

#5102



Barons Gas Station Remediation Project Barons, AB

2009 Installation and Sampling of 1 New Groundwater Well



Environmental
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PREPARED FOR:
Marie Elizabeth Read
P.O. Box 267
Irma, AB T0B 2H0

PREPARED BY:
Hasegawa Engineering
Consulting Professional Engineers
1220 31st Street North
Lethbridge, Alberta
T1H 5J8



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HASEGAWA ENGINEERING

Consulting Professional Engineers

A Division of 993997 Alberta Ltd.

1220 31st Street North Lethbridge, AB T1H 5J8

Bus: 328-2686 Fax: 328-2728 E-mail: office@hasegawa.ca

July 20, 2009

Marie Elizabeth Read
P.O. Box 267
Irma, AB T0B 2H0

Job # 07-186

Dear Marie:

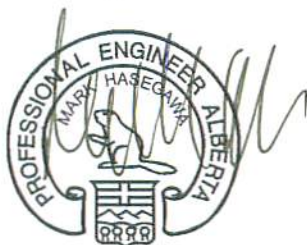
Re: Installation and Sampling of 1 New Groundwater Well at the Former Gas Station in Barons, AB

At the recommendation of Hasegawa Engineering, 1 new groundwater well was installed at the service station located in Barons, Alberta. The new well was installed on the south side of Main Street directly south of the gas station and east of groundwater monitoring wells MW-14 & MW-15, which were installed on December 29, 2008 (refer to Figure 1 for well locations).

Soil samples were analyzed onsite during drilling using an OVM (Organic Vapor Meter) to screen for hydrocarbons. In addition, one soil sample was submitted to Bodycote Labs for analysis of contaminants. A groundwater sample was taken at a later date and submitted to Bodycote for analysis as well. The test results are enclosed in the following report.

We trust that the enclosed information meets your requirements. Please feel free to contact me at 403-328-2686 if you have any questions or comments regarding these results.

Sincerely,



Mark Hasegawa P. Eng.
Hasegawa Engineering
Consulting Professional Engineers

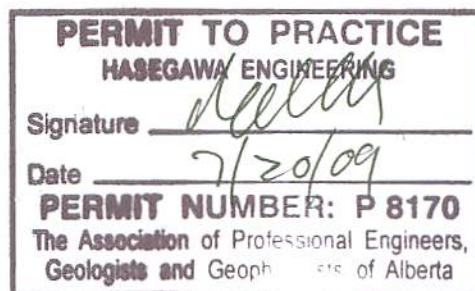


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1.0 INTRODUCTION

1.1 *Project Background*

The Barons gas station site is located on Main Street in Barons, Alberta. Soil and groundwater contamination at the site were first discovered in 1993. Subsequently site investigation activities were conducted and revealed soil and groundwater was impacted by petroleum hydrocarbons. Site remediation was also conducted at this location. In August of 1996 soil beneath the pumps was removed and a soil vapor extractor system was installed. In May of 2003 soil east of the building was removed and land-farmed.

Site investigation was also conducted subsequent to remedial activities. Free product was detected in MW-2 in the Dec. 2001 groundwater sampling event. MW-2 was destroyed during the soil remediation in 2003, therefore no groundwater samples could be obtained from MW-2 in the 2007 sampling event. Free product was present in MW-3 in the 2007 and 2008, groundwater sampling events. MW-3 is located to the south of the fuel dispensers located at the gas station. Although previously, two groundwater wells located south of Main Street, showed no impact south of MW-3, those wells have been since been destroyed. Previous sampling events showed the groundwater flow direction to be to the south; therefore it was advised that three new groundwater wells be installed south of the former gas station to delineate off-site contamination plume. The results of the groundwater analysis show that groundwater samples taken from MW-13 meet Alberta Environment guidelines with the exception of petroleum hydrocarbon fraction F2. The groundwater samples from MW-14 and MW-15 located offsite to the south of Main Street showed no impact from the free product present in MW-13. To further delineate off-site contamination, one additional well was proposed to the east of groundwater wells MW-14 and MW-15. The results of new well installation are contained in this report.

1.2 *Scope of Work*

The specific activities included in this assessment included:

- Drilling and installation of 1 new groundwater well to the south of the subject property east of groundwater wells MW-14 and MW-15.
- Sampling of soil during drilling of the well and readings taken from soil using an OVM (Organic Vapor Meter) to determine hydrocarbon content.
- Submission of one soil sample from the well corresponding to the highest OVM reading for the well.
- Gauging of the new well to establish the water table elevation, purging of the well to allow recharging of fresh groundwater, sampling of groundwater from the well
- Submission of 1 soil sample and 1 groundwater sample for analysis for BTEX, F1, F2, F3, and F4.

- Complete summary report, which includes results, maps, conclusions and recommendations for future work

1.3 Study Objectives

The primary objective of this project was to provide the owner or owners, with verification of whether or not there has been additional off-site impact to soil or groundwater.

2.0 METHODOLOGY

2.1 Soil Sampling and Analysis

On June 12, 2009, a solid stem auger rig was used to advance the soil boring for the new well. Bedrock was reached at approximately 14 feet, and the well was completed to a depth of 20' below ground level. At each 5 foot interval, a soil sample was taken directly from the auger flight and visually examined to determine soil type, moisture content, color, and the presence of odor. In addition, two soil samples were taken at each 5 foot interval, one sample was stored in a Ziploc bag and labeled while a corresponding sample was placed in a 500 ml jar and stored on ice in a cooler. The samples stored in the Ziploc bags were allowed to equilibrate for 10 minutes and then were tested using an OVM (Organic Vapor Meter) to quantify hydrocarbon content. The soil jar sample from each well corresponding to the highest OVM reading was identified and submitted to Bodycote Labs on June 12, 2009, for analysis. The results of the field analysis are presented in Table 1.

2.2 Groundwater Sampling and Gauging

Groundwater sampling occurred at the subject property on June 30, 2009. Prior to sampling, the well was gauged to determine the depth to water. The well was then purged of at least two well bore volumes or until the well went dry. A groundwater sample was then collected using a hand bailer and stored on ice. The Groundwater sample was preserved at 4 degrees C and sent to Bodycote Labs for analysis.

2.3 Assessment Criteria

Results obtained from Bodycote Labs for the submitted samples of soil and groundwater were evaluated to ensure validity by:

- Reviewing all data provided by the lab to ensure correct methodologies were utilized and laboratory errors had not occurred;

- Comparing concentrations of each indicator parameter to the corresponding Permissible Exposure Limits; and
- Determining whether any concentration that exceeds the exposure limits was not the result of unrelated events.

3.0 SOIL RESULTS

3.1 General

The soil sample submitted for laboratory analysis was tested for BTEX (Benzene, Toluene, Ethylbenzene, and Total Xylenes), F1, F2, F3, and F4. The results of this analysis are included in this section.

3.2 Soil Analytical Results

Soil samples were obtained during drilling of the groundwater well MW-16 on June 12, 2009. The soil analytical results are shown in Table 1 below. Results are compared against the AENV Commercial Guidelines for fine grained soils.

Table 1: Soil Analytical Results

SAMPLE LOCATION	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)	F1 (Mg/L)	F2 (Mg/L)	F3 (Mg/L)	F4 (Mg/L)
Commercial Guidelines	9	450	690	1,500	660	1,500	2,500	6,600
MW-16	0.013	<0.005	0.076	0.78	14	<10	<30	<20
Detection limit	<0.004	<0.005	<0.010	0.02	<4	26	<30	<20

 - Exceeds Alberta Environment risk management guidelines for petroleum storage tank sites

As seen in Table 1, the results of soil analysis are below allowable Commercial Guidelines for fine-grained soils. Commercial guidelines for generic hydrocarbon criteria, for fine-grained soil, were obtained from AENV Risk Management Guidelines for Petroleum Storage Tank Sites.

4.0 GROUNDWATER RESULTS

4.1 General

The groundwater sample submitted for laboratory analysis was tested for BTEX (Benzene, Toluene, Ethylbenzene, and Total Xylenes), F1, F2, F3, and F4.

Groundwater Potentiometric Surface

MW-16 was gauged at the site on June 30, 2009, to determine the potentiometric surface elevation. Groundwater potentiometric surface data is shown in Table 2 below as well as in Figure 1 in Appendix A.

Table 2: Groundwater Potentiometric Surface Data

MONITORING WELL	DTW (m)	TD (m)
MW – 16	3.57	5.91

DTW= Depth To Water (measured from ground level)

TD= Total Depth

4.2 Groundwater Analytical Results

The results of the sample analysis of MW-16 are included in Table 3 below.

Table 3: Groundwater Quality Data (June 30, 2009)

SAMPLE I.D.	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)	F1 (C6-C10) (mg/L)	F2 (C10-C16) (mg/L)
Commercial Guidelines	16	342	NG	NG	24	18
MW-16	0.002	<0.001	<0.001	0.098	0.5	0.1

 - Exceeds Alberta Environment risk management guidelines for petroleum storage tank sites

The water quality of the sample taken from MW-16 is within Alberta Environment Guidelines.

The complete groundwater analytical results from Norwest labs are included in Appendix B.

Table 4 contains historical groundwater quality data from recent sampling events.

Table 4: Historical Groundwater Quality Data

SAMPLE I.D. & DATE SAMPLED	Benzene (mg/L)	Toluene (mg/L)	Ethylbenzene (mg/L)	Xylenes (mg/L)	F1 (C6-C10) (mg/L)	F2 (C10-C16) (mg/L)
Commercial Guidelines	16	342	NG	NG	24	18
Jan. 6/03						
MW-11	<0.001	<0.001	<0.001	<0.001	<0.01	<0.1
MW-12	<0.001	0.002	0.001	0.008	0.06	0.1
Mar. 13/08						
MW-1	0.002	<0.001	<0.001	0.098	0.5	0.1
MW-3	Free product in sample (see Appendix B for complete analytical results)					
MW-4	0.04	0.027	0.048	0.258	2.6	32.3
MW-5	1.07	0.015	0.041	0.601	11.6	14.5
MW-9	<0.001	<0.001	<0.001	<0.001	<0.2	0.1
MW-10	0.010	0.013	0.004	0.019	<0.2	0.1
Jan. 20/09						
MW-13	3.42	0.215	0.164	2.05	16.8	340
MW-14	<0.001	<0.001	<0.001	0.021	<0.2	0.2
MW-15	<0.001	<0.001	<0.001	0.002	<0.2	<0.1

 - Exceeds Alberta Environment risk management guidelines for petroleum storage tank sites

Free product was present in MW-3 when it was sampled on Mar. 13, 2008; therefore a hydrocarbon chromatogram analysis was conducted. The results of the analysis showed hydrocarbons in groundwater samples from MW-3 in the (c8 to c24 range), indicating the possible presence of diesel (see Appendix B for complete analytical results). As can be seen from Table 4, concentrations of fraction F2 (c10 to c16) in the groundwater samples obtained from MW-4 and MW-13 were both above allowable limits.

5.0 CONCLUSION

One new groundwater well was installed on the south side of Main Street, south of the subject property, and east of groundwater monitoring wells MW-14 and MW-15 on June 12, 2009. A Soil sample was obtained during the installation of the new well and

submitted for analysis. The results of the soil sampling and analysis indicate that the new well, MW-16, meets Alberta Environments guidelines for fine grained soil.

Groundwater gauging and sampling of MW-16, occurred on June 30, 2009. The well was gauged to determine groundwater depth. One Groundwater sample was submitted for analysis. The results of the groundwater analysis show that the groundwater sample meets Alberta Environment guidelines.

Previous sampling events showed free product was present in Monitoring well MW-3 which is located a few meters west of MW-13. Groundwater samples from MW-14, MW-15, and MW-16, located offsite to the south of Main Street show no impact from the free product present in MW-3. In addition, samples from MW-4 and MW-13 showed concentration of F2 that exceeded AENV criteria. Groundwater analytical results from MW-11, taken in 2003, were within AENV criteria.

6.0 RECOMMENDATIONS

It is proposed that all groundwater wells at the site be gauged, sampled, and analyzed for BTEX & F1 & F2. In addition Hasegawa Engineering proposes that each well be analyzed for parameters that determine the potential for natural attenuation of any remaining contaminants. For a proposed sampling & analysis schedule, refer to Table 5.

Table 5

Well	BTEX	F1	F2	OXYGEN	NITRATE	SULFATE	IRON	REDOX POTENTIAL	METHANE
1	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓	✓	✓	✓	✓
13	✓	✓	✓	✓	✓	✓	✓	✓	✓
14	✓	✓	✓	✓	✓	✓	✓	✓	✓
15	✓	✓	✓	✓	✓	✓	✓	✓	✓
16	✓	✓	✓	✓	✓	✓	✓	✓	✓

The results of this analysis will then be reviewed to determine:

- 1) The potential for natural Attenuation as a renewal option at this site.
- 2) Any other delineation activities.

Once all pertinent data is obtained a survey report will be provided that will also include further recommendations.

Appendix A

Maps and Figures

Appendix B

Analytical Reports

Soil Analytical Results

Bodycote TESTING GROUP

Analytical Report

Page 1 of 3

Bill To: Hasegawa Engineering
Report To: Hasegawa Engineering
1220 - 31 Street North
Lethbridge, AB, Canada
T1H 5J8
Attn: Mike Oler
Sampled By:
Company:

Project: 07186
ID: Barons Former Gas Station
Name: Barons Former Gas Station
Location:
LSD:
P.O.:
Acct code:

Lot ID: 687412
Control Number:
Date Received: Jun 15, 2009
Date Reported: Jun 19, 2009
Report Number: 1227755

Reference Number 687412-1
Sample Date
Sample Time
Sample Location
Sample Description Barons Former Gas
Station
Soil
Matrix

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Soil					
Extraction Date		16-Jun-09			
Benzene	Dry Weight	mg/kg	0.013		0.004
Toluene	Dry Weight	mg/kg	<0.005		0.005
Ethylbenzene	Dry Weight	mg/kg	0.076		0.010
Total Xylenes (m,p,o)	Dry Weight	mg/kg	0.78		0.010
Volatile Petroleum Hydrocarbons - Soil					
Extraction Date		16-Jun-09			
F1 C6-C10	Dry Weight	mg/kg	14		4
F1 -BTEX	Dry Weight	mg/kg	13		4
Extractable Petroleum Hydrocarbons - Soil					
Extraction Date		16-Jun-09			
F2c C10-C16	Dry Weight	mg/kg	<10		10
F3c C16-C34	Dry Weight	mg/kg	<30		30
F4c C34-C50	Dry Weight	mg/kg	<20		20
F4HTGCC C34-C50+	Dry Weight	mg/kg	<20		20
% C50+	%		<5		
Silica Gel Cleanup					
Silica Gel Cleanup			Done		
Soil % Moisture					
Moisture	Soil % Moisture	%	12.10		

Approved by:

Michael Yohemas, BSc
Laboratory Operations Manager

Groundwater Analytical Results



Analytical Report

Bill To: Hasegawa Engineering
Report To: Hasegawa Engineering
1220 - 31 Street North
Lethbridge, AB, Canada
T1H 5J8
Attn: Mike Oler
Sampled By: Mike Oler
Company: Hasegawa

Project:
ID: Barons MW 16
Name: Barons Gas Station
Location:
LSD:
P.O.:
Acct code:

Lot ID: **690339**
Control Number: A126337
Date Received: Jul 2, 2009
Date Reported: Jul 8, 2009
Report Number: 1231911

Reference Number 690339-1
Sample Date Jun 30, 2009
Sample Time NA
Sample Location
Sample Description Barons MW 16
Matrix Water

Analyte	Units	Results	Results	Results	Nominal Detection Limit
Mono-Aromatic Hydrocarbons - Water					
Benzene	mg/L	0.002			0.001
Toluene	mg/L	<0.001			0.001
Ethylbenzene	mg/L	<0.001			0.001
Total Xylenes (m,p,o)	mg/L	0.098			0.001
Volatile Petroleum Hydrocarbons - Water					
F1 -BTEX	mg/L	0.4			0.2
F1 C6-C10	mg/L	0.5			0.2
Extractable Petroleum Hydrocarbons - Water					
F2 C10-C16	mg/L	0.1			0.1
F3 C16-C34	mg/L	<0.1			0.1
F3+ C34+	mg/L	<0.1			0.1

Approved by:

Michael Yohemas, BSc
Laboratory Operations Manager



Methodology and Notes

Bill To: Hasegawa Engineering
Report To: Hasegawa Engineering
1220 - 31 Street North
Lethbridge, AB, Canada
T1H 5J8
Attn: Mike Oler
Sampled By: Mike Oler
Company: Hasegawa

Project:
ID: Barons MW 16
Name: Barons Gas Station
Location:
LSD:
P.O.:
Acct code:

Lot ID: **690339**
Control Number: A126337
Date Received: Jul 2, 2009
Date Reported: Jul 8, 2009
Report Number: 1231911

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
BTEX-CCME - Water	US EPA	* US EPA method, 8260B/5030B	06-Jul-09	BTG Calgary
TEH-CCME - Water	MMCA	* Petroleum Hydrocarbons in water, A108.0	03-Jul-09	BTG Calgary

* Bodycote method(s) based on reference method

References

Alta. Env. Alberta Environment Method
US EPA US Environmental Protection Agency Test Methods

Comments:

- Sample description taken from container MW16

Please direct any inquiries regarding this report to our Client Services group.

Results relate only to samples as submitted.

The test report shall not be reproduced except in full, without the written approval of the laboratory.



Hydrocarbon Chromatogram

Bill To: Hasegawa Engineering
Report To: Hasegawa Engineering

1220 - 31 Street North
Lethbridge, AB, Canada
T1H 5J8

Attn: Mike Oler

Sampled by:

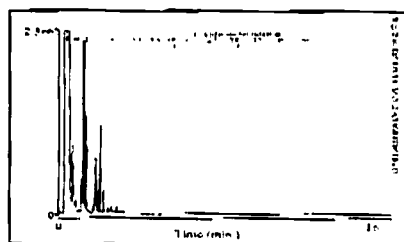
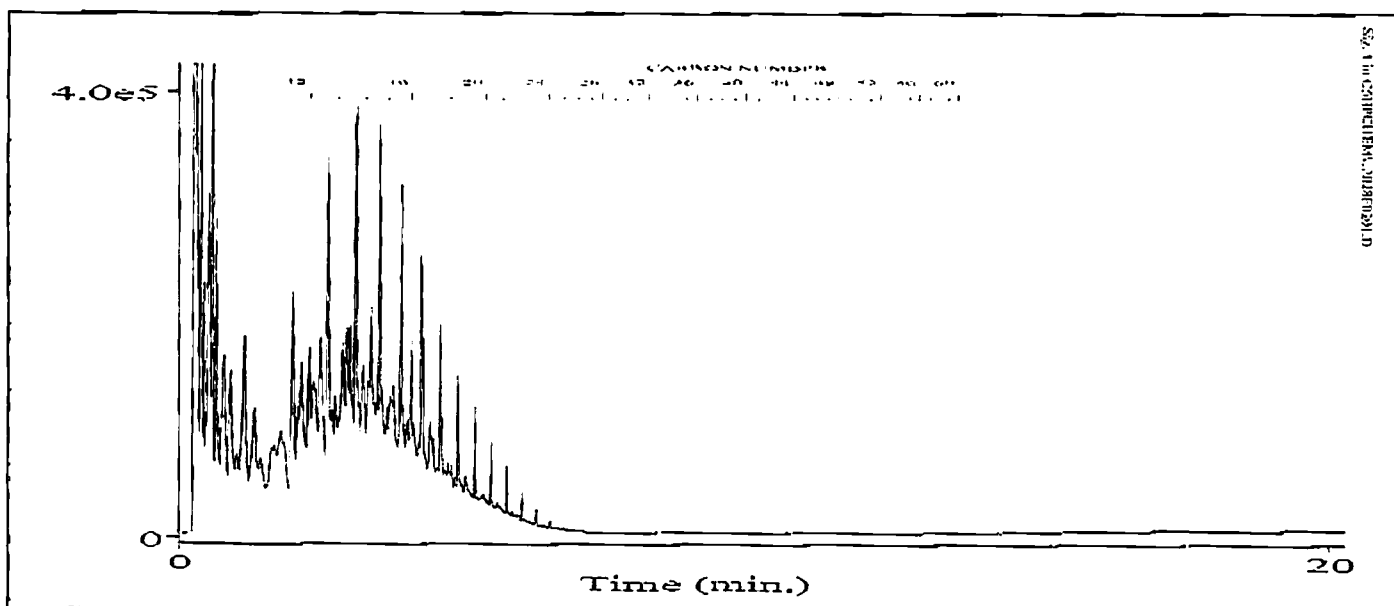
Company:

Project ID:
Name: Barons
Location:
LSD:
P.O.:

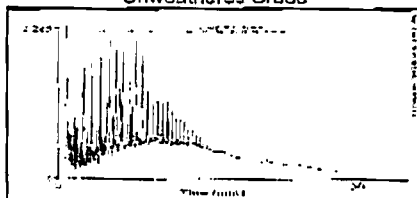
Lot ID: 607183
Control Number: A034507
Data Received: Mar 13, 2008
Date Reported:
Report Number:

NWL Number: 607183-2
Sample Date:

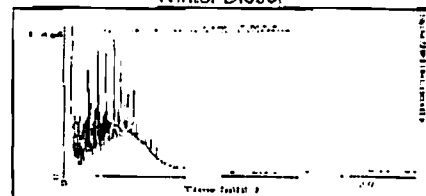
Sample Description: MW3



TYPICAL PRODUCT CHROMATOGRAMS
Unweathered Crude



Winter Diesel



Product Carbon Number Ranges

Hydrocarbon Assessment

Gasoline C4-C12
Varsol C8-C12

Kerosene C7-C16
Diesel C8-C22

Lubricating Oils C20-C40
Crude Oils C3-C60+

The chromatogram contains hydrocarbons in c8 to c24 range indicating the possible presence of diesel.