



Specialists in Explosives, Blasting and Vibration  
Consulting Engineers

April 2, 2018

Dragados-Tomlinson Joint Venture  
5597 Power Road  
Ottawa, Ontario  
K1G 3N4

Attention: Mr. Kevin Stadelmann

**Re: Interim Weekly Vibration Monitoring Report – March 26 to April 1, 2018**  
**Combined Sewage Storage Tunnel (CSST) – Site 5 Operations**

Dear Mr. Stadelmann,

Attached please find the interim weekly summary report detailing the results of the vibration monitoring program developed and implemented as part of the construction operations for the Combined Sewage Storage Tunnel (CSST) Project – Site 5 Operations in Ottawa, Ontario. This monitoring program was initiated on March 31, 2017 and has been recording vibrations generated as a result of the construction equipment in order to confirm predictable levels and to guard against possible adverse impacts on the surrounding structures.

A full time on-site Vibration Monitoring Program is currently implemented to delineate vibration intensities experienced at a representative sampling of structures around the Site 5 construction areas as a result of the construction equipment in operation. The monitoring instruments installed consist of Instantel tri-directional digital seismographs capable of measuring vibration intensities up to 254mm/s at a frequency response of 2 – 250Hz or 1 – 315Hz depending on the installation. The units are programmed to measure all vibration levels continuously at a sampling rate of 1024 samples per second. Following each five minute interval, the units review the 307,200 measured vibrations and permanently records the peak particle velocity for that time interval while deleting all subordinate vibration intensities. This process is repeated for all subsequent five minute time intervals thereby providing maximum vibration intensities experienced at the monitored areas throughout the day.



Such a configuration permits continuous monitoring of vibration levels and provides complete coverage of all vibrations, construction induced or otherwise, experienced at the monitored structure. Events recorded under this program mode are marked by an “H” on the vibrations summary report. As an additional analytical tool, the seismographs are configured to record a more detailed waveform in the event that vibration intensities exceeded a pre-set trigger of 4mm/s. This feature permits advanced analysis in the event that anomalous elevated readings are recorded. Events recorded under this program mode are marked by a “W” on the vibrations summary report.

As per the Contract Specification 02482, Subsection 1.5.1.1, the following threshold, response and shutdown values are observed at Site 5:

<b>Project Threshold, Response and Shutdown Values</b>			
<b>Description of Event</b>	<b>Threshold Value (PPV)</b>	<b>Response Value (PPV)</b>	<b>Shutdown Value (PPV)</b>
Continuous/ Intermittent Source	4mm/s	6mm/s	7mm/s
Transient Source	5mm/s	8mm/s	9mm/s
Blasting	10mm/s	16mm/s	20mm/s

The monitoring locations itemized below were installed for the following sites on the listed days and remain installed during the construction operations:

**Site 5A/5B**

- **141/151 Stanley Avenue** – Installed on March 31, 2017
- **133 Stanley Avenue** – Installed on August 4, 2017
- **IOS Shaft 5A Location** (Borehole and Surface) – Installed on Sept 5, 2017
- **IOS Shaft IOS Location** (Borehole and Surface) – Installed on Oct 13, 2017



**Site 5C**

- **54 Queen Victoria Street** – Installed on March 31, 2017
- **51 Queen Victoria Street** – Installed on April 11, 2017
- **55 Queen Victoria Street** – Installed on January 12, 2018
- **50 Queen Victoria Street** – Installed on January 12, 2018

The following readings generated at Site 5 monitoring locations exceeded the 4mm/s trigger level during the interim monitoring period:

<b>Vibration Readings Exceeding 4mm/s During Interim Monitoring Period</b>						
<b>Ref. Event #</b>	<b>Location</b>	<b>Date</b>	<b>Time</b>	<b>Velocity (mm/s)</b>	<b>Cause of Event</b>	<b>Applicable Project Limit Exceeded</b>
<b>Site 5A/5B</b>						
N/A	<b>No Events</b>	N/A	N/A	N/A	N/A	N/A
<b>Site 5C</b>						
N/A	<b>No Events</b>	N/A	N/A	N/A	N/A	N/A

# EXPLOTECH

All recorded Histogram summaries and Waveform details for Site 5 are available for reference at anytime on the [www.constructionvibrations.com](http://www.constructionvibrations.com) website. A summary list is attached to this interim report for reference. Should you have any questions or concerns related to the information contained herein or the monitoring program undertaken, please do not hesitate to contact the undersigned at your leisure.

Kindest regards,



Mitch Malcomson, P.Eng.

**CSST - Site 5  
M7550A DTJV  
March 26, 2018 to April 1, 2018**

**Event Report: Event List - z:\to be archived\2 csst temp folders\site 5**

Type	Serial No.	Date/Time	No. Chan	Trigger	Tran Peak (mm/s)	Vert Peak (mm/s)	Long Peak (mm/s)	Mic Peak (dB)	PVS1 (mm/s)	Job	Description
H	BE15997	Mar 26 /18 06:02:35	3	Manual	0.254	0.254	0.254	***	0.381	7550	Site 5C - 54 Queen Victoria Street
H	BE18786	Mar 26 /18 06:06:53	3	Manual	0.508	0.635	0.508	***	0.783	7550	Site 5C - 55 Queen Victoria Street
H	BE15757	Mar 26 /18 06:07:19	4	Manual	0.381	0.254	0.254	109.9L	0.421	7550	Site 5AB - 133 Stanley Avenue
H	BE22085	Mar 26 /18 06:07:32	3	Manual	0.381	0.254	0.127	***	0.402	7550	Site 5C - 50 Queen Victoria Street
H	BE17376	Mar 26 /18 06:07:33	3	Manual	0.381	0.254	0.254	***	0.402	7550	Site 5C - 51 Queen Victoria Street
H	BE16212	Mar 26 /18 06:07:34	6	Manual	2.032	1.651	2.667	***	3.139	7550	Site 5A - IOS Shaft IOS Location
H	BE20061	Mar 26 /18 06:07:39	6	Manual	0.381	0.254	0.254	***	0.381	7550	Site 5A - IOS Shaft 5A Location
H	BE20059	Mar 26 /18 06:07:44	8	Manual	1.143	1.270	0.254	112.3L	1.276	7550	Site 5AB - 141+151 Stanley Avenue
H	BE15997	Mar 27 /18 06:02:34	3	Manual	0.762	0.508	0.889	***	1.024	7550	Site 5C - 54 Queen Victoria Street
H	BE18786	Mar 27 /18 06:06:53	3	Manual	0.889	0.635	0.508	***	1.000	7550	Site 5C - 55 Queen Victoria Street
H	BE16212	Mar 27 /18 06:06:56	6	Manual	2.413	1.397	1.651	***	3.095	7550	Site 5A - IOS Shaft IOS Location
H	BE17376	Mar 27 /18 06:06:57	3	Manual	0.381	0.254	0.254	***	0.402	7550	Site 5C - 51 Queen Victoria Street
H	BE20059	Mar 27 /18 06:07:10	8	Manual	1.524	1.397	0.254	131.7L	1.529	7550	Site 5AB - 141+151 Stanley Avenue
H	BE15757	Mar 27 /18 06:07:22	4	Manual	0.381	0.254	0.254	120.1L	0.421	7550	Site 5AB - 133 Stanley Avenue
H	BE22085	Mar 27 /18 06:07:33	3	Manual	0.254	0.381	0.127	***	0.421	7550	Site 5C - 50 Queen Victoria Street
H	BE20061	Mar 27 /18 06:07:35	6	Manual	0.254	0.254	0.254	***	0.381	7550	Site 5A - IOS Shaft 5A Location
H	BE15997	Mar 27 /18 06:01:54	3	Manual	0.381	0.254	0.508	***	0.582	7550	Site 5C - 54 Queen Victoria Street
H	BE20059	Mar 28 /18 06:07:04	8	Manual	1.270	1.397	0.254	104.2L	1.408	7550	Site 5AB - 141+151 Stanley Avenue
H	BE15757	Mar 28 /18 06:07:19	4	Manual	0.381	0.254	0.381	106.0L	0.421	7550	Site 5AB - 133 Stanley Avenue
H	BE22085	Mar 28 /18 06:07:32	3	Manual	0.254	0.254	0.127	***	0.311	7550	Site 5C - 50 Queen Victoria Street
H	BE18786	Mar 28 /18 06:07:33	3	Manual	0.762	0.635	0.635	***	0.842	7550	Site 5C - 55 Queen Victoria Street
H	BE20061	Mar 28 /18 06:07:33	6	Manual	0.254	0.254	0.254	***	0.381	7550	Site 5A - IOS Shaft 5A Location
H	BE16212	Mar 28 /18 06:07:36	6	Manual	2.540	1.651	2.286	***	2.811	7550	Site 5A - IOS Shaft IOS Location
H	BE17376	Mar 28 /18 06:07:36	3	Manual	0.381	0.381	0.254	***	0.402	7550	Site 5C - 51 Queen Victoria Street
H	BE15997	Mar 29 /18 06:02:33	3	Manual	0.635	0.254	0.381	***	0.660	7550	Site 5C - 54 Queen Victoria Street
H	BE17376	Mar 29 /18 06:06:55	3	Manual	0.381	0.381	0.254	***	0.475	7550	Site 5C - 51 Queen Victoria Street
H	BE16212	Mar 29 /18 06:06:57	6	Manual	3.048	1.524	1.905	***	3.341	7550	Site 5A - IOS Shaft IOS Location
H	BE20059	Mar 29 /18 06:07:06	8	Manual	2.159	3.302	1.905	110.2L	3.614	7550	Site 5AB - 141+151 Stanley Avenue
H	BE15757	Mar 29 /18 06:07:21	4	Manual	0.381	0.254	0.254	117.8L	0.421	7550	Site 5AB - 133 Stanley Avenue
H	BE20061	Mar 29 /18 06:07:33	6	Manual	0.508	0.635	0.254	***	0.635	7550	Site 5A - IOS Shaft 5A Location
H	BE22085	Mar 29 /18 06:07:33	3	Manual	0.254	0.381	0.254	***	0.440	7550	Site 5C - 50 Queen Victoria Street
H	BE18786	Mar 29 /18 06:07:34	3	Manual	0.762	0.635	0.635	***	0.861	7550	Site 5C - 55 Queen Victoria Street
H	BE15997	Mar 30 /18 06:01:56	3	Manual	3.048	2.794	1.651	***	4.204	7550	Site 5C - 54 Queen Victoria Street
H	BE18786	Mar 30 /18 06:06:54	3	Manual	0.508	0.635	0.635	***	0.762	7550	Site 5C - 55 Queen Victoria Street
H	BE16212	Mar 30 /18 06:06:56	6	Manual	2.667	1.397	1.905	***	3.200	7550	Site 5A - IOS Shaft IOS Location
H	BE17376	Mar 30 /18 06:06:57	3	Manual	0.381	0.508	0.381	***	0.596	7550	Site 5C - 51 Queen Victoria Street
H	BE20061	Mar 30 /18 06:06:57	6	Manual	0.381	0.381	0.254	***	0.458	7550	Site 5A - IOS Shaft 5A Location
H	BE20059	Mar 30 /18 06:07:06	8	Manual	1.270	2.286	0.889	116.7L	2.321	7550	Site 5AB - 141+151 Stanley Avenue
H	BE15757	Mar 30 /18 06:07:23	4	Manual	0.381	0.254	0.254	112.6L	0.421	7550	Site 5AB - 133 Stanley Avenue
H	BE22085	Mar 30 /18 06:07:32	3	Manual	0.254	0.254	0.127	***	0.359	7550	Site 5C - 50 Queen Victoria Street
H	BE15997	Mar 31 /18 06:01:57	3	Manual	0.508	0.381	0.635	***	0.718	7550	Site 5C - 54 Queen Victoria Street
H	BE17376	Mar 31 /18 06:06:54	3	Manual	0.381	0.508	0.254	***	0.568	7550	Site 5C - 51 Queen Victoria Street
H	BE20061	Mar 31 /18 06:06:55	6	Manual	0.381	0.381	0.254	***	0.458	7550	Site 5A - IOS Shaft 5A Location
H	BE20059	Mar 31 /18 06:07:04	8	Manual	1.524	1.778	0.635	130.5L	1.823	7550	Site 5AB - 141+151 Stanley Avenue
H	BE15757	Mar 31 /18 06:07:20	4	Manual	0.254	0.254	0.254	127.7L	0.381	7550	Site 5AB - 133 Stanley Avenue
H	BE18786	Mar 31 /18 06:07:32	3	Manual	0.762	0.635	0.635	***	0.950	7550	Site 5C - 55 Queen Victoria Street
H	BE22085	Mar 31 /18 06:07:32	3	Manual	0.254	0.254	0.127	***	0.311	7550	Site 5C - 50 Queen Victoria Street
H	BE16212	Mar 31 /18 06:07:36	6	Manual	0.762	0.889	0.889	***	1.276	7550	Site 5A - IOS Shaft IOS Location
H	BE15997	Apr 1 /18 06:02:34	3	Manual	0.381	0.635	0.508	***	0.730	7550	Site 5C - 54 Queen Victoria Street
H	BE18786	Apr 1 /18 06:06:51	3	Manual	0.889	0.762	0.762	***	1.000	7550	Site 5C - 55 Queen Victoria Street
H	BE16212	Apr 1 /18 06:06:55	6	Manual	1.016	1.143	2.794	***	2.984	7550	Site 5A - IOS Shaft IOS Location
H	BE15757	Apr 1 /18 06:07:24	4	Manual	0.254	0.254	0.254	127.1L	0.440	7550	Site 5AB - 133 Stanley Avenue
H	BE22085	Apr 1 /18 06:07:32	3	Manual	0.254	0.254	0.127	***	0.311	7550	Site 5C - 50 Queen Victoria Street
H	BE17376	Apr 1 /18 06:07:34	3	Manual	0.381	0.381	0.254	***	0.421	7550	Site 5C - 51 Queen Victoria Street
H	BE20061	Apr 1 /18 06:07:35	6	Manual	0.381	0.381	0.254	***	0.458	7550	Site 5A - IOS Shaft 5A Location
H	BE20059	Apr 1 /18 06:07:44	8	Manual	1.143	1.016	0.635	124.2L	1.244	7550	Site 5AB - 141+151 Stanley Avenue