



TETRA TECH EBA

2015 GROUNDWATER MONITORING PROGRAM 124 MAIN STREET, BARONS, ALBERTA ALBERTA MUNICIPAL AFFAIRS SITE #9558



PRESENTED TO
VILLAGE OF BARONS

DECEMBER 2015
ISSUED FOR USE
FILE: ENVIND03335-03

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EXECUTIVE SUMMARY

Tetra Tech EBA Inc. (Tetra Tech EBA) was retained by the Village of Barons (Barons) to conduct a groundwater monitoring program (GWMP) for a property located at 124 Main Street in Barons, Alberta (the site), see Figure 1. The site is included within the Alberta Municipal Affairs Tank Site Remediation Program (AMA Program), Site Number: 9558.

The 2015 GWMP is based on recommendations made in Tetra Tech EBA's 2014 Groundwater and Soil Vapour Monitoring Program Report (Tetra Tech EBA File: ENVIND03335-02 dated December 2014). The objective of the 2015 GWMP was to document current petroleum hydrocarbon (PHC) concentrations in groundwater and to evaluate the potential for the natural attenuation of PHC compounds beneath the site.

Discussion and Conclusions

Concentrations of benzene, toluene, ethylbenzene and xylenes (BTEX), and PHC fractions F1 and F2, were less than the laboratory detection limit, and/or Alberta Tier 1 Guidelines in the groundwater at the locations tested in 2015 with the exception of benzene at 08MW07 in October. Historically, concentrations of benzene (0.068 mg/L), ethylbenzene (0.036 mg/L), and PHC fraction F2 (1.8 mg/L) were reported greater than the Tier 1 Guidelines in 2008 at 08MW06, and benzene was reported greater than the Tier 1 Guideline at 09MW11 in 2009 (0.0057 mg/L). BTEX and PHC fractions F1 and F2 were less than the Tier 1 Guidelines in 2014. These two locations (08MW06 and 09MW11) have subsequently not been located or have been destroyed.

Routine groundwater parameters were analyzed for the first time in 2014, and continued in 2015 to assist in determining the potential for the natural attenuation of PHCs in the groundwater at the site. Concentrations of total dissolved solids (TDS), sodium, sulphate, chloride, nitrate, nitrite, and manganese greater than the Alberta Tier 1 Guidelines were measured in one or more monitoring wells in 2014 and in 2015. The concentrations of these parameters, excluding chloride, may reflect natural groundwater composition.

While degradation of hydrocarbons occurs under both aerobic and anaerobic conditions, aerobic breakdown is more rapid. The significance of the redox condition is, therefore, that under aerobic (oxic) conditions, many PHCs are expected to attenuate much faster than under anoxic conditions. Therefore, if inferred oxic conditions prevail at the edge of the dissolved hydrocarbon plume, the migration of hydrocarbons may stabilize or decrease.

The inferred redox status of groundwater at the monitoring wells on site appear to be stable (oxic), with the exception of 08MW07, which changed to anoxic in October. This location is down-gradient of the former underground storage tank (UST) and is also the same location where concentrations of PHCs increased. The change to anoxic at this location suggests that subsurface conditions are not ideal for the continued attenuation of PHCs.

Recommendations

Based on the 2015 GWMP, Tetra Tech EBA recommends to continue the semi-annual groundwater monitoring program with the same analytical suite in 2016 to aid in monitoring natural attenuation at the site.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
1.0 INTRODUCTION.....	1
1.1 General	1
1.2 Previous Environmental Assessments	1
1.3 Authorization	1
1.4 Scope of Work	2
1.5 Qualifications of Assessors.....	2
2.0 METHODS	2
2.1 Project Safety.....	2
2.2 Groundwater Monitoring, Sampling, and Analytical Testing.....	3
2.3 Data Evaluation.....	3
3.0 RESULTS.....	3
3.1.1 Groundwater Elevations and Field Monitoring Results	3
3.1.2 Groundwater Chemical Quality.....	4
4.0 DISCUSSION	4
5.0 RECOMMENDATIONS	5
6.0 CLOSURE.....	6
REFERENCES	7

APPENDIX SECTIONS

TABLES

Table 1	Monitoring Well Completion Details and 2015 Field Monitoring Results
Table 2	2015 Groundwater Analytical Results
Table 3	Historical Groundwater Analytical Results

FIGURES

Figure 1	Site Location Plan
Figure 2	Site Plan Showing Borehole, Monitoring Well and Soil Vapour Well Locations
Figure 3	Site Plan Showing Groundwater Elevations (April 23, 2015)
Figure 4	Site Plan Showing Groundwater Elevations (October 7, 2015)

APPENDICES

Appendix A	Tetra Tech EBA's General Conditions
Appendix B	Laboratory Certificates
Appendix C	Record of Site Condition

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Village Of Barons and their agents. Tetra Tech EBA Inc. (Tetra Tech EBA) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Village Of Barons, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech EBA's Services Agreement. Tetra Tech EBA's General Conditions are provided in Appendix A of this report.

1.0 INTRODUCTION

1.1 General

Tetra Tech EBA Inc. (Tetra Tech EBA) was retained by the Village of Barons (Barons) to conduct a groundwater monitoring program (GWMP) for a property located at 124 Main Street in Barons, Alberta (the site), see Figure 1. The site is included within the Alberta Municipal Affairs Tank Site Remediation Program (AMA Program), Site Number: 9558.

The 2015 GWMP is based on recommendations made in Tetra Tech EBA's 2014 Groundwater and Soil Vapour Monitoring Program Report (Tetra Tech EBA File: ENVIND03335-02, dated December 2014). The objective of the 2015 GWMP was to document current petroleum hydrocarbon (PHC) concentrations in groundwater and to evaluate the potential for the natural attenuation of PHC compounds beneath the site.

1.2 Previous Environmental Assessments

A Revised Risk Management Plan (RMP) was completed for the site (Tetra Tech EBA File: ENVIND03335-01, dated May 2014) which recommended the implementation of a GWMP and a soil vapour monitoring program (SVMP). The RMP was based on previous environmental site assessments (ESAs) conducted at the site by Tetra Tech EBA which identified concentrations of PHCs in the soil and groundwater greater than the referenced Alberta Environment and Sustainable Resource Development¹ (ESRD) 2014 Alberta Tier 1 Soil and Groundwater Remediation Guidelines (Tier 1 Guidelines). Note that the Revised RMP has not yet been approved by Alberta Environment and Parks (AEP).

Details of the previous ESAs are presented in the following documents:

- Phase II and Phase III Environmental Site Assessment. 124 Main Street. Lot 17, Block 2, Plan 2605X. AMA Site 9558. Barons, Alberta. Tetra Tech EBA File: L22101183.001, dated October 2009.
- Underground Storage Tank Removal and Monitoring. AMA Site 9558. Barons, Alberta. Tetra Tech EBA File: L22101183.004, dated December 2011.

Tetra Tech EBA's 2014 Groundwater and Soil Vapour Monitoring Program Report (Tetra Tech EBA File: ENVIND03335-02, dated December 2014) included the documentation of PHC concentrations in groundwater and the implementation of a SVMP to identify potential risks to occupants using the site and the adjacent commercial business to the east from exposure to soil vapours, specifically from PHCs. The results of the SVMP indicated that soil vapour concentrations did not exceed the calculated indoor and outdoor soil vapour screening level concentrations, and that further soil vapour monitoring was not required.

1.3 Authorization

Ms. Laurie Beck, of the Village of Barons, provided written authorization to Tetra Tech EBA to proceed with the GWMP via a signed Services Agreement dated April 13, 2015.

¹ Currently Alberta Environment and Parks (AEP).

1.4 Scope of Work

The scope of work for the semi-annual (April and October) groundwater monitoring and sampling included the following:

- Provided project management, safety, and coordination services.
- Monitored the four accessible wells (08MW01, 08MW03, 08MW07, and 09MW11). Monitoring included the measurement of liquid levels including light non-aqueous phase liquid (LNAPL), if present, using a Heron™ electronic interface probe, and well headspace combustible vapour concentrations (CVCs) using an RKI Eagle II hydrocarbon surveyor (RKI).
- Purged each well, prior to sampling, of at least three standing volumes of water, or until practically dry, and allowed the water level in the well to recover; collected groundwater samples from each well.
- Submitted four groundwater samples to Maxxam Analytics Inc. (Maxxam), located in Calgary, Alberta, for chemical analyses of the following parameters: benzene, toluene, ethylbenzene, and xylenes (BTEX), PHC fractions F1 and F2, routine groundwater chemistry, and dissolved iron and manganese.
- Prepared this report discussing the field observations and analytical results, comparing the results to historic data and the Tier 1 Guidelines.
- Prepared an updated record of site condition (ROSC) to accompany the groundwater assessment report.

1.5 Qualifications of Assessors

Mr. Jamie LaMontagne, EP., conducted the groundwater monitoring and sampling. Mr. LaMontagne is an Environmental Technologist for Tetra Tech EBA's Environmental Discipline and has over 13 years of experience in the environmental industry.

Mr. Brad Calder, B.Sc., ATT, authored this report. Mr. Calder is a Environmental Scientist with Tetra Tech EBA's Environmental Discipline and has over three years of experience in the environment industry.

Mr. Jaymes Going, B.Sc., EP, acted as the Project Manager, assisted with the interpretation of the data, and conducted the intermediate review of this report. Mr. Going is a Environmental Consultant with Tetra Tech EBA's Environmental Discipline and has over six years of experience in the environment industry.

Mr. Henri Carriere, P.Eng., M.N.R.M., conducted the final review of the report. Mr. Carriere is a Senior Environmental Engineer with Tetra Tech EBA in the Environmental Discipline in Calgary, Alberta. Mr. Carriere has over 20 years of experience in the environment industry.

2.0 METHODS

This section describes the methods applied by Tetra Tech EBA during the GWMP.

2.1 Project Safety

A pre-job hazard assessment and safe work form were completed prior to the initiation of the fieldwork and applicable safe work procedures were reviewed. The safe work form was reviewed on site by the Tetra Tech EBA representative.

2.2 Groundwater Monitoring, Sampling, and Analytical Testing

Tetra Tech EBA personnel conducted the GWMP on April 23 and October 7, 2015. Liquid levels were measured using a Heron™ electronic interface probe at all accessible groundwater monitoring wells (08MW01, 08MW03, 08MW07, and 09MW11). Monitoring wells were screened for headspace CVCs using a RKI. Prior to sampling, groundwater wells were purged of approximately three standing well volumes of water, or until the well was practically dry, and allowed to recover to near static levels prior to collecting the samples. Groundwater samples were collected using dedicated disposable bailers, stored in laboratory-supplied bottles, appropriately preserved/filtered, and stored on ice in a cooler. The samples were transported to Maxxam under chain-of-custody (COC) documentation for analysis of BTEX, PHC fractions F1 and F2, routine groundwater parameters, and dissolved iron and manganese.

Tetra Tech EBA's standard procedures for purging, sampling, preserving, and transporting groundwater samples were followed to avoid cross-contamination and to ensure sample quality was maintained. Groundwater monitoring and sampling was conducted in accordance with Tetra Tech EBA Work Methods (WM4203).

Table 1 summarizes groundwater monitoring well completion details and the 2015 monitoring results. Groundwater monitoring well locations are presented on Figure 2.

2.3 Data Evaluation

Based on the surrounding land use and the desired end land use for the site, groundwater analytical results were compared to the Tier 1 Guidelines for residential/parkland land use, fine-grained soils. The Tier 1 approach is based on the assumption that all exposure pathways and receptors relevant to a particular land use are present and operative. Such receptors and pathways include the domestic use aquifer (DUA), freshwater aquatic life (FAL), direct soil contact (ecological and human), off-site migration, and vapour inhalation.

Groundwater analytical results were also evaluated for redox conditions to comment on the shallow groundwater's natural attenuation capacity.

The three simplified redox levels in groundwater that will be discussed are summarized below:

- Oxidic Zone: Nitrate concentrations are typically stable, but dissolved iron and manganese are not present in appreciable concentrations.
- Suboxic Zone: Nitrate concentrations are less than 1 mg-N/L; dissolved manganese is present in concentrations greater than 0.1 mg/L without an accompanying dissolved iron increase.
- Anoxic Zone: Nitrate has been reduced; dissolved iron and dissolved manganese occur in concentrations typically greater than 0.1 mg/L; sulphate reduction is occurring, based on observations made during sampling and/or sulphate concentrations are considerably less than background values.

3.0 RESULTS

3.1.1 Groundwater Elevations and Field Monitoring Results

Groundwater level measurements obtained on April 23, 2015 ranged from 1.40 metres below grade (mbg) at 08MW07 to 1.59 mbg at 09MW11. Groundwater level measurements obtained on October 7, 2015 ranged from 2.30 mbg at 08MW07 to 2.55 mbg at 09MW11. Based on the calculated relative groundwater elevations, the apparent local groundwater flow direction was to the northwest at a gradient of 0.004 m/m in April 2015 (Figure 3), and 0.003 m/m in October 2015 (Figure 4).

Monitoring well headspace CVCs measurements obtained on April 23, 2015 ranged from less than the instrument detection limit to 40 ppm at 08MW07 and 09MW11. CVCs measurements obtained on October 7, 2015 ranged from less than the instrument detection limit to 45 ppm at 09MW11.

Figure 3 presents the groundwater elevations on April 23, 2015 and Figure 4 presents the groundwater elevations on October 7, 2015.

3.1.2 Groundwater Chemical Quality

Concentrations of BTEX and PHC fractions F1 and F2 were less than the laboratory detection limits in the groundwater at most locations sampled in April and October, with the exception of 08MW07 in October. The concentration of benzene (0.027 mg/L) in October at 08MW07 was greater than the Tier 1 Guideline (0.005 mg/L). Xylenes and PHC fraction F2 were also detected at this location in October, however, were less than the Tier 1 Guidelines.

Nitrate and nitrite concentrations were greater than the Tier 1 Guidelines (3 mg/L and 0.06 mg/L, respectively) at most monitoring wells, with the exception of nitrate concentrations at 08MW07 (October), and nitrite concentrations at 08MW01 (October), and 08MW07 (April and October).

Total dissolved solids (TDS) concentrations were greater than the Tier 1 Guideline (500 mg/L) at all locations sampled, ranging from 4,800 mg/L at 08MW07 to 9,700 mg/L at 08MW01.

Chloride concentrations were greater than or equal to the Tier 1 Guideline (120 mg/L) at 08MW01 and 08MW03 (April and October) and 08MW07 (April).

Sodium and sulphate concentrations were greater than the Tier 1 Guideline (200 mg/L and 500 mg/L, respectively) at all locations sampled.

Dissolved manganese concentrations were greater than the Tier 1 Guideline (0.05 mg/L) in the groundwater at all locations sampled, ranging from 0.1 mg/L at 08MW07 (April) to 1.8 mg/L at 09MW11 (October). Concentrations of dissolved iron were less than the laboratory detection limit at all locations tested.

Laboratory analytical results, including methods of analyses, are presented as Appendix B. A summary of the 2015 groundwater analytical results is provided in Table 2. Historical groundwater analytical results are summarized in Table 3.

4.0 DISCUSSION

Concentrations of BTEX and PHC fractions F1 and F2, were less than the laboratory detection limits, and/or Alberta Tier 1 Guidelines in the groundwater at most of the locations tested in 2015 with the exception of benzene at 08MW07 in October. Historically, concentrations of benzene (0.068 mg/L), ethylbenzene (0.036 mg/L), and PHC fraction F2 (1.8 mg/L) were reported greater than the Tier 1 Guideline in 2008 at 08MW06 and benzene was reported greater than the Tier 1 Guideline at 09MW11 in 2009 (0.0057 mg/L). BTEX and PHC fractions F1 and F2 were less than the Tier 1 Guidelines in 2014. These two locations (08MW06 and 09MW11) have subsequently not been located or have been destroyed.

Routine groundwater parameters were analyzed for the first time in 2014, and continued in 2015 to assist in determining the potential for the natural attenuation of PHCs in the groundwater at the site. Concentrations of TDS, sodium, sulphate, chloride, nitrate, nitrite, and manganese greater than the Alberta Tier 1 Guidelines were measured in one or more monitoring wells in 2014, and in 2015. The concentrations of these parameters, excluding chloride may reflect natural groundwater composition.

While degradation of hydrocarbons occurs under both aerobic and anaerobic conditions, aerobic breakdown is more rapid. The significance of the redox condition is, therefore, that under aerobic (oxic) conditions, many PHCs are expected to attenuate much faster than under anoxic conditions. Therefore, if inferred oxic conditions prevail at the edge of the dissolved hydrocarbon plume, the migration of hydrocarbons may stabilize or decrease.

The inferred redox status of groundwater at the monitoring wells on site appear to be stable (oxic) with the exception of 08MW07 which changed to anoxic in October. This location is down-gradient of the former UST and is also the same location where concentrations of PHCs increased. The change to anoxic at this location suggests that subsurface conditions are not ideal for the continued attenuation of PHCs.

5.0 RECOMMENDATIONS

Based on the 2015 GWMP, Tetra Tech EBA recommends to continue the semi-annual groundwater monitoring program with the same analytical suite in 2016 to aid in monitoring natural attenuation at the site.

A copy of the ROSC form is included in Appendix C.

6.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
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PERMIT TO PRACTICE TETRA TECH EBA INC.	
Signature	
Date	<i>December 17 2015</i>
PERMIT NUMBER: P245	
The Association of Professional Engineers and Geoscientists of Alberta	

REFERENCES

Alberta Environment and Sustainable Resource Development. 2014. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Environmental Policy Branch. Edmonton, Alberta.

Tetra Tech EBA. 2014. Groundwater and Soil Vapour Monitoring Program. 124 Main Street, Barons, Alberta. File: ENVIND03335-02, dated December 2014.

EBA Engineering Consultants Ltd. 2009. Phase II and Phase III Environmental Site Assessment. 124 Main Street. Lot 17, Block 2, Plan 2605X. AMA Site 9558. Barons, Alberta. File: L22101183.001, dated October 2009.

EBA A Tetra Tech Company. 2011. Underground Storage Tank Removal and Monitoring. AMA Site 9558. Barons, Alberta. File: L22101183.004, dated December 2011.

TABLES

Table 1	Monitoring Well Completion Details and 2015 Field Monitoring Results
Table 2	2015 Groundwater Analytical Results
Table 3	Historical Groundwater Analytical Results

Table 1: Monitoring Well Completion Details and 2015 Field Monitoring Results

Monitoring Well I.d.	Date of Installation	TOP Elevation ¹ (m)	Monitoring Well Depth (mbg) ²	Screen Interval (mbg)	Screened In	Depth to Groundwater (mBTOC) ³	Depth to Groundwater (mbg)	Groundwater Elevation (m)	Combustible Vapour Concentrations ⁴	Depth to Groundwater (mBTOC) ⁴	Depth to Groundwater (mbg)	Groundwater Elevation (m)	Combustible Vapour Concentrations ⁴
						April 23, 2015				October 7, 2015			
08MW01	18-Nov-08	98.64	6.1	1.6 to 6.1	Lark	1.40	1.54	97.24	ND	2.33	2.47	96.31	ND
08MW03	18-Nov-08	98.71	6.1	1.6 to 6.1	Clay and bedrock	1.44	1.51	97.27	ND	2.38	2.45	96.33	ND
08MW07	18-Nov-08	98.47	6.1	1.6 to 6.1	Clay and bedrock	1.31	1.40	97.17	40 ppm	2.21	2.30	96.26	ND
09MW11	9-Mar-09	98.82	6.1	3.1 to 6.1	Clay and bedrock	1.56	1.59	97.27	40 ppm	2.52	2.55	96.31	45 ppm

Notes:
Benchmark: Top bolt of fire hydrant located on the northwest corner of Main Street and Alberta Avenue.
¹ Elevation of top of pipe casing.
² Meters below grade.
³ Meters below top of pipe casing.
⁴ Combustible vapour concentrations measured in parts per million using a RKI Eagle II.
ND - Non-Detect

Table 2: 2015 Groundwater Analytical Results

Parameter	Unit	Tier 1 Guideline ¹	08MW01		08MW03		08MW07		09MW11	
			4/23/2015	10/7/2015	4/23/2015	10/7/2015	4/23/2015	10/7/2015	4/23/2015	10/7/2015
Hydrocarbons										
Benzene	mg/L	0.005	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	0.027	<0.0004	<0.0004
Toluene	mg/L	0.024	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Ethylbenzene	mg/L	0.0024	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004
Xylene Total	mg/L	0.3	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	0.0025	<0.0008	<0.0008
F1 (C6-C10) - BTEX	mg/L	2.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
F2 (C10-C16 Hydrocarbons)	mg/L	1.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.21	<0.1	<0.1
Nutrients										
Nitrate (as NO3-) (Filtered)	mg-N/L	3	68	78	40	54	44	1.8	21	20
Nitrite (as NO2-) (Filtered)	mg-N/L	0.06	0.72	0.58	1.1	1.6	0.018	0.54	1.2	1.4
Total Nitrogen	mg-N/L	NG	68.72	78.58	41.10	55.60	44.02	2.34	22.20	21.40
Calculated Nitrate (as N) (Filtered)	mg-N/L	NG	300	350	180	240	190	7.8	92	87
Calculated Nitrite (as N) (Filtered)	mg-N/L	NG	2.4	1.9	3.5	5.1	0.059	1.8	3.9	4.8
Routine										
pH (Lab)	pH Units	6.5-8.5	7.86	7.46	7.88	7.57	7.94	7.55	7.79	7.48
Hardness as CaCO3	mg/L	NG	3,100	3,500	2,900	3,000	2,400	2,000	2,800	2,900
Electrical Conductivity (EC)	uS/cm	NG	9,900	10,000	8,300	8,600	9,300	5,600	7,800	8,000
Total Dissolved Solids (TDS)	mg/L	500	9,300	9,700	7,700	7,800	8,300	4,800	7,100	7,600
Chloride (Cl) (Filtered)	mg/L	120	160	170	120	140	120	69	110	110
Alkalinity (total as CaCO3)	mg/L	NG	700	710	750	750	650	880	680	690
Bicarbonate	mg/L	NG	860	860	920	910	790	1,100	830	840
Calcium (Filtered)	mg/L	NG	460	500	440	450	370	340	410	430
Carbonate	mg/L	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Hydroxide	mg/L	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Magnesium (Filtered)	mg/L	NG	470	540	430	450	350	270	430	440
Alkalinity (pp as CaCO3)	mg/L	NG	<0.5	-	<0.5	-	<0.5	-	<0.5	-
Potassium (Filtered)	mg/L	NG	10	12	9.4	11	9.7	7.8	9.1	11
Sodium (Filtered)	mg/L	200	1,500	1,600	1,200	1,200	1,600	760	1,100	1,100
Sulphate (SO4) (Filtered)	mg/L	500	5,900	6,000	4,900	4,900	5,200	2,800	4,600	4,900
Metals										
Iron (Filtered)	mg/L	0.3	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Manganese (Filtered)	mg/L	0.05	0.56	0.64	0.41	0.52	0.1	1.8	1.5	1.6
Inorganics										
Anion Sum	meq/L	NG	150	150	120	120	130	79	110	120
Cation Sum	meq/L	NG	130	140	110	110	120	73	100	110
Ionic Balance	N/A	NG	0.88	0.94	0.9	0.89	0.91	0.92	0.91	0.9
Lab Identification Number			MC8643	NJ1453	MC8644	NJ1454	MC8642	NJ1456	MC8641	NJ1455
Lab Report Number			B533570	B589879	B533570	B589879	B533570	B589879	B533570	B589879

Notes:

¹ Alberta Environment and Sustainable Resource Development (ESRD). 2014. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land and Forestry Policy Branch, Policy Division. 195 pp. References guidelines are for fine-grained soils under residential/parkland land use.

NG - No guideline.

< = less than laboratory reportable detection limit.

BOLD AND SHADED - Exceeds Guideline.

Table 3: Historic Groundwater Analytical Results

Parameter	Unit	Tier 1 Guideline ¹	08MW01		08MW03		08MW06*	08MW07		08MW08*	09MW09*	09MW11		09MW13*
			11/28/2008	7/18/2014	11/28/2008	7/18/2014	11/28/2008	11/28/2008	7/18/2014	11/28/2008	3/26/2009	3/26/2009	7/18/2014	3/26/2009
Hydrocarbons														
Benzene	mg/L	0.005	<0.0009	<0.0004	<0.0009	<0.0004	0.068	<0.0009	<0.0004	<0.0009	0.0017	0.0057	0.0022	<0.0009
Toluene	mg/L	0.024	<0.0009	<0.0004	<0.0009	<0.0004	<0.0004	<0.0009	<0.0004	<0.0009	<0.0009	<0.0009	<0.0004	<0.0009
Ethylbenzene	mg/L	0.0024	<0.0009	<0.0004	<0.0009	<0.0004	0.036	<0.0009	<0.0004	<0.0009	<0.0009	<0.0009	<0.0004	<0.0009
Xylene Total	mg/L	0.3	<0.002	<0.0008	<0.002	<0.0008	0.072	<0.002	<0.0008	<0.002	<0.002	<0.002	<0.0008	<0.002
Xylene (m & p)	mg/L	NG	<0.0008	<0.0008	<0.0008	<0.0008	0.059	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008	<0.0008
Xylene (o)	mg/L	NG	<0.0004	<0.0004	<0.0004	<0.0004	0.014	<0.0004	<0.0004	<0.0004	0.0005	<0.0004	<0.0004	<0.0004
F1 (C6-C10) - BTEX	mg/L	2.2	<0.1	<0.1	<0.1	<0.1	1.6	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
F2 (C10-C16 Hydrocarbons)	mg/L	1.1	<0.1	<0.1	<0.1	<0.1	1.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nutrients														
Nitrate (as NO3-) (Filtered)	mg-N/L	NG	--	330	--	170	--	--	180	--	--	--	93	--
Nitrite (as NO2-) (Filtered)	mg-N/L	NG	--	2.4	--	4.4	--	--	0.21	--	--	--	4.9	--
Nitrogen (Total Oxidised)	mg-N/L	NG	--	75	--	39	--	--	41	--	--	--	23	--
Nitrate (as N) (Filtered)	mg-N/L	3	--	74	--	38	--	--	41	--	--	--	21	--
Nitrite (as N) (Filtered)	mg-N/L	0.06	--	0.72	--	1.3	--	--	0.063	--	--	--	1.5	--
Routine														
Alkalinity (Carbonate as CaCO3)	mg/L	NG	--	<0.5	--	<0.5	--	--	<0.5	--	--	--	<0.5	--
pH (Lab)	pH Units	6.5-8.5	--	7.52	--	7.62	--	--	7.63	--	--	--	7.41	--
Hardness as CaCO3	mg/L	NG	--	3,000	--	2,900	--	--	2,300	--	--	--	2,600	--
Electrical Conductivity (EC)	uS/cm	NG	--	9,900	--	8,300	--	--	9,100	--	--	--	7,800	--
Total Dissolved Solids (TDS)	mg/L	500	--	8,800	--	6,900	--	--	7,600	--	--	--	6,500	--
Chloride (Cl) (Filtered)	mg/L	120	--	160	--	120	--	--	120	--	--	--	110	--
Alkalinity (total as CaCO3)	mg/L	NG	--	670	--	740	--	--	600	--	--	--	680	--
Bicarbonate	mg/L	NG	--	820	--	900	--	--	730	--	--	--	830	--
Calcium (Filtered)	mg/L	NG	--	450	--	440	--	--	360	--	--	--	380	--
Carbonate	mg/L	NG	--	<0.5	--	<0.5	--	--	<0.5	--	--	--	<0.5	--
Hydroxide	mg/L	NG	--	<0.5	--	<0.5	--	--	<0.5	--	--	--	<0.5	--
Magnesium (Filtered)	mg/L	NG	--	460	--	440	--	--	330	--	--	--	390	--
Alkalinity (pp as CaCO3)	mg/L	NG	--	<0.5	--	<0.5	--	--	<0.5	--	--	--	<0.5	--
Potassium (Filtered)	mg/L	NG	--	9.7	--	9.6	--	--	9.1	--	--	--	8.2	--
Sodium (Filtered)	mg/L	200	--	1,700	--	1,200	--	--	1,600	--	--	--	1,100	--
Sulphate (SO4) (Filtered)	mg/L	500	--	5,200	--	4,100	--	--	4,600	--	--	--	4,000	--
Metals														
Iron (Filtered)	mg/L	0.3	--	<0.06	--	<0.06	--	--	<0.06	--	--	--	<0.06	--
Manganese (Filtered)	mg/L	0.05	--	0.54	--	0.37	--	--	0.15	--	--	--	1.5	--
Lead (Filtered)	mg/L	0.01	<0.001	--	<0.001	--	0.0031	0.0003	--	<0.001	<0.001	<0.001	--	<0.001
Inorganics														
Anion Sum	meq/L	NG	--	130	--	110	--	--	110	--	--	--	100	--
Cation Sum	meq/L	NG	--	140	--	110	--	--	120	--	--	--	100	--
Ionic Balance	N/A	NG	--	1	--	1	--	--	1	--	--	--	1	--
Lab Identification Number			M95064	KD2520	M95065	KD2521	M95066	M95067	KD2519	M95068	O23768	O23766	KD2518	O23767
Lab Report Number			A865936	B461485	A865936	B461485	A865936	A865936	B461485	A865936	A913848	A913848	B461485	A913848

Notes:

¹ Alberta Environment and Sustainable Resource Development (ESRD). 2014. Alberta Tier 1 Soil and Groundwater Remediation Guidelines. Land and Forestry Policy Branch, Policy Division. 195 pp. References guidelines are for fine-grained soils under residential/parkland land use.

NG - No guideline.

< = less than laboratory reportable detection limit.

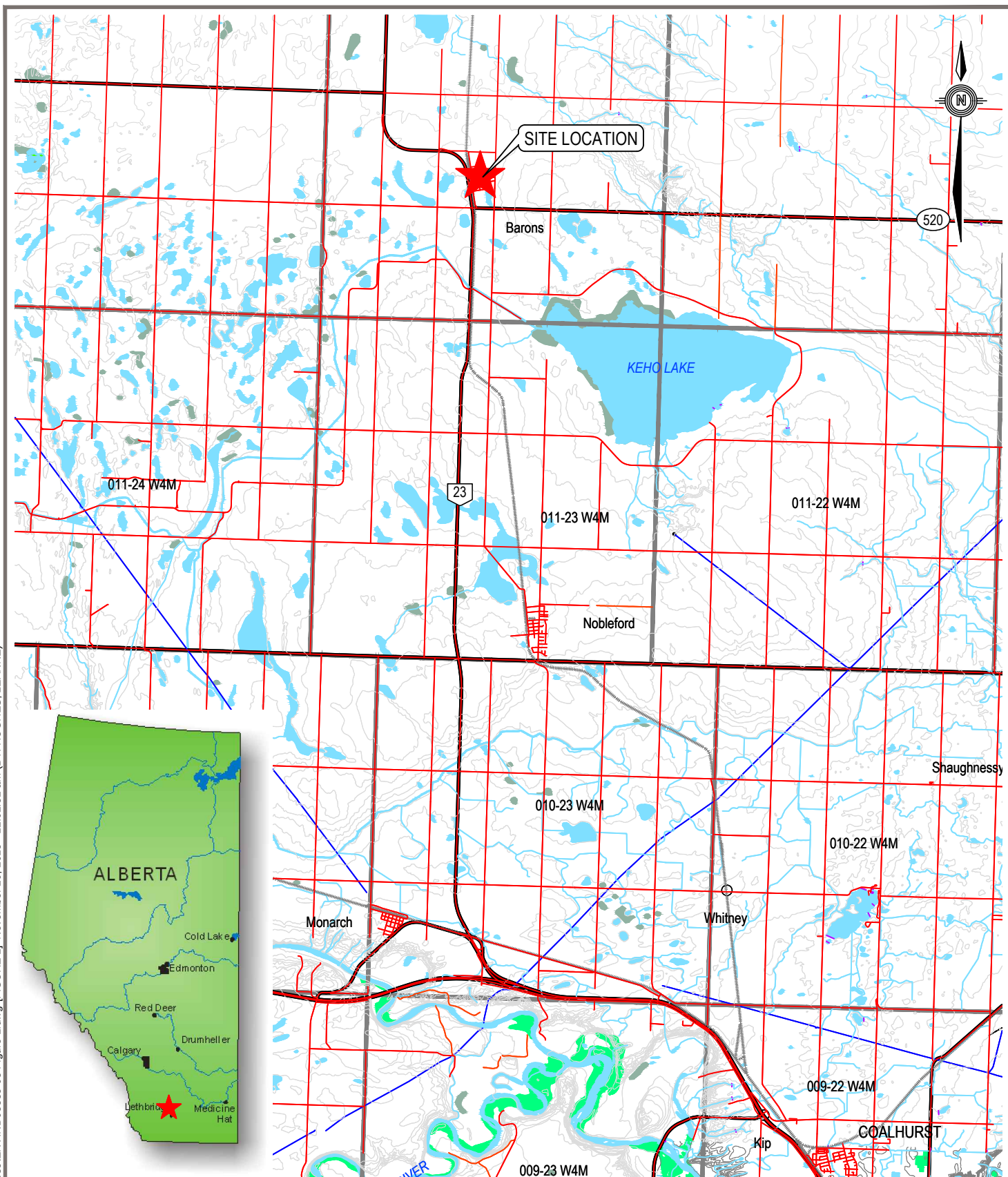
*Monitoring well destroyed or not located.

BOLD AND SHADED - Exceeds Guideline.

FIGURES

Figure 1	Site Location Plan
Figure 2	Site Plan Showing Borehole, Monitoring Well and Soil Vapour Well Locations
Figure 3	Site Plan Showing Groundwater Elevations (April 23, 2015)
Figure 4	Site Plan Showing Groundwater Elevations (October 7, 2015)

C:\Riverbend\Drafting\ENV\IND\ENV\IND03335-03 Figure 1.dwg [FIGURE 1] November 20, 2015 - 12:02:52 am (BY: HUGHES, LEANNE)



NOTES
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CLIENT

Village of Barons



TETRA TECH EBA

2015 GROUNDWATER AND SOIL VAPOUR
MONITORING PROGRAM, 124 MAIN STREET,
BARONS, ALBERTA, AMA SITE 9558

SITE LOCATION PLAN

PROJECT NO.
ENVIND03335-03

DWN
LCH

CKD
BC

REV
0

OFFICE
LETHBRIDGE

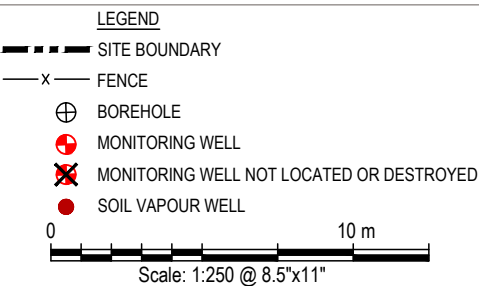
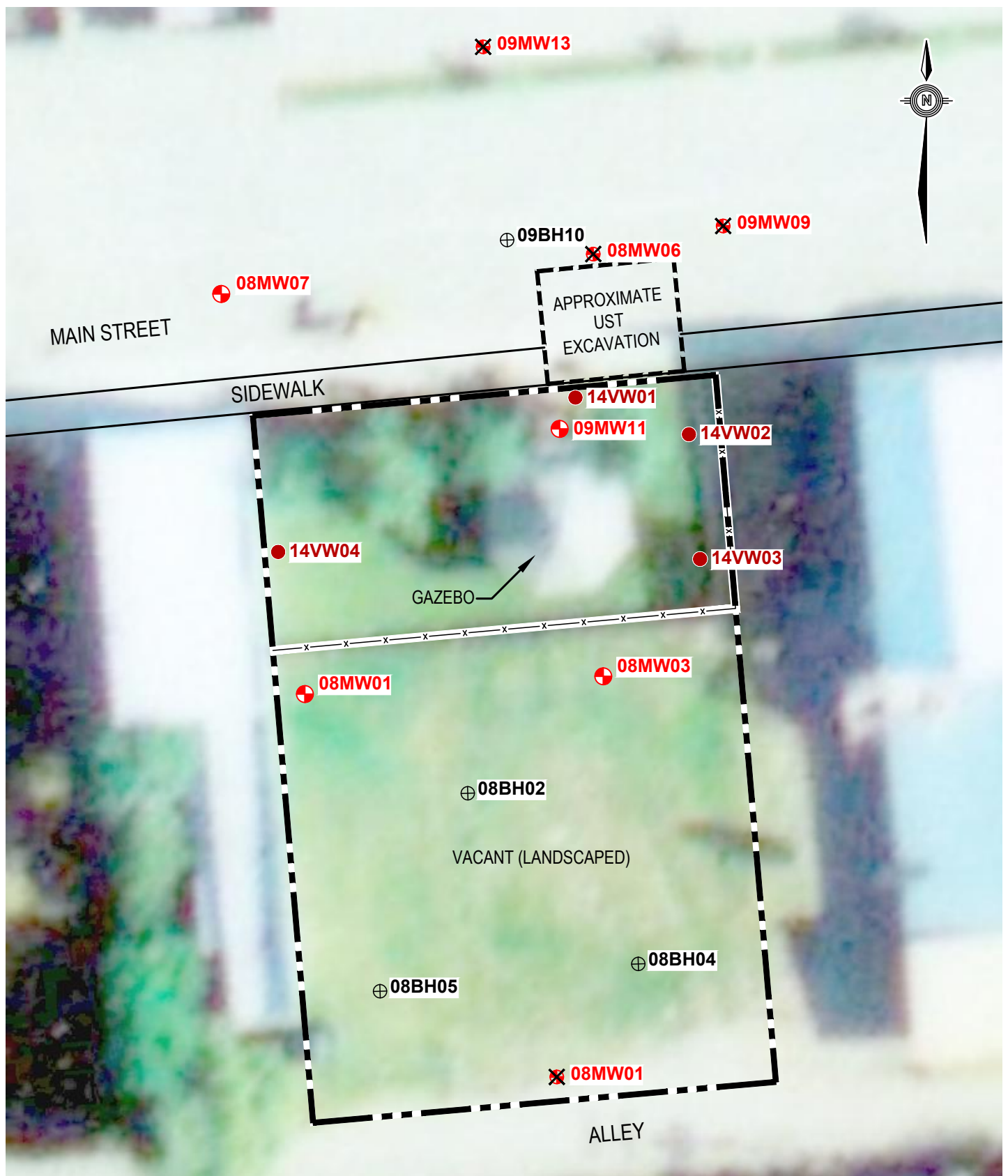
DATE
November 2015

Figure 1

0 8 km

Scale: 1:150,000 @ 8.5"x11"

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CLIENT

Village of Barons



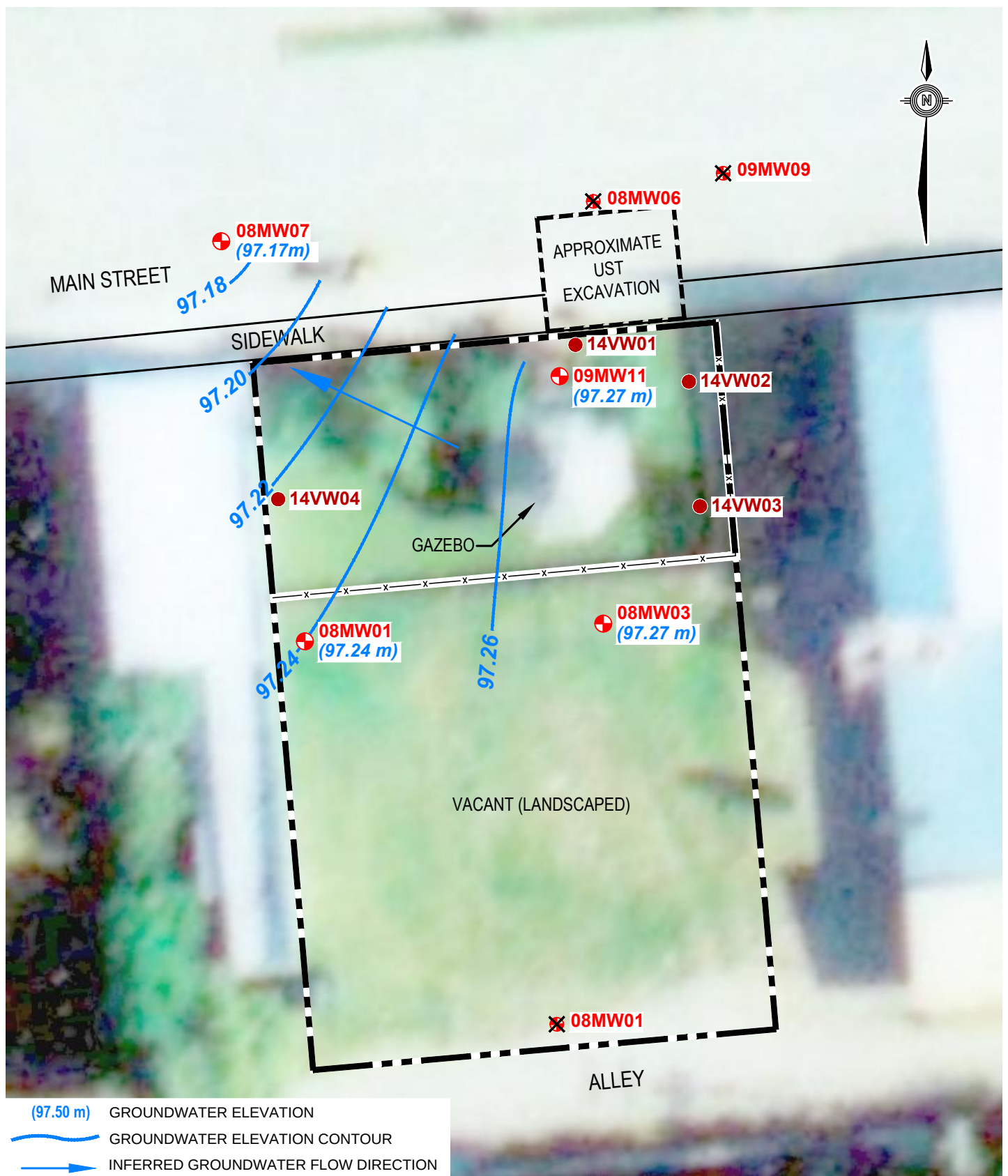
TETRA TECH EBA

**2015 GROUNDWATER AND SOIL VAPOUR
MONITORING PROGRAM, 124 MAIN STREET,
BARONS, ALBERTA, AMA SITE 9558
SITE PLAN SHOWING BOREHOLE,
MONITORING WELL AND
SOIL VAPOUR WELL LOCATIONS**

PROJECT NO. ENVIND03335-03	DWN LCH	CKD BC	REV 0
OFFICE LETHBRIDGE	DATE November 2015		

Figure 2

C:\Riverbend\Drafting\ENV\IND\ENV\IND03335-03 Figures 2,3,4.dwg [FIGURE 3] November 20, 2015 - 9:50:18 am (BY: HUGHES, LEANNE)



- LEGEND**
- SITE BOUNDARY
 - x — FENCE
 - MONITORING WELL
 - SOIL VAPOUR WELL

0 10 m

Scale: 1:250 @ 8.5"x11"

CLIENT

Village of Barons



TETRA TECH EBA

2015 GROUNDWATER AND SOIL VAPOUR
MONITORING PROGRAM, 124 MAIN STREET,
BARONS, ALBERTA, AMA SITE 9558

SITE PLAN SHOWING
GROUNDWATER ELEVATIONS
(April 23, 2015)

PROJECT NO.
ENVIND03335-03

DWN
LCH

CKD
BC

REV
0

OFFICE
LETHBRIDGE

DATE
November 2015

Figure 3

C:\Riverbend\Drafting\ENV\IND\ENV\IND03335-03 Figures 2.3.4.dwg [FIGURE 4] November 20, 2015 - 12:48:10 am (BY: HUGHES, LEANNE)



(97.50 m) GROUNDWATER ELEVATION
 ——— GROUNDWATER ELEVATION CONTOUR
 ——— INFERRED GROUNDWATER FLOW DIRECTION

- LEGEND**
- SITE BOUNDARY
 - x — FENCE
 - MONITORING WELL
 - SOIL VAPOUR WELL

0 10 m
 Scale: 1:250 @ 8.5"x11"

CLIENT

Village of Barons



TETRA TECH EBA

**2015 GROUNDWATER AND SOIL VAPOUR
 MONITORING PROGRAM, 124 MAIN STREET,
 BARONS, ALBERTA, AMA SITE 9558**

**SITE PLAN SHOWING
 GROUNDWATER ELEVATIONS
 (October 7, 2015)**

PROJECT NO.
 ENVIND03335-03

DWN
 LCH

CKD
 BC

REV
 0

OFFICE
 LETHBRIDGE

DATE
 November 2015

Figure 4

APPENDIX A

TETRA TECH EBA'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOENVIRONMENTAL REPORT

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This report pertains to a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment.

This report and the assessments and recommendations contained in it are intended for the sole use of Tetra Tech EBA's client. Tetra Tech EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than Tetra Tech EBA's Client unless otherwise authorized in writing by Tetra Tech EBA. Any unauthorized use of the report is at the sole risk of the user.

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2.0 ALTERNATE REPORT FORMAT

Where Tetra Tech EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed Tetra Tech EBA's instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by Tetra Tech EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of Tetra Tech EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except Tetra Tech EBA. The Client warrants that Tetra Tech EBA's instruments of professional service will be used only and exactly as submitted by Tetra Tech EBA.

Electronic files submitted by Tetra Tech EBA have been prepared and submitted using specific software and hardware systems. Tetra Tech EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

3.0 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by Tetra Tech EBA in its reasonably exercised discretion.

4.0 INFORMATION PROVIDED TO TETRA TECH EBA BY OTHERS

During the performance of the work and the preparation of the report, Tetra Tech EBA may rely on information provided by persons other than the Client. While Tetra Tech EBA endeavours to verify the accuracy of such information when instructed to do so by the Client, Tetra Tech EBA accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

APPENDIX B

LABORATORY CERTIFICATES

Your Project #: ENVIND03335-03
Site Location: 124 MAIN ST. (GAZEBO), BARONS, AB AMA
9558
Your C.O.C. #: A186129

Attention: JAYMES GOING

TETRA TECH EBA INC.
442-10 STREET NORTH
LETHBRIDGE, AB
CANADA T1H 2C7

Report Date: 2015/04/29

Report #: R1860499

Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B533570

Received: 2015/04/25, 09:40

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	4	N/A	2015/04/28	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	4	N/A	2015/04/27	AB SOP-00039	CCME CWS/EPA 8260C m
Chloride by Automated Colourimetry	4	N/A	2015/04/29	AB SOP-00020	SM 22-4500-Cl G m
Conductivity @25C	4	N/A	2015/04/28	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16)	1	2015/04/27	2015/04/27	AB SOP-00040 AB SOP-00037	CCME PHC-CWS
CCME Hydrocarbons in Water (F2; C10-C16)	3	2015/04/27	2015/04/28	AB SOP-00040 AB SOP-00037	CCME PHC-CWS
Hardness	4	N/A	2015/04/29	AB WI-00065	Auto Calc
Elements by ICP - Dissolved	4	N/A	2015/04/28	AB SOP-00042	EPA 200.7 CFR 2012 m
Ion Balance	4	N/A	2015/04/28	AB WI-00065	SM 1030E
Sum of cations, anions	4	N/A	2015/04/29	AB WI-00065	SM 1030E
Nitrate and Nitrite	4	N/A	2015/04/28	AB SOP-00023	Auto Calc
Nitrate + Nitrite-N (calculated)	4	N/A	2015/04/28	AB SOP-00023	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	4	N/A	2015/04/27	AB SOP-00023	SM 22 4110 B m
pH @25°C (Alkalinity titrator)	4	N/A	2015/04/28	AB SOP-00005	SM 22 4500-H+B m
Sulphate by Automated Colourimetry	4	N/A	2015/04/29	AB SOP-00018	SM 22 4500-SO ₄ E m
Total Dissolved Solids (Calculated)	4	N/A	2015/04/29	AB WI-00065	SM 1030E

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.

Ioana Stoica, Project Manager

Email: IStoica@maxxam.ca

Phone# (403)735-2227

=====

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 #: B533570
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: 124 MAIN ST. (GAZEBO), BARONS, AB AMA
9558
Sampler Initials: JL

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		MC8641	MC8642	MC8643	MC8644		
Sampling Date		2015/04/23 14:00	2015/04/23 14:30	2015/04/23 15:00	2015/04/23 15:30		
COC Number		A186129	A186129	A186129	A186129		
	Units	09MW11	08MW07	08MW01	08MW03	RDL	QC Batch
Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	7883013
Volatiles							
Benzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	7883280
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	7883280
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	7883280
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	7883280
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	7883280
Xylenes (Total)	mg/L	<0.00080	<0.00080	<0.00080	<0.00080	0.00080	7883280
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	7883280
(C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	7883280
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	108	108	108	109	N/A	7883280
4-Bromofluorobenzene (sur.)	%	111	110	111	110	N/A	7883280
D4-1,2-Dichloroethane (sur.)	%	115	115	116	118	N/A	7883280
O-TERPHENYL (sur.)	%	92	100	101	93	N/A	7883013
RDL = Reportable Detection Limit N/A = Not Applicable							

Maxxam Job #: B533570
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: 124 MAIN ST. (GAZEBO), BARONS, AB AMA
9558
Sampler Initials: JL

ROUTINE WATER (WATER)

Maxxam ID		MC8641	MC8642	MC8642			MC8643		MC8644		
Sampling Date		2015/04/23 14:00	2015/04/23 14:30	2015/04/23 14:30			2015/04/23 15:00		2015/04/23 15:30		
COC Number		A186129	A186129	A186129			A186129		A186129		
	Units	09MW11	08MW07	08MW07 Lab-Dup	RDL	QC Batch	08MW01	RDL	08MW03	RDL	QC Batch

Calculated Parameters											
Anion Sum	meq/L	110	130	N/A	N/A	7882644	150	N/A	120	N/A	7882644
Cation Sum	meq/L	100	120	N/A	N/A	7882644	130	N/A	110	N/A	7882644
Hardness (CaCO ₃)	mg/L	2800	2400	N/A	0.50	7882642	3100	0.50	2900	0.50	7882796
Ion Balance	N/A	0.91	0.91	N/A	0.010	7882643	0.88	0.010	0.90	0.010	7882797
Dissolved Nitrate (NO ₃)	mg/L	92	190	N/A	0.22	7882587	300	0.44	180	0.22	7882587
Nitrate plus Nitrite (N)	mg/L	22	44	N/A	0.050	7882588	68	0.10	41	0.050	7882588
Dissolved Nitrite (NO ₂)	mg/L	3.9	0.059	N/A	0.033	7882587	2.4	0.033	3.5	0.033	7882587
Total Dissolved Solids	mg/L	7100	8300	N/A	10	7882675	9300	10	7700	10	7882675

Misc. Inorganics											
Conductivity	uS/cm	7800	9300	N/A	1.0	7884086	9900	1.0	8300	1.0	7884086
pH	pH	7.79	7.94	N/A	N/A	7884085	7.86	N/A	7.88	N/A	7884085

Anions											
Alkalinity (PP as CaCO ₃)	mg/L	<0.50	<0.50	N/A	0.50	7884076	<0.50	0.50	<0.50	0.50	7884076
Alkalinity (Total as CaCO ₃)	mg/L	680	650	N/A	0.50	7884076	700	0.50	750	0.50	7884076
Bicarbonate (HCO ₃)	mg/L	830	790	N/A	0.50	7884076	860	0.50	920	0.50	7884076
Carbonate (CO ₃)	mg/L	<0.50	<0.50	N/A	0.50	7884076	<0.50	0.50	<0.50	0.50	7884076
Hydroxide (OH)	mg/L	<0.50	<0.50	N/A	0.50	7884076	<0.50	0.50	<0.50	0.50	7884076
Dissolved Sulphate (SO ₄)	mg/L	4600 (1)	5200 (1)	5400	50	7885971	5900 (1)	50	4900 (1)	50	7885971
Dissolved Chloride (Cl)	mg/L	110	120	120	1.0	7885966	160	1.0	120	1.0	7885966

Nutrients											
Dissolved Nitrite (N)	mg/L	1.2	0.018	N/A	0.010	7884093	0.72	0.010	1.1	0.010	7884093
Dissolved Nitrate (N)	mg/L	21 (1)	44 (1)	N/A	0.050	7884093	68 (1)	0.10	40 (1)	0.050	7884093

Elements											
Dissolved Calcium (Ca)	mg/L	410	370	N/A	0.30	7883688	460	0.30	440	0.30	7883688
Dissolved Iron (Fe)	mg/L	<0.060	<0.060	N/A	0.060	7883688	<0.060	0.060	<0.060	0.060	7883688
Dissolved Magnesium (Mg)	mg/L	430	350	N/A	0.20	7883688	470	0.20	430	0.20	7883688
Dissolved Manganese (Mn)	mg/L	1.5	0.10	N/A	0.0040	7883688	0.56	0.0040	0.41	0.0040	7883688
Dissolved Potassium (K)	mg/L	9.1	9.7	N/A	0.30	7883688	10	0.30	9.4	0.30	7883688
Dissolved Sodium (Na)	mg/L	1100 (1)	1600 (1)	N/A	2.5	7883688	1500 (1)	2.5	1200 (1)	2.5	7883688

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate

N/A = Not Applicable

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

Maxxam Job #: B533570
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: 124 MAIN ST. (GAZEBO), BARONS, AB AMA
9558
Sampler Initials: JL

GENERAL COMMENTS

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

Package 1	9.0°C
-----------	-------

Sample MC8643-01 : Cation anion balance investigated data quality confirmed.

Results relate only to the items tested.

Maxxam Job #: B533570
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: 124 MAIN ST. (GAZEBO), BARONS, AB AMA
9558
Sampler Initials: JL

QUALITY ASSURANCE REPORT

QA/QC	Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7883013	MWB	Matrix Spike		O-TERPHENYL (sur.)	2015/04/27		103	%	50 - 130
				F2 (C10-C16 Hydrocarbons)	2015/04/27		110	%	50 - 130
7883013	MWB	Spiked Blank		O-TERPHENYL (sur.)	2015/04/27		104	%	50 - 130
				F2 (C10-C16 Hydrocarbons)	2015/04/27		107	%	70 - 130
7883013	MWB	Method Blank		O-TERPHENYL (sur.)	2015/04/27		104	%	50 - 130
				F2 (C10-C16 Hydrocarbons)	2015/04/27	<0.10		mg/L	
7883013	MWB	RPD		F2 (C10-C16 Hydrocarbons)	2015/04/27	NC		%	40
7883280	ABG	Matrix Spike		1,4-Difluorobenzene (sur.)	2015/04/27		107	%	70 - 130
				4-Bromofluorobenzene (sur.)	2015/04/27		112	%	70 - 130
				D4-1,2-Dichloroethane (sur.)	2015/04/27		111	%	70 - 130
				Benzene	2015/04/27		103	%	70 - 130
				Toluene	2015/04/27		96	%	70 - 130
				Ethylbenzene	2015/04/27		99	%	70 - 130
				m & p-Xylene	2015/04/27		99	%	70 - 130
				o-Xylene	2015/04/27		97	%	70 - 130
				(C6-C10)	2015/04/27		101	%	70 - 130
7883280	ABG	Spiked Blank		1,4-Difluorobenzene (sur.)	2015/04/27		110	%	70 - 130
				4-Bromofluorobenzene (sur.)	2015/04/27		109	%	70 - 130
				D4-1,2-Dichloroethane (sur.)	2015/04/27		114	%	70 - 130
				Benzene	2015/04/27		110	%	70 - 130
				Toluene	2015/04/27		103	%	70 - 130
				Ethylbenzene	2015/04/27		106	%	70 - 130
				m & p-Xylene	2015/04/27		106	%	70 - 130
				o-Xylene	2015/04/27		106	%	70 - 130
				(C6-C10)	2015/04/27		105	%	70 - 130
7883280	ABG	Method Blank		1,4-Difluorobenzene (sur.)	2015/04/27		108	%	70 - 130
				4-Bromofluorobenzene (sur.)	2015/04/27		111	%	70 - 130
				D4-1,2-Dichloroethane (sur.)	2015/04/27		111	%	70 - 130
				Benzene	2015/04/27	<0.00040		mg/L	
				Toluene	2015/04/27	<0.00040		mg/L	
				Ethylbenzene	2015/04/27	<0.00040		mg/L	
				m & p-Xylene	2015/04/27	<0.00080		mg/L	
				o-Xylene	2015/04/27	<0.00040		mg/L	
				Xylenes (Total)	2015/04/27	<0.00080		mg/L	
				F1 (C6-C10) - BTEX	2015/04/27	<0.10		mg/L	
7883280	ABG	RPD		(C6-C10)	2015/04/27	<0.10		mg/L	
				Benzene	2015/04/27	1.9		%	40
				Toluene	2015/04/27	1.5		%	40
				Ethylbenzene	2015/04/27	1.5		%	40
				m & p-Xylene	2015/04/27	1.7		%	40
				o-Xylene	2015/04/27	1.3		%	40
				Xylenes (Total)	2015/04/27	1.6		%	40
				F1 (C6-C10) - BTEX	2015/04/27	NC		%	40
				(C6-C10)	2015/04/27	NC		%	40
7883688	SRT	Matrix Spike		Dissolved Calcium (Ca)	2015/04/27		NC	%	80 - 120
				Dissolved Iron (Fe)	2015/04/27		83	%	80 - 120
				Dissolved Magnesium (Mg)	2015/04/27		NC	%	80 - 120
				Dissolved Manganese (Mn)	2015/04/27		NC	%	80 - 120
				Dissolved Potassium (K)	2015/04/27		93	%	80 - 120
				Dissolved Sodium (Na)	2015/04/27		NC	%	80 - 120
7883688	SRT	Spiked Blank		Dissolved Calcium (Ca)	2015/04/27		94	%	80 - 120

Maxxam Job #: B533570
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: 124 MAIN ST. (GAZEBO), BARONS, AB AMA
9558
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	Units	QC Limits
7883688	SRT	Method Blank	Dissolved Iron (Fe)	2015/04/27		94	%	80 - 120
			Dissolved Magnesium (Mg)	2015/04/27		97	%	80 - 120
			Dissolved Manganese (Mn)	2015/04/27		93	%	80 - 120
			Dissolved Potassium (K)	2015/04/27		94	%	80 - 120
			Dissolved Sodium (Na)	2015/04/27		92	%	80 - 120
			Dissolved Calcium (Ca)	2015/04/27	<0.30		mg/L	
			Dissolved Iron (Fe)	2015/04/27	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2015/04/27	<0.20		mg/L	
			Dissolved Manganese (Mn)	2015/04/27	<0.0040		mg/L	
			Dissolved Potassium (K)	2015/04/27	<0.30		mg/L	
7883688	SRT	RPD	Dissolved Sodium (Na)	2015/04/27	<0.50		mg/L	
			Dissolved Calcium (Ca)	2015/04/28	0.099		%	20
			Dissolved Iron (Fe)	2015/04/28	1.2		%	20
			Dissolved Magnesium (Mg)	2015/04/28	1.4		%	20
			Dissolved Manganese (Mn)	2015/04/28	0.86		%	20
			Dissolved Potassium (K)	2015/04/28	2.3		%	20
			Dissolved Sodium (Na)	2015/04/28	2.9		%	20
			Alkalinity (Total as CaCO ₃)	2015/04/28		94	%	80 - 120
			Alkalinity (PP as CaCO ₃)	2015/04/28	<0.50		mg/L	
			Alkalinity (Total as CaCO ₃)	2015/04/28	<0.50		mg/L	
7884076	CPI	Spiked Blank	Bicarbonate (HCO ₃)	2015/04/28	<0.50		mg/L	
7884076	CPI	Method Blank	Carbonate (CO ₃)	2015/04/28	<0.50		mg/L	
7884076	CPI	RPD	Hydroxide (OH)	2015/04/28	<0.50		mg/L	
			Alkalinity (PP as CaCO ₃)	2015/04/28	NC		%	20
			Alkalinity (Total as CaCO ₃)	2015/04/28	0.49		%	20
			Bicarbonate (HCO ₃)	2015/04/28	0.51		%	20
			Carbonate (CO ₃)	2015/04/28	NC		%	20
			Hydroxide (OH)	2015/04/28	NC		%	20
7884085	CPI	Spiked Blank	pH	2015/04/28		100	%	97 - 103
7884085	CPI	RPD	pH	2015/04/28	0.23		%	N/A
7884086	CPI	Spiked Blank	Conductivity	2015/04/28		103	%	90 - 110
7884086	CPI	Method Blank	Conductivity	2015/04/28	<1.0		uS/cm	
7884086	CPI	RPD	Conductivity	2015/04/28	0		%	20
7884093	JLD	Matrix Spike	Dissolved Nitrite (N)	2015/04/27		101	%	80 - 120
			Dissolved Nitrate (N)	2015/04/27		101	%	80 - 120
			Dissolved Nitrite (N)	2015/04/27		102	%	80 - 120
			Dissolved Nitrate (N)	2015/04/27		103	%	80 - 120
7884093	JLD	Method Blank	Dissolved Nitrite (N)	2015/04/27	<0.010		mg/L	
			Dissolved Nitrate (N)	2015/04/27	<0.010		mg/L	
7884093	JLD	RPD	Dissolved Nitrite (N)	2015/04/27	NC		%	20
			Dissolved Nitrate (N)	2015/04/27	NC		%	20
7885966	KP9	Matrix Spike [MC8642-01]	Dissolved Chloride (Cl)	2015/04/29		NC	%	80 - 120
7885966	KP9	Spiked Blank	Dissolved Chloride (Cl)	2015/04/29		105	%	80 - 120
7885966	KP9	Method Blank	Dissolved Chloride (Cl)	2015/04/29	<1.0		mg/L	
7885966	KP9	RPD [MC8642-01]	Dissolved Chloride (Cl)	2015/04/29	0.62		%	20
7885971	KP9	Matrix Spike [MC8642-01]	Dissolved Sulphate (SO ₄)	2015/04/29		NC	%	80 - 120
7885971	KP9	Spiked Blank	Dissolved Sulphate (SO ₄)	2015/04/29		104	%	80 - 120
7885971	KP9	Method Blank	Dissolved Sulphate (SO ₄)	2015/04/29	<1.0		mg/L	

Maxxam Job #: B533570
Report Date: 2015/04/29

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: 124 MAIN ST. (GAZEBO), BARONS, AB AMA
9558
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC				Date				
Batch	Init	QC Type	Parameter	Analyzed	Value	Recovery	Units	QC Limits
7885971	KP9	RPD [MC8642-01]	Dissolved Sulphate (SO4)	2015/04/29	3.5		%	20
N/A = Not Applicable Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement. Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference. 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. Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination. Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency. 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). 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 < 5x RDL).								

Maxxam Job #: B533570
Report Date: 2015/04/29

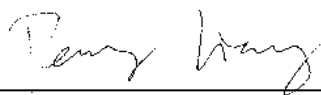
TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: 124 MAIN ST. (GAZEBO), BARONS, AB AMA
9558
Sampler Initials: JL

VALIDATION SIGNATURE PAGE

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



Luba Shymushovska, Organics – Senior Analyst



Peng Liang, Senior Analyst

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.

Company:	Invoice To: TETRA TECH EBA, INC.	C/O Report Address ☐
Contact:	JAYMES GOING	
Address:	442-10th ST. N. LETHBRIDGE	
	Prov: AB	PC: TH247
Contact #s:	Ph: 329-9009	Cell: 634-3566

Report To:	Same as Invoice
S/A.	
Prov:	PC:
Ph:	Cell:

Report Distribution (E-Mail):

jgoing@eba.ca
glamontagne@eba.ca

REGULATORY GUIDELINES:

☒ AT1

☐ CCME

☐ Regulated Drinking Water

☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise

PO #: ENVIND03335-03
Project # / Name: 124 MAWST. (GRAZED) - G.W. Hensberry
Site Location: BARONS, AB AMA 9558
Quote #: EBA
Sampled By: JAMIE LAMONTAGNE 634386

SERVICE REQUESTED: ☐ RUSH (Contact lab to reserve)
Date Required: _____
☒ REGULAR (5 to 7 Days)

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00
1	09MW11	Monitoring well	G.W	15/08/23 14:00
2	08MW07	↓	↓	14:30
3	08MW01	↓	↓	15:00
4	08MW03	↓	↓	15:30
5				
6				
7				
8				
9				
10				
11				
12				

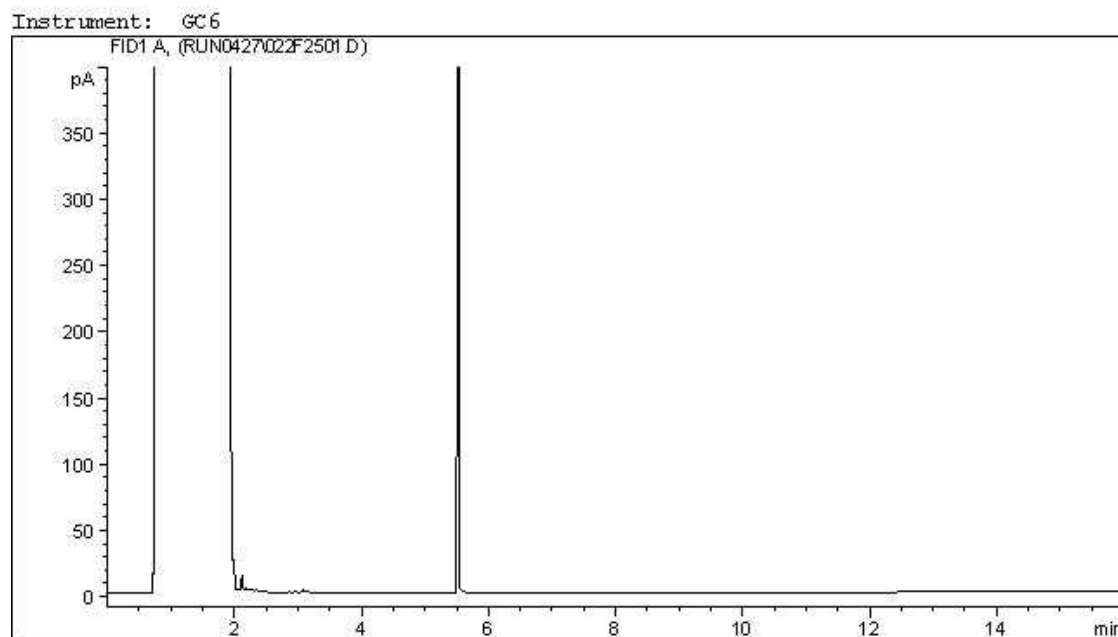
[illegible]

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

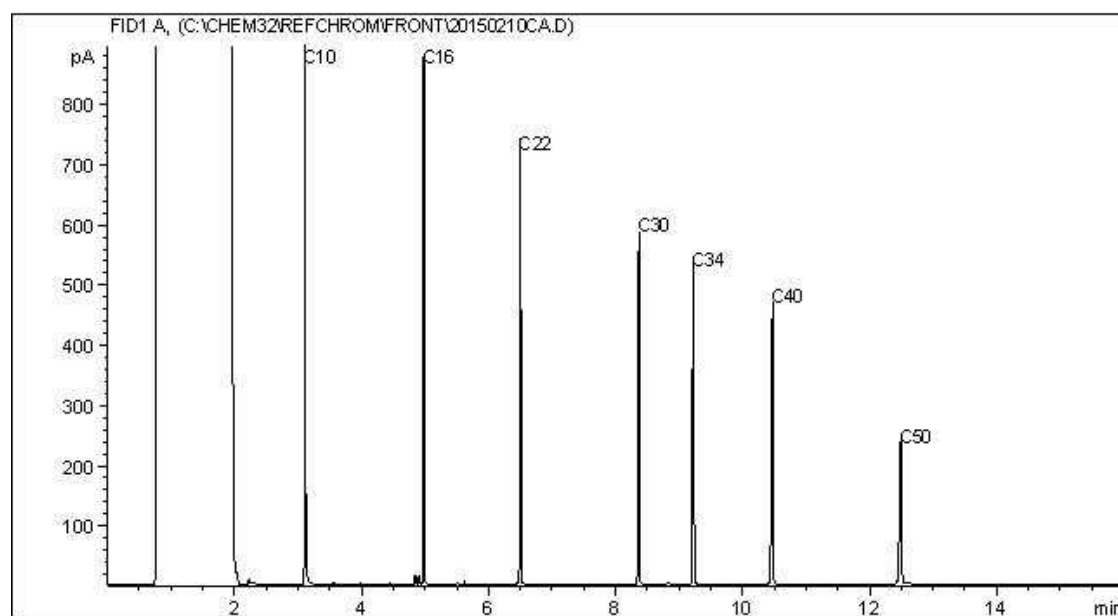
Relinquished By (Signature/Print): <i>JAMIE MONTAGNE</i>	Date (YY/MM/DD): <i>15 APR 14</i>	Time (24:00): <i>13:00</i>
Relinquished By (Signature/Print): <i>[Signature]</i>	Date (YY/MM/DD):	Time (24:00):
Special Instructions: <i>* Diss metals filtered & preserved (F/P)</i>	# of Jars Used & Not Submitted	

LAB USE ONLY									
Received By: 	Date: 15/04/25	Time: 0940	Maxxam Job #:						
Lab Comments:			<table border="1"> <tr> <th>Custody Seal</th> <th>Temperature</th> <th>Location</th> </tr> <tr> <td>N</td> <td>9, 9, 9</td> <td>A</td> </tr> </table>	Custody Seal	Temperature	Location	N	9, 9, 9	A
Custody Seal	Temperature	Location							
N	9, 9, 9	A							

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



Carbon Range Distribution - Reference Chromatogram

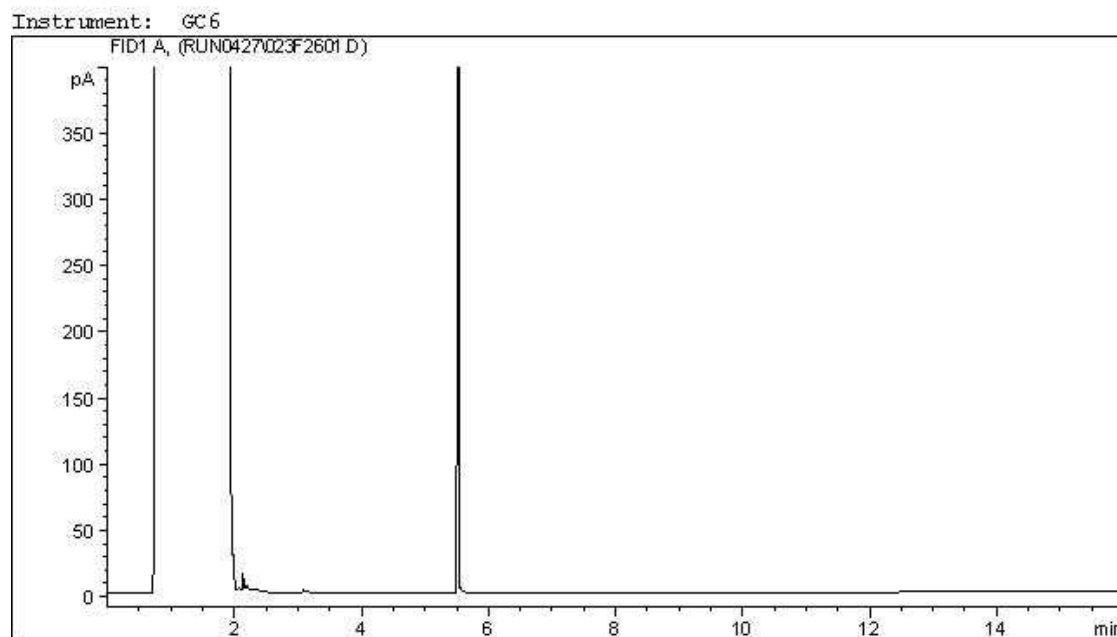


TYPICAL PRODUCT CARBON NUMBER RANGES

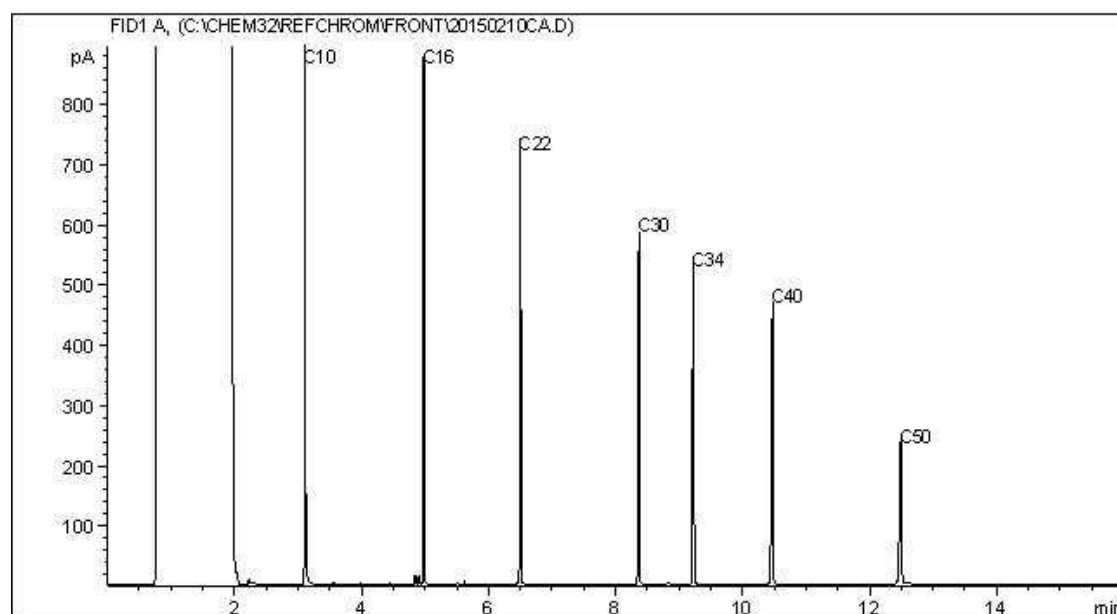
Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

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



Carbon Range Distribution - Reference Chromatogram

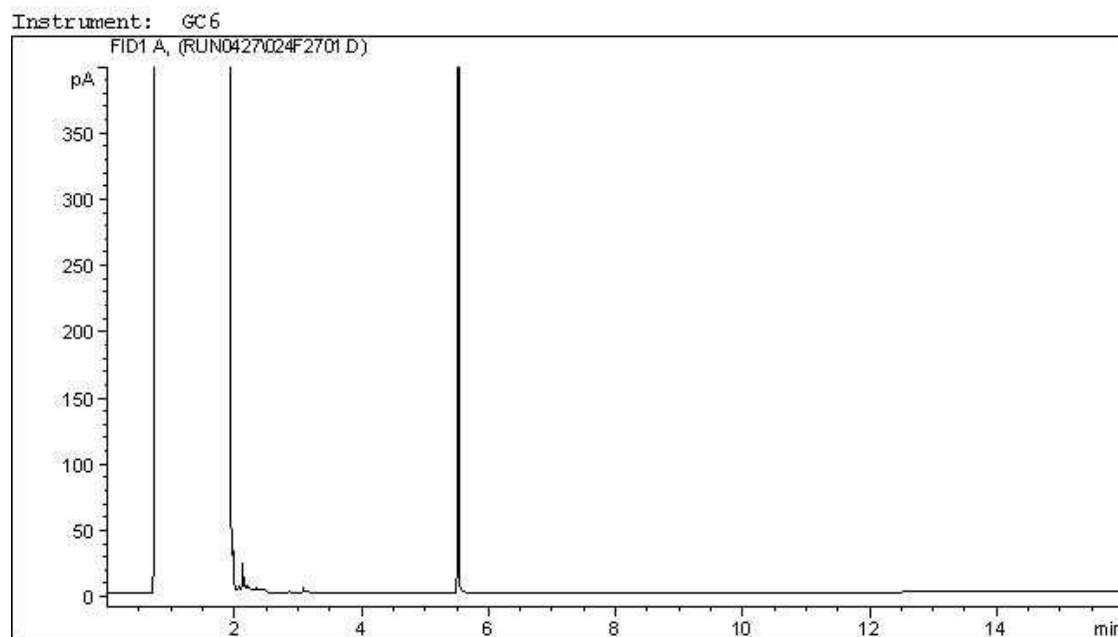


TYPICAL PRODUCT CARBON NUMBER RANGES

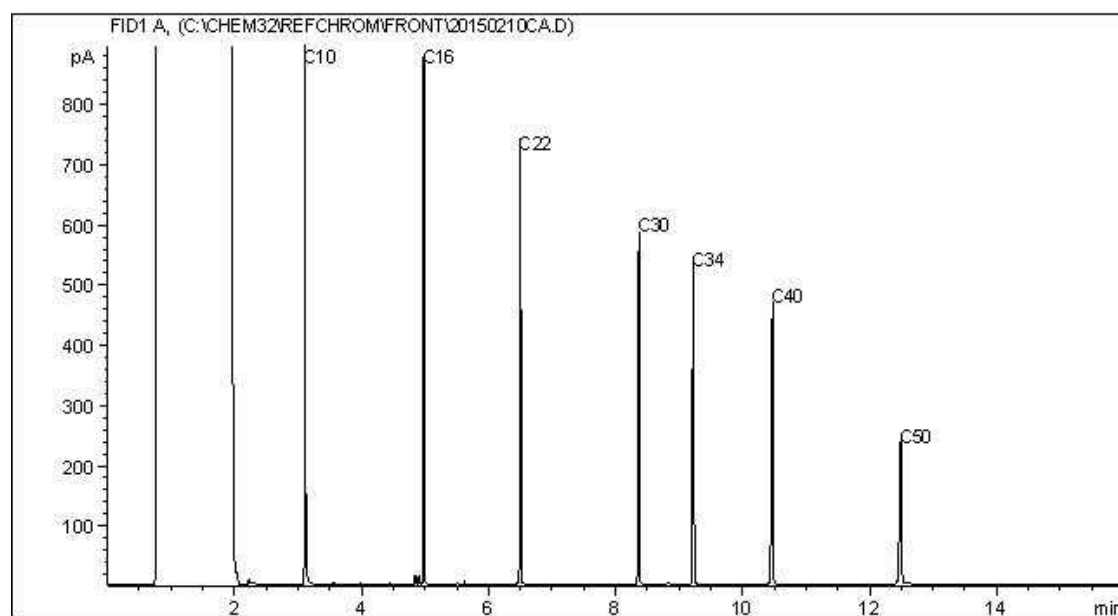
Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

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



Carbon Range Distribution - Reference Chromatogram

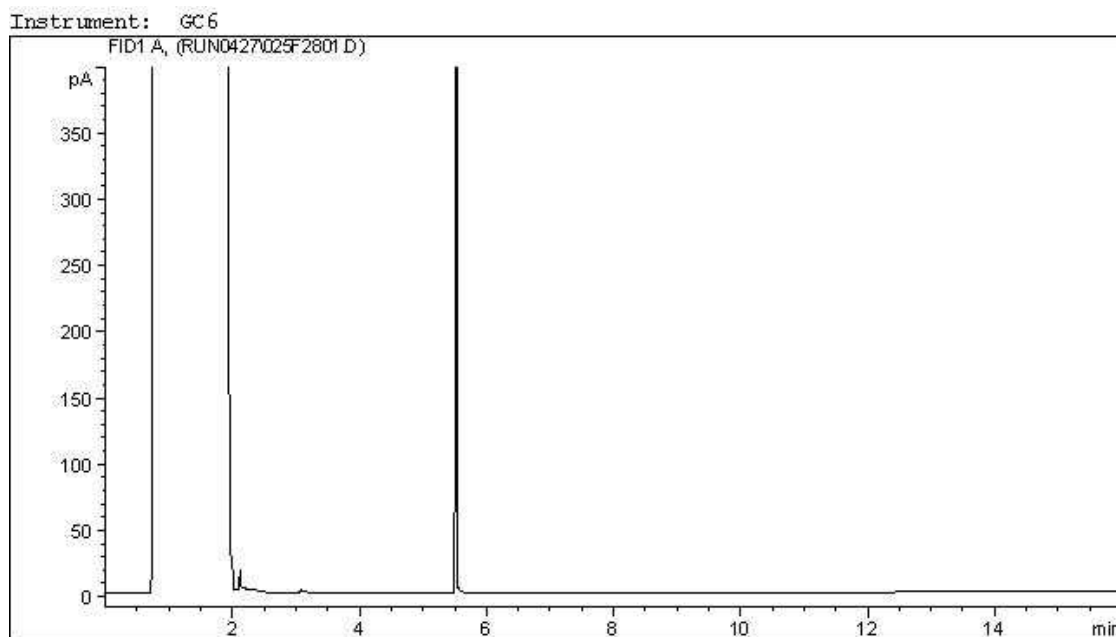


TYPICAL PRODUCT CARBON NUMBER RANGES

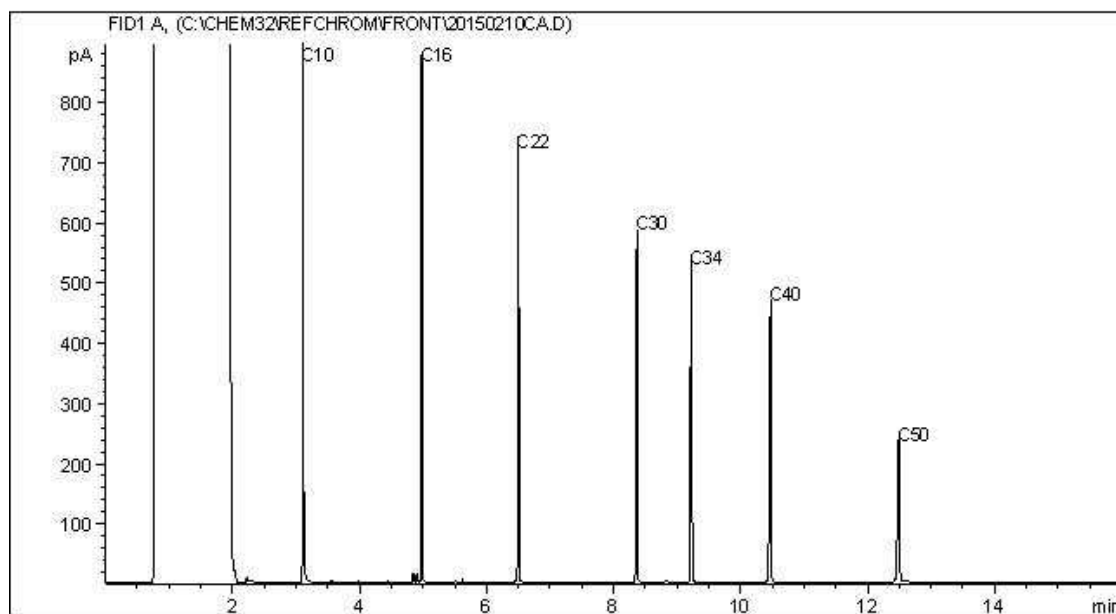
Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

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

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.

Your Project #: ENVIND03335-03
Site Location: BARONS AMA 9558-124 MAIN ST
Your C.O.C. #: A108368

Attention: JAYMES GOING

TETRA TECH EBA INC.
442-10 STREET NORTH
LETHBRIDGE, AB
CANADA T1H 2C7

Report Date: 2015/10/20
Report #: R2061331
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B589879

Received: 2015/10/10, 09:53

Sample Matrix: Water
Samples Received: 4

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Alkalinity @25C (pp, total), CO ₃ ,HCO ₃ ,OH	4	N/A	2015/10/14	AB SOP-00005	SM 22 2320 B m
BTEX/F1 in Water by HS GC/MS/FID	4	N/A	2015/10/20	AB SOP-00039	CCME CWS/EPA 8260c m
Chloride by Automated Colourimetry	3	N/A	2015/10/16	AB SOP-00020	SM 22-4500-Cl G m
Chloride by Automated Colourimetry	1	N/A	2015/10/19	AB SOP-00020	SM 22-4500-Cl G m
Conductivity @25C	4	N/A	2015/10/14	AB SOP-00005	SM 22 2510 B m
CCME Hydrocarbons in Water (F2; C10-C16)	4	2015/10/15	2015/10/16	AB SOP-00040 AB SOP-00037	CCME PHC-CWS m
Hardness	4	N/A	2015/10/16	AB WI-00065	Auto Calc
Elements by ICP - Dissolved	4	N/A	2015/10/16	AB SOP-00042	EPA 200.7 CFR 2012 m
Ion Balance	4	N/A	2015/10/15	AB WI-00065	Auto Calc
Sum of cations, anions	4	N/A	2015/10/16	AB WI-00065	Auto Calc
Nitrate and Nitrite	4	N/A	2015/10/18	AB WI-00065	Auto Calc
Nitrate + Nitrite-N (calculated)	4	N/A	2015/10/18	AB WI-00065	Auto Calc
Nitrogen, (Nitrite, Nitrate) by IC	4	N/A	2015/10/15	AB SOP-00023	SM 22 4110 B m
pH @25°C (Alkalinity titrator)	4	N/A	2015/10/14	AB SOP-00005	SM 22 4500-H+B m
Sulphate by Automated Colourimetry	3	N/A	2015/10/16	AB SOP-00018	SM 22 4500-SO4 E m
Sulphate by Automated Colourimetry	1	N/A	2015/10/19	AB SOP-00018	SM 22 4500-SO4 E m
Total Dissolved Solids (Calculated)	3	N/A	2015/10/17	AB WI-00065	Auto Calc
Total Dissolved Solids (Calculated)	1	N/A	2015/10/19	AB WI-00065	Auto Calc

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.

Ioana Stoica, Project Manager

Email: IStoica@maxxam.ca

Phone# (403)735-2227

=====

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.

Total Cover Pages : 1

Page 1 of 14

Maxxam Job #: B589879
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: BARONS AMA 9558-124 MAIN ST
Sampler Initials: JL

AT1 BTEX AND F1-F2 (WATER)

Maxxam ID		NJ1453	NJ1454	NJ1455	NJ1456		
Sampling Date		2015/10/08 10:30	2015/10/08 10:30	2015/10/08 11:00	2015/10/08 11:10		
COC Number		A108368	A108368	A108368	A108368		
	UNITS	08MW01	08MW03	09MW11	08MW07	RDL	QC Batch
Hydrocarbons							
F2 (C10-C16 Hydrocarbons)	mg/L	<0.10	<0.10	<0.10	0.21	0.10	8072492
Volatiles							
Benzene	mg/L	<0.00040	<0.00040	<0.00040	0.027	0.00040	8075570
Toluene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	8075570
Ethylbenzene	mg/L	<0.00040	<0.00040	<0.00040	<0.00040	0.00040	8075570
m & p-Xylene	mg/L	<0.00080	<0.00080	<0.00080	0.0012	0.00080	8075570
o-Xylene	mg/L	<0.00040	<0.00040	<0.00040	0.0013	0.00040	8075570
Xylenes (Total)	mg/L	<0.00080	<0.00080	<0.00080	0.0025	0.00080	8075570
F1 (C6-C10) - BTEX	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	8075570
F1 (C6-C10)	mg/L	<0.10	<0.10	<0.10	<0.10	0.10	8075570
Surrogate Recovery (%)							
1,4-Difluorobenzene (sur.)	%	107	108	108	107	N/A	8075570
4-Bromofluorobenzene (sur.)	%	104	105	105	105	N/A	8075570
D4-1,2-Dichloroethane (sur.)	%	114	115	113	120	N/A	8075570
O-TERPHENYL (sur.)	%	97	96	98	102	N/A	8072492
RDL = Reportable Detection Limit							
N/A = Not Applicable							

Maxxam Job #: B589879
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: BARONS AMA 9558-124 MAIN ST
Sampler Initials: JL

ROUTINE WATER (WATER)

Maxxam ID		NJ1453			NJ1454			NJ1455	NJ1455		
Sampling Date		2015/10/08 10:30			2015/10/08 10:30			2015/10/08 11:00	2015/10/08 11:00		
COC Number		A108368			A108368			A108368	A108368		
	UNITS	08MW01	RDL	QC Batch	08MW03	RDL	QC Batch	09MW11	09MW11 Lab-Dup	RDL	QC Batch

Calculated Parameters											
Anion Sum	meq/L	150	N/A	8070983	120	N/A	8070983	120	N/A	N/A	8070983
Cation Sum	meq/L	140	N/A	8070983	110	N/A	8070983	110	N/A	N/A	8070983
Hardness (CaCO ₃)	mg/L	3500	0.50	8070981	3000	0.50	8070981	2900	N/A	0.50	8070981
Ion Balance	N/A	0.94	0.010	8070982	0.89	0.010	8070982	0.90	N/A	0.010	8070982
Dissolved Nitrate (NO ₃)	mg/L	350	0.44	8070984	240	0.44	8070984	87	N/A	0.22	8070984
Nitrate plus Nitrite (N)	mg/L	79	0.020	8070985	56	0.020	8070985	21	N/A	0.020	8070985
Dissolved Nitrite (NO ₂)	mg/L	1.9	0.033	8070984	5.1	0.033	8070984	4.8	N/A	0.033	8070984
Total Dissolved Solids	mg/L	9700	10	8070986	7800	10	8070986	7600	N/A	10	8070986

Misc. Inorganics											
Conductivity	uS/cm	10000	1.0	8073162	8600	1.0	8073162	8000	N/A	1.0	8073162
pH	pH	7.46	N/A	8073161	7.57	N/A	8073161	7.48	N/A	N/A	8073161

Anions											
Alkalinity (PP as CaCO ₃)	mg/L	<0.50	0.50	8073158	<0.50	0.50	8073158	<0.50	N/A	0.50	8073158
Alkalinity (Total as CaCO ₃)	mg/L	710	0.50	8073158	750	0.50	8073158	690	N/A	0.50	8073158
Bicarbonate (HCO ₃)	mg/L	860	0.50	8073158	910	0.50	8073158	840	N/A	0.50	8073158
Carbonate (CO ₃)	mg/L	<0.50	0.50	8073158	<0.50	0.50	8073158	<0.50	N/A	0.50	8073158
Hydroxide (OH)	mg/L	<0.50	0.50	8073158	<0.50	0.50	8073158	<0.50	N/A	0.50	8073158
Dissolved Sulphate (SO ₄)	mg/L	6000 (1)	50	8077569	4900 (1)	50	8077566	4900 (1)	N/A	50	8079377
Dissolved Chloride (Cl)	mg/L	170	1.0	8077568	140	1.0	8077565	110	N/A	1.0	8079375

Nutrients											
Dissolved Nitrite (N)	mg/L	0.58	0.010	8073779	1.6	0.010	8073779	1.4	N/A	0.010	8073779
Dissolved Nitrate (N)	mg/L	78 (1)	0.10	8073779	54 (1)	0.10	8073779	20 (1)	N/A	0.050	8073779

Elements											
Dissolved Calcium (Ca)	mg/L	500	0.30	8075095	450	0.30	8075095	430	440	0.30	8075095
Dissolved Iron (Fe)	mg/L	<0.060	0.060	8075095	<0.060	0.060	8075095	<0.060	<0.060	0.060	8075095
Dissolved Magnesium (Mg)	mg/L	540 (1)	2.0	8075095	450	0.20	8075095	440	440	0.20	8075095
Dissolved Manganese (Mn)	mg/L	0.64	0.0040	8075095	0.52	0.0040	8075095	1.6	1.6	0.0040	8075095
Dissolved Potassium (K)	mg/L	12	0.30	8075095	11	0.30	8075095	11	11	0.30	8075095
Dissolved Sodium (Na)	mg/L	1600 (1)	5.0	8075095	1200 (1)	5.0	8075095	1100 (1)	1200 (1)	5.0	8075095

RDL = Reportable Detection Limit

Lab-Dup = Laboratory Initiated Duplicate

N/A = Not Applicable

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

Maxxam Job #: B589879
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: BARONS AMA 9558-124 MAIN ST
Sampler Initials: JL

ROUTINE WATER (WATER)

Maxxam ID		NJ1456		
Sampling Date		2015/10/08 11:10		
COC Number		A108368		
	UNITS	08MW07	RDL	QC Batch
Calculated Parameters				
Anion Sum	meq/L	79	N/A	8070983
Cation Sum	meq/L	73	N/A	8070983
Hardness (CaCO ₃)	mg/L	2000	0.50	8070981
Ion Balance	N/A	0.92	0.010	8070982
Dissolved Nitrate (NO ₃)	mg/L	7.8	0.044	8070984
Nitrate plus Nitrite (N)	mg/L	2.3	0.020	8070985
Dissolved Nitrite (NO ₂)	mg/L	1.8	0.033	8070984
Total Dissolved Solids	mg/L	4800	10	8070986
Misc. Inorganics				
Conductivity	uS/cm	5600	1.0	8073162
pH	pH	7.55	N/A	8073161
Anions				
Alkalinity (PP as CaCO ₃)	mg/L	<0.50	0.50	8073158
Alkalinity (Total as CaCO ₃)	mg/L	880	0.50	8073158
Bicarbonate (HCO ₃)	mg/L	1100	0.50	8073158
Carbonate (CO ₃)	mg/L	<0.50	0.50	8073158
Hydroxide (OH)	mg/L	<0.50	0.50	8073158
Dissolved Sulphate (SO ₄)	mg/L	2800 (1)	20	8077566
Dissolved Chloride (Cl)	mg/L	69	1.0	8077565
Nutrients				
Dissolved Nitrite (N)	mg/L	0.54	0.010	8073779
Dissolved Nitrate (N)	mg/L	1.8	0.010	8073779
Elements				
Dissolved Calcium (Ca)	mg/L	340	0.30	8075095
Dissolved Iron (Fe)	mg/L	<0.060	0.060	8075095
Dissolved Magnesium (Mg)	mg/L	270	0.20	8075095
Dissolved Manganese (Mn)	mg/L	1.8	0.0040	8075095
Dissolved Potassium (K)	mg/L	7.8	0.30	8075095
Dissolved Sodium (Na)	mg/L	760 (1)	5.0	8075095
RDL = Reportable Detection Limit N/A = Not Applicable (1) Detection limits raised due to dilution to bring analyte within the calibrated range.				

Maxxam Job #: B589879
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TETRA TECH EBA INC.
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GENERAL COMMENTS

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

Package 1	9.7°C
Package 2	5.3°C

Sample NJ1454-01 : Cation anion balance investigated data quality confirmed.

Results relate only to the items tested.

Maxxam Job #: B589879
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: BARONS AMA 9558-124 MAIN ST
Sampler Initials: JL

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8072492	JA7	Matrix Spike	O-TERPHENYL (sur.)	2015/10/16		103	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2015/10/16		110	%	50 - 130
8072492	JA7	Spiked Blank	O-TERPHENYL (sur.)	2015/10/16		96	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2015/10/16		107	%	70 - 130
8072492	JA7	Method Blank	O-TERPHENYL (sur.)	2015/10/16		98	%	50 - 130
			F2 (C10-C16 Hydrocarbons)	2015/10/16	<0.10		mg/L	
8072492	JA7	RPD	F2 (C10-C16 Hydrocarbons)	2015/10/16	NC		%	40
8073158	XLI	Spiked Blank	Alkalinity (Total as CaCO3)	2015/10/14		94	%	80 - 120
8073158	XLI	Method Blank	Alkalinity (PP as CaCO3)	2015/10/14	<0.50		mg/L	
			Alkalinity (Total as CaCO3)	2015/10/14	<0.50		mg/L	
			Bicarbonate (HCO3)	2015/10/14	<0.50		mg/L	
			Carbonate (CO3)	2015/10/14	<0.50		mg/L	
			Hydroxide (OH)	2015/10/14	<0.50		mg/L	
8073158	XLI	RPD	Alkalinity (PP as CaCO3)	2015/10/14	NC		%	20
			Alkalinity (Total as CaCO3)	2015/10/14	0.30		%	20
			Bicarbonate (HCO3)	2015/10/14	0.30		%	20
			Carbonate (CO3)	2015/10/14	NC		%	20
			Hydroxide (OH)	2015/10/14	NC		%	20
8073161	XLI	Spiked Blank	pH	2015/10/14		100	%	97 - 103
8073161	XLI	RPD	pH	2015/10/14	0.13		%	N/A
8073162	XLI	Spiked Blank	Conductivity	2015/10/14		101	%	90 - 110
8073162	XLI	Method Blank	Conductivity	2015/10/14	<1.0		uS/cm	
8073162	XLI	RPD	Conductivity	2015/10/14	0.52		%	20
8073779	JLD	Matrix Spike	Dissolved Nitrite (N)	2015/10/15		100	%	80 - 120
			Dissolved Nitrate (N)	2015/10/15		101	%	80 - 120
8073779	JLD	Spiked Blank	Dissolved Nitrite (N)	2015/10/15		100	%	80 - 120
			Dissolved Nitrate (N)	2015/10/15		101	%	80 - 120
8073779	JLD	Method Blank	Dissolved Nitrite (N)	2015/10/15	<0.010		mg/L	
			Dissolved Nitrate (N)	2015/10/15	<0.010		mg/L	
8073779	JLD	RPD	Dissolved Nitrite (N)	2015/10/15	NC		%	20
			Dissolved Nitrate (N)	2015/10/15	NC		%	20
8075095	JHC	Matrix Spike [NJ1455-02]	Dissolved Calcium (Ca)	2015/10/16		NC	%	80 - 120
			Dissolved Iron (Fe)	2015/10/16		91	%	80 - 120
			Dissolved Magnesium (Mg)	2015/10/16		NC	%	80 - 120
			Dissolved Manganese (Mn)	2015/10/16		NC	%	80 - 120
			Dissolved Potassium (K)	2015/10/16		104	%	80 - 120
			Dissolved Sodium (Na)	2015/10/16		NC	%	80 - 120
8075095	JHC	Spiked Blank	Dissolved Calcium (Ca)	2015/10/16		94	%	80 - 120
			Dissolved Iron (Fe)	2015/10/16		95	%	80 - 120
			Dissolved Magnesium (Mg)	2015/10/16		101	%	80 - 120
			Dissolved Manganese (Mn)	2015/10/16		97	%	80 - 120
			Dissolved Potassium (K)	2015/10/16		98	%	80 - 120
			Dissolved Sodium (Na)	2015/10/16		96	%	80 - 120
8075095	JHC	Method Blank	Dissolved Calcium (Ca)	2015/10/16	<0.30		mg/L	
			Dissolved Iron (Fe)	2015/10/16	<0.060		mg/L	
			Dissolved Magnesium (Mg)	2015/10/16	<0.20		mg/L	
			Dissolved Manganese (Mn)	2015/10/16	<0.0040		mg/L	
			Dissolved Potassium (K)	2015/10/16	<0.30		mg/L	
			Dissolved Sodium (Na)	2015/10/16	<0.50		mg/L	
8075095	JHC	RPD [NJ1455-02]	Dissolved Calcium (Ca)	2015/10/16	0.82		%	20
			Dissolved Iron (Fe)	2015/10/16	NC		%	20
			Dissolved Magnesium (Mg)	2015/10/16	0.22		%	20

Maxxam Job #: B589879
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: BARONS AMA 9558-124 MAIN ST
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8075570	ABG	Matrix Spike	Dissolved Manganese (Mn)	2015/10/16	1.5		%	20
			Dissolved Potassium (K)	2015/10/16	0.33		%	20
			Dissolved Sodium (Na)	2015/10/16	0.82 (1)		%	20
			1,4-Difluorobenzene (sur.)	2015/10/20		105	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/10/20		106	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/10/20		110	%	70 - 130
			Benzene	2015/10/20		92	%	70 - 130
			Toluene	2015/10/20		89	%	70 - 130
			Ethylbenzene	2015/10/20		93	%	70 - 130
			m & p-Xylene	2015/10/20		92	%	70 - 130
8075570	ABG	Spiked Blank	o-Xylene	2015/10/20		92	%	70 - 130
			F1 (C6-C10)	2015/10/20		87	%	70 - 130
			1,4-Difluorobenzene (sur.)	2015/10/20		108	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/10/20		105	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/10/20		111	%	70 - 130
			Benzene	2015/10/20		94	%	70 - 130
			Toluene	2015/10/20		91	%	70 - 130
			Ethylbenzene	2015/10/20		95	%	70 - 130
			m & p-Xylene	2015/10/20		94	%	70 - 130
			o-Xylene	2015/10/20		94	%	70 - 130
8075570	ABG	Method Blank	F1 (C6-C10)	2015/10/20		87	%	70 - 130
			1,4-Difluorobenzene (sur.)	2015/10/20		110	%	70 - 130
			4-Bromofluorobenzene (sur.)	2015/10/20		104	%	70 - 130
			D4-1,2-Dichloroethane (sur.)	2015/10/20		111	%	70 - 130
			Benzene	2015/10/20	<0.00040		mg/L	
			Toluene	2015/10/20	<0.00040		mg/L	
			Ethylbenzene	2015/10/20	<0.00040		mg/L	
			m & p-Xylene	2015/10/20	<0.00080		mg/L	
			o-Xylene	2015/10/20	<0.00040		mg/L	
			Xylenes (Total)	2015/10/20	<0.00080		mg/L	
8075570	ABG	RPD	F1 (C6-C10) - BTEX	2015/10/20	<0.10		mg/L	
			F1 (C6-C10)	2015/10/20	<0.10		mg/L	
			Benzene	2015/10/20	NC		%	40
			Toluene	2015/10/20	NC		%	40
			Ethylbenzene	2015/10/20	NC		%	40
			m & p-Xylene	2015/10/20	NC		%	40
			o-Xylene	2015/10/20	NC		%	40
			Xylenes (Total)	2015/10/20	NC		%	40
			F1 (C6-C10) - BTEX	2015/10/20	NC		%	40
			F1 (C6-C10)	2015/10/20	NC		%	40
8077565	JH0	Matrix Spike	Dissolved Chloride (Cl)	2015/10/16		NC	%	80 - 120
8077565	JH0	Spiked Blank	Dissolved Chloride (Cl)	2015/10/16		103	%	80 - 120
8077565	JH0	Method Blank	Dissolved Chloride (Cl)	2015/10/16	<1.0		mg/L	
8077565	JH0	RPD	Dissolved Chloride (Cl)	2015/10/16	0.45		%	20
8077566	JH0	Matrix Spike	Dissolved Sulphate (SO4)	2015/10/16		NC	%	80 - 120
8077566	JH0	Spiked Blank	Dissolved Sulphate (SO4)	2015/10/16		104	%	80 - 120
8077566	JH0	Method Blank	Dissolved Sulphate (SO4)	2015/10/16	<1.0		mg/L	
8077566	JH0	RPD	Dissolved Sulphate (SO4)	2015/10/16	0.96		%	20
8077568	JH0	Matrix Spike	Dissolved Chloride (Cl)	2015/10/16		105	%	80 - 120
8077568	JH0	Spiked Blank	Dissolved Chloride (Cl)	2015/10/16		103	%	80 - 120
8077568	JH0	Method Blank	Dissolved Chloride (Cl)	2015/10/16	<1.0		mg/L	
8077568	JH0	RPD	Dissolved Chloride (Cl)	2015/10/16	NC		%	20

Maxxam Job #: B589879
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: BARONS AMA 9558-124 MAIN ST
Sampler Initials: JL

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
8077569	JH0	Matrix Spike	Dissolved Sulphate (SO4)	2015/10/16		109	%	80 - 120
8077569	JH0	Spiked Blank	Dissolved Sulphate (SO4)	2015/10/16		107	%	80 - 120
8077569	JH0	Method Blank	Dissolved Sulphate (SO4)	2015/10/16	<1.0		mg/L	
8077569	JH0	RPD	Dissolved Sulphate (SO4)	2015/10/16	NC		%	20
8079375	ZI	Matrix Spike	Dissolved Chloride (Cl)	2015/10/19		106	%	80 - 120
8079375	ZI	Spiked Blank	Dissolved Chloride (Cl)	2015/10/19		101	%	80 - 120
8079375	ZI	Method Blank	Dissolved Chloride (Cl)	2015/10/19	<1.0		mg/L	
8079375	ZI	RPD	Dissolved Chloride (Cl)	2015/10/19	NC		%	20
8079377	ZI	Matrix Spike	Dissolved Sulphate (SO4)	2015/10/19		99	%	80 - 120
8079377	ZI	Spiked Blank	Dissolved Sulphate (SO4)	2015/10/19		100	%	80 - 120
8079377	ZI	Method Blank	Dissolved Sulphate (SO4)	2015/10/19	<1.0		mg/L	
8079377	ZI	RPD	Dissolved Sulphate (SO4)	2015/10/19	NC		%	20

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

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.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

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).

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 < 5x RDL).

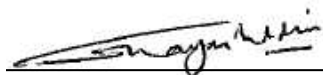
(1) Detection limits raised due to dilution to bring analyte within the calibrated range.

Maxxam Job #: B589879
Report Date: 2015/10/20

TETRA TECH EBA INC.
Client Project #: ENVIND03335-03
Site Location: BARONS AMA 9558-124 MAIN ST
Sampler Initials: JL

VALIDATION SIGNATURE PAGE

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



Ghayasuddin Khan, M.Sc., B.Ed., P.Chem, Scientific Specialist



Janet Gao, Supervisor

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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Edmonton: 9331 - 48 Street, T6B 2R4. Ph: (780) 577-7100, Fax: (780) 450-4187, Toll free: (877) 465-8889
www.maxxamanalytics.com

Chain of Custody

A108368

Page: 1 of 1

Company: **TETRA TECH EBA**
Contact: **JAMES GOING**
Address: **442-10th St. N. LETHBRIDGE**
Prov: **AB** PC: **T1A 2C7**
Contact #: **Ph: 403.329.9009 Cell: 403.634.386**

Report To: **Same as Invoice** ☒
Report Distribution (E-Mail):
jamontagne@eba.ca
jgoing@eba.ca

REGULATORY GUIDELINES:
☒ AT1
☐ CCME
☐ Regulated Drinking Water
☐ Other:

All samples are held for 60 calendar days after sample receipt, unless specified otherwise.
PO #: **ENVIND03335-03**
Project # / Name: **BARONS AMA 9558-124 Main St.**
Site Location:
Quote #: **EBA**
Sampled By: **S. Jamontagne** **634.3562**

SERVICE REQUESTED:
☐ RUSH (Contact lab to reserve)
Date Required:
☒ REGULAR (5 to 7 Days)

	Sample ID	Depth (unit)	Matrix GW / SW Soil	Date/Time Sampled YY/MM/DD 24:00	BTEX F	Sieve (75 micron)	Regulated Metals (AT1)	Salinity	Assessment	Basic Class II Landfill					DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX F1-F2	DBTEX F1-F4	DBTEX 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10-Oct-15 09:53

Ioana Stoica



B589879

NB6

INS-0059

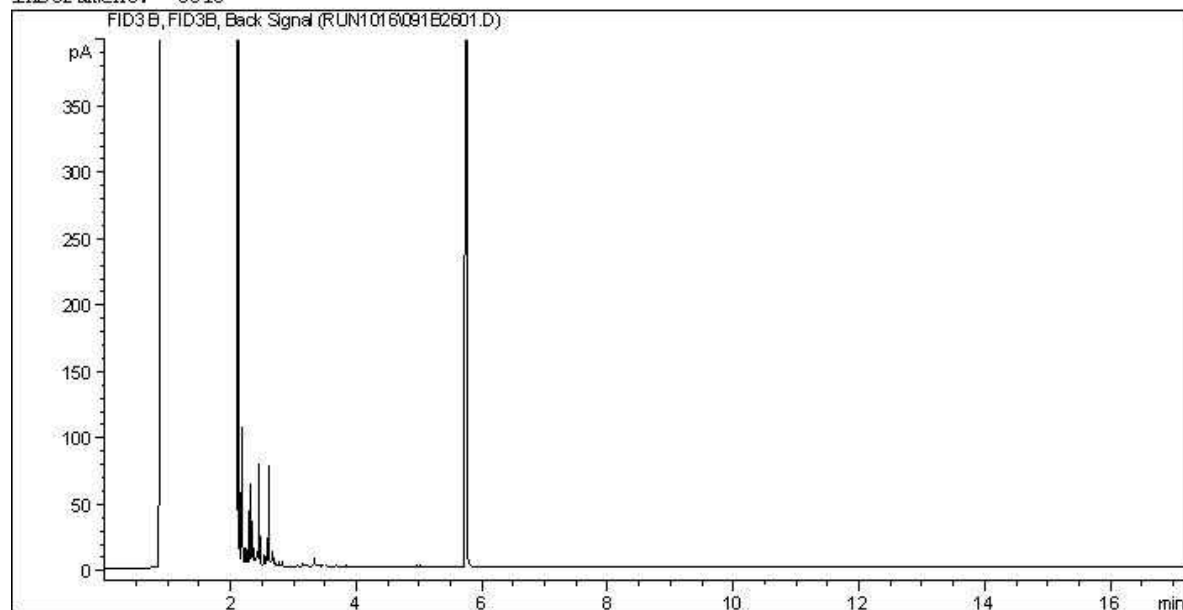
Please indicate Filtered, Preserved or Both (F, P, F/P)

Relinquished By (Signature/Print): **JAMIE JAMONTAGNE** Date (YY/MM/DD): **15/10/09** Time (24:00): **9:00**
Relinquished By (Signature/Print): Date (YY/MM/DD): Time (24:00):
Special Instructions: **Diss. Fe & Mn Acid Filtered & Preserved** # of Jars Used & Not Submitted

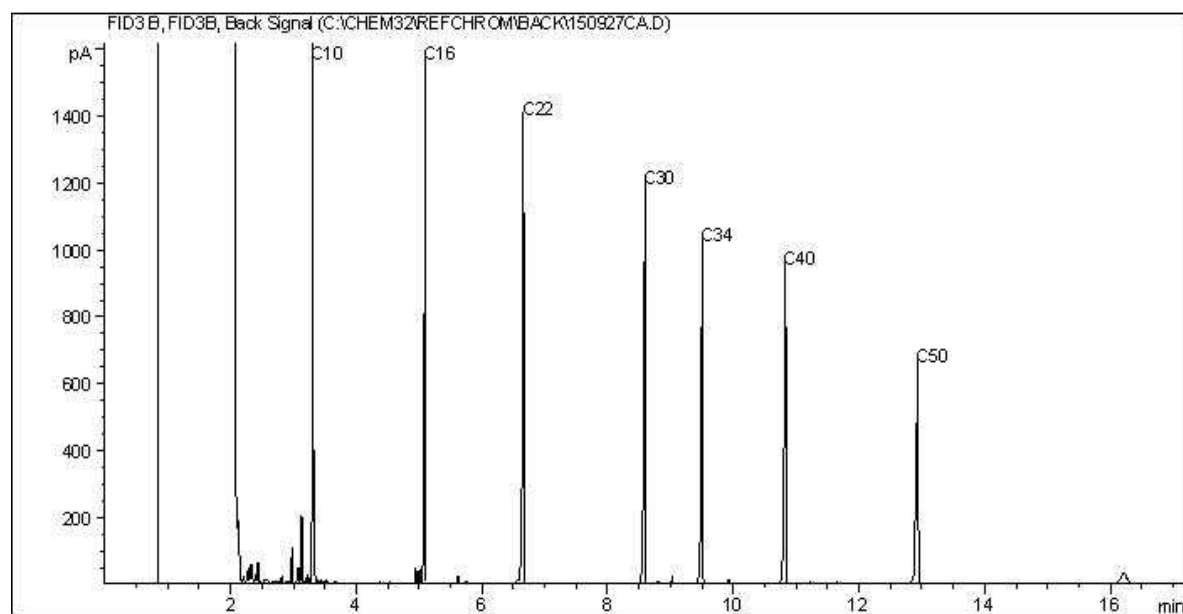
LAB USE ONLY
Received By: **Ioana Stoica** Date: **2015/10/10** Time: **9:53** Maxxam Job #:
Custody Seal: **44** Temperature: **10, 10, 19** Ice: **44**
Lab Comments: **51516**

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

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

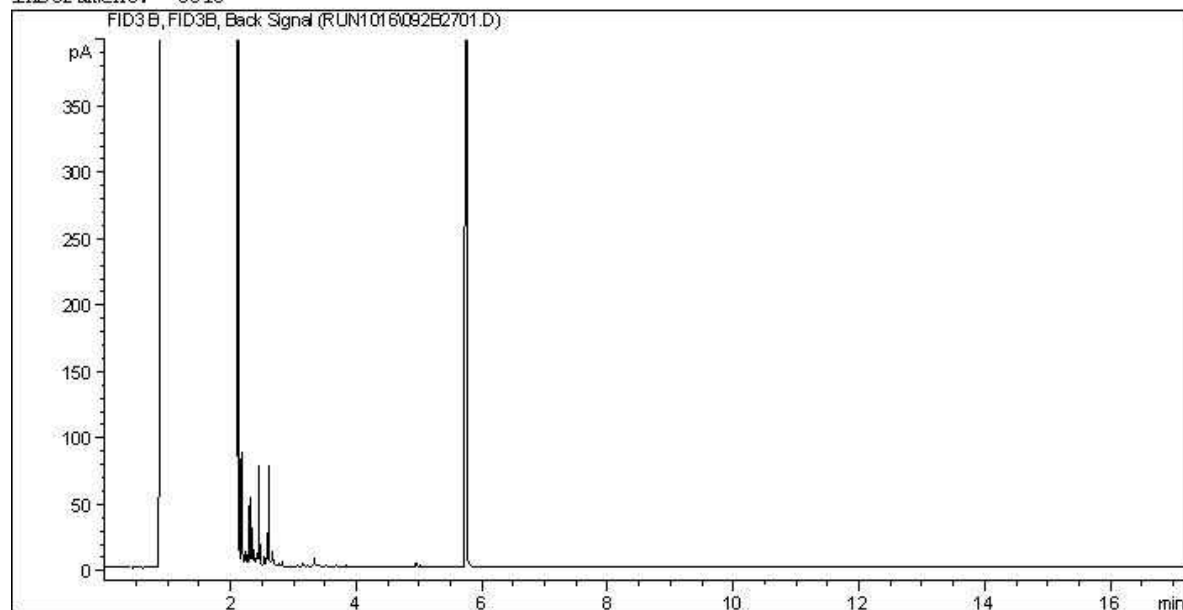
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Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

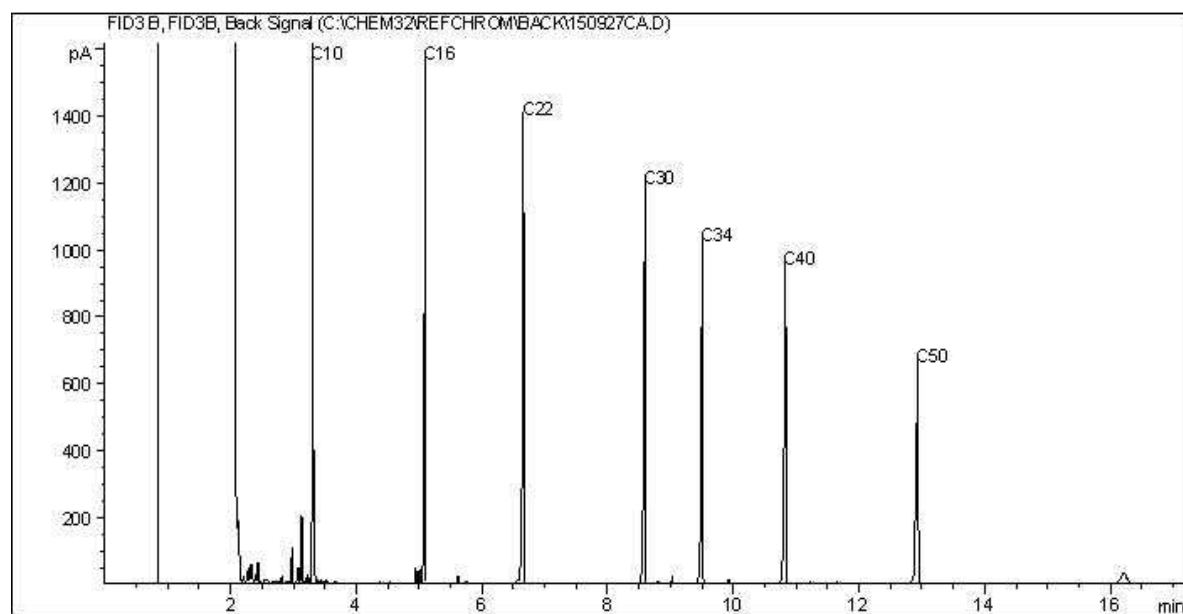
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

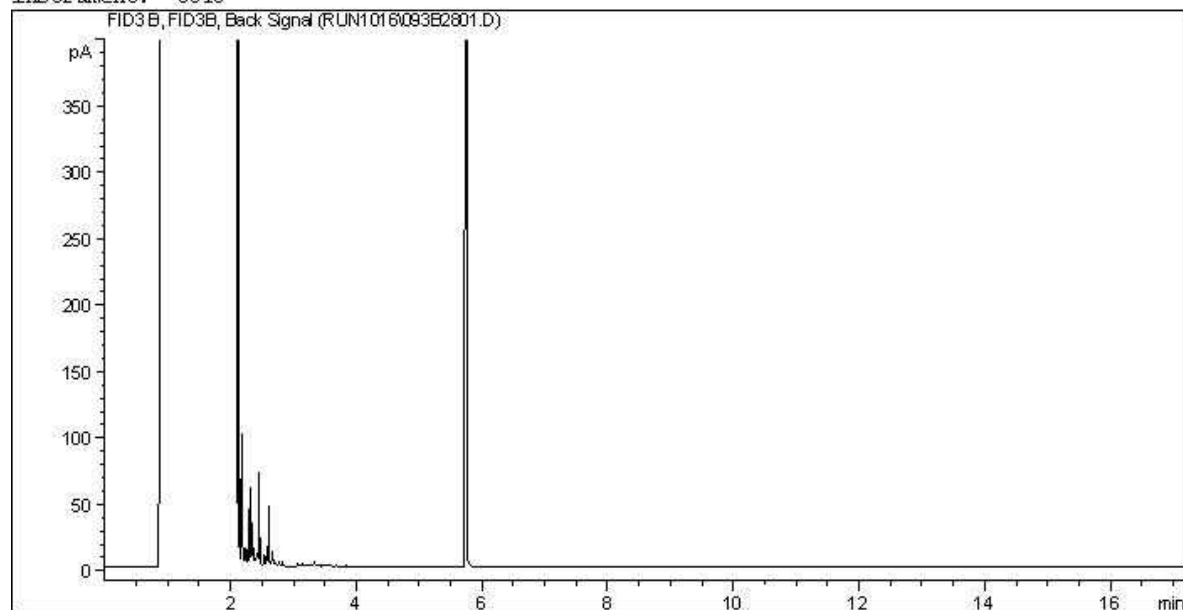
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Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

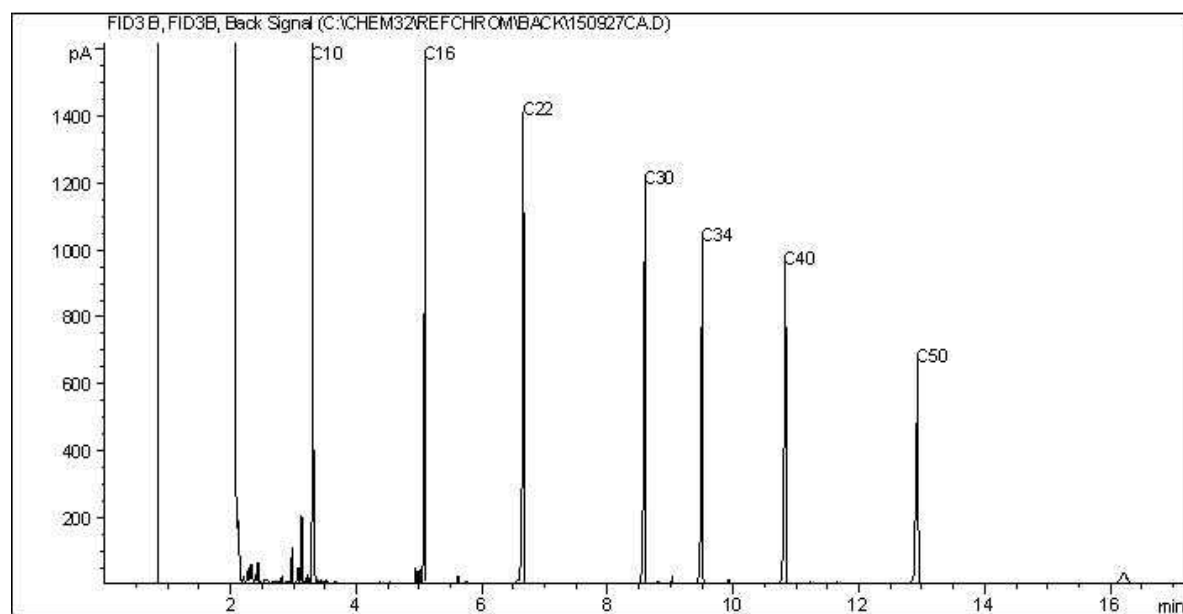
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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

Instrument: GC13



Carbon Range Distribution - Reference Chromatogram



TYPICAL PRODUCT CARBON NUMBER RANGES

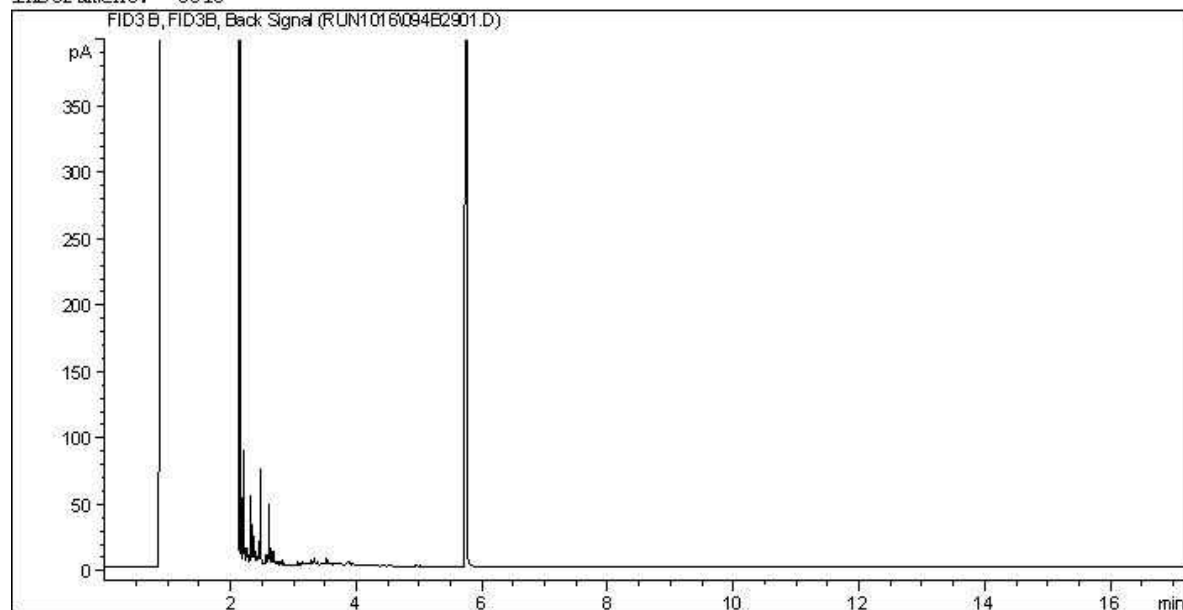
Gasoline:	C4 - C12	Diesel:	C8 - C22
Varsol:	C8 - C12	Lubricating Oils:	C20 - C40
Kerosene:	C7 - C16	Crude Oils:	C3 - C60+

Page 1 of 1

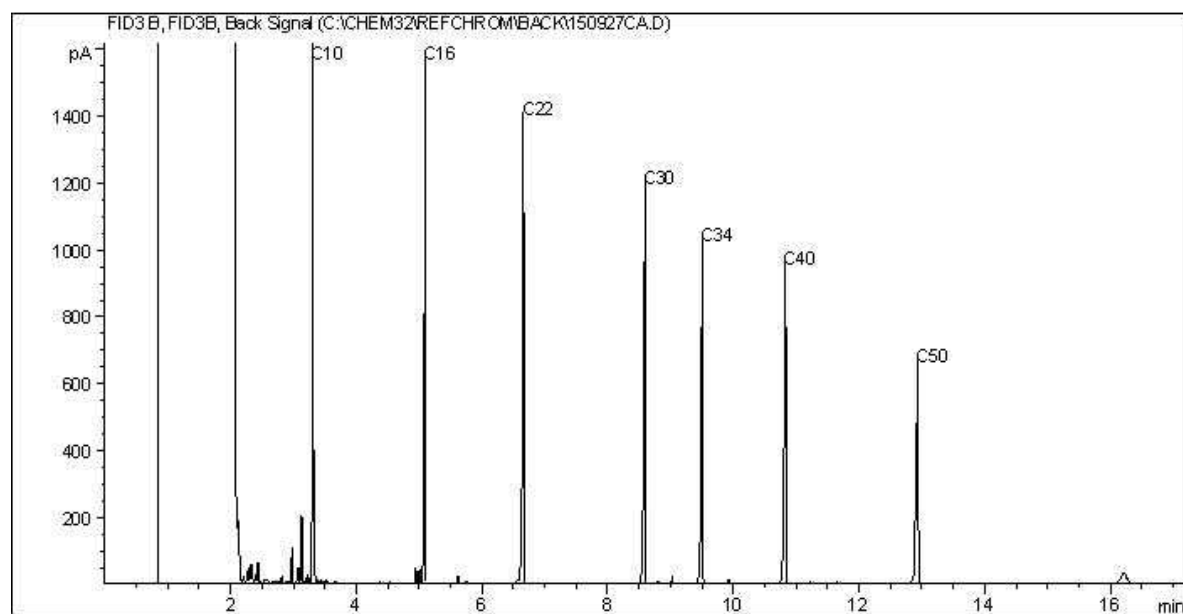
Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

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

Instrument: GC13



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.

APPENDIX C

RECORD OF SITE CONDITION

Record of Site Condition



1 REPORT AND FORM INFORMATION			
Title of report	Groundwater Monitoring Program. 124 Main Street Barons, AB. Alberta Municipal Affairs Site #9558		
Report date (dd-mon-yyyy)	Dec 2015	Record of Site Condition (RSC) ID No. ^ψ	

2 SITE IDENTIFICATION AND PHYSICAL LOCATION								
2.1 Site name		AMA Site #9558						
2.2 Address of site		124 Main Street						
		Municipality	Barons					Alberta
2.3 Legal land description of site (if multiple, list all.)								
Plan, Block, Lot (PBL)			Alberta Township System (ATS)					
Plan	Block	Lot	LSD	Quarter	Section	Township	Range	Meridian
2605X	2	14						

3 STAKEHOLDERS			
3.1 Operator			
Company	Village of Barons	Contact person	Laurie Beck
Mailing address	PO Box 129 Barons AB T0L 0G0	Position held	Administrator
		Business phone No.	403.757.3633
		Business fax No.	403.757.2599
		Business e-mail	Barons@figment.ca
3.2 Consultant ☐ Not applicable			
Company	Tetra Tech EBA Inc.	Contact person	Jaymes Going
Mailing address	442 - 10 Street North Lethbridge, AB T1H 2C7	Position held	Environmental Consultant
		Business phone No.	403.329.9990
		Business fax No.	403.328.8817
		Business e-mail	Jaymes Going@tetrattech.com
3.3 Landowner(s)			
Land type	☐ Private ☐ Special Areas ☐ Parks and protected area ☒ Public (if not private, provide Disposition No.: _____)		
Landowner(s)	☒ Same as operator ☐ Other		

^ψ: Do not fill in. Reserved for internal administrative purposes only.

Record of Site Condition



3.4 Occupant(s)			
Are there occupants at the site?	☐ Yes	☒ No	☐ To be determined (TBD)
Occupant(s)	☐ Same as operator	☐ Same as landowner	☐ Other
What is the type of occupancy?	☐ Apartment building	☐ Town house	☐ Single detached house
	☐ Agricultural	☐ Industrial	☐ Commercial
	☒ Other (specify) <u>Public park/Roadway</u>		

4 OPERATING STATUS	
☐ Operating	☐ Suspended
☒ Abandoned	☐ Decommissioning in progress
☐ Reclaimed (provide Reclamation Certificate No.(s): _____)	☐ Closed
☐ Not applicable	

5 TYPE OF ACTIVITY AND SITE					
5.1 Petroleum Storage Tank Site					☒ Yes
5.1.1 ESRD file No.(s)				PTMAA site No.	
5.1.2 Types of activity					
☐ Retail gas station	☐ Aviation fuelling station	☐ Bulk fuel	☐ Other (specify): _____		
5.2 Upstream Oil and Gas Facility					☐ Yes
5.2.1 ESRD file No.(s)				AER approval No.(s)	
5.2.2 AER authorization type		☐ Approval	☐ License	☐ Permit	☐ Order
		☐ Other (specify) _____			
5.2.3 Types of activity					
☐ Wellsite and associated facility	☐ Satellite	☐ Battery	☐ Pipeline		
☐ Compressor and pumping station	☐ Other (specify): _____				
5.3 Approved Facility Under Environmental Protection and Enhancement Act (EPEA)					☐ Yes
5.3.1 ESRD approval No.(s)				AER approval No.(s)	
5.3.2 Types of approved activity					
☐ Chemical manufacturing plant	☐ Enhanced recovery in-situ oil sands or heavy oil processing plant	☐ Fertilizer manufacturing plant	☐ Landfill		
☐ Metal manufacturing plant	☐ Oil refinery	☐ Oilsands processing plant	☐ Oil production site		
☐ Pesticide manufacturing plant	☐ Petrochemical manufacturing plant	☐ Pipeline	☐ Power plant		
☐ Pulp and paper processing plant	☐ Sour gas processing plant	☐ Sulphur manufacturing or processing plant	☐ Waste management facility		
☐ Wood treatment plant	☐ Other (specify): _____				

Record of Site Condition



5.4 Facility Under EPEA Code of Practice				☐ Yes	
5.4.1 ESRD registration No.(s)				AER registration No.(s)	
5.4.2 Type of Code of Practice					
☐	Asphalt paving plant	☐	Compressor and pumping station	☐	Concrete producing plant
☐	Pesticides	☐	Pipeline	☐	Land treatment of soils containing hydrocarbons
☐	Small incinerator	☐	Sweet gas processing plant	☐	Other (<i>specify</i>): _____
5.5 Other Activity					
☐ Yes					
5.5.1 ESRD file No.(s)		Other site ID No.(s)		Authorized by	
5.5.2 Types of activity					
☐	Dry cleaning operation	☐	Highway maintenance yard	☐	Transportation
☐	Other (<i>specify</i>): _____				

6 SITE CHARACTERIZATION					
6.1 What Environmental Site Assessments (ESA) Have Been Conducted and Completed to Date?					
☒ Phase I ESA ☒ Phase II ESA (<i>check all that apply.</i>) ☒ Initial intrusive sampling ☐ delineation completed ☒ post-remediation monitoring ☐ final confirmatory sampling					
6.2 Contaminants of Potential Concern (COPC)					
6.2.1 Does the site have any of the conditions that require the mandatory use of <i>Alberta Tier 2 Soil and Groundwater Remediation Guidelines</i> (ESRD, 2007 and updates)? (<i>check all that apply in Section 6.2.1.1.</i>)					
☒ Yes ☐ No (<i>→proceed to Section 6.2.2.</i>)					
6.2.1.1 Identify any conditions that require the approaches of the <i>Alberta Tier 2 guidelines</i>. (<i>see Alberta Tier 1 Soil and Groundwater Remediation Guidelines</i> (ESRD, 2007 and updates), for details.)					
☐	Contamination within 30 cm of building foundation	☐	Unusual building feature (<i>eg. earthen floor</i>)	☐	Contamination within 10 m distance of surface water body
☒	Fractured bedrock	☐	Potentially high hydraulic conductivity ($> 10^{-5}$ m/sec.)	☐	Other (<i>see Alberta Tier 1 guidelines and specify</i>): _____
6.2.1.2 Did the <i>Alberta Tier 2</i> approach lead to a soil or groundwater guideline that was lower than the corresponding Tier 1 guideline for the same contaminant(s)?					
☐ Yes ☐ TBD ☒ No (<i>→proceed to Section 6.2.2.</i>)					
6.2.1.3 If you answered 'yes' or 'TBD' to Section 6.2.1.2, identify the group of contaminants for each COPC with a mandatory Tier 2 guideline that is lower than the corresponding Tier 1 guideline (<i>check all that apply, see Alberta Tier 1 guidelines, Tables 1-4 for detailed listing</i>).					
☐	General and inorganic parameters	☐	Metals		
☐	Hydrocarbons	☐	Halogenated aliphatics		
☐	Chlorinated aromatics	☐	Pesticides		
☐	Other organics	☐	Radionuclides		
☐	Salt	☐	Other (<i>specify</i>): _____		

Record of Site Condition



6.2.1.4 Did any past or current ESA relevant to this investigation identify an exceedance of the mandatory Tier 2 guidelines referred to in Section 6.2.1.3 (e.g. Tier 2 guidelines that are lower than the corresponding Tier 1 guidelines)? ☐ Yes ☐ No ☐ TBD	
6.2.1.5 If you answered 'yes' in Section 6.2.1.4, have all relevant COPC been remediated to meet the mandatory Tier 2 guidelines? ☐ Yes ☐ No	
6.2.2. Did any past or current ESA relevant to this investigation identify a drilling waste disposal area? ☐ Yes ☒ No (→proceed to Section 6.2.3.)	
6.2.2.1 If a drilling waste disposal area was identified, did any past or current ESA identify non-compliance with the compliance options outlined in <i>Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification</i> (AER, 2014), as amended? ☐ Yes ☐ No	
6.2.2.2 If you answered 'yes' in Section 6.2.2.1, have all COPC been remediated to meet the compliance options outlined in <i>Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification</i> (AER, 2014), as amended? ☐ Yes ☐ No	
6.2.2.3 For any COPC that did not meet the compliance options in <i>Assessing Drilling Waste Disposal Areas</i>, identify the group of contaminants (check of all that apply, see the Alberta Tier 1 guidelines, Tables 1-4 for detailed listing).	
☐ General and inorganic parameters	☐ Metals
☐ Hydrocarbons	☐ Halogenated aliphatics
☐ Chlorinated aromatics	☐ Pesticides
☐ Other organics	☐ Radionuclides
☐ Salt	☐ Other (specify): _____
6.2.3 For all areas and COPCs not assessed under Sections 6.2.1 or 6.2.2, did any ESA relevant to this investigation identify an exceedance over the Alberta Tier 1 guidelines? ☒ Yes ☐ No (→proceed to Section 6.3.)	
6.2.3.1 If you answered 'yes' in Section 6.2.3, have all COPC been remediated to meet the Alberta Tier 1 guidelines? ☐ Yes ☒ No ☐ TBD	
6.2.3.2 For any COPC that exceeded Alberta Tier 1 guidelines in Section 6.2.3.1, identify the group of contaminants. (check all that apply, see the Alberta Tier 1 guidelines, Tables 1-4 for detailed listing.)	
☐ General and inorganic parameters	☐ Metals
☒ Hydrocarbons	☐ Halogenated aliphatics
☐ Chlorinated aromatics	☐ Pesticides
☐ Other organics	☐ Radionuclides
☐ Salt	☐ Other (specify): _____

Record of Site Condition



6.3 Status of Investigation

6.3.1 Identify soil and groundwater guidelines used to assess the COPCs that are the subject of this investigation (check all that apply).

- ☒ Alberta Tier 1 Soil and Groundwater Remediation Guidelines – 2007 and updates,
☐ Coarse grained ☒ Fine grained
☒ Alberta Tier 2 Soil and Groundwater Remediation Guidelines – 2007 and updates,
☐ Pathway exclusion ☐ Guideline adjustment ☐ Site specific remediation objectives
☐ Assessing Drilling Waste Disposal Areas: Compliance Options for Reclamation Certification
 (AER, 2014), as amended
☐ Other (specify): _____

6.3.2 What land use classification(s) is used?

- ☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☒ Other (specify: Parkland)

6.3.3 What is the outcome of the investigation? (check one only.)

- ☐ For all COPCs on-site and off-site, no exceedance has been found above any applicable soil and groundwater guidelines in any prior and current assessments.
☐ All contamination on-site and off-site has been completely remediated and meets the applicable soil and groundwater guidelines.
☒ One or more COPC still exceeds the applicable soil or groundwater guidelines.

6.3.4 How many contaminated areas are there currently at the site?

One ☐ None ☐ TBD

6.3.5 Are all contaminated areas and potential contaminated areas assessed during this investigation?

☒ Yes ☐ No

6.3.6 For all areas of potential environmental concern, list the dates when the contamination was discovered (specify dd-mon-yyyy): Nov 2008; _____

6.3.7 For all areas that have been identified in Section 6.3.4, have all substance releases been reported to ESRD?

☒ Yes ☐ No ☐ Not applicable

6.3.8 If the answer to Section 6.3.7 is 'yes', list all Incident No.(s) (attach separate sheet if necessary):

_____; ☒ Not assigned

6.3.9 What is the approximate, cumulative amount of land area remaining exceeding applicable remediation guidelines? _____ (m²) ☐ None ☒ TBD

6.3.10 Is there non-aqueous phase liquid (NAPL) product remaining on site? ☐ Yes ☒ No ☐ TBD

6.3.11 Is there non-aqueous phase liquid (NAPL) product remaining off site? ☐ Yes ☐ No ☒ TBD

6.3.12 What is the remediation status of the contaminated areas at site?

- | | |
|---|---|
| ☐ No remediation required | ☐ Site has exceedance but no remediation plan |
| ☒ Remediation plan developed | ☐ Active remediation |
| ☐ Remediation completed | ☐ Post remediation assessment completed |
| ☒ Ongoing risk management plan – on-site | ☒ Ongoing risk management plan – off-site |
| ☐ Remediation Certificate issued for some area(s) (provide Remediation Certificate No.(s): _____) | |
| ☐ Remediation Certificate cancelled for some area(s) (provide Remediation Certificate No.(s): _____) | |

Direction for Completing the Remainder of the Form

Attach the analytical summary tables of the COPCs that are the subject of this investigation and still present at this site. A detailed listing of COPCs can be found with Tables 1-4 in *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (ESRD, 2007 and updates), as amended. Refer to the *RSC User's Guide* for detailed information on format and other requirements regarding the summary table.

For the remainder of the form, follow the directions below:

- If the COPCs on-site and off-site have never exceeded any applicable soil and groundwater guidelines in any prior and current assessments, → proceed to Section 8, or
- If the COPCs on-site and off-site have been completely remediated and meet the applicable soil and groundwater guidelines, → proceed to Section 8, or
- For all other circumstances, continue with Section 6.4.

6.4 Key Transport Factors for Existing COPCs

6.4.1 What is the horizontal distance to the nearest water well from the edge of the nearest contaminated area?

☐ 0-50 m ☐ 50-100 m ☒ 100-300 m ☐ 300-1000 m ☐ > 1000 m

6.4.2 What is the horizontal distance to the nearest surface water body from the edge of the contaminated area?

☐ ≤10 m ☐ 10-50 m ☐ 50-100 m ☐ 100-300 m ☒ 300-1000 m ☐ > 1000 m

6.4.3 Does delineation achieve closure above the groundwater water table that is nearest to the ground surface?

☐ Yes (→ go to Section 6.5.) ☒ No ☐ TBD

6.4.4 Is the groundwater that is nearest the ground surface a domestic use aquifer (DUA) as defined in Alberta Tier 2 guidelines?

☒ Yes ☐ No ☐ TBD ☐ Not required (NR)

6.4.5 Is there a hydraulic barrier, as defined in Alberta Tier 2 guidelines, between the base of the contaminated area and the DUA?

☐ Yes ☐ No ☒ TBD ☐ NR

6.4.6 If you answered 'yes' to Section 6.4.5, provide the measured largest value of the hydraulic conductivity (as value $\times 10^{-7}$ m/sec.) for the 5.0 m vertical layer from the bottom of the contaminated zone.

_____ ($\times 10^{-7}$ m/sec.) ☐ TBD ☐ NR

6.5 On-site Characterization

6.5.1 What is the dominant soil texture that governs substance transport at the site?

☐ Coarse grained ☒ Fine grained ☐ TBD ☐ Not applicable (must identify reason in Section 6.2.1.1.)

6.5.2 What are the shallowest and deepest measured depths (meters below ground surface) of the water table at site?

Shallowest: 1.40 (m) Deepest: 2.55 (m) ☐ TBD ☐ NR (specify max. depth assessed: _____ (m))

6.5.3 What is the dominant horizontal direction of groundwater flow for the near surface water table?

(N, NW, etc.: NW) ☐ TBD ☐ NR

6.5.4 What is the existing land use classification?

☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☒ Other (specify) Parkland

6.5.5 What is the end land use classification?

☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☒ Other (specify) Parkland

Record of Site Condition



6.5.6 Identify exposure pathways for which the applicable guidelines are exceeded on-site (check all that apply).			
☐	Vapour inhalation	☐	Soil ingestion
☒	Ingestion of potable water	☐	Soil dermal (skin) contact
☐	Fresh water aquatic life	☐	Soil contact for plants and invertebrates
☐	TBD	☐	Other (specify): _____

6.6 Off-site Characterization			
6.6.1 Are there COPCs off-site exceeding applicable soil or groundwater guidelines?			
☐ No (→ if on-site contamination was reported, proceed to Section 7, otherwise, proceed to Section 8.) ☒ Yes ☐ TBD			
6.6.2 What is the current land use classification for any off-site area(s) identified in Section 6.6.1?			
☐ Natural ☐ Agricultural ☐ Residential ☐ Commercial ☐ Industrial ☒ Other (specify) <u>Road</u>			
6.6.3 What is the end land use classification for any off-site area(s) identified in Section 6.6.1?			
☐ Natural ☐ Agricultural ☐ Residential ☐ Commercial ☐ Industrial ☒ Other (specify) <u>Road</u>			
6.6.4 Is there any substance concentration under a road allowance exceeding the applicable soil or groundwater guidelines?			
☒ Yes ☐ No (→ proceed to Section 6.6.6.) ☐ TBD			
6.6.5 What is the most sensitive land use classification adjacent to the road allowance?			
☐ Natural ☐ Agricultural ☒ Residential ☐ Commercial ☐ Industrial ☒ Other (specify) <u>Parkland</u>			
6.6.6 Identify exposure pathways for which the applicable guidelines are exceeded off-site (check all that apply).			
☐	Vapour inhalation	☐	Soil ingestion
☒	Ingestion of potable water	☐	Soil dermal (skin) contact
☐	Fresh water aquatic life	☐	Soil contact for plants and invertebrates
☐	TBD	☐	Other (specify): _____

7 RISK MANAGEMENT PLAN (RMP)

7.1 What is the Plan for Contaminated Areas Still Remaining on and off the Site? (check one only.)

- ☐ Complete remediation (→ proceed to Section 8).
- ☒ Partial remediation with risk management for some residual contamination.
- ☐ Risk management for all remaining contamination.

7.2 Key Progress of RMP

7.2.1 If the site needs an on-going RMP, answer all the following questions that apply to the RMP.

☐ Yes	☒ No	Are contaminated areas completely delineated horizontally and vertically in soil?
☐ Yes	☒ No	Are contaminated areas completely delineated horizontally and vertically in groundwater?
☒ Yes	☐ No	Is source identified and completely delineated?
☒ Yes	☐ No	Is source migrating or has migrated off-site?
☐ Yes	☒ No	Is source left as is?
☒ Yes	☐ No	Is source partially removed and residual source being managed?
☐ Yes	☒ No	Is source controlled with physical or administrative methods?
☒ Yes	☐ No	Are all pathways of concern identified?
☒ Yes	☐ No	Have all relevant receptors been identified and protected?
☒ Yes	☐ No	Is there a monitoring program in place to verify RMP success?
☐ Yes	☒ No	Are there third parties related to this RMP? (if the answer is 'no', skip the next question.)
☐ Yes	☐ No	If there are third parties, have all of them accepted the RMP?
☐ Yes	☒ No	Is there a commitment from person(s) responsible to implement and monitor the RMP until final remediation guidelines are achieved?
☒ Yes	☐ No	Is there a contingency plan in place should the RMP fail?
☒ Yes	☐ No	Is the RMP implemented for the site?

Public Disclosure and Privacy Notification

The *Record of Site Condition* form is a public record that is disclosed in accordance with section 35 of the *Environmental Protection and Enhancement Act*, *Disclosure of Information Regulation*, and *Ministerial Order 23/2004*. Reasonable efforts have been made to minimize collection of personal information where possible. Personal information on the form is collected under the authority of section 12(c) and other provisions of the *Environmental Protection and Enhancement Act* and is in compliance with section 33(a) and 33(c) of the *Freedom of Information and Protection of Privacy Act* (FOIP). Personal information collected on this form will be used by Alberta Environment and Sustainable Resource Development (ESRD) or the Alberta Energy Regulator (AER), as the case may be, for the purposes of administering its programs.

Accuracy of Information

The information in this document has been submitted by persons other than ESRD or the AER. The Department, the Government of Alberta, and the AER cannot and do not warrant that the information in this document is current, accurate, complete, or free of errors. Persons accessing the information provided should not rely on it, and any reliance on the information provided is taken at the sole risk of the user. Users of this information are advised to conduct their own due diligence to satisfy themselves of the environmental condition of the property of interest.

Record of Site Condition



8 DECLARATION

This *Record of Site Condition* form was prepared for the purpose of reporting on the state of environmental site conditions and, where applicable, for the purpose of remediation or reclamation, for:

AMA Site #9558 (site name) (the "Site").

I, as the licensed operator or authorized representative, have reviewed all information that was used in preparation of this form and I am satisfied that it was prepared in a manner consistent with the Applicable Standard¹ together with any relevant additional guidance that is available from Alberta Environment and Sustainable Resource Development as of this date for conducting environmental site assessments.

Having conducted reasonable inquiries to obtain all relevant information, to my knowledge, the statements made in this form are true as of this date. I have disclosed all pertinent information of which I am aware concerning the historical and current environmental condition of the Site to the Director.

Any use which a third party, other than the Crown in right of Alberta or the AER, makes of this form, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. The undersigned accepts no responsibility for damages, if any, suffered by any third party, other than the Crown in right of Alberta and the AER, as a result of decisions made or actions based on this form. Any exclusions or disclaimers to the contrary contained in any attachment to this form are of no force or effect as against the Crown in right of Alberta and the AER.

Footnote ¹:

"Applicable Standard" means

- a) for the purposes of upstream oil and gas sites,
 - i) *2010 Reclamation Criteria for Wellsites and Associated Facilities Application Guidelines* (ESRD 2011),
 - ii) CSA Standard Z769, *Phase II Environmental Site Assessment*, as amended, for any Phase II site assessment information used in preparation of this form on all upstream oil and gas sites not included in a) i);
- b) for the purposes of all other sites, CSA Standard Z768, *Phase I Environmental Site Assessment*, as amended, for any Phase I site assessment information and with CSA Standard Z769, *Phase II Environmental Site Assessment*, as amended, for any Phase II site assessment information used in preparation of this form.

By signing below, I as the licensed operator or authorized representative, confirm the information provided herein is correct and complete, to the best of my knowledge and belief.

Name of operator	Name of authorized representative	Title of authorized representative (e.g. officer, director)	Signature	Date (dd-mon-yyyy)