January 26, 2021

Mr. Andy De Jong, Landfill Technologist
Regional Municipality of Halton
Public Works - Waste Management & Road Operations
1151 Bronte Road
Oakville, Ontario
L6M 3L1

Dear Mr. De Jong:

Subject: 2020 Gas Emission Study - Closed Oakville Ninth Line Landfill

WSP Canada Inc. (WSP) is pleased to provide you with the results of the surface emission study for the Closed Oakville Ninth Line Landfill Site (the Site). The purpose of this study was to determine areas of elevated total hydrocarbons (THC) and combustible gas concentrations, which are indicators of areas in which landfill gas may be escaping through the existing cover soils. Although methane gas is odourless, it is a surrogate measurement for a leak where odourous compounds, such as reduced sulphurs or volatile organic compounds (VOCs), may be emitted from a landfill.

SAMPLING METHODOLOGY

The field program was completed on July 30, 2020. The sampling methodology for the study was based on procedures outlined in the South Coast Air Quality Management District Rule 1150.2 "*CONTROL OF GASEOUS EMISSIONS FROM MUNICIPLE SOLID WASTE LANDFILLS"* (Rule 1150.2).

The sampling program consisted of a walk-over survey of the entire Site using a handheld flame ionization detector (FID) for THC analysis and a photo ionization detector (PID) for combustible gas analysis. A Thermofisher TVA2020 was used to collect the THC and combustible gas measurements. The TVA2020 can use both FID and PID simultaneously. An FID measures organic compounds by utilizing a flame produced by the combustion of hydrogen and air. The FID was calibrated against U.S. EPA protocol methane gas. The FID was used as a THC analyzer in the study. The PID consists of an ultraviolet (UV) lamp of a specific energy and an ionization chamber and is used to detect aromatics, unsaturated hydrocarbons and chlorinated hydrocarbons as well as some inorganic gases. A PID was calibrated to isobutylene and used to sample combustible gases.

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Since both detectors may be displayed and logged simultaneously, the relative response of the two detectors may give some clues about the identity of the compound being measured. For instance, a PID does not respond to methane at all, but a FID responds very well. A high FID reading with virtually no PID response might indicate the presence of methane. Conversely, PIDs respond very well to some inorganic gases that FIDs cannot detect. A high PID reading with no FID reading might suggest the presence of an inorganic compound. With readings from both detectors readily available, the TVA2020 can help a user make decisions about the type of compound present and which detector reading to use.

The monitoring was conducted in a grid formation, measuring the THC and combustible gas concentrations at approximately five (5) centimetres above the ground. Measurements were obtained along a pre-defined grid with spacing in the north-south and east-west direction of 20 metres, unless “hotspots” were identified. “Hotspots” are defined as any visible cracking larger than five (5) centimetres in width, areas of bubbling surface water, areas with no vegetation, and/or areas consisting of dead vegetation. These “hotspots”, if identified, would be measured in addition to the points along the pre-defined grid pattern. It is noted that no “hotspots” were identified during the July 30 survey at the Site. It should be noted that some areas of the Site were composed of thick vegetation, trees and slopes that made the areas inaccessible during the site visit, as a result some of the northern areas were not surveyed.

In accordance with Rule 1150.2 methodology, the maximum concentration of organic compounds, as methane, measured at any point on the surface of the landfill, shall not exceed 500 ppm. Any areas or points exhibiting readings higher than 500 ppm THC, as methane, were noted as part of this monitoring event. These points were marked by recording the UTM co-ordinates from a handheld GPS unit.

The results of the monitoring are presented in **Table 1**, and the locations are shown in **Figure 1**.

RESULTS

During the monitoring survey, one WSP representative walked over the approximate extent of refuse at the Site monitoring THC and combustible gas concentrations. During the survey, the ambient temperature ranged between 23 °C and 27 °C, and the wind conditions were light and variable. There had been no measurable precipitation for the 72 hours preceding the sampling date. These conditions were considered ideal for the monitoring program.

A majority of the Site was covered in vegetation. The east side of the landfill was mostly a rugby field covered by maintained grass; the west side of the landfill had more vegetation including trees. The survey locations can be found on **Figure 1** and in **Table 1**.

The FID and PID readings obtained during the monitoring survey exhibited non-detectable concentrations for THC and low concentrations of VOCs.

DISCUSSION

The survey locations at the Site each had a concentration of 0.0 ppm for THC, well below the 500 ppm guideline, indicating there was no significant THC emissions from the Site.

The combustible gas concentrations ranged from 0.5 – 6.3 ppm. A high PID reading with no FID reading might suggest the presence of an inorganic compound. A background concentration measured across the street from the site was 1.6 ppm on the PID. The average PID concentration on the site was 1.7 ppm, slightly above the background measurement. Based on the findings no remedial measures are required. There are no significant indicators of areas in which landfill gas may be escaping through the existing landfill cover.

Part of the routine site inspections, visual indicators of gas emissions should be identified, including bubbling surface water, dead vegetation, or visible cracking larger than five centimetres in width. Based on the findings of the study, additional surface monitoring should only be necessary if the findings of the subsurface monitoring and/or visual inspections indicate a potential issue with landfill gas migration from the Site.

We trust that this letter is satisfactory for your needs. If you have any questions or comments, please contact our office.

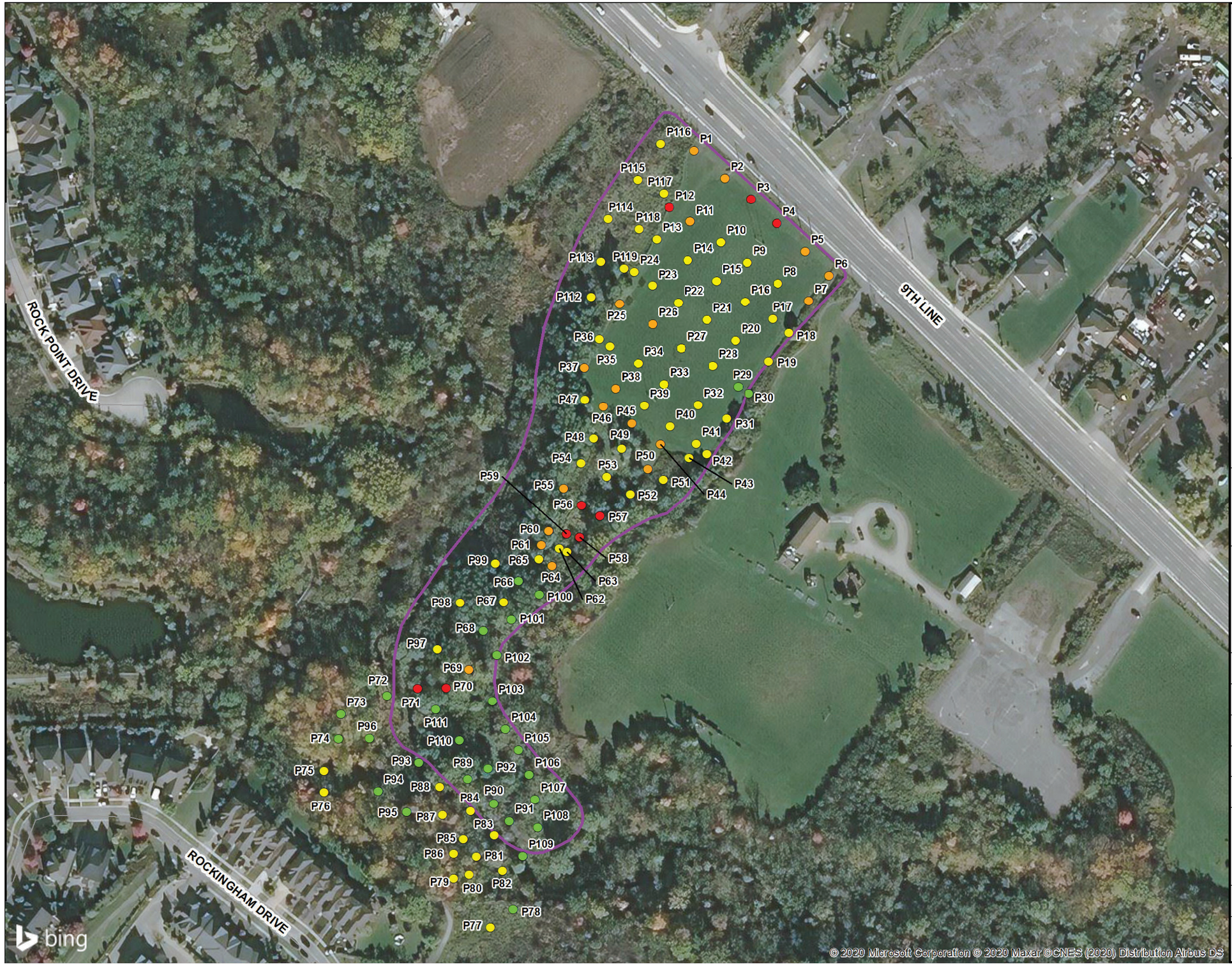
Yours truly,

WSP Canada Inc.

Paul Knabe, B.Sc.
Environmental Consultant

Stephen J. Taziar, P.Eng., DCE
Senior Project Engineer

FIGURES



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LEGEND

APPROXIMATE EXTENT OF REFUSE

COMPUSTIBLE GAS READING

- 0 - 1 ppm
- 1 - 2 ppm
- 2 - 3 ppm
- > 3 ppm

N W E S

20 10 0 20 Metres

CLIENT:

REGIONAL MUNICIPALITY OF HALTON

PROJECT:

GAS EMISSIONS MONITORING
CLOSED OAKVILLE NINTH LINE
LANDFILL SITE

PROJECT NO:	DATE:
181-30000-00 106	JANUARY 2021

DESIGNED BY: -

DRAWN BY: T.P.

CHECKED BY: -

FIGURE NO:	SCALE:
1	1:2,000

TITLE:

GAS EMISSIONS MONITORING LOCATIONS

DISCIPLINE: ENVIRONMENT

ISSUE:	REV.:
-	-

TABLES

TABLE 1
SURFICIAL GAS MONITORING POINTS
NINTH LINE LANDFILL SITE - 2020 GAS EMISSION SURVEY

POINT	COMBUSTIBLE GAS CONCENTRATION (ppm)	TOTAL HYDROCARBONS CONCENTRATION (ppm)	LATITUDE	LONGITUDE
P1	2.7	0	43.50143	-79.68852
P2	3.0	0	43.50130	-79.68832
P3	4.2	0	43.50120	-79.68815
P4	4.5	0	43.50108	-79.68798
P5	2.4	0	43.50095	-79.68780
P6	2.8	0	43.50083	-79.68765
P7	2.3	0	43.50072	-79.68778
P8	1.7	0	43.50080	-79.68798
P9	1.4	0	43.50090	-79.68818
P10	1.2	0	43.50100	-79.68835
P11	3.0	0	43.50110	-79.68855
P12	3.2	0	43.50117	-79.68868
P13	2.0	0	43.50102	-79.68877
P14	1.8	0	43.50092	-79.68857
P15	1.5	0	43.50082	-79.68838
P16	1.2	0	43.50072	-79.68820
P17	1.5	0	43.50063	-79.68802
P18	1.5	0	43.50057	-79.68792
P19	1.6	0	43.50043	-79.68805
P20	1.3	0	43.50053	-79.68827
P21	1.5	0	43.50063	-79.68845
P22	1.3	0	43.50072	-79.68863
P23	1.2	0	43.50080	-79.68880
P24	2.0	0	43.50087	-79.68892
P25	2.8	0	43.50072	-79.68902
P26	2.7	0	43.50062	-79.68880
P27	1.8	0	43.50050	-79.68862
P28	1.2	0	43.50042	-79.68842
P29	0.7	0	43.50032	-79.68825
P30	0.8	0	43.50028	-79.68818
P31	1.3	0	43.50017	-79.68833
P32	1.4	0	43.50023	-79.68852
P33	1.4	0	43.50033	-79.68873
P34	1.5	0	43.50043	-79.68890
P35	1.7	0	43.50052	-79.68908
P36	1.7	0	43.50055	-79.68915
P37	2.1	0	43.50042	-79.68925
P38	2.3	0	43.50032	-79.68905
P39	2.0	0	43.50023	-79.68887

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POINT	COMBUSTIBLE GAS CONCENTRATION (ppm)	TOTAL HYDROCARBONS CONCENTRATION (ppm)	LATITUDE	LONGITUDE
P40	1.8	0	43.50013	-79.68870
P41	1.9	0	43.50005	-79.68853
P42	1.6	0	43.50000	-79.68847
P43	2.0	0	43.49998	-79.68858
P44	2.1	0	43.50005	-79.68877
P45	2.4	0	43.50015	-79.68895
P46	2.2	0	43.50023	-79.68913
P47	1.7	0	43.50027	-79.68925
P48	1.6	0	43.50008	-79.68920
P49	1.7	0	43.50003	-79.68902
P50	2.2	0	43.49993	-79.68885
P51	1.8	0	43.49988	-79.68875
P52	1.8	0	43.49982	-79.68897
P53	2.0	0	43.49990	-79.68912
P54	2.0	0	43.49997	-79.68928
P55	2.4	0	43.49985	-79.68940
P56	6.3	0	43.49977	-79.68928
P57	5.8	0	43.49972	-79.68917
P58	4.5	0	43.49962	-79.68930
P59	3.7	0	43.49963	-79.68938
P60	2.6	0	43.49965	-79.68950
P61	2.5	0	43.49958	-79.68955
P62	2.0	0	43.49957	-79.68943
P63	2.0	0	43.49955	-79.68938
P64	2.2	0	43.49948	-79.68948
P65	1.8	0	43.49952	-79.68957
P66	1.0	0	43.49942	-79.68970
P67	1.1	0	43.49932	-79.68980
P68	0.9	0	43.49918	-79.68993
P69	2.2	0	43.49900	-79.69003
P70	4.9	0	43.49892	-79.69018
P71	4.3	0	43.49892	-79.69037
P72	0.5	0	43.49888	-79.69057
P73	0.6	0	43.49880	-79.69087
P74	1.0	0	43.49868	-79.69088
P75	1.1	0	43.49853	-79.69098
P76	1.2	0	43.49843	-79.69098
P77	1.1	0	43.49778	-79.68992
P78	1.0	0	43.49787	-79.68977

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POINT	COMBUSTIBLE GAS CONCENTRATION (ppm)	TOTAL HYDROCARBONS CONCENTRATION (ppm)	LATITUDE	LONGITUDE
P79	1.3	0	43.49802	-79.69015
P80	1.3	0	43.49803	-79.69005
P81	1.4	0	43.49812	-79.69000
P82	1.3	0	43.49805	-79.68983
P83	1.3	0	43.49822	-79.68988
P84	1.3	0	43.49833	-79.69003
P85	1.3	0	43.49820	-79.69008
P86	1.3	0	43.49813	-79.69015
P87	1.3	0	43.49832	-79.69022
P88	1.3	0	43.49845	-79.69023
P89	0.9	0	43.49848	-79.69005
P90	0.8	0	43.49837	-79.68988
P91	0.6	0	43.49828	-79.68978
P92	0.6	0	43.49853	-79.68992
P93	0.6	0	43.49857	-79.69037
P94	0.6	0	43.49843	-79.69063
P95	0.6	0	43.49833	-79.69045
P96	0.5	0	43.49868	-79.69068
P97	1.1	0	43.49910	-79.69023
P98	1.2	0	43.49932	-79.69008
P99	1.1	0	43.49950	-79.68985
P100	0.9	0	43.49935	-79.68957
P101	0.9	0	43.49923	-79.68975
P102	1.0	0	43.49907	-79.68985
P103	0.9	0	43.49885	-79.68988
P104	0.8	0	43.49872	-79.68980
P105	0.8	0	43.49862	-79.68972
P106	0.8	0	43.49850	-79.68965
P107	0.9	0	43.49838	-79.68962
P108	0.8	0	43.49825	-79.68960
P109	0.8	0	43.49812	-79.68970
P110	0.8	0	43.49867	-79.69010
P111	0.9	0	43.49882	-79.69025
P112	1.1	0	43.50075	-79.68920
P113	1.2	0	43.50092	-79.68913
P114	1.2	0	43.50112	-79.68908
P115	1.3	0	43.50130	-79.68888
P116	1.2	0	43.50147	-79.68873
P117	1.1	0	43.50123	-79.68872

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POINT	COMBUSTIBLE GAS CONCENTRATION (ppm)	TOTAL HYDROCARBONS CONCENTRATION (ppm)	LATITUDE	LONGITUDE
P118	1.2	0	43.50107	-79.68888
P119	1.1	0	43.50088	-79.68898