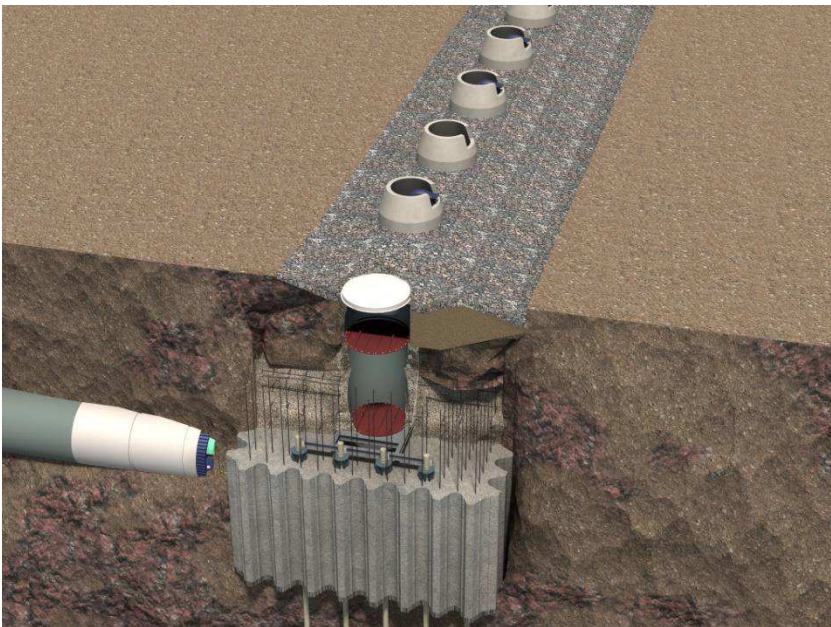


APPENDIX H NOISE STUDIES

H.2: Baseline Environmental Noise Study

Annacis Island WWTP New Outfall System

Vancouver Fraser Port Authority
Project and Environmental Review Application



 **metrovancouver**
SERVICES AND SOLUTIONS FOR
A LIVABLE REGION

**CDM
Smith**

 **BKL**

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September 6, 2017

File: 3697-17A

CDM Smith Canada
4710 Kingsway, Suite 1001
Burnaby, BC
V5H 4M2

Attention: Jeff Chen,

Dear Jeff:

**Re: Annacis WWTP Construction
Baseline Environmental Noise Study**

As requested, BKL Consultants has completed a baseline environmental impact assessment for the above project concerning a nearby bald eagle habitat. The purpose of our study was to measure the existing ambient noise levels for a week. Using this information, you will have your team determine the anticipated impact on the eagles, if any, during different construction phases. This document summarizes the measurement procedures and results of the monitoring.

Project Overview

The measurement was conducted on the roof of 456 Humber Place from August 14-21, 2017 about 200 m from Highway 9 as shown in Figure 1 below. The eagle's nest was about 40 m from the measurement location.

Weather conditions throughout the week were favourable for noise monitoring with light winds, generally from the south-southeast, and no with precipitation. Weather data downloaded from a private weather station located approximately 4 km NNW of the site on Glenwood Drive, just south of North Fraser Way, is presented in Appendix A.



Figure 1. Aerial Photo of the Measurement Location

Instrumentation

Measurements were conducted using a Larson Davis 820 sound level meter which meets Type 1 precision according to ANSI S1.4:1983. The sound level meter was field calibrated before and after the monitoring period using a Brüel & Kjær Type 4230 calibrator. The meter was programmed to record daily A-weighted equivalent noise levels (Leq24)¹ plus hourly interval sound levels and statistics (e.g. Leq, Lmax, Lmin, L1, L10, L50, L90, L95 and L99). Lmax and Lmin are the maximum and minimum levels recorded during the measurement period. Statistical indices Li are the sound levels that were exceeded for i% of the measurement period. For example, L10 is the level that was exceeded 10% of the time.

Results

The overall weekly measurement results are summarised in Table 1 below.

Table 1: Overall Weekly Measurement Results (dBA)

	Leq	Lmax	Lmin	L1	L10	L50	L90	L95	L99
Result	61	92	50	70	61	58	55	54	52

¹ The Leq is the steady level that, within a specified time interval, would contain the same amount of energy as the actual time-varying level. Although it is, in a sense, an "average," it is strongly influenced by the loudest events because they contain the majority of the energy.

The daily equivalent levels are summarised in Table 2.

Table 2: Daily (24 hour) Leq Results

Date	Leq(24) (dBA)
Monday Aug 14/21*	61
Tuesday Aug 15	62
Wednesday Aug 16	60
Thursday Aug 17	64
Friday Aug 18	61
Saturday Aug 19	59
Sunday Aug 20	59

**Aug 14/21 includes data from 09:00 to 24:00 on Aug 14 and from 00:00 to 06:00 on Aug 21. The 3 hours of data from 06:00 to 09:00 on Aug 21 is missing due to an equipment malfunction.*

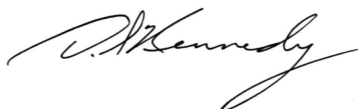
Hourly interval sound levels and statistics are provided in Appendix B.

We trust this summary of the noise measurements conducted is sufficient for your purposes. Noise measurement data will be stored and available for future use and further processing if required. Please contact us if you have any queries regarding this document.

Sincerely,

BKL Consultants Ltd.

per



Douglas S. Kennedy, P.Eng.

Enclosures

Appendix A - Weather Data

Weather History for Burnaby, BC [IBCBURNA51]

Summary

August 14, 2017 - August 21, 2017

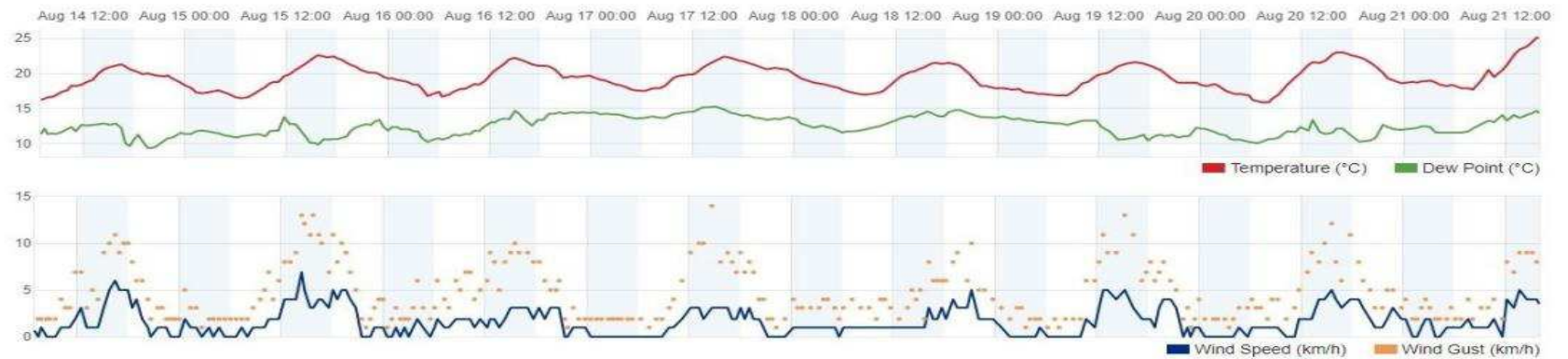
	High	Low	Average
Temperature	25.2 °C	15.7 °C	19.6 °C
Dew Point	15.4 °C	9.4 °C	12.5 °C
Humidity	78%	44%	63.9%
Precipitation	0 mm	--	--

	High	Low	Average
Wind Speed	6.9 km/h	--	1.5 km/h
Wind Gust	14 km/h	--	--
Wind Direction	--	--	SSE
Pressure	1017.5 hPa	1007.3 hPa	--

Graphs Table

Weather History Graph

August 14, 2017 - August 21, 2017



Hourly Measurement Results (dBA)

Date	Time	Leq	Lmax	Lmin	L(1)	L(10)	L(50)	L(90)	L(95)	L(99)
14Aug 17	9:00:00	61	72	57	67	62	60	58	58	57
14Aug 17	10:00:00	60	70	58	65	62	60	59	59	58
14Aug 17	11:00:00	61	76	57	66	62	60	59	59	58
14Aug 17	12:00:00	61	75	57	68	63	60	59	59	58
14Aug 17	13:00:00	61	79	57	68	62	60	58	58	57
14Aug 17	14:00:00	60	68	56	65	61	59	58	57	57
14Aug 17	15:00:00	60	71	56	66	61	59	58	57	57
14Aug 17	16:00:00	63	82	57	75	63	59	58	58	57
14Aug 17	17:00:00	63	86	57	74	64	60	58	58	58
14Aug 17	18:00:00	69	90	56	83	69	60	58	58	57
14Aug 17	19:00:00	63	82	56	76	63	58	57	56	56
14Aug 17	20:00:00	64	82	56	75	66	59	57	57	56
14Aug 17	21:00:00	59	70	55	65	61	58	56	56	55
14Aug 17	22:00:00	58	69	55	63	59	57	56	55	55
14Aug 17	23:00:00	57	66	54	62	59	57	55	55	54
15Aug 17	0:00:00	58	77	54	63	59	57	56	55	55
15Aug 17	1:00:00	56	67	52	63	57	55	54	53	53
15Aug 17	2:00:00	55	64	52	58	56	55	53	53	52
15Aug 17	3:00:00	61	81	52	74	63	55	54	53	53
15Aug 17	4:00:00	68	92	53	82	59	56	54	54	53
15Aug 17	5:00:00	59	66	55	62	60	59	57	57	56
15Aug 17	6:00:00	61	69	58	67	62	60	59	58	58
15Aug 17	7:00:00	60	71	58	65	61	60	59	59	58
15Aug 17	8:00:00	60	74	56	66	61	59	57	57	56
15Aug 17	9:00:00	64	85	56	79	60	58	56	56	56
15Aug 17	10:00:00	60	69	56	66	62	59	57	57	56
15Aug 17	11:00:00	61	71	57	66	62	60	59	58	58
15Aug 17	12:00:00	60	71	57	66	62	59	58	58	57
15Aug 17	13:00:00	60	72	57	66	62	60	58	58	57
15Aug 17	14:00:00	61	82	57	67	62	59	58	58	57
15Aug 17	15:00:00	60	72	57	65	62	59	58	58	57
15Aug 17	16:00:00	59	67	57	64	61	59	58	57	57
15Aug 17	17:00:00	64	81	57	75	67	60	58	58	57
15Aug 17	18:00:00	61	83	57	66	61	59	58	57	57
15Aug 17	19:00:00	66	84	55	77	68	60	57	57	56
15Aug 17	20:00:00	66	88	56	78	66	59	57	57	56
15Aug 17	21:00:00	60	71	56	68	61	58	57	57	56
15Aug 17	22:00:00	59	72	55	66	60	58	56	56	55
15Aug 17	23:00:00	59	79	55	68	60	57	56	56	55
16Aug 17	0:00:00	58	74	54	67	59	57	55	55	54
16Aug 17	1:00:00	60	82	53	68	60	56	54	54	53
16Aug 17	2:00:00	56	80	51	60	58	55	53	53	52
16Aug 17	3:00:00	55	60	52	58	56	54	53	53	52
16Aug 17	4:00:00	58	75	53	65	59	56	54	54	53
16Aug 17	5:00:00	58	65	54	62	60	58	56	56	55
16Aug 17	6:00:00	61	68	58	66	62	60	59	58	58

Hourly Measurement Results (dBA)

Date	Time	Leq	Lmax	Lmin	L(1)	L(10)	L(50)	L(90)	L(95)	L(99)
16Aug 17	7:00:00	60	69	58	65	62	60	59	59	58
16Aug 17	8:00:00	60	79	57	65	61	60	58	58	58
16Aug 17	9:00:00	60	78	57	66	61	60	58	58	57
16Aug 17	10:00:00	60	68	57	65	61	60	59	58	58
16Aug 17	11:00:00	60	70	57	65	61	59	58	58	57
16Aug 17	12:00:00	63	84	56	75	64	60	58	58	57
16Aug 17	13:00:00	60	68	57	65	61	60	59	58	58
16Aug 17	14:00:00	62	81	58	72	63	60	59	59	58
16Aug 17	15:00:00	60	72	58	65	61	60	59	58	58
16Aug 17	16:00:00	61	79	57	69	61	59	58	58	57
16Aug 17	17:00:00	61	77	56	69	61	59	58	58	57
16Aug 17	18:00:00	61	84	57	68	61	59	58	57	57
16Aug 17	19:00:00	60	73	56	66	61	59	58	57	57
16Aug 17	20:00:00	60	83	55	68	62	59	57	57	56
16Aug 17	21:00:00	59	73	56	66	60	58	57	56	56
16Aug 17	22:00:00	59	70	54	66	60	58	56	56	55
16Aug 17	23:00:00	59	73	55	67	61	58	56	56	55
17Aug 17	0:00:00	58	73	53	67	59	57	55	54	54
17Aug 17	1:00:00	57	77	52	64	57	55	54	53	53
17Aug 17	2:00:00	57	69	54	63	58	56	54	54	54
17Aug 17	3:00:00	58	81	53	65	59	56	54	54	53
17Aug 17	4:00:00	57	74	53	62	58	56	54	54	53
17Aug 17	5:00:00	59	67	55	64	60	59	57	56	56
17Aug 17	6:00:00	61	69	59	67	62	61	59	59	59
17Aug 17	7:00:00	60	76	58	64	61	60	59	58	58
17Aug 17	8:00:00	61	84	58	68	62	60	59	58	58
17Aug 17	9:00:00	60	70	57	66	61	60	58	58	57
17Aug 17	10:00:00	65	92	57	72	62	60	59	58	58
17Aug 17	11:00:00	60	70	57	65	62	60	59	58	58
17Aug 17	12:00:00	71	89	58	82	73	63	59	59	58
17Aug 17	13:00:00	62	81	57	70	62	60	58	58	57
17Aug 17	14:00:00	61	77	57	68	62	60	59	58	58
17Aug 17	15:00:00	60	68	57	66	62	59	58	58	57
17Aug 17	16:00:00	60	75	57	66	62	59	58	58	57
17Aug 17	17:00:00	68	89	57	82	61	59	58	58	57
17Aug 17	18:00:00	71	92	56	84	72	61	58	57	57
17Aug 17	19:00:00	61	81	55	70	63	59	57	57	56
17Aug 17	20:00:00	58	70	55	66	59	58	56	56	55
17Aug 17	21:00:00	65	85	56	78	65	58	56	56	56
17Aug 17	22:00:00	58	70	54	65	61	57	55	55	55
17Aug 17	23:00:00	65	87	53	78	65	57	55	54	54
18Aug 17	0:00:00	69	86	51	80	72	63	55	54	52
18Aug 17	1:00:00	62	84	50	76	57	54	52	51	50
18Aug 17	2:00:00	54	66	50	62	56	53	52	51	51
18Aug 17	3:00:00	55	71	51	62	57	54	53	52	52
18Aug 17	4:00:00	56	64	52	60	58	56	54	53	52

Hourly Measurement Results (dBA)

Date	Time	Leq	Lmax	Lmin	L(1)	L(10)	L(50)	L(90)	L(95)	L(99)
18Aug 17	5:00:00	58	65	54	62	60	58	56	55	54
18Aug 17	6:00:00	61	69	57	67	63	60	59	58	58
18Aug 17	7:00:00	60	78	58	65	61	60	59	58	58
18Aug 17	8:00:00	60	69	57	65	62	60	58	58	58
18Aug 17	9:00:00	60	74	57	66	62	60	59	58	58
18Aug 17	10:00:00	62	82	56	72	62	60	58	58	57
18Aug 17	11:00:00	61	76	57	69	61	59	58	58	57
18Aug 17	12:00:00	60	73	57	65	61	59	58	58	57
18Aug 17	13:00:00	61	79	57	64	61	60	58	58	57
18Aug 17	14:00:00	60	71	57	67	62	60	58	58	57
18Aug 17	15:00:00	61	79	56	68	62	59	58	57	57
18Aug 17	16:00:00	60	76	56	65	60	59	58	57	57
18Aug 17	17:00:00	59	70	57	65	60	59	57	57	57
18Aug 17	18:00:00	60	79	56	68	60	59	57	57	56
18Aug 17	19:00:00	59	77	56	67	60	58	57	57	56
18Aug 17	20:00:00	59	72	56	64	60	58	57	57	56
18Aug 17	21:00:00	60	82	56	67	62	59	57	57	56
18Aug 17	22:00:00	59	72	55	65	60	58	56	56	55
18Aug 17	23:00:00	57	69	55	65	58	57	55	55	55
19Aug 17	0:00:00	58	81	54	65	59	57	56	55	55
19Aug 17	1:00:00	57	67	54	62	58	56	55	55	54
19Aug 17	2:00:00	59	80	52	68	59	56	54	54	53
19Aug 17	3:00:00	54	60	52	57	55	54	53	53	52
19Aug 17	4:00:00	55	67	51	61	57	54	53	53	52
19Aug 17	5:00:00	56	68	52	62	59	55	54	53	53
19Aug 17	6:00:00	58	68	54	64	60	57	55	55	54
19Aug 17	7:00:00	58	71	54	63	59	57	55	55	54
19Aug 17	8:00:00	59	76	54	65	60	58	56	56	55
19Aug 17	9:00:00	59	77	56	66	61	58	57	56	56
19Aug 17	10:00:00	59	68	55	65	61	58	56	56	56
19Aug 17	11:00:00	59	68	55	64	61	58	57	56	56
19Aug 17	12:00:00	62	79	56	73	63	59	57	57	56
19Aug 17	13:00:00	63	83	55	78	61	58	57	56	56
19Aug 17	14:00:00	59	68	55	65	60	58	57	56	56
19Aug 17	15:00:00	59	75	55	65	61	58	57	56	56
19Aug 17	16:00:00	59	67	56	63	60	58	57	56	56
19Aug 17	17:00:00	59	74	55	65	60	58	57	57	56
19Aug 17	18:00:00	61	83	55	69	61	58	56	56	55
19Aug 17	19:00:00	59	68	55	66	61	58	56	56	55
19Aug 17	20:00:00	58	70	53	66	60	57	55	54	54
19Aug 17	21:00:00	58	73	54	67	59	57	55	55	54
19Aug 17	22:00:00	58	67	54	64	60	57	55	55	55
19Aug 17	23:00:00	57	70	53	65	59	56	54	54	53
20Aug 17	0:00:00	60	83	52	70	59	55	53	53	52
20Aug 17	1:00:00	54	64	51	61	55	53	52	52	51
20Aug 17	2:00:00	54	73	50	62	55	52	51	51	50

Hourly Measurement Results (dBA)

Date	Time	Leq	Lmax	Lmin	L(1)	L(10)	L(50)	L(90)	L(95)	L(99)
20Aug 17	3:00:00	54	72	50	59	54	52	51	51	50
20Aug 17	4:00:00	53	63	50	58	54	52	51	51	50
20Aug 17	5:00:00	55	72	50	59	55	53	52	51	50
20Aug 17	6:00:00	56	66	53	64	57	55	54	53	53
20Aug 17	7:00:00	57	79	52	64	58	55	54	53	52
20Aug 17	8:00:00	58	81	52	64	58	56	54	53	53
20Aug 17	9:00:00	57	67	54	62	58	57	56	55	55
20Aug 17	10:00:00	57	65	55	60	58	57	56	55	55
20Aug 17	11:00:00	57	67	54	61	58	57	55	55	54
20Aug 17	12:00:00	57	67	54	62	58	57	55	55	54
20Aug 17	13:00:00	58	65	55	62	59	57	56	56	55
20Aug 17	14:00:00	58	71	54	65	60	57	55	55	55
20Aug 17	15:00:00	58	70	55	64	60	57	56	55	55
20Aug 17	16:00:00	65	84	54	79	62	58	56	56	55
20Aug 17	17:00:00	66	84	55	78	67	58	56	56	55
20Aug 17	18:00:00	60	82	55	71	60	57	56	56	55
20Aug 17	19:00:00	59	71	54	67	61	58	56	56	55
20Aug 17	20:00:00	58	69	55	64	60	57	56	56	55
20Aug 17	21:00:00	58	68	54	65	60	57	56	56	55
20Aug 17	22:00:00	59	77	54	67	61	58	56	55	54
20Aug 17	23:00:00	58	75	54	67	61	56	55	55	54
21Aug 17	0:00:00	56	69	51	66	56	54	53	52	52
21Aug 17	1:00:00	55	66	51	61	56	54	52	52	52
21Aug 17	2:00:00	56	72	51	67	57	54	53	52	51
21Aug 17	3:00:00	57	81	50	65	57	54	53	52	51
21Aug 17	4:00:00	56	62	53	60	58	56	54	54	53
21Aug 17	5:00:00	60	73	56	66	61	59	58	57	56

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