



23 November 2016

File: 16-1544-7

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The City of Saskatoon  
Major Projects Division, Transportation and Utilities  
202 4<sup>th</sup> Avenue North  
Saskatoon, SK S7K 0K1

Attention: Mr. Rob Tomiyama; Project Manager

**Subject: 2016 Groundwater Monitoring Program  
Caswell Transit Operations Site  
Saskatoon, SK**

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The City of Saskatoon retained PINTER & Associates Ltd. (PINTER) to conduct groundwater monitoring at the Caswell Transit Operations Site, located at 301 24<sup>th</sup> Street West, 232 Avenue C North, 316 Avenue C North, and 321 Avenue C North (Subject Property). The objectives of the groundwater monitoring program are to complete annual groundwater sampling and monitoring and to compare the year-to-year results to evaluate changes in site conditions.

## **Background**

In August of 2014, PINTER performed a Limited Phase II Environmental Site Assessment (ESA) on the Subject Property to establish environmental conditions on the Subject Property and to identify any environmental impacts. Sixteen groundwater monitoring wells were installed on the Subject Property. Key recommendations from the Limited Phase II ESA included the removal of PHC affected surface soils from the northeast parking lot of 321 Avenue C North and the development of a groundwater monitoring plan. PINTER supervised a limited remedial excavation in January of 2015, where approximately 8 m<sup>3</sup> of PHC impacted soil was removed from the northeast parking lot.

Groundwater monitoring and sampling of the wells installed in 2014 occurred in the fall of 2015. It was recommended that a third year of monitoring and laboratory analytical data was needed to determine groundwater trends at the Site.

## **Scope of Work**

The scope of work for the 2016 monitoring and sampling event included:

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- Collecting physical data from each monitoring well, consisting of:
  - depth to groundwater;
  - depth of light non-aqueous phase liquids (LNAPL) (if present);
  - well headspace combustible vapour concentration readings (WVCR);
  - pH;
  - oxidation reduction potential (ORP);
  - temperature;
  - dissolved oxygen (DO);
  - electrical conductivity (EC) and
  - general observations.
- Collecting samples from sixteen monitoring wells for laboratory analysis of benzene, toluene, ethylbenzene, xylenes (BTEX), and petroleum hydrocarbon (PHC) Fractions F1 (C<sub>6</sub> to C<sub>10</sub>) and F2 (>C<sub>10</sub> to C<sub>16</sub>).
- Collecting samples from two monitoring wells for laboratory analysis of lead.
- Preparing a report describing the results of field and laboratory testing.

The scope of work was completed as described above, considering the following notes and exceptions:

- Monitoring Well 14-3 could not be located; therefore, the well was not monitored or sampled.
- Monitoring Well 14-25, located in the northeast corner of the maintenance shop was not sampled due to the presence of a layer of LNAPL (light non-aqueous phase liquid).
- Dissolved oxygen readings were not reported due to a sensor failure.

## **Methodology**

### ***Groundwater Monitoring and Sampling***

PINTER completed follow-up groundwater monitoring and sampling of fifteen monitoring wells on 21 October 2016. During the monitoring events, each well was monitored for depth to water, depth to LNAPL (if present), and WVCRs. WVCRs were measured with an RKI Eagle vapour analyzer operating in methane elimination mode and calibrated to a known hexane standard.

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Groundwater samples were collected via a low flow sampling system utilizing a peristaltic pump and an In-Situ™ smarTROLL multi parameter handheld system, which recorded the temperature, pH, oxidation reduction potential (ORP), dissolved oxygen (DO), and electrical conductivity (EC) of each sample while it was collected in clean laboratory-supplied sample bottles. The sample bottles were specific to the type of analysis required and preserved according to the laboratory's requirements and labeled according to a pre-determined sample identification protocol. Groundwater samples were kept cool in an ice-chilled cooler until they were transferred to the laboratory.

### ***Applicable Guidelines***

The City of Saskatoon does not use groundwater in the water treatment process and has a bylaw in place, which prohibits the use of groundwater as a potable source; therefore, the protection of groundwater (potable) pathway has been eliminated.

In addition, groundwater levels at the Site are between 1.8 and 3.0 m bgs and the majority of the Site is capped with asphalt therefore the ecological contact pathway has been eliminated.

The closest surficial waterbody is the South Saskatchewan River, located approximately 1,100 m southeast of the Site. Due to the distance to the river, the protection of groundwater for freshwater aquatic life and wildlife watering pathway has been eliminated.

The guidelines used to compare the results of the laboratory analyses included the following:

- Saskatchewan Ministry of Environment 2016, Saskatchewan Environmental Quality Guidelines, Tier 2 guidelines for coarse-grained soil, commercial land use, vapour inhalation or non-potable criteria, whichever is more sensitive (SMOE, 2016).

Coarse-grained soils were applied, as they will govern contaminant transport for the vapour inhalation pathway.

## **Results**

### ***WVCR***

WVCR results are included with the laboratory analysis results in Table 1, Appendix A. WVCRs readings ranged from 0 ppm to 170 ppm. Monitoring wells 14-25 and 14-37 had the highest readings, 140 ppm and 170 ppm, respectively.

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### ***Groundwater Monitoring***

The results of the groundwater monitoring event are presented in the Site Monitoring Report (2016) in Table 2, Appendix A. The depth to groundwater ranged between 1.81 to 2.96 m bgs. Groundwater flow was determined to be flowing in a southerly direction, towards the South Saskatchewan River.

### ***Petroleum Hydrocarbons***

The results of laboratory analyses are included in Table 1, Appendix A and are presented in Figure 1 and Figure 2, Appendix B. Appendix C presents a copy of the laboratory Certificate of Analysis.

Monitoring well 14-25 was found to have an oily liquid on the surface of the water within the well; therefore, a sample was not submitted for lab analysis. The following monitoring wells had exceedances over the applicable guidelines for PHC Fraction F2 in groundwater:

- 14-23 – 38.8 mg/L
- 14-23 Duplicate – 37.2 mg/L

All other monitoring wells had PHC Fraction F1 and BTEX concentrations below the applicable guidelines.

### ***Lead***

Table 1, Appendix A presents the analytical results from groundwater samples analyzed for lead. The potable groundwater pathway has been eliminated for the Site; therefore, there are no applicable guidelines for lead. Both samples collected from monitoring wells 14-23 and the duplicate were above laboratory method detection limits.

## **Discussion**

The results of the laboratory analysis and groundwater monitoring events for 2014, 2015, and 2016 are presented in Table 1, Appendix A.

### ***Groundwater Monitoring***

Current groundwater levels have increased slightly since the 2015 monitoring event. Previous observations indicate that groundwater flows in a southerly direction, toward the South

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Saskatchewan River. This was confirmed during the 2016 monitoring event by using groundwater levels referenced to sea level.

### ***Petroleum Hydrocarbons***

In 2014 and 2015, the concentrations of PHC Fraction F2 in samples collected from monitoring well 14-23 had exceeded applicable guidelines. During previous monitoring events and the current monitoring event, the water in monitoring well 14-23 was discolored and had a strong PHC odour. In the current study, concentrations in water samples collected from monitoring well 14-23, exceeded applicable guidelines for PHC Fraction F2, however, the concentrations have decreased since 2015. The concentration of PHC Fraction F1 in the 2016 sample however, has increased since 2015, but is still below the concentration found during the 2014 monitoring event.

Additionally, monitoring well 14-25, which had no exceedances in 2014, was above applicable guidelines for PHC Fraction F2 in groundwater in 2015. During the current monitoring event and the 2015 monitoring event, an oily liquid was detected above the water column. In 2016, due to the presence of the oily liquid, it was determined that the well is still impacted and a sample was not collected for analysis.

### ***Lead***

During the 2014 monitoring event, four monitoring wells were sampled for lead analysis. Monitoring wells 14-01 and 14-06 were below method detection limits while monitoring wells 14-03 and 14-23 were above method detection limits. In 2015, only those monitoring wells, which exceeded method detection limits, were selected for lead analysis. Lead concentrations in monitoring wells 14-03 and 14-23 remained above method detection limits and were higher than the previous year. During the 2016 event, monitoring well 14-03 could not be located; therefore, a sample was not submitted for analysis. In 2016, the concentration of lead in the sample collected from monitoring well 14-23 had decreased from 0.555 mg/L in 2015, to 0.00016 mg/L in 2016.

### **Conclusions**

With the exception of PHC Fraction F1 in well 14-23, the concentrations of contaminants in groundwater at the Site appear to be stable or decreasing. No evidence of contaminant migration has been identified within the wells present on the Site.

The results of the 2016 groundwater monitoring program are summarized below. Appendix D presents the completed Saskatchewan Ministry of Environment Qualified Persons Certificate.

To: Mr. Rob Tomiyama, Project Manager  
Re: 2016 Groundwater Monitoring Program  
23 November 2016


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1. Groundwater elevations increased from 2015 to 2016.
2. Overall, the concentrations of PHC contaminants in groundwater are relatively similar to those measured in the 2014 and 2015 studies.
3. Samples collected from monitoring well 14-23 exceed the applicable guidelines for PHC Fraction F2 in groundwater. The blind duplicate associated with monitoring well 14-23 (DUPLC), also exceeds applicable PHC Fraction F2 guidelines.
4. As in 2015, monitoring well 14-25 was observed to contain an oily liquid.
5. The concentration of lead in the water sample collected from monitoring well 14-23 has decreased from 0.555 mg/L in 2015, to 0.00016 mg/L in 2016.

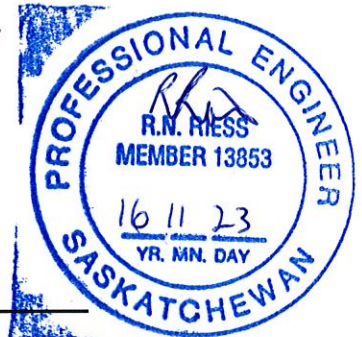
It is understood that the City of Saskatoon is moving forward with exploring the future land use of the Site and that this process will involve a Detailed Phase II ESA. The intent of the Detailed Phase II ESA is to delineate the soil and groundwater impacts on the Site and that the data from this assessment will be used to develop remediation and risk management strategies for the Site. It is assumed that the continuing monitoring of the existing wells on the Site will be incorporated into the Detailed Phase II ESA and subsequent environmental work on the Site.

Yours sincerely,

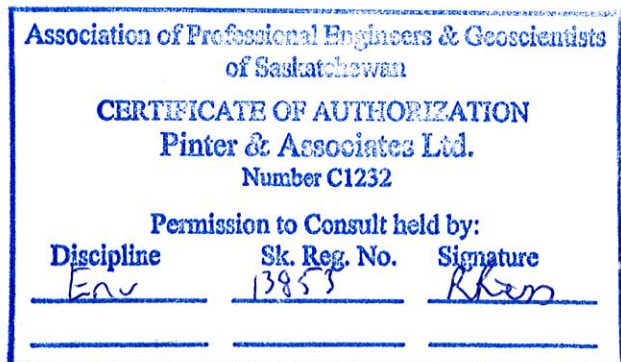
PINTER & Associates Ltd.

  
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Date: 23 November 2016





**PINTER**  
& ASSOCIATES LTD

# **Appendix A**

## **Tables**

TABLE 1: Summary of Groundwater Analytical Results - Hydrocarbons and Lead

Well ID	Sample ID	ALS Sample ID	Date Sampled (dd mm yy)	Well Headspace Vapour Concentration <sup>a</sup> (ppm)	Monocyclic Hydrocarbons				Petroleum Hydrocarbon Fractions		Lead (mg/L)
					Benzene (mg/L)	Toluene (mg/L)	Ethyl-benzene (mg/L)	Xylenes (mg/L)	F1-BTEX (>C <sub>6</sub> -C <sub>10</sub> ) (mg/L)	F2 (>C <sub>10</sub> -C <sub>16</sub> ) (mg/L)	
Method Detection Limit					0.00050	0.00050	0.00050	0.00071	0.1	0.25	0.000050
14-01	14-01 (16)	L1847307-1	21 Oct 16	0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-01 (15)	L1683126-1	02 Oct 15	25	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-01	L1478162-11	26 Jun 14	200	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	<0.000050
14-03	-	-	-	-	-	-	-	-	-	-	-
	14-03 (15)	L1683126-2	02 Oct 15	130	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	0.00407
	14-03	L1478162-10	26 Jun 14	790	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	0.000067
14-05	14-05 (16)	L1847307-2	21 Oct 16	130	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-05 (15)	L1683126-3	02 Oct 15	120	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-05	L1478162-9	26 Jun 14	80	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	0.23	-
14-06	14-06 (16)	L1847307-3	21 Oct 16	0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-06 (15)	L1683126-4	02 Oct 15	5	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-06	L1478162-8	26 Jun 14	20	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	<0.000050
14-12	14-12 (16)	L1847307-4	21 Oct 16	0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-12 (15)	L1683126-14	02 Oct 15	5	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-12	L1478162-3	26 Jun 14	6450	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	-
14-13	14-13 (16)	L1847307-5	21 Oct 16	95	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-13 (15)	L1683126-16	02 Oct 15	80	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-13	L1478162-1	26 Jun 14	4200	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	-
14-15	14-15 (16)	L1847307-6	21 Oct 16	20	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-15 (15)	L1683126-15	02 Oct 15	110	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-15	L1478162-2	26 Jun 14	4350	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	-
14-18	14-18 (16)	L1847307-7	21 Oct 16	0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-18 (15)	L1683126-8	02 Oct 15	10	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-18	L1478162-14	26 Jun 14	10	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	-
14-20	14-20 (16)	L1847307-8	21 Oct 16	40	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-20 (15)	L1683126-11	02 Oct 15	180	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-20	L1478162-17	26 Jun 14	25	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	0.26	-
14-23	14-23 (16)	L1847307-9	21 Oct 16	0	<0.00050	<0.00050	<0.00050	<0.0020	1.31	<b>38.8</b>	0.00016
	DUPL	L1847307-10	21 Oct 16	-	<0.00050	<0.00050	0.00051	<0.0020	0.76	<b>37.2</b>	0.00024
	14-23 (15)	L1683126-12	02 Oct 15	230	<0.00050	<0.00050	<0.00050	<0.00071	0.19	<b>141</b>	0.555
	DUPLC	L1683126-13	02 Oct 15	-	<0.00050	<0.00050	<0.00050	<0.00071	0.16	<b>351</b>	-
	14-23	L1478162-18	26 Jun 14	65	<0.00050	<0.00050	<0.00050	<0.0020	3.52	<b>136</b>	0.000155
14-25	-	-	21 Oct 16	140	-	-	-	-	-	-	-
	14-25 (15)	L1683126-9	02 Oct 15	200	<0.00050	<0.00050	<0.00050	<0.00071	3.13	<b>277</b>	-
	14-25	L1478162-16	26 Jun 14	25	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	0.32	-
	DUP-B	L1478162-20	26 Jun 14	-	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	0.21	-



**TABLE 1: Summary of Groundwater Analytical Results - Hydrocarbons and Lead**

Well ID	Sample ID	ALS Sample ID	Date Sampled (dd mm yy)	Well Headspace Vapour Concentration <sup>a</sup> (ppm)	Monocyclic Hydrocarbons				Petroleum Hydrocarbon Fractions		Lead (mg/L)
					Benzene (mg/L)	Toluene (mg/L)	Ethyl-benzene (mg/L)	Xylenes (mg/L)	F1-BTEX (>C <sub>6</sub> -C <sub>10</sub> ) (mg/L)	F2 (>C <sub>10</sub> -C <sub>16</sub> ) (mg/L)	
<b>Method Detection Limit</b>					0.00050	0.00050	0.00050	0.00071	0.1	0.25	0.000050
14-27	14-27 (16)	L1847307-11	21 Oct 16	120	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-27 (15)	L1683126-10	02 Oct 15	170	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-27	L1478162-15	26 Jun 14	45	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	-
14-33	14-33 (16)	L1847307-12	21 Oct 16	0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-33 (15)	L1683126-7	02 Oct 15	60	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-33	L1478162-12	26 Jun 14	0	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	-
14-37	14-37 (16)	L1847307-13	21 Oct 16	170	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	0.59	-
	14-37 (15)	L1683126-5	02 Oct 15	75	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	0.66	-
	DUPLB	L1683126-6	02 Oct 15	-	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	0.77	-
	14-37	L1478162-13	26 Jun 14	10	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	0.60	-
	DUP-A	L1478162-19	26 Jun 14	-	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	0.64	-
14-41	14-41 (16)	L1847307-14	21 Oct 16	110	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-41 (15)	L1683126-17	02 Oct 15	140	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-41	L1478162-6	26 Jun 14	120	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	-
14-42	14-42 (16)	L1847307-15	21 Oct 16	65	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-
	14-42 (15)	L1683126-18	02 Oct 15	120	<0.00050	<0.00050	<0.00050	<0.00071	<0.10	<0.25	-
	14-42	L1478162-7	26 Jun 14	20	<0.00050	<0.00050	<0.00050	<0.0020	<0.20	<0.20	-

**Applicable Guidelines**

Saskatchewan Environmental Quality Guidelines (2015) - Tier 2B guidelines, Groundwater, Commercial Land Use, Coarse-Grained Soils	1.8	258 <sup>b</sup>	76 <sup>b</sup>	48	9.1	17	NC
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Associated ALS File: L1683126, L1478162, L1847307

All terms defined in body of PINTER report.

DUP-A is the duplicate sample for 14-37

DUPLB is the duplicate sample for 14-37 (15)

DUP-B is the duplicate sample for 14-25

DUPLC is the duplicate sample for 14-23 (15)

DUPL is a duplicate sample taken from 14-23(16)

<sup>a</sup> Field screening results are measured using a combustible gas meter calibrated to a hexane standard.

<sup>b</sup> Management Limit

< Denotes concentrations less than indicated detection limit.

NC Denotes no applicable criteria.

**BOLD** Concentration greater than or equal to applicable Tier 2B Saskatchewan Ministry of Environment Environmental Quality Guidelines for Commercial Land Use and Coarse-Grained Subsurface Soils, Vapour Inhalation/Non-Potable

**Table 2. Site Monitoring Report (2014 and 2015)**

Monitoring Well ID	Sample ID	Date (dd mm yy)	Well Screen Interval (m bgs)	Well Depth <sup>a</sup> (m btoc)	Surface Elevation (m)	Water Elevation (m)	Depth to LNAPL (m bgs)	Depth to Groundwater (m bgs)	WVCRs <sup>b</sup> (ppm)	DO (mg/L)	ORP (mV)	pH	Temp (°C)	EC (µS/cm)	Sample Comments	
14-01	14-01 (16)	21 Oct 16	2.7 to 4.2	4.12	488.754	486.258	-	2.496	0	-	97.8	7.04	12.29	1120		
	14-01 (15)	02 Oct 15				486.224	-	2.53	25	4.78	98	7.28	12.19	2,380	-	
	14-01	26 Jun 14				486.474	-	2.28	200	3.40	251	7.04	6.70	1,890	-	
14-03	14-03 (16)	21 Oct 16	2.7 to 4.2	4.14	488.976	488.976	-	-	-	-	-	-	-	-	Unable to locate this well	
	14-03 (15)	02 Oct 15				486.266	-	2.71	130	3.69	82	7.12	10.69	1,018	-	
	14-03	26 Jun 14				486.646	-	2.33	790	3.02	247	7.19	9.50	994	-	
14-05	14-05 (16)	21 Oct 16	2.2 to 3.6	3.55	488.863	486.388	-	2.48	130	-	100	6.97	12.34	1,120		
	14-05 (15)	02 Oct 15				486.343	-	2.52	120	0.54	96	6.91	12.31	1,231	-	
	14-05	26 Jun 14				486.703	-	2.16	80	0.62	206	7.03	7.90	1,190	-	
14-06	14-06 (16)	21 Oct 16	3.3 to 4.2	3.90	488.503	486.146	-	2.36	0	-	86	6.87	10.71	987		
	14-06 (15)	02 Oct 15				486.083	-	2.42	5	1.72	117	7.13	12.75	984	-	
	14-06	26 Jun 14				486.323	-	2.18	20	3.42	230	7.25	9.20	1,080	-	
14-12	14-12 (16)	21 Oct 16	2.7 to 4.2	4.50	487.443	485.258	-	2.19	0	-	77	6.95	11.92	2,629		
	14-12 (15)	02 Oct 15				485.253	-	2.19	5	1.09	57	7.05	14.74	2,211	-	
	14-12	26 Jun 14				485.113	-	2.33	6450	0.85	282	7.39	10.40	2,520	-	
14-13	14-13 (16)	21 Oct 16	2.7 to 4.2	3.62	487.350	485.268	-	2.08	95	-	30	7.09	11.83	2,067		
	14-13 (15)	02 Oct 15				485.130	-	2.22	110	0.52	6	7.08	14.83	2,149	-	
	14-13	26 Jun 14				485.260	-	2.09	4200	8.35	465	7.18	9.90	2,060	-	
14-15	14-15 (16)	21 Oct 16	3.6 to 5.1	4.72	487.600	485.232	-	2.37	20	-	-40	7.16	11.68	1,666		
	14-15 (15)	02 Oct 15				485.120	-	2.48	80	0.28	-85	7.43	14.61	1,602	-	
	14-15	26 Jun 14				485.240	-	2.36	4350	8.34	500	7.78	8.10	1,610	-	
14-18	14-18 (16)	21 Oct 16	3.0 to 4.5	4.37	-	-	-	2.76	0	-	46	6.94	18.19	2,516		
	14-18 (15)	02 Oct 15				-	-	3.19	10	2.40	48	7.13	19.75	1,987	-	
	14-18	26 Jun 14				-	-	3.19	10	2.66	221	7.12	17.60	2,040	-	
14-20	14-20 (16)	21 Oct 16	2.0 to 3.5	3.18	-	-	-	1.81	40	-	84	7.15	19.66	2,455		
	14-20 (15)	02 Oct 15				-	-	2.32	180	0.46	51	7.20	20.88	2,408	-	
	14-20	26 Jun 14				-	-	2.34	25	2.66	221	7.12	17.60	2,040	-	
14-23	14-23 (16)	21 Oct 16	2.0 to 3.5	3.53	487.804	485.535	-	2.27	0	-	-	-	-	-	Grey to black color; PHC odour	
	14-23 (15)	02 Oct 15				485.384	-	2.42	230	-	-	-	-	-	-	Solvent/diesel odour, sheen
	14-23	26 Jun 14				485.394	-	2.41	65	1.95	-34	7.08	13.50	1,980	-	Strong PHC odour, murky
14-25	14-25 (16)	21 Oct 16	2.7 to 4.2	3.88	-	-	2.77	-	140	-	-	-	-	-		
	14-25 (15)	02 Oct 15				-	-	2.80	200	-	-	-	-	-	-	Oil and water mix
	14-25	26 Jun 14				-	-	2.78	25	0.57	247	7.05	15.40	1,420	-	Light yellow color, oily
14-27	14-27 (16)	21 Oct 16	1.5 to 3.0	3.09	-	-	-	2.39	120	-	84	7.09	17.67	1,936		
	14-27 (15)	02 Oct 15				-	-	2.45	170	2.44	69	7.12	18.90	1,636	-	
	14-27	26 Jun 14				-	-	2.48	45	5.96	255	7.10	17.70	1,780	-	
14-33	14-33 (16)	21 Oct 16	1.5 to 3.0	2.96	-	-	-	1.93	0	-	66	7.15	17.30	1,554		
	14-33 (15)	02 Oct 15				-	-	2.18	60	0.38	49	7.07	18.95	3,081	-	
	14-33	26 Jun 14				-	-	1.93	0	3.90	273	7.12	17.90	1,720	-	
14-37	14-37 (16)	21 Oct 16	1.5 to 3.0	2.77	-	-	-	1.97	170	-	-24	6.94	14.45	656		
	14-37 (15)	02 Oct 15				-	-	2.15	75	0.34	-82	7.06	17.06	1,098	-	
	14-37	26 Jun 14				-	-	1.83	10	0.35	65	6.95	14.20	690	-	
14-41	14-41 (16)	21 Oct 16	3.0 to 4.5	4.75	487.423	484.697	-	2.73	110	-	87	6.95	11.27	1,122		
	14-41 (15)	02 Oct 15				485.513	-	2.91	140	3.89	66	7.00	13.16	1,172	-	
	14-41	26 Jun 14				484.823	-	2.60	120	5.44	217	6.89	16.00	710	-	

**Table 2. Site Monitoring Report (2014 and 2015)**

Monitoring Well ID	Sample ID	Date (dd mm yy)	Well Screen Interval (m bgs)	Well Depth <sup>a</sup> (m btoc)	Surface Elevation (m)	Water Elevation (m)	Depth to LNAPL (m bgs)	Depth to Groundwater (m bgs)	WVCRs <sup>b</sup> (ppm)	DO (mg/L)	ORP (mV)	pH	Temp (°C)	EC (µS/cm)	Sample Comments
14-42	14-42 (16)	21 Oct 16	2.1 to 3.6	3.79	487.353	484.391	-	2.96	65	-	97	6.87	12.61	2,002	
	14-42 (15)	02 Oct 15				484.223	-	3.13	120	1.35	68	6.87	13.34	2,129	-
	14-42	26 Jun 14				484.303	-	3.05	20	3.51	225	6.81	8.00	2,320	-

<sup>a</sup> Well depth is measured from the top of the casing

<sup>b</sup> Field screening results are measured using a combustible gas meter calibrated to a hexane standard.

All terms defined in body of PINTER report

m bgs - meters below ground surface

m btoc - metres below top of casing

LNAPL - light non-aqueous phase liquid

WVCRs - well headspace vapour concentration

DO - dissolved oxygen

ORP - oxidation reduction potential

EC - electrical conductivity

ppm - parts per million

mg/L - milligrams per liter

mV - millivolts

µS/cm - microsiemens per centimeter

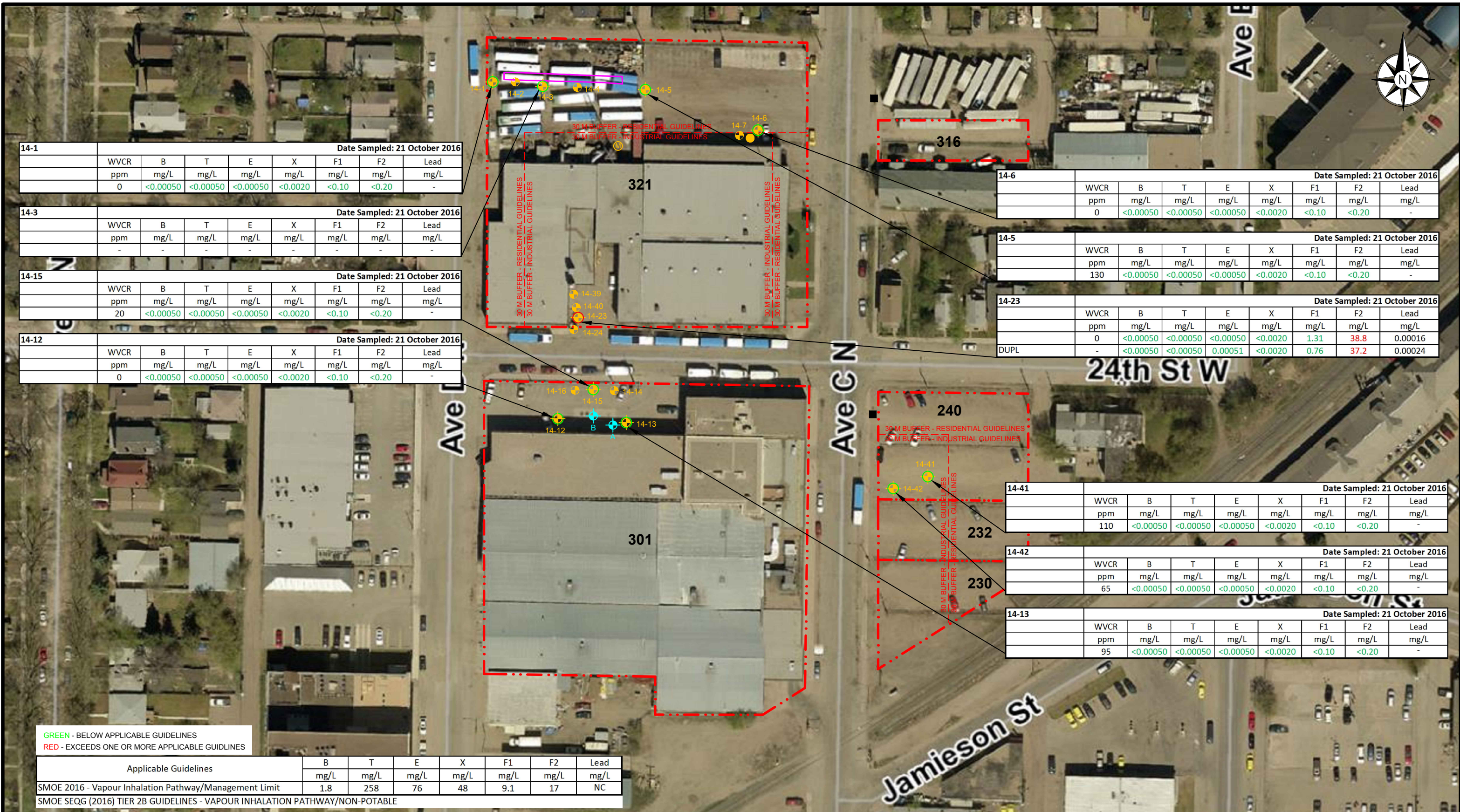


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## **Appendix B**

### **Figures**





**14-1** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-3** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
-	-	-	-	-	-	-	-

**14-15** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
20	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-12** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-6** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-5** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
130	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-23** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead	
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
0	<0.00050	<0.00050	<0.00050	<0.0020	1.31	38.8	0.00016	
DUPL	-	<0.00050	<0.00050	0.00051	<0.0020	0.76	37.2	0.00024

**14-41** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
110	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-42** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
65	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-13** Date Sampled: 21 October 2016

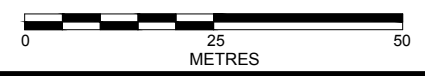
WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
95	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

GREEN - BELOW APPLICABLE GUIDELINES  
 RED - EXCEEDS ONE OR MORE APPLICABLE GUIDELINES

Applicable Guidelines	B	T	E	X	F1	F2	Lead
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SMOE 2016 - Vapour Inhalation Pathway/Management Limit	1.8	258	76	48	9.1	17	NC
SMOE SEQG (2016) TIER 2B GUIDELINES - VAPOUR INHALATION PATHWAY/NON-POTABLE							

- NOTES:**
- IMAGE SOURCE FROM CITY OF SASKATOON IMAPS. IMAGE DATED 2011 ( ACCESSED JUNE 2014 ).
  - THIS DRAWING IS PREPARED FOR ILLUSTRATIVE PURPOSES ONLY.
  - THIS IS NOT A LEGAL SURVEY.
  - ALL MEASUREMENTS ARE IN METRES.
  - SURVEY INFORMATION COLLECTED BY HEMISPHERE S320 GPS.
  - LOCATIONS OF ALL MARKED UTILITIES ARE APPROXIMATE.
  - SASKATCHEWAN MINISTRY OF ENVIRONMENT (SMOE SEQG) (2016) TIER 2B GUIDELINES - VAPOUR INHALATION PATHWAY/NON-POTABLE
  - BTEX: B= BENZENE, T= TOLUENE, E= ETHYLBENZENE, X= XYLENES  
F1 TO F4 = PETROLEUM HYDROCARBON FRACTIONS F1 TO F4
  - MGL = MILLIGRAMS PER LITRE
  - WVCR = WELL HEADSPACE VAPOUR READINGS

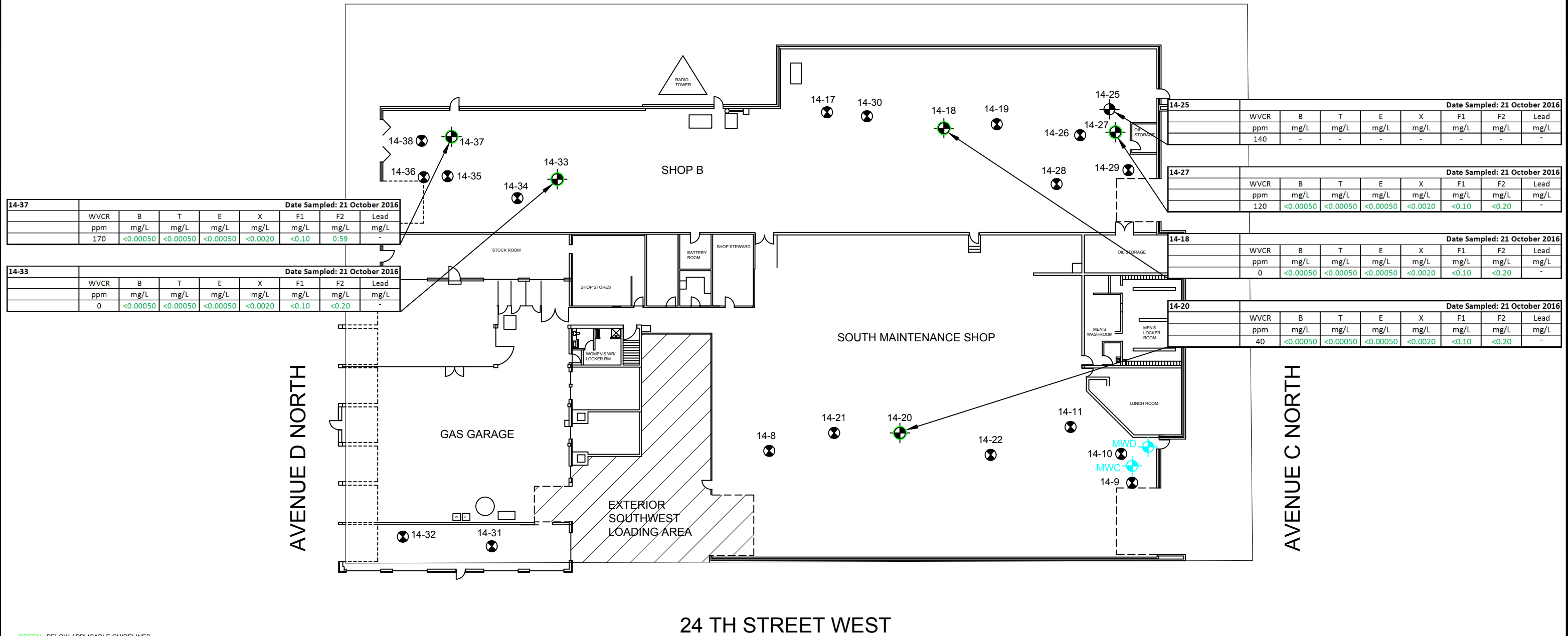
- LEGEND**
- SUBJECT PROPERTY - APPROXIMATE LOCATION
  - HISTORICAL MECHANIC'S PITS
  - TEMPORARY BENCHMARK
  - TEST HOLE
  - MONITORING WELL
  - PRE-EXISTING MONITORING WELL
  - SURFACE SAMPLE
  - MANHOLE



SCALE: 1: 1000  
 FILE: H:\2 PROJECTS\1544 CITY OF SASKATOON CIVIC OPERATIONS CENTRE\1544-7 CASWELL TRANSIT MONITORING (2016)\1544-7 DRAWINGS

**FIGURE 1**  
 DETAILED GROUNDWATER ANALYTICAL RESULTS 2015  
 DATE: 16 NOVEMBER 2016  
 1544-7 CASWELL TRANSIT MONITORING SASKATOON, SK.  
 DRAWN BY: NA  
 CHECKED BY: JC





**14-37** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
170	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	0.59	-

**14-33** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-25** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
140	-	-	-	-	-	-	-

**14-27** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
120	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-18** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
0	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

**14-20** Date Sampled: 21 October 2016

WVCR	B	T	E	X	F1	F2	Lead
ppm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
40	<0.00050	<0.00050	<0.00050	<0.0020	<0.10	<0.20	-

GREEN - BELOW APPLICABLE GUIDELINES  
 RED - EXCEEDS ONE OR MORE APPLICABLE GUIDELINES

Applicable Guidelines	B	T	E	X	F1	F2	Lead
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SMOE 2016 - Vapour Inhalation Pathway/Method Limit	1.8	258	76	48	9.1	17	NC
SMOE SEQG (2016) TIER 2B GUIDELINES - VAPOUR INHALATION PATHWAY/NON-POTABLE							



710A-48TH STREET EAST  
 SASKATOON SK S7K 5B4  
 306.244.1710  
 pintermain@pinter.ca

**NOTES:**

1. IMAGE SOURCE FROM CITY OF SASKATOON IMAPS. IMAGE DATED 2011 ( ACCESSED JUNE 2014 ).
2. THIS DRAWING IS PREPARED FOR ILLUSTRATIVE PURPOSES ONLY.
3. THIS IS NOT A LEGAL SURVEY.
4. ALL MEASUREMENTS ARE IN METRES.
5. SURVEY INFORMATION COLLECTED BY HEMISPHERE S320 GPS.
6. LOCATIONS OF ALL MARKED UTILITIES ARE APPROXIMATE.
7. SASKATCHEWAN MINISTRY OF ENVIRONMENT (SMOE SEQG) (2016) TIER 2B GUIDELINES - VAPOUR INHALATION PATHWAY/NON-POTABLE
8. BTEX: B=BENZENE, T=TOLUENE, E=ETHYLBENZENE, X=XYLENES  
F1 TO F4 = PETROLEUM HYDROCARBON FRACTIONS F1 TO F4
9. MG/L = MILLIGRAMS PER LITRE
10. WVCR = WELL HEADSPACE VAPOUR READINGS

**LEGEND**

- TEST HOLE
- MONITORING WELL
- PRE-EXISTING MONITORING WELL

SCALE: NTS

FILE: H:\2\ PROJECTS\1544 CITY OF SASKATOON CIVIC OPERATIONS CENTRE\1544-7 CASWELL TRANSIT MONITORING (2016)\1544-7 DRAWINGS

**FIGURE 2**  
 DETAILED GROUNDWATER ANALYTICAL RESULTS  
 INTERIOR MONITORING WELLS

16 NOVEMBER 2016  
 1544-7 CASWELL TRANSIT MONITORING  
 SASKATOON, SK.

DRAWN BY: NA  
 CHECKED BY: JC



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**Appendix C**  
**Certificate of Analysis**



Pinter and Associates Ltd.  
ATTN: JESSICA CUTTER  
710A 48th Street East  
Saskatoon SK S7K 5B4

Date Received: 21-OCT-16  
Report Date: 28-OCT-16 14:38 (MT)  
Version: FINAL

Client Phone: 306-244-1710

## Certificate of Analysis

Lab Work Order #: L1847307  
Project P.O. #: NOT SUBMITTED  
Job Reference: 1544-7  
C of C Numbers:  
Legal Site Desc: SASKATOON,SK

Brian Morgan, B.Sc. Hons.  
Client Services Manager

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ADDRESS: #819-58th St E., Saskatoon, SK S7K 6X5 Canada | Phone: +1 306 668 8370 | Fax: +1 306 668 8383  
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company



## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1847307-1 14-1 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Toluene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
EthylBenzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Xylenes	<0.0020	-		0.0020	mg/L	-	24-OCT-16	25-OCT-16	R3579101
o-Xylene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1(C6-C10)	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1-BTEX	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Surr: 1,4-Difluorobenzene	96.5	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 4-Bromofluorobenzene	81.9	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 3,4-Dichlorotoluene	81.1	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	<0.20	-		0.20	mg/L	-	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	86.3	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294
L1847307-2 14-5 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Toluene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
EthylBenzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Xylenes	<0.0020	-		0.0020	mg/L	-	24-OCT-16	25-OCT-16	R3579101
o-Xylene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1(C6-C10)	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1-BTEX	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Surr: 1,4-Difluorobenzene	95.9	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 4-Bromofluorobenzene	87.4	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 3,4-Dichlorotoluene	73.2	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	<0.20	-		0.20	mg/L	-	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	85.5	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294
L1847307-3 14-6 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Toluene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
EthylBenzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Xylenes	<0.0020	-		0.0020	mg/L	-	24-OCT-16	25-OCT-16	R3579101
o-Xylene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1(C6-C10)	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1-BTEX	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Surr: 1,4-Difluorobenzene	96.3	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 4-Bromofluorobenzene	81.2	-		1	%	-	24-OCT-16	25-OCT-16	R3579101

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1847307-3 14-6 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER <b>BTEX and F1 (C6-C10)</b> Surr: 3,4-Dichlorotoluene	81.8	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
<b>F2 (&gt;C10 -C16)</b> F2 (C10-C16) Surr: 2-Bromobenzotrifluoride	<0.20 82.4	- -		0.20 N/A	mg/L %	- -	26-OCT-16 26-OCT-16	28-OCT-16 28-OCT-16	R3582294 R3582294
L1847307-4 14-12 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b> Benzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Toluene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
EthylBenzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Xylenes	<0.0020	-		0.0020	mg/L	-	24-OCT-16	25-OCT-16	R3579101
o-Xylene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1(C6-C10)	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1-BTEX	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Surr: 1,4-Difluorobenzene	95.8	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 4-Bromofluorobenzene	80.5	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 3,4-Dichlorotoluene	89.8	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
<b>F2 (&gt;C10 -C16)</b> F2 (C10-C16) Surr: 2-Bromobenzotrifluoride	<0.20 78.3	- -		0.20 N/A	mg/L %	- -	26-OCT-16 26-OCT-16	28-OCT-16 28-OCT-16	R3582294 R3582294
L1847307-5 14-13 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b> Benzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Toluene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
EthylBenzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Xylenes	<0.0020	-		0.0020	mg/L	-	24-OCT-16	25-OCT-16	R3579101
o-Xylene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1(C6-C10)	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1-BTEX	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Surr: 1,4-Difluorobenzene	91.5	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 4-Bromofluorobenzene	82.1	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 3,4-Dichlorotoluene	89.3	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
<b>F2 (&gt;C10 -C16)</b> F2 (C10-C16) Surr: 2-Bromobenzotrifluoride	<0.20 73.4	- -		0.20 N/A	mg/L %	- -	26-OCT-16 26-OCT-16	28-OCT-16 28-OCT-16	R3582294 R3582294
L1847307-6 14-15 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER <b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b> <b>BTEX and F1 (C6-C10)</b> Benzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1847307-6 14-15 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER									
<b>BTEX and F1 (C6-C10)</b>									
Toluene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
EthylBenzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Xylenes	<0.0020	-		0.0020	mg/L	-	24-OCT-16	25-OCT-16	R3579101
o-Xylene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1(C6-C10)	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1-BTEX	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Surr: 1,4-Difluorobenzene	95.9	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 4-Bromofluorobenzene	94.9	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	<0.20	-		0.20	mg/L	-	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	80.6	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294
L1847307-7 14-18 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER									
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>									
<b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Toluene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
EthylBenzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Xylenes	<0.0020	-		0.0020	mg/L	-	24-OCT-16	25-OCT-16	R3579101
o-Xylene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1(C6-C10)	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1-BTEX	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Surr: 1,4-Difluorobenzene	95.2	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 4-Bromofluorobenzene	82.3	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	<0.20	-		0.20	mg/L	-	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	81.6	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294
L1847307-8 14-20 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER									
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>									
<b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Toluene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
EthylBenzene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Xylenes	<0.0020	-		0.0020	mg/L	-	24-OCT-16	25-OCT-16	R3579101
o-Xylene	<0.00050	-		0.00050	mg/L	-	24-OCT-16	25-OCT-16	R3579101
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1(C6-C10)	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
F1-BTEX	<0.10	-		0.10	mg/L	-	24-OCT-16	25-OCT-16	R3579101
Surr: 1,4-Difluorobenzene	95.1	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 4-Bromofluorobenzene	78.3	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
Surr: 3,4-Dichlorotoluene	75.6	-		1	%	-	24-OCT-16	25-OCT-16	R3579101
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	<0.20	-		0.20	mg/L	-	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	86.4	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294



## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1847307-11 14-27 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER									
<b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Toluene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
EthylBenzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Xylenes	<0.0020	-		0.0020	mg/L	-	25-OCT-16	26-OCT-16	R3580997
o-Xylene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1(C6-C10)	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1-BTEX	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Surr: 1,4-Difluorobenzene	101.8	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 4-Bromofluorobenzene	84.0	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 3,4-Dichlorotoluene	97.2	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	<0.20	-		0.20	mg/L	-	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	80.8	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294
L1847307-12 14-33 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER									
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>									
<b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Toluene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
EthylBenzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Xylenes	<0.0020	-		0.0020	mg/L	-	25-OCT-16	26-OCT-16	R3580997
o-Xylene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1(C6-C10)	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1-BTEX	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Surr: 1,4-Difluorobenzene	95.9	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 4-Bromofluorobenzene	80.3	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 3,4-Dichlorotoluene	83.0	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	<0.20	-		0.20	mg/L	-	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	85.2	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294
L1847307-13 14-37 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER									
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>									
<b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Toluene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
EthylBenzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Xylenes	<0.0020	-		0.0020	mg/L	-	25-OCT-16	26-OCT-16	R3580997
o-Xylene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1(C6-C10)	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1-BTEX	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Surr: 1,4-Difluorobenzene	97.5	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 4-Bromofluorobenzene	98.9	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 3,4-Dichlorotoluene	88.0	-		1	%	-	25-OCT-16	26-OCT-16	R3580997

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L1847307-13 14-37 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER									
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	0.59	+/-0.18		0.20	mg/L	0	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	85.6	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294
L1847307-14 14-41 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER									
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>									
<b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Toluene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
EthylBenzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Xylenes	<0.0020	-		0.0020	mg/L	-	25-OCT-16	26-OCT-16	R3580997
o-Xylene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1(C6-C10)	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1-BTEX	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Surr: 1,4-Difluorobenzene	98.3	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 4-Bromofluorobenzene	80.7	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 3,4-Dichlorotoluene	87.1	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	<0.20	-		0.20	mg/L	-	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	87.1	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294
L1847307-15 14-42 Sampled By: JC/TVC on 21-OCT-16 @ 12:00 Matrix: WATER									
<b>BTEX, F1 (C6-C10) and F2 (&gt;C10-C16)</b>									
<b>BTEX and F1 (C6-C10)</b>									
Benzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Toluene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
EthylBenzene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Xylenes	<0.0020	-		0.0020	mg/L	-	25-OCT-16	26-OCT-16	R3580997
o-Xylene	<0.00050	-		0.00050	mg/L	-	25-OCT-16	26-OCT-16	R3580997
m+p-Xylene	<0.0010	-		0.0010	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1(C6-C10)	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
F1-BTEX	<0.10	-		0.10	mg/L	-	25-OCT-16	26-OCT-16	R3580997
Surr: 1,4-Difluorobenzene	99.1	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 4-Bromofluorobenzene	80.9	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
Surr: 3,4-Dichlorotoluene	81.1	-		1	%	-	25-OCT-16	26-OCT-16	R3580997
<b>F2 (&gt;C10 -C16)</b>									
F2 (C10-C16)	<0.20	-		0.20	mg/L	-	26-OCT-16	28-OCT-16	R3582294
Surr: 2-Bromobenzotrifluoride	84.0	-		N/A	%	-	26-OCT-16	28-OCT-16	R3582294

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

## Reference Information

## QC Samples with Qualifiers &amp; Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
<b>Sample Parameter Qualifier Key:</b>			
Qualifier	Description		
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.		
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.		
SFP	Sample was Filtered and Preserved at the laboratory		
SMI	Surrogate recovery could not be measured due to sample matrix interference.		

## Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTX,F1-SK	Water	BTEX and F1 (C6-C10)		EPA 8260C/5021A and CWS PHC Tier 1
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. BTEX Target compound concentrations are measured using mass spectrometry detection. The instrumental portion of F1 analysis is carried out in accordance with the Canada Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method.				
F2-SK	Water	F2 (>C10 -C16)		EPA 3511/CCME PHC CWS-GC-FID
Petroleum Hydrocarbons (F2-F4) in Water Method is adapted from US EPA Method 3511: Organic Compounds in Water by Micro-extraction" (Nov 2002) with instrumental analysis as per the "Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil - Tier 1 Method" (CCMS, Dec 2000) Water samples (in their entirety) are extracted using hexane prior to capillary column gas chromatography with flame ionization detection (GC/FID).				
MET-D-CCMS-SK	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030B / EPA 6020A

This procedure involves preliminary filtration through a 0.45 um filter followed by instrumental analysis using collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

\*\* The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SK	ALS ENVIRONMENTAL - SASKATOON, SASKATCHEWAN, CANADA

## Chain of Custody Numbers:

## GLOSSARY OF REPORT TERMS

*Surr* - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.

*mg/kg* - milligrams per kilogram based on dry weight of sample

*mg/kg wwt* - milligrams per kilogram based on wet weight of sample

*mg/kg lwt* - milligrams per kilogram based on lipid-adjusted weight

*mg/L* - unit of concentration based on volume, parts per million.

< - Less than.

D.L. - The reporting limit.

N/A - Result not available. Refer to qualifier code and definition for explanation.

MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.

Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent.

Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



### Quality Control Report

Workorder: L1847307

Report Date: 28-OCT-16

Page 1 of 3

Client: Pinter and Associates Ltd.  
710A 48th Street East  
Saskatoon SK S7K 5B4

Contact: JESSICA CUTTER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>BTX,F1-SK</b>		<b>Water</b>						
<b>Batch</b>	<b>R3579101</b>							
<b>WG2416538-3</b>	<b>LCS</b>							
Benzene			98.8		%		70-130	25-OCT-16
Toluene			100.3		%		70-130	25-OCT-16
EthylBenzene			99.7		%		70-130	25-OCT-16
Xylenes			104.0		%		70-130	25-OCT-16
o-Xylene			102.0		%		70-130	25-OCT-16
m+p-Xylene			106.0		%		70-130	25-OCT-16
F1(C6-C10)			101.2		%		70-130	25-OCT-16
<b>WG2416538-2</b>	<b>MB</b>							
Benzene			<0.00050		mg/L		0.0005	25-OCT-16
Toluene			<0.00050		mg/L		0.0005	25-OCT-16
EthylBenzene			<0.00050		mg/L		0.0005	25-OCT-16
Xylenes			<0.0020		mg/L		0.002	25-OCT-16
o-Xylene			<0.00050		mg/L		0.0005	25-OCT-16
m+p-Xylene			<0.0010		mg/L		0.001	25-OCT-16
F1(C6-C10)			<0.10		mg/L		0.1	25-OCT-16
Surrogate: 1,4-Difluorobenzene			98.5		%		70-130	25-OCT-16
Surrogate: 4-Bromofluorobenzene			84.8		%		70-130	25-OCT-16
Surrogate: 3,4-Dichlorotoluene			91.4		%		70-130	25-OCT-16
<b>Batch</b>	<b>R3580997</b>							
<b>WG2418078-1</b>	<b>DUP</b>	<b>L1847462-29</b>						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	26-OCT-16
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	26-OCT-16
EthylBenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	26-OCT-16
Xylenes		<0.0020	<0.0020	RPD-NA	mg/L	N/A	30	26-OCT-16
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	26-OCT-16
m+p-Xylene		<0.0010	<0.0010	RPD-NA	mg/L	N/A	30	26-OCT-16
F1(C6-C10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	26-OCT-16
<b>WG2418078-3</b>	<b>LCS</b>							
Benzene			99.4		%		70-130	26-OCT-16
Toluene			97.5		%		70-130	26-OCT-16
EthylBenzene			101.1		%		70-130	26-OCT-16
Xylenes			99.4		%		70-130	26-OCT-16
o-Xylene			98.0		%		70-130	26-OCT-16
m+p-Xylene			100.8		%		70-130	26-OCT-16





**Environmental**

## Quality Control Report

Workorder: L1847307

Report Date: 28-OCT-16

Page 2 of 3

Client: Pinter and Associates Ltd.  
710A 48th Street East  
Saskatoon SK S7K 5B4

Contact: JESSICA CUTTER

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>BTX,F1-SK</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R3580997</b>							
<b>WG2418078-3</b>	<b>LCS</b>							
F1(C6-C10)			101.2		%		70-130	26-OCT-16
<b>WG2418078-2</b>	<b>MB</b>							
Benzene			<0.00050		mg/L		0.0005	26-OCT-16
Toluene			<0.00050		mg/L		0.0005	26-OCT-16
EthylBenzene			<0.00050		mg/L		0.0005	26-OCT-16
Xylenes			<0.0020		mg/L		0.002	26-OCT-16
o-Xylene			<0.00050		mg/L		0.0005	26-OCT-16
m+p-Xylene			<0.0010		mg/L		0.001	26-OCT-16
F1(C6-C10)			<0.10		mg/L		0.1	26-OCT-16
Surrogate: 1,4-Difluorobenzene			98.2		%		70-130	26-OCT-16
Surrogate: 4-Bromofluorobenzene			74.1		%		70-130	26-OCT-16
Surrogate: 3,4-Dichlorotoluene			97.9		%		70-130	26-OCT-16
<b>F2-SK</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R3582294</b>							
<b>WG2416540-2</b>	<b>LCS</b>							
F2 (C10-C16)			97.4		%		70-130	28-OCT-16
<b>WG2416540-1</b>	<b>MB</b>							
F2 (C10-C16)			<0.20		mg/L		0.2	28-OCT-16
<b>MET-D-CCMS-SK</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R3581603</b>							
<b>WG2416798-3</b>	<b>CRM</b>	<b>TMRM_20</b>						
Lead (Pb)-Dissolved			102.9		%		80-120	26-OCT-16
<b>WG2416798-2</b>	<b>DUP</b>	<b>L1847307-9</b>						
Lead (Pb)-Dissolved		0.00016	0.00018		mg/L	12	20	26-OCT-16
<b>WG2416798-1</b>	<b>MB</b>							
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	26-OCT-16
<b>WG2416798-4</b>	<b>MS</b>	<b>L1847307-10</b>						
Lead (Pb)-Dissolved			95.9		%		70-130	26-OCT-16

# Quality Control Report

Workorder: L1847307

Report Date: 28-OCT-16

Client: Pinter and Associates Ltd.  
710A 48th Street East  
Saskatoon SK S7K 5B4

Page 3 of 3

Contact: JESSICA CUTTER

## Legend:

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Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

## Sample Parameter Qualifier Definitions:

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Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

---

## Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

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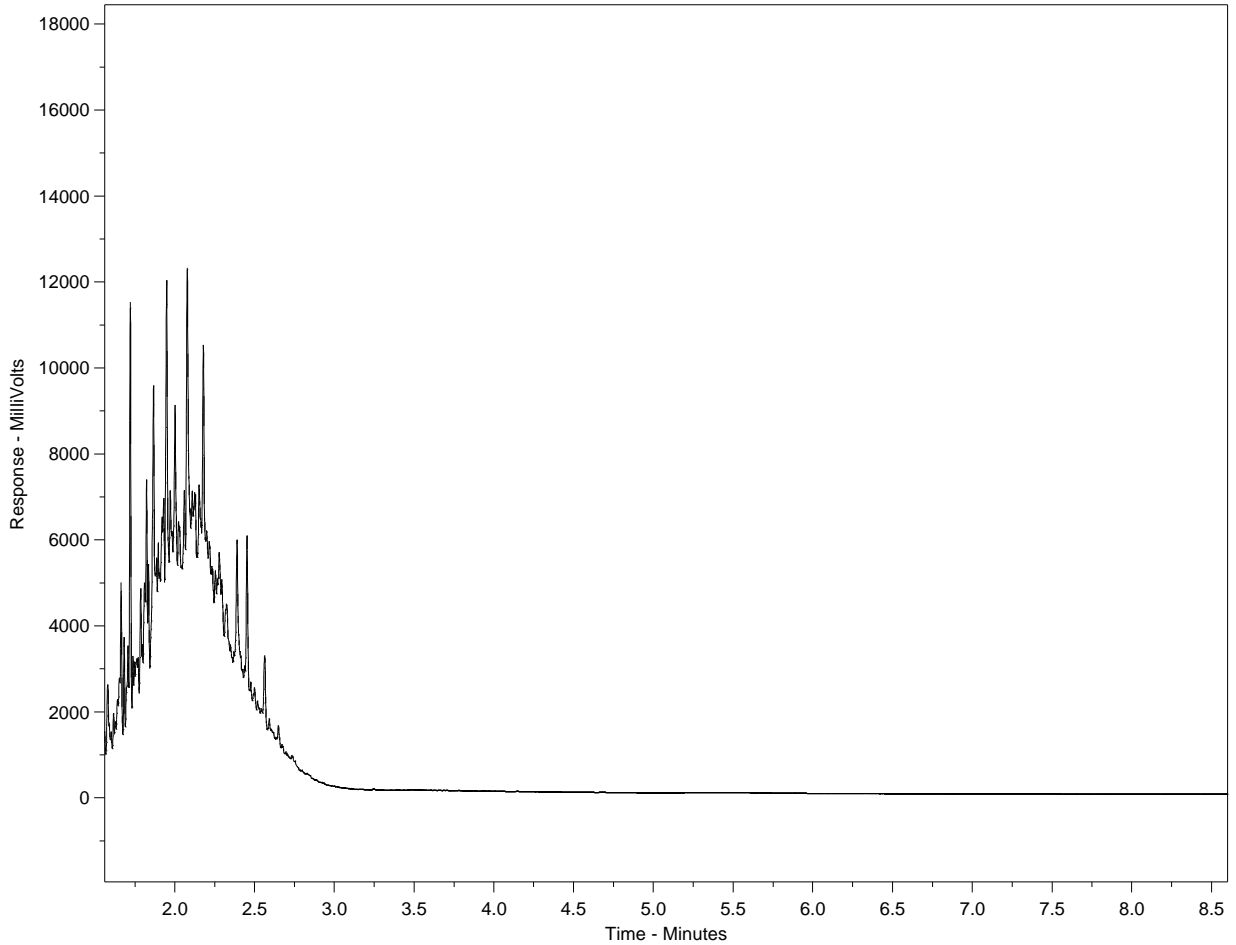
The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

# CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



**ALS Sample ID: L1847307-9**  
**Client ID: 14-23**



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

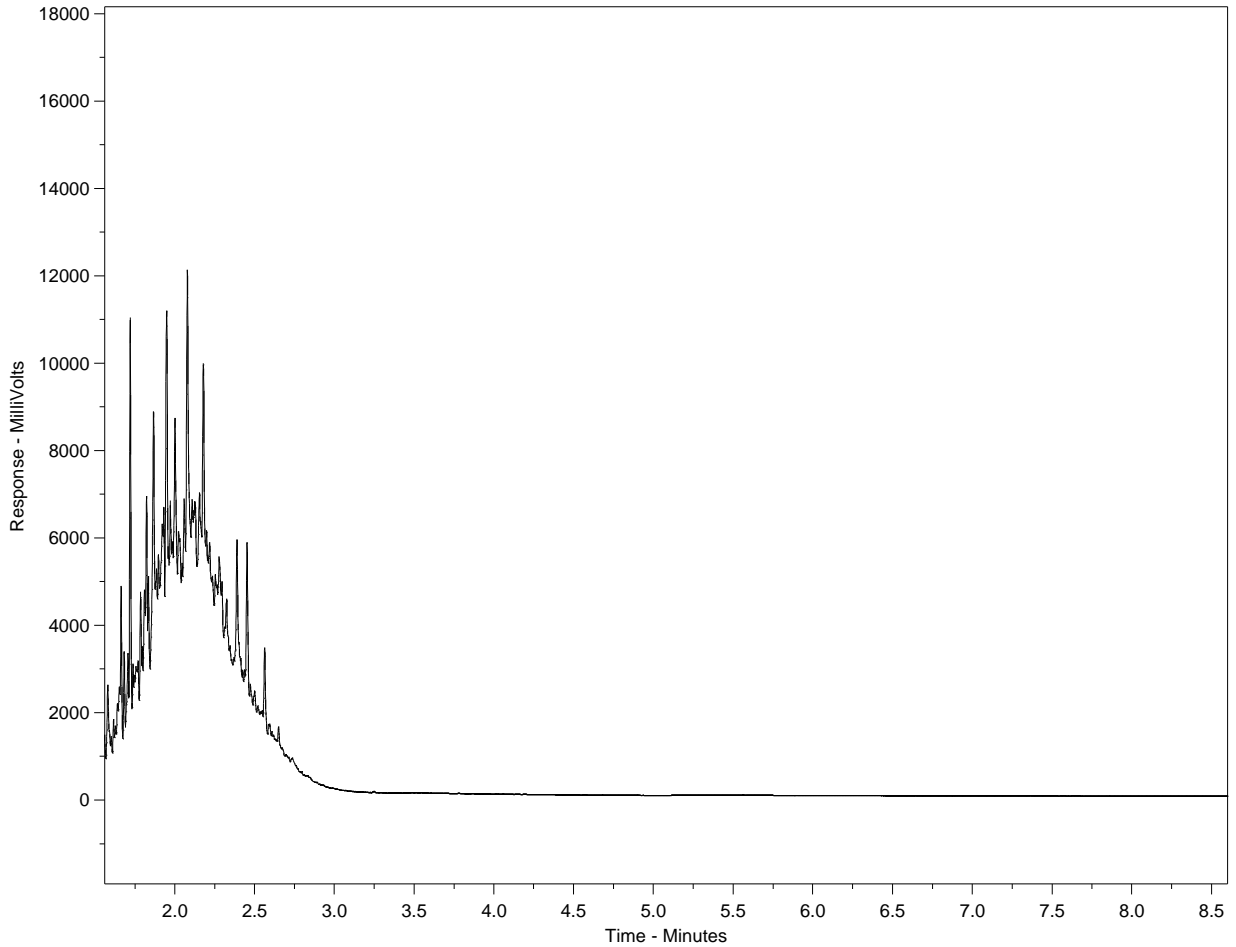
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at [www.alsglobal.com](http://www.alsglobal.com).

# CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



**ALS Sample ID: L1847307-10**  
**Client ID: DUPL**



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

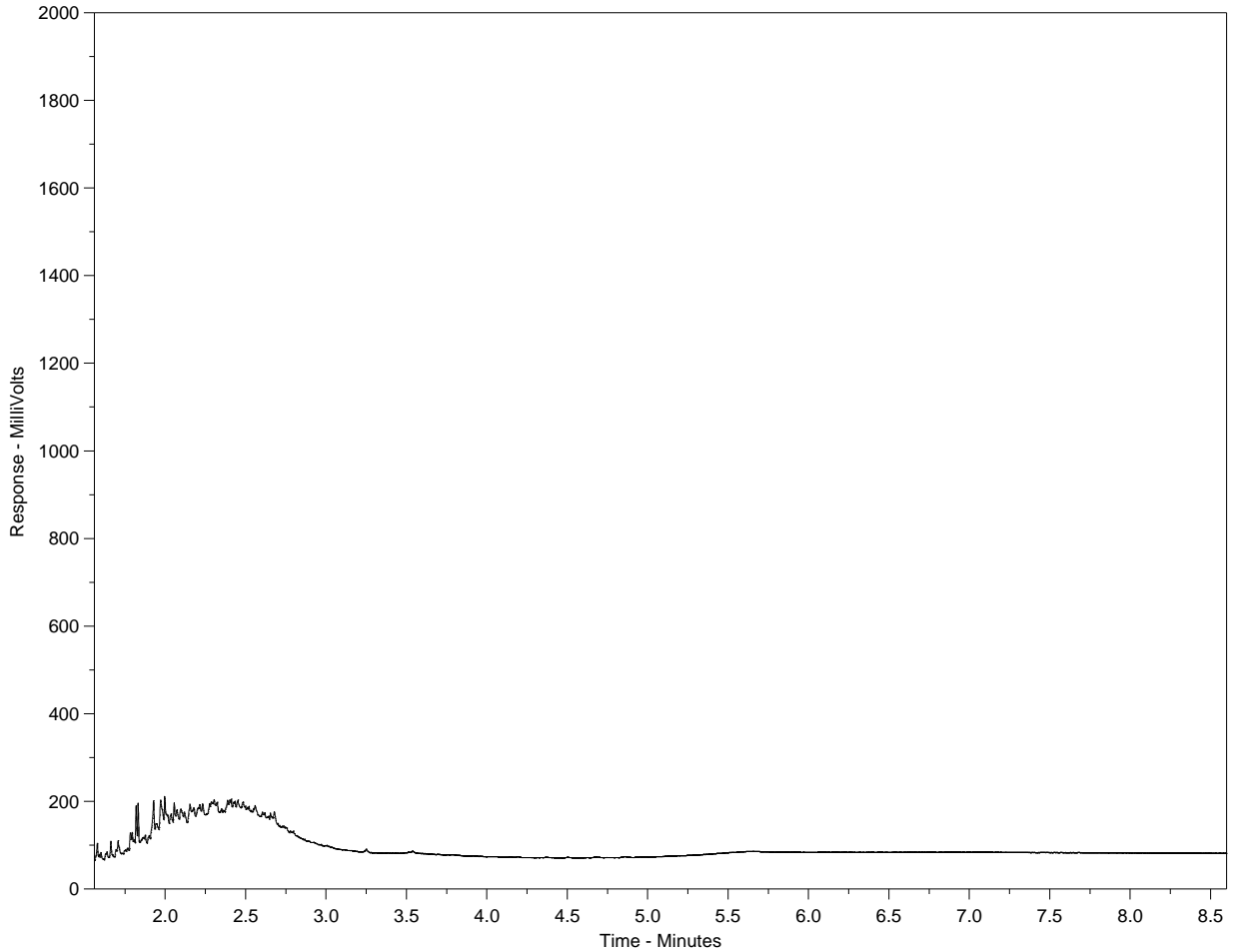
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at [www.alsglobal.com](http://www.alsglobal.com).

# CCME F2-F4 HYDROCARBON DISTRIBUTION REPORT



**ALS Sample ID: L1847307-13**  
**Client ID: 14-37**



← F2 →		← F3 →		← F4 →	
nC10	nC16		nC34		nC50
174°C	287°C		481°C		575°C
346°F	549°F		898°F		1067°F
← Gasoline →			← Motor Oils/ Lube Oils/ Grease →		
← Diesel/ Jet Fuels →					

The CCME F2-F4 Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and four n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

Note: This chromatogram was produced using GC conditions that are specific to ALS Canada CCME F2-F4 method. Refer to the ALS Canada CCME F2-F4 Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at [www.alsglobal.com](http://www.alsglobal.com).



<b>Report To</b>			<b>Report Form:</b>			<b>e Requested (Rush for routine analysis subject to availability)</b>											
Company: PINTER & Associates Ltd.			<input checked="" type="checkbox"/> Standard <input type="checkbox"/> Other			<input checked="" type="radio"/> Regular (Standard Turnaround Times - Business Days)											
Contact: Jessica Cutter			<input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> Excel <input type="checkbox"/> Digital <input type="checkbox"/> Fax			<input type="radio"/> Priority (2-4 Business Days) - 50% Surcharge - Contact ALS to Confirm TAT											
Address: 710A 48th Street East Saskatoon, SK S7K 5B4			Email 1: <a href="mailto:jessica.cutter@pinter.ca">jessica.cutter@pinter.ca</a>			<input type="radio"/> Emergency (1-2 Bus. Days) - 100% Surcharge - Contact ALS to Confirm TAT											
Phone: 306.244.1710    Fax: 306.933.4986			Email 2: <a href="mailto:ryan.riess@pinter.ca">ryan.riess@pinter.ca</a>			<input type="radio"/> Same Day or Weekend Emergency - Contact ALS to Confirm TAT											
Invoice To Same as Report? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No			<b>Client / Project Information</b>			Please indicate below Filtered, Preserved or both (F, P, F/P)											
Hardcopy of Invoice with Report? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No			Job #: 1544-7														
Company: SAME			PO / AFE:														
Contact:			LSD: Saskatoon, SK														
Address:			Quote #: Q37502			Analysis Request											
Phone:			ALS Contact: Brian Morgan														
Lab Work Order # (lab use only)			Sampler: JC/TVC			Number of Containers											
<b>Sample #</b>	<b>Sample Identification</b> (This description will appear on the report)	<b>Date</b> (dd-mmm-yy)	<b>Time</b> (hh:mm)	<b>Sample Type</b>													
14-1		21-Oct-16		Water	X												
14-5		21-Oct-16		Water	X												
14-6		21-Oct-16		Water	X												
14-12		21-Oct-16		Water	X												
14-13		21-Oct-16		Water	X												
14-15		21-Oct-16		Water	X												
14-18		21-Oct-16		Water	X												
14-20		21-Oct-16		Water	X												
14-23		21-Oct-16		Water	X	X											
DUPL		21-Oct-16		Water	X	X											
14-27		21-Oct-16		Water	X												
14-33		21-Oct-16		Water	X												
14-37		21-Oct-16		Water	X												
14-41		21-Oct-16		Water	X												
14-42		21-Oct-16		Water	X												

DD 21-OCT-16 4pm 15°C

RR




**PINTER**  
& ASSOCIATES LTD

**Appendix D**  
**Qualified Persons Certificate**

PRINT

RESET FORM

 **Qualified Person Certificate**

September 2015 | CSB | CSB19001

This form is to be used by a qualified person when providing an opinion to the minister on aspects such as an environmental protection plan, environmental sampling, operating plan or design plan under the Saskatchewan Environmental Code.

The form helps ensure consistent information is provided to the minister and provides direction to the qualified person and the regulated community.

**A. General Information**

For assistance completing this form or for more information, please contact our Client Service Office:  
**Email:** [centre.inquiry@gov.sk.ca](mailto:centre.inquiry@gov.sk.ca)  
**Tel** (toll free in North America): 1-800-567-4224  
**Tel** (Regina): 306-787-2584

For assistance on technical aspects related to certificate requirements please contact the RBR and Code Management Branch:  
**Email:** [saskcodesecretariat@gov.sk.ca](mailto:saskcodesecretariat@gov.sk.ca)

**Once completed:**  
All certificates (except for Water Main or Sewage Main) should be submitted to the Ministry of Environment through:  
**Online Services:** <https://envonline.gov.sk.ca/login/>

Water Main and Sewage Main chapter related certificates should be submitted to the Water Security Agency through:  
**Email:** [WSA.EngineeringandApprovals@wsask.ca](mailto:WSA.EngineeringandApprovals@wsask.ca)  
**Fax:** 306-787-0780  
**Mail:**  
Environmental and Municipal Management Services Division  
Engineering Approvals Unit  
Water Security Agency  
420 – 2365 Albert Street  
Regina, SK S4P 4K1

**B. Qualified Person Contact Information**

Name	Ryan Riess		
Business Name	PINTER & Associates Ltd.		
Address	710 48th Street East		
Address			
City/Town	Saskatoon	Province	SK
		Postal Code	S7K 5B4
Country	Canada		
Phone Number	306-244-1710	Email	ryan.riess@pinter.ca

**Qualified Person Designation Number** (if applicable)

**On-line services transaction number** that this submission will be associated to (provided by organization)



### C. Organization Contact Information

Contact Name	Rob Tomiyama		
Organization Name	City of Saskatoon		
Address	202 4th Avenue North		
Address			
City/Town	Saskatoon	Province	SK
		Postal Code	S7K 0K1
Country	Canada		
Phone Number	306-657-8688	Email	rob.tomiyama@saskatoon.ca

### D. Certification

I do hereby certify that:

*Select chapter name*

1. I am a qualified person as that term is defined in the of the Saskatchewan Environmental Code.

Site Assessment Chapter

2. To the best of my knowledge and the best of my professional ability, recognizing the standard of care expected of a professional doing this work, it is my professional opinion that: (select opinion(s) applicable to chapter specified in section 1)

#### Corrective Action Plan Chapter

- The methods and components in the environmental protection plan, if carried out in accordance with that plan, will satisfy the results-based objective described in section 2-1 of the chapter.
- Any endpoint selected in the corrective action plan:
- properly addresses the substances of potential concern; and
  - is appropriate for the use, proposed use or exposure scenarios with respect to the environmentally impacted site.
- The laboratory analysis procedures produce accurate, precise and reliable results.
- The quality assurance and quality control for sampling and analytical procedures produce accurate, precise and reliable results.

#### Hydrostatic Testing Chapter

- The methods and components in the environmental protection plan, if carried out in accordance with that plan, will satisfy the results-based objective described in section 2-1 of the chapter.
- The quality assurance and quality control for sampling and analytical procedures produce accurate, precise and reliable results.

#### Industrial Source (Air Quality) Chapter

- The methods and components in the environmental protection plan, if carried out in accordance with that plan, will satisfy the results-based objective described in section 1-8 of the chapter.
- The quality assurance and quality control for sampling and analytical procedures produce accurate, precise and reliable results.

### Sewage Main Chapter

- The methods and components in the environmental protection plan, if carried out in accordance with that plan, will satisfy the results-based objective described in section 2-1 of the chapter.
- The sewage main design plan, if carried out in accordance with that plan, will satisfy the requirements set out in subsection (2) of the Sewage Main Chapter.
- Monitoring and commissioning requirements:
  - there is no physical cross-connection between a sewage main and a water main that could permit the passage of any sewage or contaminated water into a supply of water that is intended for human consumption or a human consumptive use;
  - there is no physical cross-connection between a sewage main and surface water or groundwater, unless otherwise approved by the minister;
  - there is no physical interconnection between a sewage main and a storm sewer in a manner that would allow sewage in the sewage main to be discharged through the storm sewer;
  - the sewage main is constructed to a sufficient depth to protect against freezing and to receive sewage from basements without flooding;
  - the infiltration and exfiltration rate for pressure testing of polyvinyl chloride sewage mains and fittings does not exceed 4.6 litres per millimetre diameter of pipe per kilometre length per day; and
  - the sewage main is designed and constructed to create a local environment free of odour complaints.
- The quality assurance and quality control for sampling and analytical procedures produce accurate, precise and reliable results.

### Site Assessment Chapter

- The methods and components in the environmental protection plan, if carried out in accordance with that plan, will satisfy the results-based objective described in section 2-1 of the chapter.
- The report satisfies the requirements set out in the CAN/CSA-Z769-00 (R2008) - Phase II Environmental Site Assessment standard.
- The quality assurance and quality control for sampling and analytical procedures produce accurate, precise and reliable results.

### Water Main Chapter

- The methods and components in the environmental protection plan, if carried out in accordance with that plan, will satisfy the results-based objective described in section 2-1 of the chapter.
- The water main design plan, if carried out in accordance with that plan, will satisfy the requirements set out in subsection (2).
- Monitoring and commissioning requirements:
  - the requirements for commissioning a water main set out in the Waterwork Start-Up Standard have been met;
  - the water in the water main meets the concentration limits for the parameters set out in Table 3 in the Appendix of The Waterworks and Sewage Works Regulations, within the timelines set out in that Table;
  - to ensure that the water meets the chemical treatment standards set out in clause 27(6)(b) of *The Waterworks and Sewage Works Regulations* when the water main is commissioned;
  - to ensure that the water meets the microbial and bacteriological standards set out in subsection 29(3) of *The Waterworks and Sewage Works Regulations* when the water main is commissioned; and
  - a pressure test of the water main has been conducted and the water main has passed that pressure test.
- The quality assurance and quality control for sampling and analytical procedures produce accurate, precise and reliable results.

3. I have the following qualifications and thereby fulfill the requirements to be a qualified person for the chapter mentioned in section 1: (select one)

- A person licensed to practise professional engineering or professional geoscience pursuant to *The Engineering and Geoscience Professions Act*.
- A person who is a practising member as defined in *The Agrologists Act, 1994*.
- A person who is an applied science technologist or certified technician pursuant to *The Saskatchewan Applied Science Technologists and Technicians Act*.
- An operator who holds at least the corresponding certificate for the classification of the waterworks or sewage works that is set out in the Saskatchewan Water and Wastewater.
- An individual who is designated by the minister.

4. I have the following additional information to provide: (additional information)

5. The information submitted was prepared by me, or under my direct supervision, or was prepared by a third party(ies) and has been reviewed and accepted by me; and was prepared in accordance with an appropriate quality assurance/quality control system that ensured qualified personnel properly gathered and evaluated all the information contained in and underlying this submission.

6. In providing the opinion in section 2 and any additional information in section 4 I have:

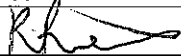
- a) taken all reasonable and prudent action to ensure that the certificate or opinion does not contain any misrepresentation;
- b) disclosed all material facts; and
- c) complied with any applicable professional standards.

7. I am aware that this Qualified Person Certificate and any additional information submitted is deemed to be public information unless otherwise prescribed.

8. I am aware that a contravention of section 6:

- a) could result in prosecution;
- b) could result in the imposition of an administrative penalty; and
- c) could result in a complaint to the professional association to which the qualified person belongs.

Signature of Applicant



Date of Application

23 Nov 2016

Professional seal, association member number  
or ministry qualified person designation number  
(if applicable)

