16 May 2014

AMEC Project No.: TY126001

Goldcorp Canada Limited
Porcupine Gold Mines
4315 Gold Mine Road
Timmins ON P0N 1H0

Attention: Ms. Kathy-Lynn Morrish
Environmental Compliance Coordinator

Dear Ms. Morrish

Re: Air Quality Monitoring Program
Annual Summary Report – 2013
Timmins, Ontario

AMEC Environment and Infrastructure, a division of AMEC Americas Limited (AMEC), is pleased to submit to Goldcorp Canada Limited (Goldcorp) the annual summary report for the data collected in 2013 from the air quality monitoring program undertaken in the City of Timmins at the following sampling locations with non-continuous samplers: near the Extendicare Facility, the Mattagami River Conservation Area office, the Shania Twain Tourist Centre and the Claim Post, Aura Lake and Snowmobile Crossing sites.

These sampling stations were operated and maintained by Goldcorp in 2013.

Please contact Ray Potvin at your convenience if you have any questions about the report.

Sincerely,

AMEC Environment and Infrastructure,
A Division of AMEC Americas Limited

Ray Potvin, MSc. P. Eng
Air Quality Specialist

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Senior Air Quality Management Specialist

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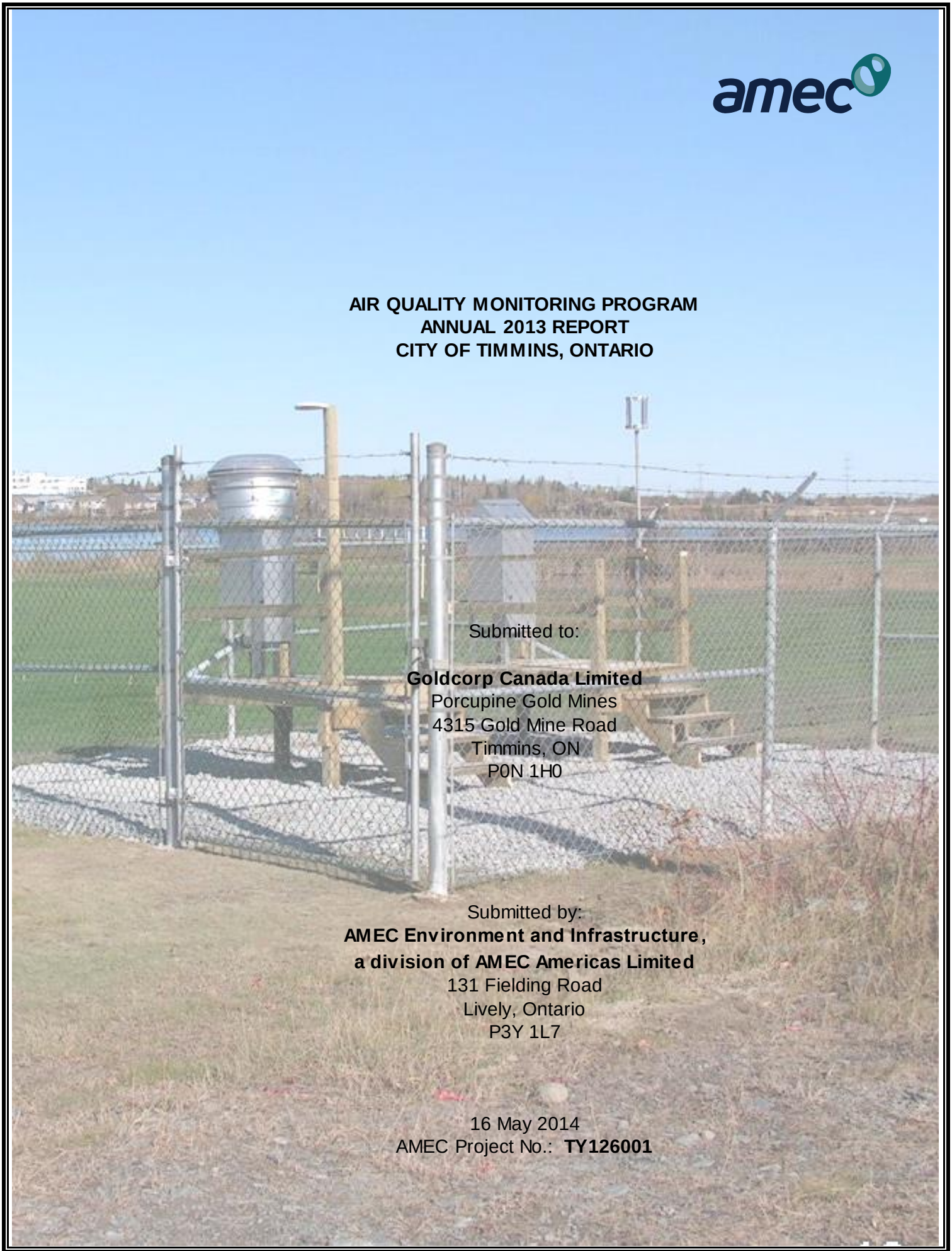

AIR QUALITY MONITORING PROGRAM
ANNUAL 2013 REPORT
CITY OF TIMMINS, ONTARIO

Submitted to:

Goldcorp Canada Limited
Porcupine Gold Mines
4315 Gold Mine Road
Timmins, ON
P0N 1H0

Submitted by:
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AMEC Project No.: **TY126001**

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1.0 INTRODUCTION

AMEC Environment and Infrastructure, a division of AMEC Americas Limited (AMEC) is pleased to provide a summary of the 2013 results for the air quality monitoring program undertaken in the City of Timmins for Goldcorp Canada Limited (Goldcorp) in relation to the Hollinger Open Pit Mine Project. Goldcorp staff operated and maintained the sampling stations and AMEC provided technical guidance to Goldcorp field staff and liaison with the laboratories as required, and prepared the quarterly data summary reports.

This report summarizes the results obtained with non-continuous samplers in 2013 at stations in the vicinity of the Extendicare Facility, the Mattagami River Conservation Area Office, the Shania Twain Tourist Centre and the Claim Post site. The dustfall data from the Aura Lake and Snowmobile Crossing stations, commissioned in October 2013, are also included.

This report also provides trend analyses for the period 2010 to 2013 for the Extendicare Facility, the Mattagami River Conservation Area Office and the Shania Twain Tourist Centre sites.

2.0 BACKGROUND

As part of the Hollinger Open Pit Mine Project in Timmins, AMEC provided to Goldcorp and to the Ministry of the Environment (Ministry) a monitoring plan to collect baseline air quality data near the mine site (hereafter called the Site). The plan was approved in late summer of 2009 and three air quality sampling stations (near the Extendicare Facility, the Mattagami River Conservation Area Office, and the Shania Twain Tourist Centre) were commissioned in November 2009. The purpose of the baseline monitoring program was to obtain an air quality data base near residential areas adjacent to the Site during the pre-operational period of the project.

Field operations at the Site were initiated in 2013 with the removal of overburden and trial blasts in preparation for the construction of the berm on the Site perimeter.

3.0 SAMPLING STATION LOCATIONS

The locations of the sampling stations in operation in 2013 are shown on the aerial photo in Appendix A. The three monitoring locations established in November were chosen so as to 'triangulate' the sectors near the Site and thus provide optimum coverage of the most populated areas. Prevailing wind patterns were also considered in the selection of the sites.

The chosen locations for these sampling stations are as follows in relation to the Site:

1. West Station: on the Shania Twain Road and just west, northwest of the Shania Twain Tourist Centre.
2. Northeast Station: just south of the Extendicare Facility located in the community of Schumacher.
3. Northwest Station: south of Gilles Lake near the Mattagami River Conservation Authority (MRCA) office.

In September 2012, a dustfall sampler was installed at the Claim Post site. In October 2013, dustfall sampling was initiated at the Aura Lake and Snowmobile Crossing sites. These stations were added to better assess the possible impact of dust emissions from the proposed haul road.

During the fourth quarter of 2013, the Extendicare Facility and the Shania Twain Tourist Centre sampling stations were relocated to nearby sites established for the real-time monitors.

Photos of the sampling stations are provided in Appendix B.

4.0 FIELD SAMPLING, ANALYTICAL METHODS AND INSTRUMENTATION

The field sampling and analytical methods for Total Suspended Particulates (TSP), Inhalable Particulates (PM_{10}) and total dustfall have been described in detail in previous quarterly and annual reports and are unchanged. Magnesium (reported as magnesium oxide) was added to the list of elements for the TSP and PM_{10} samples, effective 1 October 2013.

Due to a change in the sampling and analytical methodology, passive sampling for sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) was interrupted for April at all sites. As of May, passive sampling uses Radiello® passive/diffusive samplers which has been used for environmental monitoring, ambient and outdoor air monitoring, industrial hygiene, industrial air quality (IAQ), personal sampling and breathing zone assessment. The radial design offers higher capacity and faster uptake/sampling rates than traditional passive monitors. It has been used in Europe for over a decade. The technology is recognized by the USEPA, but at this time there is no “approved” status. However, it is used in three large EPA studies. This technology is currently used in ambient air quality studies for the Government of Alberta and Saskatchewan.

The passive samples were previously analyzed with a methodology developed, approved and validated by Alberta Environment with the support of the Alberta Research Council, the Clean Air Strategic Alliance of Alberta, and the National Research Council of Canada.

5.0 FIELD SAMPLING OPERATIONS

For routine operations, the sites were visited for each hi-vol filter change to meet the requirements of the 1 in 6 day sampling schedule. Additional visits were made to change hi-vol motors for re-brushing, resolve instrumentation issues, perform flow calibration checks and preventative maintenance, and witness audits performed by the Ministry. The dustfall and passive samplers were changed monthly, coinciding as close as possible to the beginning of a month.

The field operations were described in detail in the 2013 quarterly reports. The highlights are as follows:

- Due to unacceptable failure rates, all the brushless hi-vol motors that had been installed in 2012 were replaced with standard brushed motors during the first quarter.

- The PM_{10} data from 15 February to 22 April for the Extendicare PM_{10} sampler was corrected based on the flow calibration check undertaken by Goldcorp staff on 25 April, 2013.
- The Ministry performed hi-vol flow audits on 16 May and 19 September, and in both instances the ±10% flow criterion was met.
- The electronic BGI flow calibrator was sent by Goldcorp staff to the manufacturer for re-certification to NIST traceability in December 2013. The overall uncertainty of the calibrator was determined to be 0.60%, with an error of 0.25% in the flow at standard conditions (Q_s) relative to the EPA standard.

6.0 RESULTS

The results for the 2013 sampling program are presented in Appendix C-1 for the hi-vol data, Appendix C-2 for the dustfall data and Appendix C-3 for the passive SO_2 and NO_2 data. By convention, all results below the analytical detection limit were reported at half the detection limit. Iron (Fe) in the TSP and PM_{10} particulate samples is reported conservatively as ferric oxide (Fe_2O_3). Some of the iron may not be in the form of ferric oxide. Magnesium (Mg) is reported as magnesium oxide (MgO) due to its high reactivity in air with oxygen. Sulphur is reported as sulphate (SO_4), on the assumption that all the sulphur in the sulphate form. This again is a conservative estimate.

For comparison purposes, the O. Reg.419/05 Schedule 3 Standard 24-hour values are presented. Schedule 3 values came into effect on February 1, 2010 for the mining and smelting sectors. For cadmium and its compounds, the standard of 0.025 µg/m^3 became effective on 1 February 2013. Section 20 guidelines under O.Reg. 419/05 for 24-hour averages are also presented. Also included for comparison are the 24-hour Ambient Air Quality Criteria (AAQCs) for elements in TSP and the annual AAQC for nickel in TSP, effective April 2012. AAQCs are desirable concentrations in air based on the protection of health and the environment. They are used in environmental assessments, special studies and for the assessment of general air quality.
The Ministry also has an interim AAQC for PM_{10}. In April 2012, it introduced a 24-hour average AAQC for manganese and its compounds (0.2 µg/m^3), for nickel and its compounds (0.1 µg/m^3) and an annual AAQC for nickel and its compounds (0.02 µg/m^3), all in the PM_{10} fraction.

A summary of the statistical analysis for 2013 for the TSP and PM_{10} particulate concentrations is presented in Table 1 below. In 2013, the 1 in 6 day hi-vol sampling schedule comprised a possible total of 61 sampling days.

A summary of the statistical analysis for 2013 for the total dustfall results is presented in Tables 5a and 5b, and for the SO_2 and NO_2 results in Table 7 below.

6.1 Total Suspended and Inhalable Particulates

The geometric and arithmetic mean TSP and PM_{10} concentrations in 2013 were higher at the MRCA station, followed by the Shania twain and Extendicare Facility stations. The differences in the means between locations varied from about 2 to7 µg/m^3. The annual geometric means for

TSP were well below the Ministry AAQC of 60 µg/m^3 with values ranging from 11.2 (Extendicare Facility) to 15.0 µg/m^3 (MRCA). The 90th and 95th percentiles show that more of the higher values were measured at the MRCA site. The highest 24-hour TSP concentration was 107 µg/m^3 (MRCA site on 28 May), such that there no exceedences of the Schedule 3 TSP standard of 120 µg/m^3. The highest 24-hour PM_{10} concentration was 50 µg/m^3 (MRCA site on 28 May) which is equal to the PM_{10} 24-hour interim AAQC of 50 µg/m^3.

Three (3) TSP/PM_{10} sample pairs had PM_{10} concentrations greater than the TSP concentrations. The results were confirmed as being correct by the laboratory. In the absence of additional information to determine which result was suspect, the PM_{10} results were invalidated. Five (5) sample results are not available due to instrumentation problems and seven (7) samples were invalidated due to filter issues. Overall for the three stations in 2013, the % valid data was 95.9% (351/366), which is above the Ministry minimum target of 90% and desirable target of 95%. The Shania Twain station had the lowest % valid data record with 90% for TSP.

Approximately one third of the TSP samples and one fifth of the PM_{10} samples were analyzed for the targeted elements listed in Appendix C-1. At the three (3) sampling locations, the following elements were usually reported below their method detection limit: As, Cd, Co, Ni, Se and V. Cr was detected for 20% to 50% of the samples, whereas Pb was detected at slightly over half the samples. Cu, Fe, Mg, Mn, S and Zn were usually above their detection limit. Cu is known to be emitted from the armature of the hi-vol motors with brushes whereas Fe, Mg, S and Zn are naturally occurring crustal elements. The 'detectable' elements such as Cr, Pb, Cu, Fe (reported as ferric oxide), Mg (reported as MgO) and Mn in the TSP and PM_{10} samples had 24-hour maximum concentrations much lower than the Ministry standards, guidelines and AAQCs. Annual average concentrations were not reported for the elements with 50% or more of the results below their method detection limit. This was the case for Cd and Ni in TSP and Ni in PM_{10} that have annual AAQCs.

Table 1: Summary Statistics for the 2013 TSP and PM_{10} Particulate Data

	Extendicare Facility		MRCA Site		Shania Twain Site	
Statistic	**TSP**	**PM_{10}**	**TSP**	**PM_{10}**	**TSP**	**PM_{10}**
Annual geometric mean ($\mu g/m^3$)	11.2	6.0	15.0	8.1	12.5	7.4
Annual arithmetic mean ($\mu g/m^3$)	17.4	9.6	23.8	12.7	19.0	10.7
Maximum 24 hour ($\mu g/m^3$)	65	29	107	50	65	36
90^{th} Percentile	38.9	21.4	51.0	26.3	39.0	20.6
95^{th} Percentile	45.8	26.0	67.0	36.1	48.5	27.6
No. of valid samples	58	59	61	60	55	58
% valid data	95	97	100	98	90	95
No. samples> Sch. 3 (TSP)	0	n/a	0	n/a	0	n/a
No. samples> Sch. 3 (TSP metals)	0	n/a	0	n/a	0	n/a
No. samples> Section 20 guideline (TSP metals)	0	n/a	0	n/a	0	n/a
No. samples> Annual AAQC (TSP)	0	n/a	0	n/a	0	n/a
No. samples> 24 hr AAQC (TSP metals))	0	n/a	0	n/a	0	n/a
No. samples> 24 hr AAQC (PM_{10} metals))	n/a	0	n/a	0	n/a	0
No. samples> 24 hour AAQC (PM_{10} metals)	n/a	0	n/a	0	n/a	0

The concentrations of elements in PM_{10} were always lower than in the respective TSP samples.

Table 2 provides a summary of the annual TSP results from 2010 to 2013. The annual means were higher at the three locations in 2010 and lower in 2012 and 2013. The results suggest a small downward trend in the annual means for the four-year period at the three stations. However more data is required to support this observation. For the four-year period, on average, the TSP concentrations were higher at the MRCA office location. The higher concentrations at that site likely reflect particulate matter contributions from nearby sources in the commercial area. These include traffic emissions and significant open spaces and parking lots from which dust re-suspension could occur under dry and windy conditions. The annual geometric means were well below the Ministry AAQC of 60 $\mu g/m^3$. The lowest average concentrations for the four-year period were recorded at the Extendicare Facility station.

There were only two (2) exceedences of the 24-hour Schedule 3 standard: one in 2010 at the Shania Twain station and the other in 2012 at the Extendicare Facility station. It was noted that there were drilling activities on the day of the exceedence in the area of the Extendicare Facility site. There were no exceedences of any standard, guideline or AAQC for metals in TSP. On an annual basis, the % valid data was at least 90%.

Table 3 provides a summary of the annual PM_{10} results from 2010 to 2013. For the four-year period, on average, the PM_{10} concentrations were slightly higher at the MRCA office location. As for TSP, the annual means were higher at the three locations in 2010. The evidence of a downward trend in the annual means is less than that of TSP. During the four-year period, there were five (5) exceedences of the 24-hour interim AAQC: one in 2010 at the Shania Twain station, one in 2010 and two in 2011 at the MRCA Office station and one in 2012 at the Extendicare Facility station. There were no exceedences of the 24-hour AAQC for manganese and nickel in PM_{10} which were introduced by the Ministry in April 2012. On an annual basis, the % valid data was at least 93%.

Table 4 shows the seasonal variability in the TSP and PM_{10} concentrations estimated from the composite quarterly means for the period 2010 to 2013. The results indicate that the highest quarterly means for both dust size fractions and for the three sites were recorded in the second and third quarters. The lowest quarterly means were obtained in the fourth quarter. In the absence of snow cover and under generally drier conditions, natural sources of dust would be expected to be higher during the second and third quarters.

Table 2: Summary Statistics for the 2010 to 2013 TSP Particulate Data

	Extendicare Facility				MRCA Site				Shania Twain Site			
Statistic	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**
Annual geometric mean (µg/m^3)	20	14	15	11	28	20	15	15	25	16	14	13
Four- year geometric mean (µg/m^3)	15				22				17			
Annual arithmetic mean (µg/m^3)	25	18	23	17	34	27	23	24	31	21	20	19
Four- year arithmetic mean (µg/m^3)	21				27				23			
Maximum 24 hour (µg/m^3)	110	78	129	65	88	85	87	107	121	65	81	65
90th Percentile	45	32	47	39	64	54	48	51	53	38	42	39
95th Percentile	54	38	730	46	74	58	64	67	58	49	51	49
No. of valid samples	59	57	61	58	59	60	61	61	61	61	61	55
% valid data	97	93	100	95	97	98	100	100	100	100	100	90

	Extendicare Facility				MRCA Site				Shania Twain Site			
Statistic	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**
No. samples> Sch. 3 (TSP)	0	0	1	0	0	0	0	0	1	0	0	0
No. samples> Sch. 3 (TSP metals)	0	0	0	0	0	0	0	0	0	0	0	0
No. samples> Section 20 guideline (TSP metals)	0	0	0	0	0	0	0	0	0	0	0	0
Exceedence of Annual AAQC (TSP)	0	0	0	0	0	0	0	0	0	0	0	0
Exceedence of 24 hr AAQC (TSP metals)	0	0	0	0	0	0	0	0	0	0	0	0

Table 3: Summary Statistics for the 2010 to 2013 PM_{10} Particulate Data

	Extendicare Facility				MRCA Site				Shania Twain Site			
Statistic	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**
Annual geometric mean ($\mu g/m^3$)	11	8	7	6	14	10	7	8	14	6	8	7
Four- year geometric mean ($\mu g/m^3$)	8				10				9			
Annual arithmetic mean ($\mu g/m^3$)	13	13	10	10	18	15	11	13	17	11	11	11
Four- year arithmetic mean ($\mu g/m^3$)	12				14				13			
Maximum 24 hour ($\mu g/m^3$)	49	44	60	29	53	59	38	50	57	46	42	36
90^{th} Percentile	26	23	22	21	39	24	27	26	30	21	21	21
95^{th} Percentile	29	24	28	26	42	26	31	36	38	24	31	28
No. of valid samples	60	60	58	59	61	61	57	60	59	61	58	58
% valid data	98	98	95	97	100	100	93	98	97	100	95	95
No. samples> 24 hr AAQC (PM_{10})	0	0	1	0	1	2	0	0	1	0	0	0
No. samples> 24 hour AAQC (PM_{10} elements)	-	-	0	0	-	-	0	0	-	-	0	0
No. samples>Annual AAQC (PM_{10} metals)	n/a	n/a	0	0	n/a	n/a	0	0	n/a	n/a	0	0

Table 4: Seasonal Variability in the 2010 to 2013 TSP and PM_{10} Levels

2010 - 2013	Q1		Q2		Q3		Q4	
Station	TSP	PM_{10}	TSP	PM_{10}	TSP	PM_{10}	TSP	PM_{10}
Extendicare Facility	15	10	29	14	27	17	12	6
MRCA Office	20	12	37	17	34	18	17	9
Shania Twain	16	11	34	16	28	18	13	7

6.2 Total Dustfall

The monthly total dustfall results for 2013 are shown in Appendix C-2. Table 5a below presents a summary of the results for Extendicare Facility, MRCA Office and Shania Twain stations. The annual average total dustfall values were essentially similar at the three stations, ranging from 1.2 to 1.4 g/m^2/30days. The percent valid data was 100%.

In 2013, there were no exceedences of the Ministry monthly standard (7.0 g/m^2/30 days). The maximum value was 4.3 g/m^2/30days and recorded at the MRCA station.

On average, the insoluble portion (such as road dust and other inorganic particulate matter not readily soluble in water) was substantially less than the soluble portion of the total dustfall material collected. This is consistent with previous data collected at these stations.

Much of the soluble portion of dustfall could be particulate sulphate and nitrate compounds which are well known components of acid rain and acid deposition and are transported large distances from outside the area. There likely are other particulate materials contributing to the soluble fraction such as biological matter. The total dustfall levels were generally higher at the three stations during the period April to October (see Appendix C-2) when the potential for dusting is greater from exposed ground surfaces such as parking lots, streets and parklands.

Table 5b below presents a summary of the results for the Claim Post, Aura Lake and Snowmobile Crossing stations. The annual mean for the Claim Post station was 2.0 g/m^2/30days. The maximum was 4.1 g/m^2/30days which is well below the Ministry monthly standard (7.0 g/m^2/30 days). Since the stations were established in October, the means for the Aura Lake and Snowmobile Crossing stations are for the October to December period. For that period, there were no exceedences of the Ministry monthly standard. There was no loss of data for the three stations.

Table 5a: Summary Statistics for the 2013 Total Dustfall Data

	Extendicare Facility			MRCA Site			Shania Twain Site		
Statistic	Insol	Sol	Total	Insol	Sol	Total	Insol	Sol	Total
Mean ($g/m^2/30d$)	0.43	0.84	1.3	0.50	0.95	1.4	0.39	0.84	1.2
Max. ($g/m^2/30d$)	1.30	3.10	3.9	1.40	3.40	4.3	1.20	2.70	3.7
No.>Sch.3 Std	n/a	n/a	0	n/a	n/a	0	n/a	n/a	0
No.valid samples	12	12	12	12	12	12	12	12	12
Annual % Valid data	100	100	100	100	100	100	100	100	100

Table 5b: Summary Statistics for the 2013 Total Dustfall Data

	Claim Post[a]			Aura Lake[b]			Snowmobile Crossing[b]		
Statistic	Insol	Sol	Total	Insol	Sol	Total	Insol	Sol	Total
Mean ($g/m^2/30d$)	0.96	1.00	2.0	0.47	0.60	1.1	0.75	0.64	1.4
Max. ($g/m^2/30d$)	3.00	2.60	4.1	1.10	0.74	1.7	1.30	0.88	2.0
No.>Sch.3 Std	n/a	n/a	0	n/a	n/a	0	n/a	n/a	0
No.valid samples	12	12	12	3	3	3	3	3	3
Annual % Valid data	100	100	100	100	100	100	100	100	100

[a] Sampling initiated in September 2012 [b] Sampling initiated in October 2013

For the Claim Post, Aura Lake and Snowmobile Crossing stations, the insoluble portion of total dustfall was essentially the same as the soluble portion. More data is required to better determine the relative contribution of each portion.

The 2010 to 2013 summary statistics for the dustfall results are shown in Table 6 for the three stations established in late 2009. The highest four-year mean was recorded at the MRCA Office station (2.5 g/m^2/30 days), followed closely by the Shania Twain station (2.3 g/m^2/30 days). The lowest four-year mean was recorded at the Extendicare Facility station (1.8 g/m^2/30 days). There was no obvious trend in the annual dustfall levels. However the highest annual means for the three stations were recorded in 2010 and 2012, and the lowest annual means were recorded in 2013, again for the three stations. The Environment Canada climate data for the Timmins area

shows much higher total precipitation amounts in 2013 compared to 2010, 2011 and 2012. This would explain, at least in part, the lower dustfall levels in 2013.

A total of eight (8) exceedences (two at the Extendicare Facility, and three at each of the MRCA and Shania Twain stations) were recorded from 135 samples collected during the four-year period. This represents an exceedence rate of 5.9%.

For the four-year period, the mean insoluble portion of dustfall was 34%, 42% and 41% of the total dustfall at the Extendicare Facility, MRCA Office and Shania Twain stations respectively.

Table 6: Summary Statistics for the 2010 to 2013 Total Dustfall Data

	Extendicare Facility				MRCA Site				Shania Twain Site			
Statistic	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**
Annual average (g/m^2/30days)	2.1	1.4	2.2	1.3	2.9	2.6	3.1	1.4	2.8	2.2	3.0	1.2
Four-year average (g/m^2/30days)	1.8				2.5				2.3			
Maximum value (g/m^2/30days)	7.3	4.1	8.1	3.9	7.8	7.8	14.2	4.3	13.1	6.5	11.9	3.7
No. samples > Sch. 3 Std (7.0 g/m^2/30days)	1(Dec)	0	1(Aug)	0	1(July)	1(Jun)	1(Aug)	0	1(Jun)	0	2(June Aug)	0
No. of valid samples	11	10	12	12	10	10	12	12	11	11	12	12
% valid data	92	83	100	100	83	83	100	100	92	92	100	100
Average % insoluble fraction	35	26	43	33	56	41	36	36	53	32	46	33
Average % insoluble fraction	34				42				41			

6.3 Passive SO_2 and NO_2

As explained earlier, sampling was disrupted in April due to a change in the sampling and analytical methods. Consequently 11 months of data are available with a valid data record of 92%.

The annual mean SO_2 concentration for 2013, as shown in Table 7, was essentially identical at all stations with values ranging from 0.2 to 0.3 ppb. As seen in Appendix C-3, in most instances the background SO_2 concentrations were typically somewhat higher during the colder months presumably due to the combustion of sulphur-bearing fuels and poorer air dispersion.

The mean NO_2 concentration was slightly higher at the MRCA Office (1.4 ppb) and Shania Twain (1.5 ppb) stations compared to the mean concentration at the Extendicare Facility (1.0 ppb). The NO_2 concentrations were more variable than SO_2 with the seasons and the variability was site-dependent. However, some of the higher values were recorded in the colder months, suggesting some seasonal dependency to the heating seasons. In addition to emissions from heating sources, traffic emissions also likely contributed to the background levels due to poorer air dispersion in the colder months.

Table 7: Summary Statistics for the 2013 Passive SO_2 and NO_2 Data

	Extendicare Facility		MRCA Site		Shania Twain Site	
Statistic	**SO_2**	**NO_2**	**SO_2**	**NO_2**	**SO_2**	**NO_2**
Mean (ppb)	0.2	1.0	0.2	1.4	0.3	1.5
NO_2/SO_2	5.0		7.0		5.0	
Max. (ppb)	0.4	2.3	0.7	3.7	0.8	3.4
No. valid samples	11[a]	11[a]	11[a]	11[a]	11[a]	11[a]
% Valid data	92	92	92	92	92	92

[a] Sampling disrupted in April due to a sampling and analytical method change

For the three stations in 2013, the mean concentration of NO_2 was consistently higher than the concentration of SO_2, with annual NO_2/SO_2 ratios ranging from 5.0 to 7.0. This is consistent with the results from previous years.

Tables 8 and 9 provide a summary of the passive SO_2 and NO_2 data collected during the period 2010 to 2013. The four-year SO_2 mean was essentially identical at the three stations with concentrations of 0.3 and 0.4 ppb, and no obvious trend in the annual means. For NO_2, the four-year average was higher at the MRCA Office station (2.8 ppb), followed by the Shania Twain station (2.4 ppb) and the Extendicare Facility station (1.4 ppb).

Table 8: Summary Statistics for the 2010 to 2013 Passive SO_2 Data

	Extendicare Facility				MRCA Site				Shania Twain Site			
Statistic	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**
Annual mean (ppb)	0.2	0.3	0.4	0.2	0.2	0.3	0.4	0.2	0.2	0.4	0.5	0.3
Maximum value (ppb)	0.4	0.7	0.9	0.4	0.3	0.9	0.8	0.7	0.4	1.1	1.0	0.8
No. of valid samples	12	12	12	11	12	12	12	11	11	12	12	11
% valid data	100	100	100	92	100	100	100	92	92	100	100	92
Four- year mean (ppb)	0.3				0.3				0.4			

Table 9: Summary Statistics for the 2010 to 2013 Passive NO_2 Data

	Extendicare Facility				MRCA Site				Shania Twain Site			
Statistic	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**	**2010**	**2011**	**2012**	**2013**
Annual mean (ppb)	1.7	1.6	1.3	1.0	3.5	3.2	3.2	1.4	2.6	2.6	2.7	1.5
Maximum value (ppb)	2.6	3.6	3.0	2.3	4.2	5.9	12.2	3.7	4.3	7.3	12.2	3.4
No. of valid samples	12	12	12	11	12	12	12	11	11	12	12	11
% valid data	100	100	100	92	100	100	100	92	92	100	100	92
Four- year mean ppb)	1.4				2.8				2.4			
Four-year mean (NO_2/SO_2)	4.7				9.3				6.0			

There is no obvious annual trend in the mean NO_2 concentrations for the three stations for the period 2010-2013. However, the NO_2 concentration in 2013 was lower at all the stations. It could be speculated that the cooler and wetter climate in 2013 could have had an influence in the resulting lower NO_2 concentrations. For the four-year period, the mean concentration of NO_2 was higher than the concentration of SO_2 by a factor ranging from about 5 (Extendicare Facility) to over 9 (MRCA Office site). The higher NO_2 concentrations at the MRCA station probably result from the impact of nearby traffic emissions.

There are no Ministry standards, guidelines or AAQCs for SO_2 and NO_2 data obtained from passive samplers. The Ministry has an annual AAQC for SO_2 of 20 ppb for data obtained using continuous analyzers. Using this value as a basis of comparison, the range of annual SO_2 concentrations of 0.2 ppb to 0.5 ppb obtained from passive sampling are substantially lower than the annual AAQC. The Ministry does not have a 30-day or annual AAQC for NO_2. The passive data will be used for trend analysis during the different phases of the project and as a screening tool to assess whether continuous sampling of SO_2 could be warranted in the future. The passive NO_2 data will complement the real-time data from several stations equipped with continuous NO_2 analyzers commissioned during 2013.

7.0 CONCLUSIONS

The results show that as in 2013, the concentrations of particulate matter, as determined from measurements of TSP, PM_{10} and total dustfall during the period 2010 to 2103 can be impacted by existing background sources to the point where at times, Ministry standards, guidelines and AAQCs are marginally exceeded.

There were no exceedences of any Ministry standard, guideline and AAQC in 2013 for TSP and PM_{10}, as well as for their constituents. For the period 2010 to 2013, the annual geometric mean levels of TSP and PM_{10} seem to be trending downward. Since 2010, there have been only two exceedences of the TSP 24-hour standard from a data base of 714 samples (0.3% exceedence rate), and no exceedences of the annual standard. There have been five exceedences of the 24-hour PM_{10} AAQC from a data base of 712 samples (exceedence rate of 0.7%). The annual mean TSP and PM_{10} concentrations have been consistently higher at the MRCA station.

As in 2010, 2011 and 2012, in 2013 the concentration of elements, such as heavy metals, were observed to be quite low in both the TSP and PM_{10} samples and well below Ministry standards, guidelines and AAQCs. A number of the elements continued to have concentrations consistently below their method detection limit.

In 2013, there were no exceedences of the Ministry monthly standard for total dustfall. Since 2010, there have been eight exceedences recorded from 135 samples. This represents an exceedence rate of 5.9%.

The highest four-year mean was recorded at the MRCA Office station (2.5 $g/m^2/30$ days), followed closely by the Shania Twain station (2.3 $g/m^2/30$ days). The lowest four-year mean was recorded

at the Extendicare Facility station (1.8 g/m^2/30 days). There was no obvious trend in the annual dustfall levels. However the highest annual means for the three stations established in late 2009 were recorded in 2010 and 2012, and the lowest annual means were recorded in 2013, again for the three stations. The Environment Canada climate data for the Timmins area shows much higher total precipitation amounts in 2013 compared to 2010, 2011 and 2012. This would explain, at least in part, the lower dustfall levels in 2013.

For most samples, with some exceptions, the soluble portion of dustfall was higher than the insoluble portion, suggesting that the contributions to total dustfall measurements were mostly from sources other than road traffic or construction activities. For the four-year period, the mean insoluble portion of dustfall was 34%, 42% and 41% of the total dustfall at the Extendicare Facility, MRCA Office and Shania Twain stations respectively.

From a very limited data base, there were no exceedences of the Ministry monthly total dustfall standard at the Claim Post, Aura Lake and Snowmobile Crossing stations. In addition, it appears that the insoluble portion of the total dustfall at these locations is very similar to the soluble portion, unlike the results from the three stations commissioned in late 2009.

The concentrations of SO_2 and NO_2 recorded in 2013, determined from passive sampling, continue to reflect the low background values in the area. The levels of NO_2 were consistently higher than those of SO_2 and in some instances, as for SO_2, displayed a seasonal pattern with higher values during the colder seasons. There is no obvious annual trend in the mean NO_2 concentrations for the three stations for the period 2010-2013. However, the NO_2 concentration in 2013 was lower at all the stations. It could be speculated that the cooler and wetter climate in 2013 could have had an influence in the resulting lower NO_2 concentrations.

For the four-year period, the mean concentration of NO_2 was higher than the concentration of SO_2 by a factor ranging from about 5 (Extendicare Facility) to over 9 (MRCA Office site). The higher NO_2 concentrations at the MRCA station probably result from the impact of nearby traffic emissions and from other sources in the commercial area near the MRCA Office station.

There are no Ministry standards, guidelines or AAQCs for SO_2 and NO_2 data obtained from passive samplers. The Ministry has an annual AAQC for SO_2 of 20 ppb for data obtained using continuous analyzers. Using this value as a basis of comparison, the range of annual SO_2 concentrations of 0.2 ppb to 0.5 ppb obtained from passive sampling are substantially lower than the annual AAQC. The Ministry does not have a 30-day or annual AAQC for NO_2. The passive data will be used for trend analysis during the different phases of the project and as a screening tool to assess whether continuous sampling of SO_2 could be warranted in the future. The passive NO_2 data will complement the real-time data from several stations equipped with continuous NO_2 analyzers commissioned by Goldcorp during 2013.

The data collected since 2010 provides a solid data base for determining background air quality in the communities of Schumacher and South Porcupine near the Project site. This data can later be used to assess changes in air quality as the Project moves from the construction to the operational phases.

APPENDIX A

Aerial Photo of the Sampling Program Area

Goldcorp Canada Limited
Baseline Air Quality Monitoring Program
Annual 2013 Report
Timmins, Ontario
May 2014

APPENDIX B

Photos of the Sampling Stations

Figure 1: Photo of Air Sampling Station at the MRCA Office Site

Figure 2: Photo of Air Sampling Station at the Shania Twain Road Site

Figure 3: Photo of Air Sampling Station at the Extendicare Facility Site

Figure 4: Photo of Dustfall Sampling Station at the Claim Post Site

APPENDIX C

Appendix C-1: TSP and PM_{10} Sampling Results (2012)

Appendix C-2: Total Dustfall Sampling Results (2012)

Appendix C-3: SO_2 and NO_2 Passive Sampling Results (2012)

Appendix C-1

TSP and PM_{10} Sampling Results (2013)

Extendicare Facility Monitoring Results for TSP and Metals (2013)
(results expressed in µg/m^3)

Date	TSP	As	Cd	Cr	Co	Cu	Fe(Fe_2O_3)	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
January 4, 2013	9	0.0018	0.0006	0.0006	0.0006	0.0028	0.7436	0.0009		0.0063	0.0009	0.0031	0.3610	0.0006	0.0115	1.083
January 10, 2013	4	0.0018	0.0006	0.0006	0.0006	0.0123	0.2297	0.0020		0.0017	0.0009	0.0031	0.2830	0.0006	0.0121	0.849
January 16, 2013	20															
January 22, 2013	7															
January 28, 2013	19	0.0018	0.0006	0.0014	0.0006	0.0191	0.8008	0.0043		0.0049	0.0043	0.0031	0.8750	0.0006	0.0462	2.625
February 3, 2013	1.5															
February 9, 2013	no sample															
February 15, 2013	11	0.0018	0.0006	0.0013	0.0006	0.0197	0.4833	0.0009		0.0038	0.0009	0.0031	0.2100	0.0006	0.0322	0.630
February 21, 2013	4															
February 27, 2013	6															
March 5, 2013	6	0.0018	0.0006	0.0006	0.0006	0.0304	0.1599	0.0009		0.0017	0.0009	0.0031	0.3090	0.0006	0.0122	0.927
March 11, 2013	4															
March 17, 2013	4															
March 23, 2013	1.5	0.0018	0.0006	0.0006	0.0006	0.0209	0.1290	0.0009		0.0011	0.0009	0.0031	0.1060	0.0006	0.0133	0.318
March 29, 2013	11															
April 4, 2013	20															
April 10, 2013	23	0.0018	0.0006	0.0014	0.0006	0.0351	1.6388	0.0009		0.0116	0.0018	0.0031	0.3450	0.0006	0.0260	1.035
April 16, 2013	10															
April 22, 2013	18															
April 28, 2013	17	0.0018	0.0006	0.0006	0.0006	0.0132	0.7350	0.0035		0.00776	0.0009	0.0031	1.1100	0.0006	0.0126	3.330
May 4, 2013	65															
May 10, 2013	56															
May 16, 2013	26	0.0018	0.0006	0.0006	0.0006	0.0189	1.7217	0.0009		0.0119	0.0009	0.0031	0.2450	0.0006	0.0132	0.735
May 22, 2013	30															
May 28, 2013	41															
June 3, 2013	15	0.0018	0.0006	0.0012	0.0006	0.0159	0.4433	0.0009		0.00406	0.0009	0.0031	0.1170	0.0006	0.0101	0.351
June 9, 2013	44															
June 15, 2013	33															
June 21, 2013	25	0.0018	0.0006	0.0021	0.0006	0.0396	1.5044	0.0009		0.0106	0.0009	0.0031	0.4190	0.0006	0.0148	1.257
June 27, 2013	17															
July 3, 2013	57															
July 9, 2013	23	0.0018	0.0006	0.0016	0.0006	0.0158	0.8094	0.0009		0.0067	0.0009	0.0031	1.070	0.0006	0.0092	3.210
July 15, 2013	38															
July 21, 2013	12															
July 27, 2013	19	0.0018	0.0006	0.0018	0.0006	0.0498	0.6292	0.0020		0.0064	0.0009	0.0031	1.010	0.0006	0.0183	3.030
August 2, 2013	14															
August 8, 2013	15															
August 14, 2013	17	0.0018	0.0006	0.0006	0.0006	0.0207	0.6607	0.0009		0.0048	0.0009	0.0031	0.088	0.0006	0.0097	0.264
August 20, 2013	43															
August 26, 2013	34															

Extendicare Facility Monitoring Results for TSP and Metals (2013)
(results expressed in µg/m^3)

Date	TSP	As	Cd	Cr	Co	Cu	Fe(Fe_2O_3)	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
September 1, 2013	21	0.0018	0.0006	0.0006	0.0006	0.0285	0.3804	0.0009		0.0038	0.0028	0.0031	0.817	0.0006	0.0113	2.451
September 7, 2013	19															
September 13, 2013	14															
September 19, 2013	22	0.0018	0.0006	0.0006	0.0006	0.0267	0.3403	0.0026		0.0040	0.0009	0.0031	1.540	0.0006	0.0137	4.620
September 25, 2013	no sample															
October 1, 2013	33															
October 7, 2013	8	0.0018	0.0006	0.00155	0.0006	0.0160	0.5177	0.0009	0.1444	0.0043	0.0009	0.00305	0.044	0.00155	0.0067	0.132
October 13, 2013	17															
October 19, 2013	3															
October 25, 2013	7	0.0018	0.0006	0.00155	0.0006	0.0147	0.8437	0.0009	0.1212	0.0034	0.0009	0.00305	0.127	0.00155	0.0069	0.381
October 31, 2013	11															
November 6, 2013	4															
November 12, 2013	invalid															
November 18, 2013	13						0.7951									
November 24, 2013	1.5															
November 30, 2013	4	0.0018	0.0006	0.00155	0.0006	0.0073	0.3232	0.0026	0.0697	0.0027	0.0029	0.00305	0.457	0.00155	0.0086	1.371
December 6, 2013	1.5															
December 12, 2013	1.5															
December 18, 2013	4	0.0018	0.0006	0.00155	0.0006	0.0267	0.3117	0.0009	0.0764	0.0023	0.0009	0.00305	0.296	0.00155	0.0081	0.888
December 24, 2013	1.5															
December 30, 2013	3															
Geometric mean	11.2	n/r	n/r	n/r	n/r	0.0186	0.5446	n/r	0.0982	0.0043	n/r	n/r	0.331	n/r	0.0130	0.994
Arithmetic mean	17.4	n/r	n/r	n/r	n/r	0.0217	0.6762	n/r	0.1029	0.0052	n/r	n/r	0.491	n/r	0.0148	1.474
Max. concentration	65.0	n/r	n/r	n/r	n/r	0.0498	1.7217	n/r	0.1444	0.0119	n/r	n/r	1.540	n/r	0.0462	4.620
Min. concentration	1.5	n/r	n/r	n/r	n/r	0.0028	0.1290	n/r	0.0697	0.0011	n/r	n/r	0.044	n/r	0.0067	0.132
90th percentile	38.9															
95th percentile	45.8															
Standard*	120	n/a	0.025*	n/a	n/a	50	25	0.5	120	n/a	2	n/a	n/a	2	120	n/a
No. > Sch. 3 value*	0	n/a	0	n/a	n/a	0	0	0	0	n/a	0	n/a	n/a	0	0	n/a
Guideline	n/a	0.3	n/a	1.5	0.1	n/a	n/a	n/a	n/a	2.5	n/a	10	n/a	n/a	n/a	n/a
No. > guideline	n/a	0	n/a	0	0	n/a	n/a	n/a	n/a	0	n/a	0	n/a	n/a	n/a	n/a
AAQC (24 h)	n/a	0.3	0.025	0.5	0.1	50	25	0.5	120	0.4	0.2	10	n/a	2	120	n/a
No. > AAQC (24 h)	n/a	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0	n/a
Annual AAQC	60	n/a	0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.04	n/a	n/a	n/a	n/a	n/a
No. > Annual AAQC	0	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
No. of valid samples	58	20	20	20	20	20	21	20	4	20	20	20	20	20	20	20
No. samples < mdl	6	20	20	9	20	0	0	14	0	0	16	20	0	16	0	0
Detection limit	3	0.0036	0.0012	0.0012	0.0012	0.0012	0.0061	0.0018	0.0310	0.0006	0.0018	0.0061	0.0150	0.0012	0.003	0.045
Half detection limit	1.5	0.0018	0.0006	0.0006	0.0006	0.0006	0.0031	0.0009	0.0155	0.0003	0.0009	0.0031	0.0075	0.0006	0.0015	0.023
% < detection limit	10	100	100	45	100	0	0	70	0	0	80	100	0	80	0	0
% valid data	95															

Notes:

All non detectable results were reported as 1/2 the detection limit

* O. Reg.419/05 schedule 3, 24-hour standard effective February 1, 2013

n/r: Statistics not reported due to high % of values < detection limit

Total Fe expressed as Fe_2O_3 All S assumed to be in SO_4 form Feb 9: motor failure September 25: Filter misplaced November 12: Sampler malfunction

Extendicare Facility Monitoring Results for PM_{10} and Metals (2013)
(results expressed in µg/m^3)

Date	PM_{10}	As	Cd	Cr	Co	Cu	$Fe(Fe_2O_3)$	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
January 4, 2013	7	0.0018	0.0006	0.0006	0.0006	0.0108	0.3546	0.0009		0.0030	0.0009	0.0031	0.3470	0.0006	0.0133	1.041
January 10, 2013	1.5															
January 16, 2013	no sample															
January 22, 2013	7															
January 28, 2013	14															
February 3, 2013	inv	0.0018	0.0006	0.0006	0.0006	0.0023	0.4004	0.0009		0.0033	0.0009	0.0031	0.2850	0.0006	0.0339	0.855
February 9, 2013	4															
February 15, 2013	10															
February 21, 2013	1.5															
February 27, 2013	1.5															
March 5, 2013	1.5	0.0018	0.0006	0.0006	0.0006	0.0076	0.1659	0.0009		0.0019	0.0009	0.0031	0.2790	0.0006	0.0126	0.837
March 11, 2013	1.5															
March 17, 2013	1.5															
March 23, 2013	1.5															
March 29, 2013	7															
April 4, 2013	1.5	0.0018	0.0006	0.0006	0.0006	0.0050	0.7350	0.0009		0.0067	0.0009	0.0031	0.4930	0.0006	0.0115	1.479
April 10, 2013	10															
April 16, 2013	5															
April 22, 2013	12															
April 28, 2013	13															
May 4, 2013	20	0.0018	0.0006	0.0006	0.0006	0.0061	1.1783	0.0009		0.0086	0.0009	0.0031	0.2740	0.0006	0.0115	0.822
May 10, 2013	10															
May 16, 2013	14															
May 22, 2013	10															
May 28, 2013	16															
June 3, 2013	8	0.0018	0.0006	0.0006	0.0006	0.0039	0.2420	0.0009		0.0026	0.0009	0.0031	0.1080	0.0006	0.0091	0.324
June 9, 2013	25															
June 15, 2013	17															
June 21, 2013	16															
June 27, 2013	9															
July 3, 2013	26	0.0018	0.0006	0.0042	0.0006	0.0069	2.5626	0.0022		0.0185	0.0026	0.0031	0.1650	0.0018	0.0107	0.495
July 9, 2013	18															
July 15, 2013	19															
July 21, 2013	7															
July 27, 2013	15															
August 2, 2013	12	0.0018	0.0006	0.0006	0.0006	0.0061	0.2174	0.0059		0.0022	0.0009	0.0031	0.1150	0.0006	0.0063	0.345
August 8, 2013	10															
August 14, 2013	12															
August 20, 2013	29															
August 26, 2013	27															

Extendicare Facility Monitoring Results for PM_{10} and Metals (2013)
(results expressed in µg/m^3)

Date	PM_{10}	As	Cd	Cr	Co	Cu	$Fe(Fe_2O_3)$	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
September 1, 2013	18	0.0018	0.0006	0.0006	0.0006	0.0088	0.1516	0.0009		0.0018	0.0030	0.0031	0.8580	0.0006	0.0238	2.574
September 7, 2013	13															
September 13, 2013	12															
September 19, 2013	21															
September 25, 2013	26															
October 1, 2013	23	0.0018	0.0006	0.00155	0.0006	0.0131	1.2212	0.0024	0.2988	0.0103	0.0009	0.00305	0.7050	0.0016	0.0123	2.115
October 7, 2013	1.5															
October 13, 2013	1.5															
October 19, 2013	1.5															
October 25, 2013	5															
October 31, 2013	4	0.0018	0.0006	0.00155	0.0006	0.0052	0.1430	0.0021	0.0155	0.0020	0.0009	0.00305	0.6010	0.0016	0.0131	1.803
November 6, 2013	1.5															
November 12, 2013	1.5															
November 18, 2013	7						0.4404									
November 24, 2013	1.5															
November 30, 2013	1.5	0.0018	0.0006	0.00155	0.0006	0.0140	0.1544	0.0022	0.0963	0.0014	0.0025	0.00305	0.3630	0.0016	0.0089	1.089
December 6, 2013	1.5															
December 12, 2013	1.5															
December 18, 2013	1.5															
December 24, 2013	1.5															
December 30, 2013	3	0.0018	0.0006	0.00155	0.0006	0.0232	0.1630	0.0020	0.1295	0.0015	0.0024	0.00305	0.3100	0.0016	0.0087	0.930
Geometric mean	6.0	n/r	n/r	n/r	n/r	0.0074	0.3671	n/r		0.0034	n/r	n/r	0.3159	n/r	0.0122	0.948
Arithmetic mean	9.6	n/r	n/r	n/r	n/r	0.0087	0.5807	n/r		0.0049	n/r	n/r	0.3772	n/r	0.0135	1.131
Max. concentration	29.0	n/r	n/r	n/r	n/r	0.0232	2.5626	n/r		0.0185	n/r	n/r	0.8580	n/r	0.0339	2.574
Min. concentration	1.5	n/r	n/r	n/r	n/r	0.0023	0.1430	n/r		0.0014	n/r	n/r	0.1080	n/r	0.0063	0.324
90th percentile	21.4															
95th percentile	26.0															
AAQC (24 h)	50*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.2**	0.1**	n/a	n/a	n/a	n/a	n/a
No. > AAQC (24 h)	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	n/a	n/a	n/a	n/a	n/a
Annual AAQC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.02	n/a	n/a	n/a	n/a	n/a
No. > Annual AAQC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
No. of valid samples	59	13	13	13	13	13	14	13	4	13	13	13	13	13	13	13
No. samples < mdl	19	13	13	8	13	0	0	7	1	0	9	13	0	8	0	0
Detection limit	3	0.0036	0.0012	0.0012	0.0012	0.0012	0.0061	0.0018	0.0310	0.0006	0.0018	0.0061	0.0150	0.0012	0.003	0.045
Half detection limit	1.5	0.0018	0.0006	0.0006	0.0006	0.0006	0.0031	0.0009	0.0155	0.0003	0.0009	0.0031	0.0075	0.0006	0.0015	0.023
% < detection limit	31	100	100	62	100	0	0	54	25	0	69	100	0	62	0	0
% valid data	97															

Notes:

All non detectable results were reported as 1/2 the detection limit

* Interim 24-hour criterion

** Effective April 2012

n/r: Statistics not reported due to high % of values < detection limit

Total Fe expressed as Fe_2O_3 | All S assumed to be in SO_4 form | Total Mg expressed as MgO | Jan 16: motor failure

February 15 and March 29 results increased 20% based on April 25 calibration c | Feb 3 result invalidated: PM_{10} > TSP

April 10,16 and 22 results increased 20% based on April 25 calibration check

MRCA Office Monitoring Results for TSP and Metals (2013)
(results expressed in µg/m^3)

Date	TSP	As	Cd	Cr	Co	Cu	$Fe(Fe_2O_3)$	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
January 4, 2013	6															
January 10, 2013	8	0.0018	0.0006	0.0006	0.0006	0.0169	0.4319	0.0009		0.0024	0.0009	0.0031	0.3020	0.0006	0.0081	0.906
January 16, 2013	13	0.0018	0.0006	0.0006	0.0006	0.0050	0.6864	0.0009		0.0055	0.0009	0.0031	0.4870	0.0017	0.0131	1.461
January 22, 2013	9															
January 28, 2013	26	0.0018	0.0006	0.0006	0.0006	0.0347	0.5119	0.0040		0.0038	0.0037	0.0031	0.8560	0.0006	0.0271	2.568
February 3, 2013	4															
February 9, 2013	17															
February 15, 2013	6	0.0018	0.0006	0.0006	0.0006	0.0110	0.1181	0.0009		0.0015	0.0009	0.0031	0.2650	0.0006	0.0128	0.795
February 21, 2013	6															
February 27, 2013	6															
March 5, 2013	3	0.0018	0.0006	0.0006	0.0006	0.0250	0.1081	0.0009		0.0010	0.0009	0.0031	0.3030	0.0006	0.0080	0.909
March 11, 2013	1.5															
March 17, 2013	11															
March 23, 2013	1.5	0.0018	0.0006	0.0006	0.0006	0.0157	0.0635	0.0009		0.0003	0.0009	0.0031	0.0990	0.0006	0.0041	0.297
March 29, 2013	22															
April 4, 2013	30															
April 10, 2013	14	0.0018	0.0006	0.0006	0.0006	0.0301	0.8437	0.0009		0.0061	0.0009	0.0031	0.3570	0.0006	0.0530	1.071
April 16, 2013	13															
April 22, 2013	54															
April 28, 2013	81	0.0018	0.0006	0.0054	0.0021	0.0464	5.2052	0.0047		0.0344	0.0052	0.0031	1.2000	0.0023	0.0386	3.600
May 4, 2013	47															
May 10, 2013	18															
May 16, 2013	28	0.0018	0.0006	0.0006	0.0006	0.0497	1.4300	0.0009		0.0097	0.0009	0.0031	0.2410	0.0006	0.0147	0.723
May 22, 2013	18															
May 28, 2013	107															
June 3, 2013	15	0.0018	0.0006	0.0006	0.0006	0.0665	0.6492	0.0009		0.0054	0.0009	0.0031	0.1070	0.0006	0.0205	0.321
June 9, 2013	51															
June 15, 2013	42															
June 21, 2013	40	0.0018	0.0006	0.0035	0.0006	0.189	3.4606	0.0038		0.0262	0.0032	0.0031	0.4340	0.0018	0.0255	1.302
June 27, 2013	24															
July 3, 2013	67															
July 9, 2013	49	0.0018	0.0006	0.0048	0.0006	0.0784	4.1470	0.0036		0.0305	0.0032	0.0031	1.200	0.0018	0.0362	3.600
July 15, 2013	35															
July 21, 2013	40															
July 27, 2013	24	0.0018	0.0006	0.0023	0.0006	0.0814	0.8237	0.0024		0.0077	0.0018	0.0031	1.000	0.0006	0.0197	3.000
August 2, 2013	28															
August 8, 2013	24															
August 14, 2013	25	0.0018	0.0006	0.0006	0.0006	0.0582	1.3928	0.0009		0.0087	0.0019	0.0031	0.105	0.0006	0.0182	0.315
August 20, 2013	73															
August 26, 2013	43															

MRCA Office Monitoring Results for TSP and Metals (2013)
(results expressed in µg/m^3)

Date	TSP	As	Cd	Cr	Co	Cu	Fe(Fe_2O_3)	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
September 1, 2013	23	0.0018	0.0006	0.0006	0.0006	0.0692	0.6006	0.0009		0.0049	0.0032	0.0031	0.886	0.0006	0.0118	2.658
September 7, 2013	18															
September 13, 2013	14															
September 19, 2013	37	0.0018	0.0006	0.0006	0.0006	0.0614	1.5959	0.0038		0.0112	0.0026	0.0031	1.590	0.0006	0.0279	4.770
September 25, 2013	44															
October 1, 2013	54															
October 7, 2013	8	0.0018	0.0006	0.00155	0.0006	0.0353	0.6349	0.0009	0.1743	0.0050	0.0009	0.00305	0.057	0.00155	0.0089	0.171
October 13, 2013	19															
October 19, 2013	3															
October 25, 2013	15	0.0018	0.0006	0.00155	0.0006	0.0559	1.0353	0.0009	0.3270	0.0069	0.0019	0.00305	0.160	0.00155	0.0125	0.480
October 31, 2013	15															
November 6, 2013	10															
November 12, 2013	7	0.0018	0.0006	0.00155	0.0006	0.0210	0.3918	0.0009	0.0913	0.0029	0.0009	0.00305	0.158	0.00155	0.0114	0.474
November 18, 2013	11						0.6607									
November 24, 2013	1.5															
November 30, 2013	15	0.0018	0.0006	0.00155	0.0006	0.0717	0.3203	0.0034	0.1162	0.0026	0.0042	0.00305	0.649	0.00155	0.0139	1.947
December 6, 2013	1.5															
December 12, 2013	1.5															
December 18, 2013	6	0.0018	0.0006	0.00155	0.0006	0.0599	0.3518	0.0023	0.0780	0.0025	0.0009	0.00305	0.448	0.00155	0.0158	1.344
December 24, 2013	5															
December 30, 2013	12															
Geometric mean	15.0	n/r	n/r	n/r	n/r	0.0393	0.6705	n/r	0.1364	0.0050	n/r	n/r	0.355	n/r	0.0161	1.065
Arithmetic mean	23.8	n/r	n/r	n/r	n/r	0.0515	1.1574	n/r	0.1574	0.0085	n/r	n/r	0.519	n/r	0.0191	1.558
Max. concentration	107.0	n/r	n/r	n/r	n/r	0.1890	5.2052	n/r	0.3270	0.0344	n/r	n/r	1.590	n/r	0.0530	4.770
Min. concentration	1.5	n/r	n/r	n/r	n/r	0.0050	0.0635	n/r	0.0780	0.0003	n/r	n/r	0.057	n/r	0.0041	0.171
90th percentile	51.0															
95th percentile	67.0															
Standard*	120	n/a	0.025*	n/a	n/a	50	25	0.5	120.0	n/a	2	n/a	n/a	2	120	n/a
No. > Sch. 3 value*	0	n/a	0	n/a	n/a	0	0	0	0	n/a	0	n/a	n/a	0	0	n/a
Guideline	n/a	0.3	n/a	1.5	0.1	n/a	n/a	n/a	n/a	2.5	n/a	10	n/a	n/a	n/a	n/a
No. > guideline	n/a	0	n/a	0	0	n/a	n/a	n/a	n/a	0	n/a	0	n/a	n/a	n/a	n/a
AAQC (24 h)	n/a	0.3	0.025	0.5	0.1	50	25	0.5	120	0.4	0.2	10	n/a	2	120	n/a
No. > AAQC (24 h)	n/a	0	0	0	0	0	0	0	0	0	0	0	n/a	0	0	n/a
Annual AAQC	60	n/a	0.005	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.04	n/a	n/a	n/a	n/a	n/a
No. > Annual AAQC	0	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
No. of valid samples	61	21	21	21	21	21	22	21	5	21	21	21	21	21	21	21
No. samples < mdl	5	21	21	12	20	0	0	13	0	1	11	21	0	12	0	0
Detection limit	3	0.0036	0.0012	0.0012	0.0012	0.0012	0.0061	0.0018	0.0310	0.0006	0.0018	0.0061	0.0150	0.0012	0.003	0.045
Half detection limit	1.5	0.0018	0.0006	0.0006	0.0006	0.0006	0.0031	0.0009	0.0155	0.0003	0.0009	0.0031	0.0075	0.0006	0.0015	0.023
% < detection limit	8	100	100	57	95	0	0	62	0	5	52	100	0	57	0	0
% valid data	100															

Notes:

All non detectable results were reported as 1/2 the detection limit

* O. Reg.419/05 schedule 3, 24-hour standard effective February 1, 2013

n/r: Statistics not reported due to high % of values < detection limit

Total Fe expressed as Fe_2O_3 Total Mg expressed as MgO

All S assumed to be in SO_4 form

MRCA Office Monitoring Results for PM_{10} and Metals (2013)
(results expressed in µg/m^3)

Date	PM_{10}	As	Cd	Cr	Co	Cu	$Fe(Fe_2O_3)$	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
January 4, 2013	5	0.0018	0.0006	0.0006	0.0006	0.0026	0.4748	0.0009		0.0035	0.0009	0.0031	0.3360	0.0006	0.0087	1.008
January 10, 2013	4															
January 16, 2013	9	0.0018	0.0006	0.0006	0.0006	0.0075	0.3747	0.0009		0.0031	0.0009	0.0031	0.4660	0.0017	0.0132	1.398
January 22, 2013	4															
January 28, 2013	15															
February 3, 2013	1.5	0.0018	0.0006	0.0006	0.0006	0.0139	0.0744	0.0009		0.0008	0.0009	0.0031	0.0680	0.0006	0.0134	0.204
February 9, 2013	6															
February 15, 2013	4															
February 21, 2013	3															
February 27, 2013	4															
March 5, 2013	1.5	0.0018	0.0006	0.0006	0.0006	0.0044	0.1607	0.0009		0.0016	0.0009	0.0031	0.2870	0.0006	0.0069	0.861
March 11, 2013	1.5															
March 17, 2013	5															
March 23, 2013	1.5															
March 29, 2013	14															
April 4, 2013	16	0.0018	0.0006	0.0021	0.0006	0.0059	0.9381	0.0009		0.0077	0.0019	0.0031	0.5150	0.0006	0.0108	1.545
April 10, 2013	7															
April 16, 2013	5															
April 22, 2013	22															
April 28, 2013	36															
May 4, 2013	15	0.0018	0.0006	0.0006	0.0006	0.0059	0.6435	0.0009		0.0053	0.0009	0.0031	0.3140	0.0006	0.0093	0.942
May 10, 2013	12															
May 16, 2013	14															
May 22, 2013	8															
May 28, 2013	50															
June 3, 2013	4	0.0018	0.0006	0.0006	0.0006	0.0075	0.1424	0.0009		0.0018	0.0009	0.0031	0.0830	0.0006	0.0073	0.249
June 9, 2013	32															
June 15, 2013	inv															
June 21, 2013	21															
June 27, 2013	15															
July 3, 2013	49	0.0018	0.0006	0.0061	0.0006	0.0722	4.9192	0.0035		0.0342	0.0045	0.0031	0.237	0.0022	0.0343	0.711
July 9, 2013	29															
July 15, 2013	22															
July 21, 2013	22															
July 27, 2013	17															
August 2, 2013	15	0.0018	0.0006	0.0006	0.0006	0.0079	0.4919	0.0009		0.0035	0.0009	0.0031	0.129	0.0006	0.0086	0.387
August 8, 2013	15															
August 14, 2013	14															
August 20, 2013	37															
August 26, 2013	26															

MRCA Office Monitoring Results for PM_{10} and Metals (2013)
(results expressed in µg/m^3)

Date	PM_{10}	As	Cd	Cr	Co	Cu	$Fe(Fe_2O_3)$	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
September 1, 2013	18	0.0018	0.0006	0.0006	0.0006	0.0218	0.1888	0.0009		0.0021	0.0023	0.0031	0.862	0.0006	0.0159	2.586
September 7, 2013	12															
September 13, 2013	10															
September 19, 2013	26															
September 25, 2013	23															
October 1, 2013	24	0.0018	0.0006	0.00155	0.0006	0.0133	1.55012	0.0024	0.40338	0.0121	0.0009	0.00305	0.514	0.00155	0.0222	1.542
October 7, 2013	1.5															
October 13, 2013	9															
October 19, 2013	1.5															
October 25, 2013	5															
October 31, 2013	11	0.0018	0.0006	0.00155	0.0006	0.0113	0.400	0.0033	0.0155	0.00345	0.0009	0.00305	1.19	0.00155	0.0159	3.570
November 6, 2013	1.5															
November 12, 2013	3															
November 18, 2013	6						0.26026									
November 24, 2013	1.5															
November 30, 2013	9	0.0018	0.0006	0.00155	0.0006	0.0071	0.2717	0.0030	0.09296	0.00220	0.0030	0.00305	0.495	0.00155	0.0104	1.485
December 6, 2013	1.5															
December 12, 2013	1.5															
December 18, 2013	6															
December 24, 2013	5															
December 30, 2013	5	0.0018	0.0006	0.00155	0.0006	0.0131	0.200	0.0025	0.13612	0.00153	0.0009	0.00305	0.363	0.00155	0.0114	1.089
Geometric mean	8.1	n/r	n/r	n/r	n/r	0.0096	0.3900	n/r	0.0943	0.0035	n/r	n/r	0.3201	n/r	0.0122	0.960
Arithmetic mean	12.7	n/r	n/r	n/r	n/r	0.0139	0.7394	n/r	0.1620	0.0059	n/r	n/r	0.4185	n/r	0.0135	1.256
Max. concentration	50.0	n/r	n/r	n/r	n/r	0.0722	4.9192	n/r	0.4034	0.0342	n/r	n/r	1.1900	n/r	0.0343	3.570
Min. concentration	1.5	n/r	n/r	n/r	n/r	0.0026	0.0744	n/r	0.0155	0.0008	n/r	n/r	0.0680	n/r	0.0069	0.204
90th percentile	26.3															
95th percentile	36.1															
AAQC (24 h)	50*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.2**	0.1**	n/a	n/a	n/a	n/a	n/a
No. > AAQC (24 h)	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	n/a	n/a	n/a	n/a	n/a
Annual AAQC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.02	n/a	n/a	n/a	n/a	n/a
No. > Annual AAQC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
No. of valid samples	60	14	14	14	14	14	15	14	4	14	14	14	14	14	14	14
No. samples < mdl	10	14	14	8	14	0	0	9	1	0	10	14	0	8	0	0
Detection limit	3	0.0036	0.0012	0.0012	0.0012	0.0012	0.0061	0.0018	0.0310	0.0006	0.0018	0.0061	0.0150	0.0012	0.003	0.045
Half detection limit	1.5	0.0018	0.0006	0.0006	0.0006	0.0006	0.0031	0.0009	0.0155	0.0003	0.0009	0.0031	0.0075	0.0006	0.0015	0.023
% < detection limit	16	100	100	57	100	0	0	64	25	0	71	100	0	57	0	0
% valid data	98															

Notes:

All non detectable results were reported as 1/2 the detection limit

* Interim 24-hour criterion

** Effective April 2012

n/r: Statistics not reported due to high % of values < detection limit June 15th: Invalid sample (filter ripped)

Total Fe expressed as Fe_2O_3 Total Mg expressed as MgO

All S assumed to be in SO_4 form

Shania Twain Rd Monitoring Results for TSP and Metals (2013)
(results expressed in µg/m^3)

Date	TSP	As	Cd	Cr	Co	Cu	Fe(Fe_2O_3)	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
January 4, 2013	5															
January 10, 2013	3	0.0018	0.0006	0.0006	0.0006	0.0086	0.1739	0.0009		0.0014	<0.0018	0.0031	0.2480	0.0006	0.0064	0.744
January 16, 2013	17	0.0018	0.0006	0.0014	0.0006	0.0069	1.3042	0.0009		0.0094	0.0009	0.0031	0.4630	0.0013	0.0157	1.389
January 22, 2013	14															
January 28, 2013	13	0.0018	0.0006	0.0006	0.0006	0.0269	0.4290	0.0009		0.0033	0.0034	0.0031	1.1500	0.0006	0.0175	3.450
February 3, 2013	1.5															
February 9, 2013	no sample															
February 15, 2013	5	0.0018	0.0006	0.0013	0.0006	0.0105	0.2128	0.0009		0.0016	0.0009	0.0031	0.1640	0.0006	0.0315	0.492
February 21, 2013	5															
February 27, 2013	9															
March 5, 2013	6	0.0018	0.0006	0.0006	0.0006	0.0148	0.1607	0.0009		0.0013	0.0009	0.0031	0.2830	0.0006	0.0071	0.849
March 11, 2013	5															
March 17, 2013	3															
March 23, 2013	1.5	0.0018	0.0006	0.0006	0.0006	0.0104	0.1456	0.0009		0.0011	0.0009	0.0031	0.0990	0.0006	0.0043	0.297
March 29, 2013	11															
April 4, 2013	21															
April 10, 2013	31	0.0018	0.0006	0.0018	0.0006	0.0173	2.1993	0.0009		0.0148	0.0028	0.0031	0.3460	0.0006	0.0419	1.038
April 16, 2013	18															
April 22, 2013	20															
April 28, 2013	32	0.0018	0.0006	0.0019	0.0006	0.0199	1.9305	0.0044		0.0153	0.0009	0.0031	1.1500	0.0006	0.0185	3.450
May 4, 2013	61															
May 10, 2013	21															
May 16, 2013	43	0.0018	0.0006	0.0023	0.0006	0.0209	3.2604	0.0022		0.0204	0.0029	0.0031	0.2640	0.0017	0.0232	0.792
May 22, 2013	23															
May 28, 2013	39															
June 3, 2013	14	0.0018	0.0006	0.0021	0.0006	0.0300	0.8351	0.0009		0.00647	0.0035	0.0031	0.1130	0.0006	0.0163	0.339
June 9, 2013	38															
June 15, 2013	39															
June 21, 2013	35	0.0018	0.0006	0.0029	0.0006	0.0275	2.5054	0.0037		0.0197	0.0023	0.0031	0.4420	0.0018	0.0194	1.326
June 27, 2013	18															
July 3, 2013	65															
July 9, 2013	25	0.0018	0.0006	0.0025	0.0006	0.0351	1.0696	0.0009		0.0077	0.0019	0.0031	1.090	0.0006	0.0103	3.270
July 15, 2013	31															
July 21, 2013	invalid															
July 27, 2013	19	0.0018	0.0006	0.0014	0.0006	0.0324	0.5749	0.0023		0.0059	0.0009	0.0031	1.020	0.0006	0.0210	3.060
August 2, 2013	22															
August 8, 2013	23															
August 14, 2013	28	0.0018	0.0006	0.0033	0.0006	0.0852	1.9934	0.0009		0.0124	0.0023	0.0031	0.104	0.0006	0.0147	0.312
August 20, 2013	59															
August 26, 2013	44															

Shania Twain Rd Monitoring Results for TSP and Metals (2013)
(results expressed in µg/m^3)

Date	TSP	As	Cd	Cr	Co	Cu	Fe(Fe_2O_3)	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
September 1, 2013	23	0.0018	0.0006	0.0006	0.0006	0.0253	0.5606	0.0009		0.0050	0.0029	0.0031	0.871	0.0006	0.0212	2.613
September 7, 2013	26															
September 13, 2013	20															
September 19, 2013	24	0.0018	0.0006	0.0006	0.0006	0.0129	0.5205	0.0030		0.0055	0.0009	0.0031	1.560	0.0006	0.0145	4.680
September 25, 2013	invalid															
October 1, 2013	invalid															
October 7, 2013	10	0.0018	0.0006	0.0006	0.0006	0.0093	0.5348	0.0009	0.14276	0.0040	0.0009	0.00305	0.059	0.0006	0.0114	0.177
October 13, 2013	14															
October 19, 2013	5															
October 25, 2013	5	0.0018	0.0006	0.0006	0.0006	0.0105	0.5777	0.0009	0.10956	0.0041	0.0009	0.00305	0.136	0.0006	0.0087	0.408
October 31, 2013	11															
November 6, 2013	7															
November 12, 2013	8	0.0018	0.0006	0.0006	0.0006	0.0092	0.5463	0.0009	0.13114	0.0043	0.0009	0.00305	0.166	0.0006	0.0115	0.498
November 18, 2013	10						0.6978									
November 24, 2013	no sample															
November 30, 2013	no sample															
December 6, 2013	1.5															
December 12, 2013	4															
December 18, 2013	1.5	0.0018	0.0006	0.0006	0.0006	0.0279	0.2402	0.0023	0.0155	0.0019	0.0009	0.00305	0.312	0.0006	0.0099	0.936
December 24, 2013	3															
December 30, 2013	4															
Geometric mean	12.5	n/r	n/r	n/r	n/r	0.0180	0.6558	n/r	0.0751	0.0050	n/r	n/r	0.328	n/r	0.0142	0.984
Arithmetic mean	19.0	n/r	n/r	n/r	n/r	0.0221	0.9749	n/r	0.0997	0.0073	n/r	n/r	0.502	n/r	0.0163	1.506
Max. concentration	65.0	n/r	n/r	n/r	n/r	0.0852	3.2604	n/r	0.1428	0.0204	n/r	n/r	1.560	n/r	0.0419	4.680
Min. concentration	1.5	n/r	n/r	n/r	n/r	0.0069	0.1456	n/r	0.0155	0.0011	n/r	n/r	0.059	n/r	0.0043	0.177
90th percentile	39.0															
95th percentile	48.5															
Standard*	120	n/a	0.025*	n/a	n/a	50	25	0.5	120.0	n/a	2	n/a	n/a	2	120	n/a
No. > Sch. 3 value*	0	n/a	0	n/a	n/a	0	0	0	0	n/a	0	n/a	n/a	0	0	n/a
Guideline	n/a	0.3	n/a	1.5	0.1	n/a	n/a	n/a	n/a	2.5	n/a	10	n/a	n/a	n/a	n/a
No. > guideline	n/a	0	n/a	0	0	n/a	n/a	n/a	n/a	0	n/a	0	n/a	n/a	n/a	n/a
AAQC (24 h)	n/a	0	0	1	0	50.000	25	1	120	0	0	10	n/a	2	120	n/a
No. > AAQC (24 h)	n/a	0	0	0	0	0.000	0	0	0	0	0	0	n/a	0	0	n/a
Annual AAQC	60	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
No. > Annual AAQC	0	n/a	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
No. of valid samples	55	20	20	20	20	20	21	20	4	20	19	20	20	20	20	20
No. samples < mdl	4	20	20	10	20	0	0	14	1	0	11	20	0	17	0	0
Detection limit	3	0.0036	0.0012	0.0012	0.0012	0.0012	0.0061	0.0018	0.0310	0.0006	0.0018	0.0061	0.0150	0.0012	0.003	0.045
Half detection limit	1.5	0.0018	0.0006	0.0006	0.0006	0.0006	0.0031	0.0009	0.0155	0.0003	0.0009	0.0031	0.0075	0.0006	0.0015	0.023
% < detection limit	7	100	100	50	100	0	0	70	25	0	58	100	0	85	0	0
% valid data	90															

Notes:

All non detectable results were reported as 1/2 the detection limit

* O. Reg.419/05 schedule 3, 24-hour standard effective February 1, 2013

n/r: Statistics not reported due to high % of values < detection limit

Total Fe expressed as Fe_2O_3 All S assumed to be in SO_4 form Total Mg expressed as MgO

Feb 9: motor failure

July 21: filter misplaced on PM_{10} sampler; September 25: double exposure

October 1: Filter double exposed with September 25 filter November 24 and 30: sampler did not run

Shania Twain Rd Monitoring Results for PM_{10} and Metals (2013)
(results expressed in µg/m^3)

Date	PM_{10}	As	Cd	Cr	Co	Cu	$Fe(Fe_2O_3)$	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
January 4, 2013	5	0.0018	0.0006	0.0015	0.0006	0.0095	0.7608	0.0019		0.0058	0.0009	0.0031	0.3130	0.0006	0.0777	0.939
January 10, 2013	1.5															
January 16, 2013	7	0.0018	0.0006	0.0006	0.0006	0.0049	0.4176	0.0009		0.0030	0.0009	0.0031	0.3190	0.0006	0.0115	0.957
January 22, 2013	6															
January 28, 2013	12															
February 3, 2013	inv	0.0018	0.0006	0.0006	0.0006	0.0022	0.1310	0.0009		0.0012	0.0009	0.0031	0.2230	0.0006	0.0055	0.669
February 9, 2013	4															
February 15, 2013	5															
February 21, 2013	4															
February 27, 2013	8															
March 5, 2013	4	0.0018	0.0006	0.0006	0.0006	0.0036	0.1413	0.0009		0.0013	0.0009	0.0031	0.2050	0.0006	0.0054	0.615
March 11, 2013	inv															
March 17, 2013	3															
March 23, 2013	1.5															
March 29, 2013	7															
April 4, 2013	12	0.0018	0.0006	0.0006	0.0006	0.0049	0.7665	0.0022		0.0064	0.0009	0.0031	0.4700	0.0006	0.0100	1.410
April 10, 2013	10															
April 16, 2013	3															
April 22, 2013	11															
April 28, 2013	17															
May 4, 2013	22	0.0018	0.0006	0.0006	0.0006	0.0100	1.2412	0.0009		0.0090	0.0009	0.0031	0.3090	0.0006	0.0129	0.927
May 10, 2013	14															
May 16, 2013	19															
May 22, 2013	10															
May 28, 2013	20															
June 3, 2013	5	0.0018	0.0006	0.0014	0.0006	0.0091	0.3975	0.0009		0.0032	0.0027	0.0031	0.0930	0.0006	0.0085	0.279
June 9, 2013	23															
June 15, 2013	18															
June 21, 2013	17															
June 27, 2013	12															
July 3, 2013	31	0.0018	0.0006	0.0062	0.0006	0.0127	3.5178	0.0026		0.0205	0.0037	0.0031	0.207	0.0018	0.0150	0.621
July 9, 2013	17															
July 15, 2013	invalid															
July 21, 2013	7															
July 27, 2013	13															
August 2, 2013	14	0.0018	0.0006	0.0006	0.0006	0.0073	0.3546	0.0009		0.0026	0.0009	0.0031	0.114	0.0006	0.0063	0.342
August 8, 2013	15															
August 14, 2013	16															
August 20, 2013	31															
August 26, 2013	27															

Shania Twain Rd Monitoring Results for PM_{10} and Metals (2013)
(results expressed in µg/m^3)

Date	PM_{10}	As	Cd	Cr	Co	Cu	Fe(Fe_2O_3)	Pb	MgO	Mn	Ni	Se	S	V	Zn	SO_4
September 1, 2013	15	0.0018	0.0006	0.0006	0.0006	0.0061	0.1115	0.0009		0.0012	0.0023	0.0031	0.840	0.0006	0.0056	2.520
September 7, 2013	13															
September 13, 2013	11															
September 19, 2013	19															
September 25, 2013	36															
October 1, 2013	19	0.0018	0.0006	0.00155	0.0006	0.0043	1.1469	0.0009	0.2888	0.0078	0.0009	0.00305	0.503	0.00155	0.0100	1.509
October 7, 2013	1.5															
October 13, 2013	5															
October 19, 2013	3															
October 25, 2013	4															
October 31, 2013	9	0.0018	0.0006	0.00155	0.0006	0.0035	0.2402	0.0040	0.0155	0.0028	0.0009	0.00305	1.12	0.00155	0.0134	3.360
November 6, 2013	1.5															
November 12, 2013	7															
November 18, 2013	5						0.3346									
November 24, 2013	1.5															
November 30, 2013	6	0.0018	0.0006	0.00155	0.0006	0.0058	0.3518	0.0021	0.0714	0.0028	0.0026	0.00305	0.442	0.0016	0.0109	1.326
December 6, 2013	1.5															
December 12, 2013	1.5															
December 18, 2013	1.5															
December 24, 2013	1.5															
December 30, 2013	5	0.0018	0.0006	0.00155	0.0006	0.0058	0.1716	0.0026	0.0996	0.0014	0.0009	0.00305	0.275	0.00155	0.0116	0.825
Geometric mean	7.4	n/r	n/r	n/r	n/r	0.0058	0.4128	n/r	0.0751	0.0034	n/r	n/r	0.312	n/r	0.0107	0.937
Arithmetic mean	10.7	n/r	n/r	n/r	n/r	0.0064	0.6723	n/r	0.1188	0.0049	n/r	n/r	0.388	n/r	0.0146	1.164
Max. concentration	36.0	n/r	n/r	n/r	n/r	0.0127	3.5178	n/r	0.2888	0.0205	n/r	n/r	1.120	n/r	0.0777	3.360
Min. concentration	1.5	n/r	n/r	n/r	n/r	0.0022	0.1115	n/r	0.0155	0.0012	n/r	n/r	0.093	n/r	0.0054	0.279
90th percentile	20.6															
95th percentile	27.6															
No. > AAQC (24 h)	50*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.2**	0.1**	n/a	n/a	n/a	n/a	n/a
Annual AAQC	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	0	n/a	n/a	n/a	n/a	n/a
Annual AAQC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.02	n/a	n/a	n/a	n/a	n/a
No. > Annual AAQC	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0	n/a	n/a	n/a	n/a	n/a
No. of valid samples	58	14	14	14	14	14	15	14	4	14	14	14	14	14	14	14
No. samples < mdl	9	14	14	7	14	0	0	8	1	0	10	14	0	9	0	0
Detection limit	3	0.0036	0.0012	0.0012	0.0012	0.0012	0.0061	0.0018	0.0310	0.0006	0.0018	0.0061	0.0150	0.0012	0.003	0.045
Half detection limit	1.5	0.0018	0.0006	0.0006	0.0006	0.0006	0.0031	0.0009	0.0155	0.0003	0.0009	0.0031	0.0075	0.0006	0.0015	0.023
% < detection limit	15	100	100	50	100	0	0	57	25	0	71	100	0	64	0	0
% valid data	95															

Notes:

All non detectable results were reported as 1/2 the detection limit

* Interim 24-hour criterion

** Effective April 2012

n/r: Statistics not reported due to high % of values < detection limit

Total Fe expressed as Fe_2O_3 All S assumed to be in SO_4 form Total Mg expressed as MgO

Feb 3 and March 11 result invalidated: PM_{10} > TSP July 15: Filter misplaced on TSP sampler

Appendix C-2

Total Dustfall Sampling Results (2012)

Extendicare Facility Monitoring Results for Dustfall (2013)
(results expressed in g/m^2/30days)

Month	No. Exposure Days	Dustfall (insoluble)	Dustfall (soluble)	Dustfall (total)
January	32	0.14	0.48	0.6
February	28	0.18	0.72	0.9
March	31	0.11	0.64	0.8
April	29	0.27	0.69	1.0
May	31	0.88	0.64	1.5
June	28	0.45	0.55	1.0
July	33	0.60	0.92	1.5
August	30	0.83	3.10	3.9
September	31	0.19	0.52	0.7
October	32	1.30	0.69	2.0
November	28	0.15	0.63	0.8
December	32	0.06	0.47	0.5
Arithmetic mean		0.43	0.84	1.3
Max. value		1.30	3.10	3.9
Min. value		0.06	0.47	0.5
Standard		n/a	n/a	7.0
No. > Sch. 3 value		n/a	n/a	0
No. of valid samples		12	12	12
Detection limit		0.01	0.01	0.02
Half detection limit		0.005	0.005	0.01

MRCA Office Monitoring Results for Dustfall (2013)
(results expressed in g/m^2/30days)

Month	No. Exposure Days	Dustfall (insoluble)	Dustfall (soluble)	Dustfall (total)
January	32	0.06	0.49	0.6
February	28	0.05	0.53	0.6
March	31	0.08	0.48	0.6
April	29	0.37	0.81	1.2
May	31	0.78	0.53	1.3
June	28	1.3	1.1	2.4
July	33	1.40	1.30	2.7
August	30	0.93	3.40	4.3
September	31	0.31	0.74	1.1
October	32	0.29	0.59	0.9
November	28	0.35	0.99	1.3
December	32	0.04	0.41	0.5
Arithmetic mean		0.50	0.95	1.4
Max. value		1.40	3.40	4.3
Min. value		0.04	0.41	0.5
Standard		n/a	n/a	7.0
No. > Sch. 3 value		n/a	n/a	0
No. of valid samples		12	12	12
Detection limit		0.01	0.01	0.02
Half detection limit		0.005	0.005	0.01

Shania Twain Rd Monitoring Results for Dustfall (2013)
(results expressed in g/m^2/30days)

Month	No. Exposure Days	Dustfall (insoluble)	Dustfall (soluble)	Dustfall (total)
January	32	0.29	0.37	0.7
February	28	0.05	0.55	0.6
March	31	0.03	0.38	0.4
April	29	0.28	0.74	1.0
May	31	0.64	0.45	1.1
June	28	1.20	0.99	2.2
July	33	0.34	1.10	1.4
August	30	0.97	2.70	3.7
September	31	0.29	0.93	1.2
October	32	0.27	0.66	0.9
November	28	0.34	0.76	1.1
December	32	0.03	0.42	0.5
Arithmetic mean		0.39	0.84	1.2
Max. value		1.20	2.70	3.7
Min. value		0.03	0.37	0.4
Standard		n/a	n/a	7.0
No. > Sch. 3 value		n/a	n/a	0
No. of valid samples		12	12	12
Detection limit		0.01	0.01	0.02
Half detection limit		0.005	0.005	0.01

Claim Post Monitoring Results for Dustfall (2013)
(results expressed in g/m^2/30days)

Month	No. Exposure Days	Dustfall (insoluble)	Dustfall (soluble)	Dustfall (total)
January	32	0.45	1.00	1.5
February	28	0.33	0.93	1.3
March	31	0.78	0.66	1.4
April	29	2.20	1.50	3.7
May	31	3.00	1.10	4.1
June	28	1.20	0.74	1.9
July	33	0.60	0.84	1.4
August	30	0.80	2.60	3.4
September	31	0.53	0.52	1.1
October	32	0.78	0.50	1.3
November	28	0.62	1.00	1.6
December	32	0.18	0.59	0.8
Arithmetic mean		0.96	1.00	2.0
Max. value		3.00	2.60	4.1
Min. value		0.18	0.50	0.8
Standard		n/a	n/a	7.0
No. > Sch. 3 value		n/a	n/a	0
No. of valid samples		12	12	12
Detection limit		0.01	0.01	0.02
Half detection limit		0.005	0.005	0.01

Aura Lake Monitoring Results for Dustfall (2013)
(results expressed in g/m^2/30days)

Month	No. Exposure Days	Dustfall (insoluble)	Dustfall (soluble)	Dustfall (total)
October	32	1.10	0.63	1.7
November	28	0.26	0.74	1.0
December	32	0.05	0.44	0.5
Arithmetic mean		0.47	0.60	1.1
Max. value		1.10	0.74	1.7
Min. value		0.05	0.44	0.5
Standard		n/a	n/a	7.0
No. > Sch. 3 value		n/a	n/a	0
No. of valid samples		3	3	3
Detection limit		0.01	0.01	0.02
Half detection limit		0.005	0.005	0.01

Dustfall sampler installed in October

Snowmobile Crossing Results - Dustfall (2013)

(results expressed in g/m^2/30days)

Month	No. Exposure Days	Dustfall (insoluble)	Dustfall (soluble)	Dustfall (total)
October	32	1.30	0.69	2.0
November	28	0.91	0.88	1.8
December	32	0.04	0.36	0.4
Arithmetic mean		0.75	0.64	1.4
Max. value		1.30	0.88	2.0
Min. value		0.04	0.36	0.4
Standard		n/a	n/a	7.0
No. > Sch. 3 value		n/a	n/a	0
No. of valid samples		3	3	3
Detection limit		0.01	0.01	0.02
Half detection limit		0.005	0.005	0.01

Dustfall sampler installed in October

Appendix C-3

SO_2 and NO_2 Passive Sampling Results (2012)

Monitoring Results for Passive SO_2 and NO_2 (2013)
(results expressed in ppb)

	Extendicare Home		MRCA Office		Shania Twain Rd	
Month	SO_2	NO_2	SO_2	NO_2	SO_2	NO_2
January	0.4	2.3	0.4	3.7	0.5	3.4
February	0.4	1.5	0.4	2.0	0.5	2.5
March	0.3	1.0	0.7	1.0	0.7	1.2
April	No sample	No sample	No sample	No sample	No sample	No sample
May	0.2	0.7	0.2	1.1	0.1	1.0
June	0.1	0.6	0.05	1.1	0.1	0.7
July	0.1	0.4	0.05	0.6	0.05	0.4
August	0.05	0.5	0.05	0.7	0.8	0.9
September	0.1	0.9	0.05	0.05	0.3	1.0
October	0.05	0.6	0.05	1.0	0.05	0.8
November	0.2	1.1	0.2	1.7	0.1	1.5
December	0.1	1.1	0.05	2.7	0.05	3.2
Arithmetic mean	0.2	1.0	0.2	1.4	0.3	1.5
Max. concentration	0.4	2.3	0.7	3.7	0.8	3.4
Min. concentration	0.1	0.4	0.1	0.1	0.1	0.4
No. of valid samples	11	11	11	11	11	11
Detection limit	0.1	0.1	0.1	0.1	0.1	0.1
Half detection limit	0.05	0.05	0.05	0.05	0.05	0.05

Notes:

Non detectable results reported as 1/2 the detection limit

April: Sampling disrupted due to method change at the laboratory.