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p. 867.668.3068 f. 867.668.4349

TECHNICAL MEMO

ISSUED FOR USE

TO:	Jack Bowers, Rick Kent, Government of Yukon	**DATE:**	January 18, 2013
C:	Carol Campbell, Claire Bayless, OPUS	**MEMO NO.:**	1
FROM:	Stephan Klump, Ryan Martin	**EBA FILE:**	W23103074-01

SUBJECT: Well No. 5 Gas Sampling and Analysis, Haines Junction, Yukon

1.0 INTRODUCTION

EBA Engineering Consultants Ltd., operating as EBA, A Tetra Tech Company (EBA), was retained by Government of Yukon, Community Services to conduct gas sampling and analysis at Well No. 5 in the Village of Haines Junction, Yukon (VHJ). The proposed scope of services was based on the terms of reference requested by OPUS DaytonKnight Consultants Ltd. and EBA's email proposal dated November 30, 2012. The work was authorized through Government of Yukon Contract No. C00016269 dated December 3, 2012.

2.0 BACKGROUND

On November 24, 2012, according to anecdotal information provided by Mr. Tom Buzzell of Public Works, Village of Haines Junction, a slug of gas had passed through Well No. 5 and into the piping. The gas had caused issues with the well pump and apparently erroneous readings from the pressure transducer which is used to monitor the well water level and which also triggers the low water level alarm that shuts off the well pump to prevent the pump from running dry and being damaged. The gas was eventually vented from the piping through the emergency shower in the pump house.

Well #5 is an artesian well that was drilled in the fall of 2002 and was brought online as a VHJ community potable water supply well in 2003. This overburden well is approximately 370 m deep with a screen interval from 361.9 to 369.2 m depth below grade (bg). The well produces water at a temperature of about 17°C.

Before installation of a well pump, Well No. 5 produced water under its natural artesian pressure. According to a recent shut-in test conducted by EBA in August 2011 (EBA, 2012), the static artesian pressure at the wellhead is about 78 psi which corresponds to a static hydraulic head of about 55 m above the wellhead. The operational artesian pressure at the wellhead used to be at 53 psi (during artesian flow) which corresponds to an operational hydraulic head of about 37 m above the wellhead.

Following repair of the well casing in August 2011 with a bridging casing at a depth of about 140 m, a well pump was installed in Well No. 5 in August 2012. The pump was installed at a depth of 81 m below the wellhead to maximize the available drawdown but avoid potential contact with the bridging casing. The typical operational water level during pumping is at about 60 m below the wellhead (21 m above the pump).

3.0 SCOPE OF SERVICES

As per EBA's proposal dated November 30, 2012, the scope of services for this project included:

- Development of a gas sampling method for Well No. 5;
- Site visit to conduct field screening of air quality in the well shed using a 4-way meter to test for dangerous concentrations (elevated or depleted) of methane (CH_4), carbon monoxide (CO), oxygen (O_2), and hydrogen sulfide (H_2S);
- Collection of gas samples from the wellhead during recovery and the well water using a gas trap;
- Gas analysis by an accredited laboratory to determine the composition of the gas;
- Email update to the client with field observations upon completion of the fieldwork;
- Interpretation of the analytical results; and,
- Preparation of this technical memo.

4.0 METHODS

4.1 Air Quality Field Test

EBA conducted an ambient air quality field screening using a 4-way meter before entering the well shed to verify safe conditions. The 4-way meter did not indicate any hazard due to elevated CO, CH_4, or H_2S, or depleted O_2 concentrations.

4.2 Gas Sampling

During the site visit and upon completion of the air quality test in the well shed to determine safe conditions, EBA collected two gas samples. The first sample was collected from the wellhead during recovery of the well water level. The second sample was collected directly from the well water using a gas trap. The following sections describe the methods used to collect the gas samples.

The gas samples were collected in Tedlar® bags as described below. The bags were provided by Exova in Edmonton, Alberta and were evacuated by the lab to avoid contamination of the sample.

The gas samples were sent to Exova in Edmonton, Alberta for gas chromatography analysis.

4.2.1 Wellhead Gas Sample

During pump operation, the well casing above the water level is filled with gas which is likely a mixture of air, which is drawn into the well casing during drawdown of the water level, and gas that exsolved from the groundwater.

The gas sample was collected by connecting a gas sample bag to the vent valve at the wellhead. Upon shut-off of the pump the water level recovered and displaced the gas that had accumulated in the well casing. The gas was pushed up through the vent valve and collected in the gas sample bag. Two samples were collected from the wellhead vent valve.

4.2.2 Well Water Gas Sample

Dissolved gases from the well water were sampled using a gas trap. The groundwater was passed through the gas trap where some of the dissolved gases exsolved from the water and accumulated. As soon as a sufficient amount of gas had accumulated the gas sample was transferred from the gas trap into the sample bag. Figure 1 shows a schematic of the gas trap used to collect a gas sample from the groundwater in Well No. 5. One gas sample was collected from the gas trap.

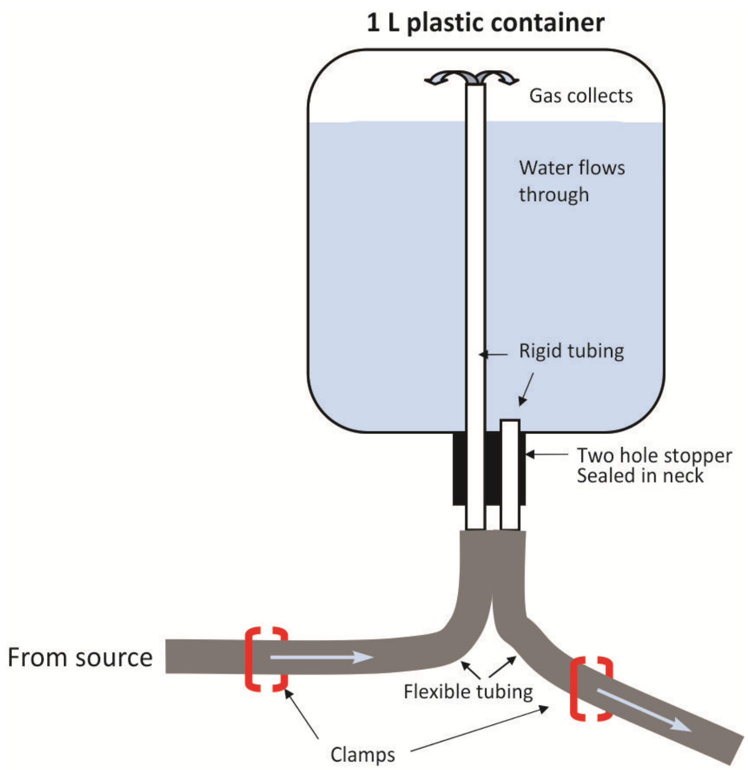

Figure 1: Schematic of the gas trap used to collect a gas sample from the groundwater in Well No. 5. To start, the jug is filled with water without any headspace. The water is then passing through the jug and gas is allowed to accumulate. When enough gas is collected the jug is placed in an upright position and the gas is transferred into a sample bag.

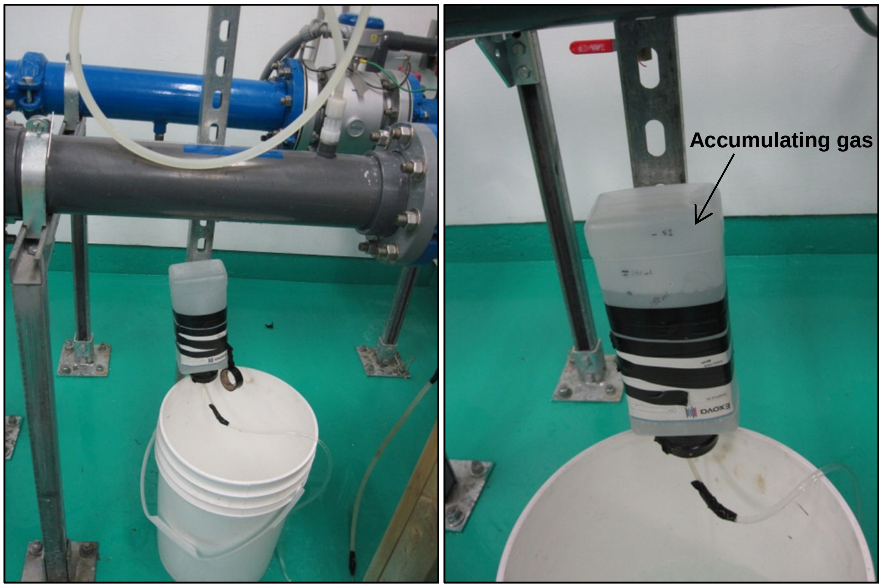

Figure 2: Photographs of the gas trap used to collect a gas sample from degassing well water. (December 5, 2012)

5.0 RESULTS AND DISCUSSION

5.1 Gas Analytical Results

Table 1 presents the laboratory analytical results for the gas samples collected from the wellhead vent valve and the gas trap.

Both samples from the wellhead showed a consistent composition that is very similar to that of atmospheric air. The samples likely consisted predominantly of air that was sucked into the well casing when the water level dropped during pumping. Gas that originated from degassing of the well water seemed to only constitute a very small portion of the gas volume in the well casing.

The composition of the sample collected from the gas trap was significantly different from the wellhead samples. The gas trap sample consisted to about 97% of nitrogen with minor percentages of oxygen and carbon monoxide.

EBA believes that the gas trap sample was more representative (even though not fully reflecting the *in situ* gas dissolved composition) of the dissolved gases in the groundwater produced from Well No. 5 whereas the wellhead samples contained ambient air that was drawn into the well casing during pump operation.

Importantly, hydrocarbons and hydrogen sulfide (H_2S) were below the detection limit of the analytical method.

Table 1: Gas Chromatography Results

Analyte	Sample	Wellhead	Wellhead	Gas Trap
	Date	Dec 6, 2012	Dec 6, 2012	Dec 5, 2012
	Lot ID	910223	910223	910223
	Detection Limit			
Nitrogen	0.01	78.13	78.13	97.16
Hydrogen	0.01	<0.01	<0.01	<0.01
Helium	0.01	<0.01	<0.01	<0.01
Oxygen	0.01	21.82	21.81	2.81
Carbon Dioxide	0.01	0.05	0.05	0.03
Methane	0.01	<0.01	<0.01	<0.01
Decanes+	0.01	<0.01	<0.01	<0.01
Ethane	0.01	<0.01	<0.01	<0.01
Propane	0.01	<0.01	<0.01	<0.01
C6	0.01	<0.01	<0.01	<0.01
C7	0.01	<0.01	<0.01	<0.01
C8	0.01	<0.01	<0.01	<0.01
Octane	0.01	<0.01	<0.01	<0.01
iso-Butane	0.01	<0.01	<0.01	<0.01
Isopentane	0.01	<0.01	<0.01	<0.01
Butane	0.01	<0.01	<0.01	<0.01
Pentane	0.01	<0.01	<0.01	<0.01
Hydrogen Sulfide	1.25 ppm	<1.25 ppm	<1.25 ppm	<1.25 ppm

All gas concentrations in **Mole %** unless otherwise stated.

5.2 Health and Safety Considerations

The samples collected from the wellhead vent valve during recovery of the water level indicate that the gas at the time of sample collection had a very similar composition of atmospheric air. These samples are likely representative of the gas that is routinely vented from the wellhead during well recovery. Since the composition is very similar to air, and hydrocarbons and hydrogen sulfide were below detection limit, EBA does not believe that there is any health and safety concern related to gas venting from the wellhead during normal operation of the well. However, under certain circumstances it may be possible for a larger volume of gas from the groundwater produced at Well No. 5 to vent from the wellhead which could possibly present health and safety concerns as discussed below.

If a large volume of the gas from the aquifer or well water were to be captured in a confined space, this could create a dangerous atmosphere to support respiration based on the low concentrations of oxygen. OSHA regulations indicate that oxygen levels below 19.5% are oxygen-deficient and immediately dangerous to life. EBA is not familiar with the ventilation or mechanics of the systems at the Well #5 wellhead, but this could potentially propose a concern in the water reservoir or in the event of a future degassing event if this gas were to end up in an area with insufficient ventilation. This should be considered by a person qualified in confined spaces and ventilation.

We understand that there may also be other operational health and safety concerns associated with gas production within the piping system; and these risks and mitigations should be considered by a mechanical or process engineer.

5.3 Dissolved Gas Composition and Conceptual Degassing Model

The observed gas composition of the gas trap sample probably represents O_2-depleted air which degasses from the groundwater. The observed gas composition is however not fully representative of the *in situ* dissolved gas composition because the water sample was not degassed quantitatively which leads to a fractionation of the gas phase based on the variable solubilities of the different gas components. That is, less soluble gases will be enriched in the gas phase whereas more soluble gases will tend to stay in solution.

Biological activity in the subsurface (e.g., decomposition of organic material) generally consumes O_2 and produces CO_2 and N_2. Under aerobic conditions, O_2 consumption is compensated for by approximately equimolar production of CO_2 and does not change the partial pressure of the other gases. However, CO_2 concentrations may be lower than expected because of its higher solubility in water and possible chemical reactions with minerals (especially carbonates). The process of denitrification, which describes the chemical or biochemical reduction of nitrate (NO_3^-) and nitrite (NO_2^-) into gaseous nitrogen oxides (NO_x) and molecular nitrogen (N_2), may also contribute to the amount of nitrogen observed in the gas samples.

The small amounts of oxygen in the samples may indicate minor contamination of the sample with air that occurred during sampling or sample storage prior to analysis. However, because the oxygen fraction in the sample is very small compared to atmospheric air (<2.8% in the sample vs. 20.1% in air) EBA concludes that the samples are representative for the gas released from the groundwater in Well No. 5 and that contamination with air is negligible (less than approximately 5%).

The following conceptual model may explain the observed gas composition. Atmospheric gases dissolve in the groundwater during recharge depending on the local temperature and atmospheric pressure conditions. The temperature during gas exchange is controlled by the shallow soil temperature in the recharge area, which usually corresponds to the shallow groundwater temperature. Although the recharge area of the groundwater produced from Well No. 5 is unknown, the recharge temperature is likely <5°C. The local pressure conditions during infiltration of the groundwater depend on the elevation of the recharge area. The groundwater moves through the subsurface and reaches significant depths where the water is heated geothermally to the observed *in situ* temperature of about 17°C. In addition to the gas dissolved in the groundwater during recharge as a result of gas exchange with the atmosphere and soil gas, gas may be produced and accumulated in the water by (bio)chemical processes such as those described above.

Two factors may cause the groundwater in Well No. 5 to degas: (i) the gas solubility in water is pressure dependent; pumping and lowering of the hydraulic head in the vicinity of the well significantly decreases the *in situ* hydrostatic pressure which lowers the solubility of the gas in water, and (ii) the gas solubility is also temperature-dependent and decreases with increasing temperature. The temperature during gas exchange with the atmosphere in the recharge area (supposedly less than 5°C) is considerably lower than the temperature of the groundwater produced from Well No. 5 (approximately 17°C).

Figure 3 shows the temperature and pressure dependence of the solubility of N-$_2$ in water. All solubilities are normalized to the solubility of N_2 at a water temperature of 17°C and the *in situ* pore pressure. The graph shows that the solubility decreases by about 5% when the well is flowing at an artesian pressure of 53 psi at the well head which corresponds to the normal operating conditions before the submersible pump was installed and put into operation in August 2012. During operation of the pump the pressure reduction causes the solubility of N_2 to decrease by about 25%. At atmospheric pressure, the solubility of N_2 decreases to less than 5% of the solubility at *in situ* pore pressure within the aquifer.

Even though pumping causes a significant reduction of the *in situ* pore pressure in the vicinity of the well, the greatest pressure reduction and associated decrease in gas solubility occurs at surface when the ambient pressure drops to atmospheric. Therefore, the main gas loss from the groundwater would be expected in the water reservoir.

However, depending on the amount of dissolved gases, some degassing may occur within the aquifer in the vicinity of the well screen as a result of the pore pressure reduction during pump operation. Before pumping from the well commenced in August 2012, groundwater production from the well only caused a decrease in the gas solubility by about 5% whereas pumping causes a decrease of about 25%. This difference in solubility may be sufficient to result in partial *in situ* degassing of the water and formation of a free gas phase in the vicinity of the well screen. The gas bubbles may migrate slowly and form larger gas volumes that may suddenly enter the well as may have been observed on November 24, 2012.

It should be noted that there is currently not enough data available to verify the above conceptual degassing model. Additional data on the *in situ* composition and amount of dissolved gases would be required for further assessment.

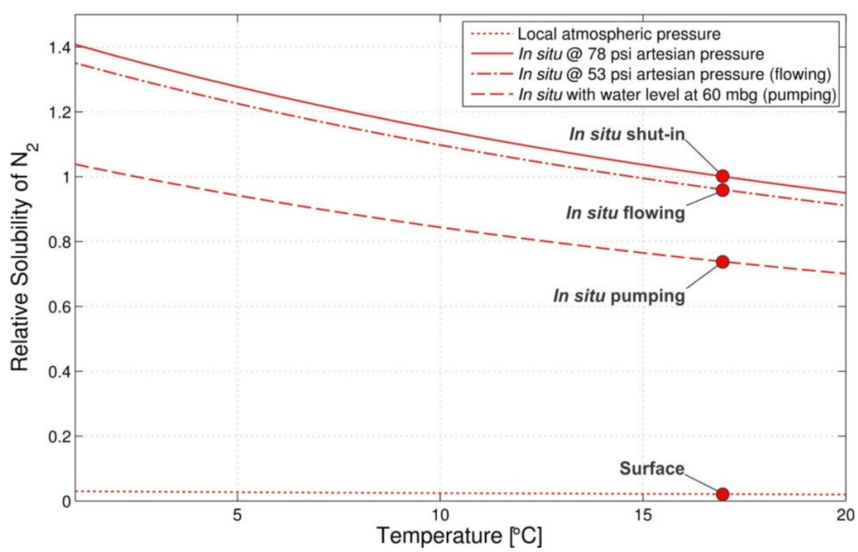

Figure 3: Relative solubility of N_2 for different water temperatures and ambient pressures. All solubilities are normalized to the solubility of N_2 at a water temperature of 17°C and the *in situ* pore pressure in the aquifer that Well No. 5 produces water from.

6.0 CONCLUSIONS

Based on the information provided above, EBA draws the following conclusions with respect to the potential gas production from Well No. 5:

- Field ambient air quality screening conducted by EBA on December 5, 2012 before entering the pump house did not indicate any hazard due to elevated CO, CH_4, or H_2S, or depleted O_2 concentrations;
- The analytical results indicate that the samples from the wellhead vent valve had a composition very similar to air whereas the sample recovered from the well water consisted almost entirely of N_2 with minor fractions of O_2 and CO_2;
- Hydrocarbon and H_2S concentrations were below the laboratory detection limit in all samples;
- Degassing of the groundwater and accumulation of a free gas phase may occur within the aquifer close to the well screen due to *in situ* pore pressure reduction as a result of pumping; however, this conceptual model is speculative and further assessment would require additional data on *in situ* dissolved gas amount and composition;
- If a large volume of the gas from the aquifer or well water were to be captured in a confined space, this could create a dangerous atmosphere to support respiration based on the low concentrations of oxygen. OSHA regulations indicate that oxygen levels below 19.5% are oxygen-deficient and immediately dangerous to life. EBA is not familiar with the ventilation or mechanics of the systems, but this could potentially propose a concern in the water reservoir or in the event of a future degassing event if this gas were to end up in an area with insufficient ventilation; and,
- There may be other risks associated with gas formation within the piping system.

7.0 RECOMMENDATIONS

Based on the information and conclusions presented in this memo, EBA makes the following recommendations:

- Water system operators and other people accessing the pump house and water reservoir should be aware of the possibility of gas production from the well and potential hazards associated with the release of gas from the well, and should be qualified in confined spaces and ventilation;
- If a similar situation as on November 24, 2012 occurs again with a slug of gas passing through the well and piping, another gas sample should be collected during venting of the pipes to confirm the composition of the gas. Health and safety considerations should be re-visited based on the analytical results of this gas sample;
- If gas production from the well is confirmed through the re-occurrence of similar events as on November 24, 2012, possible adjustments to the mechanical system should be considered in consultation with a qualified consultant. As a general guideline, we recommend that pumping water levels be managed with as few large fluctuations as possible, to minimize pressure variations which might induce gas releases from groundwater near the well screen and in the well.

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REFERENCES

EBA (2012). Hydrogeological Investigation and Well Repair – Well #5 and Well #3, Haines Junction, YT. Project report no. W23101375 prepared for OPUS DaytonKnight Consultants Ltd. [January, 2012]

Attachments:

- EBA General Conditions – Geo-environmental Report
- Laboratory report

GENERAL CONDITIONS

GEO-ENVIRONMENTAL REPORT

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Report Transmission Cover Page

Bill To:	EBA Engineering Consultants	Project:		Lot ID:	**910223**
Report To:	EBA Engineering Consultants	ID:	W23103074	Control Number:	
	Unit 6, 151 Industrial Road	Name:	Haines Junction Well No#05	Date Received:	Dec 10, 2012
	Whitehorse, YT, Canada	Location:	Haines Junction Yukon	Date Reported:	Dec 17, 2012
	Y1A 2V3	LSD:		Report Number:	1793450
Attn:	Ryan Martin	P.O.:			
Sampled By:	S. Sternbergh	Acct code:			
Company:	EBA Engineering				

Contact & Affiliation	Address	Delivery Commitments
Ryan Martin EBA Engineering Consultants Ltd -	Unit 6, 151 Industrial Road Whitehorse, Yukon Territory Y1A 2V3 Phone: (867) 668-3068 Fax: (867) 668-4349 Email: rmartin@eba.ca	On [Lot Verification] send (COA) by Email - Single Report On [Report Approval] send (Test Report, COC) by Email - Merge Reports On [Report Approval] send (Test Report) by Email - Single Report On [Report Approval] send (Test Report) by Email - Single Report On [Report Approval] send (Test Report, COC) by Email - Merge Reports On [Report Approval] send (Test Report) by Email - Single Report On [Report Approval] send (Test Report) by Email - Single Report On [Report Approval] send (Test Report, COC) by Email - Merge Reports On [Report Approval] send (Test Report) by Email - Single Report On [Report Approval] send (Test Report) by Email - Single Report
Stephan Klump EBA Engineering Consultants Ltd -	Unit 6, 151 Industrial Road, Calcite Business Centre Whitehorse, Yukon Territory Y1A 2V3 Phone: (867) 668-2071 Fax: (867) 668-4349 Email: sklump@eba.ca	On [Report Approval] send (Test Report) by Email - Single Report
Sarah Sternbergh EBA Engineering Consultants Ltd -	Unit 6, 151 Industrial Road, Calcite Business Centre Whitehorse, Yukon Territory Y1A 2V3 Phone: (867) 668-3068 Fax: (867) 668-4349 Email: ssternbergh@eba.ca	On [Report Approval] send (Test Report) by Email - Single Report

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	Y1A 2V3	LSD:		Report Number:	1793450
Attn:	Ryan Martin	P.O.:			
Sampled By:	S. Sternbergh	Acct code:			
Company:	EBA Engineering				

Contact & Affiliation	Address	Delivery Commitments
Ingrid Fuller EBA Engineering Consultants Ltd -	Unit 6, 151 Industrial Road, Calcite Business Centre Whitehorse, Yukon Territory Y1A 2V3 Phone: (867) 668-2071 Fax: (867) 668-4349 Email: ifuller@eba.ca	On [Lot Approval and Final Test Report Approval] send (Invoice) by Email - Single Report On [Lot Approval and Final Test Report Approval] send (Invoice) by Email - Single Report On [Lot Approval and Final Test Report Approval] send (Invoice) by Email - Single Report

Notes To Clients:

- Report was issued to include addition of hydrogen sulfide by length of stain tube analysis to all samples as requested by Sarah Sternbergh of EBA Engineering on December 14, 2012. Report 1793450 is an addendum to report 1793293.
- Sample 910223-2; 4265570 The sample bag contained water.

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Sample Custody

Bill To:	EBA Engineering Consultants	Project:		Lot ID:	**910223**
Report To:	EBA Engineering Consultants	ID:	W23103074	Control Number:	
	Unit 6, 151 Industrial Road	Name:	Haines Junction Well No#05	Date Received:	Dec 10, 2012
	Whitehorse, YT, Canada	Location:	Haines Junction Yukon	Date Reported:	Dec 17, 2012
	Y1A 2V3	LSD:		Report Number:	1793450
Attn:	Ryan Martin	P.O.:			
Sampled By:	S. Sternbergh	Acct code:			
Company:	EBA Engineering				

Sample Disposal Date: March 14, 2013

All samples will be stored until this date unless other instructions are received. Please indicate other requirements below and return this form to the address or fax number on the top of this page.

☐ Extend Sample Storage Until ______________________ (MM/DD/YY)

The following charges apply to extended sample storage:

Storage for an additional 30 days	$ 2.50 per sample
Storage for an additional 60 days	$ 5.00 per sample
Storage for an additional 90 days	$ 7.50 per sample

☐ Return Sample, collect, to the address below via:

- ☐ Greyhound
- ☐ DHL
- ☐ Purolator
- ☐ Other (specify) ______________________

Name ______________________
Company ______________________
Address ______________________
____
Phone ______________________
Fax ______________________

Signature ______________________

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Analytical Report

Bill To:	EBA Engineering Consultants	Project:		Lot ID:	**910223**
Report To:	EBA Engineering Consultants	ID:	W23103074	Control Number:	
	Unit 6, 151 Industrial Road	Name:	Haines Junction Well No#05	Date Received:	Dec 10, 2012
	Whitehorse, YT, Canada	Location:	Haines Junction Yukon	Date Reported:	Dec 17, 2012
	Y1A 2V3	LSD:		Report Number:	1793450
Attn:	Ryan Martin	P.O.:			
Sampled By:	S. Sternbergh	Acct code:			
Company:	EBA Engineering				

		Reference Number	910223-1	910223-2	910223-3	
		Sample Date	Dec 05, 2012	Dec 06, 2012	Dec 06, 2012	
		Sample Time	18:00	07:35	07:35	
		Sample Location				
		Sample Description	Raw Water Sample / HJ Well No- 5	Wellhead Pressure Vent	Wellhead During Recovery	
		Matrix	Gases	Gases	Gases	
Analyte		**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Gas Analysis - Not Air Corrected						
Helium	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Hydrogen	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Carbon Dioxide	Not air corrected	Mole %	0.05	0.03	0.05	0.01
Oxygen	Not air corrected	Mole %	21.82	2.81	21.81	0.01
Nitrogen	Not air corrected	Mole %	78.13	97.16	78.13	0.01
Methane	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Ethane	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Propane	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
iso-Butane	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
n-Butane	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
iso-Pentane	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
n-Pentane	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Hexanes	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Heptanes	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Octanes	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Nonanes	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Decanes +	Not air corrected	Mole %	<0.01	<0.01	<0.01	0.01
Relative Density at 15 °C	Not air corrected		0.997	0.971	0.997	
Gas Analysis						
Hydrogen Sulfide	Length of stain tube	ppm	<1.25	<1.25	<1.25	1.25

Approved by:

Robert Lessard, BSc
Consulting Scientist - Reservoir Fluids

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Methodology and Notes

Bill To:	EBA Engineering Consultants	Project:		Lot ID:	**910223**
Report To:	EBA Engineering Consultants	ID:	W23103074	Control Number:	
	Unit 6, 151 Industrial Road	Name:	Haines Junction Well No#05	Date Received:	Dec 10, 2012
	Whitehorse, YT, Canada	Location:	Haines Junction Yukon	Date Reported:	Dec 17, 2012
	Y1A 2V3	LSD:		Report Number:	1793450
Attn:	Ryan Martin	P.O.:			
Sampled By:	S. Sternbergh	Acct code:			
Company:	EBA Engineering				

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Hydrogen Sulfide by Length of Stain Detection Tube	GPA	Test for Hydrogen Sulfide and Carbon Dioxide in Natural Gas Using Length of Stain Tube, 2377-86	17-Dec-12	Exova Edmonton
Natural Gas - C7/10 Composition	GPA	* Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography, 2261-00	11-Dec-12	Exova Edmonton

** Reference Method Modified*

References

GPA	Gas Processors Association

Comments:

- Report was issued to include addition of hydrogen sulfide by length of stain tube analysis to all samples as requested by Sarah Sternbergh of EBA Engineering on December 14, 2012. Report 1793450 is an addendum to report 1793293.
- Sample 910223-2; 4265570 The sample bag contained water.