March 10, 2017

BY RESS & COURIER

Ms. Kirsten Walli
Board Secretary
Ontario Energy Board
Suite 2700, 2300 Yonge Street
Toronto, Ontario
M4P 1E4

Dear Ms. Walli:

Re: Union Gas Limited ("Union")
2017 Storage Enhancement Project
Board File #EB-2016-0322

As request by Board Staff at page 8 of their submissions dated February 21, 2017 for the 2017 Storage Enhancement Project, please find attached a copy of a letter that Stantec Consulting send to Mr. and Mrs. Smit regarding the water well monitoring program that has now been completed on their property.

The water well monitoring program determined that the Ontario Drinking Water standards were not exceeded for any health related parameters. The testing also determined that the methane was from a naturally occurring biogenic source not a thermogenic source. Stantec also provided Mr. and Mrs. Smit with some recommendations in regard to venting their water well.

If you have any questions nor required additional information please contact

Sincerely,

W.T. (Bill) Wachsmuth, RPF
Senior Administrator, Regulatory Projects
:sb

cc: Nancy Marconi, OEB
Zora Crnojacki, OEB
Andrew Mandyam, Enbridge
Tania Persad, Enbridge
Erin Henderson, Hydro One
Demetrius Kappos, MNRF

Stantec Consulting Ltd.
100-300 Hagey Boulevard, Waterloo ON N2L 0A4

March 8, 2017
File: 1609-00864

Attention: Mr. and Mrs. Smit

Dear Jake and Mary Smit,

Reference: Residential/Private Well Monitoring Program – Union Gas

On behalf of Union Gas Ltd., Stantec Consulting Ltd. (Stantec) is pleased to provide you with the analytical results of the water sample collected from your residential well (RW5) at 3232 Edys Mills Line on January 18, 2017. The water quality sample from your residence was collected from your kitchen tap with an additional water sample for isotopic analyses collected from your garage tap since the hose fitting required to collect the sample did not fit onto your kitchen tap. Stantec understands that both the garage tap and the kitchen tap deliver water that has not been treated. Based on the well questionnaire, Stantec also understands that the water from your well is not used for drinking water but is used for other household purposes.

Table 1 provides a summary of your current and historical water quality results for water sampled from your well. The 2017 water quality results are consistent with concentrations from your well measured in November 2007 and do not suggest changing conditions.

Table 1 provides a comparison of the data to the Ontario Drinking Water Standards (ODWS). The water quality results indicate that the ODWS Maximum Acceptable Concentration (MAC) was not exceeded for the tested health-related parameters.

Although sodium does not have a ODWS MAC, elevated sodium may be a concern for consumers on a sodium restricted diet and as such, the Medical Officer of Health (MOH) set a reporting limit of 20 mg/L. If you decide to use this water as your drinking water source, please advise your doctor of the water quality results at your next visit.

The water quality results from January 18, 2017 also indicate that chloride, iron, turbidity, total dissolved solids (TDS), hardness, and methane exceeded their respective ODWS:

- Chloride, turbidity, TDS, and iron are ODWS Aesthetic Objectives (AO) and are not considered a health-related risk under the ODWS.
- Hardness exceeded its respective ODWS Operational Guideline (OG). This parameter is not considered a health-related risk under the ODWS.
- Methane exceeded the ODWS AO and is discussed in further detail below.

Reference: Residential/Private Well Monitoring Program – Union Gas

METHANE GAS CONCENTRATION

The ODWS for methane is not a health-related parameter but is an aesthetic concern. The ODWS indicate that the aesthetic objective is based on gas bubble release and potential violent spurting from taps for methane concentrations above 3.0 L/m^3 (about 60 ppm$_v$). Methane bubbles in the sample tubing as well as spurting from the kitchen tap were observed during sample collection.

The ODWS indicate that if methane is allowed to accumulate in confined areas, the potential for explosive combustion exists. At concentrations of 50,000 ppm$_v$ to 150,000 ppm$_v$, methane can accumulate and become an explosive concern under some conditions. At levels below 50,000 ppm$_v$, which is the lower explosive limit (LEL), the concentration is too dilute for an explosion to occur.

In order to assess the methane risk, the Ministry of the Environment and Climate Change (MOECC) has developed criteria for methane vapour concentration. The MOECC (2016[1]) guideline for landfill gas considers that concentrations of methane greater than 10% of the LEL (5,000 ppm$_v$) may be considered hazardous conditions.

Table 1 shows that the aqueous methane concentrations from the sample collected from your well was 45 L/m^3, which is the same concentration measured in a sample collected at your well by Stantec on November 26, 2007. Using Henry's Law and the Ideal Gas Law, at 10°C and 100 kPa, the aqueous concentrations would be in equilibrium with a vapour concentration of 890 ppm$_v$. This calculated vapour concentration does not exceed the safety criteria level (5,000 ppm$_v$) presented by the MOECC (2016[1]) and is <2% of the LEL.

To evaluate the potential source of the methane, a sample was submitted for isotopic analyses of the carbon and hydrogen (^{2}H and ^{13}C) in the dissolved methane. The isotopic composition of methane is a diagnostic tool to aid in characterization of the origin of natural gas. Depending on the formation process of natural gas, the isotopic signature of the hydrogen and carbon in the methane will vary. Methane can be produced by:

- a low temperature, bacteria driven process (biogenic) of decomposition of organic matter (Schoell, 1980[2])
- a higher temperature, high pressure geological driven process (thermogenic).

The natural gas (methane) in Union Gas's storage pools is sourced from Alberta and Pennsylvania and is of thermogenic origin.

[1] MOECC, 2016. D-4-1 Assessing Methane Hazards from Landfill Sites.

[2] Schoell, M., 1980. Genetic Characterization of Natural Gases. American Association of Petroleum Geologists, Bulletin v 67.

Reference: Residential/Private Well Monitoring Program – Union Gas

The isotopic signature of the ^{13}C within methane generally ranges from -50‰ to -20‰ for thermogenic methane and -110‰ to -50‰ for biogenic methane (Whiticar, 1999[3]). The result from the sample collected from your well was -67.7‰, which falls within the expected range for biogenic methane.

The isotope signature of the ^{2}H within methane generally ranges from approximately -290‰ to -100‰ for thermogenic methane and -400‰ to -280‰ for biogenic methane (Whiticar, 1999[3]). The result from the sample at collected from your well was -299‰, with a lab repeat sample result of -290‰, which falls within the expected range for biogenic methane and just outside of the range for thermogenic methane.

Another useful distinction between thermogenic and biogenic methane is the proportions of other larger hydrocarbons present within the gas such as propane and ethane. The dissolved gas within the groundwater sample at your well was primarily methane with a trace of ethane. Propane was not detected above the laboratory quantification limit. This ratio of dissolved gas concentrations is also indicative of biogenic methane (Sharma, 2013[4]).

Based on the methane analysis, Stantec concludes that the methane from your groundwater sample is representative of naturally occurring biogenic methane, and not from a thermogenic source.

The water quality data presented in this letter and in the attached table are representative of water quality in your well on the day the data were collected. Water quality in your well may change over time. Stantec recommends that you follow the Public Health Ontario guidelines for sampling and caring for your well. Information regarding well water quality, maintenance and disinfection can be found at the Public Health Ontario web page (http://www.publichealthontario.ca/en/ServicesAndTools/LaboratoryServices/Pages/Water-testing.aspx), or contact the Lambton Public Health Unit at 1-519-383-8331 or Public Health Ontario at 1-877-543-8931.

As detailed in the Stantec letter dated January 26, 2017, Stantec recommends that you retain a licensed well contractor to bring your well in compliance with O.Reg.903 regarding well venting.

[3] Whiticar, M.J., 1999. Carbon and Hydrogen Isotope Systematics of Bacterial Formation and Oxidation of Methane. Chemical Geology, 161 (1999) 291 to 314.

[4] Sharma, S., Mulder, M.L., Sack, A., Schroeder, K. and Hammack, R. Isotope Approach to Assess Hydrologic Connections During Marcellus Shale Drilling. Groundwater (2013) 1 to 10.

Reference: Residential/Private Well Monitoring Program – Union Gas

We thank you for your participation in the Union Gas well monitoring program.

Regards,

STANTEC CONSULTING LTD.

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Attachment: Table 1 - Groundwater Analytical Results RW5

c. Evan Tomek, Doug Schmidt - Union Gas

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ATTACHMENT: TABLE 1 – GROUNDWATER ANALYTICAL RESULTS RW5

Table 1
Summary of Groundwater Analytical Results - RW5
Storage Pool Enhancement Project
Union Gas

Sample Location			RW5		
Sample Date			26-Nov-07	18-Jan-17	18-Jan-17
Sample ID			WG160900442200711 26-RW5	WG-160900864-20170118-JK1	WG-160900864-20170118-JK1 Lab-Dup
Sampling Company			STANTEC	STANTEC	STANTEC
Laboratory			MAXX	MAXX / ITT	MAXX
Laboratory Work Order			A7D2337	B711312 / 170019	B711312
Laboratory Sample ID			W11949	DTV059 / 42894	DTV059
Sample Type	Units	ODWS			Lab Replicate
Health Related parameters					
Antimony	mg/L	0.006[B]	<0.0005	<0.00050	-
Arsenic	mg/L	0.025[B]	<0.005	<0.0010	-
Barium	mg/L	1[C]	0.66	0.69	-
Boron	mg/L	5[B]	2.3	2.3	-
Cadmium	mg/L	0.005[C]	<0.0001	<0.00010	-
Chromium	mg/L	0.05[C]	<0.005	<0.0050	-
Lead	mg/L	0.01$_c$[C]	<0.0005	<0.00050	-
Nitrate (as N)	mg/L	10.0$_d$[C]	<0.1	<0.10	-
Nitrite (as N)	mg/L	1.0$_d$[C]	<0.01	<0.010	-
Selenium	mg/L	0.01[C]	<0.002	<0.0020	-
Uranium	mg/L	0.02[C]	<0.0001	<0.00010	-
Microbiological Parameters					
Escherichia coli (E.Coli)	cfu/100mL	0[A]	-	0	-
Total Coliform Background	cfu/100mL	n/v	-	32	-
Total Coliforms	cfu/100mL	0[A]	-	0	-
Aesthetic Parameters					
Chloride	mg/L	250[D]	**740[D]**	**790[D]**	-
Copper	mg/L	1[D]	<0.001	0.0010	-
Dissolved Organic Carbon (DOC)	mg/L	5[D]	0.8	0.88	-
Iron	mg/L	0.3[D]	**0.49[D]**	**0.50[D]**	-
Manganese	mg/L	0.05[D]	0.02	0.028	-
Sodium	mg/L	200$_g$[D] 20$_g$[F]	**590[DF]**	**580[DF]**	-
Sulfate	mg/L	500$_h$[D]	<1	<1.0	-
Total Dissolved Solids (Calculated)	mg/L	500[D]	**1,540[D]**	**1,600[D]**	-
Zinc	mg/L	5[D]	<0.005	0.0067	-
Operational Parameters					
Alkalinity, Total (as CaCO3)	mg/L	30-500[E]	268	270	-
Aluminum	mg/L	0.1[E]	<0.005	0.0068	-
Hardness (as CaCO3)	mg/L	80-100[E]	98	**110[E]**	-
pH	S.U.	6.5-8.5[E]	8.1	8.10	-
Sulfide	mg/L	n/v	-	0.32	-
Total Suspended Solids	mg/L	n/v	-	<10	<10
Turbidity, Lab	NTU	5$_{i\ j}$[D,E]	-	**6.8[D]**	-
Methane					
Methane (Calculated)	ppmv	10,000[G]	891	891	-
Methane	L/m3	3[D]	**45[D]**	**45[D]**	-
Dissolved Gases					
Acetylene	L/m3	n/v	-	<0.002	-
Ethane	L/m3	n/v	-	0.003	-
Ethylene (Ethene)	L/m3	n/v	-	<0.002	-
Propane	L/m3	n/v	-	<0.002	-
Propene	L/m3	n/v	-	<0.002	-
Isotope Analysis					
δ13C Methane (CH4)	none	n/v	-	-67.7 / -68.2	-
δ2H Methane (CH4)	‰	n/v	-	-299 / -289	-
Other Parameters					
Alkalinity, Bicarbonate (as CaCO3)	mg/L	n/v	264	260	-
Alkalinity, Carbonate (as CaCO3)	mg/L	n/v	3	3.1	-
Ammonia (as N)	mg/L	n/v	0.50	0.51	-
Anion Sum	meq/L	n/v	26.2	27.5	-
Beryllium	mg/L	n/v	<0.0005	<0.00050	-
Calcium	mg/L	n/v	25	29	-
Cation Sum	meq/L	n/v	27.8	27.8	-
Cobalt	mg/L	n/v	<0.0005	<0.00050	-
Electrical Conductivity, Lab	µmhos/cm	n/v	2,900	3,100	-
Ion Balance	%	n/v	2.98	0.490	-
Langelier Index (at 20 C)	none	n/v	0.331	0.368	-
Langelier Index (at 4 C)	none	n/v	0.0860	0.124	-
Magnesium	mg/L	n/v	8.5	9.8	-
Molybdenum	mg/L	n/v	0.002	0.0014	-
Nickel	mg/L	n/v	<0.001	<0.0010	-
Orthophosphate(as P)	mg/L	n/v	<0.01	<0.010	-
Phosphorus	mg/L	n/v	<0.1	<0.10	-
Potassium	mg/L	n/v	3.6	3.5	-
Saturation pH (at 20 C)	none	n/v	7.78	7.73	-
Saturation pH (at 4 C)	none	n/v	8.03	7.97	-
Silicon	mg/L	n/v	4.8	4.1	-
Silver	mg/L	n/v	<0.0001	<0.00010	-
Strontium	mg/L	n/v	0.74	0.81	-
Thallium	mg/L	n/v	<0.00005	<0.000050	-
Titanium	mg/L	n/v	<0.005	<0.0050	-
Vanadium	mg/L	n/v	<0.005	<0.0010 MI	-

Notes:

ODWS	Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines (MOE, 2006, revised January 2017)
A	ODWS Table 1 - Microbiological Standards, Maximum Acceptable Concentration
B	ODWS Table 2 - Chemical Standards, Interim Maximum Acceptable Concentration
C	ODWS Table 2 - Chemical Standards, Maximum Acceptable Concentration
D	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Aesthetic Objectives
E	ODWS Table 4 - Chemical/Physical Objectives and Guidelines, Operational Guidelines
F	ODWS Table 4 - Medical Officer of Health Reporting Limit
G	The LEL for methane is 50,000 ppmv. MOE (2016) presents criteria of 10,000 ppmv
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
<0.50	Laboratory reporting limit was greater than the applicable standard.
<0.03	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
c	This standard applies to water at the point of consumption. Since lead is a component in some plumbing systems, first flush water may contain higher concentrations of lead than water that has been flushed for five minutes.
d	Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).
g[DF]	The aesthetic objective for sodium in drinking water is 200 mg/L. The local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/L so that this information may be communicated to local physicians for their use with patients on sodium restricted diets.
h	When sulfate levels exceed 500 mg/L, water may have a laxative effect on some people.
i	Applicable for all waters at the point of consumption.
j	The operational guidelines for filtration processes are provided as performance criteria in the Procedure for Disinfection of Drinking Water in Ontario.
MI	Detection limit was raised due to matrix interferences.