Keystone Environmental
Knowledge-Driven Results

January 31, 2014

Mr. John West
Coquitlam School District No. 43
550 Poirier Street
Coquitlam, BC V3J 6A7

Dear Mr. West:

Re: Surface Water Runoff/Seepage Sampling Results
Heritage Middle School
Anmore, BC
Project No. 10988

Keystone Environmental Ltd. (Keystone Environmental) was requested by Coquitlam School District No. 43 to conduct sampling of surface water runoff and groundwater seeps present at the Heritage Middle School development in the Village of Anmore, BC (the Site). The sampling was conducted in response to a suspected septic field discharge being directed onto the Site from an adjacent property (Anmore Estates) present within Strata Plan LMS 3080 as shown on Figure 1 (attached). This letter provides a summary of sampling efforts undertaken at the Site, and provides recommendations regarding the future management of the storm water from adjacent properties on-Site.

Keystone Environmental has collected surface water samples from various sampling locations and during varying rainfall frequencies on-Site since March 26, 2013, to assess the potential for faecal contamination exposure to Site workers and visitors. The various sampling locations and frequency of the sampling events were based on varied conditions during Site development, and the presence of surface water flow and/or seeps, in addition to the catch basin along the eastern edge of the Site.

Samples were submitted for laboratory analysis of Total and Faecal Coliforms, and *Escherichia coli* (*E. coli*). Analytical results for all sampling dates are provided in Table 1 (attached), with sampling locations shown on the Site diagram (Figure 1).

The analytical results for surface water samples collected were compared against the BC Water Quality Guidelines (BCWQG) for Primary (PCR)- and Secondary-Contact Recreation (SCR) activities. Each of the locations sampled (CB IN, CB IN 2, SW-13-D, SW-13-F) indicated presence of fecal below the BCWQG, PCR and SCR criteria for *E. coli* and faecal coliforms.

The BCWQG PCR and SCR guidelines are based on the use of the geometric mean (Table 2). Using the geometric mean for comparing all data for the remaining three

Suite 320
4400 Dominion Street
Burnaby, British Columbia
Canada V5G 4G3

Telephone: 604 430 0671
Facsimile: 604 430 0672
info@KeystoneEnviro.com
KeystoneEnviro.com

surface water locations (SW-13-D, SW-13-F, and CB Out), there are no exceedances of the PCR or SCR criteria. The only individual exceedances noted at sample locations where surface water accumulates following construction activities (Table 1) were of the PCR guidelines for samples within the catch basin (CB OUT, CB IN).

Table 2 Geometric Data for Surface Water Locations

Location	Parameter	*n*	Geometric Mean	BC WQG PCR	BC WQG SCR	PCR Exceedances	SCR Exceedances
SW-13-D	*E. coli*	8	3.5	77*	385*	0	0
	Fecal coliforms	8	5.3	200*	n/g	0	0
	Total coliforms	8	1100	n/g	n/g	-	-
SW-13-F	*E. coli*	6	10.3	77*	385*	0	0
	Fecal coliforms	6	14.0	200*	n/g	0	0
	Total coliforms	6	833	n/g	n/g	-	-
CB Out	*E. coli*	9	18.1	77*	385*	1	0
	Fecal coliforms	9	54.1	200*	n/g	2	0
	Total coliforms	9	3067	n/g	n/g	-	-

Health Canada recommends a 30 day sampling program be undertaken based on a minimum of five samples collected. Table 2 outlines the geometric mean of remaining sample locations following the April 2013 – Jan 2014 sampling events. Monthly sampling frequency is less than the Health Canada recommendation, however, additional sampling was undertaken for the purpose of characterizing event-driven episodes that may affect the water quality (i.e., immediately following period of heavy rainfall), which complies with Health Canada frequency of microbiology sampling.

Based on the lack of exceedances for both PCR and SCR criteria using the geometric mean for the remaining surface water locations, and the efforts by the Site contractor to restrict access to the catch basin along the Strata boundary, Keystone Environmental recommends discontinuing water treatment efforts for faecal contamination at the Site. It is recommended that re-sampling be undertaken during the summer months when fecal coliforms and *E. coli* were previously identified on-Site. Increase of faecal coliforms and *E. coli* during summer months may be directly related to an increase in use of nearby trails by pets and wildlife. It is also recommended sampling be conducted if surface water flow conditions are significantly altered on the eastern portion of the Site.

This report has been prepared solely for the internal use of Coquitlam School District No. 43 pursuant to the agreement between Keystone Environmental Ltd. and Coquitlam School District No. 43. By using this report, Coquitlam School District No. 43 agrees that they will review and use the report in its entirety. Any use which other parties make of this report, or any reliance on or decisions made based on it, are the responsibility of such parties. Keystone Environmental Ltd. accepts no responsibility for damages, if any, suffered by other parties as a result of decisions made or actions based on this report.

If you should have any questions, please do not hesitate to contact us.

Sincerely,

Keystone Environmental Ltd.

Original signed by

Kyla Bryant, B.Sc. B.I.T
Environmental Biologist

Original signed by

Craig Patterson, B.Sc.
Project Manager

\\key-filesvr\Common\10900-10999\10988-Heritage School\Phase 103 - Fecal Testing\10988 140131 Surface Water Sampling Letter_rev.docx

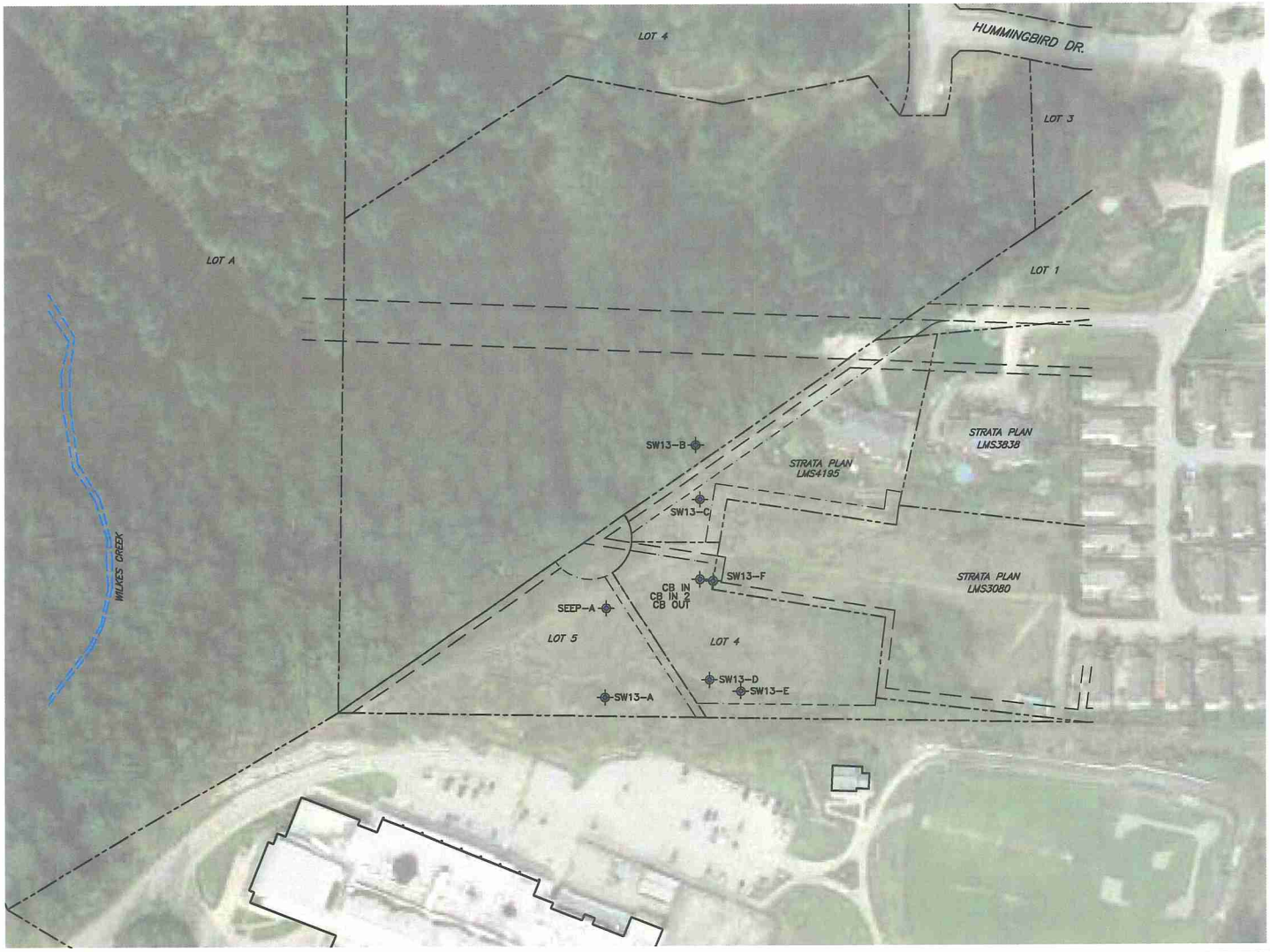
ATTACHMENTS:

- Figure 1: Sample Location Plan
- Table 1: Surface Water Analytical Results

cc: Mr. Frank Giampa, Coquitlam School District No. 43

FIGURE 1: SAMPLE LOCATION PLAN

Keystone Environmental
Knowledge-Driven Results



LEGEND

- PROPERTY OUTLINE
- SEWER RIGHT OF WAY
- EASEMENT
- CREEK
- KEYSTONE SURFACE WATER SAMPLE (2013)

Keystone Environmental

NOTE: THIS DRAWING IS FOR GENERAL INFORMATION ONLY.
LOT BOUNDARIES AND FEATURES ARE APPROXIMATE.

15m 0 75m

SCALE: 1:1500(approx.)

Heritage Middle School
Anmore, B C
Coquitlam School District #43

REVISION No.	DATE	PROJECT No.
03	Nov. 2013	10988-54

Figure 1
Sample Location Plan

PLOT SCALE: 1:1 DRAWN BY: AB/JM CADD FILE No. 10988\Ph 54\Figs\Fig1-Sample Location Plan-R3.dwg

TABLE 1: SURFACE WATER ANALYTICAL RESULTS

Keystone Environmental
Knowledge-Driven Results

Table 1 (1 of 1)
Surface Water Analytical Results
Microbiology and Total Suspended Solids
Heritage Mountain Middle School

Project No. 10988

Sample ID	SW-13-A	SW13-B	SEEP-A	SW13-C	SW-13-D								SW-13-E			SW-13-F						CB IN	CB IN	CB IN 2	CB IN 2	CB OUT								BCWQG	BCWQG
Lab Sample ID	FZ8681	GJ8360	GJ8359	GT1101	HT8668	HX1066	IA9960	ID4389	IG0710	II3137	IK2123	IK5894	HT8669	HX1067	IA9961	HT8671	IA9962	ID4390	IG0711	IK2124	IK5895	GG3218	IK5896	GG3219	IK5897	GG3220	GT1100	HT8670	HX1068	IA9963	ID4391	IG0712	II3138	IK2122	PCR	SCR
Date Sampled	26-Mar-13	15-May-13	15-May-13	25-Jun-13	08-Oct-13	23-Oct-13	07-Nov-13	20-Nov-13	04-Dec-13	18-Dec-13	08-Jan-14	10-Jan-14	08-Oct-13	23-Oct-13	07-Nov-13	08-Oct-13	07-Nov-13	20-Nov-13	04-Dec-13	08-Jan-14	10-Jan-14	29-Apr-13	10-Jan-14	29-Apr-13	10-Jan-14	29-Apr-13	25-Jun-13	08-Oct-13	23-Oct-13	07-Nov-13	20-Nov-13	04-Dec-13	18-Dec-13	08-Jan-14		
Weather	Sunny	Overcast	Overcast	Rain	Sunny	Sunny	Rain	Sunny	Sunny	Partly cloudy	Heavy Rain	Cloudy	Sunny	Sunny	Rain	Sunny	Rain	Sunny	Sunny	Heavy Rain	Cloudy	Sunny	Cloudy	Sunny	Cloudy	Sunny	Rain	Sunny	Sunny	Rain	Sunny	Sunny	Partly cloudy	Heavy rain		
24 hour precipitation (mm)	0.0	0.1	0.1	8.4	1.8	0.0	12.8	2.6	0.0	1.3	18.4	14.2	1.8	0.0	12.8	1.8	12.8	2.6	0.0	18.4	14.2	0.0	14.2	0.0	14.2	0.0	8.4	1.8	0.0	12.8	2.6	0.0	1.3	18.4		
Total precipitation since last event (mm)	-	-	-	-	-	0.3	84.6	90.7	22.7	32.2	144.5	34.4	-	0.3	84.6	-	84.9	90.7	22.7	176.7	34.4	0.0	34.4	0.0	34.4	0.0	249.5	267.5	1.5	84.6	48.6	23.0	31.2	144.5		
E. coli	10	**5100**	<2	**2200**	1	<2	24	<2	<2	<2	40	22	<1	<2	12	14	12	6	2	38	16	13	12	50	16	18	**290**	24	4	53	2	<1	76	52	77*	385*
Fecal Coliforms	10	**5100**	<2	**2200**	1	<2	24	8	<2	<1	42	22	<1	<2	13	16	12	10	6	40	16	**200**	12	100	16	**220**	**300**	28	12	34	160	8	76	54	200*	n/g
Total Coliforms	<	43000	2	12000	4100	210	7700	1700	260	66	5300	2100	3600	210	6300	3300	5900	17000	1800	5600	1700	1100	4500	1100	5800	1400	12000	4600	380	12000	5100	7500	220	7900	n/g	n/g

NOTES:
All concentrations are in colony forming units per litre (CFU/L), unless otherwise specified.
BCWQG British Columbia Water Quality Guidelines
PCR Primary-Contact Recreation
SCR Secondary-Contact Recreation
n/g No guideline for this constituent
< Less than reported detection limit
Bold Exceeds BCWQG (PCR) standard for this sample
Underlined Exceeds BCWQG (SCR) standard for this sample
* Standard should be compared with the geometric mean from at least 5 samples over a 30-day period
RDL Reportable detection limit
All precipitation data are taken from Environment Canada's Como Lake weather station in Coquitlam, B.C.