	NG
Total Selenium (Se)	mg/L	0.0002	<0.00020	0.02
Total Silicon (Si)	mg/L	0.1	0.60	NG
Total Silver (Ag)	mg/L	0.0001	<0.00010	NG
Total Sodium (Na)	mg/L	0.5	5.8	NG
Total Strontium (Sr)	mg/L	0.02	0.15	NG
Total Sulphur (S)	mg/L	0.2	3.1	NG
Total Thallium (Tl)	mg/L	0.0002	<0.00020	NG
Total Tin (Sn)	mg/L	0.001	<0.0010	NG
Total Titanium (Ti)	mg/L	0.001	<0.0010	NG
Total Uranium (U)	mg/L	0.0001	0.00093	0.01
Total Vanadium (V)	mg/L	0.001	0.0046	0.1
Total Zinc (Zn)	mg/L	0.003	<0.0030	5
<b>Calculated Parameters</b>				
Anion Sum	meq/L	N/A	1.6	NG
Cation Sum	meq/L	N/A	1.7	NG
Hardness (CaCO <sub>3</sub> )	mg/L	0.5	70	NG
Ion Balance	N/A	0.01	1.1	NG
Dissolved Nitrate (NO <sub>3</sub> )	mg/L	0.044	<0.044	NG
Nitrate plus Nitrite (N)	mg/L	0.01	<0.020	NG
Dissolved Nitrite (NO <sub>2</sub> )	mg/L	0.033	<0.033	NG
Total Dissolved Solids	mg/L	10	86	500
<b>Misc. Inorganics</b>				
Conductivity	uS/cm	1	160	NG
pH	pH	N/A	9.64	NG
<b>Anions</b>				
Alkalinity (PP as CaCO <sub>3</sub> )	mg/L	0.5	14	NG
Alkalinity (Total as CaCO <sub>3</sub> )	mg/L	0.5	69	NG
Bicarbonate (HCO <sub>3</sub> )	mg/L	0.5	49	NG
Carbonate (CO <sub>3</sub> )	mg/L	0.5	17	NG
Hydroxide (OH)	mg/L	0.5	<0.50	NG
Dissolved Sulphate (SO <sub>4</sub> )	mg/L	1	9.1	NG
Dissolved Chloride (Cl)	mg/L	1	2.7	100
<b>Nutrients</b>				
Dissolved Nitrite (N)	mg/L	0.01	<0.010	NG
Dissolved Nitrate (N)	mg/L	0.01	<0.010	NG
<b>Lab Filtered Elements</b>				
Dissolved Calcium (Ca)	mg/L	0.3	15	NG
Dissolved Iron (Fe)	mg/L	0.06	<0.060	5
Dissolved Magnesium (Mg)	mg/L	0.2	7.9	NG
Dissolved Manganese (Mn)	mg/L	0.004	<0.0004	0.2
Dissolved Potassium (K)	mg/L	0.3	4	NG
Dissolved Sodium (Na)	mg/L	0.5	5.6	NG

**Notes:**

1. Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses for Irrigation Water, 1999.

NG - no guideline

RDL - reported detection limit

ppm - parts per million

mg/L - milligrams per litre

meq/L - milliequivalent per litre

uS/cm - microSiemens per centimeter

N/A - not applicable

**BOLD** indicates samples in exceedance of applicable guidelines.

Table should be read in conjunction with accompanying report.

**Table 2**  
**Summary of Groundwater Elevations**  
**Public Services and Procurement Canada**  
**AOMC Building, Edmonton International Airport**

Well ID	Ground Elevation <sup>1</sup> (mASL)	Top of Pipe Elevation <sup>1</sup> (mASL)	Well Depth (mbgs)	Monitoring Date	Depth to Water (mbtoc)	Depth to Water (mbgs)	Groundwater Elevation (mASL)
BH32	734.72	734.55	2.79	30-May-13	0.43	0.60	734.12
				20-Sep-13	0.69	0.86	733.86
				4-Mar-14	frozen	-	-
				28-Aug-14	0.75	0.91	733.80
				23-Jul-15	0.48	0.65	734.07
				10-Sep-15	0.53	0.70	734.02
				20-Nov-15	1.01	1.18	733.54
				21-Jan-16	2.45	2.61	732.11
				25-May-16	0.45	0.62	734.10
				4-Jun-13	0.37	0.26	733.78
				20-Sep-13	0.74	0.63	733.41
				4-Mar-14	frozen	-	-
BH35	734.04	734.15	3.20	28-Aug-14	0.82	0.71	733.34
				23-Jul-15	0.39	0.28	733.76
				10-Sep-15	0.48	0.37	733.68
				20-Nov-15	1.14	1.03	733.01
				21-Jan-16	2.19	2.08	731.97
				25-May-16	0.35	0.24	733.81
				4-Jun-13	0.10	0.16	733.81
				20-Sep-13	0.55	0.60	733.36
				4-Mar-14	frozen	-	-
				27-Aug-14	0.70	0.75	733.21
				23-Jul-15	0.22	0.28	733.69
				10-Sep-15	0.32	0.37	733.59
MW46	733.96	733.91	2.91	20-Nov-15	0.98	1.04	732.93
				21-Jan-16	dry	-	-
				25-May-16	0.22	0.28	733.69
				31-May-13	0.57	1.15	736.36
				23-Sep-13	0.77	1.35	736.16
				6-Mar-14	2.51	3.09	734.42
				27-Aug-14	0.77	1.35	736.16
				21-Jul-15	0.56	1.14	736.37
				9-Sep-15	0.62	1.20	736.31
				19-Nov-15	1.06	1.64	735.87
				20-Jan-16	2.41	2.99	734.52
				26-May-16	0.59	1.17	736.34
BH48M	737.51	736.93	6.81	30-May-13	1.03	1.16	733.56
				19-Sep-13	1.05	1.18	733.54
				5-Mar-14	frozen	-	-
				28-Aug-14	1.34	1.47	733.25
				23-Jul-15	0.99	1.13	733.60
				9-Sep-15	0.90	1.03	733.69
				20-Nov-15	1.24	1.37	733.36
				21-Jan-16	2.47	2.61	732.12
				26-May-16	0.85	0.99	733.74
				29-May-13	0.57	0.59	734.42
				19-Sep-13	0.96	0.99	734.02
				5-Mar-14	2.79	2.81	732.20
BH54M	735.01	734.98	5.20	27-Aug-14	0.96	0.98	734.02
				23-Jul-15	0.62	0.65	734.36
				8-Sep-15	0.66	0.68	734.33
				18-Nov-15	1.10	1.12	733.88
				21-Jan-16	2.57	2.59	732.42
				26-May-16	0.60	0.62	734.39
				31-May-13	0.74	0.77	734.28
				23-Sep-13	0.90	0.93	734.13
				5-Mar-14	3.41	3.44	731.62
				27-Aug-14	1.14	1.17	733.89
				23-Jul-15	0.74	0.76	734.29
				9-Sep-15	0.64	0.67	734.39
BH55M	735.06	735.03	5.21	18-Nov-15	0.78	0.81	734.24
				20-Jan-16	3.06	3.09	731.96
				26-May-16	0.69	0.72	734.34
				29-May-13	0.66	0.72	733.74
				18-Sep-13	0.94	1.00	733.46
				5-Mar-14	covered	-	-
				27-Aug-14	1.07	1.13	733.33
				22-Jul-15	0.66	0.72	733.74
				8-Sep-15	0.68	0.74	733.72
				18-Nov-15	0.97	1.03	733.43
				22-Jan-16	covered	-	-
				25-May-16	0.59	0.65	733.81
BH58M	734.90	734.51	5.22	30-May-13	0.80	1.18	733.71
				19-Sep-13	1.33	1.71	733.18
				5-Mar-14	3.05	3.43	731.46
				27-Aug-14	1.34	1.73	733.17
				21-Jul-15	1.06	1.45	733.45
				9-Sep-15	1.37	1.76	733.14
				19-Nov-15	1.26	1.65	733.25
				20-Jan-16	2.80	3.18	731.72
				26-May-16	0.96	1.35	733.55
				30-May-13	1.25	1.44	732.66
				19-Sep-13	1.28	1.48	732.63
				5-Mar-14	2.78	2.97	731.13
BH59M	734.11	733.91	5.68	27-Aug-14	1.45	1.64	732.47
				21-Jul-15	1.44	1.63	732.47
				9-Sep-15	1.48	1.67	732.43
				19-Nov-15	1.47	1.66	732.45
				20-Jan-16	2.84	3.03	731.08
				26-May-16	1.34	1.54	732.57
				29-May-13	2.20	2.28	731.67
				18-Sep-13	1.63	1.71	732.24
				5-Mar-14	2.82	2.89	731.05
				27-Aug-14	2.65	2.73	731.22
				22-Jul-15	2.49	2.56	731.38
				8-Sep-15	2.23	2.31	731.64
BH62M	733.95	733.87	6.72	18-Nov-15	2.04	2.12	731.83
				22-Jan-16	2.94	3.01	730.93
				25-May-16	1.95	2.02	731.92
				29-May-13	1.87	1.99	731.95
				18-Sep-13	1.84	1.96	731.97
				5-Mar-14	2.85	2.96	730.97
				27-Aug-14	2.06	2.18	731.75
				22-Jul-15	1.88	2.00	731.93
				8-Sep-15	2.10	2.22	731.72
				18-Nov-15	2.05	2.17	731.77
				22-Jan-16	2.62	2.74	731.20
				25-May-16	1.55	1.67	732.27
BH63M	733.93	733.82	4.44				

**Table 2**  
**Summary of Groundwater Elevations**  
**Public Services and Procurement Canada**  
**AOMC Building, Edmonton International Airport**

Well ID	Ground Elevation <sup>1</sup> (mASL)	Top of Pipe Elevation <sup>1</sup> (mASL)	Well Depth (mbgs)	Monitoring Date	Depth to Water (mbtoc)	Depth to Water (mbgs)	Groundwater Elevation (mASL)
BH64M	735.01	735.01	6.78	30-May-13	2.47	2.48	732.54
				19-Sep-13	1.94	1.95	733.07
				4-Mar-14	frozen	-	-
				27-Aug-14	2.62	2.62	732.39
				22-Jul-15	2.44	2.44	732.57
				9-Sep-15	2.43	2.43	732.58
				18-Nov-15	2.20	2.21	732.81
				20-Jan-16	2.62	2.62	732.39
				26-May-16	2.19	2.19	732.83
				28-May-13	3.00	3.15	731.53
				18-Sep-13	1.73	1.87	732.80
				5-Mar-14	frozen	-	-
BH65M	734.68	734.53	8.31	27-Aug-14	1.81	1.95	732.72
				22-Jul-15	2.13	2.27	732.40
				8-Sep-15	2.22	2.37	732.31
				18-Nov-15	2.23	2.37	732.31
				22-Jan-16	2.96	3.11	731.57
				25-May-16	1.75	1.90	732.78
				4-Mar-14	3.18	3.29	730.78
				28-Aug-14	2.08	2.19	731.87
				23-Jul-15	2.10	2.21	731.86
				9-Sep-15	2.09	2.20	731.86
				19-Nov-15	1.84	1.95	732.11
				21-Jan-16	3.14	3.25	730.81
MW71-14	734.07	733.96	4.92	25-May-16	1.82	1.93	732.13
				4-Mar-14	5.20	5.26	728.87
				28-Aug-14	0.70	0.76	733.37
				23-Jul-15	0.55	0.61	733.52
				9-Sep-15	0.61	0.67	733.46
				19-Nov-15	1.10	1.16	732.97
				21-Jan-16	2.57	2.63	731.50
				25-May-16	0.60	0.66	733.47
				4-Mar-14	2.74	2.88	731.31
				28-Aug-14	0.61	0.75	733.44
				23-Jul-15	0.52	0.66	733.52
				8-Sep-15	0.65	0.79	733.39
MW73-14	734.19	734.04	6.02	19-Nov-15	1.06	1.20	732.98
				21-Jan-16	2.44	2.59	731.60
				25-May-16	0.59	0.73	733.46
				28-Aug-14	0.47	0.57	734.40
				21-Jul-15	0.44	0.54	734.43
				10-Sep-15	0.76	0.86	734.11
				19-Nov-15	0.97	1.06	733.90
				21-Jan-16	2.46	2.56	732.41
				26-May-16	0.65	0.74	734.23
				16-Sep-14	1.47	1.60	733.36
				21-Jul-15	0.51	0.64	734.32
				10-Sep-15	0.56	0.68	734.27
MW75-14	734.96	734.83	4.60	20-Nov-15	0.84	0.97	733.99
				20-Jan-16	2.54	2.66	732.30
				26-May-16	0.44	0.57	734.39
				4-Mar-14	2.72	2.83	732.00
				28-Aug-14	1.30	1.41	733.42
				21-Jul-15	1.04	1.14	733.69
				9-Sep-15	1.11	1.21	733.62
				20-Nov-15	1.15	1.25	733.58
				20-Jan-16	2.67	2.78	732.05
				26-May-16	0.94	1.05	733.78
				21-Jul-15	0.34	-	-
				10-Sep-15	0.69	-	-
MW82-15	NM	NM	5.57	20-Nov-15	0.94	-	-
				21-Jan-16	2.29	-	-
				26-May-16	0.33	-	-
				22-Jul-15	1.98	-	-
				8-Sep-15	1.83	-	-
				18-Nov-15	1.64	-	-
				22-Jan-16	2.60	-	-
				25-May-16	1.54	-	-
				3-Jun-13	6.69	5.65	730.00
				23-Sep-13	6.59	5.55	730.10
				28-Aug-14	6.42	5.37	730.28
				6-Oct-15	3.23	2.19	733.46
MW2-13	735.56	736.46	5.93	31-May-13	dry	-	-
				23-Sep-13	dry	-	-
				28-Aug-14	6.77	5.86	729.70
				6-Oct-15	6.65	5.75	729.81
				31-May-13	dry	-	-
				23-Sep-13	dry	-	-
				28-Aug-14	dry	-	-
				6-Oct-15	6.62	5.72	729.84
				4-Jun-13	6.67	5.82	730.55
				23-Sep-13	5.65	4.79	731.57
				28-Aug-14	5.40	4.55	731.82
				6-Oct-15	4.90	4.05	732.32
MW4-13	736.37	737.22	6.08	31-May-13	dry	-	-
				23-Sep-13	dry	-	-
				28-Aug-14	6.85	5.94	730.76
				6-Oct-15	4.33	3.42	733.28
				31-May-13	4.13	3.20	732.59
				23-Sep-13	4.24	3.31	732.48
				28-Aug-14	2.40	1.47	734.32
				6-Oct-15	2.85	1.91	733.88
				31-May-13	dry	-	-
				23-Sep-13	dry	-	-
				28-Aug-14	6.85	5.94	730.76
				6-Oct-15	4.33	3.42	733.28
MW5-13	736.70	737.60	5.95	31-May-13	dry	-	-
				23-Sep-13	dry	-	-
				28-Aug-14	6.85	5.94	730.76
				6-Oct-15	4.33	3.42	733.28
				31-May-13	4.13	3.20	732.59
				23-Sep-13	4.24	3.31	732.48
				28-Aug-14	2.40	1.47	734.32
				6-Oct-15	2.85	1.91	733.88
				31-May-13	dry	-	-
				23-Sep-13	dry	-	-
				28-Aug-14	6.85	5.94	730.76
				6-Oct-15	4.33	3.42	733.28
MW6-13	735.79	736.72	6.03	31-May-13	dry	-	-
				23-Sep-13	dry	-	-
				28-Aug-14	6.85	5.94	730.76
				6-Oct-15	4.33	3.42	733.28
				31-May-13	4.13	3.20	732.59
				23-Sep-13	4.24	3.31	732.48
				28-Aug-14	2.40	1.47	734.32
				6-Oct-15	2.85	1.91	733.88
				31-May-13	dry	-	-
				23-Sep-13	dry	-	-
				28-Aug-14	6.85	5.94	730.76
				6-Oct-15	4.33	3.42	733.28

**Notes:**

1. Elevations surveyed by Golder in June 2013, March 2014, and September 2014.

mASL - metres above sea level

mbgs - metres below ground surface.

mbtoc - metres below top of casing.

NM - not measured

\*- not available

Table to be read in conjunction with accompanying report.

Table 3  
AOMC Building Groundwater Chemistry Results - Petroleum Hydrocarbons  
Public Services and Procurement Canada  
AOMC Building, Edmonton International Airport

Well ID	Sampling Date	Headspace Combustible Vapour (ppm)	Parameters					
			Benzene	Toluene	Ethylbenzene	Xylenes (Total)	PHC F1 (C6-C10) - BTEX	PHC F2 (C10-C16)
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Reportable Detection Limit			0.0004	0.0004	0.0004	0.0008	0.1	0.1
CDWQ and FCSAP Guidelines			0.005 <sup>1</sup>	0.06 <sup>1</sup>	0.14 <sup>1</sup>	0.09 <sup>1</sup>	9.1 <sup>2</sup>	3.1 <sup>2</sup>
BH32	30-May-13	0	0.42	0.017	0.069	0.16	1.3	1.9
	20-Sep-13	5	0.82	0.010	0.066	0.11	0.70	0.56
	29-Aug-14	0	0.71	0.0087	0.047	0.15	0.48	0.77
	23-Jul-15	0	0.029	0.00069	0.0054	0.024	0.24	0.51
	10-Sep-15	45	0.18	0.0023	0.040	0.023	0.60	0.22
	20-Nov-15	0	1.3	0.0092	0.11	0.045	0.78	0.63
	22-Jan-16	0	3.7	0.023	0.10	0.13	0.49	1.2
BH35	25-May-16	5	0.19	0.0035	0.05	0.04	0.5	0.37
	4-Jun-13	0	0.018	<0.0004	0.0013	<0.0008	<0.10	<0.10
	20-Sep-13	0	0.19	0.0018	0.0071	0.0011	0.23	<0.10
	29-Aug-14	0	0.19	0.0019	0.0079	<0.0008	0.19	<0.10
	23-Jul-15	35	0.026	0.00053	0.00074	<0.0008	<0.10	<0.10
	10-Sep-15	0	0.0062	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	20-Nov-15	0	0.028	0.00057	0.0020	<0.0008	<0.10	<0.10
MW46	22-Jan-16	0	0.065	0.00057	<0.0004	<0.0008	<0.10	<0.10
	25-May-16	0	0.00049	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	4-Jun-13	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	20-Sep-13	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	27-Aug-14	5	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	23-Jul-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	10-Sep-15	60	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
BH48M	20-Nov-15	0	0.00097	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	25-May-16	95	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	31-May-13	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	23-Sep-13	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	6-Mar-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	27-Aug-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	21-Jul-15	40	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
BH50M	9-Sep-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	19-Nov-15	15	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	20-Jan-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	26-May-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	30-May-13	30	0.35	0.0048	0.0085	0.018	0.22	0.26
	19-Sep-13	25	3.7	0.027	0.075	0.077	<0.10	0.16
	29-Aug-14	40	1.8	0.023	0.038	0.087	<0.10	0.19
BH54M	23-Jul-15	35	0.50	0.0058	0.013	0.024	<0.10	0.12
	9-Sep-15	450	1.6	0.017	0.023	0.034	0.12	<0.10
	20-Nov-15	350	1.5	0.028	0.037	0.050	<0.10	<0.10
	21-Jan-16	80	0.95	0.013	0.036	0.050	<0.10	<0.10
	26-May-16	10	0.03	<0.0004	0.0021	0.003	<0.10	<0.10
	29-May-13	5	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	19-Sep-13	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	0.14
BH55M	5-Mar-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	27-Aug-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	23-Jul-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	8-Sep-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	18-Nov-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	21-Jan-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	26-May-16	25	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
BH57M	31-May-13	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	23-Sep-13	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	5-Mar-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	22-Jul-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	9-Sep-15	20	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	18-Nov-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	20-Jan-16	5	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
BH58M	26-May-16	20	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	29-May-13	20	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	18-Sep-13	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	27-Aug-14	15	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	22-Jul-15	40	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	8-Sep-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	18-Nov-15	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
BH59M	25-May-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	30-May-13	260	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	19-Sep-13	30	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	5-Mar-14	20	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	27-Aug-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	21-Jul-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	9-Sep-15	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
BH62M	19-Nov-15	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	20-Jan-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	26-May-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	29-May-13	20	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	18-Sep-13	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	5-Mar-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	27-Aug-14	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10

Table 3  
AOMC Building Groundwater Chemistry Results - Petroleum Hydrocarbons  
Public Services and Procurement Canada  
AOMC Building, Edmonton International Airport

Well ID	Sampling Date	Headspace Combustible Vapour (ppm)	Parameters						
			Benzene	Toluene	Ethylbenzene	Xylenes (Total)	PHC F1 (C6-C10) - BTEX	PHC F2 (C10-C16)	
Units			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
Reportable Detection Limit			0.0004	0.0004	0.0004	0.0008	0.1	0.1	
CDWQ and FCSAP Guidelines			0.005 <sup>1</sup>	0.06 <sup>1</sup>	0.14 <sup>1</sup>	0.09 <sup>1</sup>	9.1 <sup>2</sup>	3.1 <sup>2</sup>	
BH63M	29-May-13	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	18-Sep-13	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	5-Mar-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	27-Aug-14	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	22-Jul-15	40	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	8-Sep-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	18-Nov-15	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	22-Jan-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	25-May-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
BH64M	30-May-13	100	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	19-Sep-13	5	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	27-Aug-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	22-Jul-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	9-Sep-15	20	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	18-Nov-15	5	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	20-Jan-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	26-May-16	15	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	28-May-13	20	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
BH65M	18-Sep-13	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	27-Aug-14	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	22-Jul-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	8-Sep-15	25	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	18-Nov-15	5	<0.0004	0.00042	<0.0004	<0.0008	<0.10	<0.10	
	22-Jan-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	25-May-16	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	4-Mar-14	3,400	0.019	0.0027	0.086	0.052	0.81	0.53	
	29-Aug-14	20	0.081	0.0022	0.12	0.049	0.63	0.70	
MW71-14	23-Jul-15	480	0.11	0.0023	0.18	0.026	1.5	0.54	
	9-Sep-15	240	0.040	0.00076	0.059	0.0057	0.52	0.17	
	19-Nov-15	110	0.033	0.00064	0.049	0.0028	0.38	0.16	
	21-Jan-16	110	0.037	0.00052	0.0039	0.0080	0.84	0.23	
	25-May-16	65	0.11	0.0023	0.25	0.037	0.98	0.48	
	MW72-14	4-Mar-14	4,650	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
		29-Aug-14	10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
		23-Jul-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
		9-Sep-15	240	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
19-Nov-15		10	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
21-Jan-16		0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
25-May-16		0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
MW73-14		4-Mar-14	2,750	0.00041	<0.0004	<0.0004	<0.0008	<0.10	<0.10
		29-Aug-14	25	0.00068	<0.0004	<0.0004	<0.0008	<0.10	<0.10
	23-Jul-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	8-Sep-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	19-Nov-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	21-Jan-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	25-May-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	MW74-14	29-Aug-14	5	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	0.11
		21-Jul-15	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10
10-Sep-15		30	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
19-Nov-15		5	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
21-Jan-16		45	0.0011	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
26-May-16		5	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
MW75-14		16-Sep-14	1,750	1.6	0.15	0.42	1.1	1.2	1.7
		21-Jul-15	130	0.12	0.47	0.57	0.57	2.7	2.2
		10-Sep-15	3,050	1.7	0.099	0.18	0.46	1.3	0.63
	20-Nov-15	10,250	2.0	0.11	0.23	0.65	0.60	1.2	
	20-Jan-16	510	1.5	0.039	0.057	0.12	0.60	0.61	
	26-May-16	150	2.1	0.15	0.55	0.99	2.2	2.4	
	MW76-14	4-Mar-14	2,750	0.24	0.042	0.033	0.11	0.19	0.15
		29-Aug-14	100	21	5.5	0.99	5.1	<0.10	2.3
		21-Jul-15	75	14	2.8	0.75	2.6	2.5	1.9
9-Sep-15		610	14	3.6	0.97	3.6	0.41	2.0	
20-Nov-15		1,450	16	3.6	0.91	3.1	<0.10	1.6	
20-Jan-16		420	16	3.2	0.54	2.0	22	3.8	
26-May-16		50	19	3.1	0.84	2.4	<0.10	2	
MW82-15		21-Jul-15	100	<0.0004	<0.0004	0.0026	<0.0008	0.46	0.58
		10-Sep-15	190	<0.0004	<0.0004	0.0021	<0.0008	0.69	0.60
	20-Nov-15	120	<0.0004	<0.0004	0.0034	<0.0008	0.73	0.61	
	21-Jan-16	0	0.0088	0.0066	0.0061	0.015	0.64	0.67	
	26-May-16	5	<0.0004	<0.0004	0.00043	<0.0008	0.2	0.3	
MW83-15	22-Jul-15	15	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	8-Sep-15	15	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	18-Nov-15	65	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	22-Jan-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	
	25-May-16	0	<0.0004	<0.0004	<0.0004	<0.0008	<0.10	<0.10	

## Notes:

1. Health Canada Guidelines for Canadian Drinking Water Quality, October 2014.

2. Federal Contaminated Sites Action Plan Federal Interim Groundwater Quality Guidelines for Federal Contaminated Sites, Tier 2 Guidelines excluding the freshwater aquatic life pathway for coarse-grained soil and industrial land use, November 2015.

RDL - reported detection limit

ppm - parts per million

mg/L - milligrams per litre

**BOLD** indicates samples in exceedance of applicable guidelines.

Table should be read in conjunction with accompanying report.

**Table 4**  
AOMC Building Groundwater Chemistry Results - MNA Parameters  
Public Services and Procurement Canada  
AOMC Building, Edmonton International Airport

[illegible]



**Table 5**  
**Quality Assurance/Quality Control Analysis**  
**Public Services and Procurement Canada**  
**AOMC, Edmonton International Airport**

Sample Identification			BH62M	DUP16-01	Greater than 5 X RDL? <sup>1</sup>	Less than 2 X RDL? <sup>2</sup>	RPD <sup>3</sup>	MW74-14	DUP16-02	Greater than 5 X RDL? <sup>1</sup>	Within 2 X RDL? <sup>2</sup>	RPD <sup>3</sup>
Sample Collection Date			May 25, 2016					May 26, 2016				
Parameter	Units	RDL										
<b>Hydrocarbons</b>												
Benzene	ug/L	0.40	<0.40	<0.40	N	-	-	2,100	2,100	Y	N	0%
Toluene	ug/L	0.40	<0.40	<0.40	N	-	-	150	150	Y	N	0%
Ethylbenzene	ug/L	0.40	<0.40	<0.40	N	-	-	550	520	Y	N	6%
Xylenes (Total)	ug/L	0.80	<0.80	<0.80	N	-	-	990	960	Y	N	3%
F1 (C <sub>6</sub> -C <sub>10</sub> ) - BTEX	ug/L	100	<100	<100	N	-	-	2,200	1,900	Y	N	15%
F2 (C <sub>10</sub> -C <sub>16</sub> )	mg/L	0.10	<0.10	<0.10	N	-	-	2.4	2.6	Y	N	8%

**Notes:**

RPD - Relative Percent Difference.

RDL - Reported Detection Limit by the Laboratory.

1. RPD is only calculated for results that are greater than 5 times the reported detection limit.

2. Applicable to results that are less than 5 times the reported detection limit.

3. Relative percent difference is only calculated for results where at least one result is greater than 5 times the detection limit.

mg/L - milligrams per litre

**BOLD**

indicates the percent difference is greater than 30% or not within 2 X RDL.

Table should be read in conjunction with accompanying report.

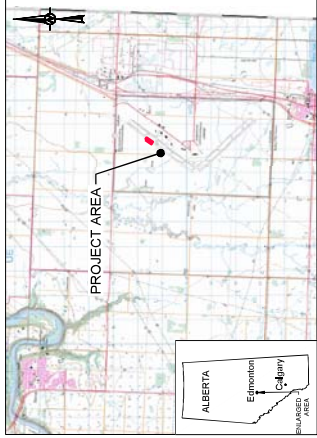


# FIGURES



LEGEND

SITE LOCATION

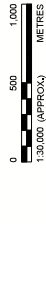


KEY MAP

NOT TO SCALE

REFERENCE(S)

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DATUM: NAD 83. PROJECTION: UTM ZONE 12.



CLIENT

**Canada**

PUBLIC SERVICES AND  
PROCUREMENT CANADA

PROJECT

ACMC 2016 POST REMEDIATION MONITORING AND LTF  
DECOMMISSIONING, EDMONTON INTERNATIONAL AIRPORT

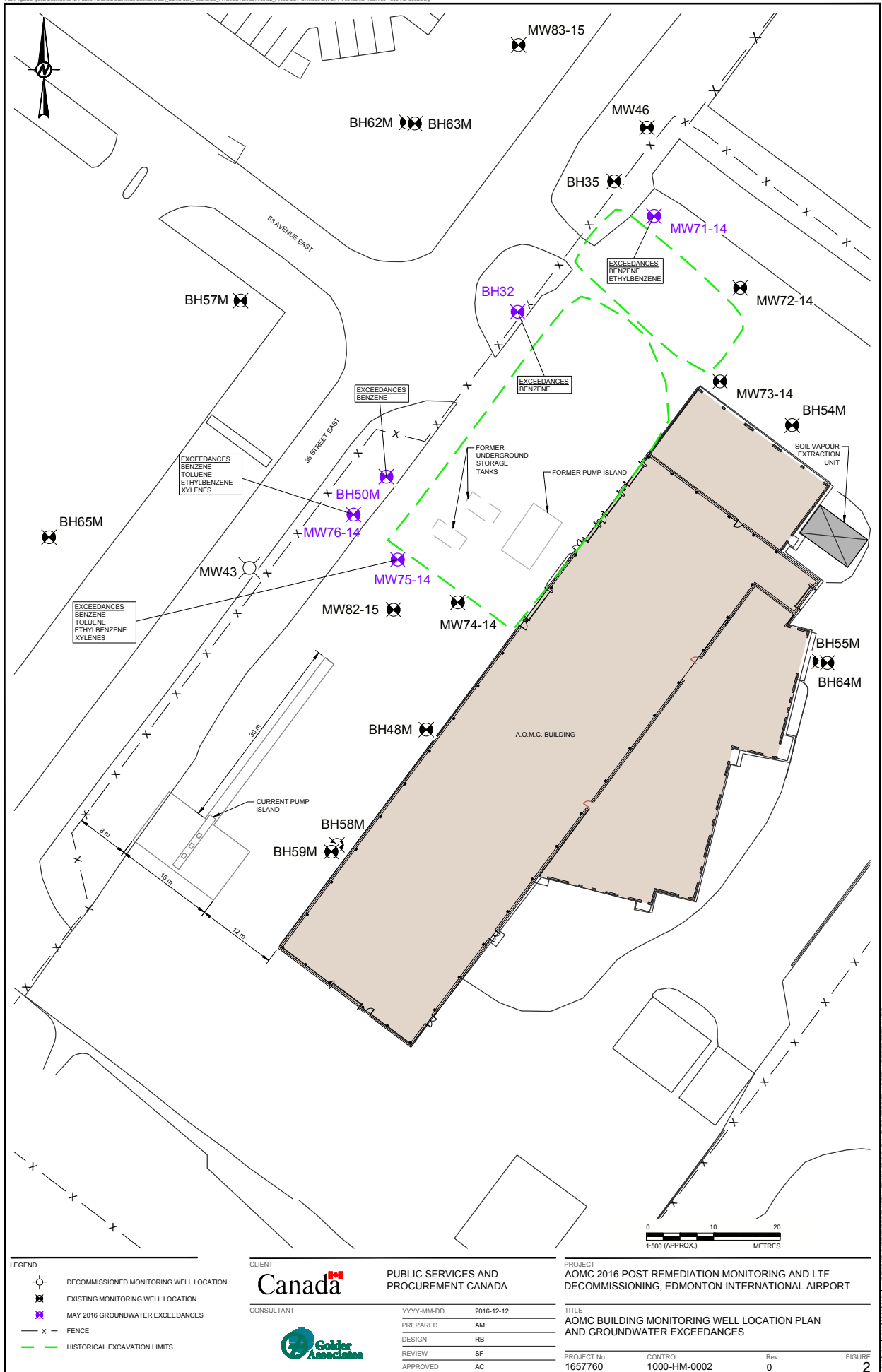
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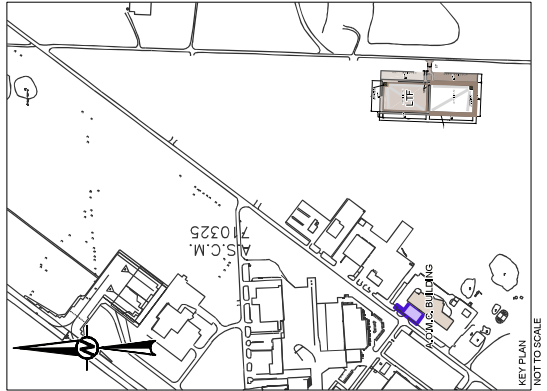
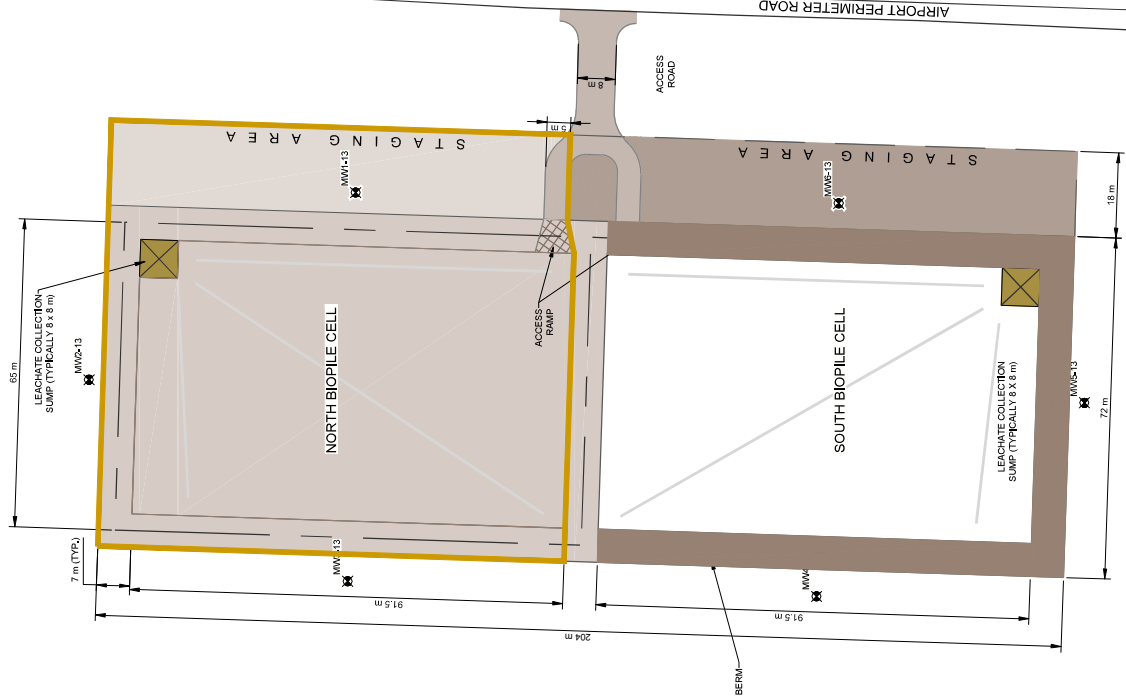
**SITE LOCATION PLAN**

CONSULTANT	YYYYMMDD	2016-12-12
PREPARED	AM	
DESIGN	RB	
REVIEW	SF	
APPROVED	AC	



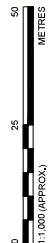
PROJECT No.	CONTROL	Rev.	FIGURE
1657760	1000-HM-0001	0	1





- LEGEND
- EXISTING MONITORING WELL LOCATION
  - DECOMMISSIONED CELL

REFERENCES  
REPRODUCED FROM DST CONSULTING GROUP DRAWING LAND TREATMENT FACILITY SITE LAYOUT, DRAWING NO. 06ED012388 C-2, DATED 25.08.2010.



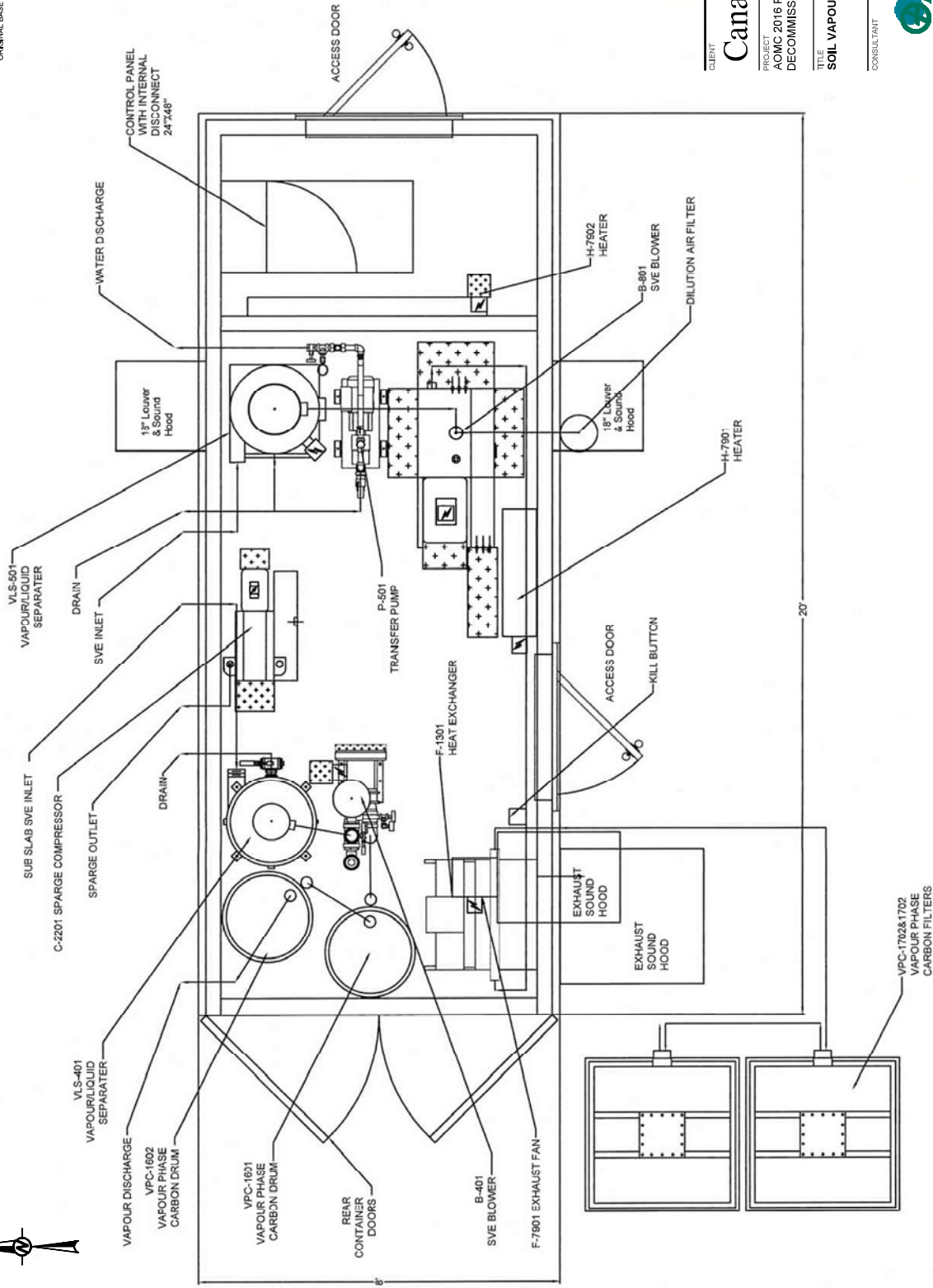
CLIENT  
**Canada**  
PUBLIC SERVICES AND PROCUREMENT CANADA

PROJECT  
ACMC 2016 POST REMEDIATION MONITORING AND LTF DECOMMISSIONING, EDMONTON INTERNATIONAL AIRPORT

TITLE  
LAND TREATMENT FACILITY (LTF) LOCATION PLAN

CONSULTANT	YYYYMMDD	2016-12-12
PREPARED	AM	
DESIGN	RB	
REVIEW	SF	
APPROVED	AC	
Rev.	0	
PROJECT No.	CONTROL	1000-HM-0003
FIGURE		3

REFERENCES:  
ORIGINAL BASE PLAN DRAWN BY NEVTERRA, PROJECT NUMBER: RTS 10087402.



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CLIENT  
**Canada**  
PUBLIC SERVICES AND  
PROCUREMENT CANADA

PROJECT  
ACWC 2016 POST REMEDIATION MONITORING AND LTF  
DECOMMISSIONING, EDMONTON INTERNATIONAL AIRPORT

TITLE  
**SOIL VAPOUR EXTRACTION (SVE) UNIT LAYOUT**

CONSULTANT	YYYYMMDD	2016-12-12
PREPARED	AM	
DESIGN	RB	
REVIEW	SF	
APPROVED	AC	
Rev.	0	
PROJECT No.	CONTROL	FIGURE
1657760	1000-HM-0004	4





# **APPENDIX A**

## **Health and Safety Plan**



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

### 1.0 CONTACTS LIST SUMMARY

#### 1.1 Emergency Contacts

Contact	Number
First aid Phone number	911
Ambulance	911
Fire	911
Police	911
Golder Crisis Hotline (from within Canada)	1-866-249-0439
Golder Media Relations	604-296-6845
Local Electrical Authority	Fortis - 310-9473
Provincial Poison Control Centre	1-800-332-1414
Roadside Assistance	Shawn Blowers 780-989-7701
Royal Sun Alliance Travel Insurance (policy #1057978)	819-566-1898 (collect anywhere) or 1-866-870-1898
Spills Reporting	ESRD 1 800 222-6514

Hospital name	Address	Phone	Level of Care Available
Leduc Community Hospital	4210 - 48 Street, Leduc AB	780-986-7711	Emergency

#### 1.2 Golder Contacts

	Name	Office Name	Office	Cell	Home
Project Manager	Steven Fiddler	Edmonton	+1 (780) 930-5478	+1 (780) 984-6600	
Project Director	Arthur Cole	Edmonton	+1 (780) 930-8636	+1 (780) 554-4581	
	Steven Fiddler	Edmonton	+1 (780) 930-5478	+1 (780) 984-6600	
	Arthur Cole	Edmonton	+1 (780) 930-8636	+1 (780) 554-4581	
	Rebecca Boyce	Edmonton	+1 (780) 930-4498	+1 (780) 983-7289	
	<del>Pamela Wescott</del> Mike	Edmonton	<del>+1 (780) 930-6792</del>	<del>+1 (587) 338-4054</del> 587-701-7311	
Client	Public Works and Government Services Canada				

#### 1.3 Missed Check-in Contacts

	Name	Phone	Cell
Project Manager	Steven Fiddler	+1 (780) 930-5478	+1 (780) 984-6600
Project Director	Arthur Cole	+1 (780) 930-8636	+1 (780) 554-4581
Other	Jonathan Smith	+1 (403) 216-8951	+1 (403) 470-7993
Other	Glenna Ravensborg	+1 (780) 930-2853	+1 (780) 690-3834



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

### 1.4 Client and Site Contacts

	Number
Site field cell phone	780 983-7289
Nearest Golder office	Canada - Edmonton
Phone	+1 (780) 483 3499
Fax	+1 (780) 483 1574
Email	

Role	Name	Number
Contact person on site	EIA - Myndy Machan	780-890-8954/780-908-7965
Golder overall site supervisor:	Rebecca Boyce	Office: +1 (780) 930-4498 Cell: +1 (780) 983-7289
Golder Alternate Site supervisor	<del>Pamela Wescott</del> Micheal	Office: <del>+1 (780) 930-6792</del> Cell: <del>+1 (587) 338-4054</del> 701-7311
	Quantum Murray site supervisor Dustin	780 993-7748
	Justin	780 903-8906

### 1.5 Subcontractor Contacts

Name	Subcontractor key staff	Phone
Quantum Murray	Matt Prier / <del>Shawn Hughes</del>	403 880-0977 / <del>780-467-8881</del>
Maxxam Analytics	Alaina Hunter	780 577-7100

*You have the right to refuse any work you feel is unsafe, or that you are not trained to do. Choose to work safely and in compliance with all HSE requirements.*

### 2.0 PROJECT PROPOSAL DETAILS

Project/Proposal Number	1657760	Start Date	Sep 19, 2016	End Date	Sep 30, 2016
Project Title	Landfarm Decommissioning_EIA				
Client Name	Public Works and Government Services Canada				

#### Brief description of project and scope of works (include any hazardous activities, if known)

Supervising the decommissioning of the north cell at the LTF. Includes sump water treatment, transferring impacted soil to the south cell, removal of liner and associated infrastructure and backfilling and grading.  
Supervising the disconnecting of the SVE unit located at the AOMC building.

### 3.0 GOLDER TEAM

Name	Office	Contact number (cell phone)	Office Phone	Role
Steven Fiddler	Edmonton	+1 (780) 984-6600	+1 (780) 930-5478	
Arthur Cole	Edmonton	+1 (780) 554-4581	+1 (780) 930-8636	
Rebecca Boyce	Edmonton	+1 (780) 983-7289	+1 (780) 930-4498	
Pamela Wescott	Edmonton	+1 (587) 338 4054	+1 (780) 930-6792	

#### Project Manager (PM)



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

- Appoint a competent site supervisor and alternate. For sites with multiple Golder projects/disciplines at work, coordinate with the overall site supervisor
- Oversee/develop hazard controls including work instructions and
- Assign only adequately trained and competent employees to the project

### Site Supervisor

- The site supervisor is responsible for the safety of all Golder employees, subcontractors, visitors and public on the parts of the site under Golder control.
- Communicate all site hazards to affected parties, in real time, as hazards, conditions and employees change.
- Ensure that work is undertaken in accordance with the hazard controls included in this HaSEP.

### Contractor

- All plant and equipment is maintained in a safe working condition
- All plant and equipment are to be registered/licensed and electrical equipment tagged and tested
- Potential hazards are to be controlled (e.g., cage over rotating parts)
- You will report any identified hazards to the Golder Associates field staff member

### Field Staff

- Inspect your worksite and equipment before starting work
- Apply the controls outlined in this HaSEP
- Look out for the safety of yourself and others
- Report unsafe acts, conditions and incidents to the site supervisor

## 4.0 CLIENT/SITE LOCATION DETAILS

### 4.1 Client/Site Location Details

Project location map (paste URL here)

<https://maps.google.com/maps?q=53.320466,-113.569064&ll=53.320108,-113.56842&spn=0.011177,0.01929&num=1&t=h&z=16>

#### 4.1.1 Site Description

If the project is near another Golder Office, has the local Office been notified of the work? ☒ Yes ☐ No

<b>Site Name</b>	AOMC LTF		
<b>Address</b>	Airport Perimeter Road, Edmonton International Airport		
<b>Coordinates</b>			
<b>Description</b>	Field west of Airport Perimeter Road.		
<b>Access info</b>			
<b>Previous land uses</b>			
<b>Site Receptors that maybe impacted by the proposed work</b>			
<b>Additional Info</b>			
<b>HSE Induction / orientation provider</b>	<input checked="" type="checkbox"/> Golder	<input type="checkbox"/> Client	<input type="checkbox"/> Contractor
<b>Site Contact Numbers</b>	<b>Field cell phone</b>	780 983-7289	<b>Satellite phone</b>
	<b>Other</b>		
<b>Nearest Golder office</b>	Canada - Edmonton	<b>Address</b>	16820 107 Avenue, Edmonton, Alberta, Canada T5P 4C3



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Opening days and hours		Email	Error! Hyperlink reference not valid.
Phone	+1 (780) 483 3499	Fax	+1 (780) 483 1574
Google Maps			



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

### 5.0 SUBCONTRACTOR DETAILS

Has Golder been assigned the role of Principal Contractor? \* ☒ Yes ☐ No

Name	Subcontractor key staff	Phone	Subcontractor activities	Risk Assessment Supplied	Method Statement Supplied	Approved Golder subcontractor?
Quantum Murray	Matt Prier	403 880-0977	decommissioning contractor	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Maxxam Analytics	Alaina Hunter	780 577-7100	laboratory	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

### 5.1 Welfare / Hygiene Facilities

The following issues should be considered when planning welfare provision including: the work to be carried out; the associated health risks; duration and number of different locations; number of people working at different locations and distances from welfare facilities.

Describe the project's welfare facilities below:

Facility	Yes	No	Describe alternate arrangements:
Toilets available?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Rest areas available?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Washing facilities available?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Drinking water available?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Area for changing and storing clothes available?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Mode of transportation to site available?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Smoking permitted on site?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Outside gate

### 6.0 PERMITS AND APPROVALS

☒ Are permits and approvals required for this project? (e.g Client supplied Permit, Hot Works Permit, Mobile Treatment Permit etc.)

Permit or Approval	Permit arranged by		
Edmonton International Airport Facility Alteration Permit	<input checked="" type="checkbox"/> Golder	<input checked="" type="checkbox"/> Client	<input type="checkbox"/> Other

### 7.0 CHECK-IN SYSTEM

#### 7.1 Check-in contacts

	Primary	Secondary
Name	Steven Fiddler	Jenny Musijowski
Phone/Email	Office: +1 (780) 930-5478 Cell: +1 (780) 984-6600 Email: Steven_Fiddler@golder.com	Office: +1 780 930-8648 Cell: Email: Jenny_Musijowski@golder.com
Check-in frequency*	Start and End of Day	If Steven cannot be contacted
By phone	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
By email	<input type="checkbox"/>	<input type="checkbox"/>
By SMS	<input checked="" type="checkbox"/>	<input type="checkbox"/>
On site	<input type="checkbox"/>	<input type="checkbox"/>

#### 7.2 Missed Check-in Procedure

Within 2 hours of missed check-in time:

1. Attempt to contact employee
2. Contact accommodation or other project personnel to determine last contact with employee
3. Notify Project Manager.
4. Project manager to determine timing of further action, based on project details.

Within 4 hours of scheduled call-in time:

1. Contact client and request assistance to locate employee.
2. Notify Project Director, Office Manager, and local authorities (as appropriate)



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## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

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### 3. Initiate Crisis Response Plan (as appropriate)

☐ Does missed check-in procedure for this project deviate from the standard procedure?



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

### 8.0 CHEMICALS AND CONTAMINANTS

#### 8.1 Possible Contaminants or Chemical Exposures

☒ Additional contaminants likely to be encountered during this project (consider previous land uses)

Contaminant Name	PHCs - Gasoline and Diesel		
Exposure routes	Skin Contact, Vapours		
Flash point		Odour threshold	
Explosive limits	LEL		UEL
Occupational Exposure Limits	TWA	300	STEL 500
		Ceiling	
<input type="checkbox"/> Air Monitoring Required			
Exposure Controls	Wear nitrile gloves when handling soil, wash with soap and water		
Medical Surveillance, if required			
Additional Info			



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

### 9.0 RISK REGISTER

#### 9.1 Risk Register

Header key:

- PA: Persons Affected
- IC: Initial Consequence
- IL: Initial Likelihood
- IR: Initial Risk
- RC: Residual Consequence
- RL: Residual Likelihood
- RR: Residual Risk
- AC: Additional controls

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Contaminated water or soil	Handling contaminants	Employee	3	3	9	Reference D&G CANHSE224 Chemical Safety · Understand the hazards of the contaminants present. · Consult MSDS, labels and other available information. Determine material compatibilities. Minimize manual handling of the contaminant. Stay out of areas where contaminant is present if possible. · Know where first aid and emergency response equipment is (shower/eyewash). Spill kit and eyewash station located in the field truck, as well as on site buildings. Participate in the medical surveillance program based on the type of contact, and the extent of potential exposure (concentration, frequency and duration) · Use chemical resistant gloves, and safety glasses.	3	2	6	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Driving	Traffic and road conditions (e.g. heavy equipment traffic)	Employee	5	3	15	Check weather conditions before travelling. Inspect your vehicle before use. Plan travel route and verify road conditions where possible. Obtain written driving directions prior to travel. Allow sufficient travel time to reach destination. Obey all traffic signs and signals. Reduce speed in construction areas. Contact the owner if traveling on a private road. Verify and follow the rules of the road (speed limit, type of vehicles, rules on passing, signage, method of communication with other vehicles). Always carry the following emergency equipment: cell phone, flashlight, emergency road kit.	5	1	5	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Driving	Vehicle-Animal Collisions	Employee	4	2	8	Be alert for wildlife or domestic animals near the road, particularly at dusk, dawn and night. Look ahead across the road from shoulder to shoulder. If you see wildlife on the road, slow down and pass carefully, they may suddenly bolt onto the road. Watch for wildlife warning signs that indicate an area of increased animal population. Take extra precaution when traveling through these areas. Use high beams whenever possible and watch roadside ditches for animals or for reflections from animal eyes. Be aware some animals move in groups and more may be near the road than can be readily seen. If the animal enters the path of the vehicle, do not swerve into the ditch or into on-coming traffic in an attempt to avoid a collision. Brake firmly if an animal is standing on, or crossing the road. Do not assume the animal will move out of your way. In the event of a collision, contact local Fish & Wildlife office or Department of Transportation if animal is still alive or if the carcass is a danger to traffic.	3	1	3	
							· All electrical equipment to be CSA approved. · Routinely inspect electrical equipment to look for damaged components. Lockout and tag out all defective equipment, before working in or around equipment and before performing maintenance on or cleaning an electrical system. Do not enter areas with high voltage equipment without permission, an escort, and following lockout procedures. Use personal locks.	4	2	8	
General	Electrical energy	Electrocution	Employee	5	2	10					

## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Pinch points	Pinch points	Employee	5	4	20	<ul style="list-style-type: none"> <li>Eliminate or guard pinch points where possible. Clearly identify pinch points.</li> <li>Train all workers in the area of the pinch points and guards that are in use.</li> <li>Establish a communication plan.</li> </ul>	3	2	6	
General	Slips, trips and falls	Slips, trips and falls	Employee	4	3	12	<ul style="list-style-type: none"> <li>Use care and attention when walking.</li> <li>Establish level pedestrian footpaths where possible. Level out work areas where possible. Choose a route free of obstacles and slippery or soft ground. Walk, don't run, in a controlled manner. Avoid making sudden changes in direction and speed.</li> <li>Wear appropriate construction safety boots that offer good support and have a good tread. Relay hazard to others, clear or mark and report the potential hazard. Keep your workspace clean, tidy and free of slipping hazards. If any equipment or materials need to be stored, designate pre-approved locations, out of traffic areas.</li> </ul>	3	3	9	
Tasks	Electrical/Mechanical room access	Energized equipment	Employee	4	3	12	<ul style="list-style-type: none"> <li>Stand well clear of energized equipment.</li> <li>No loose clothing to be worn and all long hair to be tied back. Golder employees are not permitted within 1 m of energized elements. Make sure room lighting is sufficient or use a flashlight.</li> </ul>	4	1	4	
Tasks	Electrical/Mechanical room access	Moving parts (mechanical elements i.e. motors, fans, hydraulic pistons, etc.)	Employee	4	3	12	<ul style="list-style-type: none"> <li>Assess room to identify moving elements.</li> <li>Stand well clear of equipment in operation.</li> <li>No loose clothing to be worn and all long hair to be tied back. Golder employees not permitted within 1 m of moving elements. Make sure room lighting is sufficient or use flashlight.</li> </ul>	4	1	4	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
Work Environment	Working in or near public spaces	Dust	Employee	2	3	6	Consult with neighbouring properties prior to commencing work where dust is likely to be an issue (N.B. this may be the client's responsibility). Identify potential sensitive receptors prior to commencement of work. If present, consult with potential receptors and modify procedures or timing to reduce impact. Monitor dust generation visually and apply water suppression techniques if required and permissible within water restrictions. Consider covering the fence (if present) with shade cloth to limit dust.	2	2	4	
Work Environment	Working in or near public spaces	Off-site contamination	Employee	3	3	9	If the work involves earth works (including ground penetration) any excavated material shall be prevented from exiting the site. This can be achieved by the following (actions to be based on risk at each site): - Erecting sediment control around the perimeter of the area (particularly on the low side of the site) and around open storm water systems. - Retaining a vegetated border on the site which can filter low levels of sediments in runoff - Ensuring that they are stored in areas away from the drainage flow and never place stockpiles in gutters or on nature strips. - Limiting stockpiles of topsoil to less than 2 metres in height and return to excavation as soon as possible. - Cover loads of potentially contaminated soil during transportation off site.	2	2	4	

## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
Work Environment	Working near moving vehicles	Struck by heavy vehicle	Employee	5	3	15	Be aware of vehicle blind spots. Vehicle operator must activate horn twice before reversing. Back up alarm must also be functional. Maintain eye contact with vehicle operator. Wear reflective clothing. Understand the rules of the site regarding vehicles and pedestrians.	5	1	5	



**Golder Associates**

## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
Work Environment	Working near moving vehicles	Struck by objects	Employee	3	3	9	When transporting loads on vehicles, secure the load low and/or behind cargo barriers. Snatch straps, chains, cables and winches must be certified for the load they are used for and attached to certified and rated points on the vehicles. An exclusion zone must be established and marked where there is risk of dropped objects. As a guide the exclusion zone should be 1.5 the height of the vehicle or component. Pre start inspection of vehicles to be undertaken. Any faults to vehicle or ancillary equipment shall be reported. The relevant equipment shall be tagged out and not used if faulty. Safety glasses shall be worn to protect against flying particles or objects.	3	2	6	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
Work Environment	Working on a contaminated site	Contaminants - general	Employee	3	2	6	Where exposure to chemicals may occur, use monitoring devices to quantify the exposure (i.e. a photoionisation detector to monitor for vapour exposure). Avoid unnecessary contact with chemicals and contaminated materials. Personal protective equipment including nitrile gloves shall be worn when handling soils or ground water. Where other gloves are required nitrile gloves shall be worn under these. Ensure facilities with soap and detergent is available for regular hand washing. Ensure environmentally safe disposal of all contaminated soils, water and/or contaminated clothing and PPE (e.g. into barrels for treatment and disposal). Refer local legislation or Environmental Group for more information. A minimum of one first aid trained person shall be on site at all times work is being undertaken. Ensure emergency access and egress is maintained at all times. As some gases are heavier than air, entry into all excavations deeper than 1.2 m is strictly prohibited due to it being classified a potential confined space.	2	2	4	

## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
Work Environment	Working on a contaminated site	Flammable / combustible gases and liquids	Employee	4	3	12	<p>All hazardous areas, defined as areas where flammable atmospheres are likely to be present must be designated and identified on a site plan. Review this plan on entry to the site. All employees working in hazardous areas (as defined by the site) must be an approved Contractor.</p> <p>Electrical and battery-powered equipment and equipment capable of producing a local source of ignition (e.g. flame, static electricity, friction, heat, spark, exhaust) are not permitted unless approved by the permit and certified as intrinsically safe (documented evidence required). Some examples of such equipment are power tools, portable radios, mobile phones, pagers, calculators and water quality meters. As some gases are heavier than air, entry into all excavations deeper than 1.2 m is strictly prohibited due to it being classified a potential confined space.</p> <p>Monitoring of flammable gases in ambient air (the breathing zone) will be undertaken where ground penetrating work is being performed or where any work is undertaken in enclosed areas. Work shall cease if vapour concentration exceeds 20% LEL. All personnel to evacuate at least 30m upwind.</p> <p>Contact Project Manager for advice. Flame retardant clothing shall be worn. Synthetic clothing such as vests, raincoats, polar fleece jumpers must not be worn as they can produce a spark.</p>	4	2	8	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
Work Environment	Working on a contaminated site	Vehicles	Employee	5	3	15	Where possible, request the client close the area to vehicle traffic. Where closure of the site is not possible, physical barriers must be established if working near vehicles. Traffic cones are not sufficient. Consider scheduling work during low traffic periods. High visibility clothing must be worn at all times and reflective clothing to be worn in low light conditions.	3	2	6	
							Fuelling must occur only when the equipment is turned off and all sources of ignition isolated or cooled off. No smoking while refueling. Do not use cell phone while fuelling. Bond and ground all fuel containers with the equipment before refueling. Refuel on a flat, stable and well ventilated area. Chock the vehicle/equipment before refueling to prevent movement. When fuelling from a gas can, wear protective eye wear and rubber gloves. Consider the size and weight of a full gas can. Reduce the size if possible. Use proper lifting techniques fare larger, heavier gas cans.	4	1	4	
General	Fueling	Fire, explosion	Employee	4	3	12	Refuel vehicles at commercial or designated fueling sites whenever possible. Refuel vehicles on level ground, away from waterways. Have spill kit and drip tray readily available. Position drip pan underneath the fill spout to collect any drips or spills. Ground the vehicle and containers to prevent sparking. Replace and seal fill cap and seal fuel canister after refueling.	2	2	4	

## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Pick-up truck	Ergonomics	Employee	3	4	12	Long hours sitting in a pick-up truck can cause fatigue and stiffness. Stop, get out, stretch and walk regularly, as weather and site conditions permit. Where possible, set up the seat to support good body posture (knees and hips remain at 75-90 degrees; arms slightly bent when gripping the wheel; entire forefoot placed on each pedal; back of seat and lumbar support to follow the contour of your spine).	3	1	3	
General	Pick-up truck	off-road driving	Employee	5	3	15	Use 4x4. Stay on designated trails. Take a Defense Driving Course with off-road content.	5	2	10	
General	Pick-up truck	Parking on side of the road	Employee	5	4	20	Use barrier vehicle, pylons, or road signs. Check local regulations for requirements. Pull over as far as possible from the road or park in a pull out/rest area. Turn on 4 way flashers if the stop will be short. 4 way flasher operation will drain the battery unless the engine is running. Wear a high visibility vest.	5	2	10	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Pick-up truck	Unsafe driving practices	Employee	5	3	15	Drivers must have a valid drivers license. Driver abstracts may be reviewed for company vehicle drivers, based on client/project specific requirements. Provide training on driving and loading a pick-up truck. Drive within your abilities; driver training and/or training on the project specific journey management plan may be required prior to travel. Extra caution must be taken when reversing. Use a spotter if possible. The spotter must communicate back-up instructions clearly and stand out of the way of a moving vehicle. Honk twice when reversing and once when moving forward from a stop. Cold weather and exhaust can reduce visibility. Reverse into parking spaces when possible. Check weather and routes before departure. Obtain written driving directions prior to travel. In poor weather delay departure. When arranging transport request suitable vehicle that is equipped with seatbelts, roll bar (where applicable), spare tire, winter tires, scraper, communication equipment, first aid kit, fire extinguisher. Conduct and document a preuse inspection of the vehicle including fluid levels and check that the load is secure, stable and well balanced. Carry extra windshield washer fluid is expecting to enter a dirty road area. Provide details of your planned route to your check-in contact person. Check personal communication devices daily to verify they are working. Do not use electronic devices such as cell phones or blackberries while driving. Do not undertake other distracting activities while driving (e.g. eating, programming a GPS, reading a map). Utilize flame arrestors in internal combustion engine when driving on sites where explosive atmospheres exist.	5	1	5	
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## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Fatigue	Fatigue	Employee	4	3	12	Create and record in the HaSEP the fatigue management plan for the project. For high risk situations or if signs and symptoms of fatigue are apparent, perform a Fatigue Risk Assessment for Work Schedules and include it as part of the fatigue management plan. Reference D&G CANHSE238 Fatigue for a description of high risk situations.	3	2	6	
General	Fatigue	Operating a vehicle	Employee	4	3	12	Employees are not to operate a vehicle or mobile equipment if fatigued. Create and record in the HaSEP the fatigue management plan for project related vehicle operation. For high risk situations or if signs and symptoms of fatigue are apparent, perform a Fatigue Risk Assessment for Work Schedules and include it as part of the fatigue management plan. Reference the Fatigue D&G for a description of high risk situations.	3	2	6	
General	Noise	Noise	Employee	4	5	20	Conduct dosimeter testing to establish noise levels. Install insulation or other noise dampening techniques where possible. Wear hearing protection when noise reduction is not possible. Establish job rotation. Undergo annual hearing checks.	3	4	12	
General	Site Security (small site)	Site security (small site)	Employee	2	4	8	Prevent access to the worksite through the use of barricades, cones, tape and signs.	2	2	4	
General	Using hand tools and portable equipment	Correct tool used incorrectly	Employee	3	3	9	Read operating manual before using a tool. Verify manufacturer's safe operating pressures for hydraulic hoses, valves, pipes, and filters. If unsure how to use a piece of equipment, seek advice from your Project Manager or Site Supervisor. Project Manager or Site Supervisor should verify that competent persons are operating power tools.	2	2	4	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Using hand tools and portable equipment	Damaged tools	Employee	4	3	12	Check handles and heads on hammers, sledges, shovels, picks, mattocks, and other such tools for splinters, soundness, and adequate sharpness. Remove from service and tag all tools having defects that will impair their strength or render them unsafe.	2	2	4	
General	Using hand tools and portable equipment	Electrical	Employee	5	2	10	Ensure power tools have been electrically tested and have a tag stating the due date of the next test. All power tools used outdoors must be properly grounded or double insulated. Patched, oil soaked, worn or frayed electrical cords must not be used. All extension cords should be of heavy duty sheathed insulation. Check all extension cords before use. Do not use if the insulation is cut or is taped up showing a repair. Dispose of damaged cords and use a new one. Sockets and plugs of electrical extension cords should be designed and used in a manner that prevents water ingress. If in use outdoors or in a wet environment, plugs must be equipped with a Ground Fault Interrupter (GFI). Unplug and properly store tools that are not in use.	5	1	5	

## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Using hand tools and portable equipment	Ergonomics	Employee	3	3	9	Consider ergonomic factors such as the weight of the tool, the handle texture, size and shape, vibration and your posture when using and carrying tools. Choose tools that prevent bending at the wrist and reduce gripping pressure. Where possible keep the load close to your body with its weight distributed evenly across the body (i.e. held in two hands). If load is too heavy, ask for help. Where the work is physically demanding: - Avoid exclusively using one hand or muscle group when using tools. - Rotate different people through the task. - Break the task up over the day.	3	2	6	
General	Using hand tools and portable equipment	Explosive atmosphere	Employee	5	3	15	Use only intrinsically safe tools in locations where sources of ignition may cause fire or explosion.	3	2	6	
General	Using hand tools and portable equipment	Flying objects	Employee	3	2	6	Wear safety glasses or goggles when using equipment that has the potential to eject particles or substances. This may include non powered hand tools where there is a risk of flying rock fragments.	2	2	4	
General	Using hand tools and portable equipment	Use of incorrect tool	Employee	3	2	6	Before starting work, determine the risk associated with using the incorrect tool. Obtain the correct tool wherever possible. Do not attempt to modify a tool to undertake a task that it was not designed to do.	2	2	4	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
General	Using hand tools and portable equipment	Using hand and portable powered tools	Employee	3	3	9	Reference Directive and Guideline CANHSE243 Hand and Portable Powered Tools. Indicate the power sources used to power tools (eg. Pneumatic, Electrical, Explosive) and any required safeguards (e.g. GCFI). List all tools here and attach a Work Instruction for each tool. Identify here the PPE that is required for each tool. List here the necessary training to operate the tools.	3	1	3	
General	Remediation work	Waste generation	Environment	3	5	15	All samples become waste when they are no longer required. Collect only the number of samples required to meet project excellence demands. Avoid collecting extra samples that may be contaminated or cannot be preserved to ensure analytical quality. Dispose appropriately at approved facilities. Review handling, treatment and disposal requirements. Do not treat waste samples without appropriate permit or approval. Dispose in accordance with local regulatory requirements.	3	2	6	

## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
Work Environment	Heavy machinery	Struck by heavy machinery	Employee	5	4	20	Remember: the operator of the heavy equipment has limited field of vision. Never approach an operational piece of equipment until the operator is aware of your presence and your desire to approach, and has signaled the OK to advance. The operator may want to finish a task before shutting down to let you approach. Use a radio for communication whenever possible. Stand in a safe location well outside the maximum extended reach of the shovel, dragline or excavator arm and out of the way of other mobile equipment. Once the operator signals the OK, the movement of the equipment should stop before you advance (e.g. lowering of the bucket to the ground). Check with the site superintendent/foreman as to the practices on-site for securing equipment before approaching.	5	1	5	
Work Environment	Dust	Dust (or airborne soot)	Employee	3	5	15	Determine the nature of the dust/soot and if possible dust/soot levels. Situate working area upwind of dust or soot generating equipment. Where possible, maintain or delineate a downwind temporary work area to limit public access to the worksite. Conduct industrial hygiene testing to determine dust levels if more than a nuisance dust. Determine source of the dust/soot and apply engineering controls to reduce levels where possible. Controls include, applying water or dust suppression liquids, ventilation system with dust capture and working upwind of the source. Use N95 respirator if required. Wear safety glasses or safety goggles.	3	3	9	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Risk Group	Initial Risk	Hazard	PA	IC	IL	IR	Controls	RC	RL	RR	AC
Work Environment	Excavations	Engulfment	Employee	5	4	20	Never enter an excavation deeper than 1.2 m unless it has been properly shored or sloped. People working in an excavation should not work in isolation. Another person should be present in the immediate area and acting as a spotter where possible. Keep vehicle traffic, equipment and the edge of the spoil piles as far as practically possible and at least 1 m from the edge of the excavation, farther for deep excavations. Use access ramp to enter or leave an excavation.	5	2	10	
Work Environment	Excavations	Falling, tripping	Employee	4	5	20	Set up physical barriers to prevent falls into excavations. Make sure emergency procedures have been developed. Rescue equipment and personnel should be readily available on-site.	4	2	8	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

### 10.0 PERSONAL PROTECTIVE EQUIPMENT

Item	Required	Provided by Golder	Provided by Client	Specific Requirement
<b>Coveralls</b>				
General	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>Gloves</b>				
Cut resistant	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Chemical resistant	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	nitrile
<b>Head Protection</b>				
Hard Hat	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>Hearing Protection</b>				
Disposable foam ear plugs	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	if required
<b>High Visibility Clothing</b>				
Orange	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>Safety Footwear</b>				
Safety boots	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>Eye Protection</b>				
Impact resistant safety goggles or glasses	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<b>General Protection</b>				
Sun cream or block	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

### 11.0 TRAINING

It is up to the Project Manager to arrange for the following training e.g. Confined Spaces.

Course Name	Employee Name or Role
First Aid/CPR	Pamela Wescott, Rebecca Boyce
WHIMIS	Pamela Wescott, Rebecca Boyce

*Golder H&S reads 182*

*"*

*"*

### 12.0 INCIDENT AND EMERGENCY MANAGEMENT

#### 12.1 Additional Client / Site Reporting Procedures (if ticked provide applicable details in the text box and/or attach relevant documents to this HaSEP.)

Report all incidents to PM who will inform Client.

#### 12.2 First Aid Arrangements

Method of communication	Phone	911
	Radio channel	



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)

Location of first aid kit	Field Truck
First Aider(s)	Rebecca Boyce, Pam Wescott

### 12.3 Fire Safety

Location of fire extinguishers	Field Truck Tailgate
Location of assembly point	Muster Points indicated on fence at AOMC Building

### 12.4 Site Emergency

- ☒ Site emergency procedures available  
☒ Site owner will provide emergency procedures induction/site induction

### 13.0 HSE PLAN CONTROL

It is the responsibility of the Project Manager to ensure that this HaSEP is prepared and the contents communicated at the pre-start / toolbox meeting to all project staff, Golder or subcontractor, with a copy held on site. The HaSEP has been reviewed or prepared by the Project Manager.

**If the project site is remote from the home office, this HaSEP is to be reviewed and approved by the local Golder office whether in another country, province or city.**

Role	Name (printed)	Date	Signature
Prepared by	Rebecca Boyce	September 15, 2016	RLB
Reviewed and Approved by	Steven Fiddler	September 16, 2016	[Signature]
Other			

### 13.1 Golder Sign-off

Signing below indicates you have read and agree to comply with the information contained in this document.

Date	Name	Company	Signature
Sept 19/16	Rebecca Boyce	Golder	RLB
Sept 19/16	Shaun Hughes	QMENU	[Signature]
Sept. 19/16	Matt Prier	QMENU	[Signature]
Sept 21/16	Holly Rokkitten	TC	[Signature]
Sept 21/16	Justin Derkach	QMENU	[Signature]
Sept 21/16	Dustin Francois	QMENU	[Signature]
Sept 21/16	Breg Morrison	Om Env	[Signature]
Sept 30/16	Michael MacPherson	Golder	[Signature]




[illegible]

Nature	Frequency	Person Responsible
On-site HaSEP verification with call to PM	Before work begins	Site Supervisor
Field Inspection	Once	Site Supervisor

Date	Area	Name



## HEALTH AND SAFETY ENVIRONMENT PLAN (HASEP)




-  4. Merge onto AB-2 S 5.5 km
-  5. Take exit 516 toward AB-2A/Wetaskiwin 800 m
-  6. Continue onto AB-2A 1.4 km

**Follow 50 St to Athapaskan Dr**

-  7. Turn left onto 50 St 3 min (1.5 km)
-  8. Turn right onto Athapaskan Dr 1.4 km
  -  Destination will be on the right
- 34 m

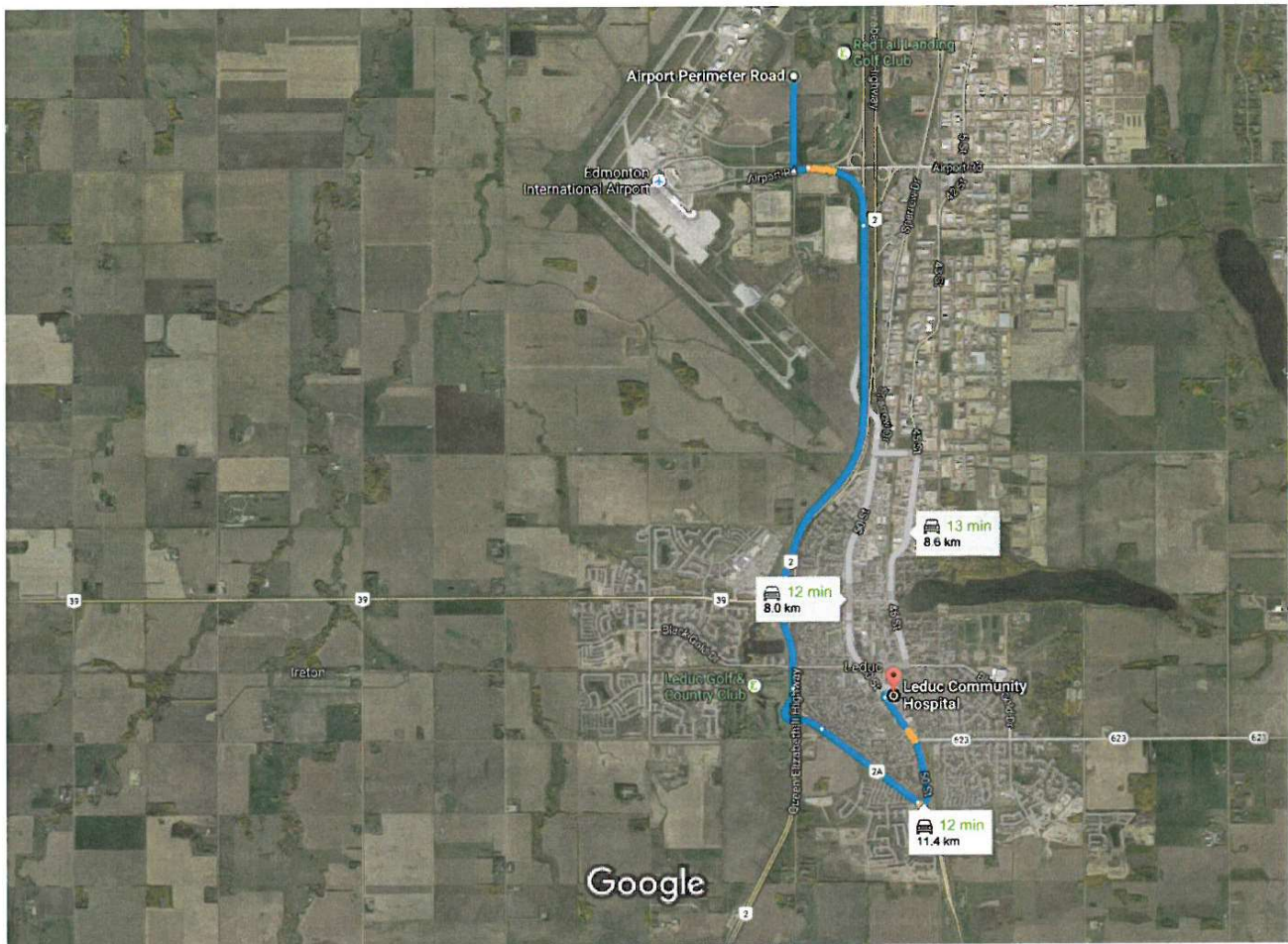
**Leduc Community Hospital**

4210 48 St, Leduc, AB T9E 5Z3

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.



Airport Perimeter Road, Calmar, AB T0C 0V0 Drive 11.4 km, 12 min  
to Leduc Community Hospital, Leduc, AB



Imagery ©2016 Google, Map data ©2016 Google 1 km

## Airport Perimeter Road

Calmar, AB T0C 0V0

### Get on AB-2 S



1. Head south on Airport Perimeter Rd toward 45 Ave E

4 min (2.3 km)



2. Turn left onto Airport Rd

1.1 km



3. Use the right lane to take the ramp to Leduc/Red Deer

160 m

1.1 km

### Continue on AB-2 S to Leduc

5 min (7.7 km)



# **APPENDIX B**

## **Facility Alteration Permits (FAP)**

## EDMONTON INTERNATIONAL AIRPORT FACILITY ALTERATION PERMIT

07/09/2016

Golder Associates Ltd.  
16820 107 Avenue, Edmonton, Alberta T5P 4C3

Attention: Steven Fiddler

RE: Facility Alteration Permit Application FAP2016-094

Submitted to Edmonton Airports on: 01/09/2016

For the Purpose of:

Decommissioning of the north biopile cell at the land treatment facility located adjacent to Airport Perimeter Road

Located at:

Airport Perimeter Road NE 1/4 15-50-25-4

Has been: Approved

The following conditions have been placed upon your project and must be adhered to throughout the duration of the project or as indicated below. Failure to do so may result in cancellation of the permit and withdrawal of approval by Edmonton Airports.

### Conditions of Approval

1. Final deliverables as outlined on the [corporate.flyeia.com/your-business-airport/construction-and-maintenance](http://corporate.flyeia.com/your-business-airport/construction-and-maintenance) website must be provided to Edmonton Airports within 60 days of project completion.
2. Applicant must notify Edmonton Airports' upon substantial completion of project

The approval of the Facility Alteration Permit by Edmonton Airports does not release the Applicant from applying to the Authorities having jurisdiction for all necessary approval, nor does approval by Edmonton Airports guarantee approval of said project by the Authorities having Jurisdiction.

If the work as outlined in the original application has not been started within six months from date of approval, this approval is considered null and void. A complete re-submission by the Applicant and approval by Edmonton Airports will then be required before construction can commence.

Any approved Facility Alteration Permits whose construction period extends beyond one year (365 days) will be required to apply for a permit renewal.

A variance in duration for permit expirations and renewals may be approved by Edmonton Airports in some instances. Contact Technical Services (FAP@flyeia.com) for more information.

Your Edmonton Airports' representative for this project is:

Corinne Kozak - Edmonton Airports

Contact email: ckozak@flyeia.com

Contact phone number: 780-890-8582

**The Edmonton Airports' representative must be contacted within 48 hours of receiving this application or prior to construction, what ever the shorter period of time is.**

For after hours contact, please call the EIA Duty manager at 780-890-8327

Any concerns or questions may be directed to Edmonton Airports' Technical Services departments at 780-890-8433 or [FAP@flyeia.com](mailto:FAP@flyeia.com)

Yours truly,

Edmonton Airports



Steve Rumley  
Vice President  
Infrastructure

Risk Assessment: 3

 File Attachment

## TERMS AND CONDITIONS

- This permit conveys permission to undertake the alteration described herein. This permit does not constitute an assessment, evaluation, or warranty of any kind or nature by Edmonton Airports of the quality of materials, design and construction employed in the performance of the work to be done by the Applicant, and Edmonton Airports assumes no responsibility for the consequences thereof.
- This permit does not constitute a warranty of any kind or nature by Edmonton Airports of the location of any underground utilities. Any locates of underground utilities completed by Edmonton Airports is done so in good faith and with the best information available. Edmonton Airports assumes no responsibility for the consequences thereof. It is assumed and recommended that the Applicant conduct a complete utility locate for the entire site, by a third party prior to any excavation.
- In the performance of the work the Applicant shall conform with all federal, provincial, municipal and local laws, regulations, bylaws or Codes, which are applicable to Edmonton Airports.
- The Applicant shall also observe and obey (and compel its officers, employees, agents and contractors to observe and obey) the rules and regulations of Edmonton Airports now in effect which are applicable to the performance of the work, and such further applicable rules and regulations which may from time to time during the said performance be promulgated by Edmonton Airports for reasons of safety, health, preservation of property or maintenance of a good and orderly appearance of the facility or for the safe and efficient operation of the facility.
- The Applicant shall indemnify and hold harmless, Edmonton Airports, its directors, officers, agents and employees, against and from (a) the risk of injuries (including wrongful death) or damage direct or consequential, to it or them or to it or their property arising out of or in connection with the performance of the work, and (b) the risk of claims and demands by third persons including the legal costs incurred by Edmonton Airports on a solicitor and his own client basis to defend such claims or demands, arising or alleged to arise out of the performance of the work and to the conditions of the leased premises during the performance of the work and following the completion of the work, whether such risks arise out of acts or omissions of the Applicant, its contractors or otherwise.
- The Applicant shall pay all claims lawfully made against it by contractors, subcontractors, suppliers and workmen, and all claims lawfully made against it by other third persons arising out of or in connection with or because of the performance of the work and the conditions of the leased premises during the performance of the work, and shall cause all contractors and subcontractors to pay all such claims lawfully made against them.
- No changes or revisions shall be made to the work authorized by this permit without prior approval of the Assigned Edmonton Airports' Technical Services department and its designated official.
- Edmonton Airports reserves the right to halt or suspend the work should the terms or conditions of the Facility Alteration Permit not be complied with.
- The Applicant shall notify the Assigned Edmonton Airports' representative not less than two days prior to the commencement of the work and shall complete the same within the number of days specified in Part 1 of this Facility Alteration Permit application. The Applicant shall advise the Assigned Edmonton Airports' representative when the work is substantially complete. Upon substantial completion of the work the Applicant shall deposit with the Assigned Edmonton Airports' representative one copy of the drawing(s) showing the as-built facilities in electronic CADD and pdf formats. If record drawings are not submitted within 60 days of project completion, a charge will be levied against the Applicant which the Applicant promises to pay, based on Edmonton Airports' cost to have the record drawings completed for the project.
- In the performance of the work, the Applicant shall not do or permit to be done any act affecting the operation of any existing plumbing, heating, fire-alarm, sewage, drainage, water supply, electrical sprinkler, ventilating, refrigerating, fuel, or communication system at the facility, or other such service system threat, including all pipes, tubes, lines, mains, wires, conduits, equipment and fixtures, except with the express written approval of the Assigned Edmonton Airports' Technical Services department, its resident engineer, or its designated official.
- Prior to the commencement of the work and throughout the performance thereof, the Applicant shall erect and maintain at its own expense in or about the space such barriers, shields and other suitable protective devices for the protection of the public and others and their property. The work shall be performed in such a manner as will cause the minimum inconvenience to members of the public and others at the facility.

**Must Be Posted at Construction Site**



EDMONTON INTERNATIONAL AIRPORT

## Facility Alteration Permit Notice

FAP2016-094

### Approved for:

Decommissioning of the north biopile cell at the land treatment facility located adjacent to Airport Perimeter Road

### Issued To:

Golder Associates Ltd.

### Date of Issue

07/09/2016

### Expiry date

07/09/2017

A handwritten signature in blue ink, appearing to read 'Darrin Schuster', is written over a horizontal line.

Edmonton Airports' Authorization

**This Permit is Valid only when used in accordance with conditions of the signed approval letter from Edmonton Airports and must be displayed at the construction site and must be produced when asked for by a representative of the Edmonton Regional Airports Authority**

## EDMONTON INTERNATIONAL AIRPORT FACILITY ALTERATION PERMIT

26/09/2016

Golder Associates Ltd.  
16820 107 Avenue, Edmonton, Alberta T5P 4C3

Attention: Steven Fiddler

RE: Facility Alteration Permit Application FAP2016-107

Submitted to Edmonton Airports on: 21/09/2016

For the Purpose of:  
Decommissioning of the soil vapour extraction unit located at the AOMC building.

Located at:  
8th Avenue, Airport Service Road (AOMC Building)

Has been: Approved

The following conditions have been placed upon your project and must be adhered to throughout the duration of the project or as indicated below. Failure to do so may result in cancellation of the permit and withdrawal of approval by Edmonton Airports.

### Conditions of Approval

1. Final deliverables as outlined on the [corporate.flyeia.com/your-business-airport/construction-and-maintenance](http://corporate.flyeia.com/your-business-airport/construction-and-maintenance) website must be provided to Edmonton Airports within 60 days of project completion.
2. Applicant must notify Edmonton Airports' upon substantial completion of project

The approval of the Facility Alteration Permit by Edmonton Airports does not release the Applicant from applying to the Authorities having jurisdiction for all necessary approval, nor does approval by Edmonton Airports guarantee approval of said project by the Authorities having Jurisdiction.

If the work as outlined in the original application has not been started within six months from date of approval, this approval is considered null and void. A complete re-submission by the Applicant and approval by Edmonton Airports will then be required before construction can commence.

Any approved Facility Alteration Permits whose construction period extends beyond one year (365 days) will be required to apply for a permit renewal.

A variance in duration for permit expirations and renewals may be approved by Edmonton Airports in some instances. Contact Technical Services (FAP@flyeia.com) for more information.

Your Edmonton Airports' representative for this project is:

Corinne Kozak - Edmonton Airports

Contact email: [ckozak@flyeia.com](mailto:ckozak@flyeia.com)

Contact phone number: 780-890-8582

**The Edmonton Airports' representative must be contacted within 48 hours of receiving this application or prior to construction, what ever the shorter period of time is.**

For after hours contact, please call the EIA Duty manager at 780-890-8327

Any concerns or questions may be directed to Edmonton Airports' Technical Services departments at 780-890-8433 or [FAP@flyeia.com](mailto:FAP@flyeia.com)

Yours truly,

Edmonton Airports



**Steve Rumley** for  
Vice President  
Infrastructure

Risk Assessment: 3

 File Attachment

## TERMS AND CONDITIONS

- This permit conveys permission to undertake the alteration described herein. This permit does not constitute an assessment, evaluation, or warranty of any kind or nature by Edmonton Airports of the quality of materials, design and construction employed in the performance of the work to be done by the Applicant, and Edmonton Airports assumes no responsibility for the consequences thereof.
- This permit does not constitute a warranty of any kind or nature by Edmonton Airports of the location of any underground utilities. Any locates of underground utilities completed by Edmonton Airports is done so in good faith and with the best information available. Edmonton Airports assumes no responsibility for the consequences thereof. It is assumed and recommended that the Applicant conduct a complete utility locate for the entire site, by a third party prior to any excavation.
- In the performance of the work the Applicant shall conform with all federal, provincial, municipal and local laws, regulations, bylaws or Codes, which are applicable to Edmonton Airports.
- The Applicant shall also observe and obey (and compel its officers, employees, agents and contractors to observe and obey) the rules and regulations of Edmonton Airports now in effect which are applicable to the performance of the work, and such further applicable rules and regulations which may from time to time during the said performance be promulgated by Edmonton Airports for reasons of safety, health, preservation of property or maintenance of a good and orderly appearance of the facility or for the safe and efficient operation of the facility.
- The Applicant shall indemnify and hold harmless, Edmonton Airports, its directors, officers, agents and employees, against and from (a) the risk of injuries (including wrongful death) or damage direct or consequential, to it or them or to it or their property arising out of or in connection with the performance of the work, and (b) the risk of claims and demands by third persons including the legal costs incurred by Edmonton Airports on a solicitor and his own client basis to defend such claims or demands, arising or alleged to arise out of the performance of the work and to the conditions of the leased premises during the performance of the work and following the completion of the work, whether such risks arise out of acts or omissions of the Applicant, its contractors or otherwise.
- The Applicant shall pay all claims lawfully made against it by contractors, subcontractors, suppliers and workmen, and all claims lawfully made against it by other third persons arising out of or in connection with or because of the performance of the work and the conditions of the leased premises during the performance of the work, and shall cause all contractors and subcontractors to pay all such claims lawfully made against them.
- No changes or revisions shall be made to the work authorized by this permit without prior approval of the Assigned Edmonton Airports' Technical Services department and its designated official.
- Edmonton Airports reserves the right to halt or suspend the work should the terms or conditions of the Facility Alteration Permit not be complied with.
- The Applicant shall notify the Assigned Edmonton Airports' representative not less than two days prior to the commencement of the work and shall complete the same within the number of days specified in Part 1 of this Facility Alteration Permit application. The Applicant shall advise the Assigned Edmonton Airports' representative when the work is substantially complete. Upon substantial completion of the work the Applicant shall deposit with the Assigned Edmonton Airports' representative one copy of the drawing(s) showing the as-built facilities in electronic CADD and pdf formats. If record drawings are not submitted within 60 days of project completion, a charge will be levied against the Applicant which the Applicant promises to pay, based on Edmonton Airports' cost to have the record drawings completed for the project.
- In the performance of the work, the Applicant shall not do or permit to be done any act affecting the operation of any existing plumbing, heating, fire-alarm, sewage, drainage, water supply, electrical sprinkler, ventilating, refrigerating, fuel, or communication system at the facility, or other such service system threat, including all pipes, tubes, lines, mains, wires, conduits, equipment and fixtures, except with the express written approval of the Assigned Edmonton Airports' Technical Services department, its resident engineer, or its designated official.
- Prior to the commencement of the work and throughout the performance thereof, the Applicant shall erect and maintain at its own expense in or about the space such barriers, shields and other suitable protective devices for the protection of the public and others and their property. The work shall be performed in such a manner as will cause the minimum inconvenience to members of the public and others at the facility.

**Must Be Posted at Construction Site**



EDMONTON INTERNATIONAL AIRPORT

## Facility Alteration Permit Notice

FAP2016-107

### Approved for:

Decommissioning of the soil vapour extraction unit located at the AOMC building.

### Issued To:

Golder Associates Ltd.

### Date of Issue

26/09/2016

### Expiry date

26/09/2017

A handwritten signature in blue ink, appearing to read 'D. Schuster', is written over a horizontal line.

Edmonton Airports' Authorization

**This Permit is Valid only when used in accordance with conditions of the signed approval letter from Edmonton Airports and must be displayed at the construction site and must be produced when asked for by a representative of the Edmonton Regional Airports Authority**



# **APPENDIX C**

## **Site Photographs**



## APPENDIX C

### Site Photographs



*Photograph 1: South sump of the LTF prior to pump and treat activities.*



*Photograph 2: South sump after pump and treat activities.*



## APPENDIX C

### Site Photographs



*Photograph 3: North sump prior to decommissioning activities.*



*Photograph 4: North sump after pump and treat activities.*



## APPENDIX C

### Site Photographs



*Photograph 5: North cell of the LTF prior to decommissioning activities.*



*Photograph 6: Removing soil from the north cell.*



## APPENDIX C

### Site Photographs



*Photograph 7: Removing gravel from the north sump.*



*Photograph 8: North sump prior to backfilling.*



## APPENDIX C

### Site Photographs



*Photograph 9: Removing the top geotextile liner.*



*Photograph 10: Removing the second liner.*



## APPENDIX C

### Site Photographs



*Photograph 11: Removing the liner from the berm and spreading soil in the north cell.*



*Photograph 12: North cell after decommissioning activities.*



# **APPENDIX D**

## **Laboratory Certificates of Analysis**

### GOLDER DATA QUALITY REVIEW CHECKLIST

Site Location: EIA

Sampling Date: May 25, 2016

Golder Project Number: 1529387

Laboratory: Maxxam Edmonton

Lab Submission Number: B640846

Was the Cooler Received at the lab under a sealed and intact custody seal?	<u>Yes</u>
Was proper chain of custody of the samples documented and kept?	<u>Yes</u>
Were sample temperatures acceptable when they reached lab?:	<u>Yes</u>
Were all samples analyzed and extracted within hold times?:	<u>Yes</u>
Has lab warranted all tests were in statistical control in CoA?:	<u>Yes</u>
Was sufficient sample provided for the requested analysis?	<u>Yes</u>
Has lab warranted all samples were analyzed with limited headspace present?:	<u>Yes</u>

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?


	Yes	No	NA	Comments
Surrogate Recovery	X			All laboratory QC results are within acceptance criteria.
Method Blank Concentration	X			
Laboratory Duplicate RPD	X			
Matrix Spike Recovery	X			
Blank Spike Recovery	X			

Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Field Blank Concentration			X	All field QC samples are within alert limits.
Trip Blank Concentration			X	
Field Duplicate RPD	X			

Is data considered reliable (Yes/No/Suspect)?: Yes  
If answer is "No" or "Suspect", describe and provide rationale:

Data Reviewed by (Print): Jenny Musijowski

Data Reviewed by (Signature): 

Date: June 3, 2016

Your Project #: 1529387-6000  
Site Location: EIA  
Your C.O.C. #: M013266, M013265

**Attention: Steven Fiddler**

GOLDER ASSOCIATES LTD  
16820-107 AVE  
EDMONTON, AB  
CANADA T5P 4C3

**Report Date: 2016/06/02**

Report #: R2190513

Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B640846**

**Received: 2016/05/25, 16:39**

Sample Matrix: Water  
# Samples Received: 12

<b>Analyses</b>	<b>Quantity</b>	<b>Date Extracted</b>	<b>Date Analyzed</b>	<b>Laboratory Method</b>	<b>Analytical Method</b>
BTEX/F1 in Water by HS GC/MS/FID	12	N/A	2016/05/29	AB SOP-00039	CCME CWS/EPA 8260c m
CCME Hydrocarbons in Water (F2; C10-C16)	4	2016/05/27	2016/05/28	AB SOP-00040 / AB SOP-00037	CCME PHC-CWS m
CCME Hydrocarbons in Water (F2; C10-C16)	7	2016/05/30	2016/05/31	AB SOP-00040 / AB SOP-00037	CCME PHC-CWS m
CCME Hydrocarbons in Water (F2; C10-C16)	1	2016/06/02	2016/06/02	AB SOP-00040 / AB SOP-00037	CCME PHC-CWS m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

\* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Alaina Hunter, Dip. BioSci, Project Manager, Environmental

Email: AHunter@maxxam.ca

Phone# (780)577-7139

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B640846  
Report Date: 2016/06/02

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: EIA  
Sampler Initials: JC

### AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		OR8585	OR8586	OR8587	OR8588		OR8589		
Sampling Date		2016/05/25 10:30	2016/05/25 11:00	2016/05/25 11:00	2016/05/25 11:20		2016/05/25 12:20		
COC Number		M013266	M013266	M013266	M013266		M013266		
	UNITS	MW83-15	BH62M	DUP16-01	BH63M	QC Batch	BH57M	RDL	QC Batch
<b>Ext. Pet. Hydrocarbon</b>									
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	8281214	<0.10	0.10	8281200
<b>Volatiles</b>									
Benzene	ug/L	<0.40	<0.40	<0.40	<0.40	8280739	<0.40	0.40	8280739
Toluene	ug/L	<0.40	<0.40	<0.40	<0.40	8280739	<0.40	0.40	8280739
Ethylbenzene	ug/L	<0.40	<0.40	<0.40	<0.40	8280739	<0.40	0.40	8280739
m & p-Xylene	ug/L	<0.80	<0.80	<0.80	<0.80	8280739	<0.80	0.80	8280739
o-Xylene	ug/L	<0.40	<0.40	<0.40	<0.40	8280739	<0.40	0.40	8280739
Xylenes (Total)	ug/L	<0.80	<0.80	<0.80	<0.80	8280739	<0.80	0.80	8280739
F1 (C6-C10) - BTEX	ug/L	<100	<100	<100	<100	8280739	<100	100	8280739
F1 (C6-C10)	ug/L	<100	<100	<100	<100	8280739	<100	100	8280739
<b>Surrogate Recovery (%)</b>									
1,4-Difluorobenzene (sur.)	%	100	99	101	100	8280739	101	N/A	8280739
4-Bromofluorobenzene (sur.)	%	129	123	124	123	8280739	123	N/A	8280739
D4-1,2-Dichloroethane (sur.)	%	105	101	103	103	8280739	105	N/A	8280739
O-TERPHENYL (sur.)	%	105	108	100	98	8281214	95	N/A	8281200
RDL = Reportable Detection Limit N/A = Not Applicable									

Maxxam Job #: B640846  
Report Date: 2016/06/02

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: EIA  
Sampler Initials: JC

### AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		OR8590	OR8591		OR8592	OR8593	OR8594		
Sampling Date		2016/05/25 12:50	2016/05/25 13:20		2016/05/25 13:50	2016/05/25 14:15	2016/05/25 14:45		
COC Number		M013266	M013266		M013266	M013266	M013266		
	UNITS	BH65M	MW46	QC Batch	BH35	BH32	MW71-14	RDL	QC Batch
<b>Ext. Pet. Hydrocarbon</b>									
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	8281214	<0.10	0.37	0.48	0.10	8281200
<b>Volatiles</b>									
Benzene	ug/L	<0.40	<0.40	8280739	0.49	190	110	0.40	8280739
Toluene	ug/L	<0.40	<0.40	8280739	<0.40	3.5	2.3	0.40	8280739
Ethylbenzene	ug/L	<0.40	<0.40	8280739	<0.40	53	250	0.40	8280739
m & p-Xylene	ug/L	<0.80	<0.80	8280739	<0.80	38	37	0.80	8280739
o-Xylene	ug/L	<0.40	<0.40	8280739	<0.40	2.1	<0.40	0.40	8280739
Xylenes (Total)	ug/L	<0.80	<0.80	8280739	<0.80	40	37	0.80	8280739
F1 (C6-C10) - BTEX	ug/L	<100	<100	8280739	<100	500	980	100	8280739
F1 (C6-C10)	ug/L	<100	<100	8280739	<100	780	1400	100	8280739
<b>Surrogate Recovery (%)</b>									
1,4-Difluorobenzene (sur.)	%	101	97	8280739	100	103	100	N/A	8280739
4-Bromofluorobenzene (sur.)	%	126	119	8280739	127	128	129	N/A	8280739
D4-1,2-Dichloroethane (sur.)	%	105	103	8280739	108	108	109	N/A	8280739
O-TERPHENYL (sur.)	%	101	94	8281214	96	95	93	N/A	8281200
RDL = Reportable Detection Limit N/A = Not Applicable									

Maxxam Job #: B640846  
Report Date: 2016/06/02

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: EIA  
Sampler Initials: JC

### AT1 BTEX AND F1-F2 (WATER)

<b>Maxxam ID</b>		OR8604	OR8605		
<b>Sampling Date</b>		2016/05/25 15:20	2016/05/25 15:50		
<b>COC Number</b>		M013265	M013265		
	<b>UNITS</b>	<b>MW72-14</b>	<b>MW73-14</b>	<b>RDL</b>	<b>QC Batch</b>
<b>Ext. Pet. Hydrocarbon</b>					
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	0.10	8281214
<b>Volatiles</b>					
Benzene	ug/L	<0.40	<0.40	0.40	8280739
Toluene	ug/L	<0.40	<0.40	0.40	8280739
Ethylbenzene	ug/L	<0.40	<0.40	0.40	8280739
m & p-Xylene	ug/L	<0.80	<0.80	0.80	8280739
o-Xylene	ug/L	<0.40	<0.40	0.40	8280739
Xylenes (Total)	ug/L	<0.80	<0.80	0.80	8280739
F1 (C6-C10) - BTEX	ug/L	<100	<100	100	8280739
F1 (C6-C10)	ug/L	<100	<100	100	8280739
<b>Surrogate Recovery (%)</b>					
1,4-Difluorobenzene (sur.)	%	101	104	N/A	8280739
4-Bromofluorobenzene (sur.)	%	124	129	N/A	8280739
D4-1,2-Dichloroethane (sur.)	%	104	107	N/A	8280739
O-TERPHENYL (sur.)	%	95	102	N/A	8281214
RDL = Reportable Detection Limit					
N/A = Not Applicable					

Maxxam Job #: B640846  
Report Date: 2016/06/02

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: EIA  
Sampler Initials: JC

#### GENERAL COMMENTS

Results relate only to the items tested.

Maxxam Job #: B640846  
Report Date: 2016/06/02

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: EIA  
Sampler Initials: JC

### QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8280739	SES	Matrix Spike [OR8605-02]	1,4-Difluorobenzene (sur.)	2016/05/29		98	%	70 - 130
			4-Bromofluorobenzene (sur.)	2016/05/29		127	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2016/05/29		107	%	70 - 130
			Benzene	2016/05/29		95	%	70 - 130
			Toluene	2016/05/29		83	%	70 - 130
			Ethylbenzene	2016/05/29		95	%	70 - 130
			m & p-Xylene	2016/05/29		91	%	70 - 130
			o-Xylene	2016/05/29		90	%	70 - 130
			F1 (C6-C10)	2016/05/29		79	%	70 - 130
8280739	SES	Spiked Blank	1,4-Difluorobenzene (sur.)	2016/05/29		98	%	70 - 130
			4-Bromofluorobenzene (sur.)	2016/05/29		123	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2016/05/29		106	%	70 - 130
			Benzene	2016/05/29		91	%	70 - 130
			Toluene	2016/05/29		80	%	70 - 130
			Ethylbenzene	2016/05/29		90	%	70 - 130
			m & p-Xylene	2016/05/29		87	%	70 - 130
			o-Xylene	2016/05/29		85	%	70 - 130
			F1 (C6-C10)	2016/05/29		77	%	70 - 130
8280739	SES	Method Blank	1,4-Difluorobenzene (sur.)	2016/05/29		100	%	70 - 130
			4-Bromofluorobenzene (sur.)	2016/05/29		127	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2016/05/29		106	%	70 - 130
			Benzene	2016/05/29	<0.40		ug/L	
			Toluene	2016/05/29	<0.40		ug/L	
			Ethylbenzene	2016/05/29	<0.40		ug/L	
			m & p-Xylene	2016/05/29	<0.80		ug/L	
			o-Xylene	2016/05/29	<0.40		ug/L	
			Xylenes (Total)	2016/05/29	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2016/05/29	<100		ug/L	
			F1 (C6-C10)	2016/05/29	<100		ug/L	
8280739	SES	RPD [OR8604-02]	Benzene	2016/05/29	NC		%	40
			Toluene	2016/05/29	NC		%	40
			Ethylbenzene	2016/05/29	NC		%	40
			m & p-Xylene	2016/05/29	NC		%	40
			o-Xylene	2016/05/29	NC		%	40
			Xylenes (Total)	2016/05/29	NC		%	40
			F1 (C6-C10) - BTEX	2016/05/29	NC		%	40
			F1 (C6-C10)	2016/05/29	NC		%	40
8281200	GG3	Matrix Spike	O-TERPHENYL (sur.)	2016/05/28		99	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/05/28		103	%	50 - 130
8281200	GG3	Spiked Blank	O-TERPHENYL (sur.)	2016/05/28		101	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/05/28		104	%	70 - 130
8281200	GG3	Method Blank	O-TERPHENYL (sur.)	2016/05/28		98	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/05/28	<0.10		mg/L	
8281200	GG3	RPD	F2 (C10-C16 Hydrocarbons)	2016/05/28	NC		%	40
8281214	GG3	Matrix Spike	O-TERPHENYL (sur.)	2016/05/31		94	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/05/31		78	%	50 - 130
8281214	GG3	Spiked Blank	O-TERPHENYL (sur.)	2016/05/31		94	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/05/31		97	%	70 - 130
8281214	GG3	Method Blank	O-TERPHENYL (sur.)	2016/05/31		93	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/05/31	<0.10		mg/L	

Maxxam Job #: B640846  
Report Date: 2016/06/02

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: EIA  
Sampler Initials: JC

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC				Date					
Batch	Init	QC Type	Parameter	Analyzed	Value	Recovery	UNITS	QC Limits	
8281214	GG3	RPD	F2 (C10-C16 Hydrocarbons)	2016/05/31	NC		%	40	
<p>Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.</p> <p>Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.</p> <p>Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.</p> <p>Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.</p> <p>Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.</p> <p>NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples &lt; 5x RDL).</p>									

Maxxam Job #: B640846  
Report Date: 2016/06/02

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: EIA  
Sampler Initials: JC

### VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Anna Koksharova, M.Sc., Organics Senior Analyst



Bert Chi, M.Sc., Organics Senior Analyst



Daniel Reslan, cCT, QP, Organics Supervisor

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Invoice Information				Report Information (if differs from invoice)				Project Information				Turnaround Time (TAT) Required			
Company: <b>Goldier Associates</b>				Company:				Quotation #:				<input checked="" type="checkbox"/> 5-7 Days Regular (Most analyses)			
Contact Name: <b>Steven Fidler</b>				Contact Name:				P.O. #/ A/E#:				PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS			
Address: <b>16820 107 Ave</b>				Address:				Project #:				Rush TAT (Surcharges will be applied)			
Phone: <b>Edmonton, AB T5P4C3</b>				Phone:				Site Location: <b>51A</b>				<input type="checkbox"/> Same Day <input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3-4 Days			
Email: <b>780-4833499/780-984-6600</b>				Email: <b>sfidler@golder.com</b>				Site #:				Date Required:			
Copies: <b>jchamula@golder.com</b>				Copies:				Sampled By: <b>J. Chamula</b>				Rush Confirmation #:			

Laboratory Use Only				Depot Reception				Analysis Requested				Regulatory Criteria				
Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	Seal Present	Seal Intact	Cooling Media	Temp	Seal Present	Seal Intact	Cooling Media	Temp	Seal Present	Seal Intact	Cooling Media	Temp
1 MW 83-15	-	2016/05/25	10:30	6W	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	7
2 BH 62M	-		11:00		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3 DUP 16-01	-		11:00		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4 BH 63M	-		11:20		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
5 BH 57M	-		12:20		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
6 BH 65M	-		12:50		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
7 MW 46	-		13:20		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
8 BH 35	-		13:50		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
9 BH 32	-		14:15		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
10 MW 71-14	-		14:45		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Please Indicate Filtered, Preserved or Both (F, P, F/P)				Relinquished by: (Signature/ Print)				Received by: (Signature/ Print)				DATE (YYYY/MM/DD)				Time (HH:MM)			
				<i>[Signature]</i>				<i>[Signature]</i>				2016/05/25				16:30			
				J. Chamula				J. Chamula				2016/05/25				16:39			

Special Instructions				Regulatory Criteria			
HOLD - DO NOT ANALYZE				<input checked="" type="checkbox"/> AT1/CCME <input type="checkbox"/> Drinking Water <input type="checkbox"/> Saskatchewan <input type="checkbox"/> D50 (Drilling Waste) <input type="checkbox"/> Other:			

Maxxam Job #			
B640846 GML			

Invoice Information				Report Information (if differs from invoice)				Project Information				Turnaround Time (TAT) Required			
Company: <u>Golden Associates</u>				Company: _____				Quotation #: _____				<input checked="" type="checkbox"/> 5-7 Days Regular (Most analyses)			
Contact Name: <u>Steven Fidler</u>				Contact Name: _____				P.O. #/ A/E #: _____				PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS			
Address: <u>16820 107 Ave</u>				Address: _____				Project #: <u>1529387-6000</u>				Rush TAT (Surcharges will be applied)			
Edmonton, AB T5P4C3				Edmonton, AB T5P4C3				Site Location: <u>EIA</u>				Same Day <input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3-4 Days <input type="checkbox"/>			
Phone: <u>780-483-3499/780-984-6600</u>				Phone: _____				Site #: _____				Date Required: _____			
Email: <u>sfidler@golder.com</u>				Email: <u>CSM@batesquality.com</u>				Sampled By: <u>J. Chanula</u>				Rush Confirmation #: _____			
Copies: <u>jchanula@golder.com</u>				Copies: _____											

Laboratory Use Only				Depot Reception				Analysis Requested				Regulatory Criteria															
<table border="1"> <tr> <th>Seal Present</th> <th>Seal Intact</th> <th>Cooling Media</th> <th>Temp</th> </tr> <tr> <td>YES</td> <td>NO</td> <td>Cooler ID</td> <td>Temp</td> </tr> <tr> <td>7</td> <td>9</td> <td>7</td> <td>7</td> </tr> </table>				Seal Present	Seal Intact	Cooling Media	Temp	YES	NO	Cooler ID	Temp	7	9	7	7												
Seal Present	Seal Intact	Cooling Media	Temp																								
YES	NO	Cooler ID	Temp																								
7	9	7	7																								
<table border="1"> <tr> <th>Seal Present</th> <th>Seal Intact</th> <th>Cooling Media</th> <th>Temp</th> </tr> <tr> <td>YES</td> <td>NO</td> <td>Cooler ID</td> <td>Temp</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Seal Present	Seal Intact	Cooling Media	Temp	YES	NO	Cooler ID	Temp																
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YES	NO	Cooler ID	Temp																								
<table border="1"> <tr> <th>Seal Present</th> <th>Seal Intact</th> <th>Cooling Media</th> <th>Temp</th> </tr> <tr> <td>YES</td> <td>NO</td> <td>Cooler ID</td> <td>Temp</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Seal Present	Seal Intact	Cooling Media	Temp	YES	NO	Cooler ID	Temp																
Seal Present	Seal Intact	Cooling Media	Temp																								
YES	NO	Cooler ID	Temp																								
<table border="1"> <tr> <th>Seal Present</th> <th>Seal Intact</th> <th>Cooling Media</th> <th>Temp</th> </tr> <tr> <td>YES</td> <td>NO</td> <td>Cooler ID</td> <td>Temp</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Seal Present	Seal Intact	Cooling Media	Temp	YES	NO	Cooler ID	Temp																
Seal Present	Seal Intact	Cooling Media	Temp																								
YES	NO	Cooler ID	Temp																								

Sample Identification		Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	# of Containers	BTEX F1	BTEX F1-F2	BTEX F1-F4	Routine Water	Regulated Metals	Mercury	Salinity	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	Analysis Requested	Regulatory Criteria	Special Instructions
1	MW 72-14	-	2016/05/25	15:20	GW	4													
2	MW 73-14	-	2016/05/25	15:50	GW	4													
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			

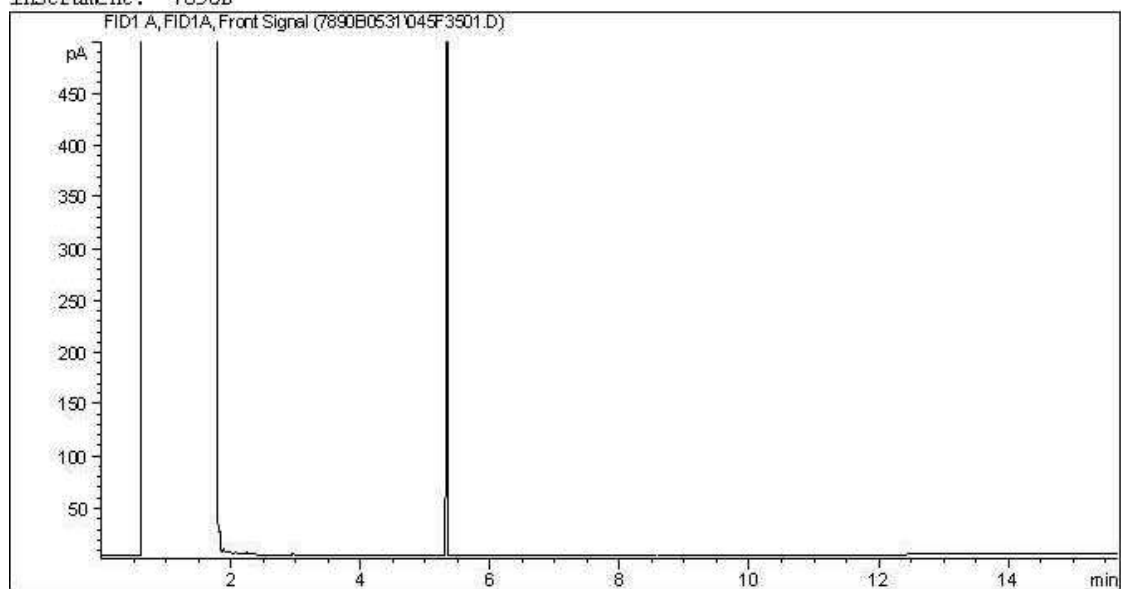
Please indicate Filtered, Preserved or Both (F, P, F/P)				Relinquished by: (Signature/ Print)		Received by: (Signature/ Print)		DATE (YYYY/MM/DD)		Time (HH:MM)		Maxxam Job #	
				<u>J. Chanula</u>		<u>ONE - Delaney M. Stanichuk</u>		2016/05/25		16:39		8640846 GML	

Maxxam Job #: B640846  
 Report Date: 2016/06/02  
 Maxxam Sample: OR8585

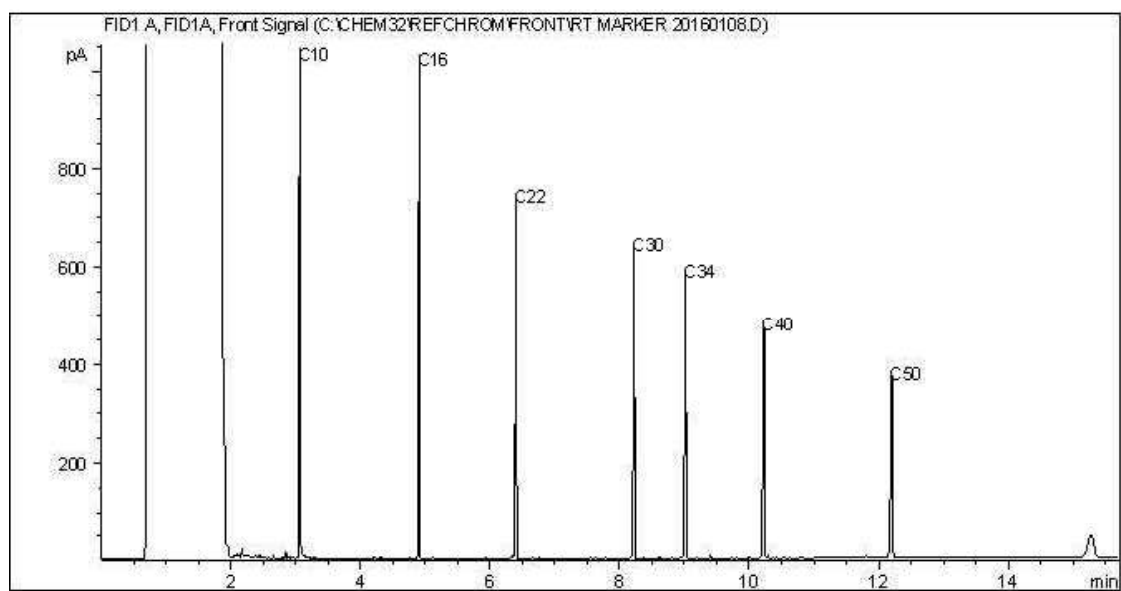
GOLDER ASSOCIATES LTD  
 Client Project #: 1529387-6000  
 Site Reference: EIA  
 Client ID: MW83-15

### CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



#### TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

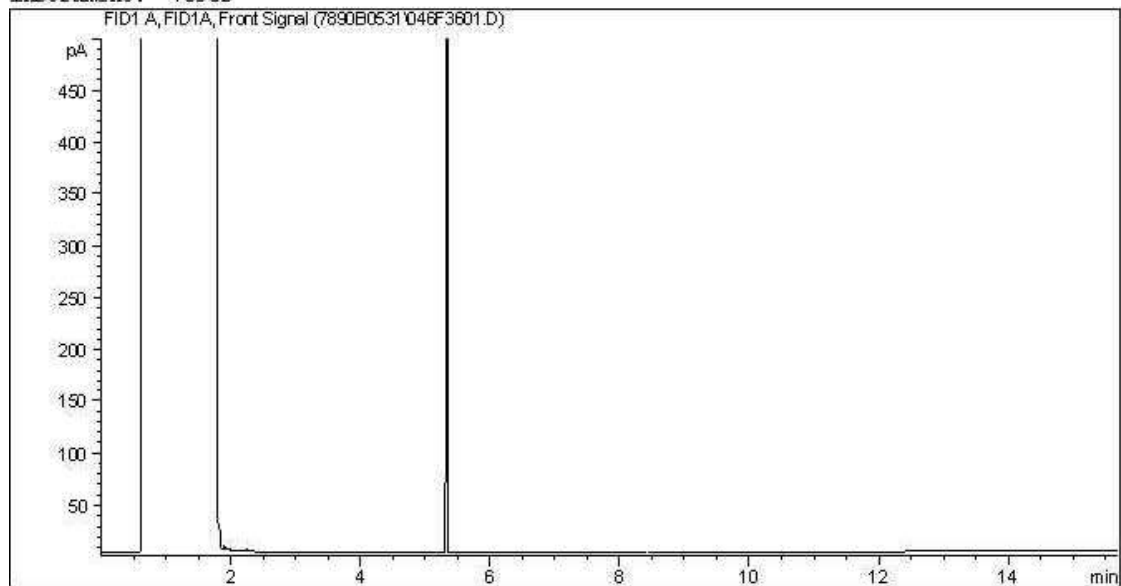
**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B640846  
Report Date: 2016/06/02  
Maxxam Sample: OR8586

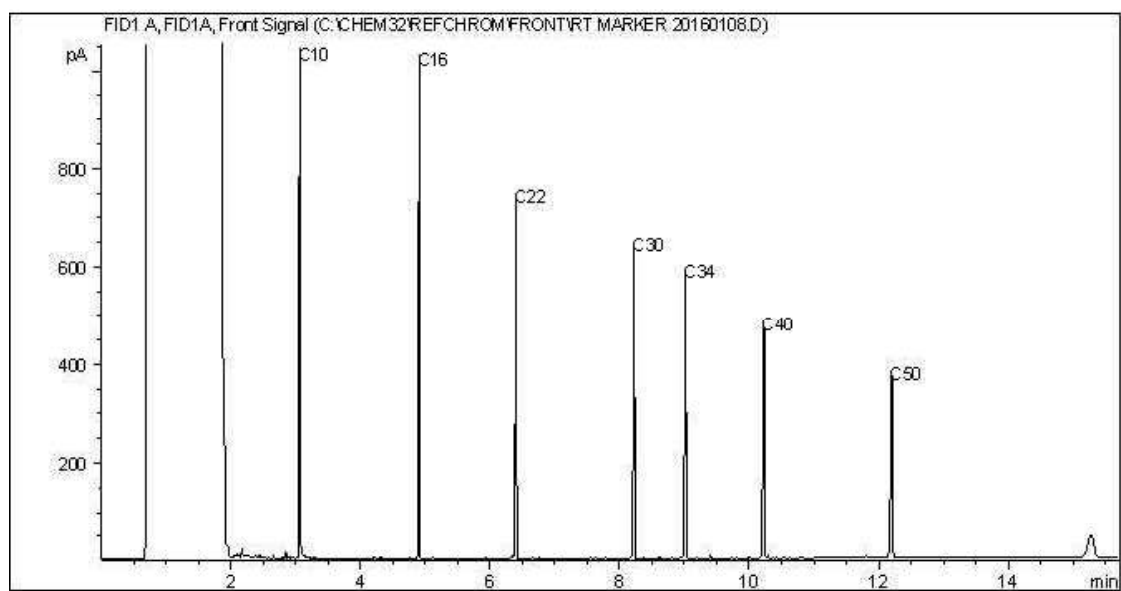
GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Reference: EIA  
Client ID: BH62M

### CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



#### TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

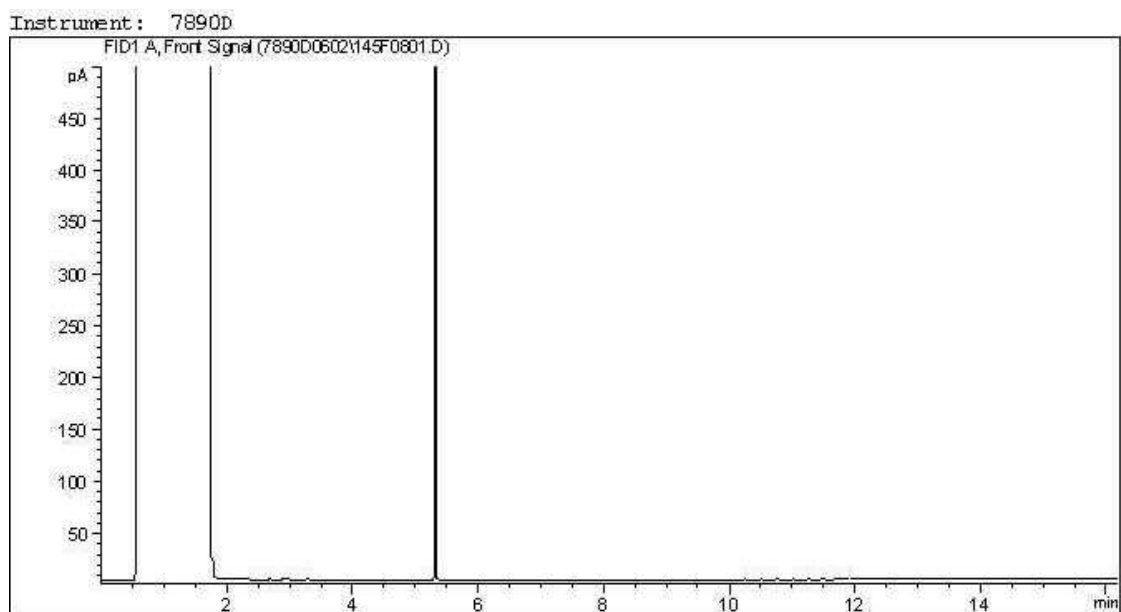
Page 1 of 1

**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

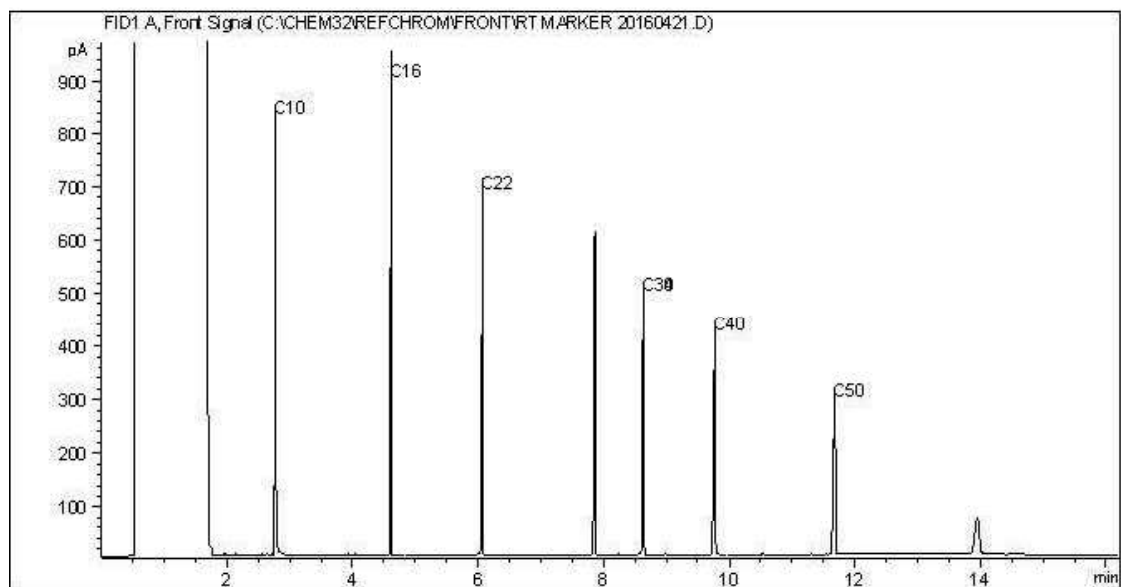
Maxxam Job #: B640846  
 Report Date: 2016/06/02  
 Maxxam Sample: OR8587

GOLDER ASSOCIATES LTD  
 Client Project #: 1529387-6000  
 Site Reference: EIA  
 Client ID: DUP16-01

### CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



### Carbon Range Distribution - Reference Chromatogram



### TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

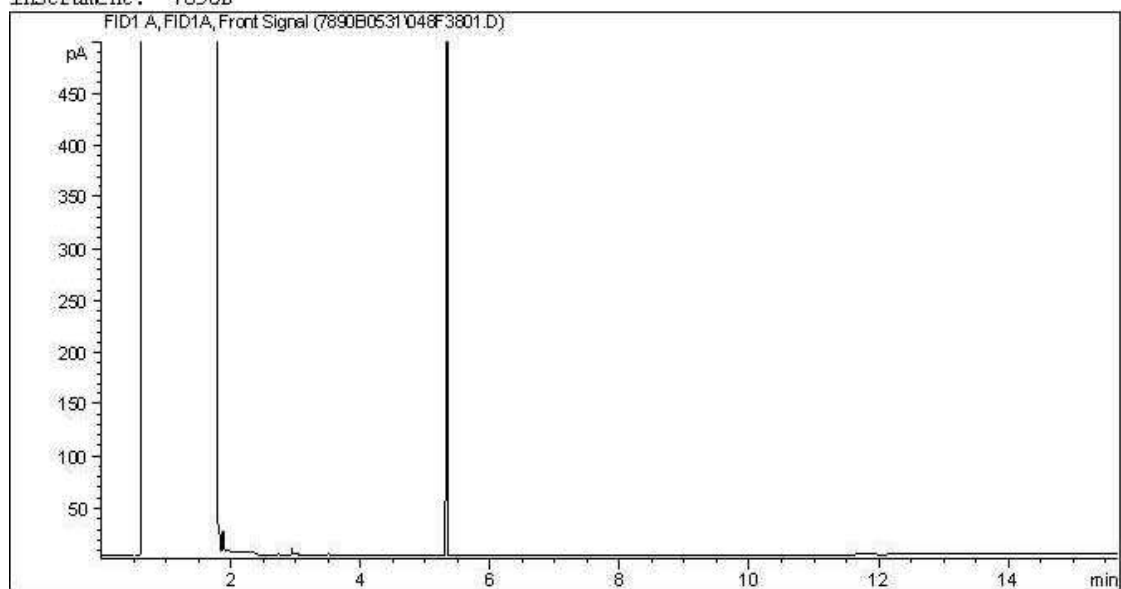
**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B640846  
Report Date: 2016/06/02  
Maxxam Sample: OR8588

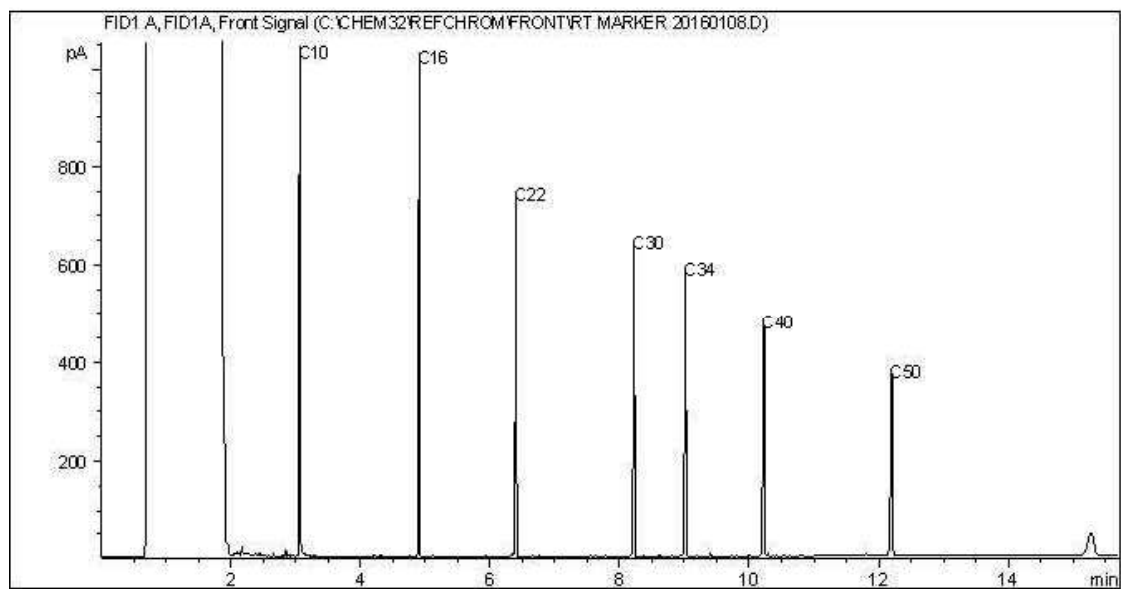
GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Reference: EIA  
Client ID: BH63M

**CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram**

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



**TYPICAL PRODUCT CARBON NUMBER RANGES**

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

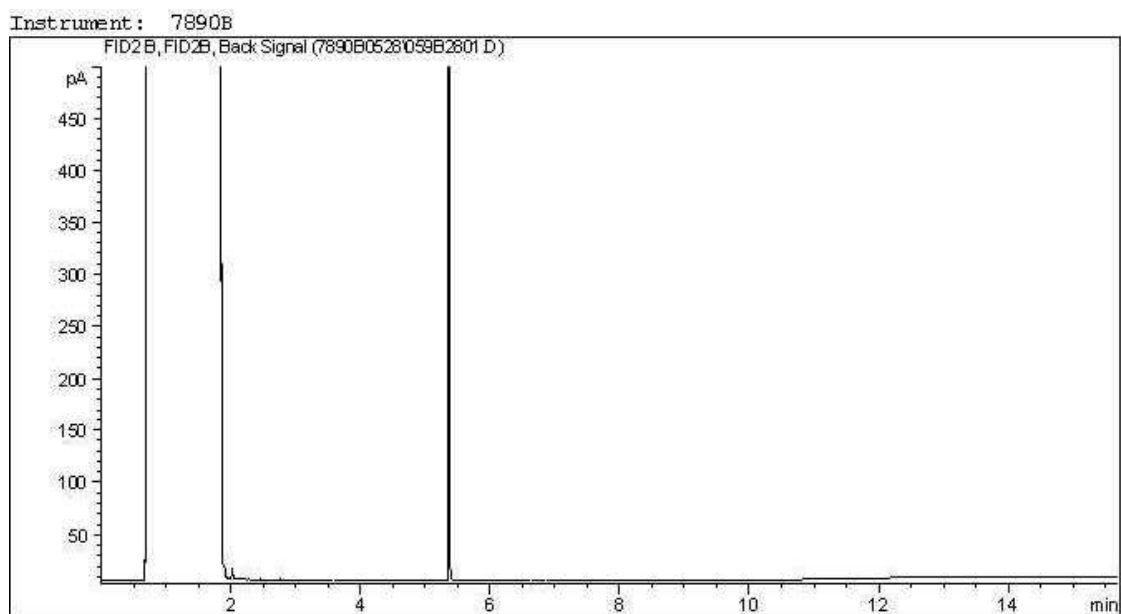
Page 1 of 1

**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

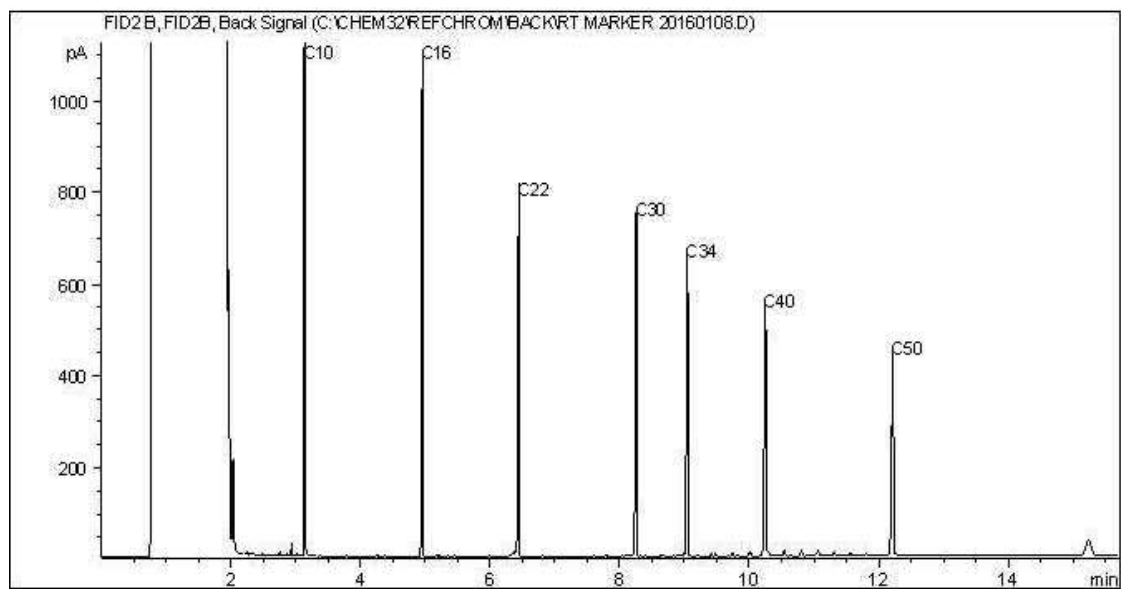
Maxxam Job #: B640846  
 Report Date: 2016/06/02  
 Maxxam Sample: OR8589

GOLDER ASSOCIATES LTD  
 Client Project #: 1529387-6000  
 Site Reference: EIA  
 Client ID: BH57M

### CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



### Carbon Range Distribution - Reference Chromatogram



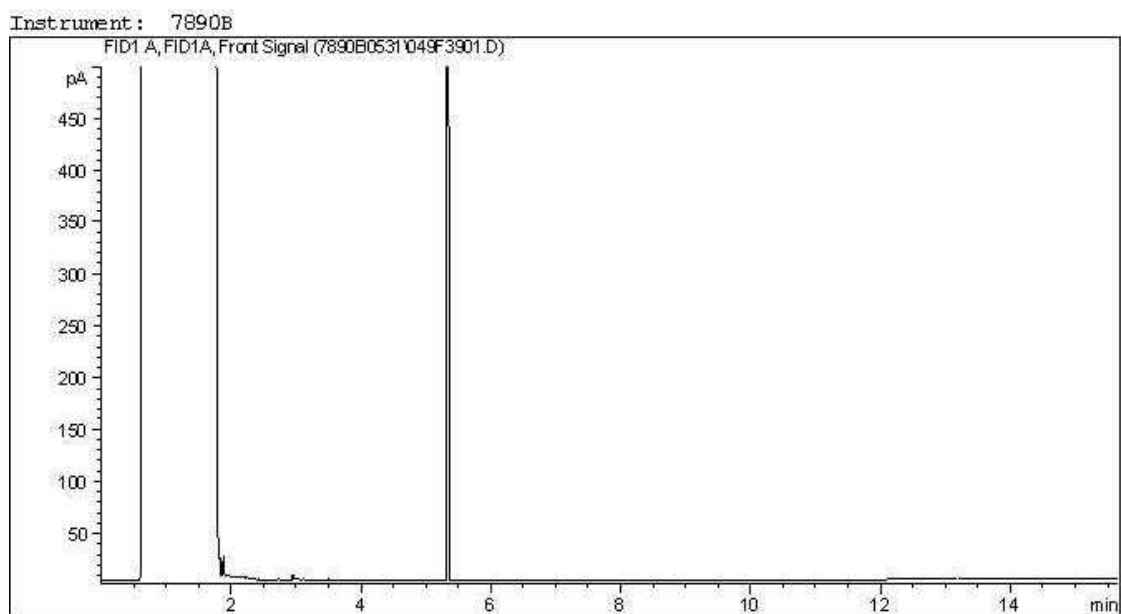
### TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

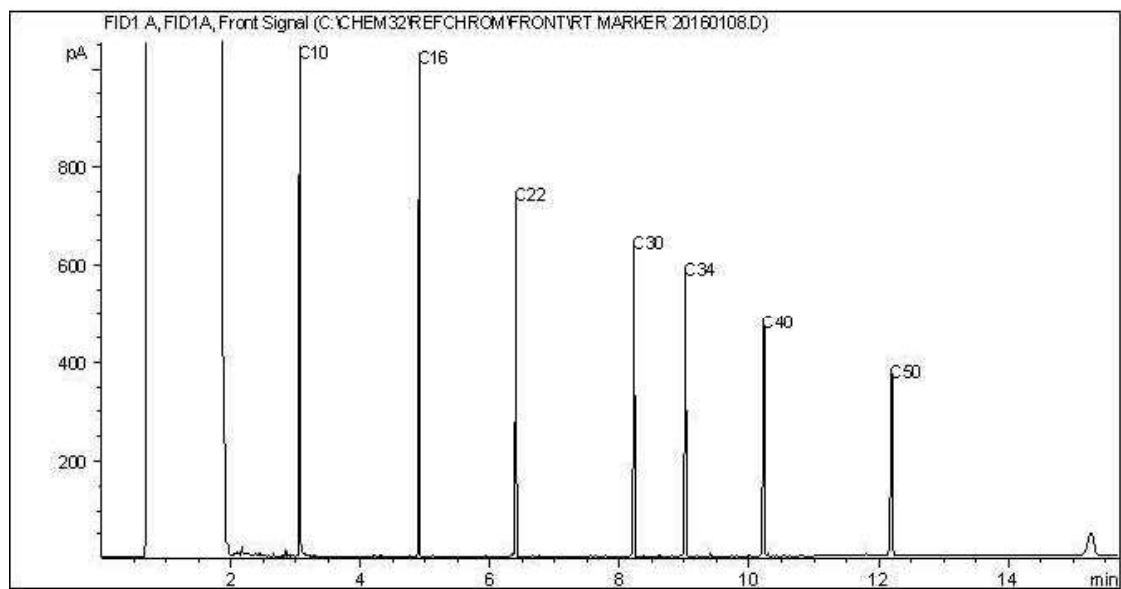
Page 1 of 1

**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

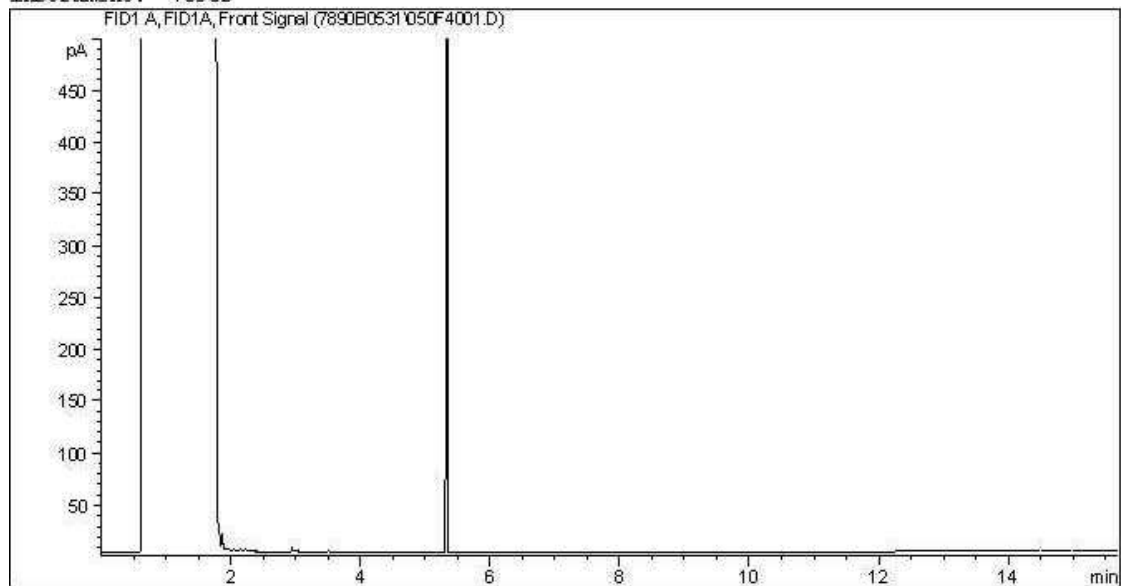
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B640846  
Report Date: 2016/06/02  
Maxxam Sample: OR8591

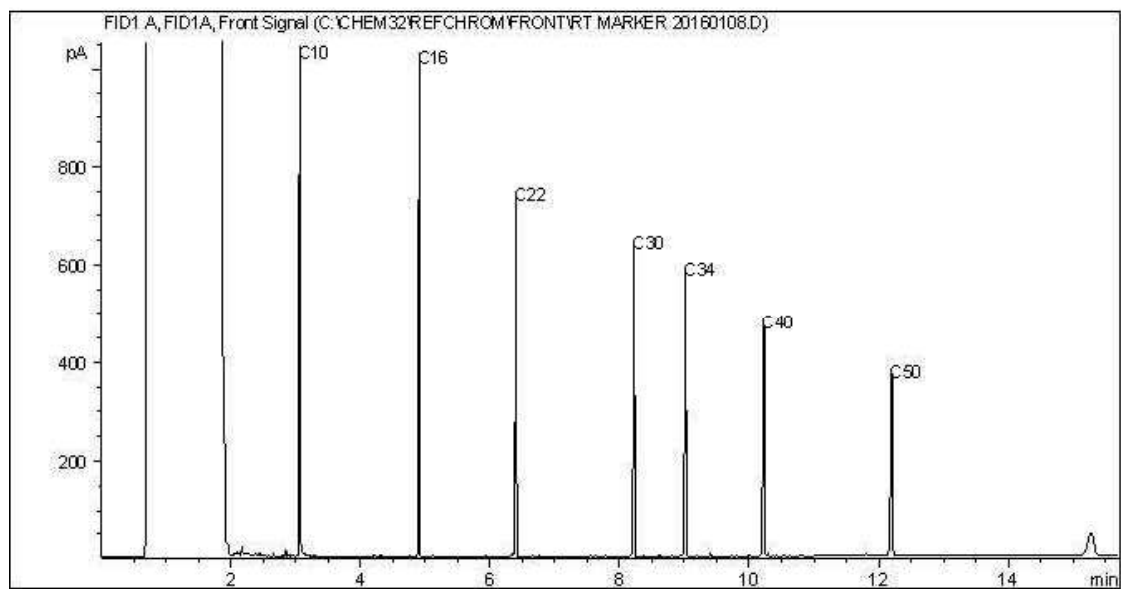
GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Reference: EIA  
Client ID: MW46

**CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram**

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



**TYPICAL PRODUCT CARBON NUMBER RANGES**

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

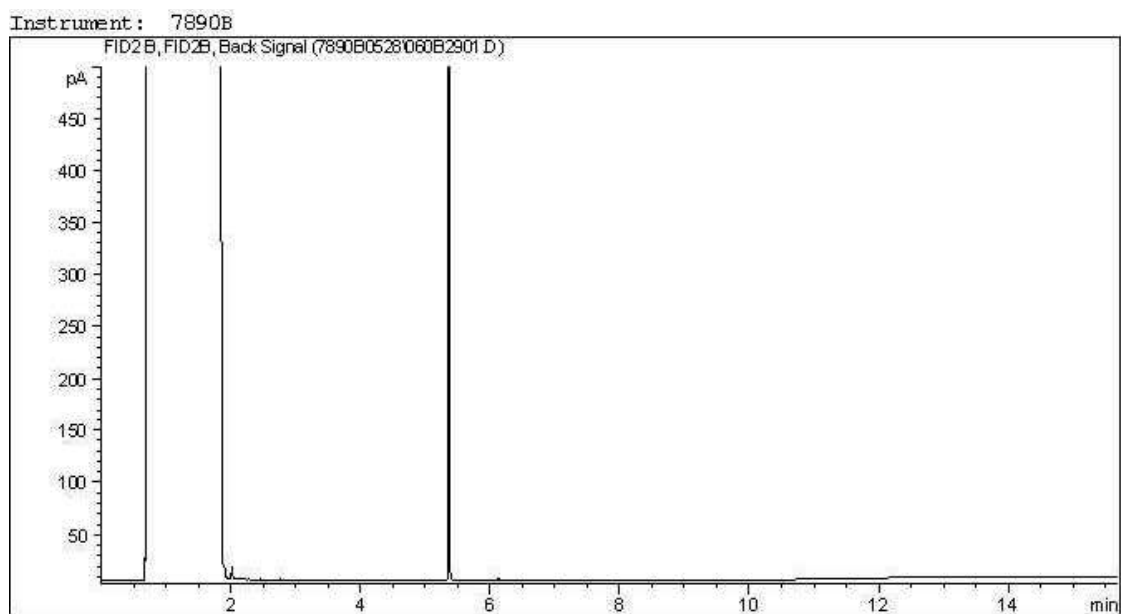
Page 1 of 1

**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

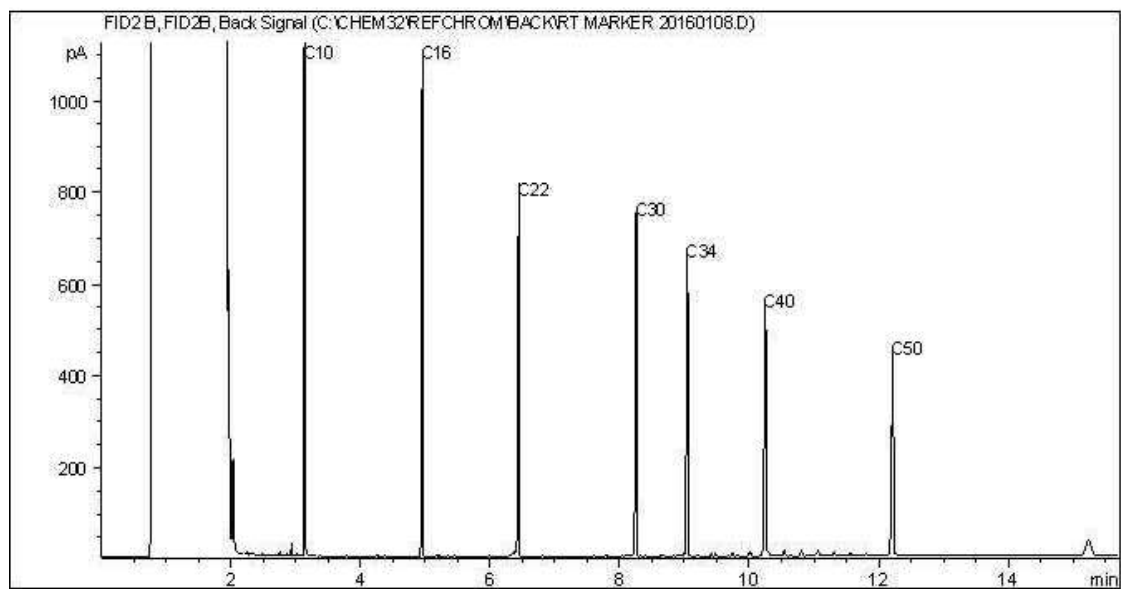
Maxxam Job #: B640846  
 Report Date: 2016/06/02  
 Maxxam Sample: OR8592

GOLDER ASSOCIATES LTD  
 Client Project #: 1529387-6000  
 Site Reference: EIA  
 Client ID: BH35

### CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



### Carbon Range Distribution - Reference Chromatogram



### TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

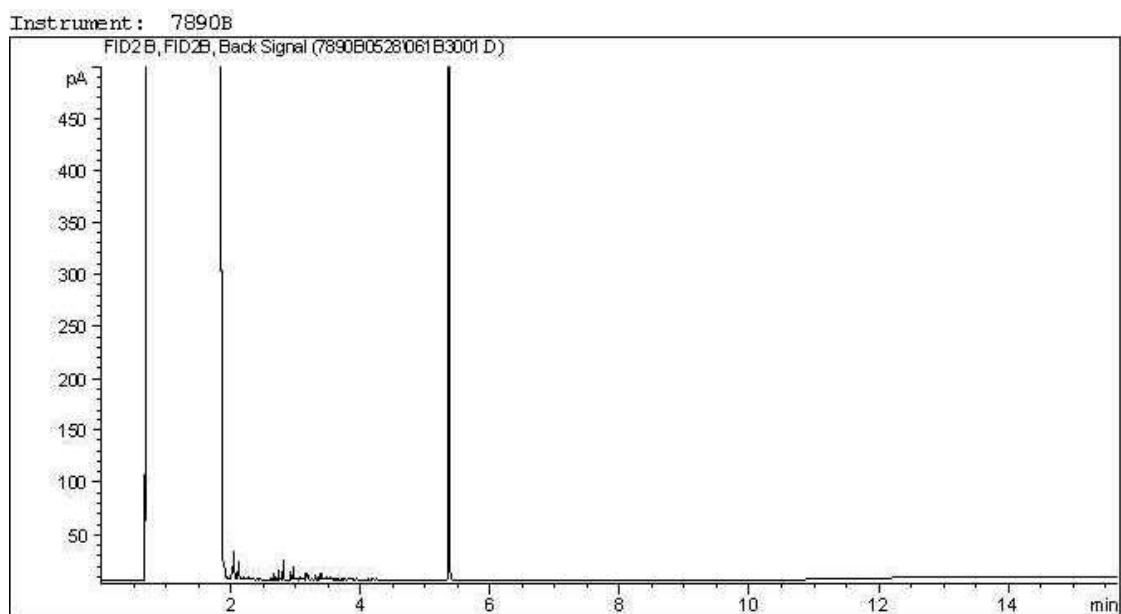
Page 1 of 1

**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

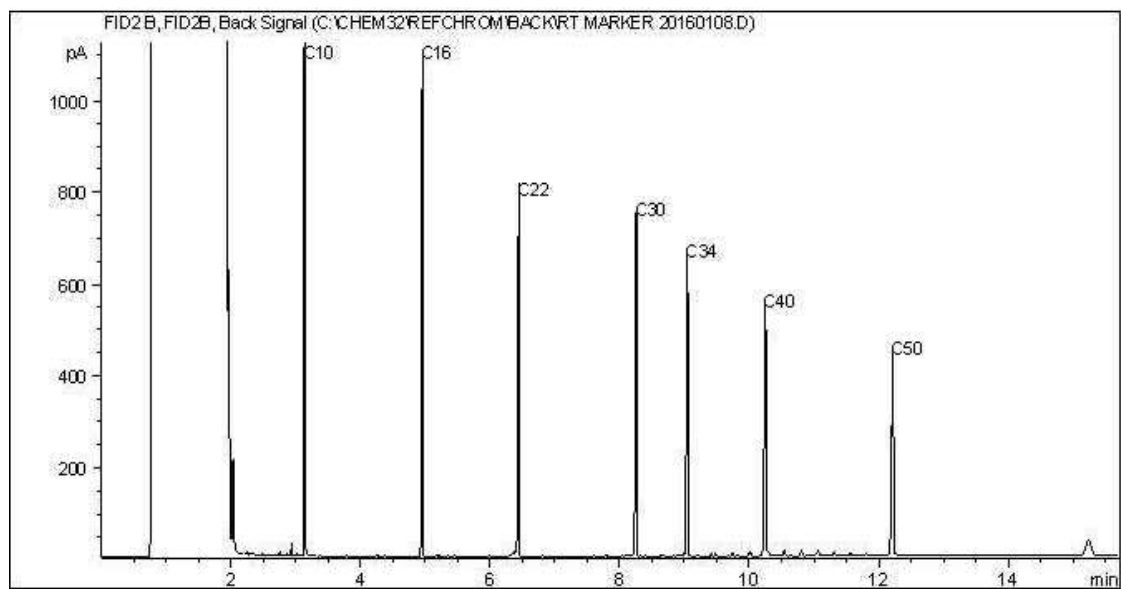
Maxxam Job #: B640846  
 Report Date: 2016/06/02  
 Maxxam Sample: OR8593

GOLDER ASSOCIATES LTD  
 Client Project #: 1529387-6000  
 Site Reference: EIA  
 Client ID: BH32

### CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



### Carbon Range Distribution - Reference Chromatogram



### TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

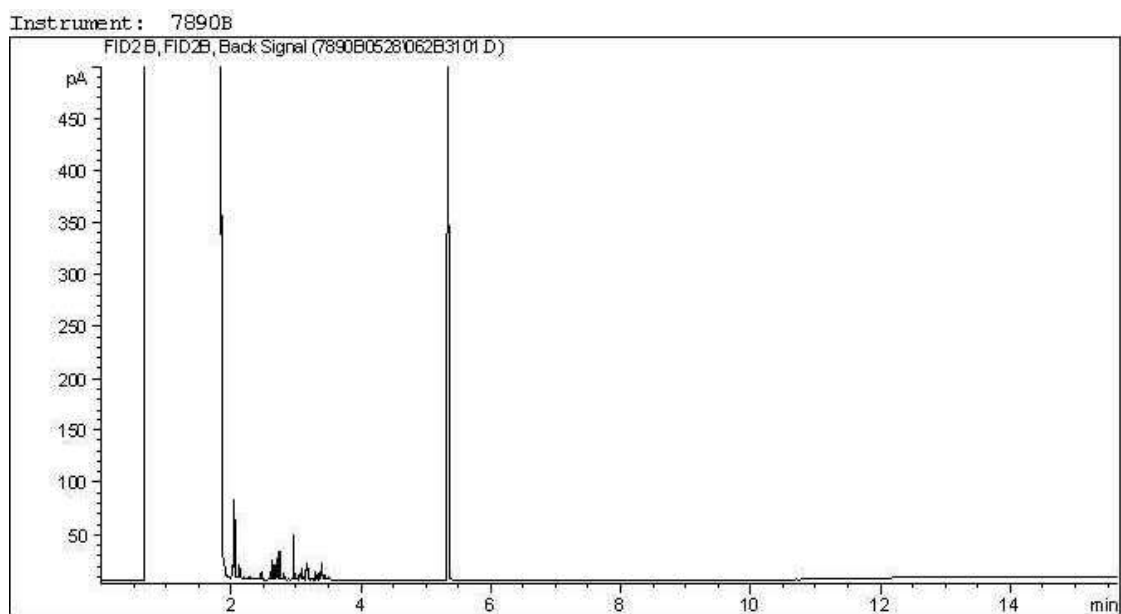
Page 1 of 1

**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

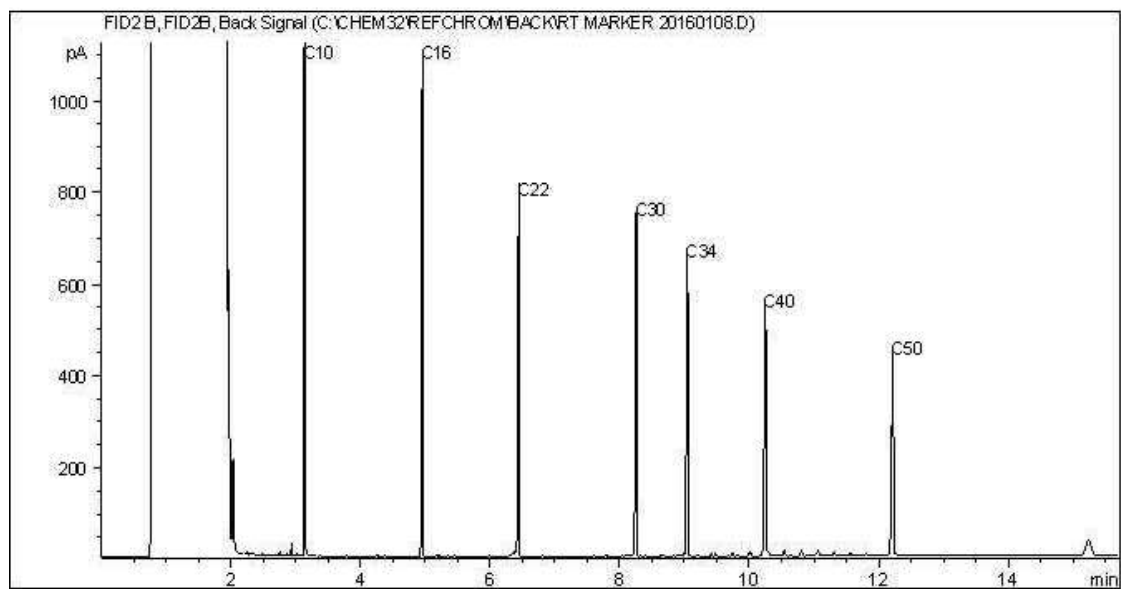
Maxxam Job #: B640846  
 Report Date: 2016/06/02  
 Maxxam Sample: OR8594

GOLDER ASSOCIATES LTD  
 Client Project #: 1529387-6000  
 Site Reference: EIA  
 Client ID: MW71-14

### CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



### Carbon Range Distribution - Reference Chromatogram



### TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

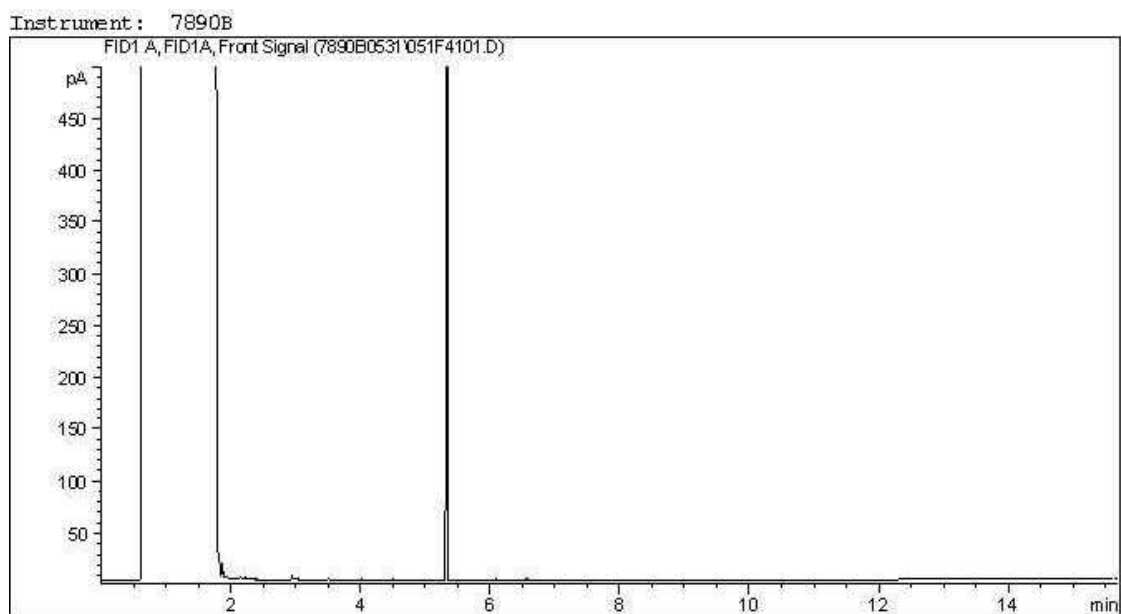
Page 1 of 1

**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

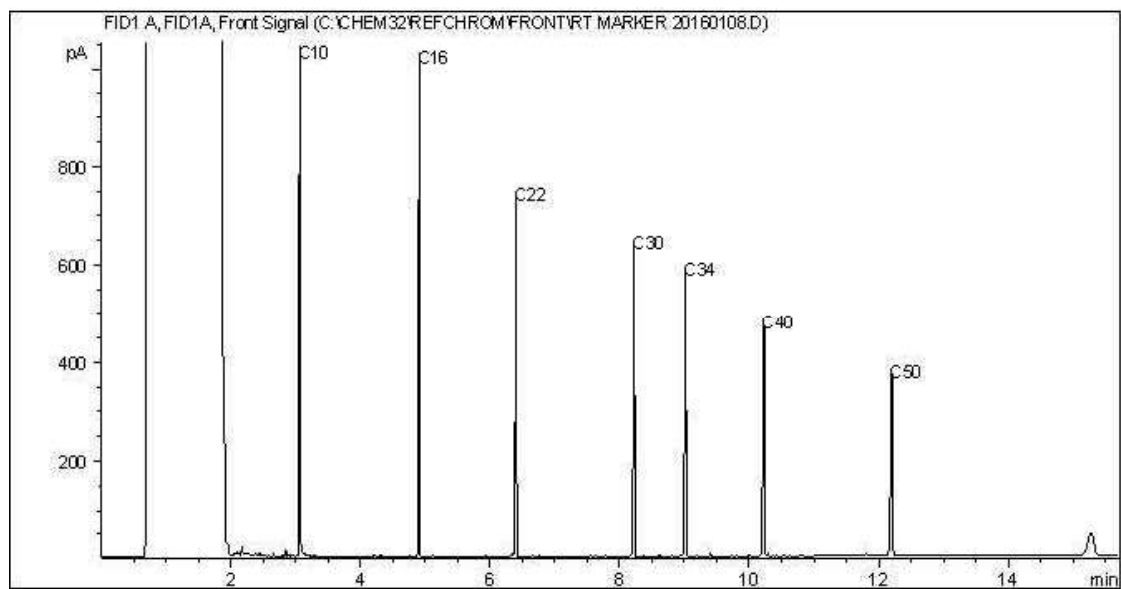
Maxxam Job #: B640846  
 Report Date: 2016/06/02  
 Maxxam Sample: OR8604

GOLDER ASSOCIATES LTD  
 Client Project #: 1529387-6000  
 Site Reference: EIA  
 Client ID: MW72-14

### CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram



### Carbon Range Distribution - Reference Chromatogram



### TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

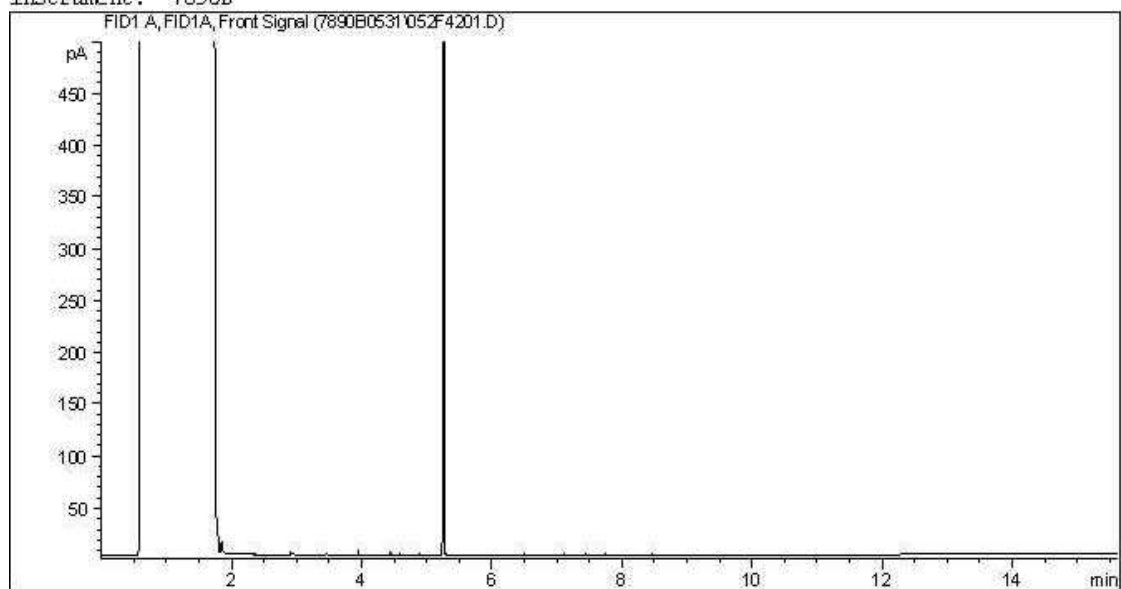
**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

Maxxam Job #: B640846  
Report Date: 2016/06/02  
Maxxam Sample: OR8605

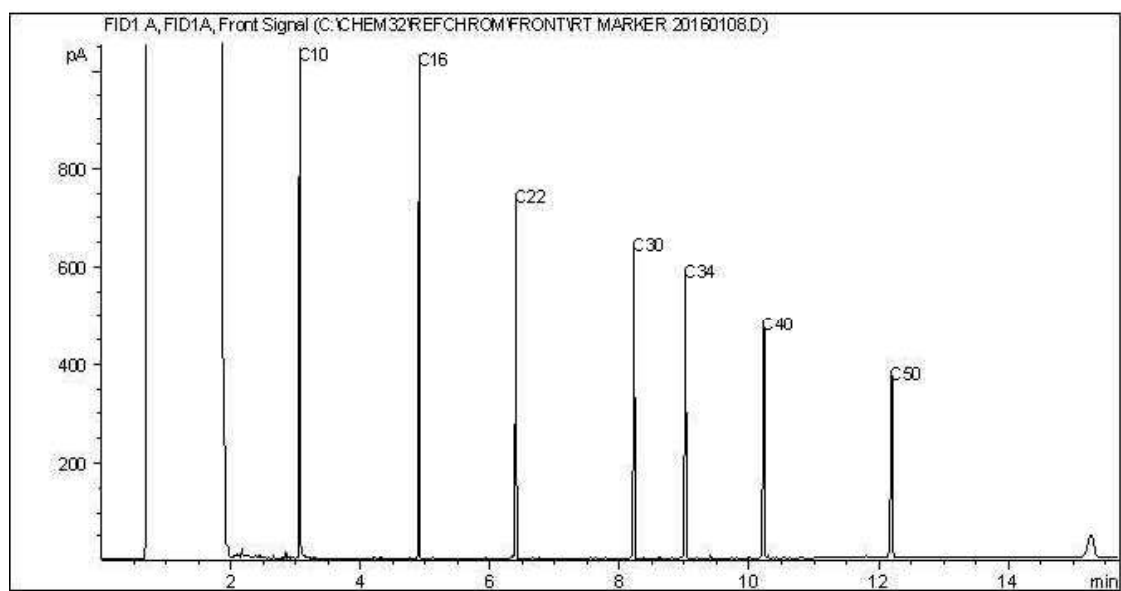
GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Reference: EIA  
Client ID: MW73-14

### CCME Hydrocarbons in Water (F2; C10-C16) Chromatogram

Instrument: 7890B



Carbon Range Distribution - Reference Chromatogram



#### TYPICAL PRODUCT CARBON NUMBER RANGES

Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

**Note:** This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

### GOLDER DATA QUALITY REVIEW CHECKLIST

Site Location: EIA

Sampling Date: May 26, 2016

Golder Project Number: 1529387

Laboratory: Maxxam Edmonton

Lab Submission Number: B641208

Was the Cooler Received at the lab under a sealed and intact custody seal?	<u>Yes</u>
Was proper chain of custody of the samples documented and kept?	<u>Yes</u>
Were sample temperatures acceptable when they reached lab?:	<u>Yes</u>
Were all samples analyzed and extracted within hold times?:	<u>Yes</u>
Has lab warranted all tests were in statistical control in CoA?:	<u>Yes</u>
Was sufficient sample provided for the requested analysis?	<u>Yes</u>
Has lab warranted all samples were analyzed with limited headspace present?:	<u>Yes</u>

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Surrogate Recovery	X			All laboratory QC results are within acceptance criteria.
Method Blank Concentration	X			
Laboratory Duplicate RPD	X			
Matrix Spike Recovery	X			
Blank Spike Recovery	X			


Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Field Blank Concentration			X	All field QC samples are within alert limits.
Trip Blank Concentration			X	
Field Duplicate RPD	X			

Is data considered reliable (Yes/No/Suspect)?: Yes

If answer is "No" or "Suspect", describe and provide rationale:

Data Reviewed by (Print): Jenny Musijowski

Data Reviewed by (Signature): 

Date: October 27, 2016

Your Project #: 1529387-6000  
Site Location: E/A  
Your C.O.C. #: m013257, m013258

**Attention: Steven Fiddler**

GOLDER ASSOCIATES LTD  
16820-107 AVE  
EDMONTON, AB  
CANADA T5P 4C3

**Report Date: 2016/06/03**

Report #: R2190985

Version: 1 - Final

**CERTIFICATE OF ANALYSIS**

**MAXXAM JOB #: B641208**

**Received: 2016/05/26, 16:14**

Sample Matrix: Water  
# Samples Received: 12

<b>Analyses</b>	<b>Quantity</b>	<b>Date Extracted</b>	<b>Date Analyzed</b>	<b>Laboratory Method</b>	<b>Analytical Method</b>
BTEX/F1 in Water by HS GC/MS/FID	12	N/A	2016/05/31	AB SOP-00039	CCME CWS/EPA 8260c m
CCME Hydrocarbons in Water (F2; C10-C16)	1	2016/05/30	2016/05/30	AB SOP-00040 / AB SOP-00037	CCME PHC-CWS m
CCME Hydrocarbons in Water (F2; C10-C16)	11	2016/05/31	2016/06/02	AB SOP-00040 / AB SOP-00037	CCME PHC-CWS m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

**Encryption Key**

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Alaina Hunter, Dip. BioSci, Project Manager, Environmental

Email: AHunter@maxxam.ca

Phone# (780)577-7139

=====

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B641208  
Report Date: 2016/06/03

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: E/A  
Sampler Initials: JC

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
OS0658 BH59M Sampling Date 2016/05/26 09:45 Matrix W <b>PETROLEUM HYDROCARBONS (CCME)</b> <b>Ext. Pet. Hydrocarbon</b> F2 (C10-C16 Hydrocarbons) <0.10 0.10 mg/L N/A 2016/05/31 2016/06/02 GG3 8281738 O-TERPHENYL (sur.) 103 50 - 130 % N/A 2016/05/31 2016/06/02 GG3 8281738 <b>VOLATILE ORGANICS BY GC-MS (WATER)</b> <b>Volatiles</b> Benzene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Toluene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Ethylbenzene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 m & p-Xylene <0.80 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 o-Xylene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Xylenes (Total) <0.80 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) - BTEX <100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) <100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 1,4-Difluorobenzene (sur.) 100 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 4-Bromofluorobenzene (sur.) 96 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 D4-1,2-Dichloroethane (sur.) 118 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710								
OS0659 BH58M Sampling Date 2016/05/26 10:10 Matrix W <b>PETROLEUM HYDROCARBONS (CCME)</b> <b>Ext. Pet. Hydrocarbon</b> F2 (C10-C16 Hydrocarbons) <0.10 0.10 mg/L N/A 2016/05/31 2016/06/02 GG3 8281738 O-TERPHENYL (sur.) 99 50 - 130 % N/A 2016/05/31 2016/06/02 GG3 8281738 <b>VOLATILE ORGANICS BY GC-MS (WATER)</b> <b>Volatiles</b> Benzene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Toluene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Ethylbenzene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 m & p-Xylene <0.80 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 o-Xylene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Xylenes (Total) <0.80 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) - BTEX <100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) <100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 1,4-Difluorobenzene (sur.) 102 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 4-Bromofluorobenzene (sur.) 97 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 D4-1,2-Dichloroethane (sur.) 116 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710								
OS0660 BH48M Sampling Date 2016/05/26 10:30 Matrix W <b>PETROLEUM HYDROCARBONS (CCME)</b> <b>Ext. Pet. Hydrocarbon</b> F2 (C10-C16 Hydrocarbons) <0.10 0.10 mg/L N/A 2016/05/31 2016/06/02 GG3 8281738 O-TERPHENYL (sur.) 98 50 - 130 % N/A 2016/05/31 2016/06/02 GG3 8281738 <b>VOLATILE ORGANICS BY GC-MS (WATER)</b> <b>Volatiles</b> Benzene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Toluene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Ethylbenzene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 m & p-Xylene <0.80 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 o-Xylene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Xylenes (Total) <0.80 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710								



Maxxam Job #: B641208  
Report Date: 2016/06/03

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: E/A  
Sampler Initials: JC

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
OS0663 MW75-14 Sampling Date 2016/05/26 12:20 Matrix W <b>PETROLEUM HYDROCARBONS (CCME)</b> <b>Ext. Pet. Hydrocarbon</b> F2 (C10-C16 Hydrocarbons) 2.4 0.10 mg/L +/- 0.96 2016/05/31 2016/06/02 GG3 8281738 O-TERPHENYL (sur.) 99 50 - 130 % N/A 2016/05/31 2016/06/02 GG3 8281738 <b>VOLATILE ORGANICS BY GC-MS (WATER)</b> <b>Volatiles</b> Benzene 2100(1) 4.0 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Toluene 150 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Ethylbenzene 550 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 m & p-Xylene 980 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 o-Xylene 12 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Xylenes (Total) 990 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) - BTEX 2200 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) 6100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 1,4-Difluorobenzene (sur.) 98 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 4-Bromofluorobenzene (sur.) 100 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 D4-1,2-Dichloroethane (sur.) 119 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710								
OS0664 DUP16-02 Sampling Date 2016/05/26 12:20 Matrix W <b>PETROLEUM HYDROCARBONS (CCME)</b> <b>Ext. Pet. Hydrocarbon</b> F2 (C10-C16 Hydrocarbons) 2.6 0.10 mg/L +/- 1.0 2016/05/31 2016/06/02 GG3 8281738 O-TERPHENYL (sur.) 101 50 - 130 % N/A 2016/05/31 2016/06/02 GG3 8281738 <b>VOLATILE ORGANICS BY GC-MS (WATER)</b> <b>Volatiles</b> Benzene 2100(1) 4.0 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Toluene 150 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Ethylbenzene 520 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 m & p-Xylene 950 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 o-Xylene 12 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Xylenes (Total) 960 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) - BTEX 1900 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) 5600 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 1,4-Difluorobenzene (sur.) 98 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 4-Bromofluorobenzene (sur.) 101 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 D4-1,2-Dichloroethane (sur.) 118 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710								
OS0665 BH50M Sampling Date 2016/05/26 13:15 Matrix W <b>PETROLEUM HYDROCARBONS (CCME)</b> <b>Ext. Pet. Hydrocarbon</b> F2 (C10-C16 Hydrocarbons) <0.10 0.10 mg/L N/A 2016/05/30 2016/05/30 SHM 8281721 O-TERPHENYL (sur.) 104 50 - 130 % N/A 2016/05/30 2016/05/30 SHM 8281721 <b>VOLATILE ORGANICS BY GC-MS (WATER)</b> <b>Volatiles</b> Benzene 30 0.40 ug/L +/- 4.2 2016/05/31 2016/05/31 SES 8281710 Toluene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Ethylbenzene 2.1 0.40 ug/L +/- 0.48 2016/05/31 2016/05/31 SES 8281710 m & p-Xylene 2.5 0.80 ug/L +/- <RDL 2016/05/31 2016/05/31 SES 8281710 o-Xylene 0.49 0.40 ug/L +/- <RDL 2016/05/31 2016/05/31 SES 8281710								

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B641208  
Report Date: 2016/06/03

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: E/A  
Sampler Initials: JC

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
OS0665 BH50M Sampling Date 2016/05/26 13:15 Matrix W <b>VOLATILE ORGANICS BY GC-MS (WATER)</b> <b>Volatiles</b> Xylenes (Total) 3.0 0.80 ug/L +/- 0.89 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) - BTEX <100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) <100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 1,4-Difluorobenzene (sur.) 102 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 4-Bromofluorobenzene (sur.) 96 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 D4-1,2-Dichloroethane (sur.) 116 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710								
OS0666 MW76-14 Sampling Date 2016/05/26 13:45 Matrix W <b>PETROLEUM HYDROCARBONS (CCME)</b> <b>Ext. Pet. Hydrocarbon</b> F2 (C10-C16 Hydrocarbons) 2.0 0.10 mg/L +/- 0.82 2016/05/31 2016/06/02 GG3 8281738 O-TERPHENYL (sur.) 100 50 - 130 % N/A 2016/05/31 2016/06/02 GG3 8281738 <b>VOLATILE ORGANICS BY GC-MS (WATER)</b> <b>Volatiles</b> Benzene 19000(1) 40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Toluene 3100(1) 40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Ethylbenzene 840 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 m & p-Xylene 1800 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 o-Xylene 610 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Xylenes (Total) 2400 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) - BTEX <100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) 21000 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 1,4-Difluorobenzene (sur.) 94 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 4-Bromofluorobenzene (sur.) 98 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 D4-1,2-Dichloroethane (sur.) 120 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710								
OS0667 BH54M Sampling Date 2016/05/26 14:20 Matrix W <b>PETROLEUM HYDROCARBONS (CCME)</b> <b>Ext. Pet. Hydrocarbon</b> F2 (C10-C16 Hydrocarbons) <0.10 0.10 mg/L N/A 2016/05/31 2016/06/02 GG3 8281738 O-TERPHENYL (sur.) 101 50 - 130 % N/A 2016/05/31 2016/06/02 GG3 8281738 <b>VOLATILE ORGANICS BY GC-MS (WATER)</b> <b>Volatiles</b> Benzene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Toluene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Ethylbenzene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 m & p-Xylene <0.80 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 o-Xylene <0.40 0.40 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 Xylenes (Total) <0.80 0.80 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) - BTEX <100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 F1 (C6-C10) <100 100 ug/L N/A 2016/05/31 2016/05/31 SES 8281710 1,4-Difluorobenzene (sur.) 99 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 4-Bromofluorobenzene (sur.) 99 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710 D4-1,2-Dichloroethane (sur.) 113 70 - 130 % N/A 2016/05/31 2016/05/31 SES 8281710								

(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B641208  
Report Date: 2016/06/03

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: E/A  
Sampler Initials: JC

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
OS0671 BH55M Sampling Date 2016/05/26 14:50 Matrix W								
<b>PETROLEUM HYDROCARBONS (CCME)</b>								
<b>Ext. Pet. Hydrocarbon</b>								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2016/05/31	2016/06/02	GG3	8281738
O-TERPHENYL (sur.)	102	50 - 130	%	N/A	2016/05/31	2016/06/02	GG3	8281738
<b>VOLATILE ORGANICS BY GC-MS (WATER)</b>								
<b>Volatiles</b>								
Benzene	<0.40	0.40	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
Toluene	<0.40	0.40	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
Ethylbenzene	<0.40	0.40	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
m & p-Xylene	<0.80	0.80	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
o-Xylene	<0.40	0.40	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
F1 (C6-C10)	<100	100	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
1,4-Difluorobenzene (sur.)	105	70 - 130	%	N/A	2016/05/31	2016/05/31	SES	8281710
4-Bromofluorobenzene (sur.)	95	70 - 130	%	N/A	2016/05/31	2016/05/31	SES	8281710
D4-1,2-Dichloroethane (sur.)	109	70 - 130	%	N/A	2016/05/31	2016/05/31	SES	8281710
OS0672 BH64M Sampling Date 2016/05/26 15:20 Matrix W								
<b>PETROLEUM HYDROCARBONS (CCME)</b>								
<b>Ext. Pet. Hydrocarbon</b>								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2016/05/31	2016/06/02	GG3	8281738
Dup.F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2016/05/31	2016/06/02	GG3	8281738
O-TERPHENYL (sur.)	100	50 - 130	%	N/A	2016/05/31	2016/06/02	GG3	8281738
Dup.O-TERPHENYL (sur.)	106	50 - 130	%	N/A	2016/05/31	2016/06/02	GG3	8281738
<b>VOLATILE ORGANICS BY GC-MS (WATER)</b>								
<b>Volatiles</b>								
Benzene	<0.40	0.40	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
Toluene	<0.40	0.40	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
Ethylbenzene	<0.40	0.40	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
m & p-Xylene	<0.80	0.80	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
o-Xylene	<0.40	0.40	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
F1 (C6-C10)	<100	100	ug/L	N/A	2016/05/31	2016/05/31	SES	8281710
1,4-Difluorobenzene (sur.)	100	70 - 130	%	N/A	2016/05/31	2016/05/31	SES	8281710
4-Bromofluorobenzene (sur.)	96	70 - 130	%	N/A	2016/05/31	2016/05/31	SES	8281710
D4-1,2-Dichloroethane (sur.)	117	70 - 130	%	N/A	2016/05/31	2016/05/31	SES	8281710

Maxxam Job #: B641208  
Report Date: 2016/06/03

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: E/A  
Sampler Initials: JC

### GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	9.7°C
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Results relate only to the items tested.

Maxxam Job #: B641208  
Report Date: 2016/06/03

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: E/A  
Sampler Initials: JC

### QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8281710	SES	Matrix Spike	1,4-Difluorobenzene (sur.)	2016/05/30		102	%	70 - 130
			4-Bromofluorobenzene (sur.)	2016/05/30		97	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2016/05/30		118	%	70 - 130
			Benzene	2016/05/30		107	%	70 - 130
			Toluene	2016/05/30		97	%	70 - 130
			Ethylbenzene	2016/05/30		99	%	70 - 130
			m & p-Xylene	2016/05/30		98	%	70 - 130
			o-Xylene	2016/05/30		100	%	70 - 130
			F1 (C6-C10)	2016/05/30		78	%	70 - 130
8281710	SES	Spiked Blank	1,4-Difluorobenzene (sur.)	2016/05/31		101	%	70 - 130
			4-Bromofluorobenzene (sur.)	2016/05/31		96	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2016/05/31		118	%	70 - 130
			Benzene	2016/05/31		109	%	70 - 130
			Toluene	2016/05/31		97	%	70 - 130
			Ethylbenzene	2016/05/31		100	%	70 - 130
			m & p-Xylene	2016/05/31		98	%	70 - 130
			o-Xylene	2016/05/31		103	%	70 - 130
			F1 (C6-C10)	2016/05/31		91	%	70 - 130
8281710	SES	Method Blank	1,4-Difluorobenzene (sur.)	2016/05/31		100	%	70 - 130
			4-Bromofluorobenzene (sur.)	2016/05/31		96	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2016/05/31		117	%	70 - 130
			Benzene	2016/05/31	<0.40		ug/L	
			Toluene	2016/05/31	<0.40		ug/L	
			Ethylbenzene	2016/05/31	<0.40		ug/L	
			m & p-Xylene	2016/05/31	<0.80		ug/L	
			o-Xylene	2016/05/31	<0.40		ug/L	
			Xylenes (Total)	2016/05/31	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2016/05/31	<100		ug/L	
			F1 (C6-C10)	2016/05/31	<100		ug/L	
8281710	SES	RPD	Benzene	2016/05/31	NC		%	40
			Toluene	2016/05/31	NC		%	40
			Ethylbenzene	2016/05/31	NC		%	40
			m & p-Xylene	2016/05/31	NC		%	40
			o-Xylene	2016/05/31	NC		%	40
			Xylenes (Total)	2016/05/31	NC		%	40
			F1 (C6-C10) - BTEX	2016/05/31	NC		%	40
			F1 (C6-C10)	2016/05/31	NC		%	40
8281721	SHM	Matrix Spike	O-TERPHENYL (sur.)	2016/05/30		107	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/05/30		NC	%	50 - 130
8281721	SHM	Spiked Blank	O-TERPHENYL (sur.)	2016/05/30		103	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/05/30		110	%	70 - 130
8281721	SHM	Method Blank	O-TERPHENYL (sur.)	2016/05/30		106	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/05/30	<0.10		mg/L	
8281721	SHM	RPD	F2 (C10-C16 Hydrocarbons)	2016/05/30	NC		%	40
8281738	GG3	Matrix Spike [OS0666-01]	O-TERPHENYL (sur.)	2016/06/02		99	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/06/02		NC	%	50 - 130
8281738	GG3	Spiked Blank	O-TERPHENYL (sur.)	2016/06/02		101	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/06/02		105	%	70 - 130
8281738	GG3	Method Blank	O-TERPHENYL (sur.)	2016/06/02		96	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/06/02	<0.10		mg/L	

Maxxam Job #: B641208  
Report Date: 2016/06/03

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: E/A  
Sampler Initials: JC

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8281738	GG3	RPD [OS0672-01]	F2 (C10-C16 Hydrocarbons)	2016/06/02	NC		%	40
<p>Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.</p> <p>Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.</p> <p>Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.</p> <p>Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.</p> <p>Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.</p> <p>NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).</p> <p>NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples &lt; 5x RDL).</p>								

Maxxam Job #: B641208  
Report Date: 2016/06/03

GOLDER ASSOCIATES LTD  
Client Project #: 1529387-6000  
Site Location: E/A  
Sampler Initials: JC

### VALIDATION SIGNATURE PAGE

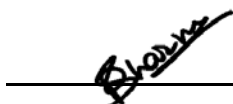
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Anna Koksharova, M.Sc., Organics Senior Analyst



Bert Chi, M.Sc., Organics Senior Analyst



Poonam Sharma, cCT, Organics Senior Analyst

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Invoice Information				Report information (if differs from invoice)				Project Information				Turnaround Time (TAT) Required			
Company: <b>Golder Associates</b>				Company:								<input checked="" type="checkbox"/> 5 - 7 Days Regular (Most analyses) <input type="checkbox"/> Rush TAT (Surcharges will be applied)			
Contact Name: <b>Steven Fidler</b>				Contact Name:											
Address: <b>16820 107 Ave Edmonton AB T5K 0A8</b>				Address:											
Phone: <b>780-483-3499 / 780-984-6600</b>				Phone:											
Email: <b>sfdider@golder.com</b>				Email:											
Copies: <b>jchenmula@golder.com</b>				Copies:											

Laboratory Use Only					Depot Reception					Analysis Requested										Regulatory Criteria																					
Sample Identification		Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	# of containers	BTEX FI-F2				Routine Water				Regulated Metals				Mercury				Salinity &				Texture (% Sand, silt, Clay)				Basic Class II Landfill				<div>HOLD - DO NOT ANALYZE</div>				Special Instructions			
						BTEX FI	VOC	F1	F2	Routine Water	Total	Dissolved	Methyl Mercury	Total	Dissolved	Sulfate	Cyanide	Pb/Cr/VI/F2	TSS	Clay	Leachate	Drinking Water	Saskatchewan DSO (Drilling Waste)	Other:																	
1 BH 59 M	-	24605/26	9:45	6:00	4																					X AT/CCME															
2 BH 53 M	-		10:30		4																																				
3 BH 48 M	-		11:15		4																																				
4 MW 74-14	-		11:40		4																																				
5 MW 82-15	-		12:20		4																																				
6 MW 75-14	-		12:20		4																																				
DUPIG-OZ	-		13:15		4																																				
BH 50 M	-		13:45		4																																				
MW 76-14	-		14:00		4																																				
BH 54 M	-				4																																				

Please indicate Filtered, Preserved or Both (F, P, F/P) →

Relinquished by: (Signature/ Print)		DATE (YYYY/MM/DD)		Time (HH:MM)		Received by: (Signature/ Print)		DATE (YYYY/MM/DD)		Time (HH:MM)		Maxxam Job #	
J Chenmula		201605/26		16:10		[Signature]		201605/26		16:14		B641208 JWF	

Invoice Information				Report Information (if differs from invoice)				Project Information				Turnaround Time (TAT) Required			
Company: <b>Golden Associates</b>				Company: _____				Quotation #: _____				<input checked="" type="checkbox"/> 5-7 Days Regular (Most analyses)			
Contact Name: <b>Steven Fidler</b>				Contact Name: _____				P.O. #/ A/E# : _____				PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS			
Address: <b>16820 103 Ave</b>				Address: _____				Project #: <b>1529387-6000</b>				Rush TAT (Surcharges will be applied)			
Phone: <b>780 483 3499 / 780 846 6000</b>				Phone: _____				Site Location: <b>E1A</b>				<input type="checkbox"/> Same Day <input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3-4 Days			
Email: <b>sfidler@golder.com</b>				Email: <b>sfidler@golder.com</b>				Site #: _____				Date Required: _____			
Copies: <b>jchenula@golder.com</b>				Copies: _____				Sampled By: <b>J. Chenula</b>				Rush Confirmation #: _____			

Laboratory Use Only				Analysis Requested				Regulatory Criteria							
Depot Reception				Analysis Requested				Regulatory Criteria							
Sample Identification	Depth (Unit)	Date Sampled (YYYY/MM/DD)	Time Sampled (HH:MM)	Matrix	Regulated Metals	Mercury	Salinity	Sieve (75 micron)	Texture (% Sand, Silt, Clay)	Basic Class II Landfill	AT1/CCME	Drinking Water	Saskatchewan	D50 (Drilling Waste)	Other:
1 BH 55 M	-	2016/05/26	1450	CU	BTEX F1-F4	BTEX F1	BTEX F1-F2	BTEX F1	VOC	Basic Class II Landfill	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 BH 64 M	-	2016/05/26	1510	CU	BTEX F1-F4	BTEX F1	BTEX F1-F2	BTEX F1	VOC	Basic Class II Landfill	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3															
4															
5															
6															
7															
8															
9															
10															

Relinquished by: (Signature/ Print) **Steve Fidler**

DATE (YYYY/MM/DD) **2016/05/26**

Received by: (Signature/ Print) **J. Chenula**

DATE (YYYY/MM/DD) **2016/05/26**

Time (HH:MM) **16:14**

Time (HH:MM) **16:14**

Please indicate Filtered, Preserved or Both (F, P, F/P) →

Maxxam Job # **B641208 JWP**

**GOLDER DATA QUALITY REVIEW CHECKLIST**

Site Location: PWGSC - EIA

Sampling Date: September 19, 2016

Golder Project Number: 1657760

Laboratory: Maxxam Edmonton

Lab Submission Number: B681163

Was the Cooler Received at the lab under a sealed and intact custody seal?

Yes

Was proper chain of custody of the samples documented and kept?

Yes

Were sample temperatures acceptable when they reached lab?:

Yes

Were all samples analyzed and extracted within hold times?:

Yes

Has lab warranted all tests were in statistical control in CoA?:

Yes

Was sufficient sample provided for the requested analysis?

Yes

Has lab warranted all samples were analyzed with limited headspace present?:

Yes

Are All Laboratory QC Within Acceptance Criteria (Yes, No, Not Applicable)?

	Yes	No	NA	Comments
Surrogate Recovery	X			All laboratory QC results are within acceptance criteria.
Method Blank Concentration	X			
Laboratory Duplicate RPD	X			
Matrix Spike Recovery	X			
Blank Spike Recovery	X			

Are All Field QC Samples Within Alert Limits (Yes, No, Not Applicable)?


	Yes	No	NA	Comments
Field Blank Concentration			X	No field QC samples were collected.
Trip Blank Concentration			X	
Field Duplicate RPD			X	

Is data considered reliable (Yes/No/Suspect)?:

Yes

If answer is "No" or "Suspect", describe and provide rationale:

Data Reviewed by (Print): Jenny Musijowski

Data Reviewed by (Signature): 

Date: September 27, 2016

Your Project #: 1657760, AOMC  
Site Location: EIA  
Your C.O.C. #: M17812

**Attention: Steven Fiddler**

GOLDER ASSOCIATES LTD  
16820-107 AVE  
EDMONTON, AB  
CANADA T5P 4C3

**Report Date: 2016/09/21**  
Report #: R2265485  
Version: 2 - Revision

**CERTIFICATE OF ANALYSIS – REVISED REPORT**

**MAXXAM JOB #: B681163**

**Received: 2016/09/19, 14:44**

Sample Matrix: Water  
# Samples Received: 1

<b>Analyses</b>	<b>Quantity</b>	<b>Date Extracted</b>	<b>Date Analyzed</b>	<b>Laboratory Method</b>	<b>Analytical Method</b>
Alkalinity @25C (pp, total), CO <sub>3</sub> ,HCO <sub>3</sub> ,OH	1	N/A	2016/09/20	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	1	N/A	2016/09/20	AB SOP-00039	CCME CWS/EPA 8260c m
Cadmium - low level CCME (Total)	1	N/A	2016/09/20	AB WI-00065	Auto Calc
Chloride by Automated Colourimetry	1	N/A	2016/09/20	AB SOP-00020	SM 22 4500-Cl G m
Conductivity @25C	1	N/A	2016/09/20	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16)	1	2016/09/20	2016/09/20	AB SOP-00040 / AB SOP-00037	CCME PHC-CWS m
Hardness	1	N/A	2016/09/20	AB WI-00065	Auto Calc
Elements by ICP-Dissolved-Lab Filtered	1	N/A	2016/09/20	AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICP - Total	1	2016/09/20	2016/09/20	AB SOP-00014 / AB SOP-00042	EPA 200.7 CFR 2012 m
Elements by ICPMS - Total	1	2016/09/20	2016/09/20	AB SOP-00014 / AB SOP-00043	EPA 200.8 R5.4 m
Ion Balance	1	N/A	2016/09/20	AB WI-00065	Auto Calc
Sum of cations, anions	1	N/A	2016/09/20	AB WI-00065	Auto Calc
Nitrate and Nitrite	1	N/A	2016/09/20	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	1	N/A	2016/09/20	AB WI-00065	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	1	N/A	2016/09/20	AB SOP-00023	SM 22 4110 B m
pH @25°C	1	N/A	2016/09/20	AB SOP-00005	SM 22 4500 H+ B m
Sulphate by Automated Colourimetry	1	N/A	2016/09/20	AB SOP-00018	SM 22 4500-SO <sub>4</sub> E m
Total Dissolved Solids (Calculated)	1	N/A	2016/09/20	AB WI-00065	Auto Calc

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

Your Project #: 1657760, AOMC  
Site Location: EIA  
Your C.O.C. #: M17812

**Attention: Steven Fiddler**

GOLDER ASSOCIATES LTD  
16820-107 AVE  
EDMONTON, AB  
CANADA T5P 4C3

**Report Date: 2016/09/21**  
Report #: R2265485  
Version: 2 - Revision

**CERTIFICATE OF ANALYSIS – REVISED REPORT**

**MAXXAM JOB #: B681163**

**Received: 2016/09/19, 14:44**

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Alaina Hunter, Dip. BioSci, Project Manager, Environmental

Email: AHunter@maxxam.ca

Phone# (780)577-7139

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Job #: B681163  
Report Date: 2016/09/21

GOLDER ASSOCIATES LTD  
Client Project #: 1657760, AOMC  
Site Location: EIA  
Sampler Initials: RB

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
PN8028 LTF-WS16-01								
Sampling Date	2016/09/19							
Matrix	W							
Sample #	LTF-WS16-01							
<b>RESULTS OF CHEMICAL ANALYSES OF WATER</b>								
<b>Calculated Parameters</b>								
Anion Sum	1.6	N/A	meq/L	N/A	2016/09/20	2016/09/20		8402300
Cation Sum	1.7	N/A	meq/L	N/A	2016/09/20	2016/09/20		8402300
Hardness (CaCO3)	70	0.50	mg/L	N/A	2016/09/20	2016/09/20		8402298
Ion Balance	1.1	0.010	N/A	N/A	2016/09/20	2016/09/20		8402299
Dissolved Nitrate (NO3)	<0.044	0.044	mg/L	N/A	2016/09/20	2016/09/20		8402301
Nitrate plus Nitrite (N)	<0.020	0.020	mg/L	N/A	2016/09/20	2016/09/20		8402302
Dissolved Nitrite (NO2)	<0.033	0.033	mg/L	N/A	2016/09/20	2016/09/20		8402301
Calculated Total Dissolved Solids	86	10	mg/L	N/A	2016/09/20	2016/09/20		8402304
<b>Misc. Inorganics</b>								
Conductivity	160	1.0	uS/cm	+/- 15	2016/09/20	2016/09/20	MA4	8403952
pH	9.64	N/A	pH	+/- 0.140	2016/09/20	2016/09/20	MA4	8403948
<b>Low Level Elements</b>								
Total Cadmium (Cd)	<0.020	0.020	ug/L	N/A	2016/09/20	2016/09/20		8403291
<b>Anions</b>								
Dissolved Chloride (Cl)	2.7	1.0	mg/L	+/- <RDL	2016/09/20	2016/09/20	KD5	8403321
Alkalinity (PP as CaCO3)	14	0.50	mg/L	+/- 2.8	2016/09/20	2016/09/20	MA4	8403951
Alkalinity (Total as CaCO3)	69	0.50	mg/L	+/- 3.2	2016/09/20	2016/09/20	MA4	8403951
Bicarbonate (HCO3)	49	0.50	mg/L	+/- 18	2016/09/20	2016/09/20	MA4	8403951
Carbonate (CO3)	17	0.50	mg/L	N/A	2016/09/20	2016/09/20	MA4	8403951
Hydroxide (OH)	<0.50	0.50	mg/L	N/A	2016/09/20	2016/09/20	MA4	8403951
Dissolved Sulphate (SO4)	9.1	1.0	mg/L	+/- 1.9	2016/09/20	2016/09/20	KD5	8403326
<b>Nutrients</b>								
Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2016/09/20	2016/09/20	LMD	8404246
Dup.Dissolved Nitrite (N)	<0.010	0.010	mg/L	N/A	2016/09/20	2016/09/20	LMD	8404246
Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2016/09/20	2016/09/20	LMD	8404246
Dup.Dissolved Nitrate (N)	<0.010	0.010	mg/L	N/A	2016/09/20	2016/09/20	LMD	8404246
<b>PETROLEUM HYDROCARBONS (CCME)</b>								
<b>Ext. Pet. Hydrocarbon</b>								
F2 (C10-C16 Hydrocarbons)	<0.10	0.10	mg/L	N/A	2016/09/20	2016/09/20	PK4	8401562
O-TERPHENYL (sur.)	106	50 - 130	%	N/A	2016/09/20	2016/09/20	PK4	8401562
<b>ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)</b>								
<b>Elements</b>								
Total Aluminum (Al)	0.042	0.0030	mg/L	+/- 0.012	2016/09/20	2016/09/20	APY	8404154
Total Antimony (Sb)	0.0024	0.00060	mg/L	+/- 0.0011	2016/09/20	2016/09/20	APY	8404154
Total Arsenic (As)	0.040	0.00020	mg/L	+/- 0.0065	2016/09/20	2016/09/20	APY	8404154
Total Barium (Ba)	0.046	0.010	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Barium (Ba)	0.047	0.010	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Total Beryllium (Be)	<0.0010	0.0010	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
Total Boron (B)	0.11	0.020	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Boron (B)	0.11	0.020	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Total Calcium (Ca)	15	0.30	mg/L	+/- 1.5	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Calcium (Ca)	15	0.30	mg/L	+/- 1.5	2016/09/20	2016/09/20	PM5	8404156
Total Chromium (Cr)	<0.0010	0.0010	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
Total Cobalt (Co)	<0.00030	0.00030	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
Total Copper (Cu)	0.0023	0.00020	mg/L	+/- 0.00050	2016/09/20	2016/09/20	APY	8404154
Total Iron (Fe)	0.073	0.060	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Iron (Fe)	0.072	0.060	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Total Lead (Pb)	<0.00020	0.00020	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
Total Lithium (Li)	<0.020	0.020	mg/L	N/A	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Lithium (Li)	<0.020	0.020	mg/L	N/A	2016/09/20	2016/09/20	PM5	8404156
Total Magnesium (Mg)	7.9	0.20	mg/L	+/- 0.66	2016/09/20	2016/09/20	PM5	8404156

Maxxam Job #: B681163  
Report Date: 2016/09/21

GOLDER ASSOCIATES LTD  
Client Project #: 1657760, AOMC  
Site Location: EIA  
Sampler Initials: RB

Sample Details/Parameters	Result	RDL	UNITS	MU	Extracted	Analyzed	By	Batch
PN8028 LTF-WS16-01								
Sampling Date 2016/09/19								
Matrix W								
Sample # LTF-WS16-01								
<b>ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)</b>								
<b>Elements</b>								
Dup.Total Magnesium (Mg)	8.1	0.20	mg/L	+/- 0.68	2016/09/20	2016/09/20	PM5	8404156
Total Manganese (Mn)	0.0048	0.0040	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Manganese (Mn)	0.0049	0.0040	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Total Molybdenum (Mo)	0.0033	0.00020	mg/L	+/- 0.00058	2016/09/20	2016/09/20	APY	8404154
Total Nickel (Ni)	0.0013	0.00050	mg/L	+/- <RDL	2016/09/20	2016/09/20	APY	8404154
Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Phosphorus (P)	<0.10	0.10	mg/L	N/A	2016/09/20	2016/09/20	PM5	8404156
Total Potassium (K)	4.1	0.30	mg/L	+/- 0.45	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Potassium (K)	4.2	0.30	mg/L	+/- 0.46	2016/09/20	2016/09/20	PM5	8404156
Total Selenium (Se)	<0.00020	0.00020	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
Total Silicon (Si)	0.60	0.10	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Silicon (Si)	0.62	0.10	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Total Silver (Ag)	<0.00010	0.00010	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
Total Sodium (Na)	5.8	0.50	mg/L	+/- 0.75	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Sodium (Na)	5.9	0.50	mg/L	+/- 0.76	2016/09/20	2016/09/20	PM5	8404156
Total Strontium (Sr)	0.15	0.020	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Strontium (Sr)	0.15	0.020	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404156
Total Sulphur (S)	3.1	0.20	mg/L	+/- 0.21	2016/09/20	2016/09/20	PM5	8404156
Dup.Total Sulphur (S)	3.2	0.20	mg/L	+/- 0.21	2016/09/20	2016/09/20	PM5	8404156
Total Thallium (Tl)	<0.00020	0.00020	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
Total Tin (Sn)	<0.0010	0.0010	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
Total Titanium (Ti)	<0.0010	0.0010	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
Total Uranium (U)	0.00093	0.00010	mg/L	+/- 0.00012	2016/09/20	2016/09/20	APY	8404154
Total Vanadium (V)	0.0046	0.0010	mg/L	+/- 0.0018	2016/09/20	2016/09/20	APY	8404154
Total Zinc (Zn)	<0.0030	0.0030	mg/L	N/A	2016/09/20	2016/09/20	APY	8404154
<b>Lab Filtered Elements</b>								
Dissolved Calcium (Ca)	15	0.30	mg/L	+/- 0.99	2016/09/20	2016/09/20	PM5	8404445
Dup.Dissolved Calcium (Ca)	15	0.30	mg/L	+/- 0.98	2016/09/20	2016/09/20	PM5	8404445
Dissolved Iron (Fe)	<0.060	0.060	mg/L	N/A	2016/09/20	2016/09/20	PM5	8404445
Dup.Dissolved Iron (Fe)	<0.060	0.060	mg/L	N/A	2016/09/20	2016/09/20	PM5	8404445
Dissolved Magnesium (Mg)	7.9	0.20	mg/L	+/- 0.43	2016/09/20	2016/09/20	PM5	8404445
Dup.Dissolved Magnesium (Mg)	7.9	0.20	mg/L	+/- 0.43	2016/09/20	2016/09/20	PM5	8404445
Dissolved Manganese (Mn)	<0.0040	0.0040	mg/L	N/A	2016/09/20	2016/09/20	PM5	8404445
Dup.Dissolved Manganese (Mn)	<0.0040	0.0040	mg/L	N/A	2016/09/20	2016/09/20	PM5	8404445
Dissolved Potassium (K)	4.0	0.30	mg/L	+/- 0.32	2016/09/20	2016/09/20	PM5	8404445
Dup.Dissolved Potassium (K)	4.0	0.30	mg/L	+/- 0.32	2016/09/20	2016/09/20	PM5	8404445
Dissolved Sodium (Na)	5.6	0.50	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404445
Dup.Dissolved Sodium (Na)	5.7	0.50	mg/L	+/- <RDL	2016/09/20	2016/09/20	PM5	8404445
<b>VOLATILE ORGANICS BY GC-MS (WATER)</b>								
<b>Volatiles</b>								
Benzene	<0.40	0.40	ug/L	N/A	2016/09/21	2016/09/21	HG3	8404610
Toluene	<0.40	0.40	ug/L	N/A	2016/09/21	2016/09/21	HG3	8404610
Ethylbenzene	<0.40	0.40	ug/L	N/A	2016/09/20	2016/09/20	HG3	8402414
m & p-Xylene	<0.80	0.80	ug/L	N/A	2016/09/20	2016/09/20	HG3	8402414
o-Xylene	<0.40	0.40	ug/L	N/A	2016/09/20	2016/09/20	HG3	8402414
Xylenes (Total)	<0.80	0.80	ug/L	N/A	2016/09/20	2016/09/20	HG3	8402414
F1 (C6-C10) - BTEX	<100	100	ug/L	N/A	2016/09/20	2016/09/20	HG3	8402414
F1 (C6-C10)	<100	100	ug/L	N/A	2016/09/20	2016/09/20	HG3	8402414
1,4-Difluorobenzene (sur.)	101	70 - 130	%	N/A	2016/09/20	2016/09/20	HG3	8402414
4-Bromofluorobenzene (sur.)	97	70 - 130	%	N/A	2016/09/20	2016/09/20	HG3	8402414
D4-1,2-Dichloroethane (sur.)	97	70 - 130	%	N/A	2016/09/20	2016/09/20	HG3	8402414

Maxxam Job #: B681163  
Report Date: 2016/09/21

GOLDER ASSOCIATES LTD  
Client Project #: 1657760, AOMC  
Site Location: EIA  
Sampler Initials: RB

### GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	10.0°C
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Sample PN8028, BTEX/F1 in Water by HS GC/MS/FID: Test repeated.

**Results relate only to the items tested.**

Maxxam Job #: B681163  
Report Date: 2016/09/21

GOLDER ASSOCIATES LTD  
Client Project #: 1657760, AOMC  
Site Location: EIA  
Sampler Initials: RB

### QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8401562	PK4	Matrix Spike	O-TERPHENYL (sur.)	2016/09/18		99	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/09/18		95	%	50 - 130
8401562	PK4	Spiked Blank	O-TERPHENYL (sur.)	2016/09/18		99	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/09/18		98	%	70 - 130
8401562	PK4	Method Blank	O-TERPHENYL (sur.)	2016/09/18		96	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2016/09/18	<0.10		mg/L	
8401562	PK4	RPD	F2 (C10-C16 Hydrocarbons)	2016/09/18	NC		%	40
8402414	HG3	Matrix Spike	1,4-Difluorobenzene (sur.)	2016/09/19		99	%	70 - 130
			4-Bromofluorobenzene (sur.)	2016/09/19		99	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2016/09/19		108	%	70 - 130
			Ethylbenzene	2016/09/19		90	%	70 - 130
			m & p-Xylene	2016/09/19		89	%	70 - 130
			o-Xylene	2016/09/19		91	%	70 - 130
			F1 (C6-C10)	2016/09/19		84	%	70 - 130
8402414	HG3	Spiked Blank	1,4-Difluorobenzene (sur.)	2016/09/19		96	%	70 - 130
			4-Bromofluorobenzene (sur.)	2016/09/19		100	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2016/09/19		105	%	70 - 130
			Ethylbenzene	2016/09/19		80	%	70 - 130
			m & p-Xylene	2016/09/19		79	%	70 - 130
			o-Xylene	2016/09/19		81	%	70 - 130
			F1 (C6-C10)	2016/09/19		100	%	70 - 130
8402414	HG3	Method Blank	1,4-Difluorobenzene (sur.)	2016/09/19		97	%	70 - 130
			4-Bromofluorobenzene (sur.)	2016/09/19		101	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2016/09/19		108	%	70 - 130
			Ethylbenzene	2016/09/19	<0.40		ug/L	
			m & p-Xylene	2016/09/19	<0.80		ug/L	
			o-Xylene	2016/09/19	<0.40		ug/L	
			Xylenes (Total)	2016/09/19	<0.80		ug/L	
			F1 (C6-C10) - BTEX	2016/09/19	<100		ug/L	
			F1 (C6-C10)	2016/09/19	<100		ug/L	
8402414	HG3	RPD	Ethylbenzene	2016/09/19	NC		%	40
			m & p-Xylene	2016/09/19	NC		%	40
			o-Xylene	2016/09/19	NC		%	40
			Xylenes (Total)	2016/09/19	NC		%	40
			F1 (C6-C10) - BTEX	2016/09/19	NC		%	40
			F1 (C6-C10)	2016/09/19	NC		%	40
8403321	KD5	Matrix Spike	Dissolved Chloride (Cl)	2016/09/20		105	%	80 - 120
8403321	KD5	Spiked Blank	Dissolved Chloride (Cl)	2016/09/20		103	%	80 - 120
8403321	KD5	Method Blank	Dissolved Chloride (Cl)	2016/09/20	<1.0		mg/L	
8403321	KD5	RPD	Dissolved Chloride (Cl)	2016/09/20	NC		%	20
8403326	KD5	Matrix Spike	Dissolved Sulphate (SO4)	2016/09/20		102	%	80 - 120
8403326	KD5	Spiked Blank	Dissolved Sulphate (SO4)	2016/09/20		102	%	80 - 120
8403326	KD5	Method Blank	Dissolved Sulphate (SO4)	2016/09/20	<1.0		mg/L	
8403326	KD5	RPD	Dissolved Sulphate (SO4)	2016/09/20	NC		%	20
8403948	MA4	Spiked Blank	pH	2016/09/20		100	%	97 - 103
8403948	MA4	RPD	pH	2016/09/20	0.21		%	N/A
8403951	MA4	Spiked Blank	Alkalinity (Total as CaCO3)	2016/09/20		100	%	80 - 120
8403951	MA4	Method Blank	Alkalinity (PP as CaCO3)	2016/09/20	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2016/09/20	<0.50		mg/L	
			Bicarbonate (HCO3)	2016/09/20	<0.50		mg/L	
			Carbonate (CO3)	2016/09/20	<0.50		mg/L	
			Hydroxide (OH)	2016/09/20	<0.50		mg/L	

Maxxam Job #: B681163  
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GOLDER ASSOCIATES LTD  
Client Project #: 1657760, AOMC  
Site Location: EIA  
Sampler Initials: RB

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC				Date				
Batch	Init	QC Type	Parameter	Analyzed	Value	Recovery	UNITS	QC Limits
8403951	MA4	RPD	Alkalinity (PP as CaCO <sub>3</sub> )	2016/09/20	NC		%	20
			Alkalinity (Total as CaCO <sub>3</sub> )	2016/09/20	NC		%	20
			Bicarbonate (HCO <sub>3</sub> )	2016/09/20	NC		%	20
			Carbonate (CO <sub>3</sub> )	2016/09/20	NC		%	20
			Hydroxide (OH)	2016/09/20	NC		%	20
8403952	MA4	Spiked Blank	Conductivity	2016/09/20		99	%	90 - 110
8403952	MA4	Method Blank	Conductivity	2016/09/20	<1.0		uS/cm	
8403952	MA4	RPD	Conductivity	2016/09/20	NC		%	20
8404154	APY	Matrix Spike	Total Aluminum (Al)	2016/09/20		95	%	80 - 120
			Total Antimony (Sb)	2016/09/20		103	%	80 - 120
			Total Arsenic (As)	2016/09/20		101	%	80 - 120
			Total Beryllium (Be)	2016/09/20		101	%	80 - 120
			Total Chromium (Cr)	2016/09/20		103	%	80 - 120
			Total Cobalt (Co)	2016/09/20		101	%	80 - 120
			Total Copper (Cu)	2016/09/20		97	%	80 - 120
			Total Lead (Pb)	2016/09/20		98	%	80 - 120
			Total Molybdenum (Mo)	2016/09/20		110	%	80 - 120
			Total Nickel (Ni)	2016/09/20		101	%	80 - 120
			Total Selenium (Se)	2016/09/20		NC	%	80 - 120
			Total Silver (Ag)	2016/09/20		102	%	80 - 120
			Total Thallium (Tl)	2016/09/20		98	%	80 - 120
			Total Tin (Sn)	2016/09/20		102	%	80 - 120
			Total Titanium (Ti)	2016/09/20		102	%	80 - 120
			Total Uranium (U)	2016/09/20		102	%	80 - 120
			Total Vanadium (V)	2016/09/20		106	%	80 - 120
			Total Zinc (Zn)	2016/09/20		NC	%	80 - 120
8404154	APY	Spiked Blank	Total Aluminum (Al)	2016/09/20		98	%	80 - 120
			Total Antimony (Sb)	2016/09/20		94	%	80 - 120
			Total Arsenic (As)	2016/09/20		99	%	80 - 120
			Total Beryllium (Be)	2016/09/20		97	%	80 - 120
			Total Chromium (Cr)	2016/09/20		102	%	80 - 120
			Total Cobalt (Co)	2016/09/20		102	%	80 - 120
			Total Copper (Cu)	2016/09/20		102	%	80 - 120
			Total Lead (Pb)	2016/09/20		100	%	80 - 120
			Total Molybdenum (Mo)	2016/09/20		103	%	80 - 120
			Total Nickel (Ni)	2016/09/20		101	%	80 - 120
			Total Selenium (Se)	2016/09/20		99	%	80 - 120
			Total Silver (Ag)	2016/09/20		99	%	80 - 120
			Total Thallium (Tl)	2016/09/20		97	%	80 - 120
			Total Tin (Sn)	2016/09/20		97	%	80 - 120
			Total Titanium (Ti)	2016/09/20		99	%	80 - 120
			Total Uranium (U)	2016/09/20		99	%	80 - 120
			Total Vanadium (V)	2016/09/20		103	%	80 - 120
			Total Zinc (Zn)	2016/09/20		98	%	80 - 120
8404154	APY	Method Blank	Total Aluminum (Al)	2016/09/20	<0.0030		mg/L	
			Total Antimony (Sb)	2016/09/20	<0.00060		mg/L	
			Total Arsenic (As)	2016/09/20	<0.00020		mg/L	
			Total Beryllium (Be)	2016/09/20	<0.0010		mg/L	
			Total Chromium (Cr)	2016/09/20	<0.0010		mg/L	
			Total Cobalt (Co)	2016/09/20	<0.00030		mg/L	
			Total Copper (Cu)	2016/09/20	<0.00020		mg/L	
			Total Lead (Pb)	2016/09/20	<0.00020		mg/L	

Maxxam Job #: B681163  
Report Date: 2016/09/21

GOLDER ASSOCIATES LTD  
Client Project #: 1657760, AOMC  
Site Location: EIA  
Sampler Initials: RB

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
				Total Molybdenum (Mo)	2016/09/20	0.00028, RDL=0.00020		mg/L	
				Total Nickel (Ni)	2016/09/20	<0.00050		mg/L	
				Total Selenium (Se)	2016/09/20	<0.00020		mg/L	
				Total Silver (Ag)	2016/09/20	<0.00010		mg/L	
				Total Thallium (Tl)	2016/09/20	<0.00020		mg/L	
				Total Tin (Sn)	2016/09/20	<0.0010		mg/L	
				Total Titanium (Ti)	2016/09/20	<0.0010		mg/L	
				Total Uranium (U)	2016/09/20	<0.00010		mg/L	
				Total Vanadium (V)	2016/09/20	<0.0010		mg/L	
				Total Zinc (Zn)	2016/09/20	<0.0030		mg/L	
8404154	APY	RPD		Total Selenium (Se)	2016/09/20	1.6		%	20
8404156	PM5	Matrix Spike [PN8028-02]		Total Barium (Ba)	2016/09/20		103	%	80 - 120
				Total Boron (B)	2016/09/20		105	%	80 - 120
				Total Calcium (Ca)	2016/09/20		101	%	80 - 120
				Total Iron (Fe)	2016/09/20		104	%	80 - 120
				Total Lithium (Li)	2016/09/20		100	%	80 - 120
				Total Magnesium (Mg)	2016/09/20		103	%	80 - 120
				Total Manganese (Mn)	2016/09/20		100	%	80 - 120
				Total Phosphorus (P)	2016/09/20		99	%	80 - 120
				Total Potassium (K)	2016/09/20		102	%	80 - 120
				Total Silicon (Si)	2016/09/20		97	%	80 - 120
				Total Sodium (Na)	2016/09/20		96	%	80 - 120
				Total Strontium (Sr)	2016/09/20		95	%	80 - 120
8404156	PM5	Spiked Blank		Total Barium (Ba)	2016/09/20		102	%	80 - 120
				Total Boron (B)	2016/09/20		104	%	80 - 120
				Total Calcium (Ca)	2016/09/20		100	%	80 - 120
				Total Iron (Fe)	2016/09/20		102	%	80 - 120
				Total Lithium (Li)	2016/09/20		100	%	80 - 120
				Total Magnesium (Mg)	2016/09/20		102	%	80 - 120
				Total Manganese (Mn)	2016/09/20		101	%	80 - 120
				Total Phosphorus (P)	2016/09/20		99	%	80 - 120
				Total Potassium (K)	2016/09/20		100	%	80 - 120
				Total Silicon (Si)	2016/09/20		96	%	80 - 120
				Total Sodium (Na)	2016/09/20		96	%	80 - 120
				Total Strontium (Sr)	2016/09/20		95	%	80 - 120
				Total Sulphur (S)	2016/09/20		95	%	80 - 120
8404156	PM5	Method Blank		Total Barium (Ba)	2016/09/20	<0.010		mg/L	
				Total Boron (B)	2016/09/20	<0.020		mg/L	
				Total Calcium (Ca)	2016/09/20	<0.30		mg/L	
				Total Iron (Fe)	2016/09/20	<0.060		mg/L	
				Total Lithium (Li)	2016/09/20	<0.020		mg/L	
				Total Magnesium (Mg)	2016/09/20	<0.20		mg/L	
				Total Manganese (Mn)	2016/09/20	<0.0040		mg/L	
				Total Phosphorus (P)	2016/09/20	<0.10		mg/L	
				Total Potassium (K)	2016/09/20	<0.30		mg/L	
				Total Silicon (Si)	2016/09/20	<0.10		mg/L	
				Total Sodium (Na)	2016/09/20	<0.50		mg/L	
				Total Strontium (Sr)	2016/09/20	<0.020		mg/L	
				Total Sulphur (S)	2016/09/20	<0.20		mg/L	
8404156	PM5	RPD [PN8028-02]		Total Barium (Ba)	2016/09/20	NC		%	20
				Total Boron (B)	2016/09/20	4.1		%	20

Maxxam Job #: B681163  
Report Date: 2016/09/21

GOLDER ASSOCIATES LTD  
Client Project #: 1657760, AOMC  
Site Location: EIA  
Sampler Initials: RB

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Total Calcium (Ca)	2016/09/20	2.3		%	20
			Total Iron (Fe)	2016/09/20	NC		%	20
			Total Lithium (Li)	2016/09/20	NC		%	20
			Total Magnesium (Mg)	2016/09/20	2.9		%	20
			Total Manganese (Mn)	2016/09/20	NC		%	20
			Total Phosphorus (P)	2016/09/20	NC		%	20
			Total Potassium (K)	2016/09/20	2.2		%	20
			Total Silicon (Si)	2016/09/20	3.6		%	20
			Total Sodium (Na)	2016/09/20	2.0		%	20
			Total Strontium (Sr)	2016/09/20	2.9		%	20
			Total Sulphur (S)	2016/09/20	1.7		%	20
8404246	LMD	Matrix Spike [PN8028-01]	Dissolved Nitrite (N)	2016/09/20		96	%	80 - 120
			Dissolved Nitrate (N)	2016/09/20		98	%	80 - 120
8404246	LMD	Spiked Blank	Dissolved Nitrite (N)	2016/09/20		99	%	80 - 120
			Dissolved Nitrate (N)	2016/09/20		100	%	80 - 120
8404246	LMD	Method Blank	Dissolved Nitrite (N)	2016/09/20	<0.010		mg/L	
			Dissolved Nitrate (N)	2016/09/20	<0.010		mg/L	
8404246	LMD	RPD [PN8028-01]	Dissolved Nitrite (N)	2016/09/20	NC		%	20
			Dissolved Nitrate (N)	2016/09/20	NC		%	20
8404445	PM5	Matrix Spike [PN8028-01]	Dissolved Calcium (Ca)	2016/09/20		95	%	80 - 120
			Dissolved Iron (Fe)	2016/09/20		101	%	80 - 120
			Dissolved Magnesium (Mg)	2016/09/20		102	%	80 - 120
			Dissolved Manganese (Mn)	2016/09/20		100	%	80 - 120
			Dissolved Potassium (K)	2016/09/20		100	%	80 - 120
			Dissolved Sodium (Na)	2016/09/20		93	%	80 - 120
8404445	PM5	Spiked Blank	Dissolved Calcium (Ca)	2016/09/20		95	%	80 - 120
			Dissolved Iron (Fe)	2016/09/20		101	%	80 - 120
			Dissolved Magnesium (Mg)	2016/09/20		102	%	80 - 120
			Dissolved Manganese (Mn)	2016/09/20		100	%	80 - 120
			Dissolved Potassium (K)	2016/09/20		100	%	80 - 120
			Dissolved Sodium (Na)	2016/09/20		95	%	80 - 120
8404445	PM5	Method Blank	Dissolved Calcium (Ca)	2016/09/20	<0.30		mg/L	
			Dissolved Iron (Fe)	2016/09/20	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2016/09/20	<0.20		mg/L	
			Dissolved Manganese (Mn)	2016/09/20	<0.0040		mg/L	
			Dissolved Potassium (K)	2016/09/20	<0.30		mg/L	
			Dissolved Sodium (Na)	2016/09/20	<0.50		mg/L	
8404445	PM5	RPD [PN8028-01]	Dissolved Calcium (Ca)	2016/09/20	0.55		%	20
			Dissolved Iron (Fe)	2016/09/20	NC		%	20
			Dissolved Magnesium (Mg)	2016/09/20	0.71		%	20
			Dissolved Manganese (Mn)	2016/09/20	NC		%	20
			Dissolved Potassium (K)	2016/09/20	0.52		%	20
			Dissolved Sodium (Na)	2016/09/20	1.4		%	20
8404610	HG3	Matrix Spike	Benzene	2016/09/20		96	%	70 - 130
			Toluene	2016/09/20		86	%	70 - 130
8404610	HG3	Spiked Blank	Benzene	2016/09/21		86	%	70 - 130
			Toluene	2016/09/21		85	%	70 - 130
8404610	HG3	Method Blank	Benzene	2016/09/20	<0.40		ug/L	
			Toluene	2016/09/20	<0.40		ug/L	
8404610	HG3	RPD	Benzene	2016/09/21	NC		%	40

Maxxam Job #: B681163  
Report Date: 2016/09/21

GOLDER ASSOCIATES LTD  
Client Project #: 1657760, AOMC  
Site Location: EIA  
Sampler Initials: RB

### QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Toluene	2016/09/21	NC		%	40
<p>N/A = Not Applicable</p> <p>Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.</p> <p>Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.</p> <p>Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.</p> <p>Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.</p> <p>Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.</p> <p>NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spiked amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than 2x that of the native sample concentration).</p> <p>NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples &lt; 5x RDL).</p>								

Maxxam Job #: B681163  
Report Date: 2016/09/21

GOLDER ASSOCIATES LTD  
Client Project #: 1657760, AOMC  
Site Location: EIA  
Sampler Initials: RB

### VALIDATION SIGNATURE PAGE

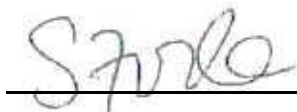
The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Daniel Reslan, cCT, QP, Organics Supervisor



Justin Geisel, B.Sc., Organics Supervisor



Suwan Fock, B.Sc., QP, Inorganics Senior Analyst

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Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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CHAIN OF CUSTODY RECORD

M 17812

Page 1 of 1

Invoice Information				Report Information (if differs from invoice)				Project Information				Turnaround Time (TAT) Required											
Company: <u>Golder Associates</u>				Company: _____				Quotation #: <u>Golder 2016</u>				<input type="checkbox"/> 5-7 Days Regular (Most analyses)											
Contact Name: <u>Steven Fiddler</u>				Contact Name: _____				P.O. #/ A/E #: _____				PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS											
Address: <u>16820-107 Ave.</u>				Address: _____				Project #: <u>1657760 - AOMC</u>				Rush TAT (Surcharges will be applied)											
Phone: <u>780 984-6600</u>				Phone: _____				Site Location: <u>EIA</u>				<input type="checkbox"/> Same Day <input type="checkbox"/> 2 Days <input checked="" type="checkbox"/> 3-4 Days											
Email: <u>sfiddler@golder.com</u>				Email: _____				Site #: _____				Date Required: <u>Sept 20/16</u>											
Copies: <u>csmdataguality@golder.com</u>				Copies: _____				Sampled By: <u>R. Boyce</u>				Rush Confirmation #: _____											
Laboratory Use Only								Analysis Requested								Regulatory Criteria							
Depot Reception																							
Sample Identification																							
1 LTF-WS16-01																							
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
Seal Present <input checked="" type="checkbox"/> NO Cooler ID <input checked="" type="checkbox"/> Temp <input checked="" type="checkbox"/> 11 7 12																							
Seal Intact <input checked="" type="checkbox"/> Temp <input checked="" type="checkbox"/>																							
Cooling Media <input checked="" type="checkbox"/>																							
Seal Present <input checked="" type="checkbox"/> NO Cooler ID <input checked="" type="checkbox"/> Temp <input checked="" type="checkbox"/>																							
Seal Intact <input checked="" type="checkbox"/> Temp <input checked="" type="checkbox"/>																							
Cooling Media <input checked="" type="checkbox"/>																							
Seal Present <input checked="" type="checkbox"/> NO Cooler ID <input checked="" type="checkbox"/> Temp <input checked="" type="checkbox"/>																							
Seal Intact <input checked="" type="checkbox"/> Temp <input checked="" type="checkbox"/>																							
Cooling Media <input checked="" type="checkbox"/>																							
Depth (Unit)								Date Sampled (YYYY/MM/DD)								Time Sampled (HH:MM)							
								2016/09/19								14:41							
Matrix								6W															
# of containers								6															
BTEX F1								<input type="checkbox"/> VOC <input type="checkbox"/>															
BTEX F1-F2								<input checked="" type="checkbox"/>															
BTEX F1-F4								<input checked="" type="checkbox"/>															
Routine Water								<input checked="" type="checkbox"/>															
Regulated Metals								<input checked="" type="checkbox"/> Tot <input checked="" type="checkbox"/> Diss															
Mercury								<input type="checkbox"/> Total <input type="checkbox"/> Dissolved															
Salinity 4																							
Siege (75 micron)																							
Texture (% Sand, Silt, Clay)																							
Basic Class II Landfill																							
HOLD - DO NOT ANALYZE																							
Special Instructions																							
AT1/CCME								<input checked="" type="checkbox"/>															
Drinking Water								<input type="checkbox"/>															
Saskatchewan								<input type="checkbox"/>															
D50 (Drilling Waste)								<input type="checkbox"/>															
Other:								<input type="checkbox"/>															

Relinquished by: (Signature/ Print)		DATE (YYYY/MM/DD)		Time (HH:MM)		Received by: (Signature/ Print)		DATE (YYYY/MM/DD)		Time (HH:MM)		Maxxam Job #	
<u>Rebecca Boyce RL By</u>		<u>2016/09/19</u>		<u>14:41</u>		<u>Don MacGregor</u>		<u>2016/09/19</u>		<u>14:44</u>		<u>B681163 TMI</u>	



# **APPENDIX E**

## **Mann-Kendall Trend Analyses**

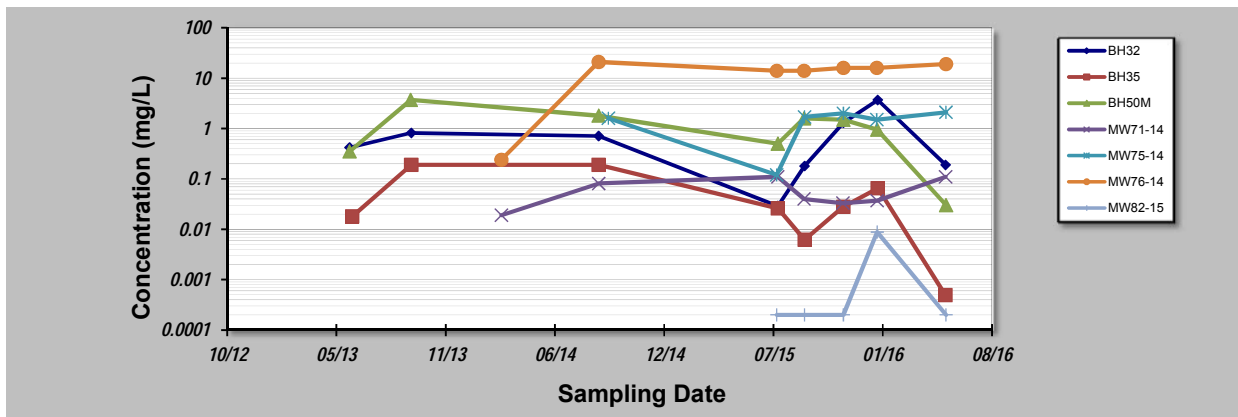
# GSI MANN-KENDALL TOOLKIT

## for Constituent Trend Analysis

Evaluation Date: **26-Oct-16**  
 Facility Name: **PWGSC - AOMC**  
 Conducted By: **Rebecca Boyce**

Job ID: **1657760**  
 Constituent: **Benzene**  
 Concentration Units: **mg/L**

Sampling Point ID:		BH32	BH35	BH50M	MW71-14	MW75-14	MW76-14	MW82-15
Sampling Event	Sampling Date	BENZENE CONCENTRATION (mg/L)						
1	30-May-13	0.42		0.35				
2	4-Jun-13		0.018					
3	19-Sep-13			3.7				
4	20-Sep-13	0.82	0.19					
5	4-Mar-14				0.019		0.24	
6	29-Aug-14	0.71	0.19	1.8	0.081		21	
7	16-Sep-14					1.6		
8	21-Jul-15					0.12	14	0.0002
9	23-Jul-15	0.029	0.026	0.5	0.11			
10	9-Sep-15			1.6	0.04		14	
11	10-Sep-15	0.18	0.0062			1.7		0.0002
12	19-Nov-15				0.033			
13	20-Nov-15	1.3	0.028	1.5		2	16	0.0002
14	20-Jan-16					1.5	16	
15	21-Jan-16			0.95	0.037			0.0088
16	22-Jan-16	3.7	0.065					
17	25-May-16	0.19	0.00049		0.11			
18	26-May-16			0.03		2.1	19	0.0002
19								
20								
Coefficient of Variation:		1.30	1.21	0.89	0.62	0.48	0.47	2.00
Mann-Kendall Statistic (S):		4	-7	-10	4	7	9	2
Confidence Factor:		64.0%	76.4%	86.2%	66.7%	86.4%	88.1%	59.2%
Concentration Trend:		No Trend	No Trend	Stable	No Trend	No Trend	No Trend	No Trend



### Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $> 95\%$  = Increasing or Decreasing;  $\geq 90\%$  = Probably Increasing or Probably Decreasing;  $< 90\%$  and  $S > 0$  = No Trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = No Trend;  $< 90\%$  and  $COV < 1$  = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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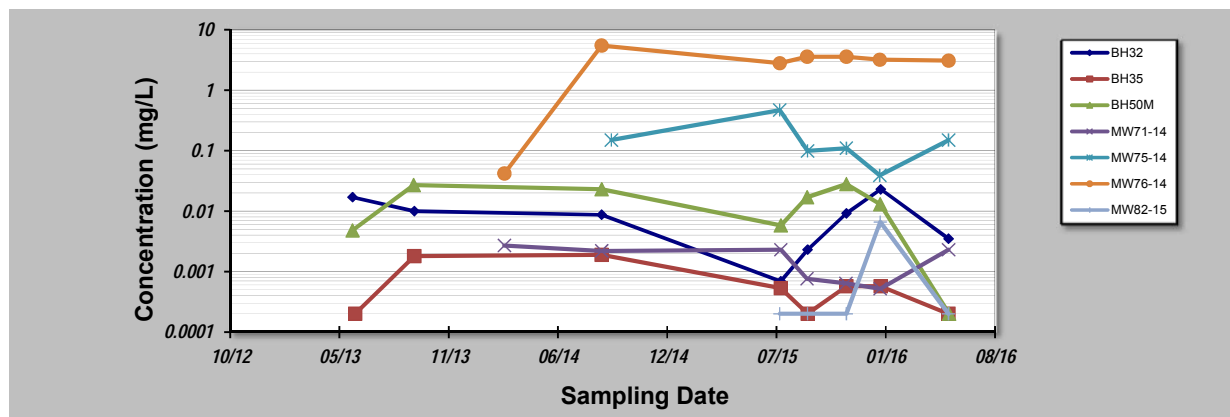
# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **26-Oct-16**  
Facility Name: **PWGSC - AOMC**  
Conducted By: **Rebecca Boyce**

Job ID: **1657760**  
Constituent: **Toluene**  
Concentration Units: **mg/L**

Sampling Point ID: **BH32** **BH35** **BH50M** **MW71-14** **MW75-14** **MW76-14** **MW82-15**

Sampling Event	Sampling Date	TOLUENE CONCENTRATION (mg/L)						
1	30-May-13	0.017		0.0048				
2	4-Jun-13		0.0002					
3	19-Sep-13			0.027				
4	20-Sep-13	0.01	0.0018					
5	4-Mar-14				0.0027		0.042	
6	29-Aug-14	0.0087	0.0019	0.023	0.0022		5.5	
7	16-Sep-14					0.15		
8	21-Jul-15					0.47	2.8	0.0002
9	23-Jul-15	0.00069	0.00053	0.0058	0.0023			
10	9-Sep-15			0.017	0.00076		3.6	
11	10-Sep-15	0.0023	0.0002			0.099		0.0002
12	19-Nov-15				0.00064			
13	20-Nov-15	0.0092	0.00057	0.028		0.11	3.6	0.0002
14	20-Jan-16					0.039	3.2	
15	21-Jan-16			0.013	0.00052			0.0066
16	22-Jan-16	0.023	0.00057					
17	25-May-16	0.0035	0.0002		0.0023	0.15	3.1	0.0002
18	26-May-16			0.0002				
19								
20								
Coefficient of Variation:		0.82	0.94	0.72	0.58	0.90	0.52	1.93
Mann-Kendall Statistic (S):		-4	-4	-4	-10	-4	0	2
Confidence Factor:		64.0%	64.0%	64.0%	90.7%	70.3%	37.9%	59.2%
Concentration Trend:		Stable	Stable	Stable	Prob. Decreasing	Stable	Stable	No Trend



## Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $> 95\%$  = Increasing or Decreasing;  $\geq 90\%$  = Probably Increasing or Probably Decreasing;  $< 90\%$  and  $S > 0$  = No Trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = No Trend;  $< 90\%$  and  $COV < 1$  = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

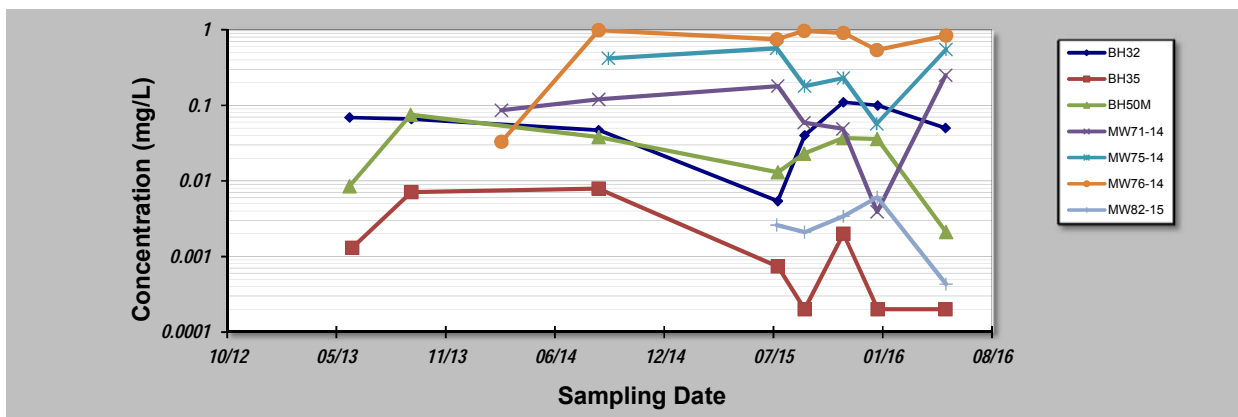
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# GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: <b>4-Mar-16</b>	Job ID: <b>1529387</b>
Facility Name: <b>PWGSC - AOMC</b>	Constituent: <b>Ethylbenzene</b>
Conducted By: <b>Jeff Rogers</b>	Concentration Units: <b>mg/L</b>

Sampling Point ID:		BH32	BH35	BH50M	MW71-14	MW75-14	MW76-14	MW82-15
Sampling Event	Sampling Date	ETHYLBENZENE CONCENTRATION (mg/L)						
1	30-May-13	0.069		0.0085				
2	4-Jun-13		0.0013					
3	19-Sep-13			0.075				
4	20-Sep-13	0.066	0.0071					
5	4-Mar-14				0.086		0.033	
6	29-Aug-14	0.047	0.0079	0.038	0.12		0.99	
7	16-Sep-14					0.42		
8	21-Jul-15					0.57	0.75	0.0026
9	23-Jul-15	0.0054	0.00074	0.013	0.18			
10	9-Sep-15			0.023	0.059		0.97	
11	10-Sep-15	0.04	0.0002			0.18		0.0021
12	19-Nov-15				0.049			
13	20-Nov-15	0.11	0.002	0.037		0.23	0.91	0.0034
14	20-Jan-16					0.057	0.54	
15	21-Jan-16			0.036	0.0039			0.0061
16	22-Jan-16	0.1	0.0002					
17	25-May-16	0.05	0.0002		0.25			
18	26-May-16			0.0021		0.55	0.84	0.00043
19								
20								
Coefficient of Variation:		0.55	1.30	0.80	0.79	0.63	0.47	0.71
Mann-Kendall Statistic (S):		0	-13	-6	-3	-3	-1	0
Confidence Factor:		45.2%	92.9%	72.6%	61.4%	64.0%	50.0%	40.8%
Concentration Trend:		Stable	Prob. Decreasing	Stable	Stable	Stable	Stable	Stable



- Notes:**
- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
  - Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
  - Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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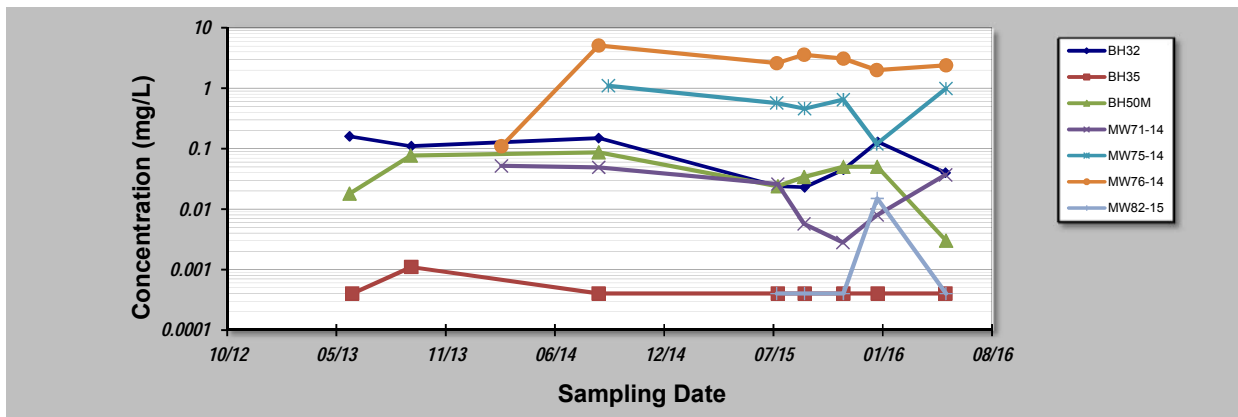
# GSI MANN-KENDALL TOOLKIT

## for Constituent Trend Analysis

Evaluation Date: **26-Oct-16**  
 Facility Name: **PWGSC - AOMC**  
 Conducted By: **Rebecca Boyce**

Job ID: **1657760**  
 Constituent: **Xylene**  
 Concentration Units: **mg/L**

Sampling Point ID:		BH32	BH35	BH50M	MW71-14	MW75-14	MW76-14	MW82-15
Sampling Event	Sampling Date	XYLENE CONCENTRATION (mg/L)						
1	30-May-13	0.16		0.018				
2	4-Jun-13		0.0004					
3	19-Sep-13			0.077				
4	20-Sep-13	0.11	0.0011					
5	4-Mar-14				0.052		0.11	
6	29-Aug-14	0.15	0.0004	0.087	0.049		5.1	
7	16-Sep-14					1.1		
8	21-Jul-15					0.57	2.6	0.0004
9	23-Jul-15	0.024	0.0004	0.024	0.026			
10	9-Sep-15			0.034	0.0057		3.6	
11	10-Sep-15	0.023	0.0004			0.46		0.0004
12	19-Nov-15				0.0028			
13	20-Nov-15	0.045	0.0004	0.05		0.65	3.1	0.0004
14	20-Jan-16					0.12	2	
15	21-Jan-16			0.05	0.008			0.015
16	22-Jan-16	0.13	0.0004					
17	25-May-16	0.04	0.0004		0.037			
18	26-May-16			0.003		0.99	2.4	0.0004
19								
20								
Coefficient of Variation:		0.68	0.51	0.67	0.81	0.55	0.57	1.97
Mann-Kendall Statistic (S):		-10	-5	-3	-9	-3	-3	2
Confidence Factor:		86.2%	68.3%	59.4%	88.1%	64.0%	61.4%	59.2%
Concentration Trend:		Stable	Stable	Stable	Stable	Stable	Stable	No Trend



### Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $> 95\%$  = Increasing or Decreasing;  $\geq 90\%$  = Probably Increasing or Probably Decreasing;  $< 90\%$  and  $S > 0$  = No Trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = No Trend;  $< 90\%$  and  $COV < 1$  = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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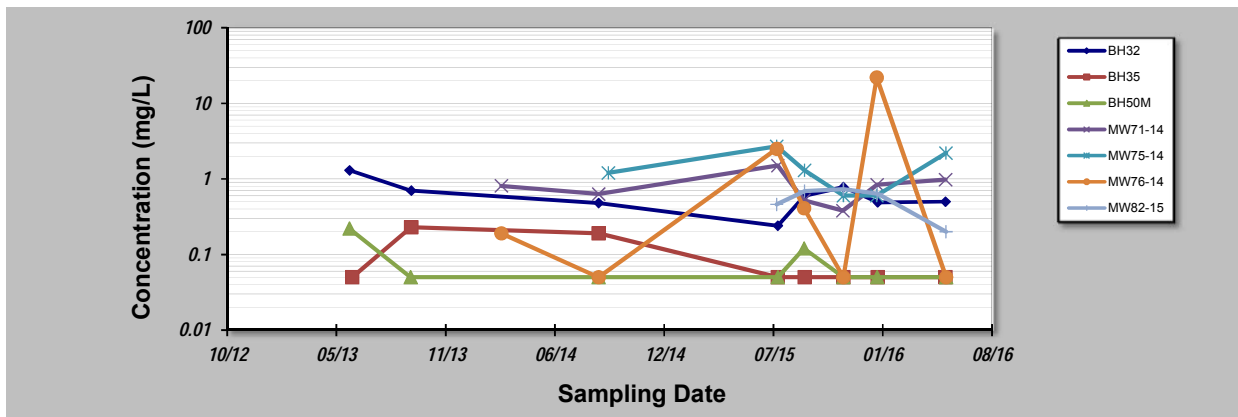
# GSI MANN-KENDALL TOOLKIT

## for Constituent Trend Analysis

Evaluation Date: **26-Oct-16**  
 Facility Name: **PWGSC - AOMC**  
 Conducted By: **Rebecca Boyce**

Job ID: **1657760**  
 Constituent: **PHC F1**  
 Concentration Units: **mg/L**

Sampling Point ID:		BH32	BH35	BH50M	MW71-14	MW75-14	MW76-14	MW82-15
Sampling Event	Sampling Date	PHC F1 CONCENTRATION (mg/L)						
1	30-May-13	1.3		0.22				
2	4-Jun-13		0.05					
3	19-Sep-13			0.05				
4	20-Sep-13	0.7	0.23					
5	4-Mar-14				0.81		0.19	
6	29-Aug-14	0.48	0.19	0.05	0.63		0.05	
7	16-Sep-14					1.2		
8	21-Jul-15					2.7	2.5	0.46
9	23-Jul-15	0.24	0.05	0.05	1.5			
10	9-Sep-15			0.12	0.52		0.41	
11	10-Sep-15	0.6	0.05			1.3		0.69
12	19-Nov-15				0.38			
13	20-Nov-15	0.78	0.05	0.05		0.6	0.05	0.73
14	20-Jan-16					0.6	22	
15	21-Jan-16			0.05	0.84			0.64
16	22-Jan-16	0.49	0.05					
17	25-May-16	0.5	0.05		0.98			
18	26-May-16			0.05		2.2	0.05	0.2
19								
20								
Coefficient of Variation:		0.49	0.83	0.77	0.45	0.60	2.26	0.40
Mann-Kendall Statistic (S):		-6	-9	-7	1	-2	0	-2
Confidence Factor:		72.6%	83.2%	76.4%	50.0%	57.0%	37.9%	59.2%
Concentration Trend:		Stable	Stable	Stable	No Trend	Stable	No Trend	Stable



### Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $> 95\%$  = Increasing or Decreasing;  $\geq 90\%$  = Probably Increasing or Probably Decreasing;  $< 90\%$  and  $S > 0$  = No Trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = No Trend;  $< 90\%$  and  $COV < 1$  = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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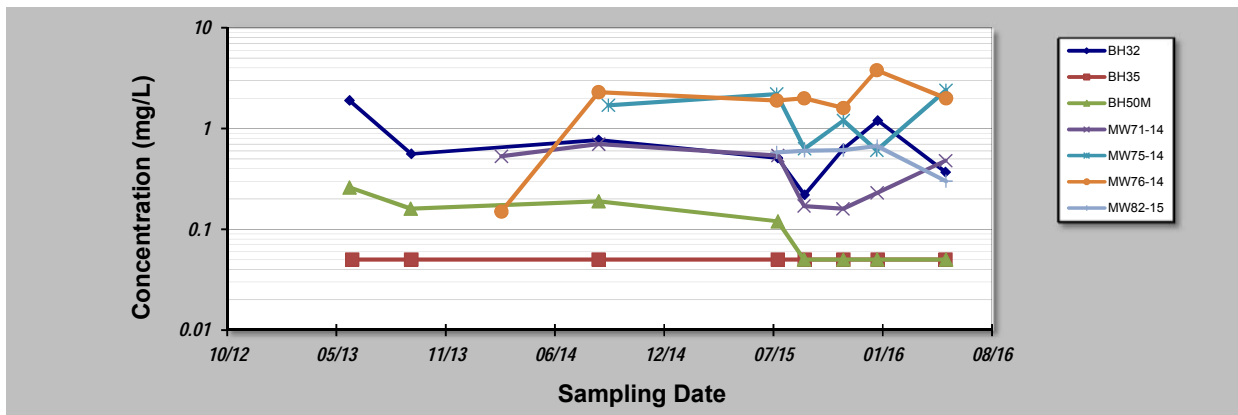
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## GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **26-Oct-16**  
 Facility Name: **PWGSC - AOMC**  
 Conducted By: **Rebecca Boyce**

Job ID: **1657760**  
 Constituent: **PHC F2**  
 Concentration Units: **mg/L**

Sampling Point ID:		BH32	BH35	BH50M	MW71-14	MW75-14	MW76-14	MW82-15
Sampling Event	Sampling Date	PHC F2 CONCENTRATION (mg/L)						
1	30-May-13	1.9		0.26				
2	4-Jun-13		0.05					
3	19-Sep-13			0.16				
4	20-Sep-13	0.56	0.05					
5	4-Mar-14				0.53		0.15	
6	29-Aug-14	0.77	0.05	0.19	0.7		2.3	
7	16-Sep-14					1.7		
8	21-Jul-15					2.2	1.9	0.58
9	23-Jul-15	0.51	0.05	0.12	0.54			
10	9-Sep-15			0.05	0.17		2	
11	10-Sep-15	0.22	0.05			0.63		0.6
12	19-Nov-15				0.16			
13	20-Nov-15	0.63	0.05	0.05		1.2	1.6	0.61
14	20-Jan-16					0.61	3.8	
15	21-Jan-16			0.05	0.23			0.67
16	22-Jan-16	1.2	0.05					
17	25-May-16	0.37	0.05		0.48			
18	26-May-16			0.05		2.4	2	0.3
19								
20								
Coefficient of Variation:		0.70	0.00	0.69	0.53	0.53	0.55	0.26
Mann-Kendall Statistic (S):		-8	0	-20	-7	-1	6	2
Confidence Factor:		80.1%	45.2%	99.3%	80.9%	50.0%	76.4%	59.2%
Concentration Trend:		Stable	Stable	Decreasing	Stable	Stable	No Trend	No Trend



### Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ( $S > 0$ ) or decreasing ( $S < 0$ ):  $> 95\%$  = Increasing or Decreasing;  $\geq 90\%$  = Probably Increasing or Probably Decreasing;  $< 90\%$  and  $S > 0$  = No Trend;  $< 90\%$ ,  $S \leq 0$ , and  $COV \geq 1$  = No Trend;  $< 90\%$  and  $COV < 1$  = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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[solutions@golder.com](mailto:solutions@golder.com)  
[www.golder.com](http://www.golder.com)

**Golder Associates Ltd.**  
**16820 107 Avenue**  
**Edmonton, Alberta, T5P 4C3**  
**Canada**  
**T: +1 (780) 483 3499**

