



Cross City Tunnel
Stack Emissions Monitoring Report
February 2020

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Executive Summary

Data capture rates can be found in the Summary of Results table on page 5. Explanations for missing data can be found in the Data Validation table on page 6.

There are no data available for VOC parameters from 1/02/2020 to 7/02/2020 due to an instrument fault.
 There are no data available for VOC parameters from 12/02/2020 to 14/02/2020 due to an instrument fault.

There were no readings over the specified limits for the reporting period.

February 2020 Exceedances						
	Unit of measurement	Averaging Period	Total CO	Total NO _x	Total PM ₁₀	Total VOC
Concentration Limit	mg/m ³	1 hour	109	19	1	11
Number of readings over limit			0	0	0	0

Monitored Parameters

The Cross City Tunnel Stack Emissions Monitoring System has been designed to continuously monitor for the following gaseous and particulate parameters:

- CO (Carbon Monoxide)
- NO (Nitrogen Oxide)
- NO₂ (Nitrogen Dioxide)
- NO_x (Total Oxides of Nitrogen)
- Methane
- TNMHC (Total Non-Methane Hydrocarbons)
- PM₁₀ (Particulate matter less than 10 microns in aerodynamic equivalent diameter)
- PM_{2.5} (Particulate matter less than 2.5 microns in aerodynamic equivalent diameter)

Atmospheric parameters also monitored in the stack are:

- Temperature (°C)
- Pressure (kPa)
- Velocity (m/s)
- Relative Humidity (%)

Data are recorded to a data logger at 5 minute averaging periods, calculated from 10 second samples. All data are retrieved periodically, at least once per 24 hours, over a private 3G network, to a central WinCollect database, where data validation is performed to remove any data not deemed as valid. Data validation is performed versus the relevant standard, and/or as per the instrument manufacturers recommended guidelines.

Nightly calibrations for the gaseous analysers are performed between 1:30am and 2:05am. This data is removed from the report automatically, and is not included in the Validation Table.

Parameter	Method	Last Calibration Date	Applicable Standard	Uncertainty
NO NO ₂ NO _x	Chemiluminescence	24/02/2020	AS 3580.5.1	± 0.008 mg/m ³ ± 0.005 mg/m ³ ± 0.005 mg/m ³
CO	Gas filter correlation non-dispersive infrared photometer	24/02/2020	AS 3580.7.1	± 0.029 mg/m ³
Methane TNMHC	Flame Ionisation Detection	24/02/2020	AS 3580.11.1	± 0.0164 mg/m ³
PM ₁₀	Tapered Element Oscillating Microbalance	24/02/2020	AS3580.9/8 AS 4323.2 – 1995	± 3.6% of reading or ± 5µg/m ³ whichever is greater
PM _{2.5}		24/02/2020		± 3.6% of reading or ± 5µg/m ³ whichever is greater
Stack Temperature	Vaisala HMP235a	11/10/2016	US EPA 454-99-005	± 0.25 °C
Stack Pressure	Pitot Tube	-		± 0.3 kPa
Relative Humidity	Vaisala HMP235a	11/10/2016		± 5%
Stack Velocity	Pitot Tube	-	ISO 10780	TBA

Glossary

The following terms may be found throughout this report:

- NO – Nitric Oxide
- NO₂ – Nitrogen Dioxide
- NO_x – Total Oxides of Nitrogen
- CO – Carbon Monoxide
- CH₄ - Methane
- PM₁₀ – Particulate Matter of 10 microns or less (aerodynamic equivalent diameter)
- PM_{2.5} – Particulate Matter of 2.5 microns or less (aerodynamic equivalent diameter)
- MET – Methane
- TNMHC – Total Non Methane Hydrocarbons
- VOC – Volatile Organic Compounds
- ppb – Parts Per Billion
- ppm – Parts Per Million
- µg/m³ – micrograms per cubic meter
- mg/m³ – milligrams per cubic meter
- m/s – meters per second
- m³/s – cubic meters per second
- kg/hr – kilograms per hour
- g/5min – grams per 5 minutes

Summary of results

February 2020 Summary

Tonnes per month (5 minute data)

	NO	NO ₂	NO _x	CO	PM _{2.5}	PM ₁₀	Met.	TNMHC
Tonnes (Corrected)	0.493	0.032	0.783	2.111	0.028	0.036	0.803	0.187
Tonnes (Measured)	0.472	0.031	0.749	2.019	0.028	0.036	0.553	0.128
Available Data Points	7986	7986	7986	7986	8282	8282	5749	5749
Total Data Points	8352	8352	8352	8352	8352	8352	8352	8352
Capture Rate (%)	98.0	98.0	98.0	98.0	99.2	99.2	71.2	71.2

Tonnes per month (1 hr data)

	NO	NO ₂	NO _x	CO	PM _{2.5}	PM ₁₀	Met.	TNMHC
Tonnes (Corrected)	0.481	0.031	0.765	1.647	0.028	0.036	0.800	0.183
Tonnes (Measured)	0.475	0.031	0.756	1.628	0.028	0.036	0.569	0.130
Available Data Points	688	688	688	688	692	692	495	495
Total Data Points	696	696	696	696	696	696	696	696
Capture Rate (%)	98.9	98.9	98.9	98.9	99.4	99.4	71.1	71.1

Average hourly concentrations

	NO(mg/m ³)	NO ₂ (mg/m ³)	NO _x (mg/m ³)	CO(mg/m ³)	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	Met. (mg/m ³)	TNMHC (mg/m ³)
Minimum	0.01	0.00	0.05	0.00	0.00	0.00	1.01	0.02
Maximum	1.95	0.65	3.08	5.79	134.47	189.32	1.52	0.81
Average	0.72	0.05	1.14	2.45	40.02	51.99	1.16	0.27

Validation Table

February 2020 Data Validation					
Start Date	End Date	Affected Parameters	Reason for Change	Changed By	Date
1/02/2020 00:00	24/02/2020 13:30	NO, NO2, NOx	Multiplier applied to data; Multiplier A: 0.898312, multiplier B: 0.898312;	TA	8/03/2020
1/02/2020 00:00	7/02/2020 11:40	CH4, NMHC	Instrument fault	TA	8/03/2020
7/02/2020 11:45	7/02/2020 14:25	CO, NO, NO2, NOx, CH4, NMHC	Maintenance	TA	8/03/2020
7/02/2020 14:30	29/02/2020 23:55	CH4	Multiplier applied to data; Multiplier A: 0.924321, multiplier B: 0.924321;	TA	8/03/2020
7/02/2020 14:30	29/02/2020 23:55	CH4	Offset applied to data; Offset A: 0.1, Offset B: 0.1;	TA	8/03/2020
12/02/2020 23:50	14/02/2020 12:45	CH4, NMHC	Instrument fault	TA	8/03/2020
14/02/2020 12:50	14/02/2020 16:55	CO, NO, NO2, NOx, CH4, NMHC, PM2.5, PM10	Maintenance	TA	8/03/2020
24/02/2020 13:35	24/02/2020 16:10	CO, NO, NO2, NOx, CH4, NMHC	Maintenance	TA	8/03/2020

This table identifies any data removed which is not automatically removed due to overnight calibration checks which are performed from 1:30 AM to 2:05 AM