Regional Municipality of Durham
Regional Municipality of York

Durham York Energy Centre
2015 Compliance Monitoring Report

EAAB File No.: EA-08-02
Condition 5

Date: October 30, 2015

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Appendices

1.0 Introduction

1.1 Purpose

The *Durham York Energy Centre 2015 Compliance Monitoring Report* has been prepared in accordance with Condition 5.3 of the Notice of Approval to Proceed with the Undertaking for the Durham and York Residual Waste Study (Ministry of Environment and Climate Change EAB File Number EA-08-02). Annual compliance reports are based on a reporting period ending November 3rd of each year, corresponding to the anniversary date of the Notice of Approval. This annual compliance report covers the period from November 3, 2014 to November 2, 2015.

Annual compliance monitoring reports follow the reporting structure established in the *Durham York Energy Centre Compliance Monitoring Program* submitted to the EAB Director on October 14, 2011 in accordance with Condition 4.1 of the Notice of Approval. As outlined in the Compliance Monitoring Program, the Annual Report consists of the following three parts.

Appendix A	EA Notice of Approval Compliance Table	Documents the proponent's progress on requirements of EA Notice of Approval
Appendix B	EA Study Document Compliance Table	Documents the proponent's progress on commitments made in the EA study document
Appendix C	Advisory Committee Annual Report	Provides a report on activities of the Advisory Committee during the reporting period as required by Condition 8.2 of the Notice of Approval

1.2 Background

The Durham York Energy Centre is an energy from waste facility located in the Municipality of Clarington, Ontario. The facility began receiving waste on February 9, 2015 and is currently being commissioned. Owned by the Regional Municipality of Durham and the Regional Municipality of York ("the Regions"), the facility processes up to 140,000 tonnes of solid, non-hazardous, municipal solid waste per year. Heat generated by waste combustion is used to generate electricity and steam. Recyclable metals are also recovered from the ash. The facility is designed, built, and operated by Covanta Energy Limited. The facility was approved under the *Environmental Assessment Act* by the Minister of the Environment and the Lieutenant Governor in Council on November 3, 2010. A multi-media Environmental Compliance Approval for waste, air and noise, and stormwater was issued on June 28, 2011 (#7306-8FDKNX). Facility construction commenced in January 2012 and it is anticipated that commissioning will be completed by the first quarter of 2016.

Appendix A

EA Notice of Approval Compliance Table

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
1.	**Definitions**			
	N/A	N/A	N/A	N/A
2.	**General Requirements**			
2.1	The proponent shall comply with the provisions in the environmental assessment which are hereby incorporated in this Notice of Approval by reference except as provided in these conditions and as provided in any other approval or permit that may be issued for the site or the undertaking.	• Commitments in the EA are carried forward in the Environmental Compliance Approval.	Carried into the ECA	Yes
2.2	These conditions do not prevent more restrictive conditions being imposed under other statutes.	• Agreed	N/A	Yes
2.3	A statement must accompany the submission of any documents, reporting requirements or written notices required by this Notice of Approval to be submitted to the Director or Regional Director identifying which conditions the submission is intended to address in this Notice of Approval.	• Submissions under the EA have included identification of each Condition being satisfied.	N/A	Yes
3.	**Public Record**			
3.1	Where a document, plan or report is required to be submitted to the ministry, the proponent shall provide two copies of the final document, plan or report to the Director: a copy for filing in the specific public record file maintained for the undertaking and a copy for staff use.	• Required by Condition 16 (1) of the Environmental Compliance Approval	Carried into the ECA	Yes
3.2	The proponent shall provide additional copies of the documents required for the public record file to the following for access by the public: a) Regional Director; b) District Manager; c) Clerks of the Regional Municipality of Durham, the Regional Municipality of York, and the Municipality of Clarington; and, d) Advisory Committee (as required in Condition 8 of this Notice of Approval).	• Ongoing	Carried into the ECA	Yes
3.3	The EAAB file number EA-08-02 shall be quoted on all documents submitted by the proponent pursuant to this Condition.	• Ongoing	N/A	Yes
4.	**Compliance Monitoring Program**			
4.1	The proponent shall prepare and submit to the Director a Compliance Monitoring Program outlining how it will comply with conditions in the Notice of Approval and other commitments made in the environmental assessment	• The Compliance Monitoring Program was submitted to the Director and Advisory Committee via letter dated October 14, 2011.	October 2011	Yes
4.2	A statement shall accompany the submission of the Compliance Monitoring Program indicating that the submission is intended to fulfil	• See Section 1.1 of the Compliance Monitoring Program	October 2011	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	Condition 4 of this Notice of Approval.			
4.3	The Compliance Monitoring Program shall be submitted within one year from the date of approval, or a minimum of 60 days prior to the start of construction, whichever is earlier.	• The Compliance Monitoring Program was submitted on October 14, 2011. This is within one year of November 3, 2010 approval date. • The October 14, 2011 submission date is more than 60 days prior to the start of construction in January 2012	October 2011	Yes
4.4	The Compliance Monitoring Program shall describe how the proponent will monitor its fulfilment of the provisions of the environmental assessment pertaining to the mitigation measures, public consultation, and additional studies and work to be carried out; the fulfilment of all other commitments made by the proponent during the environmental assessment process; and the conditions included in this Notice of Approval.	• Progress will be tracked on the compliance tables provided in Appendix A and Appendix B	October 2011	Yes
4.5	The Compliance Monitoring Program shall contain an implementation schedule.	• See next column	October 2011	Yes
4.6	The Director may require amendments to the Compliance Monitoring Program, including the implementation schedule. If any amendments are required by the Director, the Director will notify the proponent of the required amendments in writing.	• Agreed	N/A	Yes
4.7	The proponent shall implement the Compliance Monitoring Program, as it may be amended by the Director.	• Agreed	N/A	Yes
4.8	The proponent shall make the documentation pertaining to the Compliance Monitoring Program available to the ministry or its designate in a timely manner when requested to do so by the ministry.	• Required by Condition 14 (1) of the Environmental Compliance Approval	N/A	Yes
5.	**Compliance Reporting**			
5.1	The proponent shall prepare an annual Compliance Report which describes its compliance with the conditions of approval set out in this Notice of Approval and which describes the results of the proponent's environmental assessment Compliance Monitoring Program required by Condition 4.	• This annual report is the fifth annual submission in accordance with this condition	November 3, 2011 and annually thereafter until all EA conditions are met.	Ongoing
5.2	The annual Compliance Report shall be submitted to the Director within one year from the date of approval, with the first report being due in 2011, and shall cover all activities of the previous 12 month period.	• This annual report is the fifth annual submission in accordance with this condition	November 3, 2011 and annually thereafter	Yes
5.3	Subsequent compliance reports shall be submitted to the Director on or before the anniversary of the date of approval each year thereafter. Each Compliance Report shall cover all activities of the previous 12 month period.	• This annual report is the fifth annual submission in accordance with this condition	November 3, 2011 and annually thereafter	Yes
5.4	The proponent shall submit annual Compliance Reports until all conditions	• Agreed	October 2015	Ongoing

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	in this Notice of Approval and the commitments in the environmental assessment are satisfied.			
5.5	Once all conditions in this Notice of Approval have been satisfied, or have been incorporated into any other ministry approval, the proponent shall indicate in its annual Compliance Report that the Compliance Report is its final Compliance Report and that all conditions in this Notice of Approval have been satisfied.	• Agreed	November 2016	Ongoing
5.6	The proponent shall retain either on site or in another location approved by the Director, a copy of each of the annual Compliance Reports and any associated documentation of compliance monitoring activities.	• Reports to be retained on site. See Section 1.3 of the Compliance Monitoring Program. • Required by Condition 14(2) of the Environmental Compliance Approval	Carried into the ECA	Yes
5.7	The proponent shall make the Compliance Reports and associated documentation available to the ministry or its designate in a timely manner when requested to do so by the ministry.	• Agreed • Required by Condition 14(1) of the Environmental Compliance Approval	Carried into the ECA	Yes
6.	**Complaint Protocol**			
6.1	The proponent shall prepare and implement a Complaint Protocol setting out how it will deal with and respond to inquiries and complaints received during the design, construction and operation of the undertaking.	• Protocol submitted to the Director via letter dated March 10, 2011. • Director requested minor modifications to protocol in letter dated March 25, 2011 • Revised protocol approved by the Director via letter dated July 13, 2011	March 10, 2011	Yes
6.2	The Complaint Protocol shall be provided to the advisory committee for review prior to submission to the Director.	• Protocol was reviewed by the Advisory Committee on January 20, 2011 and revised based on comments received by January 31, 2011.	January 20, 2011	Yes
6.3	The proponent shall submit the Complaint Protocol to the Director within one year from the date of approval or a minimum of 60 days prior to the start of construction, whichever is earlier.	• Protocol was submitted within one year of the November 3, 2010 date of approval. • March 10, 2011 submission date is more than 60 days prior to the start of construction in January 2012.	March 10, 2011	Yes
6.4	The Director may require the proponent to amend the Complaint Protocol at any time. Should an amendment be required, the Director will notify the proponent in writing of the required amendment and date by which the amendment must be completed.	• Complaint Procedure is required by Condition 10 of the ECA	N/A	Yes
6.5	The proponent shall submit the amended Complaint Protocol to the Director within the time period specified by the Director in the notice.	• Complaint Procedure is required by Condition 10 of the ECA	N/A	Yes
7.	**Community Involvement**			
7.1	The proponent shall prepare and implement a Community	• Regions submitted a final plan via letter dated September 18, 2013.	September 18, 2013	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	Communications Plan. The plan shall be prepared in consultation with the EAAB and to the satisfaction of the Director.	This plan has been submitted prior to receipt of waste. • The Community Communications Plan was approved by the Director via letter dated September 30, 2013.		
7.2	The proponent shall finalize and submit the Community Communications Plan to the Director prior to the initial receipt of non-hazardous municipal solid waste at the site.	• Regions submitted a final plan via letter dated September 18, 2013. This plan has been submitted prior to receipt of waste.	September 18, 2013.	Yes
7.3	The Community Communications Plan shall include at a minimum details on: a) How the proponent plans to disseminate information to interested members of the public and any Aboriginal communities; b) How interested members of the public and any Aboriginal communities will be notified and kept informed about site operations; and, c) The procedures for keeping interested members of the public and Aboriginal communities informed about information on documents related to the undertaking, and when and how the information will be made available.	• Completed.	September 18, 2013.	Yes
7.4	The proponent shall give notice of and provide information about the undertaking to interested members of the public and Aboriginal communities through an internet web site and by other means. Such information shall include: a) Activities that are part of the undertaking, including monitoring activities; b) Reports and records related to the undertaking that are required to be submitted under this Notice of Approval or under any other ministry approvals that apply to the undertaking; and, c) Information on the Complaint Protocol required by Condition 6 of this Notice of Approval.	• Web site is currently operational • Documents posted on the website currently include, but are not limited to, the Complaint Protocol, Environmental Compliance Approval, Archived EA documentation, Groundwater and Surface Water Monitoring Plan, Soil Monitoring Plan, Ambient Air Monitoring Plan, Emissions Monitoring Plan, Noise Monitoring Plan, Odour Management and Mitigation Plan, Compliance Monitoring Plan, Community Communications Plan, Waste Diversion Program Monitoring Plan, Third Party Audit Plan, Draft Spill Contingency and Emergency Response Plan, Advisory Committee advertisements, agendas, and minutes, and annual monitoring reports prepared in accordance with the approved monitoring plans. • Additional information will be posted to the website as it becomes available • Required by ECA Condition 16: Public Access to Documentation	Carried into the ECA	Yes
7.5	The proponent shall hold public meetings to discuss the design, construction and operation of the undertaking, including, but not limited to: a) At least one meeting prior to the start of construction; b) At least one meeting prior to the receipt of non-hazardous municipal solid waste on site; and, c) At least one meeting a minimum of six months but not later than 12 months after the initial receipt of non-hazardous municipal solid waste	• Pre-construction public meeting was held at the Durham Regional Offices on December 7, 2011 from 5:00 pm to 6:30 pm. • Public meeting prior to receipt of waste was held in Clarington on June 25, 2014 from 5:00 pm to 8:00 pm. • Anticipated date of public meeting after receipt of waste is February 4, 2016	December 2011 June 2014 February 4, 2016	Ongoing

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	on the site.			
7.6	The proponent shall provide notice of the public meetings a minimum of 15 days prior to the meeting.	• Meeting notices for the December 2011 pre-construction meeting were advertised in local newspapers during the week of November 14, 2011 and also posted on the project website. • Meeting notices for the June 2014 prior to receipt of waste meeting were advertised in local newspapers from May 28 through June 5, 2014. • Meeting notices will be posted in local newspapers and on the project website at least 15 days prior to future meeting dates	November 2011 June 2014 January 2016	Ongoing
7.7	The proponent shall give the Director written notice of the time, date and location of each of the required community meetings a minimum of 15 days prior to the meeting.	• The MOECC Environmental Approvals Branch and District Office received an invitation to the December 7, 2011 pre-construction meeting on November 18, 2011. • The MOECC Environmental Approvals Branch District and Central Offices received an invitation to the June 25, 2014 prior to waste meeting on June 3, 2014. • The MOECC will receive an invitation at least 15 days prior to future meetings.	November 2011 June 2014 January 2016	Ongoing
8.	**Advisory Committee**			
8.1	The proponent shall establish an advisory committee to ensure that concerns about the design, construction and operation of the undertaking are considered and mitigation measures are implemented where appropriate.	• Complete • Required by ECA Condition 17: Advisory Committee	January 20, 2011 Carried into the ECA	Yes
8.2	The proponent shall provide administrative support for the advisory committee including, at a minimum: a) Providing a meeting space for advisory committee meetings; b) Recording and distributing minutes of each meeting; c) Preparing and distributing meeting notices; and, d) Preparing an annual report about the advisory committee's activities to be submitted as part of the Compliance Reports required by Condition 5 of this Notice of Approval.	• Meeting minutes and related correspondence are posted on the project website. • Annual report on advisory committee activities is included as Appendix C of this report. • Required by ECA Condition 17, and the Energy from Waste Advisory Committee (EFWAC) approved Terms of Reference	N/A	Yes
8.3	The proponent shall invite one representative from each of the following to participate on the advisory committee: a) Each of the lower tier municipalities in the Regional Municipality of Durham; and, b) Each of the lower tier municipalities in the Regional Municipality of York.	• Letters of invitation dated December 15, 2010 were sent to all listed municipalities	December 15, 2010	Yes
8.4	The proponent shall invite one representative from Central Lake Ontario	• Letter of invitation dated December 15, 2010 was sent to Central	December 15, 2010	Yes

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	Conservation Authority, and any other local conservation authorities that may have an interest in the undertaking to participate on the advisory committee.	Lake Ontario Conservation Authority		
8.5	The proponent shall invite one representative from each of the following local community groups to participate on the advisory committee: a) DurhamCLEAR; b) Durham Environmental Watch c) Zero Waste 4 Zero Burning	• Letters of invitation dated December 15, 2010 were sent to all listed local community groups.	December 15, 2010	Yes
8.6	The proponent may also invite other stakeholders to participate in the advisory committee, including but not limited to, interested members of the public, Aboriginal communities, and other federal or provincial agencies.	• Letters of invitation dated December 15, 2010 were sent to Durham Region Health Department and York Region Public Health Services. • Aboriginal communities received separate invitation to participate in other consultation activities. See Condition 9.1	December 15, 2010	Yes
8.7	A representative from the ministry shall be invited to attend meetings as an observer.	• Letters of invitation dated December 15, 2010 were sent to MOECC District Manager.	December 15, 2010	Yes
8.8	The advisory committee shall be provided with a copy of the documents listed below for information and may review the documents as appropriate and provide comments to the proponent about the documents, including the: a) Compliance Monitoring Program required by Condition 4; b) Annual Compliance Report required by Condition 5; c) Complaint Protocol required by Condition 6; d) Community Communications Plan required by Condition 7; e) The annual reports required by Condition 10; f) Ambient Air Monitoring and Reporting Plan and the results of the ambient air monitoring program required by Condition 11; g) Air Emissions Monitoring Plan required by Condition 12; h) Written report prepared and signed by the qualified professional required by Condition 16.5; i) Spill Contingency and Emergency Response Plan required by Condition 17; j) Odour Management and Mitigation Plan and the Odour Management and Mitigation Monitoring Reports required by Condition 18; k) Noise Monitoring and Reporting Plan as required by Condition 19; l) Groundwater and Surface Water Monitoring Plan, the results of the groundwater and surface water monitoring program, and the annual report on the results of the groundwater and surface water monitoring program required by Condition 20; and, m) Notice in writing of the date that municipal solid waste is first received as required by Condition 23.	Advisory Committee has reviewed and provided comments where applicable to the following documents: • Advisory Committee Terms of Reference • Compliance Monitoring Plan • 2011, 2012, 2013, 2014, 2015 Annual Compliance Reports • Complaint Protocol • Community Communications Plan • 2010, 2011, 2012, 2013, 2014 Annual Waste Diversion Reports • Ambient Air Quality Monitoring Plan • Ambient Air Quarterly and 2013, 2014 Annual report covering 20132014 activities • Air Emissions Monitoring and Reporting Plan • Third Party Auditor's Reports prepared by a qualified professional as required by Condition 16.5 • Spill Contingency and Emergency Response Plan • Odour Management and Mitigation Plan • Noise Monitoring and Reporting Plan • Groundwater and Surface water Monitoring Plan • 2012, 2013, 2014 Annual Groundwater and Surface Water reports covering the previous year activities • Soil Testing Plan • Details of first receipt of waste and fire were brought to EFWAC via EFWAC meeting held on April 9th, 2015.	Carried into the ECA	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
		• Notice to the Ministry of First receipt of waste is on the project website. **The following documents are to be provided as they are prepared:** • Future third party auditor's reports, waste diversion reports, environmental monitoring reports, compliance monitoring reports, and the annual facility operations report as required by Condition 15(1) of the Environmental Compliance Approval. • Items listed are built in to the approved EFWAC Terms of Reference		
8.9	The proponent shall hold the first advisory committee meeting within three months of the date of approval. At the first meeting, the advisory committee shall develop a Terms of Reference outlining the governance and function of the advisory committee.	• First meeting held January 20, 2011 was within three months of November 3, 2010 date of approval • Draft Terms of Reference were reviewed by the Committee and revised based on comments received both at the meeting or submitted in writing by February 14, 2011.	January 20, 2011	Yes
8.10	The Terms of Reference shall, at minimum, include: a) Roles and responsibilities of the advisory committee members; b) Frequency of meetings; c) Member code of conduct; d) Protocol for dissemination and review of information including timing; and, e) Protocol for dissolution of the advisory committee.	• Terms of Reference submitted to MOECC via letter dated February 18, 2011. • Terms of Reference approved via letter from the Director dated March 3, 2011.	February 18, 2011	Yes
8.11	The proponent shall submit the advisory committee's Terms of Reference to the Director and Regional Director.	• Terms of Reference submitted to MOECC via letter dated February 18, 2011. • Terms of Reference approved via letter from the Director dated March 4, 2011.	February 18, 2011	Yes
9.	**Consultation With Aboriginal Communities**			
9.1	The proponent shall continue to consult with any interested Aboriginal communities during the detailed design and implementation of the undertaking.	• Letters dated March 14, 2011 were sent to 22 Aboriginal communities inviting them to meet with the project team to discuss future consultation efforts. • Letters dated October 26, 2012 to Aboriginal Communities identified in the EA to advise of project updates and the project website as a resource for continuous updates. • The MOECC EAB Director, Regional Director, and Approvals Program Director were copied on all correspondence to Aboriginal Communities.	Ongoing	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
10.	**Waste Diversion**			
10.1	The proponent shall make a reasonable effort to work cooperatively with all lower tier municipalities to ensure that waste diversion programs, policies and targets set by the Regional Municipalities are being met.	• Both Regions continue to work with local municipalities to improve waste diversion and report waste diversion statistics to Waste Diversion Ontario annually. • Both Regions have long term waste management and diversion plans in place.	Ongoing	Yes
10.2	The proponent shall prepare and implement a Waste Diversion Program Monitoring Plan.	• Waste Diversion Program Monitoring Plans for Durham Region and York Region were submitted to the EAB Director and Regional Director on October 21, 2011. • The EAB Director approved the Waste Diversion Program Monitoring Plans via letter dated November 25, 2011.	October 21, 2011	Yes
10.3	The Waste Diversion Program Monitoring Plan shall provide a description of monitoring and reporting which shall at minimum include: a) Results of at source diversion programs and policies to determine the waste diversion rates and practices at both the regional and lower tier municipal level within the Regional Municipalities of Durham and York. b) Progress in the diversion programs, policies, practices and targets described in the environmental assessment, at both the regional and lower tier municipal level within the Regional Municipalities of Durham and York. c) Monitoring results for any additional diversion programs, policies, practices and targets carried out within the Regional Municipalities of Durham and York, which are not described in the environmental assessment.	• Completed	October 21, 2011	Yes
10.4	The proponent shall prepare and submit to the Director and Regional Director, commencing one year after the approval of the undertaking, annual reports detailing the results of the Waste Diversion Program Monitoring Plan.	• Fifth annual monitoring reports have been submitted to the Director and Regional Director. • Future monitoring reports to be submitted by November 3rd of each successive year.	Ongoing	Ongoing
10.5	The proponent shall post the Waste Diversion Program Monitoring Plan and the annual reports required on the proponent's web site for the undertaking.	• The Waste Diversion Monitoring Plan and annual reports for Durham and York Regions are posted on the project website	Ongoing	Yes
11.	**Ambient Air Monitoring and Reporting**			
11.1	The proponent shall prepare, in consultation with the ministry's Central Region Office and to the satisfaction of the Regional Director, an Ambient Air Monitoring and Reporting Plan for the undertaking.	• Final Plan submitted to the Regional Director August 31, 2011 • Consultation activities described under Condition 11.3 • MOECC Approval via letter dated May 30, 2012 • MOECC Approval of monitoring locations via letter dated June 5,	August 31, 2011	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
		2012.		
11.2	The proponent shall submit the Ambient Air Monitoring and Reporting Plan to the Director and Regional Director a minimum of nine months prior to the start of construction or by such other date as agreed to in writing by the Regional Director.	• Submission deadline revised to August 31, 2011 via letter from the Director dated June 30, 2011. • Submitted August 31, 2011	August 31, 2011	Yes
11.3	The proponent shall establish a working group that will provide advice on the development of the Ambient Air Monitoring and Reporting Plan. The Regions will, at a minimum, extend an invitation to Health Canada, the Durham Region Health Department, York Region Public Health Services, one participant from the advisory committee, and any other relevant federal or provincial government agencies including the ministry.	• Letters of invitation dated March 16, 2011 were sent to all listed working group participants with copies to the Director and Regional Director. • Two participants were appointed by the Advisory Committee. • Health Canada declined to participate. At Health Canada's suggestion, a representative from the Ontario Ministry of Health participated instead. • First working group meeting occurred on April 28, 2011. • Monitoring plan was revised based on comments received from the working group and circulated for comments to the MOECC Central Region Office, the Ambient Air Monitoring Working Group, and the Advisory Committee on July 7, 2011. The monitoring plan was revised based on comments received by August 15, 2011. • The Final Monitoring Plan was submitted to the Regional Director on August 31, 2011.	March 16, 2011	Yes
11.4	The Ambient Air Monitoring and Reporting Plan shall include at minimum: a) An ambient air monitoring program which includes an appropriate number of sampling locations. Siting of the sampling locations shall be done in accordance with the Ministry of the Environment's Operations Manual for Air Quality Monitoring in Ontario, March 2008, as amended from time to time; b) The proposed start date for and frequency of the ambient air monitoring and reporting to be carried out; c) The contaminants that shall be monitored as part of the Ambient Air Monitoring and Reporting Plan; and, d) At least one meeting on an annual basis between the proponent and the Regional Director to discuss the plan, the results of the ambient air monitoring program and any changes that are required to be made to the plan by the Regional Director.	• The submitted document meets these requirements. • The Regions and The MOECC met and discussed the first year annual report on July 30th, 2014. No changes were requested. • Meeting was held with Regions and MOECC on July 20, 2015 to discuss the 2014 Annual Report.	May 30, 2012	Yes
11.5	The proponent shall implement the ambient air monitoring program prior to the receipt of non-hazardous municipal solid waste on the site or at such other time that may be determined by the Regional Director and communicated to the proponent in writing and shall continue the monitoring until such time as the Regional Director notifies the proponent in writing that the Ambient Air Monitoring Program is no longer required.	• Agreed • Submitted plan includes monitoring of ambient air for one year prior to facility commissioning to establish background concentrations. • Ambient Air monitoring commenced in April 2013.	Ongoing	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
11.6	The Regional Director may require changes to be made to the Ambient Air Monitoring and Report Plan and the proponents shall implement the plan in accordance with the required changes.	• Addressing revisions required by the MOECC to the Plan are included in the Ambient Air Monitoring and Reporting Plan. • The implementation and reporting of Ambient Air Monitoring is a requirement of ECA Condition 7(4)	Carried into the ECA	Yes
11.7	The proponent shall report the results of the ambient air monitoring program to the Regional Director in accordance with the Ambient Air Monitoring and Reporting Plan.	• Agreed • In accordance with ECA Condition 7(4)(c) ambient air results will be posted to the website upon submission to the MOECC Regional Director. • Quarterly Reports and first and second annual Ambient Air Monitoring Report have been posted to the project website. • The implementation and reporting of Ambient Air Monitoring is a requirement of ECA Condition 7(4)	Carried into the ECA	Yes
11.8	Audits will be conducted by the ministry, as outlined in the Ministry of the Environment's Audit Manual for Air Quality Monitoring in Ontario, March 2008 to confirm that siting and performance criteria outlined in the Operations Manual are met. The proponent shall implement any recommendations set out in the audit report regarding siting of the sampling locations and performance criteria. The proponent shall implement the recommendations in the audit report within three months of the receipt of an audit report from the ministry.	• The monitoring program was written with reference to the MOECC Audit ManualThe Ministry of the Environment, Central Region, Technical Support Section conducts performance and site audits of the ambient air monitoring stations regularly. • The implementation and reporting of Ambient Air Monitoring is a requirement of ECA Condition 7(4)	Carried into the ECA	Yes
11.9	The proponent shall post the Ambient Air Monitoring and Reporting Plan and the results of the ambient air monitoring program on the proponent's web site for the undertaking upon submission of the plan or results of the program to the ministry.	• The Ambient Air Monitoring and Reporting Plan has been posted on the website. • Ambient Air Monitoring Reports will be posted to the website as they are completed. • The implementation and reporting of Ambient Air Monitoring is a requirement of ECA Condition 7(4)	Carried into the ECA	Yes
12.	**Emissions Monitoring**			
12.1	The proponent shall install, operate and maintain air emissions monitoring systems that will record the concentrations of the contaminants arising from the incineration of waste.	• Requirement of Environmental Compliance Approval Condition 7(2)	Carried into the ECA	Yes
12.2	The air emissions monitoring systems shall be installed and operational prior to the receipt of non-hazardous municipal solid waste at the site.	• Requirement of Environmental Compliance Approval Condition 7(2) • First receipt of waste occurred on February 9, 2015 • Continuous emissions monitoring system was installed and operational prior to first receipt of waste	February 9, 2015	Yes
12.3	The proponent shall prepare and implement an Air Emissions Monitoring	• Air Emissions Monitoring Plan submitted for comments to the	August 31, 2011	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	Plan. The Plan shall be prepared, in consultation with the ministry and to the satisfaction of the Director.	MOECC and to the Advisory Committee via letter dated July 23, 2011. • Final plan incorporating comments from MOECC and Advisory Committee submitted via letter dated August 31, 2011 • MOECC provided comments via letter dated August 21, 2012. • Regions and Covanta revised the Air Emissions Monitoring Plan on October 5, 2012, November 8, 2012, and February 11, 2013 to address comments from the MOECC. • The Air Emissions Monitoring Plan was approved by the MOECC Director via letter dated April 9, 2013.		
12.4	The Air Emissions Monitoring Plan shall include, at a minimum: a) Identification of all sources of air emissions at the site to be monitored; b) Identification of which contaminants will be monitored by continuous emissions monitoring and which by stack testing; c) The proposed start date for and frequency of air emissions monitoring; d) The frequency of and format for reporting the results of air emissions monitoring; e) The contaminants that shall be monitored, which shall include at a minimum those contaminants set out in Schedule 1 to this Notice of Approval; and, f) A notification, investigation and reporting protocol to be used in the event that the concentration(s) of one or more of the contaminants released from an emission source that requires approval under Section 9 of the *Environmental Protection Act* exceeded the relevant limits.	• Completed.	August 31, 2011	Yes
12.5	The proponent shall submit the Air Emissions Monitoring Plan to the Director, a minimum of six months prior to the start of construction or by such other date as agreed to in writing by the Director.	• Director revised submission deadline to August 31, 2011 via letter dated June 30, 2011. • Plan submitted August 31, 2011	August 31, 2011	Yes
12.6	The proponent shall implement the Air Emissions Monitoring Plan such that the monitoring commences when the first discharges are emitted from the facility to the air or at such other time as the Director may agree to in writing and shall continue until such time as the Director notifies the proponent in writing that the Air Emissions Monitoring Plan is no longer required.	• ECA Condition 5 details requirements for operation and maintenance of the air pollution control (APC) and continuous emissions monitoring systems (CEMS) equipment. • ECA Condition 6 details the facility performance requirements for combustion, APC and CEMS. • ECA Condition 13 details actions required to notify the MOECC in the event of a spill.	Carried into the ECA	Yes
12.7	The proponent shall post the reports of the air emissions monitoring systems on the proponent's web site for the undertaking.	• Required by Condition 16 (1) (a) of the Environmental Compliance Approval	Carried into the ECA	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
		• Web site reporting of emissions data is operational		
12.8	For those contaminants that are monitored on a continuous basis, the proponent shall post on the proponent's website for the undertaking the results of the monitoring for each of those contaminants in real time.	• Web site reporting of emissions data is operational • Required by ECA Condition 16 (2)	Carried into the ECA	Yes
13.	**Air Emissions Operational Requirements**			
13.1	The proponent is expected to operate the undertaking in accordance with Schedule 1 of the Notice of Approval. If the facility is not operating in accordance with Schedule 1, the operator is required to take steps to bring the facility back within these operational requirements.	• Schedule 1 is carried into the ECA as Schedule "C"ECA Condition 5 details requirements for operation and maintenance of the air pollution control (APC) and continuous emissions monitoring systems (CEMS) equipment. • ECA Condition 6 details the facility performance requirements for combustion, APC and CEMS. • ECA Condition 7 details the testing and monitoring requirements of the CEMS.ECA • Condition 13 details actions required to notify the MOECC in the event of a spill.	Carried into the ECA	Yes
13.2	Schedule 1 sets out the operational requirements the ministry expects the facility to meet during the normal operating conditions of the facility when operating under a steady state but does not include start up, shut down, or malfunction.	• Schedule 1 is carried into the ECA as Schedule "C" • ECA Condition 5 details requirements for operation and maintenance of the air pollution control (APC) and continuous emissions monitoring systems (CEMS) equipment. • ECA Condition 6 details the facility performance requirements for combustion, APC and CEMS. • ECA Condition 7 details the testing and monitoring requirements of the CEMS. • ECA Condition 13 details actions required to notify the MOECC in the event of a spill. • Schedule "F" of the ECA details the CEMS specifications required by the MOECC	Carried into the ECA	Yes
13.3	The timing and frequency of monitoring for a contaminant in Schedule 1 shall be as required by the approval granted to the facility under the *Environmental Protection Act*, should approval be granted.	• Timing and frequency are in accordance with Schedule "C" of the Environmental Compliance Approval. • ECA Condition 7 details timing and frequency for source testing.	Carried into the ECA	Yes
14.	**Daily Site Inspection**			
14.1	The proponent shall conduct a daily site inspection of the site including the non-hazardous municipal solid waste received at the site, each day the	• Agreed • See Environmental Compliance Approval Conditions 3 (6), 3 (7), 3	Carried Into the ECA	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	undertaking is in operation to confirm that: a) The site is secure; b) The operation of the undertaking is not causing any nuisance impacts; c) The operation of the undertaking is not causing any adverse effects on the environment; d) The undertaking is being operated in compliance with the conditions in this Notice of Approval and any other ministry approvals issued for the undertaking; and, e) Only non-hazardous waste is being received at the site.	(8), 5 (5), 14 (3), and 14 (5)		
14.2	If, as a result of the daily inspection, any deficiencies are noted by the employee in regard to the factors set out in Condition 14.1 above, the deficiency shall be remedied immediately by the proponent. If necessary to remedy the deficiency, the proponent shall cease operations at the site until the deficiency has been remedied.	• Agreed • See Environmental Compliance Approval Conditions 5 (5), 14 (3), and 14 (5)	Carried into the ECA	Yes
14.3	A record of the daily inspections shall be kept in the daily log book required in Condition 15. The information below must be recorded in the daily log book by the person completing the inspection and includes the following information: a) The name and signature of the person that conducted the daily inspection; b) The date and time of the daily inspection; c) A list of any deficiencies discovered during the daily inspection; d) Any recommendations for action; and, e) The date, time, and description of actions taken.	• Agreed • See Environmental Compliance Approval Conditions 5 (5), 14 (3), and 14 (5)	Carried into the ECA	Yes
14.4	The proponent shall retain either on site or in another location approved by the District Manager, a copy of the daily log book and any associated documentation regarding the daily site inspections.	• Agreed • See Environmental Compliance Approval Conditions 5 (5), 14 (3), and 14 (5) • Required by Condition 14 (2) of the Environmental Compliance Approval	Carried into the ECA	Yes
15.	**Daily Record Keeping**			
15.1	The proponent shall maintain a written daily log which shall include the following information: a) Date; b) Types, quantities, and source of non-hazardous municipal solid waste received; c) Quantity of unprocessed, processed and residual non-hazardous municipal solid waste on the site;	• Agreed • See Environmental Compliance Approval Conditions 5 (5), 14 (3), and 14 (5)	Carried into the ECA	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	d) Quantities and destination of each type of residual material shipped from the site; e) The record of daily site inspections required to be maintained by Condition 14.3; f) A record of any spills or process upsets at the site, the nature of the spill or process upset and the action taken for the clean up or correction of the spill or process upset, the time and date of the spill or process upset, and for spills, the time that the ministry and other persons were notified of the spill pursuant to the reporting requirements of the *Environmental Protection Act*; g) A record of any waste that was refused at the site, including: amounts, reasons for refusal and actions taken; and, h) The name and signature of the person completing the report.			
15.2	The proponent shall retain, either on site or in another location approved by the District manager, a copy of the daily log book and any associated documentation.	• Agreed • See Environmental Compliance Approval Conditions 5 (5), 14 (3), and 14 (5)	Carried into the ECA	Yes
15.3	The proponent shall make the daily log book and any associated documentation available to the ministry or its designate in a timely manner when requested to do so by the ministry.	• Agreed • Required by Condition 14(1) of the Environmental Compliance Approval	Carried into the ECA	Yes
16.	**Third Party Audits**			
16.1	The proponent shall retain the services of a Qualified, Independent Professional Engineer to carry out an independent audit of the undertaking.	• Selection of auditor during the construction phase of the project was approved by the Director and Regional Director via letter dated December 8, 2011.	December 8, 2011	Yes
16.2	Within six months from the date of approval or other such date as agreed to in writing by the Regional Director, the proponent shall submit to the Director and the Regional Director, the name of the Qualified, Independent Professional Engineer and the name of the company where he/she is employed.	• Deadline to submit name of auditor revised to September 30, 2011 via letter from the Director and Regional Director dated June 30, 2011. • Deadline to submit name of external auditor extended to 30 days prior to the commencement of construction to allow for the ministry's comment on the draft audit plan via letter from the MOECC Director and Regional Director dated September 30, 2011. • Regions submitted name of construction-phase auditor on November 16, 2011, more than 30 days prior to commencement of construction in January 2012. • Regions to submit name of auditor for acceptance testing phase at least six months prior to commencement of acceptance testing in accordance with approved audit plan. • Regions have submitted name of acceptance testing phase auditor via letter dated September 18, 2013.	November 16, 2011	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
		• Regions have submitted name of auditor for operations phase at least six months prior to receipt of waste in accordance with approved audit plan via letter dated June 9, 2014.		
16.3	The proponent shall submit an audit plan to the satisfaction of the Regional Director that sets out the timing of and frequency for the audits, as well as the manner in which the audits are to be carried out.	• Construction Phase Audit Plan approved by the Regional Director and Regional Director via letter dated December 8, 2011. • Regions to submit audit plan for acceptance testing phase at least 6 months prior to commencement of acceptance testing in accordance with approved audit plan. • Regions have submitted audit plan for acceptance testing phase via letter dated September 18, 2013. • Regions submitted operations phase audit plan at least 6 months prior to commencement of operations in accordance with approved audit plan via letter dated October 2, 2013. • Acceptance test audit plan approved by Regional Director via letter dated July 23, 2014. • Operations Phase audit plan approved by MOECC via letter dated October 24, 2013.	December 8, 2011	Yes
16.4	The audit shall include, at a minimum, the following: a) A detailed walkthrough of the entire site; b) A review of all operations used in connection with the undertaking; and, c) A detailed review of all records required to be kept by this Notice of Approval or under any other ministry approvals for the undertaking. d) The proponent shall obtain from the Qualified, Independent Professional Engineer, a written report of the audit prepared and signed by the Qualified, Independent Professional Engineer that summarizes the results of the audit.	• Audit plans for construction phase, acceptance testing phase, and operations phase comply with these requirements. • Carried into ECA Condition 15 (2)	Carried into the ECA	Yes
16.5	The proponent shall submit the written report summarizing the result of the audit to the Regional Director no later than 10 business days following the completion of the audit.	• The first Construction Phase Audit was undertaken on June 1, 2012 • The audit report was submitted to the MOECC on June 15, 2012, within 10 business days following the audit. • The second Construction Phase audit was undertaken on April 5, 2013 and was submitted to the MOECC on April 15, 2013. • The third Construction Phase Audit was undertaken on September 6, 2013 and was submitted to the MOECC on September 20, 2013. • The fourth Construction Phase Audit was undertaken on March 28, 2014 and submitted to the MOECC on April 14, 2014 • Carried into ECA Condition 15 (3)	Carried into the ECA	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
16.6	The proponent shall retain either on site or in another location approved by the Regional Director, a copy of the written audit report and any associated documentation.	• Copies of the first four audit reports are retained on site. • Copies of future audit reports will be retained on site as required by Condition 14 (9)(d) of the Environmental Compliance Approval • Carried into ECA Condition 15 (3)	Carried to the ECA	Yes
16.7	The proponent shall make the written audit report and any associated documentation available to the ministry or its designate in a timely manner when requested to do so by the ministry.	• Agreed • Required by Condition 14 (1) of the Environmental Compliance Approval	Carried into the ECA	Yes
16.8	The proponent shall post the written audit report on the proponent's web site for the undertaking following submission of the report to the ministry.	• The first four audit reports have been posted to the project website. • Future reports will be posted to the website as required by Condition 16(1)(d) of the Environmental Compliance Approval	Carried into the ECA	Yes
17.	**Spill Contingency and Emergency Response Plan**			
17.1	The proponent shall prepare and implement a Spill Contingency and Emergency Response Plan.	• Required by Condition 11 of the Environmental Compliance Approval • Draft Spill Contingency and Emergency Response Plan was submitted to the MOECC via letter dated September 24, 2013. • Final Spill Contingency and Emergency Response Plan was submitted to the MOECC via letter dated January 29, 2014. • MOECC approved the Spill Contingency and Emergency Response Plan via Environmental Compliance Approval amendment dated August 12, 2014.	September 24, 2013	Yes
17.2	The proponent shall submit to the Director, the Spill Contingency and Emergency Response Plan a minimum of 60 days prior to the receipt of non-hazardous municipal solid waste at the site or such other date as agreed to in writing by the Director.	• Deadline to submit plan revised to 120 days prior to the commencement date of operation by Environmental Compliance Approval Condition 11 (3). • The draft Spill Contingency and Emergency Response Plan was submitted via letter dated September 24, 2013 to the MOECC.	September 24, 2013	Yes
17.3	The Spill Contingency and Emergency Response Plan shall include, but is not limited to: a) Emergency response procedures, including notification procedures in case of a spill, fires, explosions or other disruptions to the operations of the facility; b) Cell and business phone numbers and work location for all person(s) responsible for the management of the site; c) Emergency phone numbers for the local ministry office, the ministry 's Spills Action Centre, and the local Fire Department; d) Measures to prevent spill, fires and explosions; e) Procedures for use in the event of a fire; f) Details regarding equipment for spill clean-up and all control and safety devices;	• Additional requirements included in Environmental Compliance Approval Condition 11 (2). • Completed.	September 24, 2013	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	g) Shut down procedures for all operations associated with the undertaking including alternative waste disposal site locations; h) Maintenance and testing program for spill clean-up equipment and fire fighting equipment; i) Training for site operators and emergency response personnel; and, j) A plan, identifying the location and nature of wastes on site.			
17.4	The proponent shall provide the Spill Contingency and Emergency Response Plan to the District Manager, the local Municipality of Clarington and the local Municipality of Clarington Fire Department a minimum of 30 days prior to the initial receipt of non-hazardous municipal solid waste at the site or such other date as agreed to in writing by the Director.	• Deadline to submit finalized plan to the Director revised to 120 days prior to the commencement date of operation by Environmental Compliance Approval Condition 11 (3). • Document was submitted to the District Manager, local municipality, and fire department for comments prior to final submission. • Draft Spill Contingency and Emergency Response Plan was submitted to the MOECC via letter dated September 24, 2013. • Draft Spill Contingency and Emergency Response Plan was also developed in consultation with the local municipality and local fire department in advance of the final submission to the MOECC. • Municipal building code and fire code requirements for construction are reviewed with each building permit submission.	September 24, 2013	Yes
17.5	The proponent shall take all necessary steps to contain and clean up a spill on the site. A spill or upset shall be reported immediately to the ministry's Spills Action Centre at (416) 325-3000 or 1-800-268-6060.	• Agreed. • Required by Condition 12 of the Environmental Compliance Approval • Required by Condition 13(3) of the Environmental Compliance Approval	Carried into the ECA	Yes
18.	**Odour Management and Mitigation**			
18.1	The proponent shall prepare, in consultation with the ministry's Central Region Office and to the satisfaction of the Regional Director, and implement an Odour Management and Mitigation Plan for the undertaking.	• Odour Management and Mitigation Plan submitted to MOECC on August 31, 2011. • Revised Odour Management and Mitigation Plan submitted May 4, 2012. • Odour Management and Mitigation Plan approved by Regional Director via letter dated August 21, 2012.	August 21, 2012	Yes
18.2	The proponent shall submit the Odour Management and Mitigation Plan to the Regional Director a minimum of six months prior to the start of construction or at such other time as agreed to in writing by the Regional Director.	• Deadline to submit plan revised to August 31, 2011 via letter from the Director and Regional Director dated June 30, 2011. • Plan submitted in draft form to MOECC and Advisory Committee for comments via email dated July 25, 2011 • Plan incorporating MOECC and Advisory Committee comments submitted August 31, 2011	August 31, 2011	Yes
18.3	The Odour Management and Mitigation Plan shall include at a minimum:	• Addressed in the approved odour management and mitigation plan	August 31, 2011	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	a) Standard operating and shut down procedures; b) Maintenance schedules; c) Ongoing monitoring for and reporting of odour; d) Corrective action measures and other best management practices for ongoing odour control and for potential operational malfunctions; e) A schedule for odour testing at sensitive receptors; and, f) A section that specifically addresses odour control measures should operation of the undertaking be disrupted or cease.	• Additional requirements listed in Environmental Compliance Approval Condition 8 (9).		
18.4	The proponent shall prepare and submit the Odour Management and Mitigation Monitoring Reports annually to the Regional Director with the first report submitted beginning six months following the initial receipt of non-hazardous municipal solid waste at the site or such other date as agreed to in writing by the Regional Director.	• Final Odour Monitoring and Mitigation Plan is compliant with these requirements. • The first annual Odour test was held simultaneously with the first Stack(source) test as agreed to by the MOECC on October 8, 2015. Odour test report is currently being prepared for submission to the MOECC. • Required by ECA Condition 7(8)	Carried into the ECA	Yes
18.5	The Odour Management and Mitigation Monitoring Reports shall be submitted every 12 months from the date of the submission of the first report or until such time as the Regional Director notifies the proponent in writing that the Odour Management and Mitigation Monitoring Reports are no longer required.	• Required by ECA Condition 7(8)	Carried into the ECA	Yes
18.6	The proponent shall post the Odour Management and Mitigation Monitoring Reports on the proponent's web site for the undertaking following submission of the reports to the Regional Director.	• Odour Management and Mitigation Plan posted to the website. • Required by Condition 16(1)(e) of Environmental Compliance Approval	Carried into the ECA	Yes
19.	**Noise Monitoring and Reporting**			
19.1	The proponent shall prepare and implement a Noise Monitoring and Reporting Plan for the undertaking.	• Noise Monitoring and Reporting Plan was submitted to the Director via letter dated September 15, 2011 • Noise Monitoring and Reporting Plan was approved by the MOECC via Amendment Approval dated August 12, 2014	September 15, 2011	Yes
19.2	The proponent shall submit the Noise Monitoring and Reporting Plan to the Director a minimum of 90 days prior to the start of construction or such other date as agreed to in writing by the Director.	• Final plan submitted via letter dated September 15, 2011 • Final submission date is more than 90 days prior to start of construction in January 2012	September 15, 2011	Yes
19.3	The Noise Monitoring and Reporting Plan shall include a protocol to ensure that the noise emissions from the facility comply with the limits set out in the Ministry of the environment's Publication NPC-205 "Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)", October 1995, as amended from time to time.	• Plan includes annual acoustic audits to confirm compliance. • First acoustic audit submitted on May 8, 2015 • Required by Condition 7(5) of Environmental Compliance Approval	September 15, 2011	Yes
19.4	The proponent shall post the Noise Monitoring and Reporting Plan on the	• Noise Monitoring and Reporting Plan posted to the website.	September 15, 2011	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	proponent's web site for the undertaking following submission of the plan to the Director.	• Required by Condition 16(1)(f) of the Environmental Compliance Approval		
20.	**Groundwater and Surface Water Monitoring and Reporting**			
20.1	Prior to the start of construction, the proponent shall identify any areas where the undertaking may affect groundwater or surface water. For those areas, the proponent shall prepare and implement, in consultation with the ministry's Central Region Office and to the satisfaction of the Regional Director, a Groundwater and Surface Water Monitoring Plan.	• Groundwater and Surface Water Monitoring and Reporting Plan submitted to the Regional Director via letter dated September 15, 2011 • Groundwater and Surface Water Monitoring Plan was approved by the Regional Director via letter dated October 14, 2011	September 15, 2011	Yes
20.2	The proponent shall provide the Groundwater and Surface Water Monitoring Plan to any other government agencies for review and comment, as may be appropriate.	• Groundwater and Surface Water Monitoring Plan was provided to the Central Lake Ontario Conservation Authority and the Advisory Committee for comments in August 2011	August, 2011	Yes
20.3	The Groundwater and Surface Water Monitoring Plan shall include at a minimum: a) A groundwater and surface water monitoring program; b) The proposed start date and frequency of groundwater and surface water monitoring; c) The contaminants that shall be monitored as part of the groundwater and surface water monitoring program; and, d) At least one meeting each year between the proponent and the Regional Director to discuss the plan, the results of the monitoring program and any changes that are required to be made to the plan by the Regional Director.	• Included in the approved plan • Meeting was held with Regions and MOECC on June 5, 2014 to discuss the 2013 Annual Report No changes were required • Meeting was held with Regions and MOECC on July 20, 2015 to discuss the 2014 Annual Report	September 15, 2011	Yes
20.4	The proponent shall submit the Groundwater and Surface Water Monitoring Plan to the Regional Director a minimum of 90 days prior to the start of construction or such other date as agreed to in writing by the Regional Director.	• September 15, 2011 submission date is more than 90 days prior to the start of construction in January 2012. • Groundwater Surface Water Monitoring Plan approved by the Regional Director via letter dated October 14, 2011.	September 15, 2011	Yes
20.5	The Regional Director may require changes to be made to the Groundwater and Surface Water Monitoring Plan and the proponent shall implement the plan in accordance with the required changes.	• The mechanism for changes requested by the MOE is included in the Groundwater and Surface Water Monitoring Plan. • Groundwater and Surface Water monitoring is a requirement of ECA Condition 7(14)	Carried into the ECA	Yes
20.6	The groundwater and surface water monitoring program shall commence prior to the receipt of non-hazardous municipal solid waste at the site or such other time as agreed to in writing by the Regional Director, and shall continue until such time as the Regional Director notifies the proponent in writing that the groundwater and surface water monitoring program is no longer required.	• Proposed Groundwater and Surface Water Monitoring Plan commenced prior to start of construction and will continue until the Regional Director notifies the Regions in writing that the monitoring program is no longer required. • Baseline groundwater sampling commenced in January 2012, prior to receipt of waste.	Carried into the ECA	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
20.7	Thirty days after waste is first received on site, the proponent shall prepare and submit to the Director and Regional Director, a report containing all of the results of the groundwater and surface water monitoring program.	• Groundwater and Surface Water Facility Initiation Reports were submitted to the MOECC on March 11, 2015, 30 days from when waste was first received on site February 9, 2015.	March 11, 2015	Yes
20.8	The proponent shall prepare and submit to the Director and Regional Director, an annual report containing the results of the groundwater and surface water monitoring program. The first report shall be submitted 12 months from the start of the monitoring program and every year thereafter.	• Third annual Groundwater and Surface Water monitoring report was submitted on April 30, 2015	Carried into the ECA	Yes
20.9	The proponent shall prepare and submit to the Director and Regional Director, a report containing the results of the groundwater and surface water monitoring program with 30 days of any of the following events: a) A spill occurs on site; b) A fire or explosion occurs on site; c) A process upset; or, d) Any disruption to normal operations that may directly or indirectly have an impact on groundwater or surface water.	• Included in the approved Groundwater and Surface Water Monitoring Plan • Required by Condition 7(14)(b) of the Environmental Compliance Approval	Carried into the ECA	Yes
20.10	The proponent shall post the Groundwater and Surface Water Monitoring Plan and all reports required by this condition on the proponent's web site for the undertaking following submission of the plan and reports to the ministry.	• Groundwater and Surface Water Monitoring Plan and reports are posted to the website • Future reports will be posted to the website as they are prepared. • Required by Condition 7(14)(c) of the Environmental Compliance Approval • Required by Condition 16 (1) (g) of the Environmental Compliance Approval	Carried into the ECA	Yes
21.	**Types of Waste and Service Area**			
21.1	Only non-hazardous municipal solid waste from municipal collection within the jurisdictional boundaries of the Regional Municipality of Durham and the Regional Municipality of York may be accepted at the site.	• Agreed • Required by Conditions 2 (1), 2 (2), and 2 (3) of the Environmental Compliance Approval	Carried into the ECA	Yes
21.2	Materials which have been source separated for the purposes of diversion shall not be accepted at this site. This prohibition does not apply to the non-recyclable residual waste remaining after the separation of the recyclable materials from the non-recyclable materials at a materials recycling facility or other processing facility.	• Agreed • See Condition 2 (3) (b) of the Environmental Compliance Approval	Carried into the ECA	Yes
21.3	The proponent shall ensure that all incoming waste is inspected prior to being accepted at the site to ensure that only non-hazardous municipal solid waste is being accepted.	• Agreed • See Condition 4 (2) and 4 (3) of the Environmental Compliance Approval	Carried into the ECA	Yes
21.4	If any materials other than non-hazardous municipal solid waste are found during inspection or operation, the proponent shall ensure that management and disposal of the material is consistent with ministry	• Agreed • See Condition 4 (3) of the Environmental Compliance Approval	Carried into the ECA	Yes

Condition No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	guidelines and legislation.			
22.	**Amount of Waste**			
22.1	The maximum amount of non-hazardous municipal solid waste that may be processed at the site is 140,000 tonnes per year.	• 140,000 tonnes per year is the maximum annual tonnage recognized on page 1 of the Environmental Compliance Approval	Carried into the ECA	Yes
23.	**Notice of the Date Waste First Received**			
23.1	Within 15 days of the receipt of the first shipment of waste on site, the proponent shall give the Director and Regional Director written notice that the waste has been received.	• Notification letter sent to MOECC via email on February 10, 2015, 1 day after waste was first received on site.	February 2015	Yes
24.	**Construction and Operation Contracts**			
24.1	In carrying out the undertaking, the proponent shall require that its contractors, subcontractors and employees: a) fulfill the commitments made by the proponent in the environmental assessment process, including those made in the environmental assessment an in the proponent's responses to comments received during the environm1ental assessment comment periods; b) meet applicable regulatory standards, regarding the construction and operation of the undertaking; c) obtain any necessary approvals, permits or licenses; and, d) have the appropriate training to perform the requirements of their position.	• Project Agreement requires Contractor to comply with all authorizations including the Environmental Assessment and Notice of Approval (incorporated by reference) the Certificates of Approval, and all applicable regulations. • Regions provided a full time on-site inspector during construction to monitor compliance with the terms and conditions of the contract, including compliance with EA conditions. • Carried into the ECA. Environmental Compliance Approval Condition 9(1) requires Covanta to document staff training on the EA and ECA conditions and applicable laws and regulations. • Complaint Protocol will remain in effect throughout the construction, commissioning, and operations periods in accordance with Condition 6 of the Notice to Proceed. • All building and other permits have been approved.	Carried into the ECA	Yes
25.	**Amending Procedures**			
25.1	Prior to implementing of any proposed changes to the undertaking, the proponent shall determine what *Environmental Assessment Act* requirements are applicable to the proposed changes and shall fulfill those *Environmental Assessment Act* requirements.	• Two ECA amendments were requested. The first one was to approve the "Ash Sampling and Testing Protocol" as required Condition 7.(7)(a), the "Durham York Energy Centre, Spill Contingency & Emergency Response Plan", as required Condition 11.(3), "Durham York Energy Centre, Noise Monitoring and Reporting Plan" as required Condition 7.(5)(a) and "Durham York Energy Centre, Protocol for the Measurement of Combustion Temperature and the Development of Time and Temperature Correlations" as proposed by the applicant and the second amendment was submitted for lime addition process for ash.	Carried into the ECA	Yes

Appendix B

EA Study Document Compliance Table

Relevant EA Section No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	General Requirements			
2	• The Proponents commit that if approval to proceed with the Undertaking is given, it will be the Proponents who are legally responsible for carrying out the Undertaking as approved.	• The Regions are 100% owners under the Project Agreement • Both Regions and the Contractor are named on the Environmental Compliance Approval Application at the MOECC's request. • As owners, the Regions remain legally responsible for ensuring that the contractor fulfills its duties under the contract.	Ongoing	Yes
11	• The Regions will undertake an evaluation of post-closure uses for the property associated with the Project, at the appropriate time when the Project is nearing the end of its life expectancy.	• Required by Condition 18 of the Environmental Compliance Approval • Commitment reaffirmed in Section 16 of the Design and Operations Report submitted with the Waste ECA Application • Environmental Compliance Approval Condition 18 requires the Regions to submit a Closure Plan for approval by the MOECC at least 9 months prior to facility closure.	Carried into the ECA	Yes
11	• Decommissioning of the Facility will be conducted in compliance with applicable regulatory requirements at the time of decommissioning.	• Required by Condition 18 of the Environmental Compliance Approval	Carried into the ECA	Yes
11.2	• Environmental protection awareness, spill prevention planning and contingency training will be implemented for all employees as necessary and appropriate.	• Final Spill Contingency and Emergency Response Plan was submitted to the MOECC January 29, 2014 • Staff training requirements including regulatory compliance and emergency response provided in Environmental Compliance Approval Condition 9 (1).	Carried into the ECA	Yes
15	• The Regions will prepare and submit to the Director of the EAB of the Ontario MOECC an EA Compliance Monitoring Program.	• Compliance Monitoring Program submitted to the Director via letter dated October 14, 2011 in accordance with Condition 4.1 of the EA Notice of Approval	October 14, 2011	Yes
	Air Quality			
11.1	Air quality related mitigation/management during construction will include: • Mitigation and environmental management / monitoring measures will include: • Employment of controlled entrances and exits at the construction site to minimize the offsite tracking of mud. • Temporary and permanent grassing in disturbed areas. • Dust control during dry periods. • Possible implementation of an idling protocol as required. • Adherence to an equipment maintenance program. • Ambient air quality monitoring for particulate matter will be undertaken to monitor the effectiveness of the mitigation measures.	• Construction phase nearing completion • Project Agreement requires Contractor to comply with all authorizations including Environmental Assessment and Certificates of Approval, and all applicable regulations. • Regions will provide a full time on-site inspector during construction to monitor compliance with the terms and conditions of the contract, including compliance with EA conditions. • Complaint protocol submitted to MOECC as per EA Notice to Proceed Condition 6 will be in effect throughout the construction period. • Air Quality during construction is addressed by the contractor in their site Quality Management and/or Site Specific Health and Safety Plans	Carried into the ECA	Yes
11.1	• Very low NO_x (VLN) system in the Facility's stoker	• Facility is equipped with VLN system.	February 9, 2015	Yes

Relevant EA Section No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
11.1	• SNCR for additional NO_x control	• Facility is equipped with SNCR system	February 9, 2015	Yes
11.1	• Activated carbon injection after the economizer for mercury and dioxin/furan control	• Facility is equipped with an activated carbon system	February 9, 2015	Yes
11.1	• Acid gas scrubber the removal of gases such as SO_x and HCl	• Facility is equipped with an acid gas scrubber	February 9, 2015	Yes
11.1	• A fabric filter baghouse to remove solid particulate matter	• Facility is equipped with a fabric filter baghouse	February 9, 2015	Yes
11.1	• The application of design and operations pre-processing odour control measures such as enclosed loading, negative air pressure inside the Facility and fully-enclosed feedstock delivery trucks.	• Facility design includes negative air pressure and fully enclosed waste receiving and ash loading facilities	February 9, 2015	Yes
11.1	• Provision of a Continuous Emissions Monitoring System (CEMS) at the baghouse outlet to monitor and record opacity, moisture, CO, O_2 , NO_x, SO_2, HCL and HF. Opacity measurements will be used as the filter bag leak detection system.	• Facility is equipped with a fully compliant CEMS system	February 9, 2015	Yes
11.1	• Provision of a Continuous Emissions Monitoring System (CEMS) at the economizer outlet to monitor and record O_2, SO_2 and CO.	• Facility is equipped with O2, SO2 and CO analyzers at the economizer outlet	February 9, 2015	Yes
11.1	• Provision of a Continuous Emissions Monitoring System (CEMS) to monitor and record o Flue gas temperatures at the inlet of the boiler convection section and at the baghouse inlet. o The temperature and pressure of the feedwater and steam for each boiler. o The mass flow rate of steam at each boiler.	• Facility is equipped with each of these controls.	February 9, 2015	Yes
11.1	• A long-term continuous dioxins sampling device will be installed to monitor the adsorption of dioxins onto the exchangeable adsorption-resin-filled cartridge.	• Facility is equipped with a long term dioxin and furan sampling system.	September 2015	Yes
11.1	• Emissions (stack) testing and monitoring protocol as required for the ECA under the EPA.	• As per Condition 7(1) and Schedule D of the Environmental Compliance Approval	Carried into the ECA	Yes
11.1	• NPRI emissions reporting that will entail a combination of monitoring or direct measurement, mass balance, process-specific emissions factors and engineering estimates.	• National Pollutant Release Inventory (NPRI) annual reporting is a requirement under the Canadian Environmental Protection Act (Federal)	Commissioning and Operations Period	No
11.1	• Proposed ambient air quality monitoring in the immediate vicinity of the Facility for a 3-year period.	• Ambient air monitoring in accordance with the approved monitoring plan commenced in April 2013. • Required by ECA Condition 7(4)	Carried into the ECA	Yes
	Surface Water and Groundwater			
11.2	Surface water and groundwater related mitigation and environmental	• Construction Phase nearing completion.	Carried into the	Yes

Relevant EA Section No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	management / monitoring measures during construction will include: • Construction phase drainage will route stormwater from throughout the Site to a stormwater sedimentation pond and to the extent feasible, maintain existing drainage routes. Permanent SWM ponds may be constructed early to reduce need for sedimentation ponds. • Use of perimeter ditching and site grading as well as silt fencing around forested areas to isolate runoff. • Use of setback transition use areas and erosion control fencing along watercourses. • ESC will be implemented during the construction phase to reduce potential soil loss and runoff velocities. • During the construction phase, stormwater will be routed via conveyance swales and/or storm sewers draining catchbasins to a SWM pond in the southwest corner of the Site. • The pond will discharge to the CN Rail swale and stormwater will subsequently be conveyed to Tooley Creek. • In addition to the pond, lot level, and conveyance controls such as surface stabilization measures, sediment traps, and swales enhanced with rock check dams will also be employed. • Grading plans will be designed to maintain existing drainage patterns which will ensure all captured stormwater will be routed through SWM features. • Dewatering and excavation pumping is expected in order to establish a sufficiently dry environment to construct the Facility foundations.	• Required by Condition 4(6) of the Environmental Compliance Approval • Project Agreement requires Contractor to comply with all authorizations including Environmental Assessment and Certificates of Approval, and all applicable regulations. • Regions will provide a full time on-site inspector during construction to monitor compliance with the terms and conditions of the contract, including compliance with EA conditions. • Groundwater and Surface Water Monitoring and Reporting Plan submitted via email September 15, 2011 in accordance with EA Condition 20 includes monitoring of water quality in Tooley Creek using continuous data loggers, and documentation of regular inspection and maintenance of check dams and other sediment controls. • A sediment and erosion control plan has been developed by the contractor and is in effect during the construction phase which monitors surface water. Golder has been contracted by Covanta to monitor surface water and erosion and sediment control. • Site stormwater management plan has been developed and approved by CLOCA and Clarington (Clarington Master Drainage Plan)	ECA	
11.2	• A series of groundwater monitoring wells may be installed within the Site to assess the Facility's effects on both groundwater quantity and quality during construction to be determined at subsequent approvals stage.	• Groundwater and Surface Water Monitoring Plan approved by MOECC Central Region Director on October 14, 2011 includes groundwater monitoring wells to be installed prior to facility construction and 1 well to be installed after construction. • Groundwater wells installed in December 2011. Baseline monitoring commenced January 2012.	December 2011	Yes
11.2	• Storm water pond design criteria will meet enhanced design guidance criteria found in the MOECC SWM Planning and Design Manual;	• The stormwater management pond design is compliant with this requirement and is provided in Section 6.2.4 of the Design Report • Stormwater ponds have been designed and constructed on site in the southeast and southwest corners of the EFW property	Construction Period	Yes
11.2	• Increase in runoff potential will be mitigated with peak flow attenuation, baseflow augmentation and SWM design that provides an enhanced level of receiving water protection;	• Pond has been designed with an active storage volume greater than the entire runoff volume from the 100 year storm. • Stormwater pond design has been approved and constructed on site.	Construction Period	Yes
11.2	• Accidents and malfunctions planning and spill management redundancy and stormwater control from source to discharge will ensure the protection of surface water and groundwater resources.	• Covanta submitted a Spill Contingency and Emergency Response Plan on September 24, 2013 as required by Condition 17.1 of the Notice of Approval and Condition 11(2) of the Environmental Compliance Approval	Carried into the ECA	Yes

Relevant EA Section No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
		• Storage of waste and ash is indoors on impervious surfaces with no drainage to outside the facility. • Storage of all chemical reagents is in accordance with applicable regulations. Storage of aqueous ammonia includes secondary containment. • Outdoor surface drainage discharges to the stormwater management ponds with gate valves on the outlets, providing an opportunity to contain and remediate any spills occurring outside the process buildings.		
11.2	• Monitoring of stormwater end-of-pipe Facility discharge quality (as required as part of C of A);	• Groundwater and Surface Water Monitoring and Reporting Plan was developed in consultation with MOECC Central Region Office and approved by the Central Region Director on October 14, 2011. Monitoring commenced in January 2012	Carried into the ECA	Yes
	Soils			
11.2 & 11.3	Soils related mitigation and environmental management / monitoring measures during construction will include: • Topsoil and subsoil salvage and storage. • Apply erosion and sedimentation control measures (also described in surface water).	• Regions submitted a Soil Testing plan on September 23, 2011. • Revised Soil Testing Plan submitted to the MOECC via letter dated October 5, 2012 • Soil Testing Plan Approved by the MOECC via letter dated March 15, 2013. • Project Agreement requires Contractor to comply with all authorizations including Environmental Assessment and Certificates of Approval, and all applicable regulations. • Regions will provide a full time on-site inspector during construction to monitor compliance with the terms and conditions of the contract, including compliance with EA conditions. • Erosion and sediment control monitoring is undertaken continuously in accordance with plan approved by the Ministry of Environment and Climate Change, Central Lake Ontario Conservation authority and the Municipality of Clarington • Required by ECA Condition 7(10) and 13(4)	Carried into the ECA	Yes
	Acoustic			
11.4	Acoustic related mitigation and environmental management / monitoring measures during construction will include: • Pile driving effects will be reduced through alternative technologies (e.g., vibratory pile driving), controls, and scheduling. • Construction vehicle traffic is predicted to be acceptable against applicable criteria, but short-term (i.e., 1-hour) effects during peak demand are possible. These peaking issues will be reduced through scheduling and planning of vehicle trips. • A monitoring program and contingency plan will be implemented to address any issues that may arise during the construction and post-closure periods of the Facility.	• The Regions submitted a Noise Monitoring and Reporting Plan to the Director in accordance with Condition 19 of the Notice of Approval on September 15, 2011 • Project Agreement requires Contractor to comply with all authorizations including Environmental Assessment and Certificates of Approval, and all applicable regulations, including Clarington Noise by-law. • Regions will provide a full time on-site inspector during construction to monitor compliance with the terms and conditions of the contract, including compliance with EA conditions. • Required by ECA Condition 7(5)	Carried into the ECA	Yes

Relevant EA Section No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
11.4	Noise-related mitigation and environmental management/monitoring measures during operation will include: • The Facility will be designed to current standards incorporating efficiencies and design enhancements that reduce sound emissions. • Where necessary, mitigation measures will be included to ensure applicable noise criteria are met at PORs as predicted. • Mitigation measures may include the use of equipment control options such as enclosures, local or property-line barriers, mufflers and silencers, and acoustic baffles or insulation.	• The Regions submitted a Noise Monitoring and Reporting Plan in accordance with Condition 19 of the Notice of Approval on September 15, 2011 • Noise Monitoring and Reporting Plan was approved by the MOECC via Amendment Approval dated August 12, 2014. • Condition 19.3 of the Notice of Approval requires noise emissions from the facility comply with the limits set out in the Ministry of the environment's Publication NPC-205 "Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)", October 1995, as amended from time to time. • Noise audit submitted on May 8, 2015 in accordance with the approved monitoring plan and ECA Condition 7(5) showed that facility is compliant with NPC-205. Additional testing to follow.	Carried into the ECA	Yes
	Visual			
11.5	Visual-related mitigation and environmental management / monitoring measures during construction will include: • Staging of construction activities. • Timely removal of construction debris. • A monitoring program and contingency plan will be implemented to address any issues that may arise during the construction of the Facility. • Investment in architectural enhancements to the Facility.	• An architectural concept for the facility has been developed in consultation with the Municipality of Clarington. • Facility has been constructed and landscaping completed in accordance with approved plan.	Construction Period	Yes
11.5	Visual-related mitigation and environmental management / monitoring measures during operation will include: • The use of neutral external colours and effective landscaping. • If concerns regarding Facility visibility are raised by members of the community in the vicinity of the Facility, mitigation measures will be considered such as planting trees or other suitable vegetation at the particular location to provide a screen within the line of the sight of the Facility.	• An architectural concept for the facility has been developed in consultation with the Municipality of Clarington. • Landscaping complete in accordance with the approved plan. • Need for supplementary, off-site visual remediation will be assessed on a case-by-case basis after the facility is constructed. • Awaiting sign off on the landscaping from the Municipality of Clarington	Operating Period	No
	Natural Environment			
11.6	Natural environment related mitigation and environmental management / monitoring during construction will include: • Protective protocols to avoid killing or harming wildlife during Project activities. • Wildlife corridor along the entire east-west length of the Facility's southern property line may be established to enhance wildlife movement. • Native tree and shrub species will be planted and existing species allowed to grow without disturbance providing additional habitat. • Undertake a pre-construction survey to assess bird nesting activity prior to clearing and grubbing.	• Landscape plan as approved by the Municipality of Clarington gives consideration to wildlife habitat. • Construction Site Fencing allows for a wildlife corridor to the North and South of the Site. • Reconnaissance report prepared by Golder Associates dated November 11, 2011 to address pre-construction bird nesting activities prior to start of construction. • For work offsite surrounding the Energy from Waste facility, the Regions have retained a consultant to undertake monitoring of Eastern Meadowlark. Reports will be produced and provided to the MNR as per letter dated August 28, 2013 from the MNR.	Construction Period	Yes

Relevant EA Section No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	• Habitat enhancement for Chimney Swifts, if present onsite, and once construction has been completed, compensation for the loss of hedgerow by incorporating native shrubs and trees into landscaping for the Facility.	• Construction nearing completion.		
	Social / Cultural			
11.7, 8, 9	Social / cultural related mitigation and environmental management / monitoring measures during construction will include: • See Noise above for related mitigation / management measures. • See Visual above for related mitigation / management measures • Dust control during construction will be accomplished through a number of physical and operational methods such as construction exits, timely revegetation, watering, and staging of work. • Deeply buried archaeological resources could still exist and standard conditions regarding discovery of human remains and/or other cultural heritage values will apply.	• Contract requires Covanta to document any findings of archaeological significance and to deal with these findings as directed in writing by the owner and in accordance with applicable laws. • Project Agreement requires Contractor to comply with all authorizations including Environmental Assessment and Certificates of Approval, and all applicable regulations. • Regions will provide a full time on-site inspector during construction to monitor compliance with the terms and conditions of the contract, including compliance with EA conditions. • To date no findings of archaeological significance have been found on site. • Construction nearing completion.	Construction Period	Yes
	• Road/pavement improvements to the South Service Road and Osborne Road to accommodate construction vehicles.	• Construction of improvements to South Service Road and Osborne Road will be undertaken as required • Energy drive and private truck access constructed	Ongoing	Yes
	• Formation of a Thermal Treatment Facility Site Liaison Committee (SLC) for the construction period.	• In addition to the Advisory Committee described in Notice of Approval Condition 8, the Regions have formed an Integrated Waste Management Committee (Energy from Waste-Waste Management Advisory Committee) intended to address issues of concern to the local community. • Required by ECA Condition 17	Carried into the ECA	Yes
	• Development and implementation of a Community Relations Plan (CRP) through which Durham, York, and Covanta staff will relate to the local community, including advance notification to local authorities and residents near the Facility of any planned unusual noises or activities (e.g., pile driving, steam blows) or other events that may be of concern to the local community during the construction phase. The plan will also establish contacts and procedures for providing accurate and timely information to the community in the event of an unforeseen incident that may cause concern or impact upon the community.	• A requirement of the EA Notice of Approval [See Appendix A, Section 7 (Community Communications Plan)] • Community Communications Plan was submitted to the MOECC on September 18, 2013. • MOECC approval via letter dated September 30, 2013.	Prior to receipt of non-hazardous municipal solid waste	Yes
	• Development and implementation of a community complaints system for construction.	• Complaint protocol approved by the MOECC July 13, 2011 as per Condition 6 of the EA Notice of Approval. • Requirement of Condition 10 of the Environmental Compliance Approval • Monthly reports are sent to the EFWAC and the MOECC.	Carried into the ECA	Yes

Relevant EA Section No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	• Management of residual waste in enclosed vehicles and on enclosed tipping floor	• Noted in Sections 5.3 and 5.8 of the Design and Operations Report and required by Environmental Compliance Approval Condition 4(2) and 4(5) • Construction of an enclosed tipping floor is complete. • All waste is delivered to the site in closed vehicles	Carried into the ECA	Yes
	• Air from tipping floor is used as combustion air, destroying odours and maintaining negative pressure within receiving area.	• Required by Condition 8 (1) of the Environmental Compliance Approval Construction of tipping floor and combustion air system is complete and compliant with these requirements.	Carried into the ECA	Yes
	• Management of ash and residues using various measures to reduce ash emissions.	• Requirement of Condition 4 of the Environmental Compliance Approval • See Section 8.0 of the Design and Operation Report for additional details. • Storage of ash, and will be indoors on impervious surfaces with no drainage to outside the facility. • Ash is transported to the ash storage building in enclosed conveyors • Bottom ash and fly ash handled separately. • Building maintained under negative pressure and fully ventilated to a dust collection system • Loading of trucks occurs indoors with the doors closed • Fly ash is mixed with water, cement and pozzolan to render it non-hazardous and reduce dust. • Bottom ash is immersed in quench water and retains 15-25% moisture content, reducing dust potential	Carried into the ECA	Yes
	• Mitigation of vectors/vermin through pest/vector control.	• Requirement of Condition 8 (14) of the Environmental Compliance Approval • Noted in Section 13.5 of the Design and Operations Report and Condition 8(14) • Pest/Vector control has been subcontracted to a qualified pest control company and monitored for effectiveness.	Carried into the ECA	Yes
	• Mitigation of litter through implementation of litter control program throughout the Site.	• Requirement of Condition 8(12) of the Environmental Compliance Approval • Site-wide litter collection on a daily basis as per Section 13.4 of the Design and Operations Report and Environmental Compliance Approval Condition 8(12)	Carried into the ECA	Yes
	• Some traffic control measures (traffic signals, loop ramps, etc.) may be required to the adjacent road network to address future traffic conditions in the CEBP.	• Requirement of Condition 8(10) of the Environmental Compliance Approval • Energy Drive and private truck access construction is complete, with all required off-site traffic controls.	N/A	Yes
	• The Host Community Agreement between Durham and the Municipality of	• Host Community Agreement executed on February 18, 2010	July 2015	Yes

Relevant EA Section No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
	Clarington includes the Region assuming the cost of construction of Energy Drive from Courtice Road to Osborne Road to serve the CEBP.	includes this provision • The expropriation of the lands associated with the host community agreement requirements for the York Durham Energy Centre went before the Ontario Municipal Board. A settlement was reached July 27, 2015. • Construction on the facility access road and Energy Drive has been completed.		
	• Soil testing for contaminants for a minimum of three years at which time its effectiveness will be evaluated (recommendation by Durham Region Medical Officer of Health, endorsed by both Regional Councils)	• Requirement of Condition 13 (4) of the Environmental Compliance Approval • Soil Testing plan submitted September 23, 2011 • Revised Soil Testing Plan submitted to the MOECC via letter dated October 5, 2012 • MOECC approval via letter dated March 15, 2013. • Soils testing commenced in accordance with the approved plan. • The first Soils Testing Report was completed and submitted November 19, 2013. • Second Soils Testing Report was submitted on October 23, 2015.	Carried into the ECA	Yes
	• Formation of a Thermal Treatment Facility Site Liaison Committee SLC for the operations period.	• In addition to the Advisory Committee described in Notice of Approval Condition 8, the Regions have formed an Integrated Waste Management Committee (Energy from Waste-Waste Management Advisory Committee) intended to address issues of concern to the local community. • Required by ECA Condition 17	Carried into the ECA	Yes
	• See construction above regarding development and implementation of a Community Relations Plan	• A requirement of the EA Notice of Approval [See Appendix A, Section 7 (Community Communications Plan)] • Community Communications Plan was submitted to the MOECC on September 18, 2013. • MOECC approval via letter dated September 30, 2013.	Prior to receipt of non-hazardous municipal solid waste	Yes
	• See construction above regarding development and implementation of a community complaints system for operations	• Appendix A, Complaint Protocol (Notice of Approval Condition 6 applies to construction, commissioning, and operations periods • Complaint Procedure is required by Condition 10 of the ECA	Carried into the ECA	Yes
	Economic			
11.10	• Establishment of a hazardous waste depot to serve Clarington residents.	• Will commence when land expropriation for other Host Community Agreement commitments is complete and the Certificates of Approval and Building Permit for the Durham York Energy Centre are issued. • Anticipate completion of the MHSW Depot within one year of the DYEC commencement of commercial operations. • RFP for consulting services for design and permitting by end of	January 2017	No

Relevant EA Section No.	Requirement	Status Remarks	Actual or Estimated Completion Date	Complete?
		2015.		
11.10	• Construction of Energy Drive from Courtice Road to Osborne Road to serve the Energy Park.	• Construction on the facility access road and Energy Drive is complete.	May 2015	Yes
11.10	• Construction of a SWM Facility to serve the Energy Park.	• Tied to Host Community Agreement for Energy Park Drive Construction, see previous item. • Two on site stormwater ponds have been constructed.	May 2015	Yes
11.10	• Construction of a waterfront trail from Courtice Road to the eastern limit of the Durham property.	• Waterfront trail has been completed.	October 2014	Yes
11.10	• Transfer of 22 acres of surplus land adjacent to the Courtice WPCP to Clarington.	• The transfer of 22 acres of land to Clarington was completed on October 15, 2015.	October 2015	Yes
11.10	• Commencement of the EA for servicing the Clarington Science Park.	• EA will commence when land expropriation for other Host Community Agreement commitments is complete and the Certificates of Approval and Building Permit for the Durham York Energy Centre are issued • An EA was filed on June 19, 2015 and the end of the review period was August 21, 2015.	August 2015	Yes
	Human Health and Ecological Risk			
	• Refer to “Air Quality” above.	• Refer to “Air Quality” above.		

Appendix C

Advisory Committee Annual Report 2015

Durham York Energy Centre 2015 Compliance Monitoring Report – Appendix C
Energy From Waste Advisory Committee Summary Table

Meeting #	Date	Time	Agenda Topics
11	Dec. 18, 2014	2:00-4:30 PM	• Schedule Update • Construction & Commissioning Update • Compliance Update • Review of Durham Medical Officer of Health Report on Mobile Air Quality Monitoring
12	Apr. 9, 2015	6:30-8:30 PM	• Presentation by Durham York Energy Centre Facility Manager Matt Nield On Facility Acceptance Testing • Discussion on Durham Medical Officer of Health Report on Mobile Air Quality Monitoring • Information provided to members on the Ministry of Environment and Climate Change Mobile Air Quality Monitoring TAGA Unit

Meeting #11 Agenda

Advisory Committee Annual Report

AGENDA

Energy from Waste Advisory Committee (EFWAC)

Energy from Waste Advisory Committee (EFWAC)	
SUBJECT	**Meeting #11**
MEETING DATE/TIME	**Thursday, December 18, 2014 from 2 to 4:30 PM**
LOCATION	**The Regional Municipality of Durham Headquarters** **605 Rossland Road East, Whitby – Meeting Room LL-C**
AGENDA OR REMARKS	**1. Welcome and Introductions** **2. Energy from Waste Project Update** Presentation by Gioseph Anello, Manager, Waste Planning and Technical Services, The Regional Municipality of Durham a. Schedule Update b. Construction Update c. Compliance Update **3. Health and Social Services Committee Report 2014-MOH-02** Regional Mobile Air Quality Monitoring Program **4. Next Meeting** Discussion of 2015 schedule for next meetings. **5. Meeting Adjourns**
Please contact Facilitator Sue Cumming, MCIP RPP, Cumming+Company at 866 611-3715 or cumming1@total.net with any questions.	

Meeting #11 Minutes and Presentations

Advisory Committee Annual Report

If this information is required in an accessible format, please contact 1-800-372-1102 ext. 3560

Energy from Waste Advisory Committee (EFWAC) Meeting #11

MINUTES (Approved)

SUBJECT:	Energy from Waste Advisory Committee Meeting #11
ATTENDEES:	Please refer to page 6 of 6.
LOCATION:	The Regional Municipality of Durham, Meeting Room LL-C 605 Rossland Road East, Whitby
DATE AND TIME:	Thursday, December 18, 2014 at 2 PM

ITEM	ACTION
1. WELCOME AND INTRODUCTIONS Ms. Sue Cumming, independent Facilitator, welcomed the members of the Committee and the members of the public to the eleventh meeting of the Energy from Waste Advisory Committee (EFWAC) and introduced the Committee members in attendance at the meeting. The Facilitator confirmed quorum was not obtained and thanked members for their attendance.	
2. ENERGY FROM WASTE PROJECT UPDATE a. Schedule Update Start-up operations are the next project milestone. Covanta must request from Durham and York Regions (Regions) delivery of waste to the facility by providing the Regions notification 10 days in advance of the requirement for start-up operations. The Regions have not yet received this request notification from Covanta. b. Construction Update The project is into the commissioning stage with preparation of electrical/mechanical turnover packages, and application and approval of necessary permits prior to first delivery of waste. c. Compliance Update The only outstanding Environmental Assessment (EA) obligation is the requirement of a public meeting to be held between six and 12 months following commencement of operations. All EA conditions have otherwise been met.	

A member of the Committee questioned the reason for the delay in the start-up of facility operations. The Project Team advised that the reason for this delay was due to preparation of the numerous reports required from Covanta and receipt of their related approvals from various regulatory bodies. Covanta was still waiting on three outstanding approvals from the Technical Standards and Safety Authority (TSSA) related to the commissioning and pre-seasoning of facility components.

The Project Team further advised that the August schedule was a 'plan document', subject to modification and provided as information, confirming that Covanta was still required to meet the contractual target date (December 14, 2014).

Committee members were advised that Covanta is in the final stages of preparing for first fire with a new target date anticipated in January 2015.

A member inquired about the 30-day grace period following the contractual deadline, mentioned at a recent Energy from Waste-Waste Management Advisory Committee (EFW-WMAC) meeting, and the Regions' process to commence collection of liquidated damages once the grace period has passed.

The Project Team clarified that written into the Project Agreement, and as previously approved by the Regions' Councils, is a clause which addresses liquidated damages. The Project Team further clarified that it is not legal action which prompts exercising the clause, but standard contractual action by staff advising the contractor of the Owners' intent in accordance with the contract.

The Project Team confirmed that at a recent Works Committee meeting, Commissioner Curtis advised its members that in accordance with the Project Agreement, staff would be seeking to exercise the liquidated damages clause.

The Project Team, in response to a member's request for additional information regarding air emissions and related commissioning activities, confirmed the following:

- Continuous emissions monitors are included in the turnover packages and must be calibrated prior to any stack emissions.
- Source testing is completed in the second 30 days of the acceptance testing, following the first 30 days of running and seasoning the plant.
- The Ash Testing Plan was a protocol to meet requirements of the Environmental Compliance Approval (ECA), not the EA.
- The initial bottom and fly ash quantities must be tested prior to its off-site disposal.
    - The first three shipments of bottom ash are tested and must demonstrate a concentration of less than 10 per cent combustibles.
    - A toxicity leachate characteristic procedure (TCLP) test must be performed whereby flyash is subjected to a mild acid solution and contaminant concentration, which leach into this solution, are measured.
    - The non-hazardous bottom ash can be used as daily land cover.
    - Currently, the bottom ash is to be shipped to Walker Brothers in Thorold.

○ Fly ash is first stabilized and then tested to demonstrate whether it is non-hazardous. ○ The TCLP test is used to test fly ash which determines if it to be disposed at hazardous waste facility or regular landfill. Following discussion regarding post commissioning and subsequent ash shipments, the Project Team confirmed bottom ash testing under combustibles in the ECA is at first quarterly and migrating to every three years, and that the contractual requirement comprises more frequent testing. The Project Team will confirm contractual/plan frequency and provide this information to the Committee. The Project Team also confirmed that for fly ash, a pseudo test and a chemical test are completed which demonstrate its acid level alongside additional on-site lab analysis testing and off-site TCLP testing. The Project Team will confirm required frequency and provide this information to the Committee. Additional discussion ensued regarding bottom and fly ash issues which recently occurred in Burnaby, British Columbia (Cache Creek). Members questioned how the composition of a variable waste stream is captured long term in relation to the testing schedule, and who is in receipt of these test results. The Project Team confirmed that landfills have their own Certificate of Approvals (CofA) regulated by the MOECC, and explained that manifests, including test results, are shared between locations and must be kept on-site for MOECC inspections. The Project Team will look into the tracking process used by Walker Brothers when transporting waste from the Durham York Energy Centre facility and advise the Committee, once confirmed. The Project Team will also ask that Covanta provide, if available, names of independent studies, including references, or performance data from other incinerators with regard to the reliability of the encapsulation method used for fly ash to the Committee. A member questioned the data results of the Ambient Air Monitoring Report (April to June 2014) with regard to reported concentrations showing similar minimum values and mean values. The Project Team confirmed that the MOECC audits the raw data for quality assurance and quality testing/control. The Project Team further confirmed that following any members' review of the raw data, they are welcome to submit any questions related to this data via the Facilitator to be forwarded to and addressed by the Project Team.	**Project Team to confirm frequency of bottom and fly ash sampling/testing in accordance with ECA and contract commitments.** **Project Team to confirm tracking process used by Walker Brothers when transporting waste to their landfill.** **Project Team to ask Covanta to provide, if available, performance data from other incinerators as it relates to the reliability of ash stabilization method.**
3. <u>HEALTH AND SOCIAL SERVICES COMMITTEE REPORT 2014-MOH-02</u> <u>Regional Mobile Air Quality Monitoring Program</u> The Project Team discussed Health and Social Services (H&SS) Committee report 2014-MOH-02, and related Council direction which asked the EFWAC to submit comments on this H&SS report directly to Dr. Kyle and Commissioner Curtis. This report was provided to the Committee electronically. To-date, no comments have been submitted by EFWAC members and this item is on the agenda to remind members to do so.	

A Committee member addressed discussion at the last EFWAC meeting, held in April, and consideration to holding an additional meeting to consider comments on the H&SS report for submission on behalf of the EFWAC. Further, that most attendees at this April meeting agreed that comments should be developed at the Committee level.

The Facilitator reiterated that some members would still like an opportunity to discuss these comments as a Committee - together, the Committee members and the Project Team determined the following (the Project Team confirmed sufficient time remains for EFWAC's comments to be submitted to the Commissioners):

- Committee members to be provided with the comments submitted to Dr. Kyle and Commissioner Curtis to-date, confirmed as public information by the Project Team, late January, early February.
- Committee members to provide comments to the Facilitator to be compiled and circulated amongst the Committee.
- Comment compilation to be circulated amongst Committee members in advance of the next meeting for discussion as an agenda item.

The Facilitator proposed, in response to a Committee member's examples of various comment types, that members' comments could include information as already provided in delegations, correspondence, etc. in their comments to be shared with the EFWAC members.

A Committee member reminded members that EFWAC membership differs from the EFW-WMAC whose membership is appointed by Regional and Municipal Councils noting that both groups have different reporting structures.

4. NEXT MEETING

Discussion of 2015 Schedule for Next Meetings

As follow up to the email which was circulated to EFWAC members, the Facilitator overviewed the proposed meeting dates for 2015 indicating that although some members had responded by providing their availability and preferences, many others had not yet done so. It was further noted that the proposed schedule for 2015 meetings (March, May, September and November) is tied to project deliverables as identified by the Project Team.

A committee member requested that the next meeting be an evening meeting citing the interest of the public in hearing the discussion on the Regional Mobile Air Quality Monitoring Program (Health and Social Services Committee Report). The committee member further noted that quorum was not being reached for daytime meetings and that an evening meeting was overdue. The Facilitator suggested that evening dates for the next meeting be provided. Should members not be available at these times, then dates for an afternoon meeting would then be considered.

Evening meeting date to first be considered for the next meeting, followed by an afternoon meeting date, if member availability does not permit.

A member requested that the Committee, not the Project Team, determine the schedule for the full year, and further, that the dates not necessarily be tied to the project deliverables as they felt Condition 8 identified.

In response to a member's inquiry regarding the Annual Compliance Report submitted to the MOECC, the Project Team confirmed that the ECA indicates that the first annual report for 2015 is to be submitted following the first year of operation. The Project Team confirmed that it will be due March 31, 2016, and that there is no partial or interim report submission. The Project Team, in response to a Committee member's inquiry, confirmed they will review the notes from the last meeting to review operations items discussed that the member felt were still to be considered by the Project Team and which included review of current membership, reissuing invitations, etc. and which they felt still required a response. The Project Team advised that it is up to the municipality to appoint new members and confirmed that this item will be included on the next meeting's agenda. A member questioned the timing of the next Joint Works and Finance and Administration EFW Construction Update Report. The Project Team advised that it was their understanding the Commissioner of Finance would be bringing this report forward for presentation to Council late January, early February 2015. Meeting adjourned.	

PRESENT

Mirka Januszkiewicz, Director, Waste Management, The Regional Municipality of Durham (Member)
Laura McDowell, Director, Environmental Promotion and Protection, The Regional Municipality of York (Member)
Nick Colucci, Director, Public Works, Township of Brock (Alternate)
Brad Brooks, Superintendent of Solid Waste Management, Town of Whitby (Alternate)
Ben Kester, Director of Public Works, Township of Uxbridge (Member)
Faye Langmaid, Manager of Special Projects, Municipality of Clarington (Member)
Linda Gasser, Zero Waste 4 Zero Burning (Member)
Wendy Bracken, Durham Environment Watch (Alternate)
Doug Anderson, DurhamCLEAR (Member)

Susan Cumming, Cumming + Company, EFWAC Facilitator
Melodee Smart, Administrative Assistant (Works)

Gioseph Anello, Manager, Waste Planning and Technical Services, The Regional Municipality of Durham (Alternate)
Joanne Paquette, Manager, Communications (Works)

Ken Gorman, Director, Environmental Health, The Regional Municipality of Durham (Observer)
Sandra Thomas, Issues Project Coordinator, Ministry of the Environment and Climate Change (Observer)

Kerry Meydam, Durham Environment Watch (Member)

REGRETS

Mike Saulnier, Manager, Operations, City of Oshawa (Member)
Chris Darling, Director of Development Review and Regulation, Central Lake Ontario Conservation Authority (Member)

Meeting #11 Correspondence

Advisory Committee Annual Report

Report To: Chair L. Coe and Members
Health & Social Services Committee

Report No.: 2014-MOH-02

Date: February 13, 2014

SUBJECT: Regional Mobile Air Quality Monitoring Program

RECOMMENDATION:

THAT the Health & Social Services Committee recommends to the Regional Council that it receives this report for information.

REPORT:

1. **On November 8, 2013 Regional Council issued the following Direction Memo to Dr. Robert Kyle, Commissioner & Medical Officer of Health and Cliff Curtis, Commissioner of Works as per the minutes of the Regional Council meeting held on October 30, 2013. *"THAT staff prepare a report in consideration of development and implementation of a regional air monitoring program, which would include a mobile air quality monitoring station, to ensure Regional emission targets and reductions are being achieved, to inform decision-making processes and to build public confidence with regard to air quality issues which the Region is addressing through numerous project, programs and initiatives."***

2. **The objectives of a Regional Mobile Air Quality Monitoring (RMAQM) program were to include: air zone monitoring and evaluation, point source emissions monitoring, emergency response during spills/accidental releases, odour emissions monitoring, and monitoring in the vicinity of sensitive receptors (i.e. schools, daycares, long-term care homes, etc.).**

3. **The attached report (Attachment 1) was completed in consultation with Durham Region Works Department, Ontario Ministry of the Environment, Public Health Ontario, other public health units and Stantec Consulting Ltd., who was retained to provide technical information and advice.**

4. **The four approaches/options for RMAQM program identified in the report are intended to provide Regional Council with options to consider for a mobile air monitoring program at different costs. Estimates of the costs for the various approaches/options (A, B, C, D) are outlined in tables 3, 4 and 5 on pages 10**

and 11 of the report. In addition to the costs estimates in these tables, a secure garage or storage facility would be required for approaches C and D, where a mobile vehicle/laboratory (TAGA Unit) is identified.

5. In conclusion, the goal of this report is to provide Council with background information, including several options and the associated costs, related to the establishment of a RMAQM program.

Respectfully submitted,

R.J. Kyle, MD, MHSc, CCFP, FRCPC
Commissioner & Medical Officer of Health

Recommended for presentation to the Committee.

Garry H. Cubitt, M.S.W.
Chief Administrative Officer

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REGIONAL MOBILE AIR QUALITY MONITORING PROGRAM

DURHAM REGION HEALTH DEPARTMENT
FEBRUARY 2014

REGIONAL MOBILE AIR QUALITY MONITORING PROGRAM
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APPENDIX

EXECUTIVE SUMMARY

This report was written, as per direction from Regional Council on October 30, 2013, to provide information in consideration of the development of a Regional Mobile Air Quality Monitoring (RMAQM) program.

This report was completed in consultation with Stantec Consulting Ltd., who was retained to provide information on the general requirements of such a program – technology, personnel, maintenance, data quality assurance/quality control, and initial and maintenance costs of both a Region-owned and operated program, as well as a consultant-operated program that is managed by Region of Durham staff. The Ontario Ministry of the Environment, Public Health Ontario, and other regional municipalities with similar programs were also consulted.

The RMAQM program is intended to serve the following purposes:

1) Air zone monitoring and evaluation

2) Point source emissions monitoring

3) Emergency response

4) Odour emissions monitoring

5) Monitoring in the vicinity of sensitive receptors (ie. schools, daycares, long-term care homes, etc)

The four approaches for the RMAQM program offered in the report are intended to provide Regional Council with options to consider for a mobile air monitoring program at different costs. These are:

Approach A: Hand-held monitors
Approach B: Portable monitors
Approach C: Mobile trucks or vans
Approach D: Mobile Laboratory

Approach A (hand-held monitors) typically do not have the required sensitivity for monitoring ambient air. However there are some instruments on the market that do have the required sensitivity levels (e.g. HAPSITE for VOC measurement). Their use (or the data that may be obtained from their use) do not meet any of the objectives that were intended for the RMAQM program (with the exception of emergency response monitoring).

Approach B (portable monitors) may be used for point source emissions monitoring and monitoring in the vicinity of sensitive receptors (ie. schools, daycares, long-term care homes, etc). However, it can only provide information

on short-term ambient air quality levels, and may not fulfill the data requirements for a human health or compliance assessment.

Approaches C (Mobile trucks/vans) and D (Mobile Laboratory) are able to meet all the intended purposes of the RMAQM program (except air zone monitoring and evaluation), with some limitations depending on the duration of the air quality study.

Mobile air monitoring generally implies relatively shorter-duration ambient air sampling using equipment that is capable of being moved to various locations as needed. This type of ambient air study yields data on air quality impacts and levels, such as maximum short term concentration levels, however may not be comprehensive enough to capture "worst-case" scenarios (as these occur relatively infrequently) or long-term average levels. Thus mobile air monitoring has limited use in evaluating air quality trends over time, which is required, for example, to evaluate the effectiveness of a policy or regulation, evaluate the impacts of a particular emission source on the health of a community, or enforcement activities (unless an exceedance of an air quality standard is actually measured). These types of ambient air studies generally require data on maximum short-term levels as well as annual concentration levels (eg. to assess both acute and chronic health effects).

1.0 INTRODUCTION

On October 30, 2013, Regional Council directed Dr. Robert Kyle, Commissioner & Medical Officer of Health and Cliff Curtis, Commissioner of Works, *"THAT staff prepare a report in consideration of development and implementation of a regional air monitoring program, which would include a mobile air quality monitoring station, to ensure Regional emission targets and reductions are being achieved, to inform decision-making processes and to build public confidence with regard to air quality issues which the Region is addressing through numerous project, programs and initiatives."*

The Regional Mobile Air Quality Monitoring (RMAQM) program is intended to serve the following purposes:

1) Air zone monitoring and evaluation

2) Point source emissions monitoring

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5) Monitoring in the vicinity of sensitive receptors (ie. schools, daycares, long-term care homes, etc)

This report was completed in consultation with Stantec Consulting Ltd., who was retained to provide information on the general requirements of such a program – technology, personnel, maintenance, data quality assurance/quality control, and initial and maintenance costs of both a Region-owned and operated program, as well as a consultant-operated program that is managed by Region of Durham staff (Appendix A). The types of data that may be obtained from such a program and how this data may be used by the Region of Durham will be discussed. The goal of this report is to determine whether the proposed RMAQM program meets the intended purposes and objectives and to provide Regional Council with information to support their decision-making process.

2.0 BACKGROUND

Air quality in Durham Region

The only Ontario Ministry of the Environment (MOE) air monitoring station in the Region of Durham is located in Oshawa (Durham College, 2000 Simcoe St. N.). At this monitoring station, ozone (O_3), $PM_{2.5}$ and nitrogen dioxide (NO_2) are measured. The Air Quality Ontario website provides current hourly concentrations of these contaminants, as well as Air Quality Index (AQI)

readings. Briefly, the AQI compares the concentrations of selected air pollutants to air quality standards, and a numerical value is assigned based on the pollutant with the highest concentration relative to its standard. The AQI is meant as a numerical index of air quality, rather than potential risk to human health.

The following are trends in air quality taken from the *Air Quality in Ontario Report for 2011* (Appendix B):

- Data from the Oshawa monitoring station indicate that the annual average $PM_{2.5}$ decreased between 2005 – 2011 and has consistently been below the Canada-Wide Standard (CWS) for $PM_{2.5}$.
- Between 2004 – 2011, calculated CWS ozone metrics from the Oshawa data did not meet the CWS. Only 6 of the 21 monitoring sites were able to meet the CWS for ozone, and for 4 of these 6 monitoring sites, 2011 was the first year the CWS was met. However, it is encouraging that the CWS metrics for ozone are decreasing each year.
- In general, emissions of NO_2 have been decreasing in Ontario, due to initiatives such as the phase-out of coal-fired generating stations, emissions trading regulations, emissions controls at Ontario smelters, and Drive Clean emissions testing. Between 2002 – 2011, NO_2 annual mean concentrations recorded at the Oshawa station have decreased by 68%.
- In 2011, the air quality was very good 36.7% of the time, good 59.8% of the time, and moderate 3.5% of the time. There were 2 days in 2011 where at least 1 hour in that day was rated as poor.

The transportation sector and transboundary air pollution are major contributors to air pollution in Ontario. The transportation sector accounts for 36% of volatile organic compound (VOC) emissions and 71% of NOx emissions. Transboundary air pollution accounts for about half of Ontario's smog. As such, any potential improvements to air quality in Durham Region would require programs that also address these two major contributors to air pollution in Ontario. More information on factors that affect air quality in Ontario can be found in the MOE's *Air Quality in Ontario: Report for 2011* (Appendix B).

Other sources of information on air quality in Ontario

National Pollutant Release Inventory (NPRI)

The NPRI is a database of pollutants released to air, water, or land by industrial facilities across Canada. It is publicly accessible through the Environment Canada website. It tracks the use and release of greater than 250 substances or groups of substances, such as criteria air pollutants (such as from combustion equipment), VOCs, dioxins and furans. If a facility meets reporting criteria, reporting is mandatory under the *Canadian Environmental Protection Act* (CEPA). More information can be found at: http://www.ec.gc.ca/inrp-npri/

Airborne Contaminant Discharge Monitoring and Reporting Regulation (O. Reg 127/01)

In Ontario, if a facility meets reporting criteria, they are required to report their airborne contaminant emissions under O. Reg. 127/01. Reporting requirements have been harmonized with that of the NPRI, and all reports from 2005 onward are available through the NPRI website. The public may also request copies of these reports from facility owners. More information can be found at:

http://www.ene.gov.on.ca/environment/en/industry/standards/industrial_air_emissions/airborne_contaminant/STDPROD_078154.html

Air Pollution – Local Air Quality (O. Reg. 419/05)

This regulation introduced new contaminant standards and methods for compliance assessment, and is the main tool the MOE uses to regulate industrial emissions in Ontario. It requires industrial facilities to compile all their air emissions and assess their impact on the environment against MOE air standards/guidelines. Facilities must submit Emissions Summary and Dispersion Modeling (ESDM) reports, which requires facilities to prepare air dispersion models (or a combination of dispersion models and air monitoring data) for their air emissions. ESDM reports are also required when facilities make an application for an Environmental Compliance Approval (formerly certificate of approval) to install, operate, or modify any device that emits contaminants into the air, water, or soil.

ESDM reports submitted to the MOE are available to the public through the Freedom of Information process. For more information on making a request for information, go to:

http://www.ene.gov.on.ca/environment/en/about/foi/index.htm

Ontario Toxics Reduction Act

This Act requires regulated facilities to:

- track and quantify the toxic substances that they use and create
- develop plans to reduce the use and creation of these substances
- make summaries of their plans available to the public

Toxics reduction plans submitted to the MOE are available to the public through the Freedom of Information process. For more information on making a request for information, go to:

http://www.ene.gov.on.ca/environment/en/about/foi/index.htm

Air Quality Ontario

The MOE maintains a network of fixed air monitoring stations that collect data on air pollutant concentrations, and posts hourly concentrations of each station on their website. Current pollutant concentrations at the Oshawa monitoring site can be found at:

http://www.airqualityontario.com/history/station.php?stationid=45026

3.0 SAMPLING METHODOLOGIES, SYSTEM REQUIREMENTS, AND APPROACHES FOR MOBILE AIR MONITORING

Section 2 of the Stantec Consulting Ltd report *Region of Durham, Mobile Air Monitoring Program* (2014) provides an overview of sampling methodologies for a number of contaminants that may be included in a mobile air monitoring program for the Region of Durham (Appendix A). The suggested contaminants include criteria air contaminants (nitrogen dioxide, sulphur dioxide, carbon monoxide, particulate matter, ozone etc.), metals, toxics (dioxins, furans, polycyclic aromatic hydrocarbons, polychlorinated biphenyls, etc.), total hydrocarbons, odours, volatile organic compounds (VOCs), and meteorological parameters (wind speed, wind direction, temperature, precipitation, etc.).

Section 3 and 4 of this report discuss sampling system requirements, such as equipment, shelter and storage, accessories, and power requirements. Sampling system requirements will depend on the level or approach for sampling chosen. Note that for approaches such as mobile trucks/vans or mobile laboratories, a secure building with adequate garage space would be required, in addition to storage for calibration equipment, supplies, etc. The four approaches discussed in the Stantec Consulting Ltd report are intended to provide Regional Council with options to consider for a mobile air monitoring program at different costs. These are:

Approach A: Hand-held monitors
Approach B: Portable monitors
Approach C: Mobile trucks or vans
Approach D: Mobile Laboratory

Generally, lower cost approaches, such as the hand-held monitors, are used for occupational health and safety applications. They typically do not have the required sensitivity for monitoring ambient air; however, there are some instruments on the market that do have the required sensitivity levels (e.g. HAPSITE for VOC measurement). Their use (or the data that may be obtained from their use) may not meet many of the objectives that were intended for the RMAQM program (with the exception of emergency response monitoring). The HAPSITE cannot acquire a 30 minute sample for comparison to the MOE's local

air quality regulation (O. Reg. 419/05), thus has limited use in compliance assessments.

Other portable monitors, such as the Airpointer, claim to have the sensitivity and accuracy for measuring low concentrations of ambient contaminants. However, the Airpointer is not currently certified as an equivalent reference method by the US Environmental Protection Agency (EPA), which are methods accepted by the MOE for air quality monitoring in Ontario.

Mobile air monitoring trucks or vans may be used to house rack-mounted continuous monitors for criteria air contaminants in a climate controlled environment or carry and deploy non-continuous monitors operated by field technicians when it is parked at a particular sampling site. For VOCs and toxics, a mobile laboratory equipped with continuous monitors and gas chromatographs is suggested. The MOE's Trace Ambient Gas Analyzer (TAGA) van is an example of this approach. The mobile air monitoring truck with rack mounted monitors for specific contaminants or mobile laboratory (TAGA) are able to meet the RMAQM program objectives 2-5. For more information on the various approaches and how they can be used for the RMAQM program, see Section 4 of the Stantec Consulting Ltd. report in Appendix A.

4.0 PERSONNEL QUALIFICATION REQUIREMENTS

All approaches for mobile air monitoring will require personnel to be deployed for operation and maintenance of the sampling equipment, as well as for data analysis, compilation of results, and report writing. The level of education and experience, and with that typical industry salary level, will depend on the complexity of the sampling operation. For approaches A and B (hand-held monitors and other portable monitors), a college-level technician may be trained to operate and maintain the equipment. For approaches C and D (mobile truck or laboratory), a college or university level education and experience in ambient air monitoring is recommended. Operation of a mobile laboratory requires additional education and training in analytical chemistry.

Regular equipment maintenance and calibration is required to ensure optimal performance of sampling equipment. This includes regularly scheduled zero and span verification, manual calibrations, sample filter changes (e.g., non-continuous samplers), preventative maintenance and documentation. The technicians operating the sampling equipment should be trained to complete these tasks.

A management staff member will be required to manage the RMAQM program, analyze and interpret the data, and potentially meet and present results to Council/stakeholders/community, etc. This individual would be required to have a Master's/PhD Degree in engineering, science, health science or equivalent,

certification as a professional engineer or equivalent, and at a minimum, have 5-years experience in air quality monitoring.

5.0 MOBILE AIR MONITORING PROGRAM COSTS AND OPTIONS: REGION OPERATED VS. CONSULTANT OPERATED

The costs for a mobile air monitoring program can be broken down to procurement costs for sampling equipment, yearly maintenance, personnel salaries, and laboratory analysis costs.

The following table (Table 4) was taken from the Section 9 of the Stantec Consulting Ltd report (Appendix A). It outlines the estimated capital costs and annual maintenance costs for the four approaches for mobile air monitoring.

Table 4 – Estimated Capital Costs and Annual Maintenance Costs

Approach	Capital Costs			Annual Maintenance Cost
	Min	Max	Comments	
A - Handheld	$85,000	$130,000	Range for HAPSITE VOC, a PM unit and a 4-gas unit.	$10,000 - $15,000 (spare parts, routine repairs)
B – Airpointer ®	$90,000	$140,000	Based on cost quoted by Ottawa City Council for a unit measuring 4 contaminants.	$10,000 - $15,000 (spare parts, routine repairs)
C – Mobile Van/Truck	$250,000	$400,000	Estimate for a modified cube van with 4-6 continuous analyzers, telescoping met tower, on board generator, data acquisition system, and 1-2 samplers for metals and dioxin-furan/PAH sample collection.	$25,000-$35,000 (spare parts, routine repairs, fuel costs, overhaul kits, calibration gases, vehicle maintenance, etc)
D – TAGA Unit	$1,200,000	$1,900,000	Min value based on cost reported by MOE in 1998 ($2.4 million for 2 units). Max based on inflation adjustment of 3% per year from 1998 to present.	$30,000 -$50,000 (spare parts, routine repairs, fuel costs, overhaul kits, calibration standards, vehicle maintenance, etc)

Personnel costs depend on the approach chosen. Education level, experience, and any additional certification or training will dictate the salary level of the technician. Section 5 and Table 5 in the Stantec Consulting Ltd report discusses the personnel requirements and typical industry salary levels for the four approaches presented.

Table 5 – Estimated Program Costs									
Region Owned and Operated Program (ROOP)									
Approach	Capital and Maintenance		Laboratory Costs	Region-Employed Field Personnel Salary Cost		Region of Durham Data Analyst/Project Manager Salary Cost		Total Costs	
	Min	Max		Min	Max	Min	Max	Min	Max
A - Handheld	$95,000	$145,000	-	$40,000	$50,000	$70,000	$80,000	$205,000	$275,000
B – Airpointer ®	$100,000	$155,000	-	$40,000	$50,000	$70,000	$80,000	$210,000	$285,000
C – Mobile Van/Truck	$275,000	$435,000	$54,700	$100,000	$140,000	$70,000	$80,000	$499,700	$709,700
D – TAGA Unit	$1,230,000	$1,950,000	$15,300	$210,000	$270,000	$70,000	$80,000	$1,525,300	$2,315,300
Region Owned and Consultant Operated Program (ROCOP)									
Approach	Capital and Maintenance		Laboratory Costs	Consultant-Employed Field Personnel Salary Cost		Region of Durham Data Analyst/Project Manager Salary Cost		Total Costs	
	Min	Max		Min	Max	Min	Max	Min	Max
A - Handheld	$95,000	$145,000	-	$40,000	$50,000	$70,000	$80,000	$205,000	$275,000
B – Airpointer ®	$100,000	$155,000	-	$12,000	$20,000	$70,000	$80,000	$182,000	$255,000
C – Mobile Van/Truck	$275,000	$435,000	$54,700	$20,000	$42,000	$70,000	$80,000	$419,700	$611,700
D – TAGA Unit	$1,230,000	$1,950,000	$15,300	$210,000	$270,000	$70,000	$80,000	$1,525,300	$2,315,300

Estimated laboratory analysis costs are based on the recommended sampling schedule outlined by the MOE. More details can be found in Section 8 and Table 3 of the Stantec Consulting Ltd report.

Table 3. Approximate Laboratory Costs

Contaminant	# Samples	Approx. Cost/Sample	Annual Cost		
			Approach A/B	Approach C	Approach D
			Handheld or Airpointer ®	Mobile Van	TAGA Vehicle
Metals [1]	60	$130	NA	$7,800	$7,800
Odour [2]	50	$150	NA	$7,500	$7,500
Dioxin and Furans [3]	17	$1,000	NA	$17,000	By onboard GC
PAHs [4]	30	$400	NA	$12,000	By onboard GC
Speciated VOCs [1]	60	$200	NA	$12,000	By onboard GC
Total				$54,700	$15,300

Region of Durham-operated program

A Region of Durham-operated program will incur all of the costs mentioned above: procurement costs for sampling equipment, yearly maintenance, personnel salaries for operation/maintenance staff, and laboratory analysis costs. One management staff member will be required to manage the RMAQM program, analyze and interpret the data, and potentially meet and present results to Council/stakeholders/community, etc.

Consultant-operated program

In order to ensure that the mobile air monitoring equipment is available when it is required by Durham's municipalities, a consultant-operated program requires that the Region invest the capital costs for equipment mentioned above. As with the Region of Durham-operated program, one Region of Durham management staff member will manage the RMAQM program, while the consultant will operate and maintain the equipment and/or conduct the data analysis and reporting. A consulting firm with skilled personnel would be retained as needed, and any work completed would be billed to the program.

A cost comparison between a Region-owned/operated program and a Region-owned, consultant-operated program is presented in Table 5 of the Stantec Consulting Ltd report.

6.0 LIMITATIONS TO INTERPRETATION OF DATA ACQUIRED FROM MOBILE AIR MONITORING

Mobile air monitoring generally implies relatively shorter-duration ambient air sampling using equipment that is capable of being moved to various locations as needed. This type of ambient air study yields data on air quality impacts and levels, such as maximum short term concentration levels, however may not be comprehensive enough to capture "worst-case" scenarios (as these occur relatively infrequently) or long-term average levels. Thus mobile air monitoring has limited use in evaluating air quality trends over time, which is required, for example, to evaluate the effectiveness of a policy or regulation, evaluate the impacts of a particular emission source on the health of a community, or enforcement activities (unless an exceedance of an air quality standard is actually measured). These types of ambient air studies generally require data on maximum short-term levels as well as annual concentration levels (eg. in order to assess both acute and chronic health effects).

The mobile air monitoring equipment may find use in emergency response planning, such as during an accidental release or spill, where the data may be used to evaluate levels of certain contaminants for defining hazard zones or evacuation zones and communicating impacts of such spills to the public.

The following table (Table 6) taken from the Stantec Consulting Ltd report summarizes the four approaches proposed for mobile air monitoring and their ability to meet the Region's objectives for this program:

Table 6 – Applicability of Mobile Monitoring Approaches to Region's Objectives				
	Approach A – Hand Held Monitors	Approach B – Airpointer ®	Approach C – Mobile Van/Truck	Approach D – TAGA Unit
1. Air zone monitoring and evaluation	No [1]	No [1]	No [1]	No [1]
2. Point source emissions monitoring	No	Partial [2]	Partial [2]	Partial [2]
3. Emergency response during spills/accidental releases	Yes	No	Yes	Yes
4. Odour emissions monitoring	No [3]	No	Yes	Yes
5. Monitoring in the vicinity of sensitive receptors	No	Partial [2]	Partial [2]	Partial [2]

Notes:

1- Air zone monitoring requires fixed stations with long-term monitoring to evaluate air quality trends

2- Methodology can provide partial information (e.g. short-term ambient air quality levels) but would not provide full information required for health assessment or regulatory enforcement (maximum short-term concentration levels or annual averages).

3- Hand held monitors can't sample for odour, but manual (hand) sampling for odour could also be conducted without the need for a mobile van or TAGA unit.

7.0 Other Approaches: Ontario Ministry of the Environment, Public Health Ontario

These approaches were prepared in consultation with staff from the MOE and Public Health Ontario. They provide the Region of Durham with resources for mobile air monitoring, at zero or minimal cost.

Ontario Ministry of the Environment

The Region of Durham is able to access the MOE mobile TAGA units for non-emergency purposes by submitting a request to the District Manager of the York Durham District office. Approval of such a request will depend on factors such as whether the chemicals of interest can be detected by the available sampling technology and whether there are applicable air quality standards and guidelines in Ontario Regulation 419 with which to compare the ambient air sampling results. Requests are received in January, and if a request is approved, surveys are conducted between April and October. This service is available at no cost to the Region of Durham.

The MOE mobile TAGA units are capable of measuring VOCs, chlorinated VOCs, alcohols, aldehydes, ketones and aromatic organic compounds. However, very light VOCs and heavier pesticides cannot currently be measured. Air sampling studies are typically conducted for a period of 5-10 days, to determine compliance with point-of-impingement (POI) standards, Environmental Compliance Approvals (formerly Certificate of Approval), or to verify suspicion of adverse effects.

Public Health Ontario (PHO)

Air sampling equipment is available for temporary loan free of charge to public health units in Ontario through PHO's Instrument Loan Program. A variety of air sampling equipment is available for both indoor and outdoor air sampling studies. Staff from the Occupational and Environmental Health (OEH) group is available for technical support and consultation to support investigations carried out by public health units. For this type of loan, there may be minor costs associated with consumables (ie. fuel, calibration gases, sampling cartridges, filters, etc).

Equipment is available for measuring the following contaminants in indoor environments: carbon monoxide, ammonia, indoor air quality parameters (temperature, relative humidity, etc), nitric oxide, nitrogen dioxide, ground-level ozone, sulphur dioxide, formaldehyde, particulate matter, volatile organic compounds, mercury, and ultrafine particles. Equipment is also available for measuring radiation.

For outdoor air quality, PHO maintains a van equipped with ambient air monitors for measuring oxides of nitrogen, particulate matter (i.e., PM 2.5, 4, 10, and total suspended particulate), particles less than 3 microns in diameter, and environmental noise. The mobile van is a fairly new component of their program, and to date, it has been used exclusively for PHO-directed research. However, a request may be made for loan of the mobile van and sampling equipment. PHO OEH staff would be operating the equipment, thus the loan would also depend on availability of PHO OEH staff. Any data collected using PHO equipment would be shared with PHO, which would support their efforts for environmental monitoring in Ontario.

8.0 INITIATIVES UNDERTAKEN IN OTHER JURISDICTIONS: HALTON REGION AND PEEL REGION

The information contained in this section was prepared in consultation with staff from both Halton and Peel Regions. They are both Region-managed programs, with the operation and maintenance of sampling equipment contracted to environmental consulting firms. Note that in Peel, there were no capital costs for sampling equipment.

Halton Region

There are two MOE air monitoring stations in Halton Region, in Oakville and in Burlington. Geographically speaking, most of Halton is not covered by these air monitoring stations.

In 2007, Regional Council approved funding for a five-element air quality program: stationary air monitoring (identical to those operated by the MOE across the province), portable air monitoring (two samplers that measure five common air pollutants, such as traffic-related air pollutants); airshed modelling; education and outreach; and policy development.

Milton, which is projected to double in population twice by 2031, was chosen as a site for the additional fixed monitoring station, which will be used to determine trends in air quality as the community grows. This project will require many years of data in order to start looking for trends.

The air quality monitoring program is managed by the Health Department, and the operation and maintenance of the sampling equipment is done by Rotek Environmental Inc. (with some assistance from CleanAir Environmental). This program is fully funded by the Region, which included significant initial capital costs for the equipment, consultant billing costs for operation and maintenance of sampling equipment, and personnel costs (Region staff includes a project manager, a health promotion consultant and some support from existing epidemiology staff).

Peel Region

To provide air quality monitoring in Caledon (an area of Peel Region not covered by MOE air monitoring stations), Peel Region received approval from Regional Council to implement a 5-year air quality modelling and monitoring program for PM, CO, NO2, SO2, O3, NH3, and VOC's in 2011. RWDI (environmental consulting firm) was retained in June 2012 to implement the program. Peel's strategy was to focus on the air modelling component, with air monitoring as a complement to validate the model results. This involved the installation of a passive monitor for the first year (2012), installation of a second real-time monitor in the second year (and moving the passive monitor to another location in Peel). These monitors will provide additional data where it previously did not exist.

Members of the local municipalities, the MOE, and different departments within Peel Region are part of a steering committee that provides technical support and/or strategic advice for this project.

Note that Peel Region did not purchase any of the monitoring equipment.

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January 31, 2014
File: 160950528.700

Attention: Gioseph Anello, MEng, PEng, PMP
Manager of Waste Planning & Technical Services
Region of Durham
605 Rossland East
P.O. Box 623, Whitby, ON
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Dear Gio,

Reference: Region of Durham, Mobile Air Monitoring Program

This letter provides information and discussion on the following objectives identified by Regional Council for a Staff report on the development of a Mobile Air Monitoring program for the Region:

- Parameters a mobile air monitoring unit is capable of measuring
- Equipment/sampling system requirements
- Shelter or storage requirements of the equipment
- Personnel requirements, skill sets & knowledge - operations and data analysis/reporting
- Equipment maintenance/inspection/calibration requirements
- Quality assurance/quality control requirements
- Laboratory analysis and costs
- Costing – procurement/start-up and yearly maintenance
- Criteria and/or P&P for sites or assignment of this unit
- Limitations to interpretation of data
- What extent the suggested technology/platform can fulfill the Region's five mobile air monitoring objectives.

Discussion of these objectives is provided in the following sections.

1 THE REGION'S MOBILE AIR MONITORING PROGRAM OBJECTIVES

The Region has identified the following mobile air monitoring program objectives:

1. Air zone monitoring and evaluation,
2. Point source emissions monitoring,
3. Emergency response during spills/accidental releases,
4. Odour emissions monitoring, and
5. Monitoring in the vicinity of sensitive receptors (i.e. schools, daycares, long-term-care homes, etc.)

Reference: Region of Durham, Mobile Air Monitoring Program

In general, Objective 1 (air zone monitoring and evaluation) is not normally considered as being consistent with mobile monitoring. Air zone monitoring and evaluation is normally conducted as a means to track trends in air quality over time in an air zone and evaluate the effectiveness of policy/regulation implementation. In order to achieve this objective, both maximum short-term levels (i.e. peak hourly and 24-hour average concentrations) and long-term (annual average) concentrations are measured over the course of many years to evaluate trends. This monitoring must be conducted at the same location in order to ensure consistency of the data. Therefore this objective requires long-term stationary monitors such as the stations run by the Ministry of Environment (MOE) for their annual Air Quality in Ontario Reports and Environment Canada (EC) for tracking/reporting national trends.

Mobile monitoring can be used to address Region Objectives 2-5 however there are limitations to the data obtained from the mobile monitoring methodologies that must also be considered. Some of these limitations are discussed in Section 11 below.

2 PARAMETERS A MOBILE AIR MONITORING UNIT IS CAPABLE OF MEASURING

A mobile ambient monitoring station could potentially measure a wide variety of contaminants using an assortment of methodologies. Most ambient monitoring methodologies can be categorized as either continuous or non-continuous. Continuous monitoring involves an automated sampler measuring a continuous stream of air passing through the instrument, while non-continuous methods involve manual set-up and acquisition of samples through a variety of techniques followed by laboratory analysis. Both methodologies require manual calibration and maintenance of the sampling instrumentation. A brief summary of the contaminants/parameters that could be measured in a mobile ambient monitoring station are presented in Table 1 along with some discussion on the limitations of the methodologies.

Table 1 - Overview of Sampling Methodologies

Contaminant	Methodology	Typical Sampling Schedule	Comments	Region Objectives Method Could Meet
Criteria Air Contaminants (CACs) such as nitrogen oxides, suphur dioxide, carbon monoxide, fine particulate matter, ozone, etc)	Continuous - a fast response detector that produces an output voltage that is proportional to concentration is used. One detector required per contaminant.	Continuous - instrumentation requires regular calibration and maintenance.	Instruments require climate controlled enclosure for operation. On-board electrical generator required for powering the instrumentation.	- 2 (e.g. Monitoring downwind of industry), - 3 (e.g. monitoring downwind of fire) - 5 (e.g. monitoring in vicinity of school)
Metals	Non-continuous. Air sample drawn through a filter which is sent for laboratory analysis.	Once every 6-days following MOE schedule	Utilizes a hi-volume or low volume air sampler. These instruments would normally be manually set up on the roof of a mobile monitoring	- 2 (e.g. Monitoring downwind of industry), - 5 (e.g. monitoring in

Reference: Region of Durham, Mobile Air Monitoring Program

Table 1 - Overview of Sampling Methodologies

Contaminant	Methodology	Typical Sampling Schedule	Comments	Region Objectives Method Could Meet
			unit once it has been located at a site.	vicinity of school)
Odour	Non-continuous. Air sample drawn into a sealed bag composed of an inert material (Tedlar) and sent to a specialized laboratory for odour panel analysis.	As required. Usually 10-minute average samples collected.	Odour can also be assessed instantaneously onsite using a "Nasal ranger" instrument that allows a trained user to estimate odour levels.	4 (e.g. monitoring downwind of a landfill)
Toxics (dioxins and furans, PAHs, PCBs, etc)	Non-continuous. Air sample drawn through a filter which is sent for laboratory analysis.	Once every 12-24 days following MOE schedule	Utilizes a hi-volume air sampler. These instruments would normally be manually set up on the roof of a mobile monitoring unit once it has been located at a site.	- 2 (e.g. Monitoring downwind of industry), - 5 (e.g. monitoring in vicinity of school)
	Continuous. Air sample drawn into a high resolution gas chromatograph with mass spectrometer and analyzed for the required compounds.	Continuous - instrumentation requires regular calibration and maintenance and continuous monitoring by trained personnel	This would require a mobile climate controlled laboratory in which extremely temperature and vibration sensitive equipment along with considerable amounts of support equipment would be located. This equipment would require constant attending by a trained technician.	- 2 (e.g. Monitoring downwind of industry), - 3 (e.g. monitoring downwind of fire) - 5 (e.g. monitoring in vicinity of school
Total hydrocarbons	Continuous - a fast response detector that produces an output voltage that is proportional to concentration is used.	Continuous - instrumentation requires regular calibration and maintenance.	Instrument requires climate controlled enclosure for operation.	- 2 (e.g. Monitoring downwind of industry), - 3 (e.g. monitoring downwind of fire) - 5 (e.g. monitoring in

Reference: Region of Durham, Mobile Air Monitoring Program

Table 1 - Overview of Sampling Methodologies

Contaminant	Methodology	Typical Sampling Schedule	Comments	Region Objectives Method Could Meet
				vicinity of school
Volatile Organic Compounds (Speciated VOCs)	Non-continuous. Air sample drawn into a sealed bag composed of an inert material (Tedlar), or stainless steel (SUMMA) canister or sampling tube and sent to a laboratory for analysis.	Manually set up and sampled as required.	Manual methods requiring pre-prepared SUMMA canisters or Tedlar bags.	- 2 (e.g. Monitoring downwind of industry), - 5 (e.g. monitoring in vicinity of school
	Continuous. An air sample is drawn into a gas chromatograph and analyzed for the required compounds.	Continuous - instrumentation requires regular calibration and maintenance and continuous monitoring by trained personnel	This would essentially require a mobile climate controlled laboratory in which extremely temperature and vibration sensitive equipment along with considerable amounts of support equipment would be located. This equipment would require constant attending by a trained technician.	- 2 (e.g. Monitoring downwind of industry), - 3 (e.g. monitoring downwind of fire) - 5 (e.g. monitoring in vicinity of school
Meteorology (wind speed, wind direction, temperature, precipitation, etc)	Continuous.	Continuous	Instrumentation mounted on telescoping mast attached to the mobile monitoring station.	Essential information required for Objectives 2-5.

3 EQUIPMENT/SAMPLING SYSTEM REQUIREMENTS

Depending on the parameters chosen for monitoring with a mobile station, the equipment and sampling system requirements will vary. Table 2 provides a summary of the required equipment for each contaminant/sampling method.

Reference: Region of Durham, Mobile Air Monitoring Program

Table 2 - Overview of Equipment/Sampling System Requirements

Contaminant	Equipment	Sampling System	Power Requirements
Criteria Air Contaminants (CACs) such as nitrogen oxides, sulphur dioxide, carbon monoxide, fine particulate matter, ozone, etc)	Individual Analyzer for each contaminant	• Analyzers are rack mounted. • Sampling manifold to draw air into analyzers • Data logger and cell modem for recording data	Usually a single 120V, 15 Amp circuit is sufficient for all analyzers in a station.
Metals	High or low volume air sampler.	• Stand-alone equipment	Dedicated 120V, 15 Amp circuit required for a hi-volume air sampler.
Odour	Tedlar bag or Summa canister	• Stand-alone equipment	NA
Toxics (dioxins and furans, PAHs, PCBs, etc)	High volume (hi-vol) air sampler	• Stand-alone equipment	Dedicated 120V, 15 Amp circuit required for each hi-volume air sampler.
	High resolution gas chromatograph with mass spectrometer (GC/MS)	• Analyzer desk mounted. • Sampling manifold to draw air into analyzers • PC for data acquisition and analysis • Extensive additional laboratory support equipment.	Single 120V, 15 Amp circuit
Total hydrocarbons	Individual Analyzer for each contaminant	• Analyzer rack mounted. • Sampling manifold to draw air into analyzers • Data logger and cell modem for recording data.	Usually a single 120V, 15 Amp circuit sufficient for all CAC and HC analyzers in a station.

Reference: Region of Durham, Mobile Air Monitoring Program

Table 2 - Overview of Equipment/Sampling System Requirements

Contaminant	Equipment	Sampling System	Power Requirements
Volatile Organic Compounds (Speciated VOCs)	Tedlar bag or SUMMA canister	• Sampling pump required for Tedlar Bag samples	Sampling pumps usually battery operated.
	Gas chromatograph	• Analyzer desk mounted. • Sampling manifold to draw air into analyzers • PC for data acquisition and analysis • Extensive additional laboratory support equipment.	Single 120V, 15 Amp circuit
Meteorology (wind speed, wind direction, temperature, precipitation, etc)	A variety of potential equipment types including wind vanes, cup anemometers, temp sensors, tipping bucket rain gauges, etc.	• Equipment mounted on 10-m telescoping tower (attached to mobile station) • Data logger and cell modem for recording data.	Minimal electrical power requirements

4 SHELTER OR STORAGE REQUIREMENTS OF EQUIPMENT

Continuous analyzers must be housed inside secured shelters with restricted and/or controlled public access. The shelter must be ventilated, heated and cooled to maintain an inside temperature to meet the specifications of the housed instrumentation. The shelter must also provide adequate space and electrical power supply to allow technicians to operate audit equipment and conduct ongoing maintenance.

The majority of the non-continuous monitoring techniques do not have shelter requirements. Hi-volume (and low-volume) air samplers are designed for environmental exposure and are mounted out-doors. SUMMA canister, Tedlar Bag and sorbent tube sampling for VOCs are manual methods requiring a technician to set-up and remove the equipment from the field (and send the samples to a laboratory for analysis). Likewise, odour sampling by Tedlar bags is a manual method conducted by a field technician.

Reference: Region of Durham, Mobile Air Monitoring Program

Odour sampling using a "Nasal ranger" is a manual method conducted by a trained technician and also has no shelter requirements.

Meteorological instrumentation is mounted outdoors and does not require sheltering.

Depending on the contaminants to be measured, four levels/approaches to mobile monitoring could be considered, which are outlined below.

Approach A: Hand Held Monitors

There are a number of relatively small/portable hand held monitoring devices available for measuring CACs and VOCs. In general, many of these devices are intended for near-source measurement (occupational health and safety applications) and do not have the sensitivity to measure ambient air concentrations, however there are some instruments on the market that do have the required sensitivity levels (e.g. HAPSITE for VOC measurement). Typically, separate instruments would be required to measure various CACs and VOCs. While these instruments are truly portable and can be powered either by battery or plugged into a standard electrical outlet, they are generally not designed for unattended operation. Therefore, this approach would be best used to meet Objective 3 (emergency response monitoring). While it could potentially be used for Objectives 2 and 5 (point source monitoring and sensitive receptor monitoring), the logistics of using this approach for these objectives (equipment shelter, secure location, electrical power for longer than 2-3 hour operation, data downloading, etc), would make this approach onerous for most applications.

Approach B: Portable Monitor for CACs

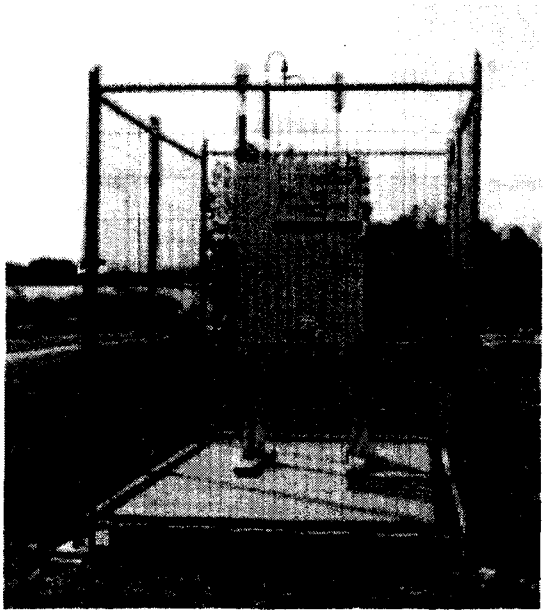
A device which has recently come on the market and is now being used/evaluated by a number of regulatory agencies is the Airpointer® portable air monitor. These instruments are relatively light-weight, portable and claim to be capable of matching the detection limits and accuracy achieved with US EPA reference methods for air monitoring. An Airpointer® can measure several CACs concurrently, with the instrumentation housed in a weather-proof and climate controlled portable container. The Region of Halton operates two of these devices and a view of one of their units is shown in Figure 1.

While these devices are portable, they are not truly mobile as pre-planning is required to locate a secure site to place the instrument, establish an electrical hook-up, and organize transport for the unit. Also, currently the Airpointer ® is not certified as an equivalent reference method by the US EPA, therefore its acceptability for use in compliance assessments could be questioned.

This approach would be most suitable to meet Objectives 2 (point source monitoring) and 5 (sensitive receptor monitoring). Due to the need for pre-planning prior to locating these monitors, they would not be suitable for emergency response monitoring (Objective 3) nor do they measure odour or speciated VOC concentrations required for odour evaluation (Objective 4).

Reference: Region of Durham, Mobile Air Monitoring Program

Figure 1. View of an Airpointer® Portable Monitor



(Photo from http://www.halton.ca/cms/One.aspx?portalId=8310&pageId=13712 accessed Dec 12, 2013)

Approach C: Mobile Truck or Trailer

This approach entails a dedicated truck/mobile home or trailer equipped with a dedicated heating/air conditioning unit, built in electrical generator to power the analyzers and sufficient room to house equipment racks, data loggers, and calibration gases. A built in GPS unit is used to record the exact location of the unit for all measurements. Examples of these types of units are presented in Figure 2.

These types of vehicles are most commonly used to house rack-mounted continuous monitors for CACs in a climate controlled environment, but could also be used to carry and deploy non-continuous monitors, provided sufficient electrical generating capacity was included in the vehicle to power these units as well. Non-continuous monitoring would be conducted manually by the field technician operating/maintaining the vehicle when it is parked at a particular sampling site, with the collected samples being submitted to a laboratory for analysis.

This approach could be used to address Region Mobile Monitoring Objectives 2-5.

Reference: Region of Durham, Mobile Air Monitoring Program

Figure 2. Examples of Mobile Air Monitoring Trucks or Vans

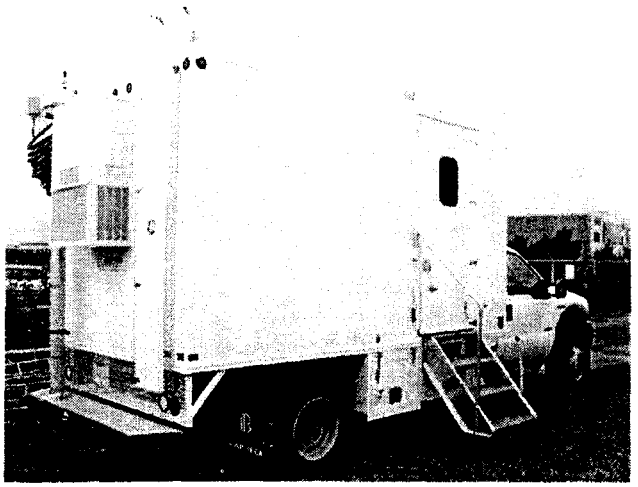


Photo from Alberni Valley News, http://www.albernivalleynews.com/news/233768661.html?print=true , Accessed Dec 10, 2013

Approach D: Mobile Laboratory

A third approach would be essentially a mobile laboratory containing continuous monitors and/or a gas chromatograph for speciated VOC measurements and/or toxics. An example of this approach is the Trace Ambient Gas Analyzer (TAGA) vans operated by the Ontario MOE. The TAGA vans are 10-m buses

modified to holding 6-7 continuous monitors for CACs, a met tower, on-board diesel generator, and tandem gas chromatograph/mass spectrometer units (along with ancillary equipment) to measure trace VOC and organic/toxic contaminants.

This approach could be used to address Region Mobile Monitoring Objectives 2-5.

Figure 3. MOE TAGA Vehicle

Photo from MOE Document "In Brief: Air Monitoring and the Mobile TAGAs", July 1998

5 PERSONNEL REQUIREMENTS, SKILL SETS, KNOWLEDGE

Start-up, Operation and Maintenance

Typically all types of monitoring will require trained personnel to conduct the equipment set-up, maintenance and monitoring.

- Approach A (hand held devices) would require a trained field technician to maintain/calibrate the equipment and operate it in the field. The technician would only be required when sampling was being conducted.
    - Minimum Education Level: College

- Qualifications: Technical diploma in electronics or related course
- Training/Certification: Equipment specific training courses (1-2 weeks)
- Experience level: Recent graduate
- Typical industry starting salary level: $40-50,000 (not including benefits).

- Approach B (Airpointer ®) would require a trained field technician to install, maintain and calibrate the equipment. Given the limited mobility of this unit, it would typically be located at a specific site for a considerable amount of time, thus a dedicated (full-time) field technician would not be required. Approximately 30-40% of a field technician's time would be required to maintain the unit, collect data, etc.

    - Minimum Education Level: College
    - Qualifications: Technical diploma in electronics or related course
    - Training/Certification: Airpointer ® equipment specific training course (1-2 weeks).
    - Experience level: Recent graduate
    - Typical industry starting salary level: $40-50,000 (not including benefits)

- Approach C (Mobile Van) would require at a minimum a single field technician to operate, maintain the equipment, collect manual samples, calibrate the equipment, and analyze the data. If the Region requires 24-7 availability/quick response time for the unit, then 2-3 personnel would be required to ensure its availability at all times. The operator(s) would require in-depth training on the operation/maintenance and calibration of all the analyzers. Depending on the frequency of moving the monitoring van, approximately 40-60% of a field technician's time would be required to move/set-up the unit/ calibrate and maintain the unit, etc.

    - Minimum Education Level: College
    - Qualifications: Technical diploma in electronics or related course
    - Training/Certification: Equipment specific training courses (2-4 weeks).
    - Experience level: 2-3 years in ambient monitoring
    - Typical industry starting salary level: $50-70,000 (not including benefits).

- Approach D (TAGA unit) would require at a minimum 1-2 full-time trained laboratory specialized technicians to operate/maintain/calibrate the equipment. If the Region requires 24-7 availability/quick response time for the unit, then 3-4 full-time trained personnel would be required to ensure its availability at all times. The operator(s) would normally require a college/university level degree in chemistry or science as well as in-depth training on the operation/maintenance and calibration of all the analyzers.

    - Minimum Education Level: College/University
    - Qualifications: Degree in analytical chemistry or science
    - Training/Certification: Equipment specific training courses (2-4 weeks).
    - Experience level: 2-3 years in ambient monitoring or analytical chemistry
    - Typical industry starting salary level: $70-90,000 (not including benefits).

Data Analysis and Reporting

For all four approaches, trained/experienced personnel would be required to analyze the data, QA/QC the results, interpret the results and write reports, synthesize the data and interpret/understand health risks and impacts to community health, meet and present results to Council, stakeholders and the community. This individual would also be responsible for overall management of the monitoring program for the Region.

The level of effort in the data analysis and reporting would be commensurate with the amount of data collected. The least level of effort would be expected for Approach A as it would be expected that limited data would be collected per field deployment. The data analysis/reporting effort would increase with approach type up to Approach D, which would be expected to require a full-time data analyst/report writer. It would be expected that Approaches B and C would require between 40-60% of the time of the data analyst/report writer (depending on how frequently the monitoring station was moved and number of reports required, etc).

- Minimum Education Level: University
- Qualifications: Master's/PhD Degree in engineering, science, health science or equivalent
- Training/Certification: Professional engineer or equivalent.
- Experience level: Minimum 5-years in air quality monitoring
- Typical industry salary level: $70-80,000 (not including benefits).

6 EQUIPMENT MAINTENANCE/INSPECTION/CALIBRATION REQUIREMENTS

The operation of both continuous and non-continuous analyzers and samplers must include regularly scheduled zero and span verification, manual calibrations, sample filter changes (e.g., non-continuous samplers), preventative maintenance and documentation. At regular intervals (specified by the manufacturer) extensive analyzer overhauls to replace various moving parts, seals, etc must be conducted.

7 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

The Ontario MOE specifies stringent AQ/QC requirements which would need to be adhered to for all sample acquisition activities. These are standard protocols used at all sampling sites in Ontario. For the TAGA vehicle approach, additional QA/QC procedures for laboratory analysis specified by US EPA/MOE would also apply.

8 LABORATORY ANALYSIS AND COSTS

Table 3 provides estimates of laboratory analysis requirements and annual costs based on the sampling frequencies noted in Table 1.

Table 3. Approximate Laboratory Costs

Contaminant	# Samples	Approx. Cost/Sample	Annual Cost		
			Approach A/B	Approach C	Approach D
			Handheld or Airpointer ®	Mobile Van	TAGA Vehicle
Metals [1]	60	$130	NA	$7,800	$7,800
Odour [2]	50	$150	NA	$7,500	$7,500
Dioxin and Furans [3]	17	$1,000	NA	$17,000	By onboard GC
PAHs [4]	30	$400	NA	$12,000	By onboard GC
Speciated VOCs [1]	60	$200	NA	$12,000	By onboard GC
Total				$54,700	$15,300

Notes:

1 – Number of samples based on following MOE 6-day sampling schedule for a 1-year period.

2 - Number of samples is an estimate for a 1-2 week ambient odour study around a plant taking daily samples at 4-5 locations per day.

3 – Number of samples based on following MOE 24-day sampling schedule for a 1-year period

4 – Number of samples based on following MOE 12-day sampling schedule for a 1-year period

9 COSTING – PROCUREMENT/START-UP AND YEARLY MAINTENANCE

Region Operated Program

Capital costs of the equipment will be dependent on the parameters measured and type of vehicle selected (for Approach C and D). The following table provides estimated ranges of capital and annual maintenance costs and the rationale for their basis. Please note that personnel costs (salary, benefits, etc) are not included in these costs and would be an additional cost consideration (see Section 5 for discussion of potential annual personnel costs).

Reference: Region of Durham, Mobile Air Monitoring Program

Table 4 – Estimated Capital Costs and Annual Maintenance Costs

Approach	Capital Costs			Annual Maintenance Cost
	Min	Max	Comments	
A - Handheld	$85,000	$130,000	Range for HAPSITE VOC, a PM unit and a 4-gas unit.	$10,000 - $15,000 (spare parts, routine repairs)
B – Airpointer ®	$90,000	$140,000	Based on cost quoted by Ottawa City Council for a unit measuring 4 contaminants.	$10,000 - $15,000 (spare parts, routine repairs)
C – Mobile Van/Truck	$250,000	$400,000	Estimate for a modified cube van with 4-6 continuous analyzers, telescoping met tower, on board generator, data acquisition system, and 1-2 samplers for metals and dioxin-furan/PAH sample collection.	$25,000-$35,000 (spare parts, routine repairs, fuel costs, overhaul kits, calibration gases, vehicle maintenance, etc)
D – TAGA Unit	$1,200,000	$1,900,000	Min value based on cost reported by MOE in 1998 ($2.4 million for 2 units). Max based on inflation adjustment of 3% per year from 1998 to present.	$30,000 -$50,000 (spare parts, routine repairs, fuel costs, overhaul kits, calibration standards, vehicle maintenance, etc)

Cost for an Environmental Consultant Operated Program

An alternative to the Region fully owning and operating a mobile monitoring program would be for the Region to manage the program and contract an environmental consultant to operate/maintain the equipment and/or conduct the data analysis and reporting. It would be expected that capital/operating/laboratory costs for the approaches described above would be similar for both a Region operated or a Consultant operated program – the Region would purchase the equipment in order to ensure its continual availability for use as required by the Region. The consultant would deploy, maintain and operate the equipment upon Region request. It would be expected that deployment times and the

availability of personnel would be similar for both a Region operated and a consultant operated program (assuming a consulting company with sufficient depth of personnel to provide 24-7 availability is retained).

As noted in Section 5, with the exception of a 100% utilized TAGA Unit (Approach D), a mobile air monitoring program would not be expected to require the full utilization of the field maintenance or data analysis staff. A comparison of the potential first-year capital and operating costs of the four approaches is presented in Table 5. It should be noted that these costs are estimates only - personnel costs are based solely on typical industry salary levels and do not include benefits, overheads, etc that would normally be included in charges by a consultant or absorbed internally by the Region for their employees. Thus actual personnel/consultant fees would be expected to be higher than those presented.

10 CRITERIA AND/OR P&P FOR SITES OR ASSIGNMENT OF THIS UNIT

Criteria for locating the mobile unit will depend on the objective for which it is being deployed. Monitoring can be conducted for objectives ranging from quantifying air quality due to emissions from a particular source or event (i.e. fire), to quantifying background air quality levels urban scale (about 50-km) areas. For each of these objectives, there are specific siting requirements listed in the MOE's Operations Manual (MOE, 2008) that should be followed as closely as possible in order to ensure the monitoring objective is achieved. However the final location of a mobile monitor will also be constrained to by considerations such as adequate security, vehicle access, set-back from roadways, and access to external power (if required, depending on equipment used).

Mobile monitoring units are usually constrained to be located next to roadways, parking lots or in fields where vehicle access is possible. MOE and US EPA provide guidelines on required set back distances from roadways that are required for various sampling objectives (i.e. to quantify the impact of a specific source versus monitoring for air quality levels representative of a large urban area). These set-back distances cannot always be achieved with a vehicle mounted mobile monitoring unit. Conversely, a vehicle mounted unit is ideal for measuring air quality impacts due to vehicle/roadway emissions, which are significant emissions sources in most areas.

11 LIMITATIONS TO INTERPRETATION OF DATA

Mobile monitoring can be used to address Objectives 2-5 provided that the limitations of the monitoring are understood. In the eventuality of an accidental release (Objective 3) mobile monitoring can provide valuable information on the air quality impacts due to the event, which can be used for emergency response planning (defining hazard zones/evacuation zones, etc) , public communication and enforcement. For Objectives 2 and 5 (point source monitoring and sensitive receptor monitoring) mobile monitoring can provide data on air quality impacts and levels, but it must be recognized that a temporary monitoring program will only provide limited information on maximum short-term concentration levels during the study period and may not define worst-case maximum levels (as these events generally occur infrequently) nor long-term (annual average) levels. Thus short-term mobile monitoring has limited usefulness for enforcement activities (unless an exceedance of an air quality standard is actually measured) or heath studies that generally need information on maximum short-term levels as well as annual concentration levels in order to assess both acute and chronic health effects.

Reference: Region of Durham, Mobile Air Monitoring Program

Table 5 – Estimated Program Costs

Region Owned and Operated Program (ROOP)

Approach	Capital and Maintenance		Laboratory Costs	Region-Employed Field Personnel Salary Cost		Region of Durham Data Analyst/Project Manager Salary Cost		Total Costs	
	Min	Max		Min	Max	Min	Max	Min	Max
A - Handheld	$95,000	$145,000	-	$40,000	$50,000	$70,000	$80,000	$205,000	$275,000
B – Airpointer ®	$100,000	$155,000	-	$40,000	$50,000	$70,000	$80,000	$210,000	$285,000
C – Mobile Van/Truck	$275,000	$435,000	$54,700	$100,000	$140,000	$70,000	$80,000	$499,700	$709,700
D – TAGA Unit	$1,230,000	$1,950,000	$15,300	$210,000	$270,000	$70,000	$80,000	$1,525,300	$2,315,300

Region Owned and Consultant Operated Program (ROCOP)

Approach	Capital and Maintenance		Laboratory Costs	Consultant-Employed Field Personnel Salary Cost		Region of Durham Data Analyst/Project Manager Salary Cost		Total Costs	
	Min	Max		Min	Max	Min	Max	Min	Max
A - Handheld	$95,000	$145,000	-	$40,000	$50,000	$70,000	$80,000	$205,000	$275,000
B – Airpointer ®	$100,000	$155,000	-	$12,000	$20,000	$70,000	$80,000	$182,000	$255,000
C – Mobile Van/Truck	$275,000	$435,000	$54,700	$20,000	$42,000	$70,000	$80,000	$419,700	$611,700
D – TAGA Unit	$1,230,000	$1,950,000	$15,300	$210,000	$270,000	$70,000	$80,000	$1,525,300	$2,315,300

Notes:

Approach A: ROOP: Assumes full-time (i.e. 8-hour/working day) deployment of the monitor in the field with one Region-employed full-time field technician
ROCOP: Assumes full-time (i.e. 8-hour/working day) deployment of the monitor in the field with one consultant-employed field technician billing full-time to the Region

Approach B: ROOP: Assumes full-time continuous operation of the unit with one Region-employed full-time field technician (24/7 monitoring)
ROCOP: Assumes full-time continuous operation of the unit by a consultant-employed field technician only billing actual time required to maintain/calibrate/move station (24/7 monitoring)

Approach C: ROOP: Assumes full-time continuous operation of the unit with two Region-employed field technicians to provide 24-7 response availability to move/maintain station
ROCOP: Assumes full-time continuous operation of then unit by consultant-employed field technicians only billing actual time required to maintain/calibrate/move station (still with 24-7 response availability)

Approach D: Assumes for both ROOP and ROCOP, full-time continuous operation of the TAGA unit with 3 full-time technicians for 24-7 monitoring.

Personnel Costs: For both ROOP and ROCOP, the personnel costs presented are only the salary ranges of the personnel (based on typical industry salary level estimates) and do not include benefits, overheads, etc. The actual personnel/consultant costs to the Region for the program would be considerably higher than those presented when these factors are considered. Data was not available/accessible to compare typical Region/consultant overheads or typical Region salary levels.

Total Costs: The cost ranges are presented for comparative purposes between the various approaches only and do not include mark-ups, overheads on personnel costs, etc. The data presented in this table are not intended to be used for setting actual Region budgets.

Reference: Region of Durham, Mobile Air Monitoring Program

12 THE EXTENT THAT THE APPROACHES CAN FULFILL THE REGION'S MOBILE AIR MONITORING OBJECTIVES

The following table provides an overview of the potential of each of the four mobile monitoring approaches discussed in this report to fulfill the Region's five mobile air monitoring objectives.

Table 6 – Applicability of Mobile Monitoring Approaches to Region's Objectives

	Approach A – Hand Held Monitors	Approach B – Airpointer ®	Approach C – Mobile Van/Truck	Approach D – TAGA Unit
1. Air zone monitoring and evaluation	No [1]	No [1]	No [1]	No [1]
2. Point source emissions monitoring	No	Partial [2]	Partial [2]	Partial [2]
3. Emergency response during spills/accidental releases	Yes	No	Yes	Yes
4. Odour emissions monitoring	No [3]	No	Yes	Yes
5. Monitoring in the vicinity of sensitive receptors	No	Partial [2]	Partial [2]	Partial [2]

Notes:

1- Air zone monitoring requires fixed stations with long-term monitoring to evaluate air quality trends

2- Methodology can provide partial information (e.g. short-term ambient air quality levels) but would not provide full information required for health assessment or regulatory enforcement (maximum short-term concentration levels or annual averages).

3- Hand held monitors can't sample for odour, but manual (hand) sampling for odour could also be conducted without the need for a mobile van or TAGA unit.

Reference: Region of Durham, Mobile Air Monitoring Program

10 CLOSURE

This letter was prepared by Stantec Consulting Ltd. for the Region of Durham. The material in it reflects Stantec's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Stantec Consulting Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Regards,

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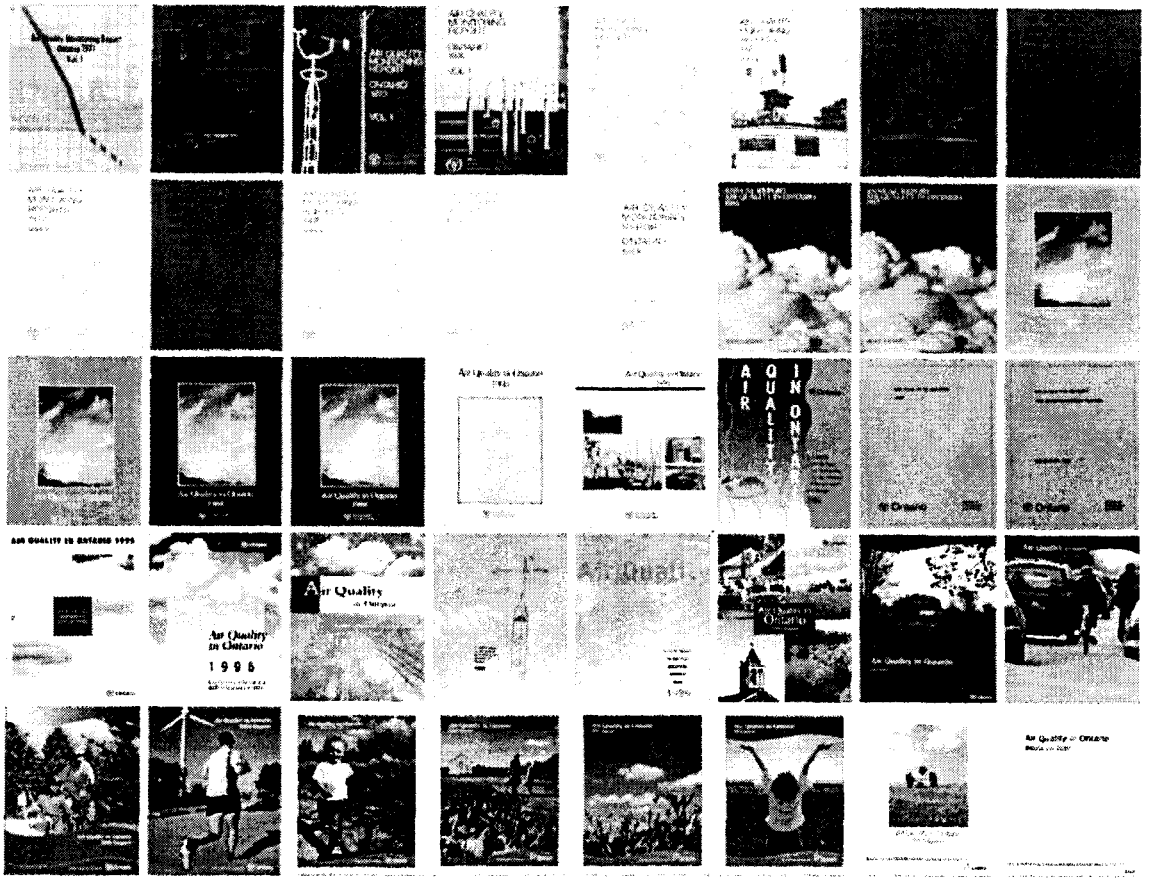
Air Quality in Ontario

Report for 2011



Ontario

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2011 Report Highlights

ONTARIO AIR QUALITY IS IMPROVING

- The 2011 air quality report marks 41 years of long-term reporting on the state of air quality in Ontario. This report summarizes province-wide trends for key airborne pollutants impacting Ontario's air quality.
- Overall, air quality has improved significantly over the past 10 years, especially for nitrogen dioxide (NO_2), carbon monoxide (CO) and sulphur dioxide (SO_2) - pollutants emitted by vehicles and industry, as well as fine particulate matter ($PM_{2.5}$), which may be emitted directly or from other emissions such as SO_2.
- Ozone is a secondary pollutant formed when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react in the presence of sunlight. Ozone annual means have increased by 7 per cent from 2002 to 2011, however, ozone summer means continue to show improvement and have decreased by 9 per cent over the same period.

Decreasing Provincial Ambient Concentrations	
NO_2	↓ 41% (2002-2011)
CO	↓ 35% (2002-2011)
SO_2	↓ 52% (2002-2011)
$PM_{2.5}$	↓ 30% (2003-2011)

ONTARIO EMISSIONS ARE DECREASING

- Emissions of nitrogen oxides (NO_x), CO and SO_2 continue to decrease due in part to Ontario's air quality initiatives such as the phase-out of coal-fired generating stations, emissions trading regulations (O. Reg. 397/01 and O. Reg. 194/05), emissions controls at Ontario smelters, and Drive Clean emissions testing, which supports the federal vehicle emission standards and lower sulphur content in transportation fuels.

Decreasing Provincial Emissions (2001-2010)	
NO_x	↓ 36%
CO	↓ 24%
SO_2	↓ 55%
$PM_{2.5}$	↓ 33%

- Transboundary influences, mainly from the U.S., account for approximately half of Ontario's smog. Emission reductions in Ontario and the U.S. have contributed to decreases in $PM_{2.5}$ and summer ozone levels. Winter and annual ozone levels are increasing due to a global rise in ozone levels.

THE ONTARIO AMBIENT AIR QUALITY CRITERIA (NO_2, CO, SO_2, and O_3)

- During 2011, the provincial Ambient Air Quality Criteria (AAQC) for NO_2, CO and SO_2 were not exceeded in any regions of Ontario where ambient air monitoring exists.
- The provincial one-hour AAQC for O_3 was exceeded at 28 of the 40 ambient air monitoring sites in 2011 for at least one hour, and these exceedances exclusively occurred in summer from May to September.

THE CANADA-WIDE STANDARDS (CWS) ($PM_{2.5}$ and Ozone)

- For a fourth year in a row, the CWS for $PM_{2.5}$ was not exceeded in Ontario. The $PM_{2.5}$ CWS 3-year metrics are trending downwards from 2005 to 2011.
- Six of the 21 designated sites met the CWS for ozone in 2011. For the first time, Barrie, London, Mississauga, and Sudbury met the CWS for ozone. The ozone CWS 3-year metrics are trending downwards from 2005 to 2011.

Table of Contents

1.0 Introduction

This annual report, the 41st in a series, summarizes the state of ambient air quality in Ontario during 2011 and examines 10-year trends. It reports on the measured levels of six common air pollutants: ground-level ozone (O_3), fine particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2) and total reduced sulphur (TRS) compounds. The report also summarizes the results from the Air Quality Index (AQI) and Smog Alert programs. The annual statistics and 10- and 20-year trends of ambient air quality data are presented in the attached appendix.

Ontario continues to benefit from one of the most comprehensive air monitoring systems in North America, comprised of 40 monitoring sites across the province that undergo regular maintenance and strict data quality assurance and quality control (QA/QC) procedures to ensure a high standard of data quality. The data, which are collected continuously at these sites, are used to determine the current state of air quality and reported in near real-time on the ministry's website at www.airqualityontario.com.

The Ministry of the Environment uses this information to:

- inform the public about Ontario's ambient air quality;
- assess Ontario's air quality and evaluate long-term trends;
- identify areas where criteria and standards are exceeded;
- provide the basis for air policy/program development;
- determine the impact from U.S. and Canadian sources on Ontario's air quality;
- provide scientists with air quality data to link environmental and human health effects to pollution levels; and
- provide smog advisories for public health protection.

2.0 Ground-Level Ozone

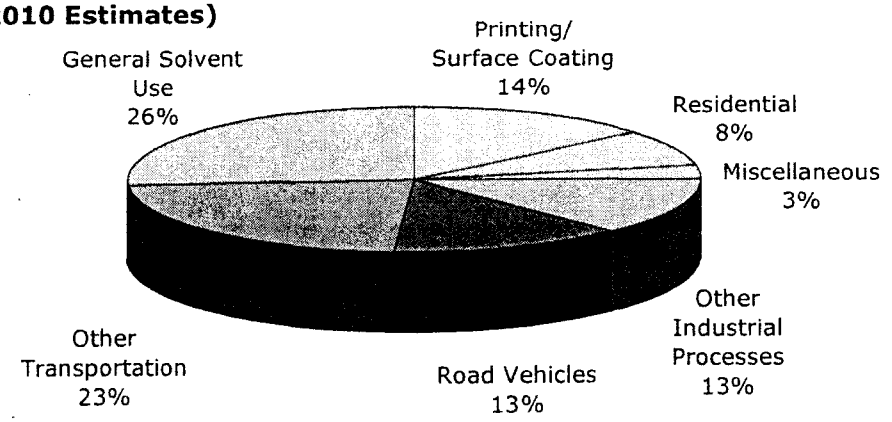
Ground-level ozone is a gas formed when nitrogen oxides (NO_X) and volatile organic compounds (VOCs) react in the presence of sunlight. While ozone at ground level is a major environmental and health concern, the naturally occurring ozone in the stratosphere is beneficial as it shields the earth from harmful ultraviolet radiation.

2.1 Characteristics, sources and effects

Ozone is a colourless, odourless gas at typical ambient concentrations, and is a major component of smog. Ozone is not generally emitted directly into the atmosphere; the formation and transport of ozone are strongly dependent on meteorological conditions and emissions of chemical precursors. Changing weather patterns contribute to differences in ozone concentrations hourly, daily, seasonally and year-to-year. In Ontario, elevated concentrations of ground-level ozone are typically recorded on hot and sunny days from mainly May to September, between noon and early evening.

Figure 2.1 shows the 2010 estimates of Ontario's VOC emissions from point, area and transportation sources. Transportation sectors accounted for approximately 36 per cent of VOC emissions. General solvent use was the second largest source of VOC emissions, accounting for approximately 26 per cent. Figure 2.2 shows the 2010 estimates of Ontario's NO_X emissions from point, area and transportation sources. Transportation sectors accounted for approximately 71 per cent of NO_X emissions (NPRI, 2012).

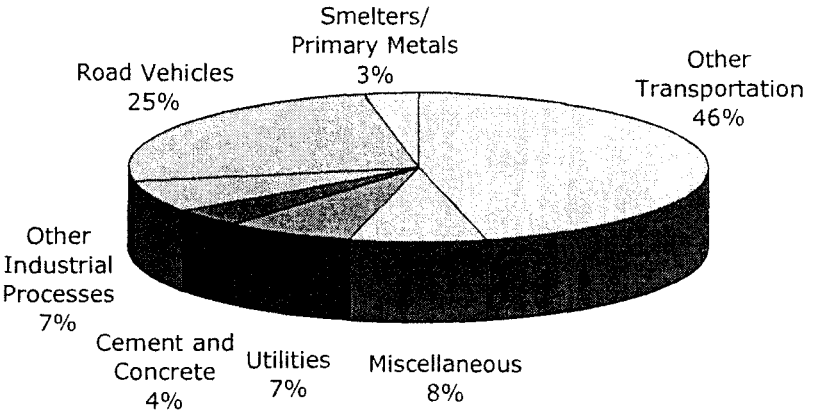
Figure 2.1
Ontario Volatile Organic Compounds Emissions by Sector (Emissions from Point/Area/Transportation Sources, 2010 Estimates)



Note: Provincial total 409 kilotonnes.
Excludes open and natural sources.

Data Source: NPRI, 2012.

Figure 2.2
Ontario Nitrogen Oxides Emissions by Sector (Emissions from Point/Area/Transportation Sources, 2010 Estimates)



Note: Provincial total 383 kilotonnes.
Excludes open and natural sources.

Data Source: NPRI, 2012.

Ozone irritates the respiratory tract and eyes. Exposure to ozone in sensitive people can result in chest tightness, coughing and wheezing. Children who are active outdoors during the summer, when ozone levels are highest, are particularly at risk. Individuals with pre-existing respiratory disorders, such as asthma and chronic obstructive pulmonary disease (COPD), are also at risk. Ozone has been linked to increased hospital admissions and premature deaths. Ozone also causes agricultural crop loss each year in Ontario, with visible leaf damage in many crops, garden plants and trees, especially during the summer months.

2.2 Monitoring results for 2011

During 2011, ozone was monitored at 40 Ontario Ministry of the Environment AQI monitoring stations. The highest annual mean was 32.8 parts per billion (ppb), measured at Grand Bend and Port Stanley, transboundary-influenced sites on the eastern shore of Lake Huron and the northern shore of Lake Erie, respectively. The lowest annual mean, 20.1 ppb, was measured at Toronto West, an urban site located near a major transportation corridor, Highway 401 and directly impacted by local nitric oxide (NO) emissions from vehicles. Generally, ozone concentrations are lower in urban areas because ozone is reduced by reacting with NO emitted by vehicles and other local combustion sources.

Ground-level ozone concentrations continued to exceed the provincial one-hour ambient air quality criterion (AAQC) of 80 ppb across the province. In 2011, Ontario's one-hour AAQC for ozone was exceeded at 28 of the 40 AQI stations for at least one hour, and these exceedances exclusively occurred

from May to September, which is considered as the summer period in this report. The maximum one-hour ozone concentrations ranged from a low of 60 ppb recorded in Thunder Bay to 115 ppb recorded at Grand Bend. Windsor Downtown recorded the most instances (42) when ozone exceeded Ontario's one-hour AAQC.

Figure 2.3 shows the geographical distribution of one-hour ozone exceedances across Ontario in 2011. Generally, higher numbers of one-hour ozone exceedances were recorded in southwestern Ontario, on the eastern shore of Lake Huron and the northern shore of Lake Erie, than over central and eastern Ontario. There were no ozone exceedances in the north. As stated in the *Transboundary Air Pollution in Ontario* report, elevated ozone levels in southwestern Ontario are generally attributed to the long-range transport of pollutants into Ontario from the United States. Transboundary air pollution is combined with local emissions of smog-related pollutants, and can impact various areas of the province during a smog episode (Yap, Reid, De Brou, & Bloxam, 2005).

Figure 2.3
Geographical Distribution of One-Hour Ozone Exceedances Across Ontario in 2011

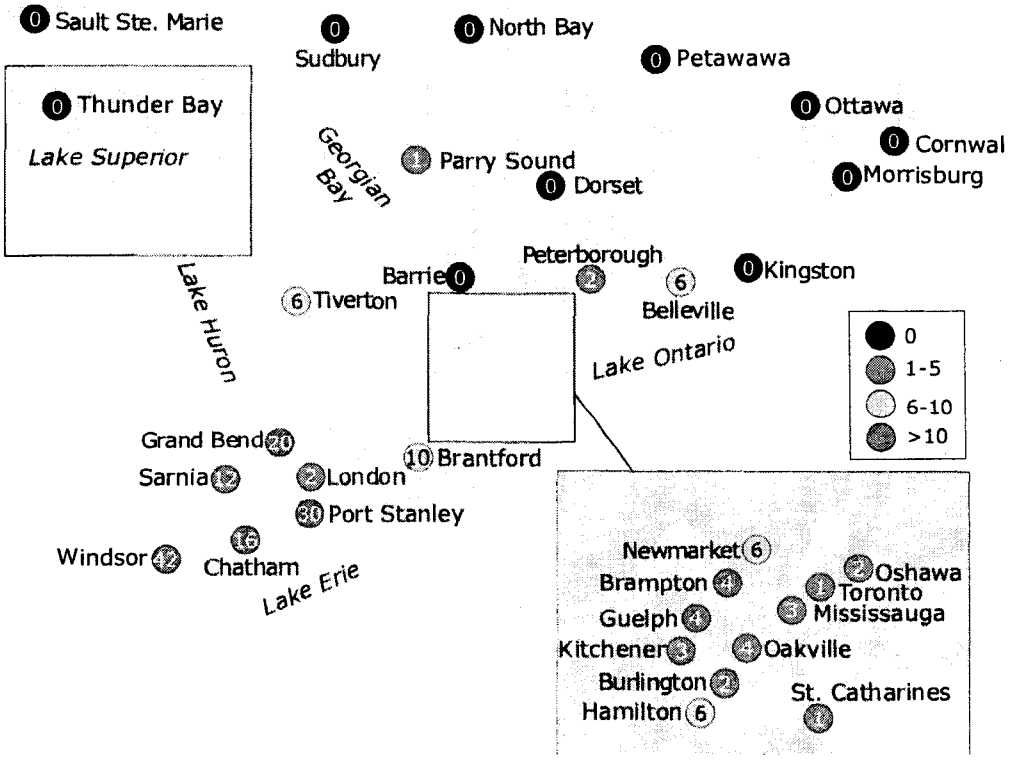
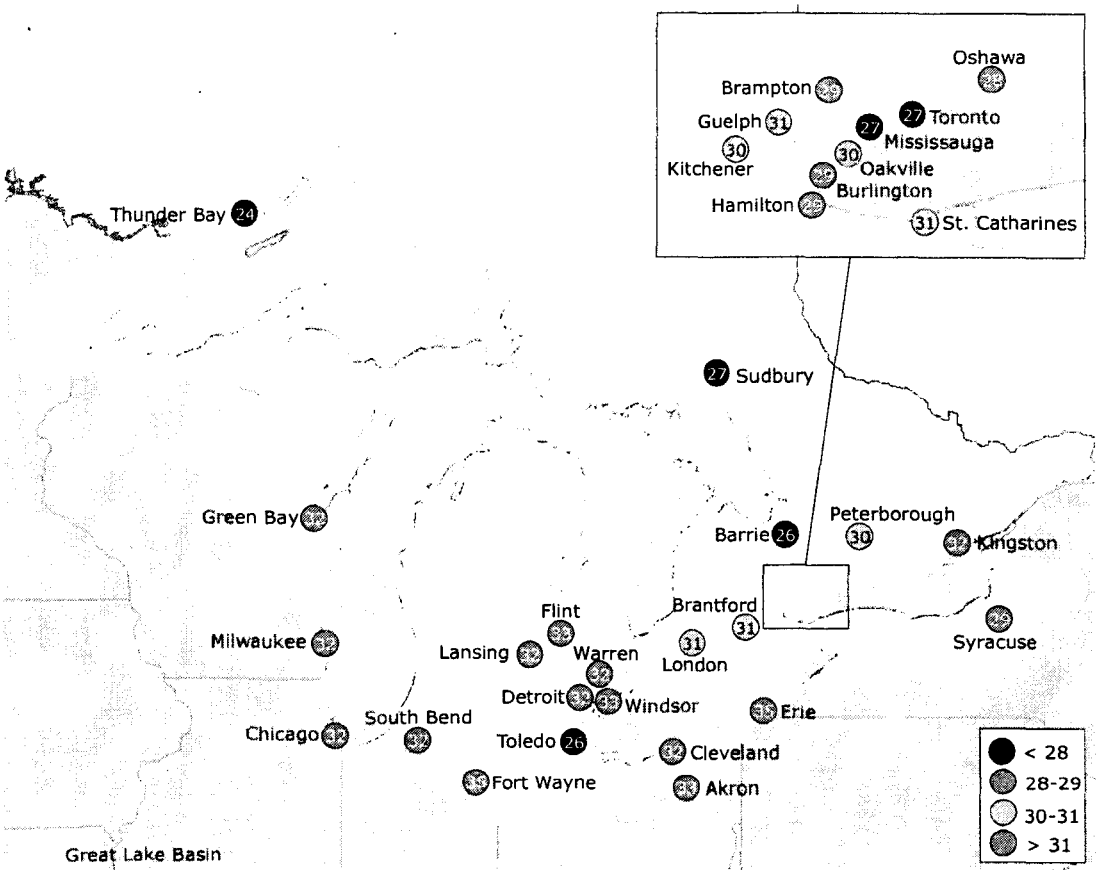


Figure 2.4 shows ozone summer (May – September) means of hourly concentrations in 2011 for cities with population greater than 100,000 in the Great Lakes Basin, including 18 sites in Ontario and 14 sites in the U.S.

Ozone summer means were generally lower in central and northern Ontario than southwestern Ontario and the U.S. Relatively high ozone concentrations at the Windsor and Kingston sites were largely impacted by transboundary pollution, whereas relatively low ozone levels at urban sites like Toronto were reduced by reactions with NO emitted by local vehicles.

Figure 2.4
Geographical Distribution of Ozone Summer Means (ppb) in 2011 in the Great Lakes Basin



Data Source: AQS, 2012.

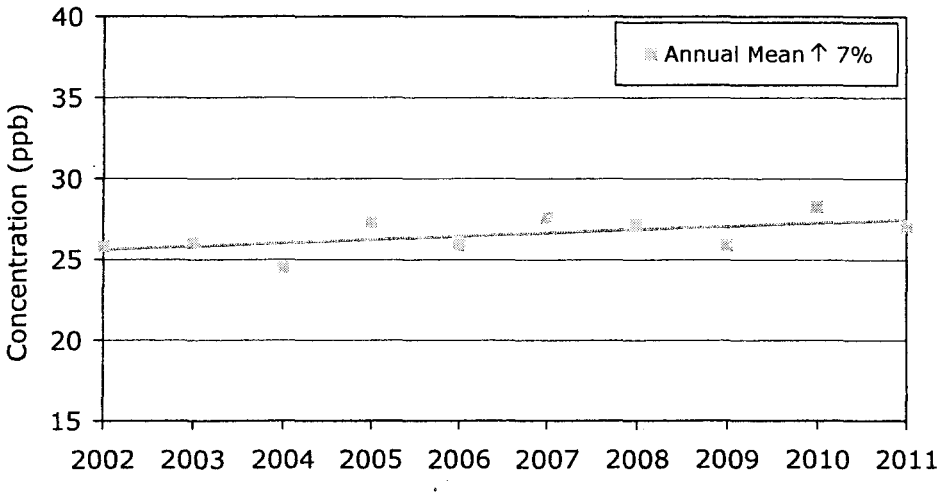
2.3 Trends

The trend of the ozone annual means is shown in Figure 2.5 for the 10-year period of 2002 to 2011. The data show an increasing trend (7 per cent) in the ozone annual means over the 10-year period.

Table 2.1 shows the spatial variability of ozone annual means in 2011 and trends of annual means from 2002 to 2011 at North Bay in northeastern Ontario; Ottawa in eastern Ontario; Toronto in central Ontario; and Windsor in southwestern Ontario. Ozone annual means and trends throughout the

10-year period differ at these four sites: the ozone annual means at North Bay and Ottawa slightly increased by approximately 2 per cent, while Toronto increased by 11 per cent and Windsor increased by 28 per cent. The increase in the ozone annual means at the Windsor site may be generally attributed to the reduction of NO_X emissions and the changeover in vehicle fleet which in turn lessened the effect of ozone titration by NO in the urban centre.

Figure 2.5
Trend of Ozone Annual Means Across Ontario (2002-2011)



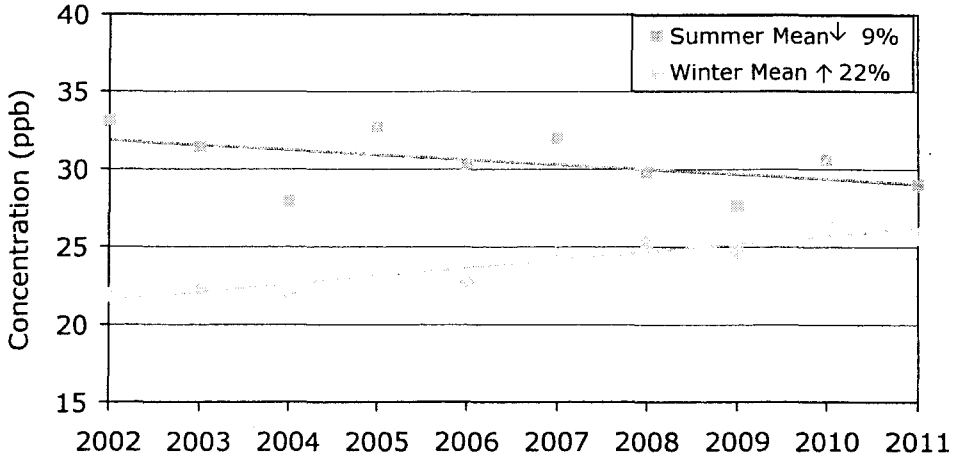
Note: Ten-year trend is a composite annual mean based on data from 36 monitoring sites.

Table 2.1: Ozone Annual Means (ppb) in 2011 and Per Cent Change from 2002-2011 at Four Select Cities.

City	Ozone Annual Mean (ppb) in 2011	Per Cent Change of Ozone Annual Mean (2002-2011)
North Bay	26.7	↑ 2%
Ottawa	24.2	↑ 2%
Toronto	25.4	↑ 11%
Windsor	27.2	↑ 28%

The trend of ozone summer means and ozone winter means, as recorded at Ontario's 36 air monitoring sites with sufficient data, is shown in Figure 2.6 for the 10-year period of 2002 to 2011. The ozone summer means have decreased by approximately 9 per cent, whereas the ozone winter means have increased by approximately 22 per cent over the past 10 years (2002 to 2011). Although the ozone winter means increased over the past 10 years, the provincial one-hour AAQC of 80 ppb for ozone was not exceeded at any of the 40 AQI sites during the winter of 2011. The increase in winter means, as shown in Figure 2.6, resulted in the overall increasing trend of ozone annual means.

Figure 2.6
Trend of Ozone Summer and Winter Means (ppb) Across Ontario (2002-2011)



Note: Ten-year trends are composite means for the summer and winter months based on data from 36 monitoring sites.
Summer: May - September; Winter: January - April, October - December.

Elevated ozone concentrations in Ontario are typically recorded during the summer months due to the local production of pollution, and transboundary pollution under certain weather conditions. The decrease in summer means over the past 10 years is largely due to the progressive reductions of NO_X emissions in Ontario and the U.S. resulting in the decrease in local ozone formation and transboundary influences especially during the summer months. In contrast, local ozone production is at its lowest in winter, and the increasing ozone winter means are mainly attributed to the rising global background concentrations, and lessened NO titration effects as a result of the reduced NO_X emissions. The increase in ozone annual means can be attributed to the reductions in local NO_X emissions, the rising global background ozone concentrations, and the variability in meteorological conditions (Yap et al., 2005).

2.4 The Canada-wide Standard for Ozone

In 2000, the Canadian Council of Ministers of the Environment (CCME) developed a Canada-wide Standard (CWS) for ozone as a result of the pollutant's adverse effects on human health and the environment. As referenced in the *Guidance Document on Achievement Determination (GDAD)*, the CWS for ozone is 65 ppb, which is based on eight-hour running average time and the 4th highest annual ambient measurement averaged over three consecutive years (Canadian Council of Ministers of the Environment, 2002).

Table 2.2 displays the calculated ozone CWS 3-year metric for designated sites where populations are greater than 100,000 across Ontario from 2005 to 2011. In 2011, six of the 21 designated sites met the CWS of 65 ppb for ozone. The communities in Barrie, London, Mississauga and Sudbury met the CWS for ozone for the first time in 2011, indicating, once again, that air quality in Ontario has improved recently. The downward trend of ozone CWS metrics from 2005 to 2011 (Table 2.2) is consistent with the declining summer means (Figure 2.6) since CWS metrics are calculated from the 4th highest ozone concentrations that are usually recorded during the summer months.

Table 2.2: Ozone CWS Metric (ppb) for Designated Sites Across Ontario

City	2003 – 2005	2004 – 2006	2005 – 2007	2006 – 2008	2007 – 2009	2008 – 2010	2009 – 2011	Change over time
Windsor Downtown	82	81	89	85	81	74	75	↓ 11%
Chatham	n/a	86	86	80	78	73	72	↓ 18%
London	74	70	73	72	69	67	65	↓ 11%
Brantford	n/r	n/r	n/r	n/r	n/r	n/r	72	-
Kitchener	79	74	77	74	71	68	66	↓ 15%
Guelph	79	77	79	75	73	70	69	↓ 13%
St. Catharines	81	75	81	76	73	67	67	↓ 17%
Hamilton Downtown	77	72	76	74	71	69	67	↓ 11%
Hamilton Mountain	82	76	80	76	74	71	70	↓ 14%
Burlington	75	72	76	74	71	68	66	↓ 11%
Oakville	81	74	80	77	75	71	69	↓ 13%
Mississauga	80	75	80	77	66	66	65	↓ 20%
Brampton	80	75	79	76	74	69	68	↓ 14%
Toronto	81	75	80	78	76	74	71	↓ 10%
Oshawa	n/a	77	80	76	74	70	68	↓ 14%
Barrie	72	69	72	71	70	67	62	↓ 11%
Peterborough	81	72	73	71	73	73	71	↓ 8%
Kingston	77	77	89	85	81	77	74	↓ 24%
Ottawa Downtown	69	67	71	68	65	61	58	↓ 15%
Sudbury	76	74	77	71	69	66	65	↓ 18%
Thunder Bay	58	57	57	55	53	54	54	↓ 7%

Notes:
The CWS for ozone is 65 ppb, which is based on eight-hour running average time and the 4th highest annual ambient measurement averaged over three consecutive years.
CWS metrics are calculated as per the GDAD.
Toronto reporting is based on Toronto Downtown, Toronto North, Toronto East and Toronto West sites.
Red font indicates an exceedance of the CWS.
n/a indicates data are not sufficient to calculate metrics.
n/r indicates site not designated for CWS reporting. Brantford was added as a CWS designated site in 2009-2011.
A linear regression is applied to derive per cent change over time.

3.0 Particulate Matter in the Air

Airborne particulate matter is the general term used to describe a mixture of microscopic solid particles and liquid droplets suspended in air. Particulate matter is classified according to its aerodynamic size, mainly due to the different health effects associated with particles of different diameters. Fine particulate matter, denoted as $PM_{2.5}$, refers to respirable particles that are less than 2.5 microns in diameter. Due to their small size, they can penetrate deep into the respiratory system. To put this in perspective, $PM_{2.5}$ is approximately 30 times smaller than the average diameter of a human hair.

Particles originate from many different industrial and transportation sources, as well as natural sources. They may be emitted directly from a source or formed in the atmosphere by the transformation of gaseous emissions. This chapter discusses the monitoring results from Ontario's ambient continuous $PM_{2.5}$ monitoring network.

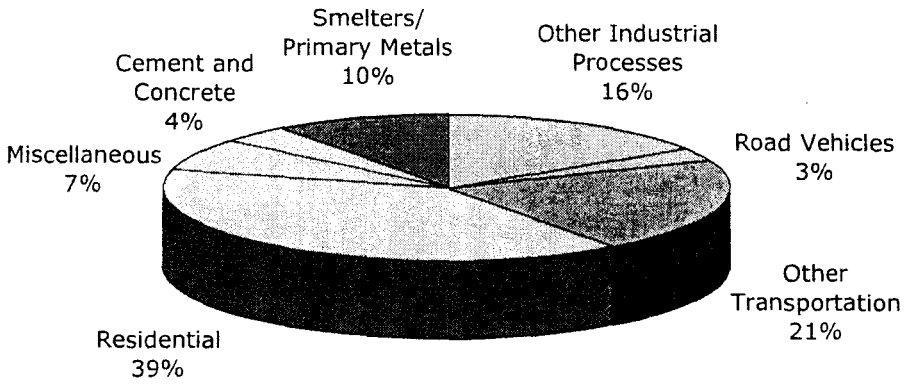
3.1 Characteristics, sources and effects

Particulate matter includes aerosols, smoke, fumes, dust, fly ash and pollen. Its composition varies with origin, residence time in the atmosphere, time of year and environmental conditions. Fine particulate matter may be emitted directly to the atmosphere as a by-product of fuel combustion. Major sources of $PM_{2.5}$ include motor vehicles, smelters, power plants, industrial facilities, residential fireplaces and wood stoves, agricultural burning and forest fires, or may be formed indirectly in the atmosphere through a series of complex chemical reactions.

Figure 3.1 shows the 2010 estimates of Ontario's primary $PM_{2.5}$ emissions from point, area and transportation sources. The residential and transportation sectors accounted for 39 per cent and 24 per cent of $PM_{2.5}$ emissions, respectively, whereas industrial processes accounted for 29 per cent (NPRI, 2012). The major contributor to residential emissions is fuel wood combustion in fireplaces and wood stoves.

Significant amounts of $PM_{2.5}$ in southern Ontario are referred to as secondary $PM_{2.5}$ being formed in the atmosphere from gaseous precursors such as SO_2 and NO_2, and of transboundary origin. During periods of elevated concentrations of $PM_{2.5}$ in Ontario, it is estimated that there are significant contributions from the U.S., specifically affecting border communities such as: Windsor and Port Stanley, on the northern shore of Lake Erie; Grand Bend and Tiverton, on the eastern shores of Lake Huron; and Parry Sound, on the eastern shore of Georgian Bay (Yap et al., 2005).

Figure 3.1
Ontario $PM_{2.5}$ Emissions by Sector (Emissions from Point/Area/Transportation Sources, 2010 Estimates)



Note: Provincial total 62 kilotonnes.
Excludes open and natural sources.

Data Source: NPRI, 2012.

3.2 Monitoring results for 2011

In 2011, Ontario's 40 air monitoring sites were equipped with a Tapered Element Oscillating Microbalance (TEOM) instrument maintained at 30°C with a Sample Equilibration System (SES) to measure $PM_{2.5}$ concentrations on an hourly basis. As shown in Figure 3.2, the 2011 annual mean $PM_{2.5}$ concentrations ranged from 3.4 micrograms per cubic metre ($\mu g/m^3$) in Petawawa to 10.5 $\mu g/m^3$ in Sarnia. The 24-hour maximum $PM_{2.5}$ concentrations ranged from 14 $\mu g/m^3$ in Petawawa to 52 $\mu g/m^3$ in Thunder Bay. The 24-hour maximum $PM_{2.5}$ concentration at Thunder Bay was recorded on July 19, 2011 due to smoke from forest fires in northwestern Ontario, which is considered as an exceptional event and not the norm for air quality in Thunder Bay. The $PM_{2.5}$ reference level of 30 $\mu g/m^3$ (based on the CWS) for a 24-hour period was exceeded at 7 of the 40 sites in 2011 on at least one occasion.

Figure 3.3 shows $PM_{2.5}$ annual concentrations for 2011 for cities with population greater than 100,000 in the Great Lakes Basin, including 18 sites in Ontario and 8 sites in the U.S. $PM_{2.5}$ annual means were generally lower in Ontario, especially in the northern part of the province, than in the U.S. Relatively higher annual $PM_{2.5}$ concentrations in Windsor and Hamilton are combined effects of transboundary pollution and local industrial emissions (Yap et al., 2005).

Figure 3.2
$PM_{2.5}$ Annual Means ($\mu g/m^3$) Across Ontario (2011)

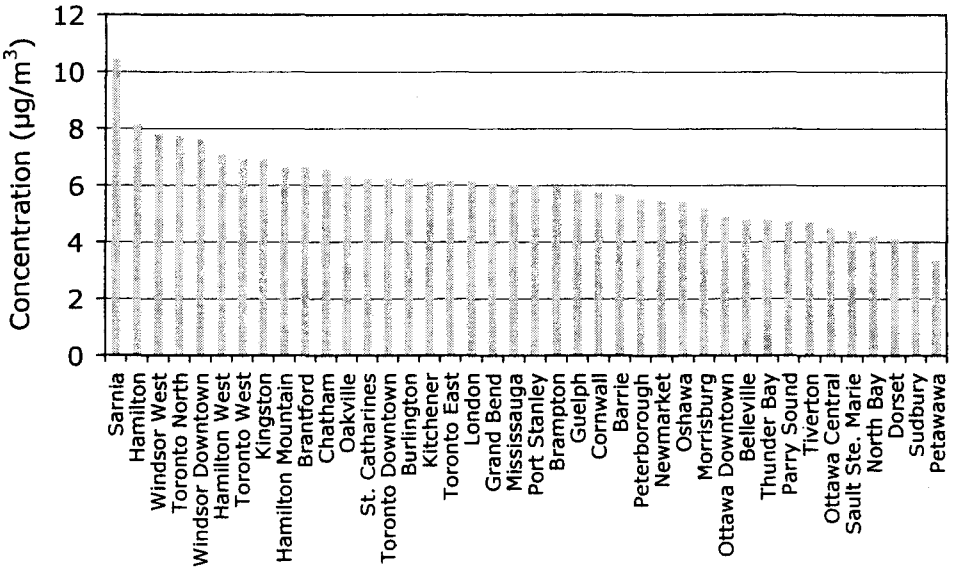
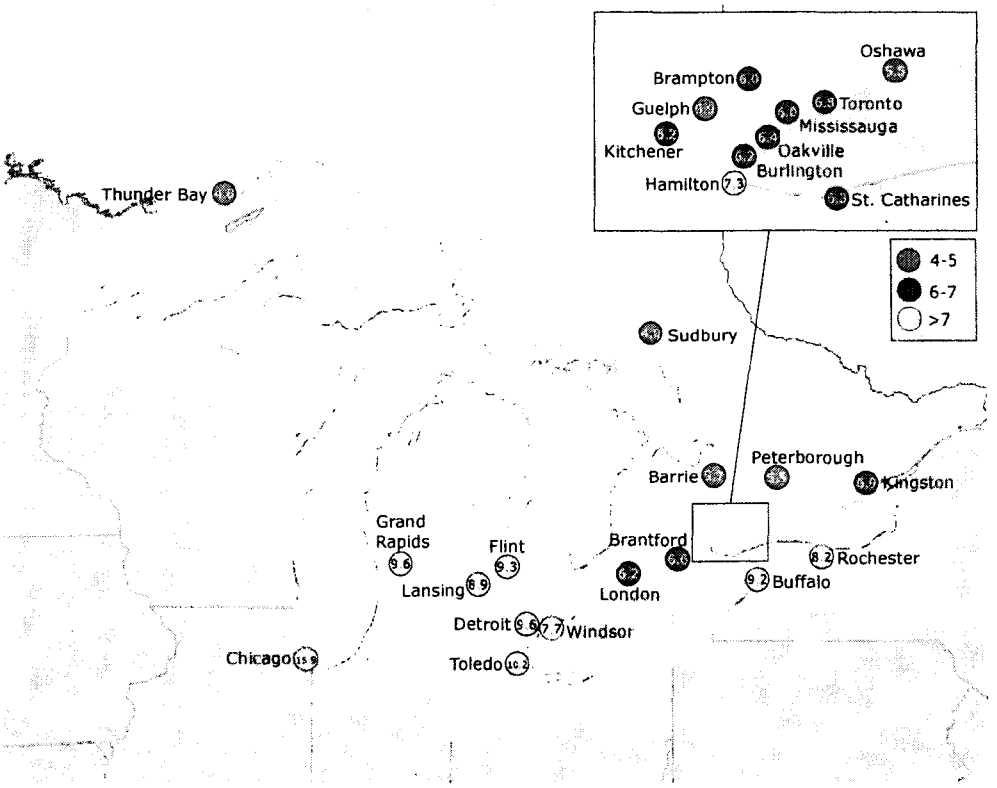


Figure 3.3
Geographical Distribution of $PM_{2.5}$ Annual Means ($\mu g/m^3$) in 2011 in the Great Lakes Basin

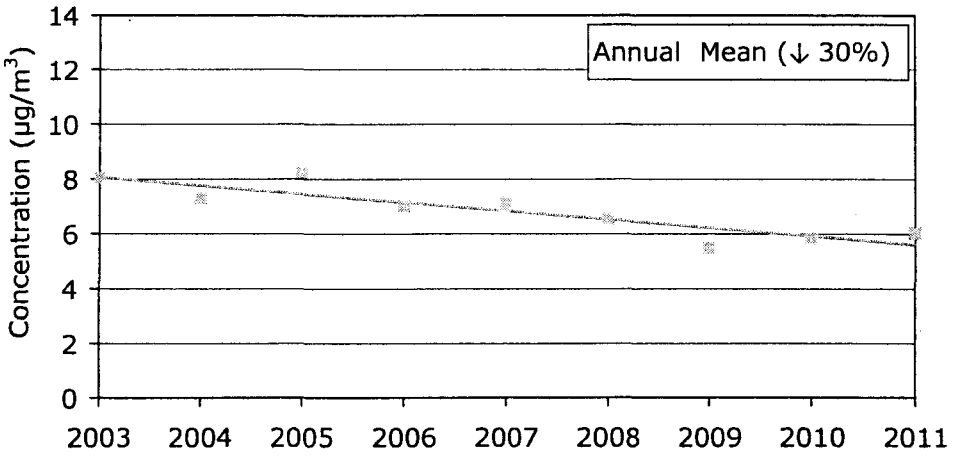


Data Source: AQS, 2012.

3.3 Trends

The trend of $PM_{2.5}$ annual means, as recorded at 34 air monitoring sites with sufficient data, is shown in Figure 3.4 for the nine-year period of 2003 to 2011. Annual means of $PM_{2.5}$ have decreased approximately 30 per cent since 2003.

Figure 3.4
Trend of $PM_{2.5}$ Annual Means ($\mu g/m^3$) Across Ontario (2003-2011)

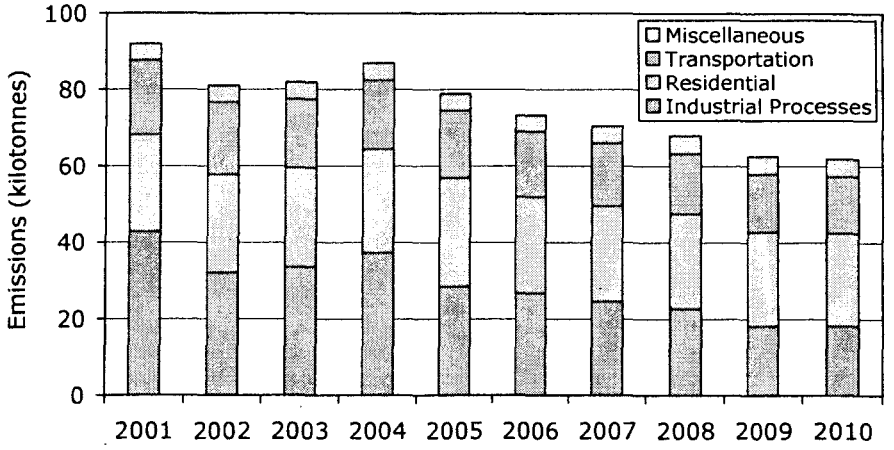


Note: The trend is a composite mean based on data from 34 monitoring sites.

Overall, provincial $PM_{2.5}$ emissions have decreased approximately 33 per cent from 2001 to 2010, as shown in Figure 3.5 (NPRI, 2012; NPRI, 2010; P. Georges, personal communication, April 1, 2010). Fine particulate emissions from industrial processes have been reduced by over 57 per cent over the 10-year period from 2001 to 2010. Emissions from the transportation sector show a gradual decrease of 23 per cent over this time period with the phase-in of new vehicles/engines having more stringent emission standards over the same period.

Table 3.1 shows $PM_{2.5}$ annual means in 2011 and trends of annual means from 2002 to 2011 at North Bay in northeastern Ontario; Ottawa in eastern Ontario; Toronto in central Ontario; and Windsor in southwestern Ontario. Spatial differences are apparent: the $PM_{2.5}$ annual means in 2011 in Windsor, an urban industrial centre, were higher than those reported at Toronto, Ottawa and North Bay, indicating influences from transboundary pollution and local emission sources. $PM_{2.5}$ annual means at North Bay, Ottawa, Toronto and Windsor decreased by approximately 27 per cent, 40 per cent, 30 per cent and 18 per cent, respectively.

Figure 3.5
Trend of Ontario $PM_{2.5}$ Emissions in Kilotonnes (2001-2010)



Note: Excludes open and natural sources.

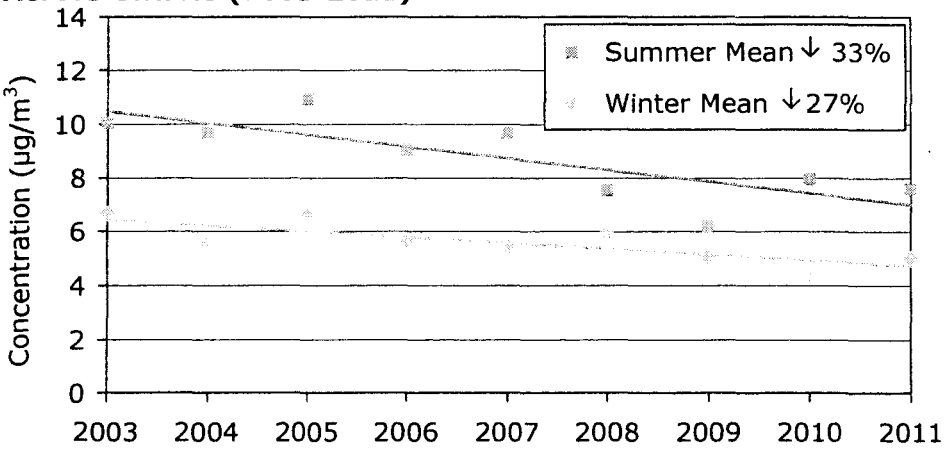
References: NPRI, 2012; NPRI, 2010; and P. Georges, personal communication, April 1, 2010.

Table 3.1: $PM_{2.5}$ Annual Means ($\mu g/m^3$) in 2011 and Per Cent Change from 2002-2011 at Four Select Cities.

City	$PM_{2.5}$ Annual Mean ($\mu g/m^3$) in 2011	Per Cent Change of $PM_{2.5}$ Annual Mean (2002-2011)
North Bay	4.2	↓ 27%
Ottawa	4.9	↓ 40%
Toronto	6.2	↓ 30%
Windsor	7.6	↓ 18%

Figure 3.6 shows the trend of the $PM_{2.5}$ summer means and $PM_{2.5}$ winter means as recorded at 34 air monitoring sites for the period of 2003 to 2011. There has been a decreasing trend in both the $PM_{2.5}$ summer and winter means during the nine-year period. The $PM_{2.5}$ summer means have decreased by approximately 33 per cent and the $PM_{2.5}$ winter means by approximately 27 per cent, which coincides with a combined reduction of primary $PM_{2.5}$ emissions (as shown in Figure 3.5) and secondary $PM_{2.5}$ formation. Figure 3.6 indicates that the summer means were consistently higher than the winter means, which can be attributed to the formation of secondary $PM_{2.5}$ under favourable synoptic patterns with lighter winds and prevailing south-westerly flows, and the potential loss of $PM_{2.5}$ with the TEOM during cooler temperatures. The ministry is replacing the TEOM $PM_{2.5}$ monitor with a new monitoring method to provide more comprehensive cold weather measurements.

Figure 3.6
Trend of $PM_{2.5}$ Summer and Winter Means ($\mu g/m^3$) Across Ontario (2003-2011)



Note: Ten-year trends are composite means for the summer and winter months based on data from 34 monitoring sites.
Summer: May - September; Winter: January - April, October - December.

3.4 The Canada-wide Standard for $PM_{2.5}$

In 2000, the CCME developed a CWS for $PM_{2.5}$ as a result of the pollutant's adverse effects on human health and the environment. As referenced in the *GDAD*, the CWS for $PM_{2.5}$ is 30 $\mu g/m^3$, 24-hour averaging time, based on the 98th percentile annual ambient measurement averaged over three consecutive years (Canadian Council of Ministers of the Environment, 2002).

Table 3.2 displays the calculated $PM_{2.5}$ CWS 3-year metric for designated CWS sites where populations are greater than 100,000 across Ontario from 2005 to 2011. The 2011 concentrations ranged from 12 $\mu g/m^3$ reported for Sudbury to 22 $\mu g/m^3$ reported for Hamilton Downtown and Kingston. The CWS of 30 $\mu g/m^3$ was not exceeded at any of the CWS designated sites. The $PM_{2.5}$ CWS 3-year metrics are trending downwards from 2005 to 2011. The 2011 $PM_{2.5}$ CWS 3-year metrics are markedly lower than those metrics reported in 2005, at all locations.

Table 3.2
$PM_{2.5}$ CWS Metric ($\mu g/m^3$) for Designated Sites Across Ontario

City	2003 – 2005	2004 – 2006	2005 – 2007	2006 – 2008	2007 – 2009	2008 – 2010	2009 – 2011	Change over time
Windsor Downtown	31	29	29	25	23	21	21	↓ 36%
Chatham	n/a	28	28	25	23	20	19	↓ 35%
London	30	28	26	23	22	20	17	↓ 42%
Brantford	n/r	n/r	n/r	n/r	n/r	n/r	20	-
Kitchener	34	30	29	25	22	19	18	↓ 49%
Guelph	34	30	28	24	21	19	18	↓ 50%
St. Catharines	29	30	31	27	23	20	19	↓ 39%
Hamilton Downtown	34	32	32	29	25	23	22	↓ 38%
Hamilton Mountain	32	31	29	26	23	21	19	↓ 42%
Burlington	30	29	28	25	22	21	19	↓ 38%
Oakville	34	30	28	24	21	19	18	↓ 50%
Mississauga	34	32	29	27	19	19	17	↓ 54%
Brampton	31	29	28	24	22	19	17	↓ 46%
Toronto	33	31	30	25	22	20	19	↓ 46%
Oshawa	n/a	29	29	25	21	19	18	↓ 43%
Barrie	30	29	28	24	21	18	17	↓ 47%
Peterborough	28	29	28	23	20	17	17	↓ 46%
Kingston	n/a	n/a	30	28	24	23	22	↓ 28%
Ottawa Downtown	30	26	25	20	17	15	14	↓ 57%
Sudbury	n/a	20	21	18	16	13	12	↓ 44%
Thunder Bay	n/a	n/a	16	15	14	13	14	↓ 15%

Notes:
The CWS for $PM_{2.5}$ is 30 $\mu g/m^3$, 24-hour average time, based on the 98th percentile annual ambient measurement averaged over three consecutive years.
CWS metrics are calculated as per the GDAD.
Toronto reporting is based on Toronto Downtown, Toronto North, Toronto East and Toronto West sites.
Red font indicates an exceedance of the CWS.
n/a indicates data are not sufficient to calculate metrics.
n/r indicates site not designated for CWS reporting. Brantford was added as a CWS designated site in 2009-2011.
A linear regression is applied to derive per cent change over time.

4.0 Other Air Pollutants

This chapter discusses characteristics, sources and effects of NO_2, CO and SO_2, as well as their ambient concentrations in 2011, and trends of ambient concentrations and emissions, where appropriate.

4.1 NITROGEN DIOXIDE

4.1.1 Characteristics, sources and effects

Nitrogen dioxide is a reddish-brown gas with a pungent odour, which transforms in the atmosphere to form gaseous nitric acid and nitrates. It plays a major role in atmospheric reactions that produce ground-level ozone, a major component of smog. Nitrogen dioxide also reacts in the air to form organic compounds, which contribute to the formation of fine particulate matter in the atmosphere.

All combustion in air produces NO_X, of which NO_2 is a component. Major sources of NO_X emissions include the transportation sector, industrial processes and utilities. Ontario's NO_X emission estimates by sector are displayed in Figure 2.2 of Section 2.1.

Nitrogen dioxide can irritate the lungs and lower their resistance to respiratory infection. People with asthma and bronchitis have increased sensitivity to NO_2. Nitrogen dioxide chemically transforms into nitric acid in the atmosphere and, when deposited, contributes to the acidification of lakes and soils in Ontario. Nitric acid can also corrode metals, fade fabrics, degrade rubber, and damage trees and crops.

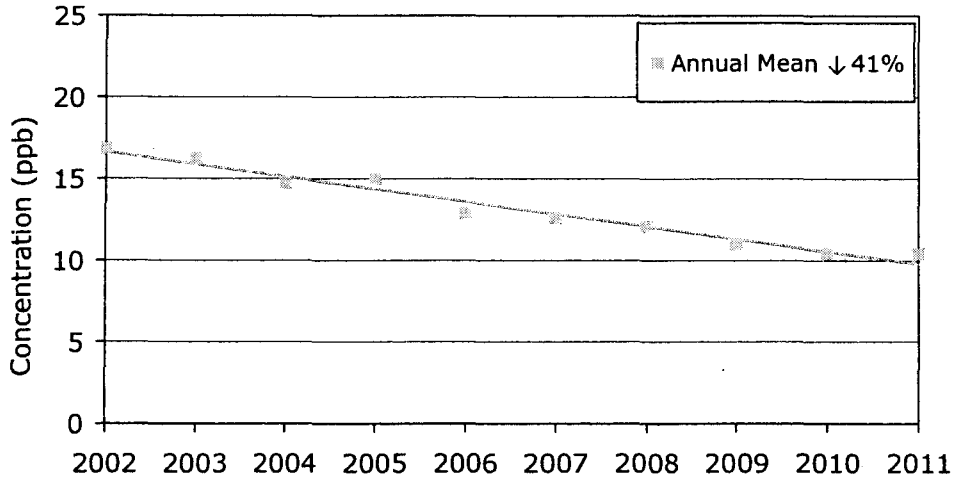
4.1.2 Monitoring results for 2011

The Toronto West site, located in an area of Toronto influenced by significant vehicular traffic, recorded the highest annual mean (19.1 ppb) for NO_2 during 2011, whereas Tiverton, a rural site, recorded the lowest NO_2 annual mean (2.5 ppb). The highest NO_2 means are recorded in large urbanized areas, such as the Greater Toronto Area (GTA) of southern Ontario. The Toronto North air monitoring station recorded the highest 24-hour average concentration (44 ppb), and Windsor West had the highest one-hour concentration (93 ppb) in 2011. The provincial 24-hour criterion of 100 ppb and one-hour criterion of 200 ppb for NO_2 were not exceeded at any of the monitoring locations in Ontario during 2011.

4.1.3 Trends

Figure 4.1 shows the trend of annual means for NO_2 concentrations from 2002 to 2011. The annual means for NO_2 concentrations decreased by approximately 41 per cent over the last decade from 2002 to 2011.

Figure 4.1
Trend of NO_2 Annual Means (ppb) Across Ontario (2002-2011)

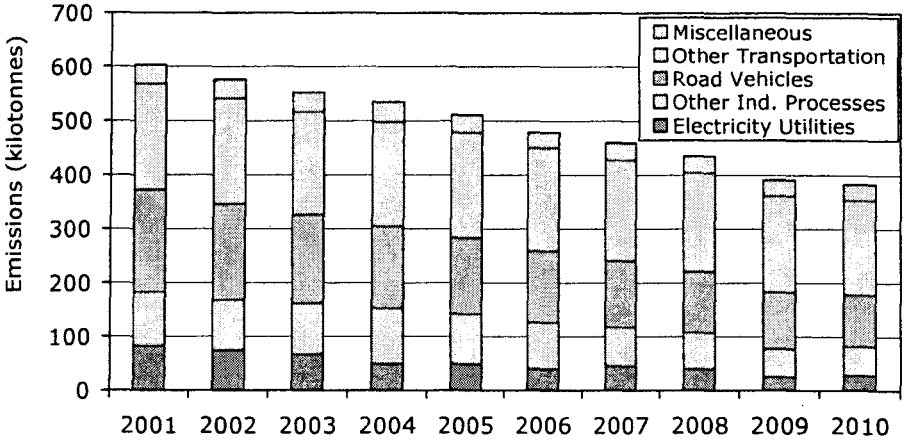


Note: The trend is a composite mean based on data from 21 monitoring sites.

Figure 4.2 displays the NO_X emission trend from 2001 to 2010. Overall, NO_X emissions have decreased approximately 36 per cent over the 10-year period (NPRI, 2012; NPRI, 2010; P. Georges, personal communication, April 1, 2010). Ontario's emissions trading regulations on sulphur dioxide and nitrogen oxides (O. Reg. 397/01 and O. Reg. 194/05) have contributed to the reduction in nitrogen oxides emissions in recent years. The NO_X emissions from on-road vehicles also decreased due to the phase-in of new vehicles having more stringent emission standards. The implementation of the Ontario's Drive Clean program in southern Ontario in 1999 also helped to further reduce the NO_X emissions from light duty gasoline vehicles.

Changes in the diurnal patterns of NO_2 concentrations at the Toronto East station can be seen in Figure 4.3 for years 2002 and 2011. The Toronto East station is located near a busy roadway and is greatly influenced by vehicular traffic, a major source of NO_X. This is evident during the morning rush-hour period (6 a.m. to 9 a.m.) when temperature inversions near the ground typically occur with light winds which in turn cause less dispersion and local build-up of pollutants. Overall, the diurnal patterns show a considerable decrease in NO_2 concentrations measured in 2011 when compared to previous years. The reduction in NO_X emissions over time is mainly due to a cleaner vehicle fleet in the GTA, and, in part, due to Ontario's Drive Clean program. NO_2 concentrations at 8 a.m. have decreased by 24 per cent between 2002 and 2011.

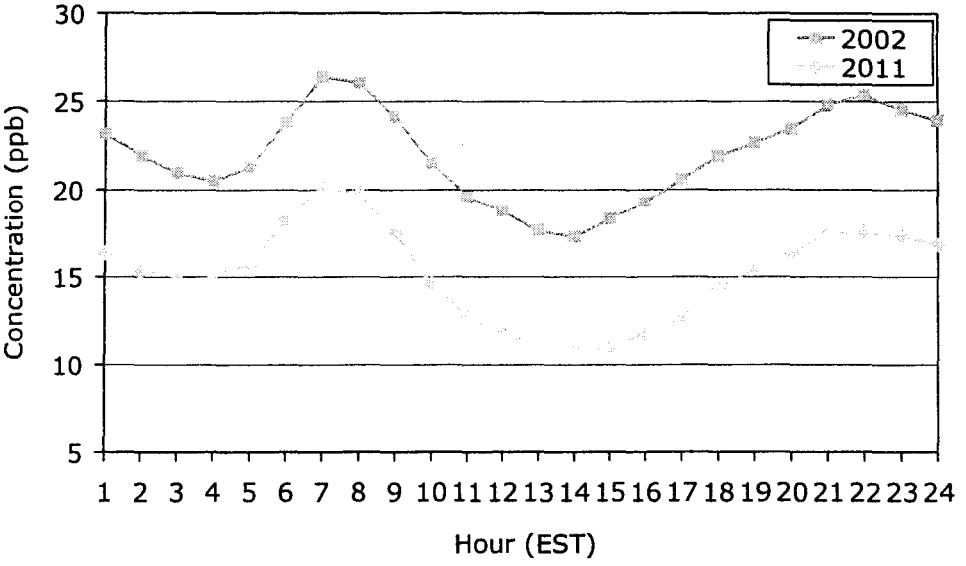
Figure 4.2
Trend of Ontario NO_X Emissions in Kilotonnes (2001-2010)



Note: Excludes open and natural sources.

References: NPRI, 2012; NPRI, 2010; and P. Georges, personal communication, April 1, 2010.

Figure 4.3
Diurnal Trend of NO_2 Concentrations (ppb) at Toronto East (2002 and 2011)

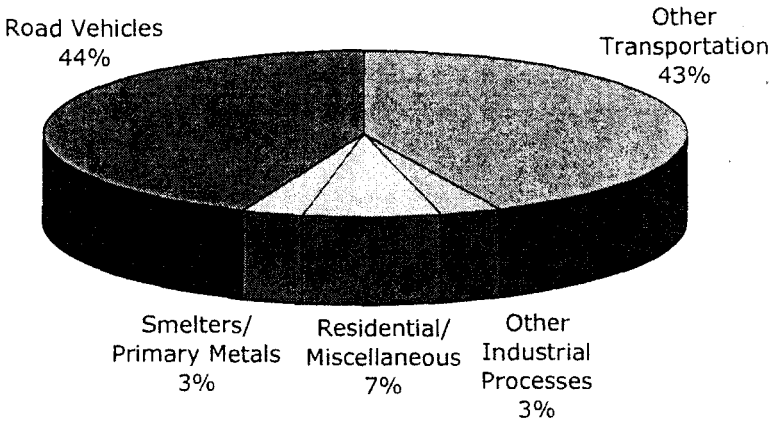


4.2 CARBON MONOXIDE

4.2.1 Characteristics, sources and effects

Carbon monoxide is a colourless, odourless, tasteless and, at high concentrations, poisonous gas. This gas can enter the bloodstream and reduce oxygen delivery to the organs and tissues. People with heart disease are particularly sensitive to CO. Exposure to high CO levels is linked with the impairment of vision, work capacity, learning ability and performance of complex tasks. Carbon monoxide is produced primarily by the incomplete combustion of fossil fuels. As displayed in Figure 4.4, the transportation sector accounted for 87 per cent of all CO emissions (NPRI, 2012).

Figure 4.4
Ontario CO Emissions by Sector (Emissions from Point/Area/ Transportation Sources, 2010 Estimates)



Note: Provincial total 2,329 kilotonnes.
Excludes open and natural sources.

Data Source: NPRI, 2012.

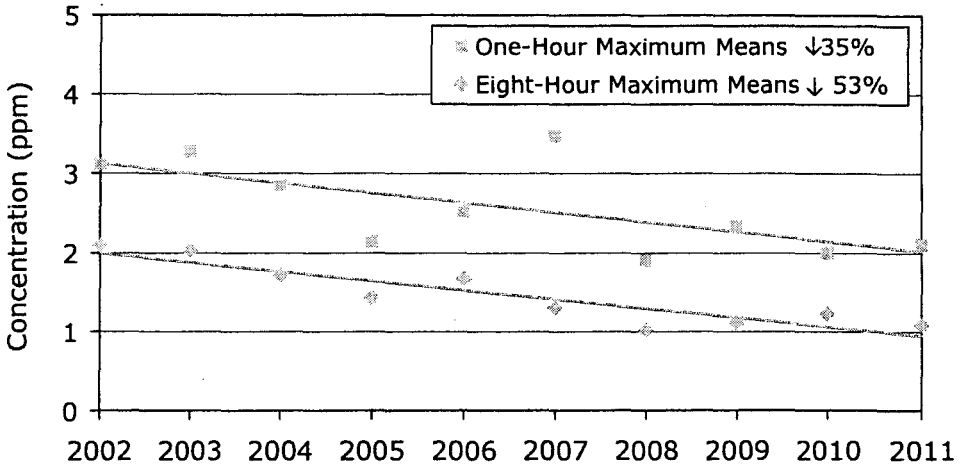
4.2.2 Monitoring results for 2011

In 2011, the highest one-hour maximum CO value, 3.77 parts per million (ppm) and the highest eight-hour maximum CO value, 1.46 ppm, were measured at the Windsor Downtown site. Typically, higher CO concentrations are recorded in urban centres as a result of vehicle emissions. Ontario's one-hour (30 ppm) and eight-hour (13 ppm) AAQC for CO were not exceeded at any of the monitoring sites in 2011.

4.2.3 Trends

Figure 4.5 shows the trend of annual means of the one-hour and eight-hour maximums for CO concentrations from 2002 to 2011. As shown in Figure 4.5, ambient CO concentrations, as measured by the annual means of the one-hour and eight-hour maximums, decreased by approximately 35 per cent and 53 per cent, respectively, over the 10-year period of 2002 to 2011 due to reductions in CO emissions from the transportation sector and to a lesser degree, the industrial sector. Figure 4.6 shows that CO emissions have been reduced by approximately 24 per cent from 2001 to 2010 (NPRI, 2012; NPRI, 2010; P. Georges, personal communication, April 1, 2010).

Figure 4.5
Trends of CO Annual Means of One-Hour and Eight-Hour Maximums (ppm) Across Ontario (2002-2011)



Note: Trends are composite means based on data from 4 sites.
Ontario one-hour AAQC = 30 ppm; eight-hour AAQC = 13 ppm.

4.3 SULPHUR DIOXIDE

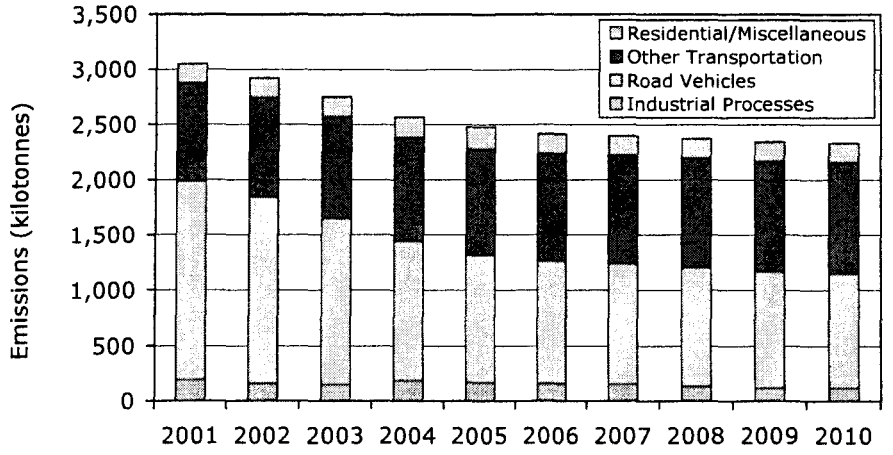
4.3.1 Characteristics, sources and effects

Sulphur dioxide is a colourless gas that smells like burnt matches. Sulphur dioxide can also be oxidized in the atmosphere to form sulphuric acid aerosols. In addition, sulphur dioxide is a precursor to sulphates, one of the main components of airborne fine particulate matter.

Electric utilities and smelters are the major sources of SO_2 emissions in Ontario, accounting for approximately 67 per cent of the provincial SO_2 emissions, as shown in Figure 4.7. Other industrial processes (e.g. petroleum refining, cement and concrete manufacturing) accounted for an additional 24 per cent. The transportation sector and miscellaneous sources

accounted for the remaining 9 per cent of all SO_2 emissions in the province according to 2010 estimates (NPRI, 2012).

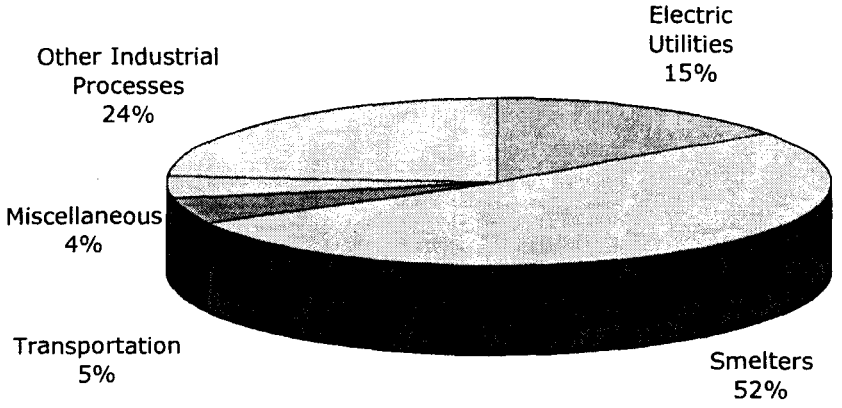
Figure 4.6
Trend of Ontario CO Emissions in Kilotonnes (2001-2010)



Note: Excludes open and natural sources.

References: NPRI, 2012; NPRI, 2010; and P. Georges, personal communication, April 1, 2010.

Figure 4.7
Ontario SO_2 Emissions by Sector (Emissions from Point/Area/ Transportation Sources, 2010 Estimates)



Note: Provincial total 268 kilotonnes.
Excludes open and natural sources.

Data Source: NPRI, 2012.

Health effects caused by exposure to high levels of SO_2 include breathing problems, respiratory illness, and the exacerbation of respiratory and cardiovascular disease. People with asthma, chronic lung disease or heart

disease are the most sensitive to SO_2. Sulphur dioxide damages trees and crops. Sulphur dioxide, like NO_2, is also a precursor of acid rain, which contributes to the acidification of soils, lakes and streams, accelerated corrosion of buildings, and reduced visibility. Sulphur dioxide also leads to the formation of fine particulate matter or $PM_{2.5}$, which have health implications and contribute to climate change.

4.3.2 Monitoring results for 2011

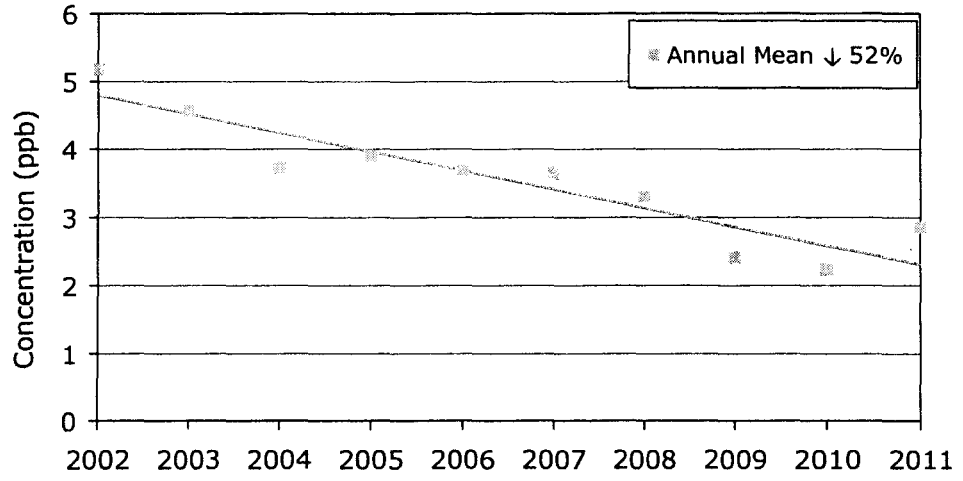
Sarnia recorded the highest annual mean (3.9 ppb) and 24-hour maximum concentration (53 ppb) of SO_2 during 2011, whereas Hamilton Downtown recorded the highest one-hour maximum (117 ppb). The highest concentrations of SO_2 historically have been recorded in the vicinity of large industrial facilities such as smelters and utilities. The provincial one-hour, 24-hour and annual AAQC of 250 ppb, 100 ppb and 20 ppb, respectively, for SO_2 were not exceeded at any of the ambient air monitoring sites in 2011.

4.3.3 Trends

Figure 4.8 shows the trend of annual means for SO_2 concentrations from 2002 to 2011. Over the 10-year period, SO_2 concentrations have decreased by approximately 52 per cent. Overall, provincial SO_2 emissions have reduced by approximately 55 per cent from 2001 to 2010, as shown in Figure 4.9 (NPRI, 2012; NPRI, 2010; P. Georges, personal communication, April 1, 2010). The reduction of SO_2 emissions over the years is the result of various initiatives which include, but are not limited to:

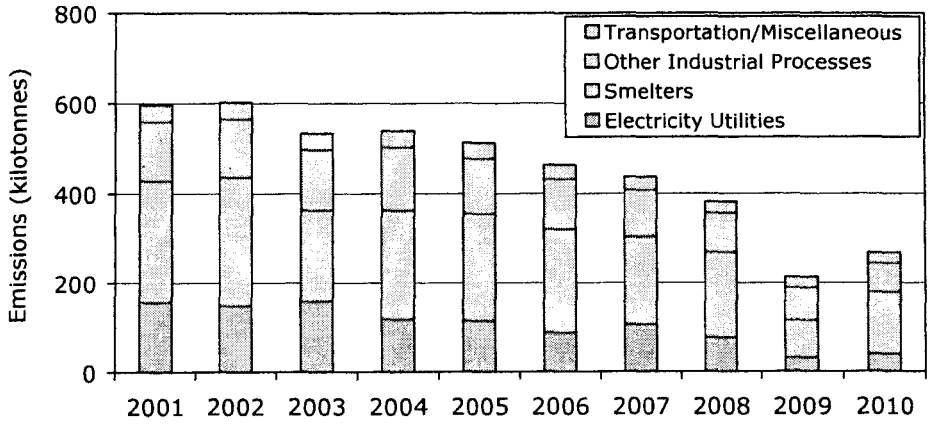
i) Control orders for Ontario smelters;
ii) Countdown Acid Rain program and Canada-wide Acid Rain Strategy;
iii) Ontario's emissions trading regulations on sulphur dioxide and nitrogen oxides (O. Reg. 397/01 and O. Reg. 194/05);
iv) Phase-out of coal-fired generating stations, with Lakeview Thermal Generating Station shut down in 2005; and
v) Low sulphur content in transportation fuels.

Figure 4.8
Trend of SO_2 Annual Means (ppb) Across Ontario (2002-2011)



Note: Ten-year trend is a composite mean based on 9 sites.

Figure 4.9
Trend of Ontario SO_2 Emissions in Kilotonnes (2001-2010)



Note: Excludes open and natural sources.

References: NPRI, 2012; NPRI, 2010; and P. Georges, personal communication, April 1, 2010.

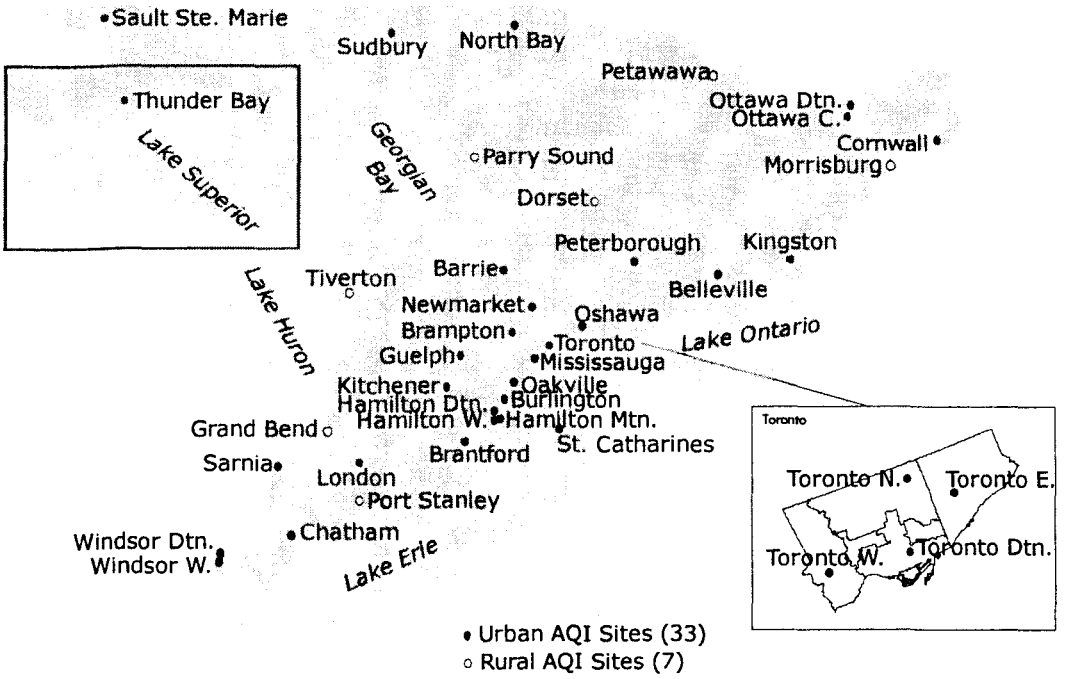
5.0 Air Quality Index and Smog Advisories

This chapter focuses on the Air Quality Index (AQI) and smog advisories. The ministry's AQI program was established in 1988, and originally included ozone, NO_2, SO_2, CO, suspended particles (SP) and TRS compounds. On August 23, 2002, the ministry replaced SP in the AQI with $PM_{2.5}$, commonly known as fine particulate matter, making Ontario the first province in Canada to do so. These fine particles penetrate deep into the lungs and are closely linked to respiratory impacts. Fine particulate matter reporting provides a more accurate representation of Ontario's air and allows people to make more informed decisions to protect their health. In association with the AQI program, the ministry launched the Air Quality Advisory program in 1993. In 2000, this program was expanded to the Smog Alert program under which smog advisories are issued.

5.1 Air Quality Indices

The Ministry of the Environment operates an extensive network of air quality monitoring sites across the province. In 2011, 40 of these sites formed the basis of the AQI network. The Air Quality Office of the Environmental Monitoring and Reporting Branch continuously obtains near real-time data for criteria air pollutants from these 40 sites.

Figure 5.1
Air Quality Index (AQI) Monitoring Sites in Ontario (2011)



The AQI network, shown in Figure 5.1, provides the public with air quality information, every hour, 24 hours a day, from across the province. The AQI is based on pollutants that have adverse effects on human health and the environment, including O_3, $PM_{2.5}$, NO_2, CO, SO_2 and TRS compounds. At the end of each hour, the concentration of each pollutant measured at each site is converted into a number ranging from zero upwards using a common scale or index. The calculated number for each pollutant is referred to as a sub-index.

At a given air monitoring site, the highest sub-index for any given hour becomes the AQI reading for that hour. The index is a relative scale, in that the lower the index, the better the air quality. The index values, corresponding categories, and potential health and environmental effects are shown in Table 5.1.

If the AQI value is below 32, the air quality is categorized as good. For AQI values in the 32-49 range (moderate category), there may be some adverse effects for very sensitive people. For index values in the 50-99 range (poor category), the air quality may have adverse effects for sensitive members of human and animal populations, and may cause significant damage to vegetation and property. With an AQI value of 100 or more (very poor category), the air quality may have adverse effects for a large proportion of those exposed.

Computed AQI values are released to the public every hour on the ministry's website at www.airqualityontario.com. The public can also access the index values by calling the ministry's air quality information Interactive Voice Response (IVR) system. (To access an English recording, call 1-800-387-7768, or in Toronto, call 416-246-0411. For a French recording, call 1-800-221-8852.) Air quality forecasts, based on regional meteorological conditions and current pollution levels in Ontario and bordering U.S. states, are also provided daily on the ministry's website and IVR system.

Table 5.1: Air Quality Index Pollutants and Their Impacts*

Index	Category	Ozone (O_3)	Fine Particulate Matter ($PM_{2.5}$)	Nitrogen Dioxide (NO_2)	Carbon Monoxide (CO)	Sulphur Dioxide (SO_2)	Total Reduced Sulphur (TRS) Compounds
0-15	Very Good	No health effects are expected in healthy people	Sensitive populations may want to exercise caution	No health effects are expected in healthy people	No health effects are expected in healthy people	No health effects are expected in healthy people	No health effects are expected in healthy people
16-31	Good	No health effects are expected in healthy people	Sensitive populations may want to exercise caution	Slight odour	No health effects are expected in healthy people	Damages some vegetation in combination with ozone	Slight odour
32-49	Moderate	Respiratory irritation in sensitive people during vigorous exercise; people with heart/lung disorders at some risk; damages very sensitive plants	People with respiratory disease at some risk	Odour	Blood chemistry changes, but no noticeable impairment	Damages some vegetation	Odour
50-99	Poor	Sensitive people may experience irritation when breathing and possible lung damage when physically active; people with heart/lung disorders at greater risk; damages some plants	People with respiratory disease should limit prolonged exertion; general population at some risk	Air smells and looks brown; some increase in bronchial reactivity in asthmatics	Increased symptoms in smokers with heart disease	Odour; increasing vegetation damage	Strong odour
100-over	Very Poor	Serious respiratory effects, even during light physical activity; people with heart/lung disorders at high risk; more vegetation damage	Serious respiratory effects even during light physical activity; people with heart disease, the elderly and children at high risk; increased risk for general population	Increasing sensitivity for asthmatics and people with bronchitis	Increasing symptoms in non-smokers with heart diseases; blurred vision; some clumsiness	Increasing sensitivity for asthmatics and people with bronchitis	Severe odour; some people may experience nausea and headaches

* Note that the information in this table is subject to change.

Table 5.2 shows the percentage distribution of hourly AQI readings for the 40 monitoring sites by the AQI category and the number of days with at least one hour AQI value greater than 49. Air quality readings in the very good and good categories ranged from approximately 90 per cent at Windsor and Sarnia to 99 per cent at Thunder Bay. On average, the AQI sites in 2011 reported air quality in the very good and good categories approximately 95 per cent of the time and moderate to poor categories about 5 per cent of the time. This is an improvement relative to the year 2010, when air quality sites on average reported air quality in the very good and good categories approximately 93 per cent of the time and moderate to poor air quality about 7 per cent of the time.

Table 5.2: Air Quality Index Summary (2011)

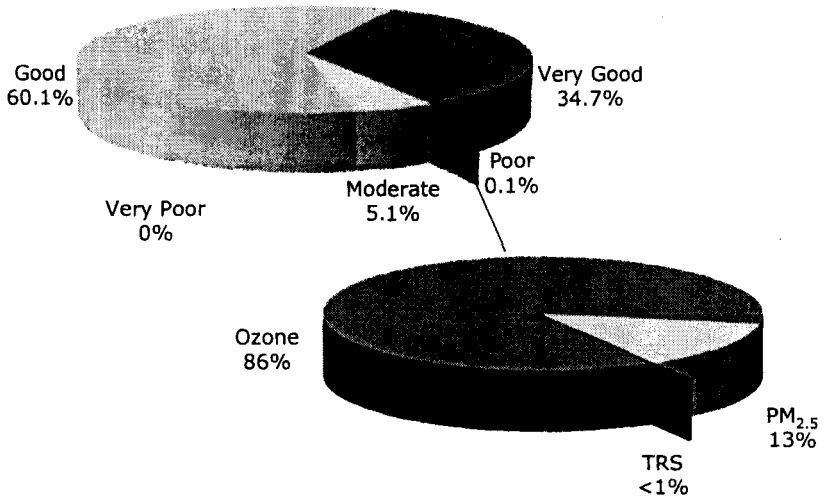
City/Town	No. of Valid Hours	Percentage of Valid Hours AQI in Range					No. of Days At Least 1 Hour > 49
		Very Good	Good	Moderate	Poor	Very Poor	
		0-15	16-31	32-49	50-99	100+	
Windsor Downtown	8756	36.8	52.8	9.9	0.5	0	13
Windsor West	8728	37.2	53.3	9.2	0.4	0	9
Chatham	8755	31.0	61.2	7.7	0.2	0	6
Sarnia	8750	20.6	69.3	10.0	0.1	0	7
Grand Bend	8753	19.9	72.8	7.0	0.2	0	8
London	8730	37.7	56.7	5.5	<0.1	0	1
Port Stanley	8755	21.2	70.1	8.4	0.3	0	7
Tiverton	8537	21.8	73.1	5.1	0.1	0	3
Brantford	8684	29.6	61.8	8.5	0.1	0	2
Kitchener	8740	32.8	61.3	5.9	<0.1	0	1
St. Catharines	8740	32.7	60.8	6.5	<0.1	0	1
Guelph	8726	30.7	62.9	6.3	<0.1	0	1
Hamilton Downtown	8751	35.9	55.3	8.7	0.2	0	8
Hamilton Mountain	8754	30.1	61.3	8.5	0.1	0	3
Hamilton West	8747	38.0	56.1	5.9	0.1	0	2
Toronto Downtown	8753	40.3	54.9	4.8	<0.1	0	1
Toronto East	8751	45.3	50.6	4.1	<0.1	0	1
Toronto North	8749	40.2	53.8	6.0	<0.1	0	1
Toronto West	8709	51.9	44.1	4.0	<0.1	0	1
Burlington	8738	37.9	57.4	4.7	<0.1	0	1

Table 5.2: Air Quality Index Summary (2011) - Continued

City/Town	No. of Valid Hours	Percentage of Valid Hours AQI in Range					No. of Days At Least 1 Hour > 49
		Very Good	Good	Moderate	Poor	Very Poor	
		0-15	16-31	32-49	50-99	100+	
Oakville	8633	35.5	59.0	5.4	<0.1	0	1
Oshawa	8748	36.7	59.8	3.5	<0.1	0	2
Brampton	8755	37.2	57.1	5.7	<0.1	0	2
Mississauga	8628	41.3	55.0	3.6	<0.1	0	1
Barrie	8675	38.7	58.3	3.1	0	0	0
Newmarket	8758	33.4	61.6	4.9	0.1	0	2
Parry Sound	8752	27.9	67.4	4.7	<0.1	0	1
Dorset	8733	35.3	61.8	2.8	0	0	0
Ottawa Downtown	8674	44.4	53.8	1.8	0	0	0
Ottawa Central	8754	41.9	56.5	1.5	0	0	0
Petawawa	8658	38.9	59.4	1.7	0	0	0
Kingston	8637	24.8	69.5	5.7	0	0	0
Belleville	8749	34.4	61.3	4.2	0.1	0	4
Morrisburg	8749	33.9	63.0	3.1	0	0	0
Cornwall	8749	35.3	62.1	2.7	0	0	0
Peterborough	8713	32.7	63.0	4.2	<0.1	0	1
Thunder Bay	8595	38.8	59.8	1.2	0.2	0	1
Sault Ste. Marie	8726	34.4	62.8	2.9	0	0	0
North Bay	8759	36.9	60.4	2.7	0	0	0
Sudbury	8745	31.9	65.7	2.4	0	0	0

Figure 5.2 shows the provincial average for the percentages of time the AQI was in the various air quality categories as recorded by all sites across the province in 2011. The pie diagram at the top left shows the category percentages. The pie diagram at the bottom right breaks down the poor air quality (0.1 per cent) into percentages of pollutants associated with the AQI above 49. Approximately 86 per cent of the poor AQI values were due to ozone, 13 per cent were due to fine particulate matter, and less than 1 per cent due to TRS compounds. Among the poor AQI values, approximately 98 per cent occurred in summer from May to September, while the remaining 2 per cent occurred in April and October.

Figure 5.2
Air Quality Index Summary (2011)



5.2 Smog Advisories

Under the Smog Alert program, smog advisories are issued to the public in advance when AQI values are expected to be greater than 49 due to elevated, widespread and persistent levels of O_3 and/or $PM_{2.5}$. Generally, smog advisories are issued 24 hours in advance; however, if elevated smog conditions occur suddenly, and weather conditions conducive to elevated smog levels are expected to continue for several hours, a smog advisory is issued effective immediately. Note that a smog advisory is a forecast and does not necessarily mean elevated smog is a certainty since it is based on weather forecasts.

Smog advisories are available to the public and media via:

i) The ministry's website at www.airqualityontario.com;
ii) Smog alerts emailed directly to everyone who subscribes to the ministry's Smog Alert network at the above website; and
iii) The ministry's air quality information IVR system. (To access an English recording, call 1-800-387-7768, or in Toronto, call 416-246-0411. For a French recording, call 1-800-221-8852.)

5.2.1 2011 Smog Advisories

In 2011, Ontarians experienced five smog advisories covering just nine days. Four of the five smog advisories occurred during the traditional smog season (May 1 to September 30 inclusive), while one smog advisory was issued on October 11, 2011 covering one day for Hamilton due to elevated $PM_{2.5}$ concentrations. In 2010, the ministry issued three smog advisories covering 12 days. The number and duration of smog advisories are highly dependent on meteorological conditions.

GLOSSARY

Air Quality Index	-	real-time information system that provides the public with an indication of air quality in cities, towns and in rural areas across Ontario.
AQI station	-	continuous monitoring station used to inform the public of general ambient air quality levels over an entire region (not a localized area) on a real-time basis; station reports on criteria pollutant levels that are not unduly influenced by a single emission source, but rather are the result of emissions from multiple sources, including those in neighbouring provinces and states.
Ambient air	-	outdoor or open air.
Carbon monoxide	-	a colourless, odourless, tasteless, and at high concentrations, poisonous gas.
Continuous pollutants	-	pollutants for which a continuous record exists; effectively, pollutants that have hourly data (maximum 8,760 values per year except leap year – e.g. 2004 where maximum values for the year are 8,784).
Continuous station	-	where pollutants are measured on a real-time basis and data determined hourly (for example ozone, sulphur dioxide).
Criterion	-	maximum concentration or level (based on potential effects) of pollutant that is desirable or considered acceptable in ambient air.
Diurnal	-	recurring every day; actions that are completed in 24 hours and repeated every 24 hours.
Exceedance	-	violation of the air pollutant concentration levels established by environmental protection criteria or other environmental standards.
Fine Particulate Matter	-	particles smaller than 2.5 microns in aerodynamic diameter, which arise mainly from fuel combustion, condensation of hot vapours and chemically-driven gas-to-particle conversion processes; also referred to as $PM_{2.5}$ or respirable particles. These are fine enough to penetrate deep into the lungs.

Glossary continued

Fossil fuels	-	natural gas, petroleum, coal and any form of solid, liquid or gaseous fuel derived from organic materials for the purpose of generating heat.
Ground-level ozone	-	colourless gas formed from chemical reactions between nitrogen oxides and volatile organic compounds (VOCs) in the presence of sunlight near the Earth's surface.
Micron	-	a millionth of a metre.
Nitrogen dioxide	-	a reddish-brown gas with a pungent and irritating odour.
Oxidation	-	a chemical reaction where a substance gains an oxygen; for example, in the atmosphere, sulphur dioxide is oxidized by hydroxyl radicals to form sulphate.
Particulate matter	-	refers to all airborne finely divided solid or liquid material with an aerodynamic diameter smaller than 44 microns.
Percentile value	-	percentage of the data set that lies below the stated value; if the 70 percentile value is 0.10 ppm, then 70 per cent of the data are equal to or below 0.10 ppm.
Primary pollutant	-	pollutant emitted directly to the atmosphere.
Secondary pollutant	-	pollutant formed from other pollutants in the atmosphere.
Smog	-	a contraction of smoke and fog; colloquial term used for photochemical smog, which includes ozone, and may include fine particulate matter, and other contaminants; tends to be a brownish haze.
Smog advisory	-	smog advisories are issued to the public when there is a strong likelihood that widespread, elevated and persistent smog levels are expected.
Stratosphere	-	atmosphere 10 to 40 kilometres above the Earth's surface.

Glossary continued

Stratospheric ozone	-	ozone formed in the stratosphere from the conversion of oxygen molecules by solar radiation; ozone found there absorbs much ultraviolet radiation and prevents it from reaching the Earth.
Sulphur dioxide	-	a colourless gas that smells like burnt matches.
Troposphere	-	atmospheric layer extending from the surface up to about 10 kilometres above the Earth's surface.

ACRONYMS

AAQC	-	Ambient Air Quality Criteria (Ontario)
AQI	-	Air Quality Index
CCME	-	Canadian Council of Ministers of the Environment
CO	-	carbon monoxide
CWS	-	Canada-wide Standard
GTA	-	Greater Toronto Area
IVR	-	Interactive Voice Response
NO	-	nitric oxide
NO_2	-	nitrogen dioxide
NO_X	-	nitrogen oxides
O_3	-	ozone
$PM_{2.5}$	-	fine particulate matter
SES (TEOM)	-	Sample Equilibration System
SO_2	-	sulphur dioxide
TEOM	-	Tapered Element Oscillating Microbalance
TRS	-	total reduced sulphur
VOCs	-	volatile organic compounds
kt	-	kilotonnes
$\mu g/m^3$	-	micrograms (of contaminant) per cubic metre (of air) – by weight
ppb	-	parts (of contaminant) per billion (parts of air) – by volume
ppm	-	parts (of contaminant) per million (parts of air) – by volume

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DURHAM REGION

SNAPSHOT

HEALTH DEPARTMENT

May 2012

Asthma

HIGHLIGHTS

- One in ten Durham Region residents aged 12 years and older has asthma.
- Rates of asthma prevalence have remained stable in Durham Region since 2001.
- The prevalence of asthma in Durham Region is similar to Ontario.
- Asthma is more prevalent in 12-19 year olds and in females.
- Measures of asthma control follow a similar pattern to asthma prevalence: stable rates in Durham Region and Ontario since 2001 and higher rates in females.
- While asthma-related emergency department (ED) visit and hospitalization rates have declined in Durham Region and Ontario, the burden of asthma is evident with over 2,300 ED visits and 190 hospitalizations in Durham Region residents in 2010.
- The highest rates of asthma-related ED visits and hospitalizations occurred in male children aged 0-4 years.
- In Ontario, statistically significant associations were found between asthma prevalence/measures of asthma control and key determinants of health: income, education, marital status, time since immigration and aboriginal status.
- In Ontario, statistically significant associations were found between asthma prevalence/ measures of asthma control and known asthma triggers: smoking and exposure to environmental tobacco smoke.
- Since 2005, outdoor air quality measured from the Oshawa monitoring station has improved.
- Durham Region Health Department has joined many other jurisdictions across Canada promoting the Air Quality Health Index.
- Durham Region Health Department supports the Public Health School Asthma Program: a school-based asthma education program.

Asthma Prevalence

What is Asthma?

Asthma is a chronic lung disease in which the airways become narrow with exposure to irritants and allergens such as air pollution, tobacco smoke and pollen[1,2]. Narrowing of the airways occurs when the airways become swollen and plugged with mucus (inflammation), and the muscles in the airway wall tighten and go into spasm (bronchoconstriction)[1,3]. Asthma symptoms can range in severity from mild to life-threatening and may include recurring persistent or severe coughing, shortness of breath, wheezing and chest tightness[1,2]. Management of asthma may involve the use of controller (maintenance) and reliever (rescue) medications. Severe asthma episodes may require treatment in a hospital setting[1,2].

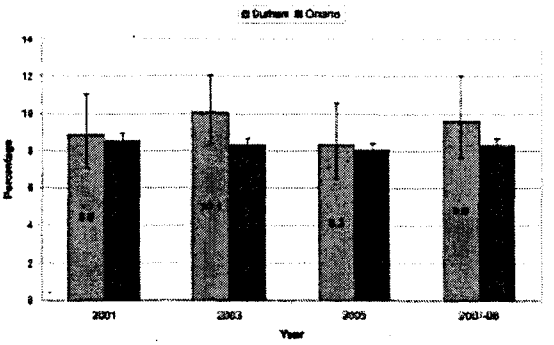
Asthma is a difficult disease to measure, in part due to changes in asthma diagnosis, treatment and hospital admission policies. Multiple indicators are needed to accurately assess the prevalence and burden of asthma, and to monitor changes over time[4]. While the specific cause of asthma is unclear, it has been suggested that asthma may develop, and is affected by, a complex group of interactions between genetic, behavioural and environmental factors[2]. In addition, the determinants of health such as income, education, social support networks and culture can shape and impact health at the individual and population levels[5]. This report describes trends in self-reported asthma prevalence, recent asthma symptoms/attacks and medication use, and rates of healthcare utilization in Durham Region and Ontario. This report also includes analyses, at the provincial level, of the relationships between asthma prevalence/measures of asthma control and known risk factors and triggers, and the determinants of health.

Asthma Prevalence

In 2007-08, the self-reported asthma prevalence rate for Durham Region residents aged 12 years and older was 9.6% (±3%), similar in Ontario at 8.3% (±0.4%). Since 2001, the rates in Durham Region and Ontario have generally remained stable (Figure 1).

Asthma is more prevalent among those in the youngest age group and in females.

Figure 1: Percentage of Residents Aged 12+ with Asthma, Durham Region and Ontario, 2001 to 2007-08



Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Table 1: Asthma Prevalence Rates by Gender and Age Groups, Durham Region and Ontario, 2007-08

	Durham Region				Ontario			
	Estimate	LCI[a]	UCI[a]	CV[a]	Estimate	LCI[a]	UCI[a]	CV[a]
By gender								
Males (12+)	8.5	5.9	12.2	18.7[c]	6.9	6.4	7.6	4.5
Females (12+)	11.0	8.0	14.2	14.7	9.6[b]	9.0	10.2	3.2
By age group								
12-19	15.0	9.4	22.1	21.9[c]	12.0[b]	10.2	12.9	6.1
20-44	11.0	7.3	15.0	18.6[c]	8.0	7.4	8.7	4.1
45-64	5.9	3.6	9.4	24.4[c]	7.6	7.0	8.6	5.5
65+	10.0	5.8	17.6	28.5[c]	7.3	6.6	8.2	5.5

Notes:
[a] LCI/UCI = lower/upper 95% confidence interval, CV = coefficient of variation
[c] Interpret with caution as CV is between 16.6 and 33.3
[b] Statistically significantly higher
Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

In 2007-08, the rate for Ontario youth aged 12 to 19 years was the highest at 12.0% compared to the older age groups. The prevalence rate for females aged 12 years and older was 9.6% compared to 6.9% for males. The results for Durham Region followed a similar pattern but the differences were not statistically significant likely due to the small sample surveyed in Durham Region (Table 1).

Asthma Control

When asthma is well controlled, people with asthma have very few or no asthma episodes. Signs of well controlled asthma include[1,6];

- Ability to sleep through the night without waking due to coughing or shortness of breath,
- Ability to exercise or be physically active without interruptions from asthma symptoms (coughing, wheezing, chest tightness or difficulty breathing),
- Reliever medication (inhaler) required less than 4 times per week (unless prescribed as a pre-treatment before physical activity/exercise), and
- No missed school or work days as a result of asthma symptoms.

In 2007-08, the rates of recent asthma symptoms/attacks and medication use in Durham Region residents aged 12 years and older was 5.5% (±2%) and 7.9% (±2%) respectively, which were comparable to Ontario's rates (Figures 2 and 3). Similar to the pattern seen with asthma prevalence, the rates of recent asthma symptoms/attacks and medication use in Durham Region and Ontario have remained stable since 2001.

The rates of recent symptoms/attacks and medication use were also highest in females: 5.5% and 7.6%, respectively, in Ontario (Tables 2 and 3). While 4.9% of Ontarians aged 12 to 19 years old reported recent asthma symptoms/ attacks and 7.5% reported recent medication use, these rates were not significantly higher than the rates in the older age groupings. The results for Durham Region followed a similar pattern but the differences were also not statistically significant.

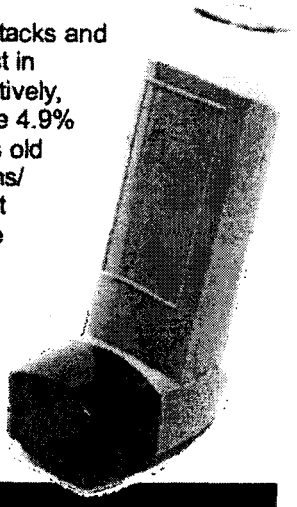
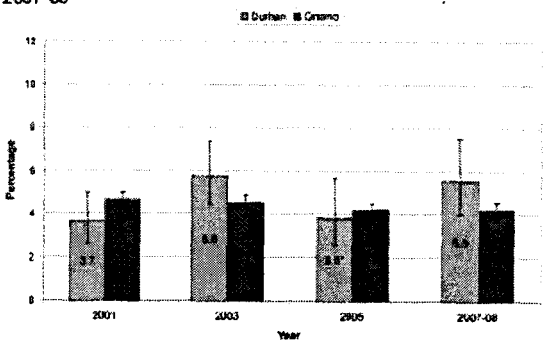
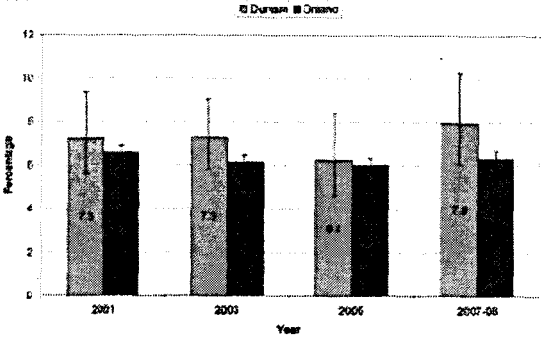


Figure 2: Percentage of Residents Aged 12+ Reporting Recent Asthma Symptoms/Attacks, Durham Region and Ontario, 2001 to 2007-08



Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Figure 3: Percentage of Residents Aged 12+ Reporting Recent Asthma Medication Use, Durham Region and Ontario, 2001 to 2007-08



Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Table 2: Rates of Recent Asthma Symptoms/Attacks by Gender and Age Group, Durham Region and Ontario, 2007-08

	Durham Region				Ontario			
	Estimate	LCI*	UCI*	CV*	Estimate	LCI*	UCI*	CV*
By gender								
Males (12+)	4.6	2.6	8.0	28.6[E]	2.9	2.6	3.3	7.3
Females (12+)	6.4	4.4	9.2	18.8[E]	5.5*	5.0	6.0	4.6
By age group								
12-19	NR	-	-	-	4.9	4.0	6.0	10.2
20-44	6.7	4.1	10.8	24.7[E]	4.2	3.6	4.7	5.7
45-64	4.5	2.5	8.1	29.9[E]	4.5	3.8	5.2	7.7
65+	NR	-	-	-	3.1	2.6	3.7	8.7

Notes:
*LCI/UCI = lower/upper 95% confidence interval, CV = coefficient of variation
[E] Interpret with caution as CV between 16.6 and 33.3
[NR] Not releasable as CV greater than 33.3
*Statistically significantly higher
Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Table 3: Rates of Recent Asthma Medication Use by Gender and Age Group, Durham Region and Ontario, 2007-08

	Durham Region				Ontario			
	Estimate	LCI*	UCI*	CV*	Estimate	LCI*	UCI*	CV*
By gender								
Males (12+)	7.0	4.8	10.0	22.9[E]	4.9	4.4	5.5	5.8
Females (12+)	8.8	6.3	12.1	16.9[E]	7.6*	7.1	8.2	3.7
By age group								
12-19	9.8	5.2	17.1	30.4[E]	7.5	6.4	8.7	7.9
20-44	9.1	6.0	13.5	20.7[E]	5.9	5.2	6.4	6.0
45-64	5.1	3.0	8.5	27.2[E]	6.5	5.8	7.4	6.3
65+	9.3	5.0	16.8	31.0[E]	8.3	6.6	7.1	6.0

Notes:
*LCI/UCI = lower/upper 95% confidence interval, CV = coefficient of variation
[E] Interpret with caution as CV between 16.6 and 33.3
[NR] Not releasable as CV greater than 33.3
*Statistically significantly higher
Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Burden of Asthma

The burden of asthma and poor asthma control is evident in the indirect costs to individuals and families, and the direct costs to the health care system[1,7].

Activity Restrictions at Home, School or Work

Asthma prevalence rates were highest among those who experienced a reduction in the amount or kinds of activities they could do at home, school or work due to a long-term health condition. In 2007-08, asthma prevalence was 14.0% in Ontario residents aged 12 years and older who "often" experienced a reduction in activities compared to 10.0% and 6.7% in those who experienced a reduction in activities "sometimes" or "never", respectively. Similarly, those who often experienced a reduction in activities showed significantly higher rates of recent symptoms/attacks and medication use compared to those who sometimes or never experienced a reduction in activities (Table 4). The results for Durham Region were similar but not statistically different (data not shown).

Number of Physician Visits

In 2007-08, the asthma prevalence rate for Ontario residents aged 12 years and older who visited a physician three or more times in the past year was 11.0% compared to 6.8% for those who visited a physician 1-2 times and 6.3% in those who did not visit a physician in the past year. Similarly, the rates of recent symptoms/attacks and medication use in the past year for Ontario residents aged 12 years and older who visited a physician three or more times in the past year were significantly higher when compared to those who visited a physician less frequently (Table 4).

Table 4: Asthma Prevalence Rates, Recent Symptoms/Attacks and Medication Use by Reduction in Activities at Home, School or Work and Physician Visits, Ontario, 2007-08

	Asthma Prevalence			Recent Symptoms/Attacks			Medication Use		
	%	LCI*	UCI*	%	LCI*	UCI*	%	LCI*	UCI*
Activity limitations									
Often	14.0*	12.2	14.9	7.6*	6.8	8.6	11.0*	10.2	12.7
Sometimes	10.0	9.2	11.3	5.8	4.9	6.3	8.1	7.2	9.2
Never	6.7	6.2	7.2	3.2	2.8	3.6	4.7	4.3	5.2
Number physician visits past year									
0 visits	6.3	5.6	7.2	2.4	1.9	3.0	3.5	2.9	8.8
1-2 visits	6.8	6.1	7.5	3.4	2.9	4.0	5.0	4.5	6.2
3+ visits	11.0*	10.1	11.6	6.0*	5.5	6.6	9.0*	9.7	4.0
Number medical specialist visits past year									
0 visits	7.3	6.8	7.8	3.4	3.1	3.7	5.2	4.8	5.7
1-2 visits	9.3	8.3	10.5	5.4	4.6	6.4	7.6	6.8	8.9
3+ visits	12.0*	11.0	13.9	7.4*	6.2	8.7	10.0*	9.0	11.7

Notes
*LCI/UCI = lower/upper 95% confidence interval
*statistically significantly higher
Source: Canadian Community Health Survey, Share File, Ontario, MOHLTC

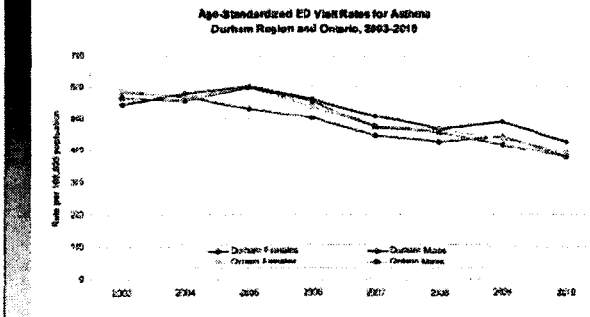
Number of Medical Specialist Visits

In 2007-08, asthma prevalence in Ontario residents aged 12 years and older who visited a medical specialist three times or more in the past year was 12.0% compared to 9.3% in those who visited 1-2 times and 7.3% in those who did not visit a medical specialist in the past year. Similarly, the rates of recent symptoms/ attacks and medication use for Ontario residents aged 12 years and older who visited a medical specialist three times or more in the past year were significantly higher when compared to those who visited a medical specialist less frequently (Table 4).

Emergency Department (ED) Visits

In 2010, there were over 2,300 ED visits due to asthma in Durham Region residents for a crude rate of 390.9 ED visits per 100,000 males and 352.6 ED visits per 100,000 females. Since 2003, the age-standardized ED visit rates for Durham Region and Ontario have declined, reaching their lowest point in 2010. In Durham Region, the rates for males were consistently higher than the female rates (Figure 4).

Figure 4: Age-standardized ED Visit Rates for Asthma, Durham Region and Ontario, 2003 to 2010



Source: ED Visits and Ontario Population Estimates 2003 to 2010, MOHLTC, IntelliHEALTH ONTARIO

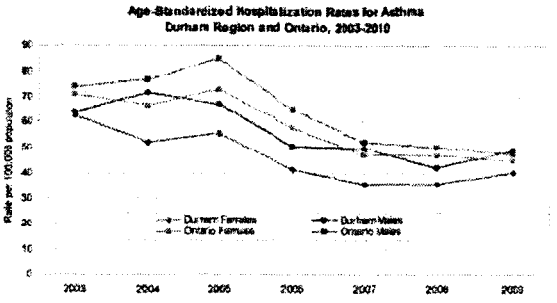
Hospitalizations

In 2010, there were over 190 hospitalizations in Durham Region residents due to asthma, for a crude rate of 33.9 per 100,000 males and 28.4 per 100,000 females. Similar to the ED visit rates, the hospitalization rates were also at their lowest point in Durham Region and Ontario in 2010, and the age-standardized hospitalization rates in Durham Region and Ontario have steadily declined since 2003. In general, the hospitalization rates for Durham Region were lower than the provincial rates (Figure 5).

The age-specific ED visit and hospitalization rates for Durham Region demonstrates the burden of asthma among children, with the highest rates occurring in male children. In 2010, the ED visit rate among Durham Region children in the 0-4 age group was 1,997.7 and 1,113.2 per 100,000 males and females, respectively. In the same age group, the hospitalization rate for Durham Region children was 319.6 per 100,000 males and 250.0 per 100,000 females.

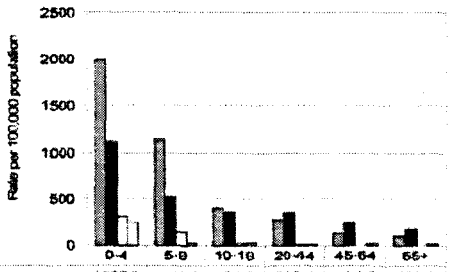
The rates in children were highest in boys. This is likely a result of the smaller airways size in males compared to females in infancy and childhood. In adults however, the ED visit and hospitalization rates were highest in females. This can be attributed to the greater likelihood of being diagnosed with asthma due to more frequent physician visits among adult females compared to adult males[8].

Figure 5: Age-standardized Hospitalization Rates, Durham Region and Ontario, 2003-2010



Source: Inpatient Discharges and Ontario Population Estimates 2003 to 2010, MOHLTC, intelliHEALTH ONTARIO

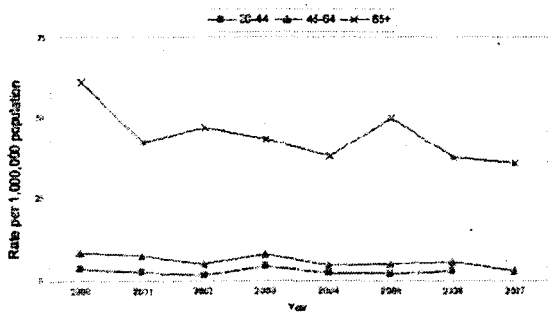
Figure 6: Age-specific rates for ED visits and Hospitalizations, Durham Region, 2010



	0-4	5-9	10-19	20-44	45-64	65+
ED visits, males	1997.7	1140.6	401.9	282.4	134.2	108.6
ED visits, females	1113.2	521.0	359.3	348.2	257.6	175.1
Hospitalization, males	319.6	137.9	17.4	9.5	-	-
Hospitalization, females	250.0	28.6	24.7	10.4	15.7	15.0

Source: ED Visits, Inpatient Discharges and Ontario Population Estimates 2010, MOHLTC, intelliHEALTH ONTARIO

Figure 7: Age-specific Death Rates for Asthma, Ontario, 2000 to 2007



Note: some data point suppressed due to small number of deaths.
Source: Deaths and Ontario Population Estimates, 2000 to 2007, MOHLTC, intelliHEALTH ONTARIO

Deaths

On average, there were less than five deaths due to asthma each year in Durham Region residents between 2000 and 2007.

In Ontario, the highest rates of death occurred among those 65 years of age and older. While the rates vary likely due to the small number of deaths, the rates in older adults have generally declined since 2001 to 35.4 deaths per 1,000,000 older adults by 2007 (Figure 7). In comparison, the death rates among younger adults were much lower over the same time period: less than 10 deaths per 1,000,000 population per year. Among those less than 20 years of age (0-19 year old age group), the rates were not reportable as the number of deaths due to asthma in this age group was less than five.

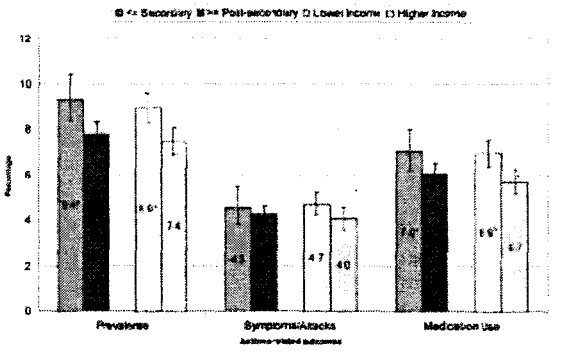
Income and Social Status: Income Level and Educational Attainment

Income and education are considered key determinants of health as these can affect overall living conditions, self-autonomy and coping strategies, and further influence health-related behaviours[5]. Lower socio-economic status has been associated with poorer asthma control in children[6], increased number of asthma-related physician visits[9] and an increased number of avoidable hospitalization admissions[10].

In 2007-08, 8.9% (±0.7%) of Ontario residents aged 12 years and older in the lower income category reported having asthma compared to 7.4% (±0.7%) in the higher income category. Similarly, 9.4% (±1.0%) of Ontario residents in the lower educational attainment category reported having asthma compared to 7.8% (±0.5%) in the higher educational attainment category (Figure 8).

A similar pattern was seen with asthma medication use: significantly higher rates of medication use among Ontario residents in the lower income and lower educational attainment categories. There were no statistically significant differences between recent asthma symptoms/attacks and socio-economic status in Ontario residents.

Figure 8: Asthma Burden by Income and Education Categories, Ontario, 2007-08



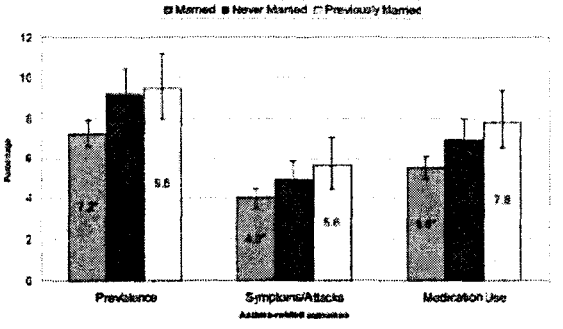
Notes: *statistically significantly higher
Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Social Support: Marital Status

Supportive relationships and the sense of satisfaction and well-being that result from them have been associated with better health[5]. In a recent Canadian study[10] it was found that those who had an avoidable hospital admission were almost twice as likely to be separated or divorced compared to those hospitalized for other reasons, or not hospitalized at all.

In 2007-08, 7.2% (±0.7%) of Ontario residents aged 20 to 64 years who were currently married reported having asthma. This was significantly lower than 9.2% (±1.2%) in those who were single/never married and 9.5% (±1.7%) in those who were previously married (i.e. separated, divorced or widowed). The rates for recent asthma symptoms/attacks and medication use followed a similar pattern showing statistically significant lower rates among those who were married compared to the other two groups (Figure 9).

Figure 9: Asthma Burden by Marital Status (20-64 Years), Ontario, 2007-08



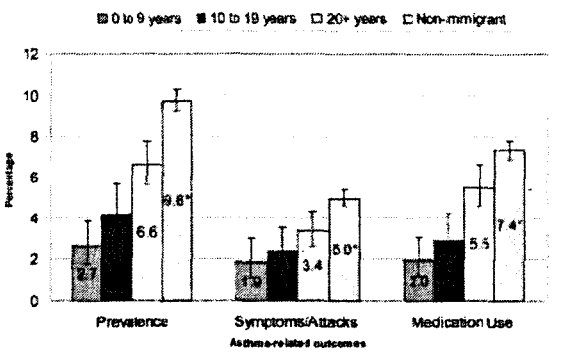
Notes: *statistically significantly lower
Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Culture: Time since Immigrations

Culture is a broad concept encompassing one's personal history and wider situational, social, political, geographic and economic factors[5]. A recent systematic review on the health of immigrants in Canada found that immigrants at the time of their arrival were healthier and had fewer chronic conditions than the native-born population, but this advantage was lost over time[11].

In 2007-08, 9.8% (±0.5%) of Ontario residents aged 12 years and older who were non-immigrants reported having asthma. This was statistically significantly higher compared to immigrants living in Canada (Figure 10). A similar pattern was seen with asthma symptoms/attacks and medication use: statistically higher rates of asthma in non-immigrants compared to immigrants living in Canada.

Figure 10: Asthma Burden by Time since Immigration, Ontario, 2007-08

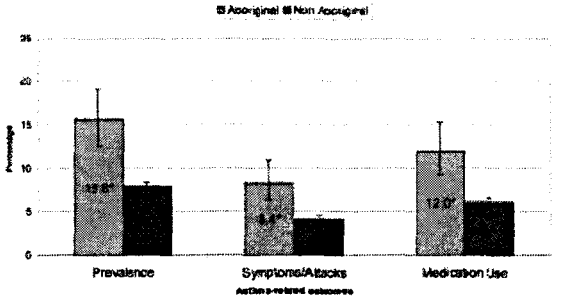


Notes: *statistically significantly higher
Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Aboriginal Status

In 2007-08, the prevalence rate of asthma was higher among Aboriginals compared to non-Aboriginals: 15.6% (±3.5%) compared to 8.0% (±0.5%). Similarly, the rates of recent asthma symptoms/attacks and medication use in Aboriginals were 8.4% (±2.5%) and 12.0% (±3.3%), respectively, compared to 4.2% (±0.3%) and 6.1% (±0.4%) among non-Aboriginals (Figure 11).

Figure 11: Asthma Burden by Aboriginal Status, Ontario, 2007-08



Notes: *statistically significantly higher
Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Asthma Risk Factors and Triggers

Asthma risk factors are factors which are associated with the development of asthma and may include a family history of allergies, low birth-weight, respiratory distress syndrome and perinatal smoking[1,2,7,12,13] and continuous exposure to sensitizing agents in the workplace in adulthood[14,15]. In 2009, the rate of smoking during pregnancy for Durham Region residents was 14% and in Ontario the rate was 12%[16].

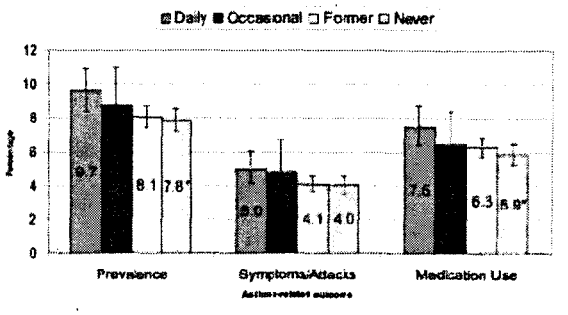
Asthma triggers such as smoking, exposure to environmental tobacco smoke (ETS), exposure to household pets and air pollution exacerbate symptoms among those with asthma[1,2]. Determining the difference between a risk factor and trigger can be challenging as some factors, such as ETS, may be both an asthma risk factor and a trigger for worsening asthma symptoms.

Smoking Status

Smoking in particular is a known asthma trigger that contributes to more severe asthma symptoms, reduced sensitivity to inhaled corticosteroids, accelerated rate of lung function decline and a risk factor for poor asthma control[17].

In 2007-08, 9.7% (±1.3%) of Ontario residents aged 12 years and older who were daily smokers reported having asthma compared to 8.8% (±2.2%), 8.1% (±0.7%) and 7.8% (±0.7%) in those who were occasional (i.e. former daily and occasional), former smokers and those who never smoked, respectively. The rates for asthma medication use followed a similar pattern with significantly lower rates among those who never smoked compared to daily smokers. There were no statistically significant differences between recent asthma symptoms/attacks and smoking status in Ontario residents (Figure 12).

Figure 12: Asthma Burden by Smoking Status, Ontario, 2007-08

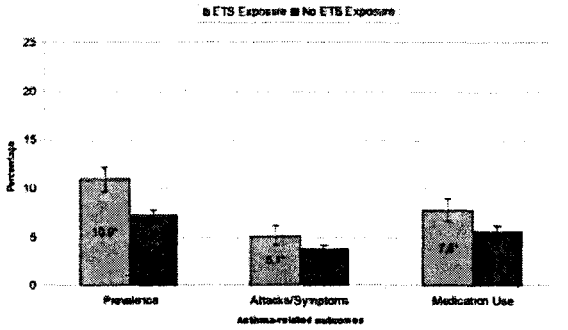


Notes. *statistically significantly lower compared to daily smokers
Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

Environmental Tobacco Smoke Exposure (ETS)

In 2007-08, 10.9% (±1.3%) of Ontario residents aged 12 years and older who were exposed to ETS in the home, car or public places reported having asthma compared to 7.3% (±0.5%) in those who were not exposed to ETS. The rates for recent asthma symptoms/attacks and medication use followed a similar pattern: statistically significant higher rates in those exposed to ETS (Figure 13).

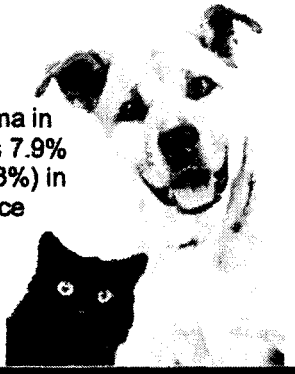
Figure 13: Asthma Burden by ETS Exposure, Durham Region and Ontario, 2007-08



Notes: *statistically significantly higher
Source: Canadian Community Health Survey, Statistics Canada, Share File, Ontario MOHLTC

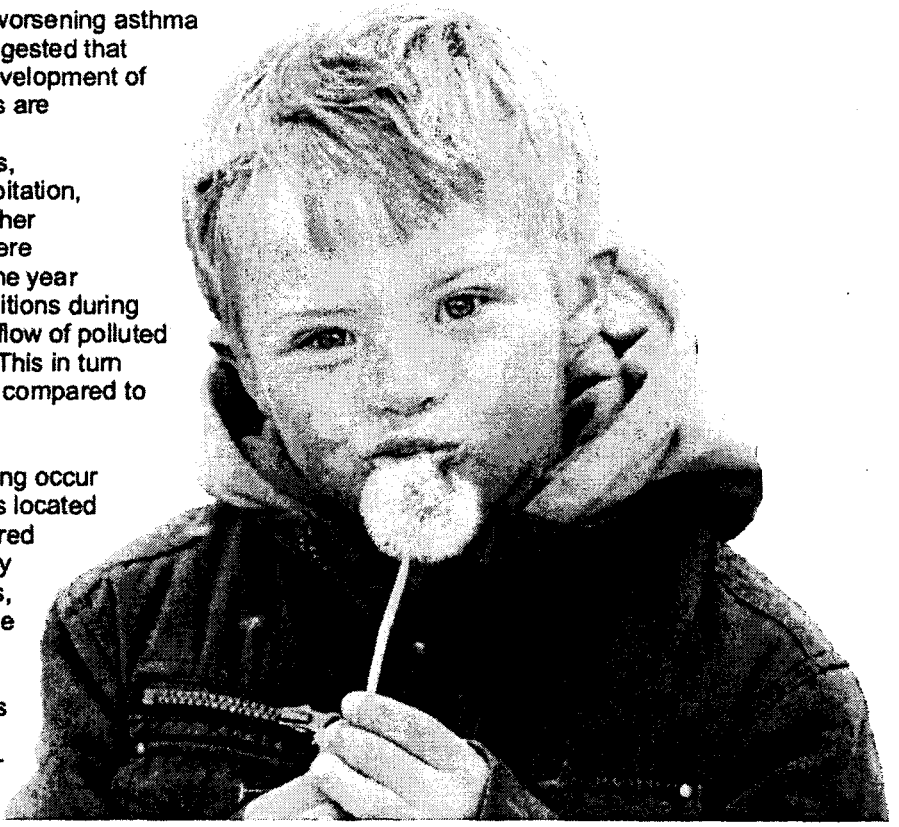
Pet Ownership

In 2001, the prevalence of asthma in Durham Region pet owners was 7.9% (±3.4%) compared to 8.3% (±3.3%) in those with no pets. This difference was not statistically significant.



Air Pollution and Ambient Air Quality (AQ) Monitoring

Air pollution has been associated with worsening asthma symptoms[1,7] and it has been further suggested that this may also be associated with the development of childhood asthma[13,18]. Air pollution levels are continuously affected by the amount of pollutants emitted from different sources, sunlight, moisture, clouds, winds, precipitation, geography, and regional and local weather conditions[19]. In 2005 and 2007, there were extended periods of smog throughout the year with high temperatures and humid conditions during the summer months, and an increased flow of polluted air into Ontario from the United States. This in turn contributed to higher air pollution levels compared to other years[20].



In Ontario, air pollution and AQ monitoring occur through a network of monitoring stations located throughout the province and are compared against provincial and national air quality standards[19]. Over the past several years, the monitoring stations have reported the number of air quality index (AQI) exceedance days and the annual mean concentrations and criteria exceedances for ground-level ozone (O_3), nitrogen dioxide (NO_2) and fine particulate matter ($PM_{2.5}$).

The AQI is an indicator of air quality based on air quality standards for six air pollutants (O_3, $PM_{2.5}$, NO_2, carbon monoxide, sulphur dioxide and total reduced sulphur compounds) and takes into consideration both environmental and human health concerns. An AQI is determined by converting the concentration of each of the pollutants into a numerical value, with each pollutant referred to as a sub-index. At each monitoring station, the highest sub-index in a given hour becomes the AQI reading for that hour. The AQI is a relative scale such that the lower the index value, the better the ambient air quality[21].

Since 2005, air quality has improved. The number of AQI exceedance days reported from the Oshawa AQ monitoring station declined to a low of 2 by 2009. The highest number of AQI exceedance days occurred in 2005 and 2007 reflecting the higher air pollution levels in Ontario during these years[20,22] (Table 5).

By 2009, the number of 1-hour provincial criterion exceedances for O_3 and $PM_{2.5}$ declined to 2 and 1, respectively. The provincial standard for NO_2 was not exceeded at any time between 2005 and 2009 (Table 5).

Table 5: Air Quality Values, Oshawa Air Quality Monitoring Station, 2005 to 2009

Air Quality Monitoring Parameters		Criterion/Reference Level	2005	2006	2007	2008	2009
AQI	Total AQI exceedance days	Number of days with at least 1 hr > 49^AA	19	9	14	2	2
O_3	Annual mean concentration (ppb)		28.8	25.1	29.0	27.0	25.5
	Number of 1-hr exceedances	Number of times > 80 ppb^A	46	9	51	7	2
NO_2	Annual mean concentration (ppb)		INS	8.9	8.1	8.5	7.4
	Number of 1-hr exceedances	Number of times > 200 ppb^AA	0	0	0	0	0
	Number of 24-hr exceedances	Number of times > 100 ppb^AA	0	0	0	0	0
$PM_{2.5}$	Annual mean concentration (µg/m³)		8.1	6.6	8.8	6.3	5.2
	Number of 24-hr exceedances	Number of times > 30 µg/m³^A	12	4	7	1	1

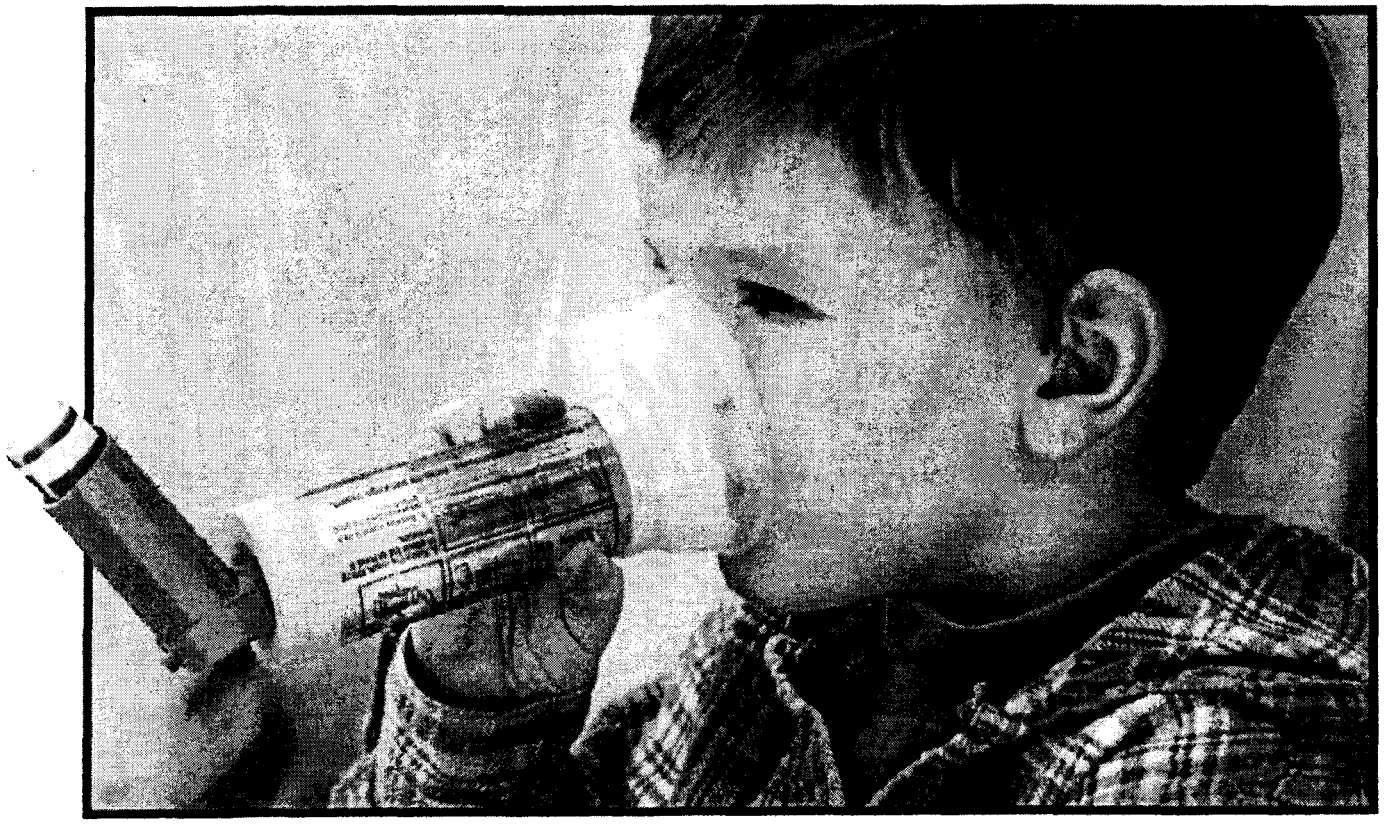
Notes: INS Insufficient data to calculate a valid annual mean
^ based on Canadian-wide standard
^A Ontario standard
^^^air quality is considered poor
Source: Ministry of the Environment, Air Quality in Ontario, 2005 to 2009

What is the Durham Region Health Department Doing About Asthma?

The Health Department plays a vital role in protecting workers and the public from exposure to ETS through the enforcement of the Smoke-Free Ontario Act.

Durham Region Health Department has also joined many other jurisdictions across Canada promoting the Air Quality Health Index (AQHI). The AQHI is a health protection tool that is designed to help make decisions to protect ones health by limiting short-term exposure to air pollution and adjusting activity levels during increased levels of air pollution. The AQHI pays particular attention to people who are sensitive to air pollution and provides them with advice on how to protect their health during air quality levels associated with low, moderate, high and very high health risks[20].

Durham Region Health Department supports the development of asthma friendly environments in settings where children with asthma live, learn and play. The Public Health School Asthma Program of Ontario's Asthma Plan of Action is a school-based asthma education program developed to create asthma friendly and supportive school environments, to teach children how to manage asthma and to support the school community in becoming asthma-friendly.



Data Sources and Notes

Canadian Community Health Survey (CCHS)

Source: Canadian Community Health Survey, 2003, 2005 and 2007-08, Statistics Canada, Share File, Ontario Ministry of Health and Long-Term Care

The Canadian Community Health Survey (CCHS) is a federal survey conducted by Statistics Canada to provide cross-sectional health information at regional, provincial, and national levels. The target population of the CCHS is residents aged 12 years and older in all provinces and territories, excluding populations on Indian Reserves, Canadian Forces Bases, and some remote areas. Data collection is done by a combination of computer-assisted personal and telephone interviewing.

Estimates with counts less than 10 or a bootstrap coefficient of variation (CV) greater than 33.3% have been suppressed. Estimates with a CV of 16.6-33.3% have been identified as marginal and should be used with caution because they are based on a small number of respondents and have high sampling variability.

Chronic health diseases, such as asthma, were defined in the CCHS as conditions that were expected to last, or have already lasted, six months or more and have been diagnosed by a health professional. The asthma-related indicators from the CCHS were based on the following questions: Asthma prevalence – Do you have asthma? Recent asthma symptoms/attacks – Have you had any symptoms or asthma attacks in the past year? Recent asthma medication use – In the past 12 months, have you taken any medicine for asthma such as inhalers, nebulisers, pills, liquids or injections?

The income categories were based on the derived variable INCDRRS, which is a distribution of residents of each health region in deciles (ten categories including approximately the same percentage of residents for each province) based on the adjusted ratio of their total household income to the low income cut-off corresponding to their household and community size. It provides, for each respondent, a relative measure of their household income to the household incomes of all other respondents in the same health region. The territories are excluded from this derived variable. To provide more stable estimates, the deciles were collapsed into two equal categories: deciles 1 to 5 for the low income category and deciles 6 to 10 for the high income category.

The educational attainment categories were based on the derived variable EDUDHO4, indicating the highest level of education acquired by any member of the household. To provide more stable estimates, the categories were collapsed into two categories: < secondary education for the lower educational attainment category and > post-secondary education for the higher educational attainment category.

Population Estimates

Source: Ontario Population Estimates, 2000-2010, Ontario Ministry of Health and Long-Term Care, intelliHEALTH ONTARIO, Extracted: August 2011 (2000-2009) and October 2011 (2010)

Emergency Department Visit (ED) Data

Source: Emergency Department Visits, 2003-2010, Ontario Ministry of Health and Long-Term Care, intelliHEALTH ONTARIO, Extracted August 2011(2000-2009) and October 2011 (2010)

Ambulatory care data representing utilization of ambulatory services in Ontario's hospitals includes but is not limited to ED visits and day surgery visits. The main diagnostic code is the 'main problem' (MP) that is deemed to be the clinically significant reason for the visit. The patient's main problem or diagnosis is coded using the International Classification of Diseases (ICD), specifically ICD-10-CA. Emergency department visits and day surgery visits for asthma were selected using ICD-10-CA codes J45 as the MP.

Hospitalization Data

Source: Hospital In-Patient Data, 1997-2010, Ontario Ministry of Health and Long-Term Care, intelliHEALTH ONTARIO, Extracted: August 2011(2000-2009) and October 2011 (2010)

In-patient hospitalization data capture all hospital separations; a separation may be due to discharge home, death or transfer to another facility. The most responsible diagnosis (MRD) is the one diagnosis which describes the most significant condition of the patient which caused the stay in hospital. The ICD-10-CA is used to code the diagnosis. All hospitalizations for asthma were selected using ICD-10-CA codes J45 as the MRD.

Mortality data

Source: Ontario Mortality Data 2002-2007, Provincial Health Planning Database, Knowledge Management and Reporting Branch, Ontario Ministry of Health and Long-Term Care, Extracted June 2011.

Mortality data are obtained from physician-completed death certificates that are collected by the Office of the Registrar General. These vital statistics data are provided to health units through the Provincial Health Planning Database of the Ontario Ministry of Health and Long-Term Care.

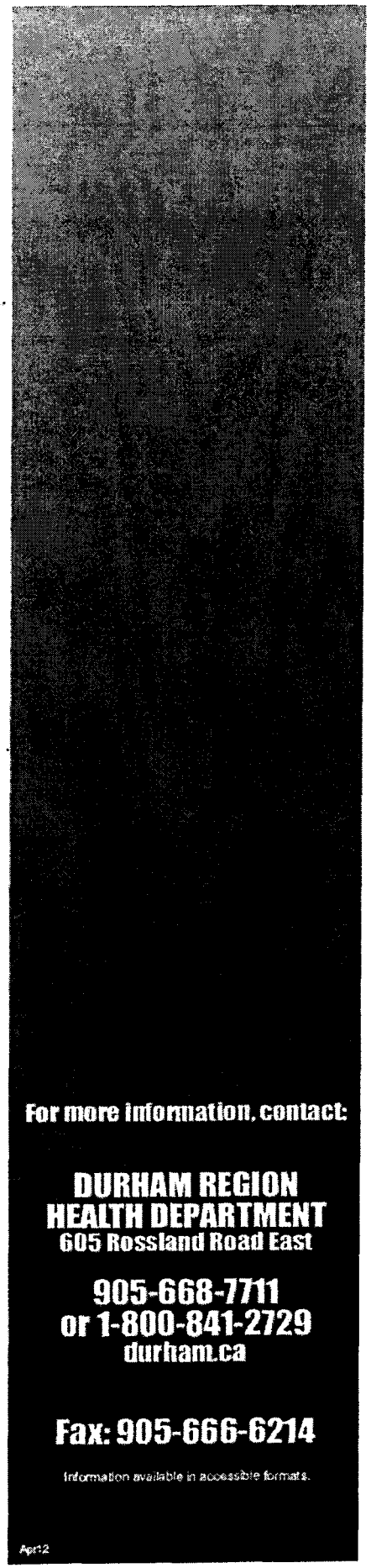
The Rapid Risk Factor Surveillance System (RRFSS)

Source: Rapid Risk Factor Surveillance System 2001, Extracted: August 2011

The RRFSS is a random-digit-dialed telephone survey of adults aged 18 years and older, conducted by the Institute for Social Research at York University, on behalf of the Durham Region Health Department. Since 2001, a sample of at least 100 Durham Region residents has been surveyed on a monthly basis regarding health risk behaviours.

Chronic health diseases, such as asthma, were defined in RRFSS as conditions that were ever diagnosed by a doctor or other health care professional. Current asthma prevalence in RRFSS was based on the questions: 'Have you ever been TOLD BY A DOCTOR or other health care professional that you have asthma?' and 'Do you still have asthma?'

Pet ownership was derived from the animal immunization module in the 2001 RRFSS survey, and was based on the questions: 'Do you or anyone in your household have any dogs?' and 'Do you or anyone in your household have any cats?'



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Information available in accessible formats.

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APPENDIX D

Effects of air quality on the health of Durham Region residents, Snapshot On Asthma

Asthma is a chronic lung disease with many risk factors and triggers, including outdoor air pollution. In order to evaluate the impact of asthma in Durham Region, the Durham Region Health Department (DRHD) completed the Snapshot on Asthma in May 2012. DRHD found that the prevalence of asthma in Durham Region has remained stable since 2001 and is similar to the prevalence of asthma in Ontario. In Durham Region (similar to Ontario), emergency department visits and hospitalizations due to asthma have declined since 2003. There were less than 5 deaths due to asthma in Durham Region each year between 2000 and 2007, compared to 35.4 deaths per 1,000,000 people over 65, 10 deaths per 1,000,000 for younger adults and < 5 deaths among those < 20 years of age in Ontario.

While asthma impacts individuals and families in Durham Region, this report suggests that the prevalence of asthma and resulting healthcare utilization in Durham Region is similar to the rest of Ontario.

APPENDIX E

Summary of Other Public Health Unit Outdoor Air Quality Monitoring Initiatives

A scan of air quality monitoring initiatives by public health units (PHUs) was completed by conducting an internet search using terms "health department air quality monitoring Ontario". Publications from Halton and Hamilton served as a starting point for health departments with active involvement in these issues. Further referrals were made and a total of 8 PHUs were contacted (Grey Bruce, Halton, Hamilton, , Lambton Peel, Toronto, Waterloo and Wellington-Dufferin-Guelph). Public Health Ontario (PHO) was also contacted as its runs an instrument loan program, which includes outdoor air pollution monitoring equipment. Those with past/current involvement with air quality monitoring projects were asked the following questions:

- What is the health department's role with respect to air quality monitoring in your Region?
- What initiated the projects (public inquiries, scientific evidence, etc)?
- How did you determine the scope of your projects?
- Does the health department conduct the monitoring themselves? Compile, review, analyze data?
- What resources does the health department have to assist with these projects?
- What is the health department doing with the data (policy/program initiatives, actions)?
- Based on your experience, what is the value added of public health participation in air quality monitoring initiatives (to those already being conducted by MOE, Environment Canada)?

A report by Perrotta and Associates (2010), *Brief Review: Using Air Monitoring as a Tool to Assess & Address Local Airsheds & Micro-Environments in Ontario*, was also reviewed. They interviewed the Ontario Ministry of the Environment (MOE), industry representatives, staff from PHUs, and staff from municipalities involved with airshed modelling and monitoring. With regard to roles and responsibilities for local airshed monitoring, there was no agreement as to whose responsibility this should be, though all the PHUs interviewed agreed that the MOE should be taking a greater role due to its technical expertise and resources. However, MOE may not have regulatory authority over many emission sources within a community, aside from industrial point sources.

Only a few PHUs have had direct involvement with air quality monitoring in their areas. There is interest in the topic, however it was echoed by a number of health units that resources for these types of projects are limited. A number of PHUs rely on MOE or Environment Canada (EC) monitoring stations for data, which is used for issuing smog advisories (Grey Bruce, Waterloo). Waterloo is

currently working on an Air Quality Assessment Report, which involves the review of air quality monitoring pollutant station data, hospitalization, emergency room and prevalence data, and scientific articles on the issue. It hopes to use this report to inform any future policy and action. Wellington-Dufferin-Guelph is not currently involved in any air quality monitoring initiatives, but stated this may be part of future discussions of its built environment committee (i.e., to support work in active transportation initiatives). PHO is conducting a noise and air pollution study, which involved side by side sampling of noise and ultrafine particles, to provide baseline data for Ontario.

Toronto Public Health (along with the Toronto Environment Office) was involved with a local air quality modelling project to address questions about air levels for a variety of air toxics in the South Riverdale neighbourhood. They assessed the individual and cumulative contribution of all contaminant sources and substances impacting the neighbourhood, including all local sources (e.g., dry cleaners and autobody shops) and all transboundary contributions (e.g., point sources that are included in the National Pollutant Release Inventory (NPRI) and the American Toxic Release Inventory. The data obtained will be used to characterize the potential health impact of air pollution in this neighbourhood by comparing air levels for each of the air pollutants against health-based benchmarks for each. (*The executive summary of the report is available online at: http://www.toronto.ca/teo/pdf/aqs-2011-06/00_executive-summary.pdf*).

Halton manages an air quality monitoring program that is funded primarily by their Region (with some funding from Ontario Ministry of Health and Long-Term Care (MOHLTC) to offset some capital costs). This project was approved by Halton Regional Council, due to concern about projected growth in the Region and the potential impacts on air quality. It has also been involved in a number of short-term monitoring projects. For example they deployed the portable samplers near an arterial road and near the QEW to assess near road pollutant concentrations to support an official plan amendment. More information on Halton's air quality monitoring initiatives can be found below.

The following responses were received directly from the Regions of Halton and Peel and Grey Bruce Health Unit (GBHU).

What is the health department's role with respect to air quality monitoring in your Region?

Halton

The air quality monitoring program is managed by the Health Department. It is fully funded by the Region although we have had some funding assistance from MOHLTC to offset some of the capital costs.

Peel

As background, the MOE operates 2 air monitors in Peel as part of the Air Quality Index network (one is Mississauga and one in Brampton). There is no MOE air monitoring station in North Peel (Caledon). There are also a few industry- operated air monitoring networks in Peel.

Peel received approval from Peel Regional Council to implement a 5-year air quality modelling and monitoring program for PM, CO, NO2, SO2, O3, NH3, and VOC's in 2011. Rowan Williams Davies and Irwin Inc. (RWDI) was retained in June 2012 to implement the program. The modelling and monitoring program is really focused on the modelling component, air quality monitoring is being done to support/validate the model and also ascertain monitoring data for an area of Peel where MOE data doesn't exist. As part of the program, a passive air monitor was installed in Caledon in 2012 to support/validate air quality modelling results for Peel. In year two of the program, we plan to install a real-time monitor in Caledon (e.g., an airpointer or similar station/device) that will capture particulate matter as well as the gaseous pollutants that are currently measured by the passive sampler, and move the passive sampler to another location in Peel.

Another role of the Health Department with respect to air quality monitoring is to review any air quality monitoring/modelling studies done by consultants for some environmental assessments or other projects in Peel, and provide input, comments or advocacy related the public health or community implications of air quality associated with the project.

GBHU

Other than the special project GBHU initiated with PHO two years ago, their role is limited to monitoring the data coming from the MOE AQ monitoring site in Tiverton and, based on that data, issuing AQ/smog advisories as appropriate.

What initiated the projects (public inquiries, scientific evidence, etc)?

Halton

The Region has had an in interest is air quality dating back to at least 2002. By 2007, concerned about projected growth in Halton and its potential impact on air quality, Halton Regional Council approved a five-element air quality program: stationary air monitoring (a fixed site in Milton, identical to those operated by the MOE across the province); portable air monitoring (two samplers that measure five common air pollutants that we move around e.g., near roadways); airshed modelling; education and outreach; and policy development.

Peel

This resulted from a combination of public inquiry/community complaints, scientific evidence, jurisdiction scan (e.g., Halton and Toronto), and a gap in the availability air quality information in Peel. Peel has long standing concerns regarding air quality impacts in the community with increasing public inquiries to the health department over the years. Peel is one of the largest and fastest growing municipalities in GTHA, and growth could have negative impacts on air quality if not managed appropriately. There is increasing scientific evidence of the negative health impacts associated with air pollution from transportation sources specifically, and populations living in close proximity to major roads, which is a concern with population growth and development in Peel and the number of existing highway corridors. A big driver for the work comes from amendments to the Regional Official Plan (ROP) in 2010 where a number of air quality policies were incorporated as a result of health department advocacy to get the policies in the ROP. ROP policy #2.2.3.3.8 directs the Region to "monitor and model air quality to accurately establish local air emissions in Peel and report on the findings from the monitoring and modelling". The health department has taken the lead on the implementation of this Official Plan policy.

GBHU

The project they initiated with PHO was initiated in the hopes it would provide information about locally generated contaminants which would in turn inform local alternative transportation strategies.

How did you determine the scope of your projects?

Halton

Scope is determined on a project-specific basis, usually by me as the project manager for the air program. For example, to determine if we could use results from Milton to "predict" air concentrations in Georgetown, we deployed the portable samplers to Georgetown for one year so that the comparison would span all seasons. To support policy in ROPA 38 (still before the Ontario Municipal Board), we deployed the portable samplers near an arterial road and near the QEW to assess near road pollutant concentrations. These studies were of limited duration (similar to others reported in the literature) – each only a few weeks long. We have also sampled air along the upwind edge of Halton to determine what is coming into the region from elsewhere; this is to help with the airshed modelling work and assessment of "background" air quality in the region.

Peel

Research and a number of background reports were prepared in advance of a Report to Council with a budget ask for the modelling and monitoring program.

This included a jurisdiction scan of air quality monitoring and modelling activities undertaken by other jurisdictions done by Peel Health staff. Also an RFP was issued in 2010 where Novus Environmental was retained to produce a report with direction on the scope and costs of a modelling/monitoring program to meet the Region's needs/goals. A subsequent RFT was issued in 2011 following Council approval of the program, and RWDI was retained in 2012 to implement the program with refinement of the program scope an ongoing process, discussed during regular meetings.

Grey Bruce Health Unit

The project was scoped on the basis of urban density and geography.

Does the health department conduct the monitoring themselves? Compile, review, analyze data?

Halton

The actual operation and maintenance of the sampling equipment is done by Rotek Environmental Inc. and we have some assistance from CleanAir Environmental. We receive a quality assured data set at the end of each calendar year (for the Milton site) or specific project (for the portable samplers) and we undertake the analysis/interpretation in-house. We also share draft copies of reports with MOE staff who provide comments/suggestions.

Peel

RWDI was retained to implement all aspects of the modelling and monitoring program for the health department. We currently have a passive air monitor in Caledon collecting bi-weekly samples of NOx/NO2, SO2, NH3, O3. RWDI installed the monitor and ships samples to Maaxam lab for analysis. The Health Department receives monthly data reports prepared by RWDI for information. RWDI is using the monitoring data that is collected to support modelling results.

GBHU

We conducted the monitoring ourselves with equipment and training provided by PHO.

What resources does the health department have to assist with these projects?

Halton

Initially, a considerable amount of money was spent to set the program up. A fixed monitoring site costs over $100,000 and each portable sampler (depending

upon the analyzers selected) is also over $100,000. Now, the resources are funding to support operation and maintenance of the equipment (roughly $100,000/yr). Halton has a dedicated full-time on air quality/climate change expert dealing with these issues that has over 22 years' experience in air quality with the MOE. In addition some statistical support for data analysis is provided by the Health Department's epidemiology team. In addition they also have a health promoter dedicated to education and outreach related to air quality and climate change issues.

Peel

I've attached the Council report that describes the budget ask for the 5-year modelling/monitoring program (note: the technical aspects of the program including the choice or model have changed since 2011, re: ongoing scope refinement). The Health Department has retained RWDI to implement all aspects of the modelling/monitoring program. A steering committee, which consists of members of the local municipalities, the MOE, and different departments within the Region, provides support in terms of technical and/or strategic advice of the project. We did not purchase any monitoring equipment.

GBHU

We relied solely on PHO for this project with respect to physical resources.

What is the health department doing with the data (policy/program initiatives, actions)?

Halton

The fixed site in Milton is used to determine trends in air quality as the community grows (Milton is projected to double twice by 2031). We now have four years of data and will, in a few more years, be able to start looking for trends. We have used the portable air samplers, as mentioned earlier, to support policy in ROPA 38 regarding land development for sensitive uses and near road environments. We are currently having internal discussions regarding future work.

Peel

The Health Department plans to use the data from the modelling/monitoring program to advocate for health promoting/protective policies and decision making in terms of land use and transportation planning, built form, and to target our social marketing campaigns. The air quality modelling work will provide us with air quality information at a 1km spatial resolution across the Region, identify source/sector contribution to local air quality, and enable scenario forecasting.

The air quality monitoring which is being undertaken as part of this project is for model validation purposes.

GBHU

The data from the project was unfortunately equivocal and could not be used to inform local policy regarding air quality and alternative transportation. It did however provide useful insight into sampling methodology that will be employed if future studies are undertaken.

Based on your experience, what is the value added of public health participation in air quality monitoring initiatives (to those already being conducted by MOE, Environment Canada)?

Halton

MOE operates two air sampling stations in Halton, one in Oakville and one in Burlington. The MOE has criteria for establishing air monitoring stations (e.g., population over 100,000) which were not met for Milton. This would have left most of Halton (geographically, though not population-weighted) without air sampling. Milton fills that gap and will also, I hope, allow us to detect changes in air quality as Milton grows. This may help us make arguments for mitigation to help offset impacts of development. Land use and transportation planning decisions affect (positively or negatively) human health. We have made (and will continue to make) suggestions based on peer-reviewed literature, though I believe it is helpful to have location-specific evidence to support health-based suggestions to our planning and transportation departments.

Peel

Information can be collected to supplement existing MOE and NAPS station data which is generally focused on regional air quality assessment and industrial compliance. The Health Department has insight into community specific issues (e.g., air quality impacts associated with growth, development, land use and transportation planning and decision making) and takes a cumulative impacts lens. Staff at the MOE and EC has the technical expertise on air quality monitoring, which PHUs should consult/collaborate to support their initiatives.

GBHU

I think there may be value in public health conducting monitoring in areas where MOE/EC sampling points are few or absent. However, care is needed in coordinating this monitoring with MOE/EC in order to ensure data consistency for comparative purposes.

Meeting #12 Agenda

Advisory Committee Annual Report

AGENDA

Energy from Waste Advisory Committee (EFWAC)

Meeting 12

Thursday, April 9, 2015

6:30 to 8:30 PM

Lower Level Boardroom (LL-C)
Durham Regional Headquarters Building
605 Rossland Road East, Whitby

1. **Welcome and Introductions**

2. **Energy from Waste Project Update: Commissioning**

   Presentation by Matthew Neild, Durham York Energy Centre Plant Manager

3. **Health and Social Services Committee Report 2014-MOH-02**

   Regional Mobile Air Quality Monitoring Program

4. **Next Meeting**

   2015 Schedule for Next Meetings

5. **Meeting Adjourns**

Please contact Facilitator Sue Cumming, MCIP RPP, Cumming+Company at 1-866-611-3715 or cumming1@total.net with any questions.

If this information is required in an accessible format, please contact 1-800-372-1102 ext. 3560.

Meeting #12 Minutes and Presentations

Advisory Committee Annual Report

If this information is required in an accessible format, please contact 1-800-372-1102 ext. 3560

Energy from Waste Advisory Committee (EFWAC) Meeting #12

MINUTES (Approved)

SUBJECT:	Energy from Waste Advisory Committee Meeting #12
ATTENDEES:	Please refer to page 8 of 8.
LOCATION:	The Regional Municipality of Durham, Meeting Room LL-C 605 Rossland Road East, Whitby
DATE AND TIME:	Thursday, April 9, 2015 at 6:30 PM

ITEM	ACTION
1. WELCOME AND INTRODUCTIONS Ms. Sue Cumming, independent Facilitator, welcomed the members of the Committee and the members of the public to the twelfth meeting of the Energy from Waste Advisory Committee (EFWAC) and introduced the Committee members in attendance at the meeting. The Facilitator confirmed quorum was not obtained and thanked members for their attendance. Ms. Cumming advised that the representatives from the Municipality of Clarington sent their regrets due to respective meeting conflicts.	
2. ENERGY FROM WASTE PROJECT UPDATE: COMMISSIONING Presentation by Matthew Neild, Durham York Energy Centre Facility Manager (Attachment 1) Matthew Neild, Facility Manager of the Durham York Energy Centre (DYEC) introduced himself. Mr. Neild advised he was from British Columbia (BC), graduated from the University of BC as a mechanical engineer, and previously held the position of Facility Manager at Covanta's Burnaby Renewable Energy Energy-from-Waste (WTE) facility, a mature facility built in 1988. Mr. Neild advised that he arrived at the DYEC in February 2015 during the latter part of construction and the first part of commissioning/start-up, and first receipt of waste. He advised his presentation will provide an overview on the status of the project. Mr. Neild advised that the two boilers, which will process 218 metric tonnes of waste per day, have reached approximately 85% full load; the air pollution control (APC) technology, a European based system, is working very well; and, that they are fine tuning controls and reagent usage, lime and carbon are used in this process, to line up with the APC. Mr. Neild identified that an issue was encountered with the soot blowers, which are turning lances used to clean the boilers for better heat transfer, however, the issue has since been rectified.	

Mr. Neild stated that from the Control Room, they can monitor all points of the DYEC site including such areas as truck traffic, fence lines, scale house activity, the ash building and portions of the internal parts of the plant.

Mr. Neild identified in the presentation pictures of the infrared cameras, which point directly onto the boiler bed from approximately seven stories up; the grates, which are used to control the combustion parameters; and the screens, devoted to continuous emissions monitoring system (CEMS) parameters. Mr. Neild also pointed out the two systems used by the lime silo which quench the gas flow ahead of lime injection, and the recirculating ash system which processes reagents and removes acid gas.

Mr. Neild also provided an overview of the tip floor and advised of the hourly requirement for truck inspection. Mr. Neild confirmed that an absolute minimum amount of unacceptable materials has been found to date during inspection, and commended the Regions' transfer stations' pre-sort. Mr. Neild advised that the automated cranes are very sophisticated, and easily direct the grapple to feed a chute at a particular rate to ensure they do not get plugged and cause boiler disruption.

Mr. Neild advised that air emissions are being continuously monitored, and that weekly, the results are being shared with the Ministry of the Environment and Climate Change (MOECC). He advised that comprehensive stack testing will be carried out during the Acceptance Period and testing for all project parameters will occur.

Mr. Neild discussed the successful completion of the pre-commissioning period which measured the parameters of bottom and fly ash. Mr. Neild confirmed that the test results for bottom ash indicated non-hazardous contents. Mr. Neild discussed the micro-encapsulation process for fly ash and confirmed lab results found no heavy metals in the fly ash. Mr. Neild advised that the next scheduled testing will occur during the Acceptance Period which is contingent upon Covanta's completion of remaining construction details and seasoning period. Mr. Neild advised that the Acceptance Period includes a rigorous 30-day full boiler operation and completion of various tests.

Mr. Neild advised that the commissioning of the turbine was proceeding this week together with Hydro One Networks Inc (HONI). Mr. Neild explained that during this commissioning, 1200 pounds per square inch of steam is injected into the unit to create approximately 18 megawatts of cold power. This power is then pushed to HONI by the outgoing transformer. Mr. Neild confirmed that adjustments were still required prior to going online to produce power on the grid.

Mr. Neild provided an overview of proposed visitor tour routes which will be offered at the DYEC, and confirmed that building occupancy for the Visitor's Centre was the last major start-up piece currently outstanding.

Tracey Ali thanked Mr. Neild for the presentation and asked for clarification with regard to what the infrared camera was picking up to assist in a reduction of NO_x levels. Mr. Neild explained that the camera picks up combustion on the sloped bed and provides a visual of the various zones of air flow, along with a permanent view from the top of the furnace through the flames, as it is opaque, to the grate to

ensure optimization of combustion. Mr. Neild further explained that it is carbon monoxide that the camera picks up and that stable furnace operation reduces NO_x and lessens the requirement of ammonia injection for NO_x control.

In response to questions from Doug Anderson regarding what the current stage was of facility construction/operations, when waste would be burned full time and what the reasons were for the delays in start-up, Mr. Neild confirmed that first fire of Boiler 1 occurred on February 13, 2015, and has reached approximately 85% full load operation, and that on February 21, 2015, first fire occurred for Boiler 2. Mr. Neild confirmed that Covanta has been burning only municipal solid waste (MSW) from the Regions with minimal to no use of gas. Further, Mr. Neild confirmed that commencement of the Acceptance Testing must first be approved by the Regions and relevant construction activities at the site must also be completed prior to entering into the Acceptance Testing. Mr. Neild explained that Covanta anticipates that the Acceptance Test will take place in approximately 30 days. The Acceptance Test itself will then takes 30 days which is then followed by a 30 day review period by the Regions. Upon approval by the Regions, Covanta would only then be in a position to move into commercial operations. Mr. Neild also advised that outstanding punch list items, not required to start commercial operations, would still be required to be completed in order to achieve final project acceptance (issuance of the Acceptance Certificate). Mr. Neild confirmed that standard construction project delays (i.e. pulling electrical wire, commissioning loops, instrumentation, etc.) were the reasons for the delay in start-up. Mr. Neild further confirmed that as it relates to project delays and in accordance with the Project Agreement, per diem liquidated damages were applicable.

Ben Kester suggested the temperatures experienced over the past two winters could also be considered as a reason for the delay.

Mirka Januszkiewicz confirmed that varying factors effected timelines, and suggested that Covanta did not also fully understand Ontario's regulatory regime. As discussed at the last meeting, Covanta underestimated the time necessary for the various agencies to review and approve all related materials.

Ms. Bracken advised that at the last Energy from Waste-Waste Management Advisory Committee (EFW-WMAC) meeting, she requested that a report on the Acceptance Test results be brought back to that Committee. Ms. Bracken asked if a same report would be brought to EFWAC, and if so, when (excerpt from February 17, 2015, EFW-WMAC minutes copied below).

> *February 17, 2015*
> *Moved by W. Bracken,*
> *"That after the Acceptance Testing results have been completed, staff present the Acceptance Testing results to the EFW-WMAC for their information."*
> *CARRIED*

Ms. Bracken felt, in accordance with the EFWAC mandate requiring members to review the operation of the facility and further to members' comment submissions on all relevant plans submitted for this facility, that the Regions should commit to including this item on the next meeting agenda, following the completion of the Acceptance Test. Ms. Bracken asked for confirmation if a motion would be required

Regions to determine the protocol of sharing results of the DYEC Acceptance Test

for this request, however, Ms. Cumming re-confirmed that quorum was not obtained. Ms. Januszkiewicz confirmed that Ms. Bracken's request would be taken under advisement and that the protocol of sharing this information would be discussed as Ms. Januszkiewicz advised that from her understanding, all reports would be posted to the project website and made available to members of the Committee. Ms. Januszkiewicz also confirmed that this information would be shared only upon review by the Regions and clarified that it would include many reports, still to be determined, related to the Acceptance Testing. Ms. Januszkiewicz reiterated that the Regions have not yet finalized dates for Acceptance Testing, and therefore, could not provide specific timing for Ms. Bracken. In response to Ms. Bracken's additional question asking if the results of the CEMS monitoring data for all parameters are within the emissions limits, Mr. Neild advised that prior to entering the Acceptance Testing phase, they are completing RATA (Relative Accuracy Test Audit) to ensure data is accurate, and confirmed that all results are being shared with the MOECC. In response to Ms. Bracken's request for an explanation as to how the opacity monitor works on the APC equipment, Mr. Neild confirmed that a technical expert opinion can be requested from Covanta to provide a detailed technical overview of the mechanisms, and related workings, of the unit as he works on the operational side. Discussion ensued with regard to the method by which leaks are detected in bags in the baghouse. Mr. Neild advised that the process is fundamental to operations and emissions, and confirmed that leaks are easily detected as when the bags are pulsed, the opacity meters monitor differential pressure across the baghouse to ensure that it is optimized as part of the treatment cycle. Ms. Bracken questioned the frequency of testing of the fly and bottom ash. Ms. Bracken compared the difference in frequency between the DYEC (tri-annually) and Covanta's facility in Burnaby, BC (per truckload), and questioned the reference Mr. Neild made at the last EFW-WMAC meeting that the quality of ash at the DYEC was much better than that at the Burnaby facility in response to Ms. Bracken asking the chemical property differences between the two sites, and the alkalinity difference. Mr. Neild acknowledged the technical discussion at the last EFW-WMAC meeting, and advised that the application of the APC equipment is important in terms of the ash it generates and proposed treatment of that ash. Mr. Neild clarified that the 'per truckload' testing in BC was implemented as a short term strategy to address the Burnaby ash issues which occurred in September 2012. Discussion ensued with regard to encapsulation. Ms. Bracken asked if at the point of breakdown, the metal and toxins which are not removed during encapsulation will eventually be released into the environment. Mr. Neild confirmed that encapsulation is a provincially approved management strategy/treatment process for ash. Mr. Neild further confirmed, in response to Ms. Bracken's additional question asking if better APC equipment produces a higher toxic content in the ash, that APC equipment is a 'consistent product in the industry', and the purpose of the equipment is to remove matter from the air, capture it into the fly ash and encapsulate it.	**and following the Regions' review of the DYEC Acceptance Test, once complete, present the DYEC Acceptance Test results to the EFWAC for information.**

As a follow up to a previous statement regarding turbine issues, and in response to Ms. Bracken questioning the specifics of this statement, Mr. Neild advised that the turbine had an oil leak as well as issues with bearings and seals, and confirmed has since been repaired and is running well.

Chris Jones questioned the relationship with the MOECC and if the teleconference meetings with the MOECC were a condition of the ECA air approval, or voluntary, to which Ms. Januszkiewicz confirmed they were not a condition of the ECA, and that throughout the project, staff have maintained contact with the MOECC, met with regulators, and provided continued information to ensure transparency and working facility knowledge to MOECC staff.

Ms. Ali asked if it is still planned that facility stack emissions results will be made publicly available. Ms. Januszkiewicz confirmed that following the Commissioning period, when results have been verified, emissions results will be accessible on the DYEC project website, on a workstation computer situated inside the Visitor's Centre, as well as on a large electronic board placed outside the Visitor's Centre.

In response to the Facilitator's inquiry as to whether the Visitor's Centre would be open by the fall, Mr. Neild advised that the current plan was to obtain full occupancy by end of April, following completion of fit and finish of remaining items currently being addressed.

3. HEALTH AND SOCIAL SERVICES COMMITTEE REPORT 2014-MOH-02

Regional Mobile Air Quality Monitoring Program

Sue Cumming reminded members that, as requested by EFWAC members at the last meeting, Committee members receive for review the comments submitted to date by other Advisory Committees regarding Durham Region's Health and Social Services Committee report 'Regional Mobile Air Quality Monitoring Program', and that EFWAC's comments on this report be provided to the Facilitator for compilation and discussion at the next meeting. To date, Ms. Cumming confirmed that comments were circulated to EFWAC members which included comments submitted on behalf of the Durham Environmental Advisory Committee, the EFW-WMAC, and the City of Oshawa's Environmental Advisory Committee. Ms. Cumming further confirmed that she had received no comments from EFWAC members for compilation and discussion at this meeting.

Ms. Cumming reminded members that they may still submit their comments directly to Dr. Kyle and Commissioner Curtis, and asked members if, although there was no quorum, they had comments for inclusion in this meeting's notes.

The following comments were received:

- Doug Anderson felt that the report's projected cost ($100,000+) was too expensive; Mr. Anderson questioned why 'off the shelf' handhelds were not being considered as the preferred option as they are able to measure air quality at less than $1,000 per unit; and, Mr. Anderson advised that an organization, Citizen Science, are also identifying best methods, at a more affordable cost, to monitor air quality.

In response to Mr. Anderson's comments regarding handheld monitoring devices, Ms. Januszkiewicz confirmed that Durham Region is aware of these devices and in question was the reliability of the data collected from such devices, and whether this data was acceptable to the MOECC.

- Wendy Bracken felt that due to fact that the DYEC facility does not continuously monitor for particulate matter and mercury, the facility's ambient air plan and related reports would not be able to identify ambient air issues at a specific facility and/or locale(s). Therefore, Ms. Bracken felt that if Durham Region were to invest in such a costly monitoring program, they should first address incinerators at Regional facilities such as the DYEC and water pollution control plants, and ensure that all possible methods of monitoring of pollution are being applied, including continuous monitoring, especially as it relates to particulate matter at the stack.

- Ben Kester inquired if the mobile testing system could be used by the Durham Emergency Management Office (DEMO) in emergency situations (i.e. recent block fire which occurred in the Town of Whitby).

In response to Mr. Kester's inquiry, Ms. Januszkiewicz advised that it could be used in emergency situations. Ms. Januszkiewicz also confirmed, in response to additional discussion, that it is the MOECC who monitors the air quality at fires, not the fire marshal, by use of their TAGA (Trace Atmospheric Gas Analyzer) units ("travelling laboratory").

- Ms. Bracken stated her uncertainty as to what parameters, especially as it relates to ultrafine particulate matter, are currently able to be monitored with the existing technology, as well as the technology's existing specifications. Ms. Bracken advised that a MOECC supervisor had previously confirmed for her that a TAGA unit had the ability to monitor ultrafine particulate matter. Therefore, Ms. Bracken mentioned that if this was an available option on a mobile unit, that Durham Region should consider its use in their chosen monitoring system, and also commit to monitoring at the DYEC and other locations for ultrafine particulate matter.

Following discussion with regard to the name of the MOECC Supervisor, Ms. Bracken was asked to provide Ms. Januszkiewicz directly, the name of this contact as Ms. Bracken confirmed she could locate where she had it referenced.

- Ms. Ali confirmed that she also shared concern that particulate matter is not being monitored continuously, and that where possible, Durham Region's program should incorporate continuous monitoring.

Additional information previously provided to the members of the EFW-WMAC regarding TAGA and related monitoring can be found at and is attached as Attachment 2:
https://www.durhamyorkwaste.ca/Assets/PublicOutreach/EFWWMAC/Meetings/Meeting_13/WMAC_Meeting13_AdditionalMaterial_MOECCFollowup.pdf

Wendy Bracken to provide Mirka Januszkiewicz with the name of the MOECC supervisor who advised Ms. Bracken that a TAGA unit can monitor ultrafine particulate matter.

4. NEXT MEETING & OTHER BUSINESS

2015 Schedule for Next Meetings

Further to the discussion regarding the 2015 EFWAC meeting schedule which took place at the last meeting in December, and the related follow up email distributed to members specifying 2015 possible dates, Ms. Cumming confirmed that limited responses were received. In order to confirm the upcoming meeting dates and contingent upon May reporting requirements, Ms. Cumming advised that an email would be forthcoming to recap current date options and finalize the 2015 EFWAC meeting schedule.

Other Business

Wendy Bracken requested that consideration be made to inviting Stantec, consultant who prepares the Ambient Air Monitoring Plan's quarterly reports, to present to EFWAC for discussion, as it relates to the results of their findings detailed in their AAMP quarterly reports. The Project Team will advise if this presentation can be arranged.

Brad Brooks questioned the Committee's review process of previous meetings' action items and removal of completed items, noting that two of the three action items had been addressed from the December 2014 meeting, however, the third action item which asked Covanta to confirm if they had available, names of independent studies, including references, or performance data from other incinerators with regard to the reliability of the encapsulation method used for fly ash to the Committee, had not been addressed, to his knowledge. Gioseph Anello confirmed that he had followed up with Covanta who advised that they were not aware of such information, but confirmed they would continue to investigate. Mr. Anello noted he had also completed an internet search which rendered no results. Mr. Brooks requested that this item be carried over to the next meeting.

Meeting adjourned.

Project Team to confirm if Stantec is available to present on the Ambient Air Monitoring Reports' Results

Project Team to continue follow up with Covanta with regard to confirming findings of additional results, if available, performance data from other incinerators as it relates to the reliability of ash stabilization method.

PRESENT

Ben Kester, Director of Public Works, Township of Uxbridge (Member)
Brad Brooks, Superintendent of Solid Waste Management, Town of Whitby (Alternate)
Chris Jones, Director of Development Review and Regulation, Central Lake Ontario Conservation Authority (Member)
Doug Anderson, DurhamCLEAR (Member)
Laura McDowell, Director, Environmental Promotion and Protection, The Regional Municipality of York (Member)
Mirka Januszkiewicz, Director, Waste Management, The Regional Municipality of Durham (Member)
Nick Colucci, Director, Public Works, Township of Brock (Alternate)
Tracey Ali, Zero Waste 4 Zero Burning (Alternate)
Wendy Bracken, Durham Environment Watch (Alternate)

Susan Cumming, Cumming + Company, EFWAC Facilitator
Melodee Smart, Administrative Assistant (Works)

Matthew Neild, Durham York Energy Centre Facility Manager, Covanta Durham York Renewable Energy L.P.
Jennifer Baron, Business Manager, Covanta Durham York Renewable Energy L.P.
Gioseph Anello, Manager, Waste Planning and Technical Services, The Regional Municipality of Durham (Alternate)
Lindsay Milne, Program Manager, Solid Waste and Diversion, The Regional Municipality of York
Luis Carvalho, Senior Project Manager, Capital Planning and Delivery, The Regional Municipality of York
Greg Borchuk, Project Manager, EFW, The Regional Municipality of Durham
Lyndsay Waller, Operations Technician, Waste Management Services, The Regional Municipality of Durham
Kristy Brooks, Technical Assistant, Waste Management Services, The Regional Municipality of Durham

Phil Dunn, Senior Environmental Officer, Ministry of the Environment and Climate Change (Observer)

Kerry Meydam, Durham Environment Watch (Member)

REGRETS

Faye Langmaid, Manager of Special Projects, Municipality of Clarington (Member)
Linda Gasser, Zero Waste 4 Zero Burning (Member)
Ken Gorman, Director, Environmental Health, The Regional Municipality of Durham (Observer)

COVANTA

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Durham York Energy Centre Project Update: Commissioning

EFWAC
April 9, 2015

Boilers & APC Plant

- Boilers are nearly at full load
- Commissioning of the sootblower system has been completed
- Atmospheric Pollution Control Plant (APC) is running well
- Currently fine tuning controls and reagent usage.

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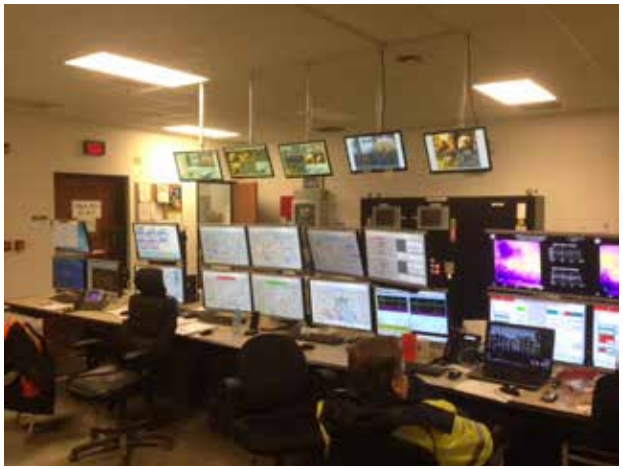
Boilers & APC Plant



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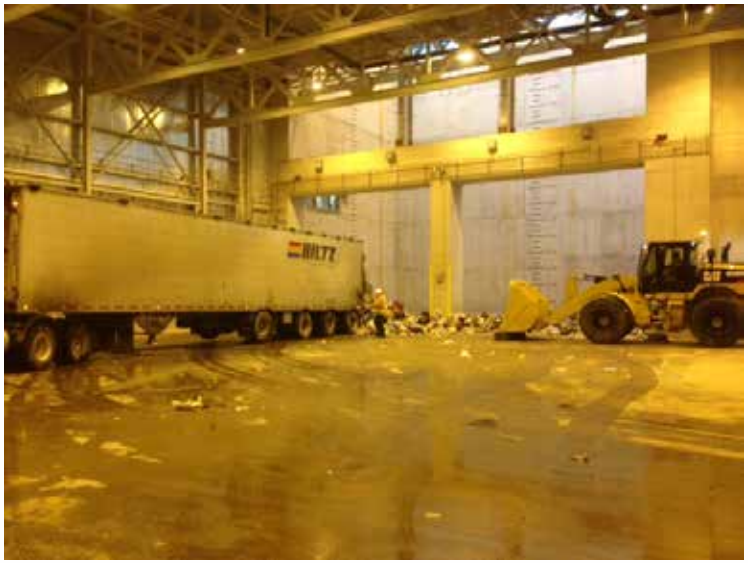
Waste Delivery

- Hourly truck waste inspections are indicating minimal unacceptable waste.



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Air Emissions

- Stack emissions are being continuously monitored
- Results are shared with MOECC
- Comprehensive stack testing to be carried out during the upcoming Acceptance testing period.

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Ash

- Pre-Commissioning period has been completed
  - Bottom Ash testing has shown the material to be non-hazardous
  - Fly ash testing has shown the cement/pozzolan micro-encapsulation process to produce non-hazardous material
- Looking forward, the next round of ash testing occurs during the Acceptance Test Period (The Commissioning Period) followed by ongoing testing during Commercial Operations (the Pre-Commissioning Period)

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Turbine

- Turbine commissioning is underway this week
- Last major piece of equipment to start-up

MOECC FOLLOW UP FROM SEPT. 30, 2014, MOECC PRESENTATION TO EFW-WMAC

Follow up to the members of the Energy from Waste-Waste Management Advisory Committee (EFW-WMAC) on behalf of Sandra Thomas, Issues Project Coordinator, York Durham District Office, Ministry of the Environment and Climate Change:

At the September 30, 2014, EFW-WMAC meeting the Ministry of the Environment and Climate Change (MOECC) staff committed to providing answers to the following questions:

Q1. What parameters are being measured by the ministry's Trace Atmospheric Gas Analyzer (TAGA) pre-first fire? Is $PM_{2.5}$ being measured?

A1. The TAGA does not have the capability to measure $PM_{2.5}$. Both of the ministry's TAGA units were deployed, which are mass spectrometers and measure volatile organic compounds (VOCs). The following VOCs were measured:

Acetone
Acetic Acid
Benzene
Toluene
Phenol
Styrene
Ethylbenzene
Chlorobenzene
1,2,4-Trimethylbenzene
Naphthalene
Trichloroethylene (TCE)
Butyl benzene
Methyl Naphthalene
Biphenyl
Tetrachloroethylene (Perchloroethylene, PCE)
Ethylene glycol
Methyl isobutyl ketone (MIBK)
n-Butyl acetate
Propylene glycol
Propanol (isopropyl alcohol)
Methyl ethyl ketone (MEK)

It is important to note that the ambient air monitoring plan includes $PM_{2.5}$ in the monitoring program.

Q2. Is the ministry able to provide the self-monitoring data for the companies located in the Clarington area or does the Freedom of Information and Protection of Privacy Act apply?

A2. I have reviewed the files for the companies located in the Clarington area. The following companies are required to conduct air monitoring and in some cases the companies post their data:

- Durham York Energy Centre - monitoring results are posted on-line at http://durhamyorkwaste.ca/project/project_doc.htm
- Ontario Power Generation - monitoring results are posted on-line at http://www.opg.com/news-and-media/News%20and%20Media%20%20Reports/2013_REMP_Report.pdf
- St. Mary's Cement - I would recommend contacting the company to request their air monitoring reports. The MOECC is bound by the Freedom of Information and Protection of Privacy Act (FOIPPA) therefore we are unable to release reports without a formal FOIPPA request.

Additionally, the MOECC has ambient air monitoring stations located throughout the province. The station located in the City of Oshawa is the closest station to the Municipality of Clarington. Results of air monitoring can be found http://www.airqualityontario.com/press/publications.php.

If you have any questions, please contact Sandra Thomas at 905 427 5607 or by email at Sandra.Thomas@ontario.ca.

Meeting #12 Correspondence

Advisory Committee Annual Report

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