March 2009

PROCEDURE FOR PREPARING AN EMISSION SUMMARY AND DISPERSION MODELLING REPORT

Version 3.0

Guidance for Demonstrating Compliance with

Ontario Regulation 419/05
Air Pollution – Local Air Quality

made under the *Environmental Protection Act*

PIBs # 3614e03

Protecting our environment. Ontario

FOREWORD

The "Procedure for Preparing an Emission Summary and Dispersion Modelling Report, February 2009, version 3.0" (the Procedure Document) provides guidance on complying with the ESDM report content requirements of Ontario Regulation 419/05: Air Pollution - Local Air Quality. This Regulation revoked and replaced Ontario Regulation 346: General - Air Pollution.

The Procedure Document is intended to provide guidance to ensure the fair and consistent implementation of the Regulation. This document updates the previous Ontario Ministry of the Environment (MOE) document "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" PIBs #3614e02 dated July 2005.

The MOE may periodically publish a list of questions and answers to assist in the interpretation of this Procedure Document. The contents of this document may also be up-dated from time to time based upon public consultation consistent with the Ontario Environmental Bill of Rights legislation. All web site addresses referred to in this document were current at the time of release.

While every effort has been made to ensure the accuracy of the information contained in this Procedure Document, it should not be construed as legal advice. In the event of conflict with requirements identified in Regulation 419/05, then the regulatory requirements shall determine the appropriate approach.

For any addenda or revisions to this guide please visit the MOE website at:

http://www.ene.gov.on.ca/en/air/ministry/index.php

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1.0 INTRODUCTION

Ontario Regulation 419/05: Air Pollution – Local Air Quality (the Regulation) made under the *Environmental Protection Act* (EPA) is the regulation that is intended to protect communities against adverse effects from local sources of air emissions[1]. The Regulation places limits on the concentration of contaminants in the natural environment that are caused by emissions from a facility. The concentrations in the natural environment are calculated at a location referred to as a "point of impingement" which is defined in section 2 of the Regulation, as follows:

Points of Impingement

"2. (1) A reference in this Regulation to a point of impingement with respect to the discharge of a contaminant does not include any point that is located on the same property as the source of contaminant.

(2) Despite subsection (1), a reference in this Regulation to a point of impingement with respect to the discharge of a contaminant includes a point that is located on the same property as the source of contaminant, if that point is located on,

(a) a child care facility; or

(b) a structure, if the primary purpose of the property on which the structure is located, and of the structure, is to serve as,

(i) a health care facility,

(ii) a senior citizens' residence or long-term care facility, or

(iii) an educational facility."

The Regulation requires that where a facility discharges a contaminant into the air from one or more sources, the concentration at any point of impingement (POI) resulting from that combined discharge must be less than the standard prescribed in the Regulation.

[1] This Regulation does not apply to discharges of contaminants from motor vehicles.

The Ontario Ministry of the Environment (MOE) also uses a broader list of point of impingement limits (MOE POI Limits)[2] and other screening tools[3] to assist in preventing adverse effects that may be caused by local sources of air pollution. Demonstration of compliance with the Regulation begins with development of an Emission Summary and Dispersion Modelling (ESDM) report that includes a summary of total property air emissions. These emissions are then converted to POI concentrations using mathematical air dispersion models. In addition, a facility may use an approved air dispersion model in combination with monitoring or measurement to determine compliance. This "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" (Procedure Document) provides guidance on complying with the requirements of the Regulation that govern the content of an ESDM report and should be used in conjunction with the MOE document "Air Dispersion Modelling Guideline for Ontario" (ADMGO) (as amended from time to time). The guidance set out in this Procedure Document became applicable when the Regulation 419/05 came into force on November 30, 2005.

The Regulation requires use of specified approved dispersion models, whereas earlier versions of the Regulation (previously known as Regulation 346: General Air Pollution) included a set of suggested dispersion models in its Appendix. In broad terms, the Regulation:

- Includes a phase-out (between 2010 and 2020) of the models in the Appendix to Regulation 346, according to a timetable that varies by industrial sector (the sectors are identified using the North American Industry Classification System). See Appendix A for a list of the industrial sectors that are to have the initial phase-out of the models in the Appendix to Regulation 346.

- Prescribes "approved dispersion models" which are required to be used when assessing compliance with the standards in Schedules 1, 2 and 3. These models include: those in the Appendix to Regulation 346, SCREEN3, ISCPRIME, AERMOD and ASHRAE. The Regulation also stipulates how the models are to be used with the various inputs (as applicable), including:
  - operating conditions;
  - source of contaminant emission rates;
  - meteorological conditions;
  - area of modeling coverage; and
  - terrain data.

[2] The generic term "limits" in the context of this guideline means any numerical concentration limit set by the MOE including standards in the schedules to the Regulation, guidelines and recommended levels for chemicals with no standard or guideline. The MOE uses a combination of air quality standards in the schedules to the Regulation and a broader list of point of impingement guidelines, available from, http://www.ene.gov.on.ca/en/air/ministry/index.php. See Note 4 under Chapter 2.2 "Update of an ESDM report" of this Procedure Document.

[3] The Jurisdictional Screening Level (JSL) list was developed by MOE to provide an additional screening tool for contaminants required to be assessed under the Regulation. Information on JSLs can be obtained from the Ministry document, "Jurisdictional Screening Level (JSL) List – A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality, February 2008".

- Includes a phased introduction of a requirement to prepare an ESDM report. The Regulation also specifies the report content and requires that the report is to be: kept on-site; made available upon request; and up-dated annually.

- Allows consideration of requests for the alteration of air quality standards that are contained in Schedule 3 of the Regulation. Requests for the alteration of Schedule 3 standards are based upon: local public input; a comparison of technology requirements and methods that are available for use; and (optional) economic factors. For more information on Alteration of Schedule 3 Standards, see MOE documents, "Guideline for Implementation of Air Standards in Ontario" and the "Guide to Requesting an Alternative Air Standard" available on the MOE website (as amended from time to time).

2.0 OVERVIEW OF ESDM REPORTS

2.1 Who is Required to Prepare an EDSM Report?

The Regulation requires the preparation of an ESDM report[4] in the following circumstances:

- By a person who is applying for a Certificate of Approval (CofA) under section 9 of the EPA – see section 22 of the Regulation.

- Before February 1 2010, by a person responsible for a facility within an industrial sector listed in Schedule 4 of the Regulation – see subsection 23(1) (see also Appendix A of this document for a list of sectors included in Schedule 4 of the Regulation).

- Before February 1 2013, by a person responsible for a facility within a class or industrial sector listed in Schedule 5 of the Regulation – see subsection 23(2) (see also Appendix A of this document for a list of sectors included in Schedule 5 of the Regulation).

- By a person who receives a written notice from a MOE Director for submission of an ESDM report – see subsection 24(1).

- By a person who discharges a contaminant that results in a POI concentration that is above an Upper Risk Threshold in Schedule 6 of the Regulation – see subsection 30(4). This report must be submitted to a MOE Director within three months of the discharge.

[4] A facility which emits only noise as a contaminant is not required to prepare an ESDM report.

- By a person requesting an Alteration of Schedule 3 Standards – see paragraph 1 of subsection 32(13) (see also the MOE documents, "Guideline for the implementation of Air Standards in Ontario" and the "Guide to Requesting an Alternative Air Standard", as amended from time to time, for more information on Alteration of Schedule 3 Standards). This ESDM report is submitted to the MOE with a request for Alteration of Schedule 3 Standards.

2.1.1 Special Case: A Property that Includes Production Facilities with Multiple NAICS Codes

As noted above, Schedule 4 and Schedule 5 of the Regulation identify the targeted sectors by which an ESDM report is to be prepared. These sectors are identified using the North American Industry Classification System (NAICS) codes maintained for Canada by Statistics Canada. There may be occasions where a property may include a variety of production processes that have different NAICS codes, one or more which may be listed on Schedules 4 of 5. In such a situation, either of the following contaminant-based options may be used in completing an ESDM report:

Option 1

Calculate POI concentrations as if all discharges from the property were from a facility in a sector listed in Schedule 4 or 5. If there is a property that contains a facility listed in a sector in Schedule 4 and a facility listed in a sector in Schedule 5, then under this option, POI concentrations shall be calculated as if all discharges from the property were from a facility in a sector listed in Schedule 4.

Option 2

1. Determine which contaminants are discharged from facilities that are in a sector listed in Schedule 4.

2. For those contaminants, calculate POI concentrations as if all discharges of those contaminants from the property were from a facility in a sector listed in Schedule 4.

3. Determine which contaminants are discharged from facilities that are in a sector listed in Schedule 5.

4. For those contaminants, calculate POI concentrations as if all discharges of those contaminants from the property were from a facility in a sector listed in Schedule 5. However, if there is a property that has a contaminant that is discharged from facility that is in a sector listed in Schedule 4 *and* from a facility that is in a sector listed in Schedule 5, the contaminant shall be treated as if it is discharged from a facility that is in a sector listed in Schedule 4.

5. For all of the remaining contaminants, calculate POI concentrations as if discharges of those contaminants from the property were from a facility in a sector not listed in Schedule 4 or 5.

2.2 Update of an ESDM report

Section 25 of the Regulation sets out the requirements relating to the updating of ESDM reports,

Facilities in Sectors listed in Schedules 4 and 5

ESDM reports that are required to be prepared for facilities within sectors identified in Schedules 4 and 5 shall after 2010 and 2013, respectively, be accurate as of December 31st in the year in which the last update was required to be completed (i.e., updated on an annual basis) and that this update be completed not later than March 31st in the following year.

Facilities Applying for a Certificate of Approval

Section 25 of the Regulation stipulates that certain ESDM reports that are required to be submitted to the MOE as part of an application for CofA be updated. The update is required if the following criteria are met:

- the CofA application is for a facility within a sector identified in Schedules 4 or 5; and
- construction of the facility began after November 30, 2005 and
- no application was made on or before that day for a CofA in respect of the facility.

For clarity, the above criteria captures 'new facilities' and is not intended to capture a modification or expansion of a facility; nor installation of a new process at an existing facility. Where the above listed criteria are met, the ESDM report that accompanied the CofA application must be accurate as of December 31st in the year the report was prepared and updated annually. This update shall be completed not later than March 31st in the following year. Note that the annual update requirement does not apply to ESDM reports that accompany CofA applications where the above criteria are not met.

Regulatory Requirements for Preparing ESDM reports (Notice, URT, Altered Standard)

Annual update requirements apply to ESDM reports that are required to be submitted to the MOE because of:

- a written notice from a MOE Director (section 24 of the Regulation);
- a predicted exceedence of an Upper Risk Threshold (URT) in Schedule 6 of the Regulation (s.30(4) of the Regulation); or

- a request to the MOE for Alteration of Schedule 3 Standards (s.32(13) of the Regulation)

The above ESDM reports must be accurate as of December 31st in the year the report was prepared and updated annually. This update shall be completed not later than March 31st in the following year. It should be noted that the annual update requirement does not apply for ESDM reports submitted for the above reasons if a MOE Director is satisfied that an exceedence of a standard and an adverse effect are not likely to occur.

In general the ESDM reports must be up-to-date as of December 31 of the relevant year. Accordingly, the ESDM reports must be dated "December 31 of the relevant year". The actual updating of the report may occur at any point throughout the relevant year, as long as the information is checked to ensure that nothing has changed (i.e. that it is current) as of December 31 of the relevant year. Finally, the Regulation allows until March 31 of the following year to complete the update of the ESDM report and ensure the information contained within it is accurate to December 31 of the previous year.

Subsections 25(9) to 25(11) of the Regulation include notification requirements (in the event of a modelled or measured exceedence of a MOE POI Limit[5]):

Under Section 25 of the Regulation – Update of ESDM report:

"(9) A person who is required under subsection (8) to complete the update of a report not later than March 31 in a year shall, as soon as practicable after that date, notify a provincial officer in writing if the person has started to use an approved dispersion model with respect to a contaminant for the purpose of completing the update but has not yet complied with section 12, and,

(a) the use of the model indicates that discharges of the contaminant may result in a contravention of section 18, 19 or 20; or

(b) sections 18, 19 and 20 do not apply to discharges of the contaminant and the use of the model indicates that discharges of the contaminant may cause an adverse effect.

(10) If a person is required to give notice under subsection (9), the Director may give the person a written notice requiring the person to provide the Director with the following in accordance with the notice:

[5] Reference to statements such as "sections 18, 19 and 20 do not apply to discharges of the contaminant and the use of the model indicates that discharges of the contaminant may cause an adverse effect", "the discharge may cause an adverse effect" and similar statements within the Regulation are meant to require assessment of contaminants with MOE POI guidelines (as well as contaminants without any MOE POI Limit).

1. ***A written statement or map identifying the location of any point of impingement where the use of the approved dispersion model indicates that discharges of the contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect.***

2. ***A written statement specifying the highest concentration of the contaminant that the approved dispersion model predicts for the point of impingement.***

3. ***A written statement specifying the number of averaging periods for which the approved dispersion model predicts that discharges of the contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect because of the concentration of the contaminant at the point of impingement, expressed as a percentage of the number of averaging periods in,***

    i. ***a period of five years, if the approved dispersion model was used in accordance with meteorological data described in paragraph 1, 1.1, 2 or 2.1 of subsection 13 (1),***

    ii. ***a period equal to the length of the period over which the meteorological data was collected, if the approved dispersion model was used in accordance with local or site-specific meteorological data described in paragraph 3 of subsection 13 (1), or***

    iii. ***a period equal to the length of the period that was used for the purposes of the computational method, if the approved dispersion model was used in accordance with meteorological data obtained from a computational method in accordance with paragraph 4 of subsection 13 (1).***

(10.1) If subsection (10) authorizes the Director to give a person a notice, the Director may instead give the person a written notice requiring the person to provide the Director with the following in accordance with the notice:

1. ***A written statement or map identifying the location of points of impingement specified in the notice.***

2. ***A written statement specifying the concentration of the contaminant that the approved dispersion model predicts at points of impingement specified in the notice.***

3. ***A written statement specifying the number of averaging periods for which the approved dispersion model predicts that discharges of the***

contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect because of the concentration of the contaminant at points of impingement specified in the notice, expressed as a percentage of the number of averaging periods in,

i. a period of five years, if the approved dispersion model was used in accordance with meteorological data described in paragraph 1, 1.1, 2 or 2.1 of subsection 13 (1),

ii. a period equal to the length of the period over which the meteorological data was collected, if the approved dispersion model was used in accordance with local or site-specific meteorological data described in paragraph 3 of subsection 13 (1), or

iii. a period equal to the length of the period that was used for the purposes of the computational method, if the approved dispersion model was used in accordance with meteorological data obtained from a computational method in accordance with paragraph 4 of subsection 13 (1).

(10.2) If a notice requires a person to provide the Director with information referred to in subsection (10) or (10.1), the person shall provide the information and update the report referred to in subsection (9) using,

(a) the AERMOD dispersion model described in paragraph 1 of subsection 6 (1);

(b) the ISCPRIME dispersion model described in paragraph 3 of subsection 6 (1); or

(c) a dispersion model or combination of dispersion models that,

(i) pursuant to subsection 7 (3), is deemed to be included in references in this Part to approved dispersion models, and

(ii) is capable of providing the information referred to in subsection (10) or (10.1), as the case may be.

(11) If a person is required to give notice under subsection (9) and, according to measurements of air samples collected at a point of impingement, discharges of the contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect because of the concentration of the contaminant at the point of impingement, the Director may give the person a written notice requiring the person to provide the Director with the following in accordance

with the notice:

1. ***A written statement or map identifying the location of the point of impingement.***

2. ***A written statement specifying the number of air samples that were collected at the point of impingement and measured for the contaminant.***

3. ***A written statement specifying the number of air samples that were collected at the point of impingement and measured for the contaminant and that indicated that discharges of the contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect because of the concentration of the contaminant at the point of impingement, expressed as a percentage of the number of air samples referred to in paragraph 2."***

(11.1) The Director shall not give a person a notice under subsection (10), (10.1) or (11) unless the Director first gives the person a draft of the notice and an opportunity to make written submissions to the Director during the period that ends 30 days after the draft is given.

A notification under subsection 25(9) of the Regulation must be made as soon as practicable after March 31 of the relevant year, regardless of the stage of refinement (i.e., even if section 12 of the Regulation has not yet been complied with). If, in this situation, the facility plans to refine the predictions of POI concentration then this should also be communicated.

2.3 Contents of an ESDM report

All ESDM reports are required to be prepared in accordance with section 26 of the Regulation. Section 26 sets out the minimum requirements to documenting compliance with MOE POI Limits. Chapter 3 of this Procedure Document sets out the minimum requirements for the contents of an ESDM report, as set out in section 26 of the Regulation.

ESDM reports are typically prepared as site-wide ESDM reports which include all contaminants that are discharged from the property. However, there are a number of sections within the Regulation which allow only specific contaminant(s) to be addressed in an ESDM report. Table 2-1 Contaminants Included in ESDM reports summarizes various sections of the Regulation which address which contaminants discharged from the property are to be assessed in an ESDM report.

Table 2-1: Contaminants Included in ESDM reports

Sections of the Regulation Requiring Site-Wide ESDM reports (i.e. All Contaminants)	**Sections of the Regulation Where Only Specified Contaminant(s) Need to be Addressed in the ESDM report**
Section 23: Facilities part of a class identified by a NAICS code listed in Schedule 4 or 5 must prepare a site-wide ESDM report addressing all sources and all contaminants.	Subsection 22(2) states that it is not necessary for an ESDM report prepared to support an application for CofA to include contaminants other than those relevant to the application.
Subsection 24(1): Facilities that receive a notice from the Director to prepare an ESDM report must ensure that it addresses all sources and all contaminants.	Subsection 24(1.1): A notice from Director to prepare an ESDM report may be for specified contaminant(s) only.
Subsection 32(13): Facilities that submit a request for an alteration of a Schedule 3 standard must prepare and submit an ESDM report that addresses all sources and all contaminants.	Subsection 30(6.1) Sets out that it is not necessary for an ESDM report prepared because of a potential exceedence of an Upper Risk Threshold (s. 30(4)) to include contaminants other than those specified in the notification given to the Director under s. 30(3).

2.4 Retention of ESDM report

Section 27 of the Regulation requires that the most up-to-date report be kept at the place to which the report relates and that the report be made available to a provincial officer upon request. The executive summary of the report is also required to be made available to the public (by posting it on the Internet or by making it available during regular business hours at the place to which the report relates).

Retention of ESDM report, etc.

27. (1) A person who prepares or updates a report that is required to be prepared or updated in accordance with section 26 shall keep a copy of the most up-to-date report at the place to which the report relates.

(2) A person who prepares or updates a report that is required to be prepared or updated in accordance with section 26 shall, on request, immediately submit a copy of the report or any part of the report to the Director or to a provincial officer.

(3) A person who prepares or updates a report that is required to be prepared or updated in accordance with section 26 shall ensure that the executive summary referred to in paragraph 15 of subsection 26 (1) is made available for examination by any person, without charge, by posting it on the Internet or by making it

available during regular business hours at the place to which the report relates.

2.5 Possible Differences When Applying for a Certificate of Approval

The starting point for all ESDM reports is that they have to include all of the requirements set out in s.26 of the Regulation. One exception to this rule is found in subsection 22(3) of the Regulation which provides the Director of section 9 of the EPA with the authority to relieve a person from the obligation to comply with any of the requirements set out in section 26 of the Regulation if the Director is of the opinion that compliance with the requirement is not necessary to understand the impact of discharges of one or more contaminants.

Requirement for ESDM report: certificates of approval

22(3) The Director may relieve a person who is required by subsection (1) to prepare a report in accordance with section 26 from the obligation to comply with any provision of subsection 26 (1) that is specified by the Director, subject to such conditions as are specified by the Director, if the Director is of the opinion that compliance with the provision is not necessary to understand the impact of discharges of one or more contaminants.

As a result, there may be some differences in the requirements for preparing an ESDM report when it is used to support an application for a CofA or to demonstrate compliance with the requirements of a Comprehensive-type CofA. This Procedure Document is designed to assist the reader by highlighting the potential differences using the text boxes accompanied by the rectangular “CofA” icon.

A question and answer document that provides guidance on a variety of topics, including how ESDM Reports are used within the CofA process, may also be published from time to time.

CofA

Applying for a CofA

Text boxes like this will explain recommendations that pertain exclusively to the process of applying for a CofA or to the process of demonstrating compliance with the requirements of a Comprehensive-type CofA. Consistent with subsection 22(3) of the Regulation, the Director under section 9 of the EPA may accept an ESDM report that does not include all the necessary information in s. 26 of the Regulation provided Director is of the opinion that compliance with the provision is not necessary to understand the impact of discharges of one or more contaminants. See Appendix G of this Procedure Document for examples.

Another important item to be aware of relates to ESDM reports which accompany CofA applications as set out in subsections 22(1.2) and 22(2.2) of the Regulation. These subsections state that any new requirements that would apply to a facility (i.e. standards or approved models) shall be included in an ESDM report one year sooner for the purposes of submitting a CofA application under section 9 of the EPA.

Requirement for ESDM report: certificates of approval

22. (1) A person who applies for a certificate of approval or amendment to a certificate of approval in respect of a facility that discharges or will discharge a contaminant into the air shall prepare a report in accordance with section 26 and submit it to the Director as part of the application.

(1.1) Section 19 shall be deemed to apply for the purpose of preparing the report referred to in subsection (1) if,

(a) the application is made after January 31, 2009 and before February 1, 2010; and

(b) section 20 will not apply to discharges of the contaminant on February 1, 2010..

(1.2) Section 20 shall be deemed to apply for the purpose of preparing the report referred to in subsection (1) if,

(a) the application is made after January 31, 2009 and before February 1, 2010 and, pursuant to subclause 20 (3) (a) (i), section 20 will first apply to discharges of the contaminant on February 1, 2010;

(b) the application is made after January 31, 2012 and before February 1, 2013 and, pursuant to subclause 20 (3) (b) (i), section 20 will first apply to discharges

of the contaminant on February 1, 2013; or

(c) the application is made after January 31, 2019 and before February 1, 2020 and, pursuant to clause 20 (3) (e), section 20 will first apply to discharges of the contaminant on February 1, 2020.

2.5.1 Calculating Fees for CofA Applications

This Procedure Document is also used under the CofA application process to calculate the Fees required by O. Reg. 363 *"Fees – Certificates of Approval"*. For further information on the CofA application process please see the MOE document "Guide to Applying for Approval (Air & Noise)" (see ene.gov.on.ca/envision/gp/4174e.pdf to obtain an electronic copy of this document, which may be amended from time to time).

O. Reg. 363/98 *"Fees – Certificates of Approval"* (the Fees Regulation) requires that all applicants for a Certificate of Approval under section 9 of the EPA submit a fee at the time of their application. This fee must be calculated in accordance with the Fees Regulation. The MOE has provided a form "Costs for EPA s.9 Applications, Supplement to Application for Approval" PIBs #4108e (the Cost Form) to assist with the fee calculation.

The Fees Regulation requires applicants to pay a fixed cost for review of equipment specified in the Fees Regulation. The applicable fee is calculated based on the quantity of the specified equipment, calculated using the formula specific for the equipment. Equipment that is not specifically referenced in the Fees Regulation may be grouped or considered equivalent if they satisfy the following conditions:

i) equivalent process activity;

ii) common contaminant emissions;

iii) emissions estimates are calculated using equivalent methods or formulas (with an allowance for modified process parameters); and

iv) dispersion calculations are performed according to equivalent methods (with an allowance for modified process parameters) and considering equivalent Points of Impingement.

Sources that are identified as negligible in accordance with section 8 of the Regulation (also refer to Chapter 7.2 of this Procedure Document) may be grouped as one source for the purposes of the Fees Regulation unless the source contains specified equipment.

3.0 MINIUMUM REQUIREMENTS FOR AN EMISSION SUMMARY AND DISPERSION MODELLING REPORT

Table 3-1 on the following page summarizes the minimum requirements of an ESDM report, consistent with the requirements of the Regulation. Chapters 4 through 11 of the Procedure Document provide more explanation of the contents identified in Table 3-1.

See Appendix D for an example format for a Table of Contents for an ESDM report.

Where there is any conflict between the ESDM report requirements in this Procedure Document and the requirements in Ontario Regulation 419/05: Air Pollution – Local Air Quality, as amended, then the requirements in the Regulation take precedence.

CofA

Applying for a CofA

It is recommended that all Emission Summary and Dispersion Modelling (ESDM) Reports submitted to the MOE as supporting information to an application for CofA include a completed copy of an Emission Summary and Dispersion Modelling Checklist and signed form that is part of the Checklist. This Checklist is included as Appendix D of this Procedure Document. **If any of the items listed in the checklist are not submitted then the ESDM report may not be accepted by the Environmental Assessment and Approvals Branch (EAAB).**

It is also recommended that the purpose and scope of the application for CofA be included in the introduction to the ESDM report.

Applications for CofA that include only noise as a contaminant are not required to complete an ESDM report.

The individual responsible for preparing the ESDM report must be able to defend the accuracy of the information presented in the report.

Table 3-1: Summary of Minimum Requirements for ESDM report

ESDM report Chapter	Minimum Requirements	See…
Executive Summary	Overview of the ESDM report and Emissions Summary Table.	This Document Chapter 4 Regulation para. 15 of s. 26(1)
Introduction and Facility Description	The Facility Description should be provided in adequate detail to select and justify appropriate facility operating conditions.	This Document Chapter 5 Regulation para. 1 of s. 26(1)
Initial Identification of Sources and Contaminants	Initial listing of all air pollution sources and contaminants emitted from the facility.	This Document Chapter 6 Regulation para. 2 of s. 26(1) para. 3i of s. 26(1)
Assessment of the Significance of Contaminants and Sources	Assess the significance of sources and contaminants and eliminate negligible ones from further analysis. The ESDM report must provide an explanation of how it was determined that an amount of a contaminant discharged is negligible and/or that a source discharges a contaminant in a negligible amount.	This Document Chapter 7 Regulation s. 8 para. 3ii of s. 26(1) para. 3iii of s. 26(1) paras. 4, 5 of s. 26(1)
Operating Conditions, Emission rate estimating and Data Quality	For each contaminant, describe the facility operating condition(s) that results in the actual maximum POI concentration that occurred within the last year or that corresponds to the maximum POI concentration that the facility is capable of. Operating conditions must correspond to the averaging period for each applicable MOE POI Limit. Estimate emission rates; describe the estimating methodology for each significant contaminant or group of similar contaminants; and classify how accurately each method is in estimating emissions.	This Document Chapter 8 Regulation s. 10 s. 11 s. 12 paras. 6, 7 of s. 26(1)

Table 3-1 Summary of Minimum Requirements for ESDM report (Continued)

ESDM report Chapter	Minimum Requirements	See…
Source Summary Table and Site Plan	Appropriate detail to support the use of the approved models.	This Document Chapter 9 Regulation paras. 8, 9 of s. 26(1)
Dispersion Modelling	This chapter should include: - a description of the local land use conditions if MOE approved regional meteorological data has been refined to reflect local land use; - identification of the approved dispersion model that was used and a description of the way in which the approved dispersion model was used that is sufficient to show compliance with sections 9 to 17 of the Regulation (guidance and a suggested summary table format is provided in Chapter 10 of this Procedure Document); and - a description of the terrain data that was employed if according to section 16, terrain data is required.	This Document Chapter 10 Regulation s. 6 s. 7 s. 9 - 17 s. 17.1 s. 26(1) paras. 10, 11 and 13
Emission Summary Table and Conclusions	A summary of the significant contaminants; the aggregate facility-wide emission rate; the maximum POI concentrations; comparison to MOE POI Limits; and interpretation of results/conclusions.	This Document Chapter 11 Regulation para. 14 of s. 26(1)
Appendices	Explanation of the identification of insignificant sources and contaminants; supporting calculations; and dispersion model input files; and an electronic copy of the input and output files;	Regulation s. 26(1) para. 12

4.0 EXECUTIVE SUMMARY

The purpose of the Executive Summary in an ESDM report is to provide an overview of the facility and to outline the facility's compliance with the appropriate MOE POI Limits.

Paragraph 15 of subsection 26(1) of the Regulation requires that the ESDM report include:

Under Subsection 26(1) of the Regulation – Contents of ESDM report:

"15. An executive summary of the information referred to in paragraphs 1 to 14 that includes, in full, the table required by paragraph 14."

Therefore, the Executive Summary must summarize all of the information required by section 26 of the Regulation to be included in the ESDM report and, must specifically include, the Emission Summary Table required by paragraph 14 of subsection 26 (1) of the Regulation. See Chapter 11 of this Procedure Document for more information on the required information that must be contained in an Emission Summary Table.

It is also recommended that the Executive Summary indicate the basis on which the ESDM report has been prepared (e.g., the ESDM report is part of an application for CofA; is required to satisfy sections 23 or 24 of the Regulation; alteration of the Schedule 3 standard, section 24 notice, etc.)

5.0 FACILITY DESCRIPTION

The purpose of the Facility Description in an ESDM report is to provide a summary of the operations and activities at the facility that discharge contaminants.

Paragraph 1 of subsection 26(1) of the Regulation requires that the Facility Description include:

Under Subsection 26(1) of the Regulation – Contents of ESDM report:

"1. A description of the activities that are engaged in on the property from which contaminants are discharged, including, if anything is produced on the property,

i. a description of what is produced and a statement of the amount of product that is produced on each day that the production process operates in accordance with the operating conditions described in paragraph 6,

ii. a description of the steps involved in the production process, including a drawing of the process,

iii. a description of the materials used in the production process, and

iv. a statement of the number of weeks per year, the number of days per week and the number of hours per day that the production process is in operation."

For the purposes of this portion of an ESDM report, a Facility Description is intended as an overview of facility operations and relevant data to support the selection of the appropriate operating conditions that will form the basis of air emission rate estimates and the assessment of maximum POI concentrations.

Information related to the four items required by paragraph 1 of subsection 26(1) of the Regulation must be provided in sufficient detail to support the identification of the operating conditions that correspond to the maximum POI concentrations. Although the above-mentioned items must always be included in an ESDM report, they may be included in a general manner in the Facility Description, if more specific information relevant to the development of estimates of air emissions and maximum POI concentrations is provided in the operating condition portion of the ESDM report. For example, if the description of the operating conditions provides specific information to support the development of estimates of air emissions and maximum POI concentration

then, the ESDM report could refer the reader to these portions of the Report and the facility description may be expressed in a general manner including an overview of:

- what is produced;
- a summary of the overall facility production rate (or rates if multiple products are manufactured);
- an explanation of how the production rate(s) relate to the operating conditions that are used to estimate emissions and predict the maximum POI concentration;
- for example, a statement within a facility description might indicate that "a maximum of 'x widgets' per day are produced where the applicable standard has a 24-hour averaging period and operating conditions, air contaminant emission rate estimates and corresponding predictions of POI concentrations contained in this ESDM report are either directly or indirectly related to this production rate";
- the basic unit processes (including a simplified process flow diagram), that are relevant to the air contaminants emitted from the facility;
- the raw materials that are most relevant to estimating air emissions; and
- the overall facility production periods that will assist in defining the appropriate averaging periods for the operating conditions. For example, to assess compliance with a standard that has a 24-hour averaging period, it would be relevant to include the daily production at the facility.

Please refer to Chapter 8 of this Procedure Document for a more detailed discussion of information required to describe the relevant operating conditions.

Providing the NAICS Code or Codes for the Facility

It is also recommended that the Facility Description of an ESDM report include the North American Industry Classification System (NAICS) code or codes that are applicable to the facility. This information is provided by companies when they report their air emissions under Ontario Regulation 127/01 – Airborne Contaminant Discharge Monitoring and Reporting and when reporting to the National Pollutant Release Inventory (NPRI) requirements from Environment Canada. The NAICS codes are maintained for Canada by Statistics Canada and may be amended from time to time. See www.statcan.ca/english/concepts/industry.htm#1. Alternatively, the following Industry Canada web-site also includes descriptions for the various NAICS code sectors and sub-sectors: http://www.ic.gc.ca/epic/site/cis-sic.nsf/en/h_00004e.html

CofA

Applying for a CofA

Applicants for a CofA must include a description of the facility however applicants are only required to provide a description of the facility that contains sources that emit contaminants in common with the sources that are the subject of the application itself.

6.0 INITIAL IDENTIFICATION OF SOURCES AND CONTAMINANTS

The purpose of this portion of an ESDM report is to provide an initial listing of the contaminants and individual sources of contaminants at the facility according to paragraphs 2 through 5 of subsection 26(1) of the Regulation:

Under Subsection 26(1) of the Regulation – Contents of ESDM report:

"2. Subject to subsections (2) and (3), a list of all contaminants that are discharged from the property and, for each of those contaminants, a list of all the sources of contaminant that are located on the property.

3. For each source of contaminant listed for a contaminant under paragraph 2,

i. a description of the source of contaminant, including the location of the source of contaminant,

ii. an indication of whether the source of contaminant was considered when using an approved dispersion model in respect of the contaminant for the purpose of this section, and

iii. if, pursuant to section 8, the source of contaminant was not considered when using an approved dispersion model in respect of the contaminant for the purpose of this section, an explanation of how it was determined that the source of contaminant discharges a negligible amount of the contaminant.

4. Subject to subsections (2) and (3), a list of all contaminants that are discharged from the property in an amount that is not negligible.

5. For each contaminant listed under paragraph 2 that is discharged from the property in an amount that is negligible, an explanation of how it was determined that the amount is negligible."

Please note that if a person wishes to account for every source and every contaminant in an ESDM report, it is acceptable to do so. However, where a person wishes to assess significance, the steps described in Chapter 7, Assessment of the Significance of Contaminants and Sources, are intended to focus the initial list into an identification of the significant[6] sources and contaminants for a more detailed analysis of emissions and POI concentrations. As a result, the guidance provided in Chapters 6 and 7 of this Procedure Document can generally be used together to satisfy the requirements of paragraphs 2 through 5 of subsection 26(1). In particular, it is recommended that the requirements of paragraph 2; subparagraphs 3 i and 3 ii and paragraph 4 of subsection 26 (1) of the Regulation be presented in a Sources and Contaminants Identification Table which includes, for each source and contaminant emitted from the facility:

- A listing of all sources on the property, including a brief description of the source or a source title; a general location (i.e., building or description of portion of property where the source can be found); and, optionally, a source identifier.

- A listing of all contaminants that may be discharged from the facility. In most cases, for the purposes of the initial listing of all sources and contaminants within a Sources and Contaminants Identification Table, it is sufficient to identify the types of contaminants (e.g., "by-products of combustion"; "volatile organic compounds"; "suspended particulate matter"; etc.)[7]. However, if some contaminants are not considered in the dispersion modelling then a specific listing of these contaminants (and not just the types of contaminants) would need to be included as part of the explanation, required by paragraph 5 of subsection 26 (1) of the Regulation, on how it was determined that these contaminants were emitted in an amount that is negligible.

- Optional: A reference to the method that was used to identify the expected contaminants (see Table 6-2, Reference Information to Assist in Identifying Contaminants).

- An indication of whether a contaminant is discharged from the facility in a negligible amount;

- An indication of whether a source discharges a negligible amount of a contaminant and, consequently, whether the source has been considered in the use of the approved dispersion models.

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6 For the purposes of the guidance information contained in this Procedure Document, the term 'insignificant' is synonymous with 'negligible' and 'significant' is synonymous with the term 'not negligible'.

7 Since the Source Summary Table (see Chapter 9.0 of this Procedure Document) includes a listing of the significant contaminants for each significant source, it is acceptable within the above-noted "Sources and Contaminants Identification Table" to include either a listing of the contaminants or a more generalized listing of the types of contaminants.

See Appendix D for an example format for a Sources and Contaminants Identification Table.

The rationale for excluding negligible sources and contaminants emitted in negligible amounts must be included in the ESDM report (e.g., in an appendix to the report).

CofA

Applying for a CofA

Consistent with subsection 22(2) of the Regulation, applicants for a CofA are required to list only those contaminants that are relevant to the application for CofA.

Example: representatives for a facility, that emits contaminants A, B and C in significant quantities, submit an application for CofA for modifications to the facility that relate to contaminant A. The ESDM report submitted as supporting information for the application is only required to include the sources of contaminant A.

It should be noted that, consistent with subsection 30(6.1) of the Regulation, ESDM reports that are required as a result of an exceedence of an Upper Risk Threshold listed in Schedule 6 of the Regulation (see in subsection 30(4) of the Regulation) are required to consider only those contaminants for which an Upper Risk Threshold is predicted to be exceeded.

6.1 Identifying Sources

For the purposes of this guideline, reference to the term “source” includes an individual point of emission or a distinct process or area from which emissions may originate.

Where multiple stacks or vents arise from a common process, the process itself may be considered a source rather than the individual points of emission. Where several separate processes, each causing a distinct mixture of contaminants, are discharged to a common stack, the original separate processes should each be considered a source. A process is a production step or series of production steps for which an emission rate is calculated based on assessing the process as a whole.

Sources shall be considered regardless of when a source was installed or whether or not approval under section 9 of the EPA was obtained for that source.

However, sources that are exempt from obtaining a CofA do not need to be identified or listed (see http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_980524_e.htm

for a copy of Ontario Regulation 524/98 – Certificate of Approval Exemptions – Air).

CofA

Applying for a CofA

Applicants for a Certificate of Approval under Section 9 of the EPA are required to document only those sources that emit contaminants in common with the sources that are the subject of the application itself.

6.1.1 Fugitive Sources

A source associated with an area rather than a distinct point of emission is known as a fugitive source. In addition, a fugitive emission source can be as a source whose emissions are not emitted through a confined process stream. In general, fugitive sources should be included in the list or in the Sources and Contaminants Identification Table. Some examples of fugitive sources are:

- leakage of gaseous contaminants from valves or pipes;
- leaks of contaminants around process operations;
- particulate emissions from roof vents on a process building;
- particulate emissions from storage piles or open material conveying; and
- particulate emissions from travel over on-site unpaved roadways, paved roadways and parking lots for the sectors identified in Table 6-1.

Where fugitive air emissions may originate from a relatively large number of individual sources, it may be reasonable to group fugitive emissions together for the purposes of identification, emission rate estimating and dispersion modelling. See Chapter 7.4 for more information on fugitive emissions.

Table 6-1: Sectors that Should List Roadways as a Source of Air Emissions

NAICS Code	NAICS Code Description
2122	Metal Ore Mining
2123	Non-Metallic Mineral Mining and Quarrying
221112	Fossil-Fuel Electric Power Generation (coal-fired only)
321113	Sawmills
3212	Veneer, Plywood and Engineered Wood Product Manufacturing
324121	Asphalt Paving Mixture and Block Manufacturing
327310	Cement Manufacturing
327320	Ready Mix Concrete Manufacturing
327330	Concrete Pipe, Brick and Block Manufacturing
327390	Other Concrete Product Manufacturing
327410	Lime Manufacturing
327420	Gypsum Product Manufacturing
331	Primary Metal Manufacturing
332	Fabricated Metal Product Manufacturing
5622	Waste Treatment and Disposal (landfills only)

This Table contains two columns. The first column contains the North American Industrial Classification System (NAICS) Code and the second column contains the corresponding NAICS Code Description.

6.2 Description of the Contaminants that May be Discharged

Contaminants that may be discharged from the facility must be identified and this may be accomplished, in most cases, using generally available information such as guidance on air emissions that is published by environmental regulatory agencies; peer-reviewed documents; or industry sponsored studies. An indication of whether or not the study was validated by a regulatory agency or an independent third party should be provided when referencing industry sponsored studies. See Table 6-2 for specific examples of reference information that can be used to identify the expected contaminants.

All contaminants that may be discharged to the air from the facility must be included in an ESDM report, even if there is no MOE POI Limit.

For further information on assessing the significance of sources and contaminants please see Chapter 7 of this Procedure Document.

Table 6-2: Reference Information to Assist in Identifying Contaminants

Material Balances: Material Safety Data Sheets for materials used in process

Emission Factor Documents and Reports.
The United States Environmental Protection Agency (US EPA) publishes a variety of emissions related information to assist facilities in assessing impacts. This information is often used to assess emission rates from various production processes. Although it is reasonable to use site or sector-specific studies as a means of identifying the expected contaminants emitted from various sources, the following references are also commonly used and widely available:

i) Emission Factors published in the US EPA Document Number AP-42 (www.epa.gov/ttn), Compilation of Air Pollutant Emission Factors. This document includes process description and emission factors for a broad range of criteria contaminant emission sources. Supplements are published regularly.

ii) Factor Information Retrieval (FIRE) Data System; www.epa.gov/ttn/chief/software/fire/index.html . The FIRE Data System (from the US EPA) is a database that can be used in an initial effort to identify contaminants. Note: although the FIRE Data system can be used to identify contaminants from a variety of sources, the quality of the emission factors listed in this system varies.

iii) Locating and Estimating (L&E) documents for specific contaminants (see www.epa.gov/ttn/chief). The L&E report series, are for specific air toxic emissions from sources (source category or substance) and characterizes the source categories for which emissions of a toxic substance have been identified. These volumes include general descriptions of the emitting processes, identifying potential release points and emission factors. The L&E series presently contains emission reports for the following contaminants: Acrylonitrile, Arsenic, Benzene, 1,3 Butadiene, Cadmium, Carbon Tetrachloride, Chlorobenzene, Chloroform, Chromium, Cyanide, Dioxins and Furans, Epichlorohydrin, Ethylene Dichloride, Ethylene Oxide, Formaldehyde, Lead, Mercury, Methyl Chloroform, Methyl Ethyl Ketone, Methylene Chloride, Nickel, Perchloroethylene, Phosgene, Polycyclic Organic Matter, Styrene, Toluene, Vinylidene Chloride and Xylene.

iv) U.S. state environmental agencies also publish information such as the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Officials (ALAPCO) (www.cleanairworld.org/).

v) Guidance and emission rate estimating information provided by the Ontario Ministry of the Environment for Regulation 127/01 - Airborne Contaminant Discharge Monitoring and Reporting (see http://www.ene.gov.on.ca/envision/monitoring/monitoring.htm) and provided by Environment Canada for reporting to the National Pollutant Release Inventory (see www.ec.gc.ca/pdb/npri/npri_home_e.cfm).

vi) Contaminants identified from site-specific source testing and/or industry sponsored studies.

vii) In addition to the above, other information from regulatory agencies in a variety of jurisdictions is also available including Environment Canada; Australia (www.deh.gov.au/); and the European Union (www.europa.eu.int/comm/environment/index_en.htm); etc.

This table contains just one column, and is intended to emphasize its contents.

6.3 General Location

The location of each source identified at the facility must be provided. The intent is to ensure that MOE staff are able to locate the source either on a site plan or in a site visit. It is acceptable at this stage of the ESDM report to provide a general location such as building number or process area.

6.4 Overview of Identifying and Assessing Sources and Contaminants

The following summarizes, in broad terms, the approach to initially identify sources and contaminants emitted from the facility; and to provide an analysis that is focused upon the significant sources and contaminants:

i) Identify the sources and contaminants emitted from the facility (for guidance, see reference material in Table 6-2 of this Procedure Document).

ii) Document the sources and contaminants in a Sources and Contaminants Identification Table or Tables.

iii) It is optional to assess the significance of sources and contaminants, but if an assessment of significance is made, it must be documented (see Chapter 7 of this Procedure Document).

iv) Develop emission rates for the significant contaminants and sources based upon a review of operating conditions (see Chapter 8 of this Procedure Document).

v) Document the emission rates and source parameters for the significant contaminants and sources in a Source Summary Table (see Chapter 9).

vi) Complete the dispersion modelling for the significant contaminants and sources (see Chapter 10).

vii) Document the results of the dispersion modelling in an Emission Summary Table (see Chapter 11).

7.0 ASSESSMENT OF THE SIGNIFICANCE OF CONTAMINANTS AND SOURCES

Please note that if a person wishes to account for every source and every contaminant in an ESDM report, it is acceptable to do so. However, a person may choose to assess the significance of sources and contaminants and eliminate negligible ones from further analysis. This approach may allow a facility to focus on a more detailed analysis of emissions and POI concentrations of the significant contaminants and sources.

Where a person opts to focus on the significant sources and contaminants, the ESDM report must provide an explanation of how it was determined that a contaminant is discharged from the facility in a negligible amount and/or that a source discharges a contaminant in a negligible amount. The results of the assessment may be summarized in a Sources and Contaminants Identification Table.

Note that although a facility may emit a contaminant in a significant amount, there may be some sources that emit this contaminant in a negligible amount. Section 8 of the Regulation provides the authority to focus on significant contaminants and sources and is set out below.

Negligible Sources of Contaminant

"8. (1) It is not necessary, when using an approved dispersion model for the purposes of this Part, to consider a source of contaminant that discharges a negligible amount of the relevant contaminant, having regard to,

(a) the total amount of the contaminant that is discharged by all the sources of contaminant with which the approved dispersion model is used; and

(b) the nature of the contaminant.

(2) Despite subsection (1), the Director may give written notice to a person who discharges or causes or permits discharges of contaminants requiring the person to consider a source of contaminant specified in the notice in accordance with the notice when the person uses an approved dispersion model for the purposes of this Part, if,

(a) the Director has reasonable grounds to believe that, if the source of contaminant is considered, the person may contravene section 18, 19 or 20; or

(b) sections 18, 19 and 20 do not apply to discharges of the relevant contaminant and the Director has reasonable grounds to believe that, if the source of contaminant is considered, a discharge of the relevant contaminant may cause an adverse effect.

(3) Before the Director gives a person a notice under subsection (2), the Director shall give the person a draft of the notice and an opportunity to make written submissions to the Director during the period that ends 30 days after the draft is given."

Section 26 of the Regulation sets out the documentation requirements for any assessment of significance that is performed. Sub-paragraph 3ii of subsection 26(1) requires that the ESDM report include an indication of whether a source of contaminant was considered when using an approved dispersion model, which relates to section 8 above.

In addition, paragraph 4 of subsection 26(1), of the Regulation requires that the ESDM report include a listing of contaminants that are emitted in significant amounts (for clarity, contaminants emitted in negligible amounts do not need to be included in the list for the dispersion modelling).

Subparagraph 3iii and paragraph 5 of subsection 26(1) require an explanation of how it was determined that contaminants and sources were considered negligible. Certain other paragraphs under subsection 26(1) require only the significant contaminants and sources to be included (e.g. in the description of operating conditions, the explanation and assessment of emissions, the source summary table, the site plan, the identification of the approved dispersion model and the emission summary table).

In summary, the combination of section 8 and paragraphs 3 thru 9 and paragraph 11 of subsection 26(1):

- allow for the exclusion of negligible contaminants and sources from both the use of the models and certain portions of the ESDM report (note that paragraph 2 of subsection 26(1), requires all sources and contaminants to be listed); and

- require an explanation of how it was determined that a contaminant is emitted in a negligible amount or a source of contaminant discharges a negligible amount of the contaminant.

Chapter 6 provides guidance on the initial listing of all sources and contaminants. The rationale for excluding insignificant sources and contaminants emitted in negligible amounts must be included in the ESDM report (e.g., in an appendix to the report). The following three options have been developed to provide guidance in assessing the significance of sources and contaminants and thereby eliminating negligible sources and contaminants from further analysis:

i) Screening-Out Contaminants that are Emitted in Negligible Amounts (refer to Chapter 7.1)

ii) Screening-Out Sources that Emit Contaminants in Negligible Amounts (refer to Chapter 7.2)

iii) Generalized Guidance to Identifying Insignificant or Significant Sources and Contaminants (refer to Chapter 7.3)

However, in an effort to ensure that ESDM reports are comprehensive enough to identify any exceedences of MOE POI Limits, the MOE may, as a result of site-specific considerations and consistent with subsection 8(2) of the Regulation, require the inclusion of sources that were originally considered insignificant.

In addition, fugitive dust emissions from on-site road-ways and storage piles may be excluded from use with the approved dispersion models under the special circumstances set out in Chapter 7.4 Fugitive Dust Emissions from On-Site Roadways and Storage Piles.

CofA

Applying for a CofA

The identification of a source or contaminant as negligible for the purposes of an ESDM report does **not** imply exemption from the need to obtain a CofA required under Section 9 of the EPA.

7.1 Screening-Out Contaminants that are Emitted in Negligible Amounts

The significant contaminants for some types of sources can be readily defined. One method of identifying significant contaminants is to use emission thresholds (See Chapter 7.1.2). Appendix B and Table B-1 provide guidance on using dispersion factors to screen-out contaminants. Another method of identifying significant contaminants is to use the MOE`s list of de minimus concentrations for contaminants that do not have MOE POI Limits. This list can be found in Table B-2B. .

7.1.1 Combustion of Natural Gas and Propane

The significant contaminant from the combustion of natural gas and propane is typically nitrogen oxides. Other contaminants, for this type of source, are generally emitted in negligible amounts.

7.1.2 Identifying Significant Contaminants Using an Emission Threshold

In most cases, contaminants that are emitted from a specific facility may be identified as negligible when they are below emission thresholds that are developed using the following formula:

$$\text{Emission Threshold (g/s)} = \frac{0.5 \times \text{MOE POI Limit } (\mu g/m^3)}{\text{Dispersion Factor } (\mu g/m^3 \text{ per g/s emission})}$$

Aggregate facility-wide emissions of a contaminant that are less than the calculated site-specific Emission Threshold may be considered negligible.

Notes for Development of Emission Thresholds:

i) The averaging period for the Emission Threshold calculation must be consistent. The averaging period for the MOE POI Limit and the dispersion factor must be the same (see following example of developing site-specific emission thresholds).

ii) The appropriate MOE POI Limit can be obtained from the MOE list of point of impingement standards and guidelines, available from the MOE website[8].

[8] For the purposes of identifying a contaminant/source as insignificant, the JSLs may also be used.

iii) Where a contaminant has more than one MOE POI Limit, multiple emission thresholds must be calculated The emission threshold(s) can be converted to the appropriate averaging period (e.g., mass per 24-hour period for a MOE POI Limit with a 24-hour averaging period).

iv) See Appendix B, Table B-1 for a Table of Dispersion Factors that are dependent upon distance from the source to the closest POI (use the source that has a POI closest to it, for multiple sources of a contaminant) and have been developed, on a maximum 1-hour average basis, by the MOE using a conservative set of assumptions. These factors can be converted to other averaging periods (to remain consistent with the averaging period for the MOE POI Limit) using the formula set out in section 17 of the Regulation or the equivalent formula set out below in Table 7-1 Averaging Period Conversion Factor (F).

v) $\mu g/m^3$ means micrograms per cubic metre.

Table 7-1: Averaging Period Conversion Factor (F)

$C_0 = C_1 \times F$

where,

C_0 = the concentration at the averaging period t_0

C_1 = the concentration at the averaging period t_1

F = factor to convert from the averaging period t_1 to the averaging period t_0

$= (t_1/t_0)^n$

and where, the exponent n is 0.28, which is generally representative of average conditions across a range of atmospheric stabilities. Note that alternative values for the exponent n can be selected, if approved by the MOE.

This Table contains just one column, and is intended to emphasize its contents.

In most cases, Emission Thresholds for contaminants without MOE POI Limits may be developed using MOE recommendations for de minimus POI concentrations (24-hour average basis) that are set out in Appendix B (see Table B-2A and Table B-2B) of this document. These de minimus concentrations are only applicable to contaminants that are <u>not</u> included in the list of MOE POI Limits or in the JSL list. The appropriate use of other dispersion modelling screening tools, such as SCREEN3 in screening-mode, as described in the MOE document, “Air Dispersion Modelling Guideline for Ontario” (as amended from time to time) may also be used to assist in the development of Emission Thresholds.

Examples of Developing Site-Specific Emission Thresholds:

1. Contaminant is Xylenes (CAS # 1330-20-7) and Shortest Distance from a Number of Sources to the Property-Line (in an area classified as urban) is 50 metres

   i) Effects-based standard in Schedule 3 of the Regulation for Xylenes is 730 $\mu g/m^3$ (24-hour average).

   ii) The 1-hour average Dispersion Factor from Appendix B for 50 metres (interpolated) = 5450 $\mu g/m^3$ per g/s.

   iii) Dispersion Factor Converted to 24-hour average is 5450 x $(1/24)^{0.28}$ = 2238 $\mu g/m^3$ per g/s.

   iv) Site-Specific Emission Threshold for Xylenes:
   = 0.5 x (730/2238) = 0.16 g/s or 14 kilograms per 24-hour period.

   Therefore, in this situation, if facility-wide emissions of Xylenes are less than 14 kilograms in a 24-hour period they can, in most cases, be considered negligible.

7.1.3 Sub-Speciation of Contaminants

There are some MOE POI Limits (e.g., mineral spirits[9]) that represent a group of contaminants. In these cases, sub-speciation into the individual components is generally not required.

In addition, there may be situations where air emissions may be comprised of a complex mixture of a relatively large number of contaminants. For example, volatile organic compound emissions from petroleum refineries are comprised of a multi-component spectrum of compounds that make up the crude oil raw material input to the facility. In this or similar type of situation, it is reasonable to focus on those substances that have already been identified through other air emission reporting processes such as Regulation 127/01 and the federal National Pollutant Release Inventory (also known as, the "One Window to National Environmental Reporting System").

9 As defined in the Regulation, "mineral spirits" are petroleum distillate mixtures of $C_7 - C_{12}$ alkanes (paraffins) and cycloalkanes (naphthenes) ranging from 5 to 20 percent aromatics by weight and less than 0.1 percent benzene by weight with a boiling point ranging from 130 – 220 degrees Celsius and a flash point ranging from 21 – 60 degrees Celsius.

7.2 Screening-Out Sources that Emit Contaminants in Negligible Amounts

Although a facility may emit a contaminant in a significant amount, there may be some sources that emit this contaminant in a negligible amount. The following chapters provide guidance to screen-out sources of contaminants emitted in negligible amounts.

7.2.1 Specific Examples of Sources that Emit Contaminants in Negligible Amounts

Appendix B, Table B-3 lists examples of sources that typically emit contaminants in negligible amounts. In general, these sources can be considered negligible.

7.2.2 Sources that are Insignificant Relative to Total Emissions

As indicated in section 8 of the Regulation, it may not be necessary to consider a source of contaminant that discharges a negligible amount of the relevant contaminant, having regard to the total amount of the contaminant that is discharged by all the sources of contaminant and to the nature of the contaminant.

Sources that, in combination, represent less than 5% of total property-wide emissions of a contaminant can, in many cases, be considered negligible sources.

There are some exceptions to this general concept and as such, the MOE may require, on a case-by-case basis, the inclusion of sources that would typically be considered insignificant relative to property-wide emissions of the contaminant. For example, a source would be required to be included in an ESDM report where it emits a relatively small amount of a contaminant, but is the main contributor to the POI concentration due to the close proximity of the source to the POI or poor atmospheric dispersion. Similarly, an otherwise negligible source may be required to be included in the ESDM report where there is concern about the nature of the contaminant.

7.3 Generalized Guidance to Identifying Insignificant or Significant Sources and Contaminants

Facility-specific assessments, within ESDM reports, of the significance of sources and contaminants can be developed and proposed but they should be submitted to the MOE Standards Development Branch (see Foreword to this document for contact information) for review. Any facility-specific assessment is required to be consistent with the Regulation (in particular, section 8 and paragraphs 3 thru 5 of sub-section 26 (1), of the Regulation). This site-specific assessment of significance can be based on either qualitative or quantitative arguments or a combination of both.

Decisions that are made by the MOE on facility-specific proposals may be communicated to others, after being generalized to remove proprietary information.

In addition, the MOE may, in cooperation with representatives of various industry sectors, develop sector-specific guidance to assist in identifying the significant sources that need to be included in an ESDM report. Sources not identified as significant could then be considered negligible.

7.4 Fugitive Dust Emissions from On-Site Roadways and Storage Piles

Fugitive dust emissions from on-site roadways and storage piles can be significant when the dust includes contaminants with health-based MOE POI Limits or the emissions are likely to be relatively great. However, in many situations, fugitive dust emissions from on-site roadways and storage piles are insignificant. In other cases, the most appropriate manner in which to manage POI concentrations from these types of sources is through an effective best management practices plan. As a result, generally, fugitive dust emissions from on-site roadways and storage piles may be excluded from the dispersion modelling assessment of compliance with MOE POI Limits, where:

i) the nature of the fugitive dust emissions is such that they are not likely to pose a health risk to humans; and

ii) the emissions are relatively small or have been minimized through effective implementation of a fugitive dust control plan, consistent with best management practices.

7.4.1 Special Case: Consideration of a Best Management Practices Plan for Fugitive Dust from On-Site Roadways and Storage Piles

Fugitive particulate from on-site roadways and storage piles (that are susceptible to wind erosion) must be included in an ESDM report when the particulate contains

significant quantities of contaminants (e.g., metals) that contribute to an MOE POI Limit that may cause a health effect. As set out below, in certain circumstances fugitive particulate does not have to be included in the ESDM report if the facility has implemented a best management practices approach to fugitive dust.

1. Sectors where metals in fugitive dust must be considered

It is anticipated that the fugitive particulate from roadways and storage piles emitted by facilities within the sectors listed in Table 7-2 may contain significant quantities of metals. Metals have health-based MOE POI Limits or, where no limit exists, metals may cause adverse health effects. Accordingly, fugitive particulate from on-site roadways and storage piles from facilities within these sectors must be included in the assessment of compliance when using an approved model unless the facility:

1. implements a best management practices (BMP) plan;
2. includes a BMP plan as an Appendix to the ESDM report;
3. retains a BMP plan and implementation on-site for inspection by the MOE); and,
4. demonstrates the following for each contaminant emitted from the roadways and storage piles that has a health-based MOE POI Limit (or may cause health effects):
    a. that the combined maximum POI concentration from all sources (including fugitive dust from roadways and storage piles) is less than 90% of the MOE POI Limit; and
    b. that the total contribution of all insignificant sources is less than 10% of the MOE POI Limit.

Table 7-2: List of Sectors Where Metal Content within Fugitive Particulate must be Considered

NAICS Code	NAICS Code Description
2122	Metal Ore Mining
331	Primary Metal Manufacturing
332	Fabricated Metal Product Manufacturing

This Table contains two columns. The first column contains the North American Industrial Classification System (NAICS) Code and the second column contains the corresponding NAICS Code Description.

The MOE may, on a case-by-case basis, require any facility to assess the significance of components of fugitive particulate based upon site-specific conditions.

2. Sectors where metals in fugitive dust is generally not anticipated

Fugitive dust emitted from facilities in the sectors listed in Table 7-3 is generally not anticipated to contain significant quantities of metals. Nevertheless, fugitive particulate from on-site roadways and storage piles from facilities within the sectors

listed in Table 7-3 must be included in the assessment of compliance with MOE POI Limits unless the facility:

1. implements a BMP plan;
2. includes a BMP plan as an Appendix to the ESDM report; and
3. retains a BMP plan and implementation on-site for inspection by the MOE.

It should be noted that proponents may be asked to include sources of fugitive dust in the ESDM report if the best management practices plan is not acceptable to the MOE.

Table 7-3 List of Sectors where Metals in Fugitive Particulate is Generally Not Anticipated

NAICS Code	NAICS Code Description
2123	Non-Metallic Mineral Mining and Quarrying
221112	Fossil-Fuel Electric Power Generation (coal-fired only)
321113	Sawmills
3212	Veneer, Plywood and Engineered Wood Product Manufacturing
324121	Asphalt Paving Mixture and Block Manufacturing
327310	Cement Manufacturing
327320	Ready Mix Concrete Manufacturing
327330	Concrete Pipe, Brick and Block Manufacturing
327390	Other Concrete Product Manufacturing
327410	Lime Manufacturing
327420	Gypsum Product Manufacturing
5622	Waste Treatment and Disposal (landfills only)

This Table contains two columns. The first column contains the North American Industrial Classification System (NAICS) Code and the second column contains the corresponding NAICS Code Description.

Appendix F of this document includes a review of approaches to manage industrial fugitive dust sources. The suggested approaches in Appendix F can be modified and customized based upon site-specific considerations including the proximity of receptors and based upon input by MOE staff.

7.4.2 When Fugitive Dust Emissions from On-Site Roadways and Storage Piles are Insignificant

Fugitive dust emissions from roadways and storage piles may generally be considered to be a negligible source for facilities within sectors that are not included in Table 7-2 and 7-3.

8.0 OPERATING CONDITIONS, EMISSION RATE ESTIMATING AND DATA QUALITY

Facility operating conditions affect contaminant emission rates and emission rates are key inputs to the use of the approved models and assessment of POI concentrations. The purpose of this portion of an ESDM report is to document both the facility operating conditions (that are relevant to estimating emission rates) and the development of emission rate estimates for the significant air contaminants discharged from the facility.

Section 10 of the Regulation relates to facility operating conditions. Section 11 sets out the requirements for emission rates. In general, section 12 sets out the requirements to "refine" emission rate estimates[10] when the combined effect of sections 10 and 11 result in predictions of exceedences of MOE POI Limits. In summary, sections 10, 11 and 12 of the Regulation work together to ensure that the assessment of maximum POI concentration are as accurate as possible and do not under-estimate actual concentrations.

8.1 Operating Conditions

Operating conditions provide key information to the development of emission rate estimates (i.e., operating conditions provide production data that translates an emission factor into an emission rate estimate). Subsection 10(1) of the Regulation states:

[10] Also note that section 12 of the Regulation allows a person to abate as an alternative to refining.

Operating Conditions

"10. (1) An approved dispersion model that is used for the purposes of this Part shall be used in accordance with one of the following scenarios for each averaging period applicable to the relevant contaminant under section 18, 19 or 20, whichever is applicable:

1. ***A scenario that, for the relevant averaging period, assumes operating conditions for the facility that would result in the highest concentration of the contaminant at a point of impingement that the facility is capable of.***

2. ***A scenario that, for the relevant averaging period, uses actual operating data for the facility for the occasion when the highest concentration of the contaminant at a point of impingement resulted during,***

   i. ***the year preceding the year in which the model is being used; or***

   ii. ***the year in which the model is being used, if the facility did not operate at any time during the year referred to in subparagraph i."***

Subsection 10(1) of the Regulation allows a choice between the scenarios described in paragraphs 1 and 2 of this subsection. In other words, when using an approved dispersion model, a person may choose to assume conservative operating conditions or to use actual operating from the previous year. In situations, where the actual operating condition (e.g., from the previous year) is used to assess compliance with the MOE POI Limits, it will also be necessary to verify compliance according to the operating condition allowed by the most recent CofA.

Although subsection 10(1) allows a choice of operating conditions, section 12 of the Regulation may require the use of the scenario described in paragraph 2 of subsection 10 (1) if an exceedence of a standard results from the use of a scenario based upon paragraph 1 of this section (see subsection 12 (2) of the Regulation for an exception to this requirement and see Chapter 8.4 of this Procedure Document for more information on refinement of emission rates).

For paragraph 1 of subsection 10(1), the approved dispersion model must be used with operating conditions that result in the maximum POI concentration for each significant contaminant, according to the averaging period for the relevant MOE POI Limit corresponding to that contaminant. For example, a 24-hour average operating condition must be used when comparing to a MOE POI Limit that has a 24-hour averaging period. If a contaminant has more that one limit, then the operating conditions and averaging periods for all those limits must be assessed and included the ESDM report.

The operating condition that corresponds to the maximum POI concentration may occur when the facility is at the maximum production level or running at a lower production level or the process is in transition. Persons preparing an ESDM report must assess all operating scenarios to determine the scenario that results in the maximum POI concentration for that contaminant. The frequency and duration of an operating condition may also be considered in the analysis, depending upon the contaminant and effect. For example, focusing the analysis on steady-state operating conditions may be reasonable if there are no acute effects associated with the contaminant during transitional operating conditions and transitional operating conditions last only for a few hours a few times per year.

Determining the appropriate Operating Conditions should be based on the following:

- the averaging period for the MOE POI Limit(s) for the contaminant;
- information contained in the Facility Description of the ESDM report;
- simultaneous versus sequential operations and emission estimates that are based upon either design capacities or actual operating data; and
- technical and operational limitations on production.

To simplify the effort in selecting the operating condition that results in a maximum POI concentration for each significant contaminant, it may be possible to develop a common operating condition for similar contaminants. Operating conditions that are developed from an understanding of process interactions and operations may also simplify this task and result in common operating conditions for a variety of significant contaminants. The development of a "worst-case" scenario for a surface-coating production line that involves a large number of different coatings and solvents based on an understanding of process conditions and raw material usage is illustrated in the example on Table 8-1 under scenario "surface coating operation". Paragraph 6 of subsection 26(1) of the Regulation states the following regarding the documentation of operating conditions within an ESDM report:

Under Subsection 26(1) of the Regulation – Contents of ESDM report:

"6. For each contaminant listed under paragraph 4, a description of the operating conditions that were used in accordance with section 10 when using an approved dispersion model in respect of the contaminant for the purpose of this section."

To summarize, in accordance with paragraph 6, the ESDM report shall include a description of the operating condition for each contaminant that is emitted in significant amounts. This description of the operating condition for each significant contaminant should:

i. identify each significant source (or group of sources) of the contaminant;

ii. describe the operating conditions of the significant sources that result in the maximum POI concentration for the contaminant, ensuring that the operating conditions correspond to the averaging period of the MOE POI Limit(s); and

iii. be based upon information contained in the Facility Description section of the ESDM report with consideration for simultaneous versus sequential operations and emissions; design capacities versus actual operating data; technical and operational limitations on production and the terms and conditions of CofAs issued to the facility.

Recent amendments to the Regulation require, in some cases, that ESDM reports be submitted with more than one operational scenario.

Subsection 30(5.2) of the Regulation – Upper risk thresholds:

(5.2) Despite subsection 10 (1), a person who prepares a report required by subsection 30(4) shall use an approved dispersion model in accordance with both of the scenarios described in subsection 10 (1), and the report shall set out separately the information relevant to each scenario.

Subsection 32(16.1) of the Regulation – Alteration of Standards:

(16.1) Despite subsection 10 (1), a person who prepares a report required by paragraph 1 of subsection 32(13) shall, for the contaminant that is the subject of the request, use an approved dispersion model in accordance with both of the scenarios described in subsection 10 (1), and the report shall set out separately the information relevant to each scenario.

ESDM reports prepared for URT exceedences (s.30) and Altered Standards (s.32) are required to assess both of the operating scenarios described in subsection 10(1) of the Regulation describing Operating Conditions, namely:

i. The conservative maximum operating scenario as set our in section 10(1) paragraph 1; and

ii. The scenario based on actual operating data from the previous year as set in section 10(1) paragraph 2.

Table 8-1 provides a series of examples of operating conditions that result in maximum POI concentrations for various types of operations. Table 8-2 provides a series of

examples for identifying operating conditions and developing emission rate estimates for different averaging periods.

CofA

Applying for a CofA

Applicants for an approval under Section 9 of the EPA are required to document operating conditions for only those significant contaminants (and relevant significant sources of these contaminants) that are the subject of the application itself. Any CofA that may be issued will be based on the Operating Conditions provided in the ESDM report.

Basic Comprehensive CofA holders may make modifications to the facility including updating the operating conditions as long as those modifications are in accordance with the conditions on the CofA and are within the Operating Envelope defined by the Basic Comprehensive CofA. For more information please see MOE guidance document, "Basic Comprehensive CofA User Guide PIBS #4391 dated April 2004" (or more recent version).

Table 8-1: Assessing Emissions at Operating Conditions that Result in Maximum POI Concentrations – Examples

Duplicate Processes/Equipment

A facility is approved for three equivalent pieces of equipment where two pieces of equipment are operating at any one time (the third is for back-up because of the importance of this equipment in maintaining overall facility production). The equipment emits contaminants that have air quality standards that are based upon chronic health-based effects.

In this situation, the ESDM report would include an assessment of emissions and POI concentrations at operating conditions where the two units are operating at the same time. The operating conditions must correspond to the averaging period of the relevant standards and selected such that the operating condition results in the maximum POI concentration.

If it appears that the facility is unconditionally approved to operate all three units and the compliance assessment suggests that operation should be limited to two units then there may be a need to amend the existing CofA.

Surface-Coating Operation

A painting operation uses a variety of paint coatings where the highest POI concentration for Contaminant X occurs under one set of paint coating and operational scenarios and the highest POI concentration for Contaminant Y occurs under a different set of paint coating and operational scenarios. In this case, the emissions and operating conditions that result in maximum POI concentrations would be based on a hypothetical paint coating that contains all relevant contaminants even though these contaminants are from different coatings.

Limitation of Peak Design Capacity

A facility or production unit has a peak design capacity but operational and/or technical limitations require that the facility can only achieve a continuous maximum operating condition that is 90% of peak design capacity. In this case, the relevant emission rate would be based on an operating condition of 90% of peak design capacity using averaging periods that are relevant to the various MOE POI Limits because this is the maximum allowable operating condition. The ESDM report should include an explanation and justification for the limitations on achieving design capacity.

Simultaneously Operating Sources with Varying Levels of Emission

A facility may contain a number of processes simultaneously emitting a contaminant where there is a statistically measurable variability to the processes and emissions. In this case the relevant operating condition and emission scenario would be developed using the highest emission from the source with the greatest contribution to the maximum POI concentration of the contaminant in combination with a statistical assessment of average emissions from all other simultaneously operating processes. The operating condition must correspond to the averaging period for each relevant MOE POI Limit.

This Table contains just one column, and is intended to emphasize its contents.

Table 8-2: Assessing Emissions at Operating Conditions that Result in Maximum POI Concentrations for Different Averaging Periods - Examples

Using the Models in the Appendix to Regulation 346: Emission rates based on an operating condition, averaged over a ½ hour period that results in the maximum POI concentration must be developed as an input to the models. Output from the dispersion models must be compared to the ½-hour average MOE POI Limits, including standards in Schedule 1 of the Regulation (up until January 31st, 2010) and Schedule 2 (beginning February 1, 2010).

Using SCREEN3, ISCPRIME or AERMOD in comparison to 1-hour average effects-based MOE POI Limits: Emission rates based on an operating condition, averaged over a 1-hour period, that results in the maximum POI concentration must be developed as an input to the models. Output from the dispersion models must be compared to the 1-hour average effects-based MOE POI Limits, including standards in Schedule 3 of the Regulation.

Using SCREEN3, ISCPRIME or AERMOD in comparison to 24-hour average MOE POI Limits: Emission rates based on an operating condition, averaged over a 24-hr period, that results in the maximum POI concentration must be developed as an input to the models. Output from the dispersion models must be compared to the 24-hour average MOE POI Limits, including 24-hour average effects-based standards in Schedule 3 of the Regulation.

The SCREEN3 dispersion model is only able to predict 1-hour average concentrations. These 1-hour results can be converted to a 24-hour average concentration by using the averaging period conversion factor set out in section 17 of the Regulation*. In this case, emission rates would correspond to a maximum 24-hour average operating condition. Annual average emission rates must not be used as modelling inputs.

Using SCREEN3, ISCPRIME or AERMOD in comparison to "X" – hour average effects-based MOE POI Limits: Emission rates based upon an operating condition, averaged over an X-hour period, that results in the maximum POI concentration must be developed as an input to the models. Output from the dispersion models must be compared to the "X"-hour average effects-based MOE POI Limits, including the standards in Schedule 3 of the Regulation. This example is intended to illustrate that when using the appropriate dispersion model, the averaging period of the operating condition that represents the maximum POI concentration must be consistent with the averaging period of the corresponding MOE POI Limits.

* Or the equivalent method set out in Table 7-1 in Chapter 7.1.2 of this Procedure Document.

Note: For the Ministry's recommended methodology for assessing contaminants with 10-minute average standards and guidelines, refer to the MOE Technical Bulletin "*Methodology for Modelling Assessments of Contaminants with 10-Minute Average Standards and Guidelines under O.Reg.419/05*", as amended.

This Table contains just one column, and is intended to emphasize its contents.

Optional: It may be useful for ESDM reports to include an assessment of emission rates and POI concentrations for different operating conditions (in addition to the assessment at operating conditions that result in the maximum POI concentration). For instance, it may be useful to assess at typical operating conditions and at actual

operating conditions that resulted in the maximum POI concentration with in the last two years.

It would also be useful to include a discussion of the frequency and duration of maximum POI concentration at the various operating conditions assessed. This additional information will be particularly important in assessing the significance of any exceedences of a MOE POI Limit. For more information on assessing frequency of exceedences see Chapter 4.5 of the MOE document "Guideline for Implementation of air Standards in Ontario (GIASO)" (as amended) and Chapter 3.5 of "Guide to Requesting an Altered Air Standard ", (as amended).

8.2 Emission Rate and Estimation Techniques

Subsection 11(1) of the Regulation states:

Source of Contaminant Emission Rates

"11. (1) An approved dispersion model that is used for the purposes of this Part shall be used with an emission rate that is determined in one of the following ways for each source of contaminant and for each averaging period applicable to the relevant contaminant under section 18, 19 or 20, whichever is applicable:

1. ***The emission rate that, for the relevant averaging period, is at least as high as the maximum emission rate that the source of contaminant is reasonably capable of for the relevant contaminant.***

2. ***The emission rate that, for the relevant averaging period, is derived from site-specific testing of the source of contaminant that meets all of the following criteria:***

   i. ***The testing must be conducted comprehensively across a full range of operating conditions.***

   ii. ***The testing must be conducted according to a plan approved by the Director as likely to provide an accurate reflection of emissions.***

   iii. ***The Director must be given written notice at least 15 days before the testing and representatives of the Ministry must be given an opportunity to witness the testing.***

   iv. ***The Director must approve the results of the testing as an accurate reflection of emissions.***

3. ***The emission rate that, for the relevant averaging period, is derived from a combination of a method that complies with paragraph 1 or 2 and ambient monitoring, according to a plan approved by the Director as likely to provide an accurate reflection of emissions."***

In summary, the emission rate estimating must be either:

- "conservative"[11], as represented by paragraph 1 of subsection 11(1); or

[11] For the purpose of this Procedure Document the term "conservative" refers to an estimated emission rate that is certain to be higher than the actual emission rate.

- as accurate as possible, as represented by the methodologies set out in paragraphs 2 and 3 of subsection 11(1).

The concepts of accuracy and conservatism in emission rate estimating work together. For example, the need for conservatism in the estimating technique should be inversely proportional to the degree of accuracy of the technique. The greater the accuracy, the less there is a need for conservatism in the emission rate estimating method.

In many cases, emission rate estimating is an iterative process where estimates start out conservative and are then refined to be more accurate and less conservative when earlier iterations result in a prediction of an exceedence of a MOE POI Limit. Although the emission rate estimating methodologies described in paragraph 2 and 3 of subsection 11(1) of the Regulation can be selected at any time, they also represent the end of the iterative or refinement process.

Paragraph 7 of subsection 26(1) of the Regulation requires that an ESDM report contain the following information with respect to emission rates:

Under Subsection 26(1) of the Regulation – Contents of ESDM report:

"7. For each source of contaminant identified under subparagraph 3 ii as a source of contaminant that was considered, with respect to a contaminant listed under paragraph 4, when using an approved dispersion model for the purpose of this section,

i. an explanation, for each averaging period used with respect to that contaminant and source of contaminant, of the method used to estimate the emission rate for the contaminant and source of contaminant,

ii. a sample calculation illustrating each method explained under subparagraph i, and

iii. an assessment of how accurately each method explained under subparagraph i estimates the emission rate, including an assessment of whether the method is more likely to overestimate or underestimate the emission rate and an assessment of how significant the overestimate or underestimate may be."

Chapters 8.2.1 through 8.2.4 of this Procedure Document provide information on four basic methods to estimate air emission rates and provide guidance on developing emission rates that are, in most cases, consistent with paragraph 1 of subsection 11(1) of the Regulation.

See Chapter 8.3 for guidance on the requirement to assess the accuracy of the emission rate estimating methodologies. See Chapter 8.4 for guidance on the requirements related to refinement of emission rates.

8.2.1 Emission Factors

Emission factors are typically constants (usually in mass emission per unit of production or mass of raw material input) which are applied to a process parameter or production rate to generate an emission rate. The most commonly used emission factors are those published by the United States Environmental Protection Agency (US EPA). The US EPA and other regulatory agencies use data from past source test campaigns to develop emission factors for a variety of industrial processes. When well-documented emission factors (e.g., such as the factors presented in US EPA guidance) are applied to a source that they were meant for; and applied in a manner that will result in a conservative estimate of emission rates then the use of emission factors is, in most cases, consistent with paragraph 1 of subsection 11(1) of the Regulation.

8.2.2 Mass Balance Calculations

A mass balance is an accounting of the material that enters and leaves from a process or reaction. Emissions resulting from many processes, such as painting or surface-coating, are a direct result (i.e., no chemical transformation through the process) of the raw material inputs to the processes. In these cases, emission rates can be estimated from the through-put of raw materials (e.g., paint and solvent usage).

Typically, mass balances that assume 100% of material usage is emitted to the air are simply accepted as reasonable where a follow-up “field verification” of material usages may be recommended depending on:

- the type of contaminants emitted;
- the magnitude of the POI concentrations relative to the relevant MOE POI Limit; and
- the presence of other evidence (e.g., odour complaints) of adverse effect.

In most cases, the use of a mass balance approach is consistent with paragraph 1 of subsection 11(1) of the Regulation where they: (i) are well documented (e.g., calculations are provided); (ii) are used for emissions that are not chemically transformed through the process; and (iii) account for all discharges/flows of the contaminant.

8.2.3 Source Tests

Source tests can be conducted at the facility to measure contaminant emission rates, which is required to prepare the ESDM report. Emission rates can also be

based on source tests conducted on another similar process. Emission rate estimates that are based on validated source tests are another acceptable approach to estimating emission rates. In order for the MOE to accept source test results, without further analysis, source tests should be validated. A MOE validated source test means:

- source testing methods were submitted to the MOE in a pre-test plan;
- the MOE accepted the pre-test plan;
- the MOE had an opportunity to witness the test; and
- the final report was reviewed and accepted by the MOE.

Source test results that have had over-sight from similar regulatory agencies may also be considered validated but proof of this validation should be documented in the ESDM report.

Results from un-validated source testing can be used to estimate emission rates but the quality of the estimates may be classified as uncertain. The quality of un-validated source testing can be improved through a review and comparison to other validated sources of information to demonstrate that the un-validated data is in the range of expected emission rates; or, if possible, through partial post-testing validation. See Chapter 8.3 Data Quality for further information. The use of source testing to estimate emission rates is, in most cases, consistent with ***paragraph 1*** (not paragraph 2) of subsection 11(1) of the Regulation when:

- source tests are validated;
- the source testing represents one specific operating condition; or
- sources tests are not validated but the results are comparable to other forms of validated emission rate information and are well documented (e.g., an executive summary that includes a summary of the sampling and analytical methodology; the name of the persons responsible for the testing; the process operating conditions that the tests were conducted under; the dates of testing; and a full test report that is available for review upon request).

When estimating emission rates according to ***paragraph 2*** of subsection 11(1) of the Regulation, source testing is required to be conducted comprehensively across a full range of operating conditions (as approved by representatives of the MOE during review of the pre-test plan) and validated according to subparagraphs 2 ii through 2 iv of subsection 11(1) of the Regulation.

8.2.4 Engineering Calculations

Emission rates can also be developed from fundamental scientific principles and measurements. In this case, an engineering estimate can be based on operating conditions, data from the literature, thermodynamic and physical properties. Included in this category of emission rate estimates are calculations based on direct source measurements that are neither considered validated source tests nor comparable to validated results, as noted above.

The use of derived formulae (sometimes in combination with accepted empirical data) is also an acceptable emission rate estimating method so long as the approach is based upon sound scientific and engineering principles and is well documented and referenced. When engineering calculations are based upon fundamental scientific principles or based upon a recognized empirical relationship (e.g., the MOE Spills Equation in Appendix C); are well documented (e.g., calculations are provided); then the use of engineering calculations is, in most cases, consistent with paragraph 1 of subsection 11 (1) of the Regulation.

See Appendix C for further guidance and reference material to assist with estimating emission rates.

8.3 Data Quality

Every emission rate estimate must include some quantification or qualification of the uncertainty of the estimation. For the purposes of this Procedure Document, the data qualification is referred to as Data Quality (i.e., the higher the quality of the data, the higher the accuracy and certainty of the emission rates and therefore assessment of POI concentrations).

This assessment of accuracy is necessary (i.e., required by subparagraph 7 iii of subsection 26 (1) of the Regulation) and is intended to avoid any underestimations that may result in a false prediction of compliance.

A “Data Quality” classification system, that provides an indication of the accuracy of the emission rate estimating methods used in the ESDM report, is set out in Chapter 8.3.1 through 8.3.4 of this Procedure Document. The basic concepts of the Data Quality classification system are: (i) that the accuracy of the emission rate estimate is directly proportional to the level of Data Quality and (ii) the “conservatism” of the emission rate estimate generally decreases with increasing Data Quality.

This Data Quality classification system may generally be used to assess the accuracy and conservatism of the emission rate estimating method, consistent with paragraph 7 iii of subsection 26 (1) of the Regulation. However, on a case-by-case basis, the MOE may request a more comprehensive assessment of the accuracy and the likelihood of an underestimated emission rate (as well as an

assessment of the significance of the error in the estimate). In addition, when there is sufficient data to quantify the range of expected emission rates (e.g., in the case of data from a continuous emission monitoring system) then it should be included in an ESDM report.

Example to Illustrate Concept of Data Quality
(for emission rate estimates that satisfy par. 1 of s. 11(1) of the Regulation)

In one situation, there are two different emission rate estimates (one higher than the other) where both emission rate estimates have the same data quality. Only the higher of the two emission rate estimates in this example can satisfy the requirements of paragraph 1 of subsection 11(1) of the Regulation.

In another situation, there are two different emission rate estimates where the lower emission rate estimate has a higher data quality than the greater emission rate estimate. In this case, the lower emission rate estimate would satisfy paragraph 1 of subsection 11(1) of the Regulation since it has higher data quality.

8.3.1 "Highest Data Quality" Emission rate estimating Techniques

- Combination of Ambient Monitoring and Dispersion Modelling: Site-specific emission rate estimating and air dispersion modelling in combination with ambient monitoring of contaminants, according to an approach that has been validated by representatives of the MOE, is anticipated to provide data of the highest qualityfor assessing POI concentrations. Appendix E of this Procedure Document contains further guidance on comparing the results of dispersion modelling and ambient monitoring in a combined modelling-monitoring analysis. This category is consistent with subsection 11(1) ***paragraph 3*** of the Regulation. A form is available on the MOE website to request approval of the modeling-monitoring plan (PIBs # 6323e) (as amended).

- Comprehensive and Validated Source Testing Over a Range of Operating Conditions: Emission rate estimates that are derived from comprehensive equipment-specific testing (e.g., source tests are conducted to measure contaminant emission rates over a range of operating conditions where process data was available and recorded; and result in a statistically significant data set), that have been sponsored and/or validated by a regulatory agency (as approved by the MOE), are anticipated to provide the highest quality estimates of emission rates and POI concentrations when estimating emission rates from the specific equipment that was tested. The use of validated continuous emission monitoring systems also represents "Highest Data Quality". This category is consistent with subsection 11(1) ***paragraph** 2* of the Regulation.

- Mass Balance: A mass balance technique can be considered to provide a Highest Data Quality estimate if:

    - 100% of the material balance is accounted for (e.g., 100% emitted to air);
    - it is reasonable to assume that the contaminants will not undergo a chemical transformation through the source/process;
    - the usage averaging period is similar to the averaging period for the air quality standard; and
    - the material usage information has been validated (e.g., through purchase records that are provided to the MOE upon request).

8.3.2 "Above-Average Data Quality" Emission rate estimating Techniques

- Validated Source Testing at One Specific Operating Condition: Emission rate estimates that are from validated source testing at one specific operating condition are anticipated to provide above-average quality of estimate of emission rates and POI concentrations.

- Mass Balance: A mass balance technique can be considered to provide emission rate estimates of above-average quality if:

    - 100% of the material balance is accounted for (e.g., 100% emitted to atmosphere);
    - it is reasonable to assume that the contaminants will not undergo a chemical transformation through the source/process; and
    - the usage averaging period is similar to the averaging period for the air quality standard.

- Emission Factors: Emission rate estimates that are developed from tests on a moderate to large number of sources where the source category population is sufficiently specific to minimize variability (e.g., US EPA, AP-42, emission factor quality rating of A or B) are anticipated to provide above-average quality of emission rate estimates.

- Engineering Calculations/Judgement: Emission rate estimates derived from fundamental scientific and engineering principles; and/or relevant empirical data can be considered above-average quality estimates if it is clear (e.g., the approach is recommended through MOE documentation) that the estimating technique will result in relatively conservative predictions.

8.3.3 "Average Data Quality" Emission Rate Estimating Techniques

- Emission Factors: Emission rate estimates that are developed from tests on a reasonable number of facilities where the source category population is sufficiently specific to minimize variability (e.g., US EPA, AP-42, emission factor

quality rating of C) are anticipated to provide average quality emission rate estimates.

- Engineering Calculations/Judgement: Emission rate estimates derived from fundamental scientific and engineering principles; and/or relevant empirical data can be considered average quality estimates.

- Partially Validated Source Testing at One Specific Operating Condition: emission rate estimates that are from source testing where the testing has only been partially validated (e.g., pre-test plan approval or post-testing assessment and documentation, by a regulatory agency, of the quality of the final source testing report) at a specific operating condition are anticipated to provide an average data quality estimate of emission rates.

8.3.4 "Marginal" or "Uncertain Data Quality" Emission Rate Estimating Techniques

- Un-Validated Source Testing at One Specific Operating Condition: emission rate estimates that are from un-validated source testing are considered to be of Uncertain Data Quality. The quality of un-validated source testing results can be up-graded to "Average Data Quality" through post-testing assessment (if enough information is available) by a regulatory agency or comparison of the test results to alternative sources of validated information (e.g., validated source testing on similar equipment and/or comparison to emission factors of at least average data quality).

- Emission Factors: Emission rate estimates that are developed from tests on only a small number of facilities where there is evidence of variability within the source category population (e.g., US EPA, AP-42, emission factor quality rating of D or E) and/or the emission factor rating is uncertain are considered to have uncertain data quality.

- Calculations/Judgement: Emission rate estimates derived from calculations where the scientific/technical integrity of the approach is uncertain are considered to have uncertain data quality.

In many cases, the use of emission rate estimating methodologies that are classified as Marginal or Uncertain Data Quality may be the only available method. Where the maximum POI concentration is not approaching the MOE POI Limit (i.e., the POI concentration is less than 10% of the respective limit), emission rate estimates of Marginal or Uncertain Data Quality, would be adequate. In most cases, where POI concentrations are more significant, emission rate estimates that are based on Marginal or Uncertain Data Quality may also be considered acceptable *provided these emission rate estimates have been altered to be sufficiently conservative*.

Depending upon the hazard associated with the contaminant and the magnitude of the POI concentrations, emission rate estimates that are identified as having Marginal or Uncertain Data Quality may warrant development of a range of estimated emission rates and POI concentrations and/or follow-up development of source-specific emission studies. In some cases, implementation of air pollution abatement may also be a reasonable requirement where Data Quality is Marginal or Uncertain and the likelihood and extent of exceedence of an air quality standard is high.

In the event that initial estimates of maximum POI concentration are above the MOE POI Limits then the above-noted Data Quality classification system also informs "refinement" to a higher level of accuracy in the predictions, as required by section 12 of the Regulation and as explained in Chapter 8.4: Refinement.

8.4 Refinement of Emission Rates

Development of emission rates and resulting POI concentrations can, in many cases, be an iterative process. Section 12 of the Regulation will determine the need for further refinement of emission rates. This section is entitled "Combined effect of assumptions for operating conditions and emission rates" and states:

Combined Effect of Assumptions for Operating Conditions and Emission Rates

"12. (1) Despite subsections 10 (1) and 11 (1), an approved dispersion model that is used for the purposes of this Part shall be used in accordance with a scenario described in paragraph 2 of subsection 10 (1) and with an emission rate determined in accordance with paragraph 3 of subsection 11 (1).

(1.1) Despite subsection (1), an approved dispersion model that is used for the purposes of this Part may be used in accordance with a scenario described in paragraph 2 of subsection 10 (1) and with an emission rate determined in accordance with paragraph 2 of subsection 11 (1) if the Director is of the opinion that the emission rate will be accurately determined.

(2) Despite subsection (1), an approved dispersion model that is used for the purposes of this Part may be used in another manner that is in accordance with sections 10 and 11 if,

(a) the use of the model does not indicate that discharges of the relevant contaminant from the property may result in a contravention of section 18, 19 or 20; or

(b) sections 18, 19 and 20 do not apply to discharges of the relevant contaminant and the use of the model does not indicate that discharges of the contaminant may cause an adverse effect.

(3) This section does not apply to a contaminant if a written abatement plan for discharges of the contaminant from the property has been prepared and submitted to a provincial officer in accordance with section 29."

If the results of an approved dispersion model indicate that discharges of a contaminant may result in an exceedence of an air quality standard or an adverse effect[12] then the modelling exercise is not complete. In order to run an approved dispersion model in accordance with the Regulation, section 12 must be complied with. Section 12 generally states that where an exceedence or adverse effect is indicated, one of the following requirements must be automatically completed:

1. Refinement: the approved dispersion model shall be used in conjunction with actual operating data in accordance with a scenario described in paragraph 2 of

[12] Where the Regulation uses language similar to "sections 18, 19 and 20 do not apply to discharges of the relevant contaminant and the use of the model does not indicate that discharges of the contaminant may cause an adverse effect" and language similar to "the discharge may cause an adverse effect" the person shall compare the concentrations to those listed in "Summary of Standards and Guidelines to support Ontario Regulation 419/05: Air Pollution – Local Air Quality" (as amended) to assess compliance. Assessment of contaminants without any MOE POI Limit must also be included. Please see MOE website at: http://www.ene.gov.on.ca/en/air/ministry/index.php.

subsection 10 (1) and emission rate estimating methods set out in paragraphs 3 in subsection 11(1) of the Regulation (i.e., highest data quality emission rate estimates) (unless the Director accepts a submission under paragraphs 2 in subsection 11(1) of the Regulation).

2. Pollution Abatement: alternatively, a pollution abatement plan that has the objective of obtaining compliance with the MOE POI Limits can be submitted to the MOE for consideration.

In summary, a conservative[13] emission rate estimating technique may be used if the ESDM report shows compliance with the MOE POI Limit. If, however, an ESDM report identifies an exceedence of a MOE POI Limit then the facility can either: (i) choose to develop and implement a pollution abatement plan; and/or (ii) refine the ESDM report in accordance with section 12 of the Regulation (i.e., using actual operating conditions and more accurate emission rate estimates of a higher data quality). [14] [15] Note that the end-point for ESDM report refinement is the highest data quality obtained from a modelling-monitoring analysis.

Table 8-3: Overview of the Section 26 ESDM report Requirements to Document Operating Conditions, Emission Rate Estimates and Data Quality

Emission Rates and Point of Impingement Concentrations at the Maximum Operating Condition

According to paragraph 6 of subsection 26(1) of the Regulation, each significant contaminant must have a description of the operating conditions that result in the maximum POI concentration (either that the facility is capable of or based on the actual operating conditions for the time period described in section 10(1), paragraph 2 of the Regulation), according to the averaging period for the relevant MOE POI limit. This description of the operating condition for each significant contaminant should:

i) identify each significant source (or group of sources) of the contaminant;
ii) describe the operating conditions of the significant sources that result in the maximum POI concentration for the contaminant, according to the averaging period for the MOE POI Limit; and
iii) be based upon information contained in the Facility Description section of the ESDM report with consideration for simultaneous versus sequential operations and emissions; design capacities; technical and operational limitations on production and the terms and conditions of CofAs issued to the facility.

Explanation of the Emission Rate Estimating Methodology and Sample Calculation (see section 11 of the Regulation)

According to subparagraph 7i, subsection 26(1) of the Regulation, an explanation of the

[13] For the purpose of this Procedure Document the term "conservative" refers to an estimated emission rate that is certain to be higher than the actual emission rate.

[14] Subsection 12(1.1) allows the Director to accept source testing over a range of operating conditions (paragraph 2 of subsection 11(1)) as the final stage in the refinement process for the emission rate estimates if the Director is of the opinion that the emission rate will be accurately determined.

[15] This statement refers to refined emission rate estimates which satisfy paragraph 3 of subsection 11(1), see Appendix E for a review of approaches for the combined analysis of modelled and monitored results.

method used to estimate emission rates must be included for each significant contaminant. The description should include a brief section for each significant source or source category. Any appropriate references should also be provided (e.g., emission factor document title and relevant information to assist a reviewer in obtaining a copy). If source testing is used to develop emission rate estimates then copies of an executive summary from the source testing report should be provided with full copies of the report available upon request. As per subparagraph 7ii, of subsection 26(1), a sample calculation that illustrates each emission rate estimating method used should also be provided.

Assessment of Accuracy/Data Quality

According to paragraph 7iii, subsection 26(1) of the Regulation, an assessment must be provided for each significant contaminant, on the accuracy of each emission rate estimating method including an assessment of whether the method is more likely to overestimate or underestimate and an assessment of how significant this error might be. In most cases, the assessments required by paragraph 7iii of subsection 26(1) of the Regulation can be satisfied by use of the Data Quality classification system described in Chapters 8.3.1 through 8.3.4 of this Procedure Document. This Data Quality classification system may generally be used to assess the accuracy and conservatism of the emission rate estimating method. However, a special case in assessing the accuracy and conservatism of the combined modelling/monitoring analysis is shown below in the error analysis of modelling/monitoring analysis.

Error Analysis of Modelling/Monitoring Analysis

The analysis of data that is gathered from the combined modelling/monitoring analysis can illustrate variability in data. Generally, for data with log normal distribution, the approach could be to take the mean of all of the emission rates and add one standard deviation. Whereas, for data with normal distribution, the approach could be to take the mean and add two standard deviations. This is the emission rate that would then be used in the ESDM report to represent the existing POI concentrations. Any approach to assess variation in emission rates data or errors in the analysis must be approved by the MOE prior to completion of the ESDM report. A form is available on the website: “Request for Approval under paragraph 3 of s. 11(1) of Regulation 419 of a Plan for Combined Analysis of Modelled and Monitoring Results” (PIBs #6323).

9.0 SOURCE SUMMARY TABLE AND SITE PLAN

A Source Summary Table is an efficient means to present information on the sources of air emission from a facility and is a required component of an ESDM report. The information in a Source Summary Table is intended for use as inputs to the approved dispersion models as set out in Chapter 10 of this Procedure Document. A scaled site plan is also required as part of an ESDM report and assists in, among other things, the locating of sources and property boundaries.

9.1 Source Summary Table

Paragraph 8 of subsection 26(1) of the Regulation sets out the information that is required for a Source Summary Table:

Under Subsection 26(1) of the Regulation – Contents of ESDM report:

"8. A table, labelled as the "Source Summary Table", that shows, for each source of contaminant identified under subparagraph 3 ii as a source of contaminant that was considered, with respect to a contaminant listed under paragraph 4, when using an approved dispersion model for the purpose of this section,

i. a label that identifies the source of contaminant,

ii. the averaging periods for which the approved dispersion model was used with respect to that contaminant and source of contaminant,

iii. for each averaging period referred to in subparagraph ii,

A. the emission rate for the contaminant and source of contaminant,

B. an indication of the method used to estimate the emission rate for the contaminant and source of contaminant,

C. an indication of how significantly the method used may overestimate or underestimate the emission rate for the contaminant and source of contaminant, and

D. the percentage that the emission rate for the contaminant and source of contaminant represents of

the total emission rate for the contaminant and all sources of contaminant that were considered, with respect to the contaminant, when using an approved dispersion model for the purpose of this section,

iv. the volumetric flow rate for discharges from the source of contaminant,

v. the temperature of discharges from the source of contaminant,

vi. the height above ground level that discharges are released into the air from the source of contaminant,

vii. the difference between the height referred to in subparagraph vi and the height above ground level of the structure that is nearest to the source of contaminant and is on the same property, and an indication of whether discharges are released into the air from the source of contaminant at a height above or below the top of that structure, and

viii. the dimensions of the part of the source of contaminant from which discharges are released into the natural environment."

Appendix D includes two suggested formats for a Source Summary Table. Other formats for the table may be used if they include all of the information required by paragraph 8 of subsection section 26(1) of the Regulation.

CofA

Applying for a CofA

Applicants for a CofA are required to document only the Source Data for those sources of contaminants that emit contaminants in common with the sources of emissions that are the subject of the application itself.

For complex sites, it may be reasonable to sub-divide the information into a series of tables. In addition, if for specific sources, the data normally required within a Source Summary Table is not required by the dispersion model then this information does not have to be included in the Source Summary Table. For example, the exit temperature from unit heaters are generally not necessary, when using the models in the Appendix to Regulation 346, to assess compliance for nitrogen oxide emission if all sources are configured as a virtual source. In this case exit temperature is not required. However, all significant contaminants

that are emitted from the facility must be included in a Source Summary Table even if there is no MOE POI Limit.

9.1.1 Additional Guidance for a Source Summary Table

Contaminant Information

It is recommended that the Source Summary Table include name and chemical abstract number (CAS #), where available, for the significant contaminants. The following web sites may provide a convenient way to obtain specific CAS numbers:

http://www.chemfinder.com
http://webbook.nist.gov/chemistry - Scroll down to Search Options
http://www.toxnet.nlm.nih.gov - Click on ChemIDplus

Units and Suggested Nomenclature

- Averaging period should be provided in hours.
- Emission rates should be provided in grams per second.
- The emission rate estimating method can be indicated using the following short-forms:
  - "EF" means Emission Factor
  - "MB" means Mass Balance
  - "V-ST" means Validated Source Test
  - "EC" means Engineering Calculation
- See Chapter 8.2 of this Procedure Document for a classification system that can, in most cases, be used to provide an indication of how significantly the emission rate estimating method may overestimate or underestimate the actual emission rate. For example, emission rate estimates of Highest Data Quality would overestimate or underestimate the actual emission rate the least significantly, while estimates of Marginal or Uncertain Data Quality would overestimate or underestimate the most significantly. The following Data Quality classifications can be used in the Source Summary Table:
  - Highest Data Quality
  - Above-Average Data Quality
  - Average Data Quality
  - Marginal or Uncertain Data Quality
- The volumetric flow-rate should be provided in cubic metres per second (actual or reference where the reference conditions, such as standard temperature and pressure, are specified).
- The temperature of the exhaust gases should be provided in degrees Celsius.

- The heights above grade and the roof and the stack diameter should be provided in metres.

9.2 Site Plan

Paragraph 9 of subsection 26(1) of the Regulation states the following regarding the information that must be placed on a site plan:

Under Subsection 26(1) of the Regulation – Contents of ESDM report:

"9. A plan of the property from which contaminants are discharged, drawn to scale, that shows,

i. the property boundary,

ii. the co-ordinates for sufficient points on the property boundary to accurately describe the boundary,

iii. each source of contaminant identified under subparagraph 3 ii as a source of contaminant that was considered when using an approved dispersion model for the purpose of this section and, for each source of contaminant, the label referred to in subparagraph 8 i,

iv. the location, dimensions and elevation of every structure on the property, and

v. an indication of which structures referred to in subparagraph iv contain child care facilities."

In most cases, for a scaled site plan, it is reasonable to provide the location, dimensions and elevations of only those on-site structures that may affect the dispersion of emissions from significant sources, according to the use of the approved dispersion model. In addition, for some complex sites it may be reasonable to use multiple scaled site plans.

10.0 DISPERSION MODELLING

Dispersion models are used to predict how a contaminant concentration is diluted as it moves through the atmosphere. The concentration of a contaminant at a specific POI is a function of a variety of parameters including meteorological conditions in the vicinity of the source and the POI, contaminant emission rate(s) and physical characteristics of the source and terrain in the vicinity of both the source and receptor. Atmospheric dispersion models use a combination of data inputs for these parameters in conjunction with mathematical algorithms that describe both the temporal and spatial variation of contaminants as they move away from the source.

Sections 6 through 17 of the Regulation contain the dispersion modeling requirements, including what models are to be used, required inputs into the models and the averaging periods that must be used for the models. References to an approved dispersion model means that sections 9 through 17 of the Regulation have been complied with. Section 17.1 of the Regulation states:

17.1 A person who is required under this Regulation to prepare or update a report in accordance with section 26 and who uses an approved dispersion model for that purpose shall comply with sections 9 to 17.

The MOE document "Air Dispersion Modelling Guideline for Ontario, (as amended) (ADMGO) provides details on the appropriate use of the approved dispersion models listed in the Regulation. Paragraphs 10 through 13 of subsection 26(1) of the Regulation identify the aspects of dispersion modelling that are to be included in an ESDM report. This Chapter provides guidance on the inclusion, within an ESDM report, of dispersion modelling inputs and outputs, consistent with the requirements of Paragraphs 10 through 13 of subsection 26(1) of the Regulation.

10.1 Inclusion of Dispersion Modelling Input Data and Output Results in an ESDM report

Paragraphs 10 through 13 of subsection 26(1) of the Regulation describe the requirements for the inclusion of dispersion modelling results in an ESDM report as follows:

Under Subsection 26(1) of the Regulation – Contents of ESDM report:

"10. A description of the local land use conditions, if meteorological data described in paragraph 2 of subsection 13 (1) was used when using an

approved dispersion model for the purpose of this section.

11. For each contaminant listed under paragraph 4, a statement identifying the approved dispersion model that was used for the purpose of this section and a description of the way in which the approved dispersion model was used that is sufficient to show compliance with sections 8 to 17.

12. For each contaminant listed under paragraph 4, an electronic copy of the input files that were used with, and the output files that were produced by, the approved dispersion model that was used for the purpose of this section.

13. A description of the terrain data that was employed when using an approved dispersion model for the purpose of this section, if section 16 required terrain data to be employed."

In addition, paragraph 14 of subsection 26(1) of the Regulation requires submission of an Emission Summary Table and this requirement is discussed in Chapter 11 of this Procedure Document.

10.1.1 Localized Land Use Conditions

Paragraph 10 of subsection 26(1) of the Regulation requires inclusion of a description of the local land use conditions that were used if, according to paragraph 2 of subsection 13(1) of the Regulation, the meteorological data used in the AERMOD dispersion model has been refined to reflect local land use.

CofA

Applying for a CofA

Applicants for a CofA are required to submit a Land Use Designation Plan as part of the supporting documentation for the noise assessment.

For more information see the MOE document, "Guide to Applying for Approval (Air and Noise), PIBs #4174e" and available at: www.ene.gov.on.ca/envision/gp/4174e.pdf

10.1.2 Guidance for Describing the Dispersion Modelling

See Appendix D for a suggested tabulated format for providing the description, required under paragraph 11 of subsection 26(1) of the Regulation, of the way in which the

approved dispersion model was used that is sufficient to show compliance with sections 9 to 17 of the Regulation. Documenting compliance with sections 10, 11, and 12 was discussed in Chapter 8 of this Procedure Document. The necessary descriptions for some of these sections may already have been included elsewhere in the ESDM report and can be simply referenced in a summary table. However, it is anticipated that it will be necessary to include, within the tabulation or a separate section of the ESDM report, descriptions of the way in which the approved dispersion model was used that is sufficient to show compliance with the following sections:

- Section 9 of the Regulation – Same Structure Contamination
- Section 13 of the Regulation – Meteorological Conditions
- Section 14 of the Regulation – Area of Modelling Coverage
- Section 15 of the Regulation – Stack Height for Certain New Sources of Contaminant
- Section 16 of the Regulation – Terrain Data
- Section 17 of the Regulation – Averaging Periods

The ADMGO provides further guidance on the above-noted sections of the Regulation. Also, see Table 10-1, on the following pages, for additional guidance on satisfying the requirements of paragraph 11, subsection 26(1) of the Regulation.

Table 10-1: Dispersion Modelling Input Summary Table: Guidance on Providing a Description of the Way in Which the Approved Dispersion Model was Used

Relevant Section of the Regulation	Section Title	Guidance to Providing a Tabulated Summary of How the Approved Dispersion Model was Used
Section 8	Negligible Sources of Contaminant	If a source(s) was not considered in the application of the dispersion models, then it is sufficient to reference the portion of the ESDM report that relates to Chapter 7 of this Procedure Document; which provides an explanation of how it was determined that the source(s) discharge a negligible amount of contaminant.
Section 9	Same Structure Contamination	If same structure contamination is applicable, then provide a description of how the methods described in Chapter 44 of the ASHRAE Handbook – HVAC Applications were combined with the dispersion modelling. See the ADMGO for more detailed guidance on Chapter 44 of the ASHRAE Handbook.
Section 10	Operating Conditions	Reference the portion of the ESDM report that relates to Chapter 8.1 of this Procedure Document and describes the operating condition that results, for each significant contaminant, in the POI concentration for that contaminant.
Section 11	Source of Contaminant Emission Rates	Reference the portion of the ESDM report that relates to Chapters 8.2 and 8.3 of this Procedure Document (i.e., provides an explanation of the methods used to estimate contaminant emission rates and an assessment of how accurately the methods estimate the emission rate).
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	If, based upon emission rate estimating methodologies that are consistent with *paragraph 1* of subsection 11(1) and operating conditions consistent with 10(1) of the Regulation, predictions of POI concentration exceed MOE POI Limits then describe either: (i) the refinement of emission rate estimates according to section 12 of the Regulation (also see Chapter 8.4 of this Procedure Document) or (ii) the abatement plan, which is an option under section 12, and its submission to a provincial officer.
Section 13	Meteorological Conditions	If using MOE regional meteorological data sets or regional meteorological data with local land use conditions, then simply indicate so with a description of the local land use conditions; or if using site-specific meteorological data, then indicate the means in which the MOE Director has approved the use of this data. See the ADMGO for more detailed guidance on the application of meteorological data.

Table 10-1 Dispersion Modelling Input Summary Table: Guidance on Providing a Description of the Way in Which the Approved Dispersion Model was Used (Continued)

Relevant Section of the Regulation	Section Title	Guidance to Providing a Tabulated Summary of How the Approved Dispersion Model was Used
Section 14	Area of Modelling Coverage (receptor locations)	If the area of the modeling coverage is applicable to the use of the approved dispersion models then it is sufficient to provide a statement or brief description of how the receptor grid pattern that was used in the modelling includes a spacing that is no greater than the largest grid interval allowed by section 14 of the Regulation and how the bounds of the grid are large enough to capture the maximum POI as required by section 14 of the Regulation. If using different modelling grid, then indicate the means in which the MOE Director has approved the use of this approach. See the ADMGO for more detailed guidance on receptor locations.
Section 15	Stack Height for Certain New Sources of Contaminant	If this section is applicable (i.e., to sources constructed after November 30, 2005), then it is sufficient to provide a summary of the actual stack heights of the relevant sources and the calculated or stipulated maximum height that can be used with the approved dispersion model. See the ADMGO for more information on Stack Height for Certain New Sources of Contaminant.
Section 16	Terrain Data	If terrain data is applicable to the use of the approved dispersion models, then it is sufficient to: • indicate whether there were any points of impingement that had an elevation higher than the lowest point from which a relevant contaminant is discharged from; and if so • provide a brief description of how terrain data was considered or employed and provide a copy of the terrain data that was used (if applicable).[16] See the ADMGO for more detailed guidance on the application of terrain data.
Section 17	Averaging Periods	Provide an indication of how the averaging periods for the dispersion model outputs were consistent with the requirements of this section and/or how any averaging period conversions were consistent with the requirements of this section. See Table 7-1 of this Procedure Document for an equivalent method, to section 17 of the Regulation, in converting POI concentrations to different averaging periods. Also, see the ADMGO for more additional guidance on the application of averaging periods.

[16] The terrain data for Ontario has been provided by the Ontario Ministry of Natural Resources in a format that can be used to run the US EPA models. Terrain data is available from the MOE's web-site, http://www.ene.gov.on.ca/ and the MOE's Public Information Centre (on compact disc).

10.1.3 Guidance for Providing Input and Output Files

Paragraph 12 of subsection 26(1) of the Regulation requires submission of an electronic copy of the input files that were used with the approved dispersion model and the output files that were produced by the use of the models. Please see the ADMGO for additional guidance on the topic of providing input and output files related to use of the approved dispersion models.

10.1.4 Guidance for Providing Terrain Data

Paragraph 13 of subsection 26(1) of the Regulation requires submission of the terrain data that was used if, according to subsection 16(1) of the Regulation, the model was used in a manner that employed terrain data. Please see ADMGO document for more detailed guidance on the use of terrain data with the approved dispersion models.

10.2 Roadways, Railways and Bodies of Water

POI concentrations must be below the relevant MOE POI Limit at all off-site locations (as per the definition of point of impingement in section 2 of the Regulation). However, there may be site-specific situations where an off-site location would not need to be considered in the ESDM report as a POI, such as:

i) Most public roadways between two separate parcels of a facility property.

ii) Most railway lines or railway right-of-ways.

iii) Bodies of water that are inside the boundaries of Ontario, except situations where an adverse effect may occur (e.g., in the vicinity of a marina).

11.0 EMISSION SUMMARY TABLE AND INTERPRETATION OF RESULTS

Paragraph 14 of subsection 26(1) of the Regulation sets out the requirements for an Emission Summary Table as follows:

Under Subsection 26(1) of the Regulation – Contents of ESDM report:

"14. A table, labelled as the "Emissions Summary Table", that shows, for each contaminant listed under paragraph 4,

i. the Chemical Abstracts Service Registry Number for the contaminant,

ii. the approved dispersion model that was used in respect of the contaminant for the purpose of this section,

iii. the averaging periods for which the approved dispersion model was used in respect of the contaminant and, for each averaging period, the sum of the emission rates for the contaminant for all sources of contaminant identified under subparagraph 3 ii as a source of contaminant that was considered when using an approved dispersion model for the purpose of this section,

iv. the standard set out for the contaminant in,

A. Schedule 1, if section 18 applies to the contaminant,

B. Schedule 2, if section 19 applies to the contaminant, or

C. Schedule 3, if section 20 applies to the contaminant,

v. the concentration predicted by the approved dispersion model for the point of impingement with the highest concentration,

vi. a comparison of the concentration referred to in subparagraph v and the standard referred to in subparagraph iv, expressed as a percentage of the standard, if section 18, 19 or 20 applies to the contaminant,

vii. the location of the point of impingement referred to in subparagraph v, if section 18, 19 or 20 applies to the contaminant and the concentration referred to in subparagraph v exceeds the standard referred to in subparagraph iv, and

viii. an indication of the likelihood, nature and location of any adverse effect, if sections 18, 19 and 20 do not apply to discharges of the contaminant."

See Appendix D for an example format for an Emission Summary Table. The following is additional guidance regarding paragraph 14 of subsection 26(1) (i.e., the Emission Summary Table in an ESDM report:

- The averaging period reference should be expressed in hours.
- The emission rates should be expressed in grams per second.
- The POI concentration should be expressed in the same units (e.g., typically, micrograms per cubic metre) as the MOE POI Limit for the respective contaminant.
- The location of the maximum POI required by subparagraph vii, may be expressed as a map which depicts the location and concentration of each maximum POI.
- To satisfy subparagraph viii, it is generally sufficient to provide:
  - A comparison to MOE POI Limits for the relevant contaminant and
  - The basis of the MOE POI Limit[17].

CofA

Applying for a CofA

Under the authority provided by Section 21 of the Regulation, Certificates of Approval (Air and Noise) may impose a more stringent standard than those included in Schedules 1, 2 and 3 of the Regulation.

It is recommended that applicants for a CofA provide a Scaled Map or Area Location Plans showing the location of the maximum point of impingement concentration for each contaminant.

Facilities that are permitted to use the models in the Appendix to Regulation 346 and are modelling a virtual source are not required to provide detailed information on the surrounding land use beyond what is required as part of the noise assessment of the application.

Applicants must be prepared to verify the accuracy of the submission.

[17] The basis of the MOE POI Limit can be identified from the MOE publication "Summary of Standards and Guidelines to Support Ontario Regulation 419/05: Air Pollution – Local Air Quality" (PIBs #6569e), as amended.

11.1 Contaminants without MOE POI Limits

MOE POI Limits are available for approximately 350 contaminants used or produced by industry in Ontario as listed in the MOE publication, "Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality (including Schedule 6 of O. Reg. 419 on Upper Risk Thresholds)" (as amended).

However, there are many more compounds that meet the definition of a contaminant under the Ontario EPA than there are contaminants with MOE POI Limits. Persons preparing an ESDM report are accountable for the assessment of all contaminants that are discharged from the facility regardless of whether or not a MOE POI Limit is available. The MOE has published a "Jurisdictional Screening Level (JSL) List - A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality" (PIBs # 6547e) to assist in the assessment of contaminants with no MOE POI Limits.

The ESDM report must provide an indication of the likelihood and nature of any adverse effect that may be caused by a contaminant with no MOE POI Limit. This may be addressed as follows:

i) If a facility emits a contaminant that does not have an MOE POI Limit, it is strongly recommended that the modelled POI concentration be compared to the JSL list. A contaminant that has a POI concentration below its respective JSL does not require further assessment but must be documented in the Emission Summary Table of the ESDM Report. If the JSL is exceeded, or the contaminant is not listed on the JSL, further assessment must be done. If the ESDM Report is submitted as part of the CofA process, this further assessment will occur with input from MOE scientists as part of the MOE's review and acceptance of a Maximum Ground Level Concentration. This value then appears in the Emission Summary Table upon completion of the review process.

ii) If the ESDM Report is being prepared under sections 23 and 25 of the Regulation (i.e., a facility within a targeted sector where the ESDM report is kept on-site and is up-dated annually); or under section 24 of the Regulation (i.e., a facility required to submit an ESDM report based upon a Notice from a MOE Director); or under section 32 (application for Alteration of Schedule 3 Standards), then the information on these contaminants without MOE POI limits should also be assessed against the JSL list. If there is no value on the JSL list or the JSL is exceeded, then this can be dealt at the next available opportunity for MOE review. The next review could occur as part of an application for a CofA, or if MOE requests a copy of the ESDM report prepared under sections 23 or 25 of the Regulation.

iii) The de minimus or threshold concentrations were also developed to screen out contaminants that are emitted in negligible amounts. Details on this screening tool are outlined in Appendix B of this ESDM Guideline Document.

CofA

Applying for a CofA

Applicants for approval under Section 9 of the EPA must submit a completed copy of MOE document “Supporting Information for a Maximum Ground Level Concentration Acceptability Request Supplement to Application for Approval, EPA S.9” (PIBS 4872) for each contaminant with no MOE POI Limit.

11.2 Providing Notice to a Provincial Officer

Section 28 of the Regulation states:

Notice to Provincial Officer as a result of Modelling or Measurements

"28. (1) A person who discharges or causes or permits the discharge of a contaminant shall, as soon as practicable, notify a provincial officer in writing if,

(a) the person uses an approved dispersion model to predict concentrations of the contaminant that result from the discharges and,

(i) the use of the model indicates that discharges of the contaminant may result in a contravention of section 18, 19 or 20, or

(ii) sections 18, 19 and 20 do not apply to discharges of the contaminant and the use of the model indicates that discharges of the contaminant may cause an adverse effect;

(b) measurements of air samples indicate that discharges of the contaminant may result in a contravention of section 18, 19 or 20; or

(c) sections 18, 19 and 20 do not apply to discharges of the contaminant and measurements of air samples indicate that discharges of the contaminant may cause an adverse effect.

(1.1) The Director may give written notice to a person who discharges or causes or permits the discharge of a contaminant requiring the person to notify a provincial officer in writing, at regular intervals specified by the Director, of any circumstances described in clause (1) (a), (b) or (c).

(1.1.1) Before the Director gives a person a notice under subsection (1.1), the Director shall give the person a draft of the notice and an opportunity to make written submissions to the Director during the period that ends 15 days after the draft is given.

(1.2) Subsection (1) does not apply to a person who complies with a notice given by the Director under subsection (1.1).

(2) If a person is required to give notice under subsection (1) or (1.1) of circumstances described in clause (1) (a) and, according to the approved dispersion model, discharges of the contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect because of the concentration of the contaminant at a point of impingement, the Director may give the person a written notice requiring the person to provide the Director with the following in accordance with the notice:

1. A written statement or map identifying the location of the point of impingement.

2. A written statement specifying the highest concentration of the contaminant that the approved dispersion model predicts for the point of impingement.

3. A written statement specifying the number of averaging periods for which the approved dispersion model predicts that discharges of the contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect because of the concentration of the contaminant at the point of impingement, expressed as a percentage of the number of averaging periods in,

i. a period of five years, if the approved dispersion model was used in accordance with meteorological data described in paragraph 1, 1.1, 2 or 2.1 of subsection 13 (1),

ii. a period equal to the length of the period over which the meteorological data was collected, if the approved dispersion model was used in accordance with local or site-specific meteorological data described in paragraph 3 of subsection 13 (1), or

iii. a period equal to the length of the period that was used for the purposes of the computational method, if the approved dispersion model was used in accordance with meteorological data obtained from a computational method in accordance with paragraph 4 of subsection 13 (1).

(2.1) If subsection (2) authorizes the Director to give a person a notice, the Director may instead give the person a written notice requiring the person to provide the Director with the following in accordance with the notice:

1. A written statement or map identifying the location of points of impingement specified in the notice.

2. A written statement specifying the concentration of the contaminant that the approved dispersion model predicts at points of impingement specified in the notice.

3. A written statement specifying the number of averaging periods for which the approved dispersion model predicts that discharges of the contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect because of the concentration of the contaminant at points of impingement specified in the notice, expressed as a percentage of the number of averaging periods in,

i. a period of five years, if the approved dispersion model was used in accordance with meteorological data described in paragraph 1, 1.1, 2 or 2.1 of subsection 13 (1),

ii. a period equal to the length of the period over which the meteorological data was collected, if the approved dispersion model was used in accordance with local or site-specific meteorological data described in paragraph 3 of subsection 13 (1), or

iii. a period equal to the length of the period that was used for the purposes of the computational method, if the approved dispersion model was used in accordance with meteorological data obtained from a computational method in accordance with paragraph 4 of subsection 13 (1).

(2.2) If a notice requires a person to provide the Director with information referred to in subsection (2) or (2.1), the person shall provide the information using,

(a) the AERMOD dispersion model described in paragraph 1 of subsection 6 (1);

(b) the ISCPRIME dispersion model described in paragraph 3 of subsection 6 (1); or

(c) a dispersion model or combination of dispersion models that,

(i) pursuant to subsection 7 (3), is deemed to be included in references in this Part to approved dispersion models, and

(ii) is capable of providing the information referred to in subsection (2) or (2.1), as the case may be.

(3) If a person is required to give notice under subsection (1) or (1.1) of circumstances described in clause (1) (b) or (c) and, according to measurements of air samples collected at a point of impingement, discharges of the contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect because of the concentration of the contaminant at the point of impingement, the Director may give the person a written notice requiring the person to provide the Director in writing with the following in accordance with the notice:

1. A written statement or map identifying the location of the point of impingement.

2. A written statement specifying the number of air samples that were collected at the point of impingement and measured for the contaminant.

3. A written statement specifying the number of air samples that were

collected at the point of impingement and measured for the contaminant and that indicated that discharges of the contaminant may result in a contravention of section 18, 19 or 20 or cause an adverse effect because of the concentration of the contaminant at the point of impingement, expressed as a percentage of the number of air samples referred to in paragraph 2."

See Chapter 4 of the MOE document, "Guideline for the Implementation of Air Standards in Ontario" (PIBs # 5166e) for guidance on factors to consider when standards are exceeded.

11.3 Assessing Concentrations and Frequency at Specified POIs

The Regulation requires that the frequency of exceedences at specified POIs may be required in some ESDM reports. A Director may require this information by issuing various notices under the Regulation. There are two types of ESDM reports that automatically require this information to be included in the ESDM report; namely, ESDM reports required under section 30 (upper risk thresholds) and section 32 (request for an alteration of a standard).

Subsection 30(8) of the Regulation requires the frequency of exceedences to be determined for the following places:

1. A health care facility.
2. A senior citizens' residence or long-term care facility.
3. A child care facility.
4. An educational facility.
5. A dwelling.
6. A place specified by the Director in a notice under subsection 30(9) as a place where discharges of a contaminant may cause a risk to human health.

In making a decision regarding a request for an altered air standard, information regarding these specific POIs and frequency of exceedences is required to enable the Director to make a decision as per subclauses (32)(21) (b) (ii) and (iv) as well as subsection 32(22) of the Regulation.

At a minimum, a facility requesting an alteration to an air standard must evaluate the magnitude and frequency of exceedences at the location of the maximum POI concentration as well as at the places listed in subsection 30(8) of the Regulation (see Chapters 2.2.1 and 4 of GIASO). For more information, see also Chapter 3.5 of Guide for Requesting an Alternative Air Standard (GRAAS).

Assessment of the frequency of exceedences based on any monitoring data must also be included in the ESDM report in addition to the modelled frequency results. The MOE may request more information on frequency and magnitude. For more information, see GIASO and Appendix A of this Guide.

11.4 Submission of a Written Abatement Plan

Section 29 of the Regulation states:

Abatement plan

"29. (1) A person who gives a notice to a provincial officer under subsection 28 (1) or (1.1) in respect of a contaminant shall, not later than 30 days after giving the notice, prepare and submit to a provincial officer a written abatement plan for the contaminant that recommends steps that should be taken to prevent discharges of the contaminant from resulting in a contravention of section 18, 19 or 20 or an adverse effect.

(2) Subsection (1) does not apply if,

(a) an abatement plan for the contaminant is already required to be submitted to a provincial officer within the 30-day period referred to in subsection (1);

(a.1) an abatement plan for the contaminant has previously been submitted to a provincial officer under subsection (1) and the Director is satisfied that another plan is not necessary; or

(b) a plan for the contaminant was submitted to the Ministry before November 30, 2005 and the Director is satisfied that it is not necessary to prepare and submit an abatement plan under subsection (1)."

At a minimum, the submission of a pollution abatement plan should be of sufficient detail to initiate a substantive discussion, with representatives of the MOE, on the options to fully address the contravention or adverse effect. The final abatement plan must demonstrate that the proposed mitigation is certain to result in compliance with the MOE POI Limits. If compliance is not certain, a facility may be able to consider a request for an alteration of the standard under section 32 of the Regulation.

11.5 Upper Risk Thresholds

Subsections 30 (1) through 30 (7) of the Regulation state:

Upper Risk Thresholds

"30. (1) A person who discharges or causes or permits the discharge of a

contaminant listed in Schedule 6 into the air shall comply with subsections (3) and (4) if there is reason to believe, based on any relevant information, that discharges of the contaminant may result in,

(a) the concentration of the contaminant exceeding the half hour upper risk threshold set out for that contaminant in Schedule 6 at a point of impingement, if section 18 or 19 applies to the person in respect of the contaminant; or

(b) the other time period upper risk threshold set out for that contaminant in Schedule 6 at a point of impingement, if section 20 applies to the person in respect of the contaminant.

(1.1) The two items in Schedule 6 that set out upper risk thresholds for total reduced sulphur (TRS) compounds specify the facilities to which they apply.

(2) Without limiting the generality of subsection (1), the reference in that subsection to relevant information includes relevant information from predictions of a dispersion model, including,

(a) an approved dispersion model or other dispersion model; or

(b) a dispersion model that is not used in accordance with this Regulation.

(3) If subsection (1) applies to a discharge, the person who discharged or caused or permitted the discharge of the contaminant shall immediately notify the Director in writing.

(4) If subsection (1) applies to a discharge, the person who discharged or caused or permitted the discharge of the contaminant shall, within three months after the discharge, prepare a report in accordance with section 26 and submit the report to the Director.

(5) If a person is required to prepare a report under subsection (4) and section 20 does not apply to the person in respect of the contaminant, section 20 shall be deemed to apply for the purpose of preparing the report and for the purpose of subsections (7) and (8).
(5.1) A person who prepares a report required by subsection (4) shall prepare the report using,

(a) the AERMOD dispersion model described in paragraph 1 of subsection 6 (1);

(b) the ISCPRIME dispersion model described in paragraph 3 of subsection 6 (1); or

(c) a dispersion model or combination of dispersion models that,

(i) pursuant to subsection 7 (3), is deemed to be included in references in this Part to approved dispersion models, and

(ii) is capable of providing the information referred to in subsection (7).

(5.2) Despite subsection 10 (1), a person who prepares a report required by subsection (4) shall use an approved dispersion model in accordance with both of the scenarios described in subsection 10 (1), and the report shall set out separately the information relevant to each scenario.

(6) Paragraphs 1, 1.1, 2 and 2.1 of subsection 13 (1) do not apply to a person who prepares a report required by subsection (4) unless meteorological data described in paragraph 3 and 4 of subsection 13 (1) is not available and cannot reasonably be available in time to prepare the report within the three-month period referred to in subsection (4).

(6.1) If a report is required by subsection (4) to be prepared in accordance with section 26, it is not necessary for the lists of contaminants required by paragraphs 2 and 4 of subsection 26 (1) to include any contaminant other than the contaminant in respect of which the Director must be notified under subsection (3).

(6.2) A person who is required to prepare a report under subsection (4) shall ensure that the table required by paragraph 14 of subsection 26 (1) contains the following additional information:

1. ***The other time period upper risk threshold set out for the contaminant in Schedule 6.***

2. ***A comparison of the concentration referred to in subparagraph 14 v of subsection 26 (1) and the other time period upper risk threshold set out for the contaminant in Schedule 6, expressed as a percentage of the threshold.***

(7) If, according to an approved dispersion model that is used for the purpose of preparing a report under subsection (4), discharges of a contaminant may result in a contravention of section 20 because of the concentration of the contaminant at a point of impingement located on a place referred to in subsection (8), the person who prepares the report shall include the following in the report:

1. ***A statement or map identifying the place that the point of impingement is located on.***

2. ***A statement specifying the highest concentration of the contaminant that the approved dispersion model predicts for the point of***

impingement.

3. A statement specifying the number of averaging periods for which the approved dispersion model predicts that discharges of a contaminant may result in a contravention of section 20 because of the concentration of the contaminant at the point of impingement, expressed as a percentage of the number of averaging periods in,

i. a period of five years, if the approved dispersion model was used in accordance with meteorological data described in paragraph 1, 1.1, 2 or 2.1 of subsection 13 (1),

ii. a period equal to the length of the period over which the meteorological data was collected, if the approved dispersion model was used in accordance with local or site-specific meteorological data described in paragraph 3 of subsection 13 (1), or

iii. a period equal to the length of the period that was used for the purposes of the computational method, if the approved dispersion model was used in accordance with meteorological data obtained from a computational method in accordance with paragraph 4 of subsection 13 (1).

The Director should be notified at the earliest stage where there is reason to believe, based on any relevant information, that discharges of a contaminant may result in an exceedence of an upper risk threshold listed in Schedule 6 of the Regulation.

It should be noted that, consistent with subsection 30(6.1) of the Regulation, ESDM reports that are required as a result of an exceedence of an upper risk threshold are only required to consider those contaminants for which an upper risk threshold is predicted to be exceeded. See Chapter 3 of the MOE document, “Guideline for the Implementation of Air Standards in Ontario” (as amended) for guidance on determining appropriate action in relation to upper risk thresholds.

11.6 Alteration of Schedule 3 Standards

Section 32 of the Regulation allows for alteration of standards in Schedule 3 during specific periods of time as a result of the phase-in of new standards; the phase-in of the SCREEN3, ISCPRIME, AERMOD and ASHRAE; and/or the use of specific models as required by a MOE Director.

See section 32 of the Regulation for more detail. The MOE document, “Guideline for the Implementation of Air Standards in Ontario” (PIBs # 5166e) (as amended) also provides guidance on the application of section 32 of the Regulation. Further information is also available in the “Guide to Requesting an Alternative Air Standard” (PIBs # 6322e) (as amended).

Appendix A: List of Sectors Targeted within Ontario Regulation 419/05

SCHEDULE 4
TARGET SECTORS FOR 2010

(for Phase-Out of Models in the Appendix to Regulation 346 and Phase-In of On-Site ESDM report Requirements in 2010)

Item	NAICS Code	North American Industry Classification System Description
1.	2122	Metal Ore Mining
2.	221112	Fossil-Fuel Electric Power Generation
3.	324110	Petroleum Refineries
4.	3251	Basic Chemical Manufacturing
5.	3252	Resin, Synthetic Rubber, and Artificial and Synthetic Fibres and Filaments Manufacturing
6.	3311	Iron and Steel Mills and Ferro-Alloy Manufacturing
7.	331410	Non-Ferrous Metal (except Aluminum) Smelting and Refining

Note: A fossil-fuel electric power generation facility with a maximum electrical power output capacity of less than 25 megawatts shall be deemed not to be part of the class identified by NAICS code 221112 (Fossil-Fuel Electric Power Generation).

SCHEDULE 5
TARGET SECTORS FOR 2013

(for Phase-Out of Models in the Appendix to Regulation 346 and Phase-In of On-Site ESDM report Requirements in 2013)

Item	NAICS Code	North American Industry Classification System Description
1.	3221	Pulp, Paper and Paperboard Mills
2.	324190	Other Petroleum and Coal Products Manufacturing
3.	325	Chemical Manufacturing
4.	326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing
5.	3279	Other Non-Metallic Mineral Product Manufacturing
6.	331	Primary Metal Manufacturing
7.	332	Fabricated Metal Product Manufacturing
8.	336	Transportation Equipment Manufacturing
9.	5622	Waste Treatment and Disposal

Notes:

i) A mobile PCB destruction facility within the meaning of Regulation 352 of the Revised Regulations of Ontario, 1990 (Mobile PCB Destruction Facilities) made under the Act shall be deemed not to be part of the class identified by NAICS code 5622 (Waste Treatment and Disposal); and

ii) A facility shall be deemed not to be part of the class identified by NAICS code 5622 (Waste Treatment and Disposal) unless the facility,
- is a solid waste combustor or incinerator, or
- is used for hazardous waste treatment or disposal.

Appendix B: Supporting Information for the Assessment of the Significance of Contaminants and Sources

Table B-1: Guidance for Screening-Out with Dispersion Factors

Table B-2A: Contaminants Not Listed in the MOE Document, "Summary of Standards and Guidelines to Support Ontario Regulation 419/05: Air Pollution – Local Air Quality" (PIBs # 6569e) that Can Be Considered Insignificant in a Specific Situation

Table B-2B: List of Contaminants Excluded from de minimus level

Table B-3: Specific Examples of Sources that Emit Contaminants in Negligible Amounts

B.1 Screening–Out Contaminants that are Emitted in Negligible Amounts

The product of a conservative dispersion modelling factor (in micrograms per cubic metre per gram per second emission) and the aggregate facility-wide emission rate of a contaminant (using the appropriate averaging period) can be compared to the corresponding MOE POI Limit as a means to conservatively but simply assess POI concentrations as appropriate. A series of appropriate conservative dispersion modelling factors have been developed for a short stack on a 6 metre tall building in combination with distances from the stack, as set out below.

Table B-1 Guidance for Screening-Out with Dispersion Factors

Distance from Source (m)	Urban Dispersion Factor ($\mu g/m^3$ per g/s emission)	Rural Dispersion Factor ($\mu g/m^3$ per g/s emission)
20	8700	10000
40	6300	8100
60	4600	5900
80	3400	5100
100	2600	4500
150	1400	3500
200	900	2800
250	600	2300
300	450	1900
350	350	1700
400	300	1500
450	250	1300
500	200	1150
600	150	950
700	120	800
800	90	650
900	80	575
1000	70	500

This Table contains three columns. The first column contains the distance from the source, and the remaining two columns contain the corresponding Dispersion Factor. The second column contains values that are to be used if modelling in urban areas, while the third column is to be used if modelling in rural areas. Refer to the MOE guidance document titled *Air Dispersion Modelling Guideline for Ontario, 2005* for urban and rural definitions.

If the aggregate facility-wide emission rate of a contaminant multiplied by the appropriate dispersion factor from the table above is less than the MOE POI Limit (or converted to a 24-hour average concentration in the case of 24-hour average MOE POI Limit) then the assessment for that contaminant is complete.

For cases where a facility has some significant emission sources of a contaminant and other sources with small emission rates, the following approach may be used:

1. sum the emissions from the less significant sources and multiply the sum by the appropriate dispersion factor;
2. Add resulting concentration to the SCREEN3 or tier 2 or 3 model results for the more significant sources of that contaminant to assess against the MOE POI Limit.

However, if the maximum concentration for the less significant sources is less than 5% of the MOE POI Limit (consistent with the conditions identified in section 6.2 of this guideline) those sources can be dropped from further assessments for that contaminant. Alternatively the maximum concentration for the less significant sources could be added to SCREEN3 or tier 2 or 3 modelling results for the more significant sources of that contaminant to assess against the MOE POI Limit. The rationale for assessing contaminants and sources as insignificant must be documented in the ESDM report.

Contaminants without MOE POI Limits that Can Be Considered Insignificant in Specific Situations

If the substance is listed in the MOE document, "Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality" (PIBs # 6569e) or JSL list, then the following de minimus or threshold concentrations are NOT applicable. The following table presents de minimus concentrations, by contaminant type/group, for contaminants that are not listed in the above-noted document.

Table B-2A: Contaminants Not Listed in the MOE document, "Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality" that Can Be Considered Insignificant in a Specific Situation

Assessment Steps		Threshold Concentration (below which impacts can be considered insignificant)
STEP 1:	If substance **ON** List of MOE POI Limits **OR ON** JSL List:	**Threshold Concentration Consideration Not Applicable** (Assessment to be based on MOE Standards or Guidelines or Acceptability of Ground Level Concentrations or JSL Limits)
STEP 2:	If substance **NOT** on List of MOE POI Limits **AND NOT** on Table B-2B:	If < 0.1 µg/m³ (24-hour average) or < 0.3 µg/m³ (1/2-hr average), then impacts can be considered insignificant
STEP 3:	If substance **NOT** on List of MOE POI Limits **AND ON** Table B-2B	If < 0.01 µg/m³ (24-hour average) or < 0.03 µg/m³ (1/2-hr average), then impacts can be considered insignificant

Note:

- List of MOE POI Limits = MOE document "Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality" (as amended from time to time);

Table B-2B List of Contaminants Excluded from *de minimus* level (see Table B-2A)

Sorted By CAS Number

CAS Number	Chemical
51-79-6	Urethane
52-24-4	Tris(1-aziridinyl) phosphine sulphide
56-53-1	Diethylstilbesterol
57-14-7	1,1-Dimethylhydrazine
60-11-7	Dimethylaminoazobenzene
60-34-4	Methyl hydrazine
72-54-8	Dichlorodiphenyl dichloroethane (DDD)
75-27-4	Bromodichloromethane
79-44-7	Dimethylcarbamoyl chloride
90-94-8	Michler's Ketone
92-87-5	Benzidine
95-69-2	p-Chloro-o-toluidine
96-33-3	Methyl acrylate
107-30-2	Chloromethyl methyl ether
107-71-1	t-Butyl peroxyacetate
117-08-8	Tetrachlorophthalic anhydride
118-74-1	Hexachlorobenzene
121-14-2	2,4-Dinitrotoluene
122-66-7	1,2-Diphenylhydrazine

Sorted By Chemical Name

CAS Number	Chemical
24304-00-5	Aluminum nitride
92-87-5	Benzidine
542-88-1	Bis(chloromethyl) ether
75-27-4	Bromodichloromethane
10599-90-3	Chloramine
107-30-2	Chloromethyl methyl ether
16941-12-1	Chloroplatinic acid
94097-88-8	(4-Chlorophenyl) cyclopropylmethanone, O-[(4-nitrophenyl)methyl] oxime
135-20-6	Cupferron
72-54-8	Dichlorodiphenyl dichloroethane (DDD)
56-53-1	Diethylstilbesterol
60-11-7	Dimethylaminoazobenzene
79-44-7	Dimethylcarbamoyl chloride
57-14-7	1,1-Dimethylhydrazine
513-37-1	Dimethylvinyl chloride
121-14-2	2,4-Dinitrotoluene
25321-14-6	2,4-/2,6-Dinitrotoluene mixture
122-66-7	1,2-Diphenylhydrazine
765-34-4	Glycidaldehyde

126-72-7	Tris(2,3-Dibromopropyl) phosphate
135-20-6	Cupferron
338-98-7	Isoflupredone acetate
513-37-1	Dimethylvinyl chloride
542-88-1	Bis(chloromethyl) ether
765-34-4	Glycidaldehyde
2385-85-5	Mirex
5714-22-7	Sulphur pentafluoride
10599-90-3	Chloramine
16941-12-1	Chloroplatinic acid
24304-00-5	Aluminum nitride
25321-14-6	2,4-/2,6-Dinitrotoluene mixture
61788-33-8	Polychlorinated Terphenyls (PCTs)
94097-88-8	(4-Chlorophenyl) cyclopropylmethanone, O-[(4-nitrophenyl)methyl] oxime
n/a	Polybrominated Biphenyls (PBBs)

118-74-1	Hexachlorobenzene
338-98-7	Isoflupredone acetate
96-33-3	Methyl acrylate
60-34-4	Methyl hydrazine
90-94-8	Michler's Ketone
2385-85-5	Mirex
95-69-2	p-Chloro-o-toluidine
n/a	Polybrominated Biphenyls (PBBs)
61788-33-8	Polychlorinated Terphenyls (PCTs)
5714-22-7	Sulphur pentafluoride
107-71-1	t-Butyl peroxyacetate
117-08-8	Tetrachlorophthalic anhydride
52-24-4	Tris(1-aziridinyl) phosphine sulphide
126-72-7	Tris(2,3-Dibromopropyl) phosphate
51-79-6	Urethane

B.2 Screening-Out Sources that Emit Contaminants in Negligible Amounts

Table B-3 Specific Examples of Sources that Emit Contaminants in Negligible Amounts

- Sources that are Exempt from Obtaining a CofA: See http://www.e-laws.gov.on.ca/html/regs/english/elaws_regs_980524_e.htm for a copy of Ontario Regulation 524/98 – Certificate of Approval Exemptions – Air.
- Maintenance welding stations.
- Minor surface coating operations within larger operations such as a touch up paint booth at an automotive manufacturing facility.
- Chemical storage room ventilation.
- Standby power generators firing liquid or gaseous fuels that are used for standby power only with periodic testing as per the Regulation.
- Fume hoods for laboratories that are used for quality control and quality assurance purposes at industrial facilities.
- Parts washers for maintenance shops.
- On-site storage tanks and facilities that are used for fueling on-site vehicles.
- Natural gas fired boilers, water heaters, space-heaters and make-up air units when the total facility-wide heat input usage for this equipment is less than 20 million kilojoules per hour.
- Low temperature handling of compounds with a vapour pressure less than 1 kiloPascal.
- Battery chargers.
- Storage and emission of nitrogen and oxygen.
- Small maintenance and janitorial activities.
- Exhaust of inert gases.

Appendix C: Reference Material for Emission rate estimating

Table C-1: Emission rate estimating Reference Material

Table C-2: Summary of Some Useful Equations and General Guidance

The following is a summary table with a list of websites (which may change with time but are accurate according to the date of this Addendum) that may assist in obtaining emissions information for specific sources. This list is not exhaustive and only intended as additional guidance.

TABLE C-1: EMISSION RATE ESTIMATING REFERENCE MATERIAL

Reference Material	Description	Relevant Link
United States Environmental Protection Agency (USEPA)		
Clearinghouse for Inventories & Emissions Factors (CHIEF)	Primary web-site for emission factors and development of emission inventories.	www.epa.gov/ttn/chief/
Emissions Factors & AP 42	AP-42 series documents emission factors for a variety of processes.	www.epa.gov/ttn/chief/ap42/index.html
Emission Inventory Improvement Program (EIIP)	EIIP was established in 1993 to promote the development and use of standard procedures for collecting, calculating, storing, reporting, and sharing air emissions data. Includes up-to-date, comprehensive emissions information for a variety of processes and sources.	www.epa.gov/ttn/chief/eiip/
Locating & Estimating (L&E) Documents	L&E documents characterizes the source categories for which emissions of a toxic substance have been identified. These volumes include general descriptions of the emitting processes, identifying potential release points and emission factors.	www.epa.gov/ttn/chief/le/index.html
Air Toxics Web Site (ATW)	ATW includes links to information on the list of the 188 Hazardous Air Pollutants (HAPs) regulated by the USEPA and corresponding development of Maximum Achievable Control Technology (MACT) standard for the 175 source categories identified as critical sources of HAPs. Over the past 10 years, EPA has issued 45 air toxics MACT standards.	www.epa.gov/ttn/atw/index.html and www.epa.gov/oar/oaqps/takingtoxics/p2.html
Toxics Release Inventory (TRI) Program	The Toxics Release Inventory (TRI) is a publicly available EPA database that contains information on toxic chemical releases reported annually by certain covered industry groups as well as federal facilities.	www.epa.gov/tri/
Emissions Factors Software and Tools	Emission rate estimating software such as web*FIRE* (air toxics Database for a variety of processes); and TANKS (assists with estimates of VOC emissions from storage tanks)	www.epa.gov/ttn/chief/software/index.html
Control Technologies for Hazardous Air Pollutants June 1991	This handbook provides detailed descriptions, design information, performance and costing data for a variety of air pollution control equipment. It is not available on-line but a hard copy can be ordered from the USEPA.	-

Reference Material	Description	Relevant Link
Environment Canada		
National Pollutant Release Inventory (NPRI)	A search engine to review annual emissions of a wide range of contaminants from facilities across Canada	www.ec.gc.ca/pdb/npri/npri_home_e.cfm
NPRI Toolbox	The "NPRI Toolbox" was created to assist those involved in preparing NPRI reports by placing all available information on estimation in one location. The Toolbox contains various methods of estimating releases, references (including guidance documents and software), case studies and examples, various spreadsheets for estimating emissions for various processes and questions and answers pertaining to release estimation.	http://www.ec.gc.ca/pdb/npri/documents/2004ToolBox/toolBox_e.cfm
Strategic Options Process (SOP)	The SOP is a multi-stakeholder effort that has resulted in the development of technical background information documents and proposals for the reduction of designated toxic pollutants.	www.ec.gc.ca/NOPP/branch/en/prod-pub.cfm?par_MenuID=8
Ontario Ministry of the Environment		
OnAir Historic Repository	Effective February 15, 2006, the Ministry of the Environment has amended Ontario Regulation 127/01 - Airborne Contaminant Discharge Monitoring and Reporting. The amended regulation harmonized the province's air emission reporting system with that of the federal government's National Pollutant Release Inventory (NPRI) program. As a result, Ontario's OnAIR web site has been discontinued. Beginning for reporting year 2005, all Ontario airborne emissions data, including those reported under the authority of O.Reg. 127/01, will be available to the public through the NPRI program. Access to data reported from 2001 through 2004, and all information relating to the previous version of the regulation, will be available in the OnAIR Historic Repository.	www.ene.gov.on.ca/envision/monitoring/ohr.htm
Spills Equation	This spills equation (provided by staff of the MOE, Environmental Monitoring and Reporting Branch) may be used to approximate evaporation rates from spills, open tanks, drums or pools	ESDM Procedure Document (www.ene.gov.on.ca/envision/gp/3614e02.pdf)
Approximating Vapour Pressure Within a Mixture of Compounds	The following approach can be used to estimate the vapour pressure of a specific compound within a liquid mixture (contained in a drum, tank, etc) when only the vapour pressure of the mixture at standard temperature and pressure is known.	

Reference Material	Description	Relevant Link
Ontario Ministry of the Environment (Continued)		
Approximating the Specific Volume of a Gas	This equation (based on Ideal Gas Law) may be used to approximate the specific volume of a gas.	ESDM Procedure Document (www.ene.gov.on.ca/envision/gp/3614e02.pdf)
Approximating Particulate Emissions from Baghouses	An emission factor of 0.01 grains/ft3 of gas or ~20 milligrams/m3 of gas can be assumed for the outlet of a baghouse. Deviations from the above baghouse emission factors can be considered for site-specific situations such as the use of validated source testing results; there are multiple baghouses where a lower emission factor is used for all but the largest baghouse; the inlet loading to a baghouse is less than 20 mg/m3; and/or baghouses are used in series.	
Guidance for Welding Operations	An MOE approvals guidance document, from the late 1980's suggests that it is reasonable to assume that 1% of the consumable electrode in electric-arc welding will be emitted as fume from the welding operation. Note: Appendix B, Table B-3 in this document indicates that maintenance welding stations can be considered as insignificant sources of air emissions.	
Approximating Isocyanate Emissions	In cooperation with the suppliers and users of isocyanates, the Ontario Ministry of the Environment (MOE) conducted a study of 1,6-Hexamethylene Diisocanate (HDI) emissions with a focus on spray booth operations in the automotive industry. Emissions factors were developed for three (3) operating conditions : - Autobody Sector using Best Management Practices; - Autobody Sector using Historical Practices; and - Original Equipment Manufacturer Sector.	Technical Bulletin (http://www.ene.gov.on.ca/envision/techdocs/5565e-tb.pdf) And Final Report (www.ene.gov.on.ca/envision/techdocs/5565e.pdf)
Other		
AWMA Air Pollution Engineering Manual	This text includes comprehensive descriptions and emission factors for a variety of industrial processes (based on information from the USEPA and industry associations) and provides information on the fundamentals of air pollution control. This text can be ordered on-line from the Air & Waste Management Association (AWMA).	http://www.awma.org/publications/index.html

This Table contains three columns. The first column contains the name of the reference material, the second column contains a description of reference material and the third column contains the corresponding link to the agencies web page on the internet.

TABLE C-2: SUMMARY OF SOME USEFUL EQUATIONS AND GENERAL GUIDANCE

Spills Equation

This equation (provided by staff of the MOE, Environmental Monitoring and Reporting Branch), may be used to approximate evaporation rates from spills, open tanks, drums or pools:

$Q = (8.5 \times 10^{-10}) \times A_p \times P^* \times M \times (u)^{0.78}$ (kg/s at 293 K or 20 degrees Celsius)

Where; Q = evaporation rate (vapour release rate), kg/s at 293 K or 20°C
A_p = pool area, in square metres
P* = partial vapour pressure (this can be estimated from the liquid mole-fraction), Pascal's
M = molecular weight, (summation of individual element molecular weights)
u= wind speed, metres per second

For evaporation rates at temperatures other than 293K or 20°C, use
$Q_t = Q \times (P_t/P_{293K}) \times (293/T_t)$; kg/s at T_t degrees Kelvin

Notes:

1. The wind speed can be estimated from site-specific data; or an assumption of typical wind-speed (i.e., 5 m/s for outdoor and 1 m/s for indoors).
2. Molecular weight can be calculated from the chemical formula for the compound and use of the periodic.
3. Partial vapour pressures for mixtures of compounds can be approximated from the equation/pro-ratio procedure set out below.
4. The above equations will be conservative for situations where the liquid level is well-below the tank/drum top. See the TANKS program (US EPA, US EPA TTN web-site) for guidance on how to account for this situation.

Approximating the Vapour Pressure within a Mixture of Compounds

In many cases it is necessary to estimate the vapour pressure of a specific compound within a liquid mixture (contained in a drum, tank, etc.) where the Material Safety Data Sheet for the mixture includes only a vapour pressure for the mixture at standard temperature and pressure. The following approach can be used to estimate emissions of constituent 'i' in the liquid mixture. However, this procedure is only a "rough" approximation using Raoult's Law.

For an ideal solution, the equilibrium partial pressure, P^*_i, of constituent 'i', in a mixture at a fixed temperature equals the product of it's vapour pressure, P_i, when pure at this temperature and its mole fraction in the liquid, $M_{f\text{-}l}$ ...

$P^*_i = P_i \times M_{f\text{-}l}$

where $M_{f\text{-}l}$ = [(mass fraction in liquid of i)/(molecular weight of i)]
Summation of (mass fraction/molecular weight) for all constituents

Notes:

The vapour pressure, P_i (in Pascal where 1atmosphere= 101.3 kilopascals or 14.7 psi or 760 mm mercury), of constituent 'i' can be identified from reference texts such as Perry's.

This Table contains just one column, and is intended to emphasize its contents.

TABLE C-2: SUMMARY OF SOME USEFUL EQUATIONS AND GENERAL GUIDANCE CONTINUED

1. Approximating the Specific Volume of a Gas (from Ideal Gas Law)

$V = (T + 460)/(1.369 \times M_w)$, ft^3/lb
where; V = specific volume, cubic feet per pound of gas;
T = temperature, degrees Fahrenheit
M_w = molecular weight, (summation of individual element molecular weights)

Conversion to cubic metres per kilogram: multiply the above by (2.2046/35.315) or (0.0624).

2. Approximating Particulate Emissions from Baghouses

An emission factor of 0.01 grains/ft^3 of gas or ~20 milligrams/m^3 of gas can be assumed for the outlet of a baghouse. This factor is relatively insensitive to changes in baghouse inlet particulate loadings, due to the caking effect of the bags and the importance this has on controlling particulate emissions (i.e., the higher the inlet dust loading the faster and greater the caking on the bags and the higher the overall particulate collection efficiency of the baghouse).

Note: Deviations from the above baghouse emission factors can be considered for site-specific situations such as the use of validated source testing results; there are multiple baghouses where an operating condition is defined using the 20 milligrams/m^3 emission factor for one baghouse and a lower emission factor for the remaining baghouses resulting in the highest point of impingement concentration that the facility is capable of; the inlet loading to a baghouse is less than 20 mg/m^3; and/or baghouses are used in series.

Reference: United States Environmental Protection Agency, "Handbook – Control Technology for Hazardous Air Pollutants, June 1991, EPA/625/6-91/014"; section 3.3.1 Control Techniques for Particulate from Point Sources, Page 3-14 and section 4.9.4 Determination of Baghouse Operating Parameters, Page 4-70 and 4-71.

3. Guidance for Welding Operations

An MOE approvals guidance document, from the late 1980's suggests that it is reasonable to assume that 1% of the consumable electrode in electric-arc welding will be emitted as fume from the welding operation.

Note: Appendix B, Table B-3 in this document indicates that maintenance welding stations can be considered as insignificant sources of air emissions.

This Table contains just one column, and is intended to emphasize its contents.

TABLE C-2: SUMMARY OF SOME USEFUL EQUATIONS AND GENERAL GUIDANCE CONTINUED

4. Approximating Isocyanate Emissions

Many spray-painting operations include the use of an isocyanate-based catalyst/activator. Recent information has caused the MOE to consider re-evaluating the acceptable emission rate estimating calculations from painting operations for a number of hexamethylene diisocyanate compounds (HDI). In 2004 (tests conducted between June and August of 2004), MOE worked with representatives of industrial users and suppliers of HDI and coatings containing these compounds, to implement a study to develop air emission factors. HDI emission factors were developed for the following situations:

- Down-draft type spray booth with high volume low pressure (HVLP) spray guns using a high solids content coating;
- Down-draft spray booth with conventional spray guns using a low solids content coating; and
- Water-wash type spray booth with electrostatic conventional gun and a high solids content coating (i.e., typically, assembly-line type applications).

The final report and a technical bulletin on this report are available through the MOE website at www.ene.gov.on.ca/envision/techdocs/5565e.pdf and www.ene.gov.on.ca/envision/techdocs/5565e-tb.pdf, respectively.

This Table contains just one column, and is intended to emphasize its contents.

Appendix D: ESDM report Check-List and Suggested Format for an ESDM report – Table of Contents

Table D-1: Sources and Contaminants Identification Table

Table D-2: Source Summary Table

Table D-3: Dispersion Modelling Input Summary Table

Table D-4: Emission Summary Table

2009
EMISSION SUMMARY AND DISPERSION MODELLING REPORT CHECKLIST

Company Name:

_____

Company Address:

_____

_____

Location of Facility:

_____

_____

The attached Emission Summary and Dispersion Modeling Report was prepared in accordance with the guidance in the MOE document "Procedure for Preparing an Emission Summary and Dispersion Modelling Report" dated February 2009 and "Air Dispersion Modelling Guideline for Ontario" dated February 2009 and the minimum required information identified in the check-list on the reverse of this sheet has been submitted.

Company Contact: _____

Name: _____

Title: _____

Phone Number: _____

Signature: _____

Date: _____

Technical Contact: _____

Name: _____

Representing: _____

Phone Number: _____

Signature: _____

Date: _____

2009
EMISSION SUMMARY AND DISPERSION MODELLING REPORT CHECKLIST

	Required Information			
			Submitted	Explanation/Reference
	Executive Summary and Emission Summary Table			
	1.1	Overview of ESDM report	□ Yes	
	1.2	Emission Summary Table	□ Yes	
1.0	**Introduction and Facility Description**			
	1.1	Purpose and Scope of ESDM report (when report only represents a portion of facility)	□ Yes	
	1.2	Description of Processes and NAICS code(s)	□ Yes	
	1.3	Description of Products and Raw Materials	□ Yes	
	1.4	Process Flow Diagram	□ Yes	
	1.5	Operating Schedule	□ Yes	
2.0	**Initial Identification of Sources and Contaminants**			
	2.1	Sources and Contaminants Identification Table	□ Yes	
3.0	**Assessment of the Significance of Contaminants and Sources**		□ Yes	
	3.1	Identification of Negligible Contaminants and Sources	□ Yes	
	3.2	Rationale for Assessment	□ Yes	
4.0	**Operating Conditions, Emission rate estimating and Data Quality**			
	4.1	Description of operating conditions, for each significant contaminant that results in the maximum POI concentration for that contaminant	□ Yes	
	4.2	Explanation of Method used to calculate the emission rate for each contaminant	□ Yes	
	4.3	Sample calculation for each method	□ Yes	
	4.4	Assessment of Data Quality for each emission rate	□ Yes	
5.0	**Source Summary Table and Property Plan**			
	5.1	Source Summary Table	□ Yes	
	5.2	Site Plan (scalable)	□ Yes	
6.0	**Dispersion Modelling**			
	6.1	Dispersion Modelling Input Summary Table	□ Yes	
	6.2	Land Use Zoning Designation Plan	□ Yes	
	6.3	Dispersion Modelling Input and Output Files	□ Yes	

	Required Information			
			Submitted	Explanation/Reference
7.0	**Emission Summary Table and Conclusions**			
	7.1	Emission Summary Table	□ Yes	
	7.2	Assessment of Contaminants with no MOE POI Limits	□ Yes	
	7.3	Conclusions	□ Yes	
	Appendices (Provide supporting information or details such as…)			
			□ Yes	
			□ Yes	
			□ Yes	
			□ Yes	
			□ Yes	
			□ Yes	
			□ Yes	
			□ Yes	
			□ Yes	
			□ Yes	

SUGGESTED TABLE OF CONTENTS FOR AN ESDM REPORT

Notes: .....

(1) It is recommended that an ESDM report prepared in support of an application for CofA should include a completed **Emission Summary and Dispersion Modelling Report Checklist**

(2) Alternate formats for an ESDM report are acceptable if they comply with the ESDM report requirements of the Regulation.

i. Table D-1: Suggested Format for a Sources and Contaminants Identification Table

Source Information			Expected Contaminants	Included in Modelling?
Source ID (optional)	Source Description or Title	General Location	Contaminants	Significant (Yes or No?)

Notes: It is optional to identify the reference information that was used to identify the Expected Contaminants from the facility.

ii. Table D-2a: Suggested Format for a Source Summary Table

FORMAT 1 – Sorted by Contaminant

Contaminant	CAS #	Source Data								Emission Data					
		Source ID	Source Description	Stack Volumetric Flow Rate (Am^3/s)	Stack Exit Gas Temperature (^oC)	Stack Inner Diameter (m)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates (x,y) (m)	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission rate estimating Technique	Sample Calculation Identifier	Emissions Data Quality	% of Overall Emissions (%)

This Table contains fourteen columns and one row header. It contains no data, and serves to present the format suggested. The first column contains the name of the contaminant that is to be modelled, and the second column contains the corresponding CAS number of the contaminant. The third column contains the identification code of the source, and the fourth column contains the source's description. The fifth to tenth columns contain the volumetric flow rate, exit gas temperature, diameter, height above grade, height above roof, and coordinates respectively, of the corresponding source being modelled. The eleventh to fourteenth columns contain emissions information for the source being modelled, and include the maximum emission rate, the averaging time period, the technique used to estimate the emissions, and the level of data quality used in estimating the emissions.

Notes for Table:

i) Source ID: should provide information on the modelling source type (e.g., Point, Area or Volume Source); the process source or sources within the modelling source (e.g., Process Line #1); and the stack or stacks within each process source.

ii) Emission rate estimating Technique Short-Forms:
"V-ST" means Validated Source Test; "ST" means Source Test; "EF" means Emission Factor; "MB" means mass balance; "EC" means engineering calculation

iii) Data Quality Categories: Highest; Above-Average; Average; and Marginal.

iv) Alternate Table Formats: are acceptable if they provide the information required, under paragraph 8 of subsection 26 (1), of the Regulation, for a source summary table. In addition, multiple source summary tables can be used.

v) Sample Calculation Identifier: Sample calculation for each different source, contaminant or estimation method should be numbered and presented in the Appendix. It is not necessary to repeat the sample calculation if same approach is used to for multiple source and/or contaminant.

iii. Table D-2b: Suggested Format for a Source Summary Table

FORMAT 2: Sorted by Source

Source Identifier	Source Description	Source Data						Emission Data							
		Stack Volumetric Flow Rate (m^3/s)	Stack Exit Gas Temperature (^oC)	Stack Inner Diameter (m)	Stack Height Above Grade (m)	Stack Height Above Roof (m)	Source Coordinates (x,y) (m)	Contaminant	CAS #	Maximum Emission Rate (g/s)	Averaging Period (hours)	Emission rate estimating Technique	Sample Calculation Identifier	Emissions Data Quality	% of Overall Emissions (%)

This Table contains fourteen columns and one row header. It contains no data, and serves to present the format suggested. The first column contains the name of the contaminant that is to be modelled, and the second column contains the corresponding CAS number of the contaminant. The third column contains the identification code of the source, and the fourth column contains the source's description. The fifth to tenth columns contain the volumetric flow rate, exit gas temperature, diameter, height above grade, height above roof, and coordinates respectively, of the corresponding source being modelled. The eleventh to fourteenth columns contain emissions information for the source being modelled, and include the maximum emission rate, the averaging time period, the technique used to estimate the emissions, and the level of data quality used in estimating the emissions.

Notes for Table:

i) Source ID: should provide information on the modelling source type (e.g., Point, Area or Volume Source); the process source or sources within the modelling source (e.g., Process Line #1); and the stack or stacks within each process source.

ii) Emission rate estimating Technique Short-Forms:
"V-ST" means Validated Source Test; "ST" means Source Test; "EF" means Emission Factor; "MB" means mass balance; "EC" means engineering calculation.

iii) Data Quality Categories: Highest; Above-Average; Average; and Marginal.

iv) Alternate Table Formats: are acceptable if they provide the information required, under paragraph 8 of subsection 26 (1) of the Regulation, for a source summary table. In addition, multiple source summary tables can be used.

v) Sample Calculation Identifier: Sample calculation for each different source, contaminant or estimation method should be numbered and presented in the Appendix. It is not necessary to repeat the sample calculation if same approach is used to for multiple sources and/or contaminant.

iv. Table D-3: Suggested Format for a Dispersion Modelling Input Summary Table

Relevant Section of the Regulation	Section Title	Description of How the Approved Dispersion Model was Used
Section 8	Negligible Sources	
Section 9	Same Structure Contamination	
Section 10	Operating Conditions	
Section 11	Source of Contaminant Emission Rates	
Section 12	Combined Effect of Assumptions for Operating Conditions and Emission Rates	
Section 13	Meteorological Conditions	
Section 14	Area of Modelling Coverage	
Section 15	Stack Height for Certain New Sources of Contaminant	
Section 16	Terrain Data	
Section 17	Averaging Periods	

v. Table D-4: Suggested Format for an Emission Summary Table

Contaminant Name	Contaminant CAS #	Total Facility Emission Rate (g/s)	Air Dispersion Model Used	Maximum POI Concentration ($\mu g/m^3$)	Averaging Period (hours)	MOE POI Limit ($\mu g/m^3$)	Limiting Effect	Regulation Schedule #	Percentage of MOE POI Limit (%)

This Table contains ten columns and one row header. It contains no data, and serves to present the format suggested. The first column contains the name of the contaminant that is to be modelled, and the second column contains the corresponding CAS number of the contaminant. The third column contains the total property-wide emissions of the contaminant. The fourth column contains the name of the air dispersion model used to model, and the fifth and sixth column contains the corresponding maximum Point of Impingement (POI) concentration predicted by the model and the model averaging period respectively. The seventh, eighth and ninth column contain Ontario's air quality limit, the corresponding limiting effect, and the Regulation Schedule Number from which the limit was obtained. The tenth column contains the ratio of the modelled maximum POI as a percentage of the Ontario air quality limit.

The term "MOE POI Limit" identified in Table D-4 refers to the following information (there may be more than one relevant MOE POI Limit for each contaminant):

(1) air quality standards in Schedules 1, 2 and 3 of the Regulation; and

(2) the guidelines for contaminants set out the MOE publication, "Summary of Standards and Guidelines to Support Ontario Regulation 419: Air Pollution – Local Air Quality" (as amended) and can be found on the MOE's web site at www.ene.gov.on.ca

(3) an acceptable concentration for contaminants with no standards or guidelines.

Appendix E: Review of Approaches for the Combined Analysis of Modelled and Monitored Results

TECHNICAL BULLETIN

March 2009

THE USE OF COMBINED MODELLING AND MONITORING ASSESSMENTS AS AN EMISSION REFINEMENT TOOL

1. INTRODUCTION

Modelling and monitoring are both tools that are used to determine air concentrations of specific contaminants. Both tools are affected by meteorological conditions as well as the amount of the contaminant being discharged to the air. When modelling and monitoring data are used together, they can lead to more accurate or refined emission rate(s) for nearby industrial sources. The use of modelling/monitoring to refine emission rates is a requirement of Ontario Regulation 419/05: Air Pollution – Local Air Quality (hereafter referred to as the Regulation). This is outlined in sections 11 and 12 of the Regulation. Section 11 describes the regulatory requirements for the determination of emission rates. In particular, paragraph 3 of section 11 (1) refers to the methodology for determining emission rates using a combination of modelling and monitoring. Section 12 describes how facility operating conditions may be used with these emission rates in an approved dispersion model. The purpose of this Technical Bulletin is to outline this methodology so that the emission rates that result are as accurate as possible.

Integrated Air Quality Management is based on consideration of air dispersion models, emission rates, and measurements. Modelling results can be used to provide information on locating monitoring sites. Monitors can provide information on measurements at particular locations. Models however can be used to assess concentrations anywhere on or off property to determine the maximum concentration. However, the use of modelling alone to assist in identifying maximum impact areas and concentration patterns is dependent on the completeness and reliability of the facility's emissions and on the meteorological data available. Model runs using a number of years of meteorological data are generally required to show the variability in maximum concentrations and their locations.

Monitoring results can be used to identify systematic biases in model predicted concentrations, which can occur due to a number of factors including the adequacy of the surface characteristics, source parameters and building information used in the modelling assessment along with uncertainties and/or omissions in the facility's emission data. Monitoring results alone cannot be used to demonstrate compliance with the Regulation which requires a facility to demonstrate compliance with Ministry of the Environment (MOE) Point of Impingement (POI) standards and guidelines (MOE POI Limits) at all offsite locations (and certain on-site locations such as daycares). Measured concentrations below a MOE POI limit at discrete monitoring locations do not guarantee that the concentrations are below the MOE POI limit at other off-site locations that are not monitored.

The various "tiers" of modelling assessment reflect the increasing complexity of a situation to be modelled, similar to the complexity and scope that a monitoring program can entail. Although air dispersion modelling alone can be used to demonstrate compliance, the two methods should be considered complementary. When used in combination, air dispersion modelling and ambient monitoring data can assist in more accurately defining a facility's emissions, source characteristics, and potentially identify sources which are of greater importance to POI concentrations than may have been determined through modelling alone. In particular, a combined monitoring and modelling analysis can be used as an emission estimating technique. It can be useful in identifying the sources of emission that are the most significant contributors to POI concentrations and/or sources where the emission rate estimates are the most uncertain. The Regulation specifically requires that the emissions in a "fully refined" ESDM report (i.e. one that is not representative of "conservative, worst-case maximum" conditions), be determined using a combination of modelling and monitoring data. Although there are many different uses and applications of combined modelling/monitoring assessments, the focus of this Technical Bulletin is its use as an emission refinement tool as required by the Regulation.

Comparisons of modelled results with monitoring data must be done with caution. Model output

concentrations depend on emissions, source parameters and meteorology as well as the uncertainty of the dispersion model. The period of available monitoring data and the locations of the monitors are also important factors when comparing model results with monitoring data. When used as an emission refinement tool, monitoring data should only be compared to modelled concentrations using meteorological data from the same time period (i.e. ambient measurements collected from May to September 2007 should only be compared to model predictions using meteorology from the same period).

With respect to the location and number of ambient monitors to use in an assessment, the ultimate purpose of the modelling/monitoring program must be considered. If the data is to be used to refine source emission rates, monitors should be placed in the vicinity of the target sources to pick up the emissions while taking into consideration the source characteristics such as stack height/building height, and any local obstructions to the air flow.

It should be noted that combined modelling and monitoring can also be used to refine source characteristics (rather than emission rates) for non-stack type sources, but a different approach must be used. The approach for source refinement is generally more complex and labour intensive. Such monitors generally have to be placed in very close proximity to the target sources and may require multiple monitors per source or source grouping to provide useful information. The use of tracer gases to minimize uncertainties in emission rates might also be useful. It should be stressed however that the Regulation only describes this method for use in emission refinement, and thus any known uncertainties in source characteristics and proposed mitigation of them must be discussed with the MOE in advance and outlined in the Plan discussed in section 2.1. Placement of monitors is a key factor in minimizing the impacts of such uncertainties and acquiring useful data from combined modelling and monitoring programs to refine emission rates. As a result most programs will require pre-consultation and a site visit by Ministry staff to approve proposed monitor locations.

Many jurisdictions provide guidance with respect to the use of modelling and monitoring data. In the UK, comparisons of modelled results with monitoring data are discussed in their guideline. The guideline describes the uncertainties in model inputs, including emissions and other factors, as potential causes of disagreements between model results and monitoring data. It is also recommended that source information and in particular emission estimates be reviewed when monitoring results do not agree with model predictions. Ultimately, this is the goal of the emissions refinement approach in the Regulation.

When monitoring data are used to assess modelling results for averaging times from 1 to 24 hours, more robust comparisons can be achieved using a percentile of the data rather than only the maximum concentrations. Percentile comparisons reduce the impacts of outliers in either the monitoring or the model results. In instances where there are other sources of the target contaminants, the impact of background sources on measured concentrations may also need to be taken into consideration for determining emission rates.

Finally, since the meteorological data may be from a location that is different than the site, any given hour in the data may describe conditions that may not have occurred at the site in question. A difference of as little as 20° in the wind rose at the wind tower site compared to the facility wind rose could significantly affect comparisons of modelled with monitored results. Careful selection of data sets is intended to generate statistical similarity to the test site. The model should generally reproduce what is expected to be measured, in an overall sense.

The accuracies and precisions of all components contributing to air concentrations must be respected and considered. The goal is to produce a consistent picture of the situation in order to properly evaluate impacts.

2. PROPOSED APPROACHES AND ISSUES

2.1 Pre-Test Plan

In order to be accepted by the MOE, all combined modelling/monitoring assessments must be completed according to a pre-approved Plan. Form 6323e entitled "*Request for Approval Under paragraph 3 of s. 11(1) of Regulation 419 of a Plan for Combined Analysis of Modelled and Monitoring Results*" can be found on the MOE website (www.ene.gov.on.ca/publications/6323e.pdf), and should be submitted to the MOE along with the Plan.

The Plan should outline the purpose of the modelling/monitoring and describe the program in sufficient detail to demonstrate that the goals will be met. At a minimum it should include the following elements:

- Scaled site plan (including property boundary, building locations, and the location of emission sources);

- Meteorological information (including the data set to be used, applicable wind roses and local land use information);
- Map of proposed monitoring locations (Note: if mobile monitors are being considered, the approach should be based on wind direction and outlined in detail);
- Details of the proposed sampling approach (including the target pollutants, method to be used, sample frequency and duration, the proposed length of the program, and laboratory/analytical details);
- Proposed data analysis/screening approach (i.e. how to discern between valid and invalid samples);
- Proposed air dispersion modelling approach (i.e. model to be used for emission refinement, initial target sources for emission adjustment, etc).

Pre-consultation with the MOE is recommended prior to submission of the Plan. Also, the proposed monitoring program should satisfy the requirements outlined in the "Operations Manual for Air Quality Monitoring in Ontario" (www.ene.gov.on.ca/publications/6687e.pdf), which contains guidance on ambient monitoring, such as monitoring techniques, siting criteria and other related issues.

2.2 Monitoring Approaches

In the past, ambient monitoring data has generally been collected at stationary or fixed locations. However, variable location monitors used in conjunction with meteorological forecasting information may be used in order to reduce the amount of time and expense necessary to collect sufficient data. Although generally similar in most respects, the approaches used to conduct these assessments have important differences that must be considered. Each is discussed separately below.

2.2.1 FIXED LOCATION MONITORING (i.e., Ambient Air Quality Station)

This type of situation usually provides a significant quantity of data points to be considered in the analysis. Selection of data sub-sets should be done to focus the analysis on higher observed concentrations, known as "hits". In cases where several sources contribute to the measured values, selecting particular monitoring sites or times might be necessary to separate the impacts of the sources.

2.2.1.1 Monitoring Data Analysis & Screening for Fixed Location Monitoring

The first and most important step in the analysis of a long term dataset is to examine the data for general trends (increases/decreases, periods of distinct levels, percentile information, contaminant ratios, levels consistently above normal ambient concentration, etc.). The data should be screened based on the wind directions that occurred during each sample. High measured values that occur contrary to the wind conditions (i.e. when the monitor was upwind of the source) may indicate additional sources in the area or a meteorological anomaly between the met tower site and the facility location. These data should be carefully examined to determine how they may be used in the analysis.

"Pollution rose" analyses of monitoring data can help support the link between the monitoring results and the suspected source(s). Where multiple monitoring stations are located close to the facility of interest, the analysis becomes even more valuable. The creation of a "pollution rose" could be limited to a simple 4 sector analysis (associating count of concentration within a range by wind direction: i.e. <0.01, >0.01 to <0.04, >0.04…). The wind rose should clearly point towards the suspected source(s), otherwise this may indicate the presence of other sources.

Measured levels at or below "normal ambient levels", may indicate that the suspected source is emitting very little of those specific contaminants; however the potential for a poorly located monitor (i.e. one that is too far away from the facility) should also be considered.

If the monitor has captured data for other contaminants that are emitted by the source under study, these should be treated in parallel and subjected to the same data review. The inclusion of multiple contaminants will allow for a ratio analysis, which can be extremely useful in separating different contributing sources at a facility. For example, at some facilities, the ratios of specific contaminants are different when released from process sources versus fugitive sources. For contaminants emitted from the same or similar sources at a facility, the contaminant ratios in the emission rates should be similar to the ratios of the measured concentrations for high events. If the measured ratios are not comparable to any of the emission ratios this could indicate that several sources are contributing, or that there is an error in the emission ratios. In these instances, the emission estimates and source characteristics should be carefully reviewed.

For the analysis of 1 to 24 hour average concentrations, select a percentage (or X highest values) of the data over the time period for which both

modelling and monitoring are available. This percentage should be based on the data, averaging period and time available for the study, and will vary depending on the amount of data available and on the frequency of high concentrations in the data set. The study should not be limited to only the highest observed concentration which may have biases of its own. The high values selected (i.e. the "hits") should be defined as a distinct threshold above background (i.e. at least 50% above background). The MOE generally expects that studies use a minimum of 30 "hits" for data on a 24-hour average basis (i.e. daily measurements). Monitoring data collected over shorter durations (i.e. 1-hour averages) will also require approximately 30 hits collected over at least 20 different days.

It should also be noted that values measured on "calm days" might be difficult to model. The meteorological data may show a fairly constant direction at 1 m/s when in actuality the wind was varying in direction and lower in speed. While screening these values may prove too time consuming, this should however be considered in the biases plot analysis (described later).

It is recommended that a "site plan plot" be set-up for each measurement where a "hit" was identified. This plot will illustrate the ambient measurements for each monitor in relation to the key sources of emission, the property-line, the monitor and key receptor locations and the wind rose for the specific monitoring period/day. The site plan should also have a north arrow, a scale and comments/notes on the facility operation for the monitoring period. An example site plan plot is provided in Figure 1.

Once the observed "hit" data has been selected, the values should be recorded in a table or spreadsheet arranged by date and/or time. An additional column should be set aside for the model predictions, once available.

2.2.2 VARIABLE LOCATION MONITORING

For mobile monitors and other short term monitoring studies near sources, there is usually much less data available for analysis (a limited number of samples during a limited period of time) in comparison to fixed location monitoring stations. However, these programs are usually designed such that the samples specifically capture emissions from the target facility (i.e. the monitor is located downwind during time periods when the facility is operating). Therefore it is more likely that the monitor will register a hit. Similar to fixed location monitoring, approximately 30 "hits" would generally be required for mobile monitoring programs. Site specific wind speeds and directions should also be collected as part of the data set, wherever possible.

The analysis is virtually identical to analyses for fixed location datasets. In the case of mobile datasets, all downwind samples considered to be a hit will be included in the analysis except where there are known suspect values. Suspect data could, for example, be an indication in the survey report that the facility wasn't operating or fully operating at the time of the measurement.

2.2.2.1 Monitoring Data Analysis & Screening for Variable Location Monitoring

Similar to the approach used for fixed location monitoring, the dataset should be subject to a pre-screening analysis to confirm it is linked to the suspected sources and that a clear signal is present (compared to upwind values or/and normal ambient values). As described earlier, ratio analyses can also be used to help separate different sources or source types. Refer to Section 2.2.1.1 for further details.

Mobile monitoring is also more likely to use non-standard averaging periods during sample collection. For example, in order to accommodate site or staffing requirements, the sampling may only be done during daytime hours, whereas the facility may operate for the entire day. This must be considered in the modelling and generation of model outputs.

2.3 Air Dispersion Modelling Approaches

The general approach used in the air dispersion modelling part of the assessment is similar for both fixed and mobile monitors. However, there are some key differences related to receptor placement and wind direction variation that affect how the assessment is done. These are discussed in the following sections.

2.3.1 Modelling Approach for Fixed Location Monitoring

When the combined modelling/monitoring analysis is being done to refine emissions, the modelling is usually completed in an iterative process, focusing particularly on sources where there is a high degree of uncertainty in the emission rates. This modelling is usually completed only for the days on which the selected high values (i.e. "hits") occurred, and must consider any applicable variations in production or emission rates, such that the emissions correspond to those that occurred on each monitoring day. This type of

approach typically results in distributions of emission rates for the target source(s).

Comparisons between modelled and observed concentrations are done using quantile:quantile (Q-Q) plots to assess how well the observations match the modelled results. This is discussed in further detail in section 3.0.

When completing dispersion modelling for a combined analysis, care should be taken in determining the model inputs and settings as accurately as possible. Any significant uncertainties should be recorded and subjected to a sensitivity analysis if appropriate. For example, if there was uncertainty in the height of the buildings causing plume downwash, a second model run could show the sensitivity of the model results to that parameter. Also the emission inventory must be representative of the actual process/production conditions that occurred during the monitoring, and will not necessarily reflect worst case maximum emissions. Emission rates should be analyzed to assess their appropriateness in regard to the averaging time and adjusted accordingly (i.e. tank filling emission rates are likely very discontinuous in time and might not impact monitoring results collected over a longer sampling period due to variations in wind directions).

In order to reduce the impacts of discrepancies between the actual wind directions transporting the facility emissions and the wind directions in the meteorological data set, model results are output at clusters of receptors near the monitoring location. A grid of elevated receptors should be set up for each monitor. For example, the grid could include one receptor on the exact monitor location, and 4 additional receptors each offset by 20 to 100m on both sides of each axis (see Figure 2). This is dependant on the distance of the monitors from the facility sources – the farther the distance, the greater the required offset. The sampling height of the station should be used as the receptor elevation. The model should be run for the same periods (hours or days) on which valid monitoring was available (i.e., all valid monitoring for the time period selected for comparison with modelled results). The average of the five receptors surrounding the monitor location is then used as the representative modelled concentration.

The use of the most appropriate meteorological data will greatly improve the analysis. The selection of meteorological data should take into account the distance to site and proximity to lakes and other local influences (ridges, mountains, etc…). Shifts in the wind rose between the wind tower site and the facility of as little as 20° could affect comparisons of modelled results with observed data. In addition, appropriate land use characterization could have a significant influence on model results.

2.3.2 Modelling Approach for Variable Location Monitoring

Although short term/variable location surveys attempt to take measurements as close to the plume centreline as possible, the wind direction will often shift during the sampling period. If there were changes in wind direction over the sample collection period, the percentage of time that the monitor was downwind must be considered in determining whether the measurement is considered a “hit”. In general, the monitor should be downwind of the source for 50 to 75% of the monitoring period. For example, for an 8 hour monitoring period, the monitor would have to be downwind for a minimum of 4 hours to be considered a hit.

To account for uncertainty in the location of the monitor relative to the plume centreline, the modelling can be performed using a line of receptors (≈10 receptors) placed perpendicular to and centred on the prevailing wind direction during the sampling period. The meteorological data should be examined to ensure that the monitor was downwind of the main suspected emission sources during sample collection. The receptors are spaced to intersect with a 20 or 40 degree spread from the prevailing wind direction (i.e. 10° or 20° on either side of the assumed centerline). This type of receptor arrangement is shown in Figure 3. Note that the most significant source may not be the same for all sampling locations.

3.0 Biases Analyses and Emissions Refinement

Figure 4 presents a typical example of a bias analyses graph using a quantile:quantile (Q:Q) plot. Although there are other forms of presentation for this data, this Technical Bulletin will focus on the use of Q:Q plots.

The biases graph allows rapid identification of biases in favour of modelling or monitoring. The closer the points are to the center line (1 to 1 factor line) the better the fit between the modelling and the monitoring. If values are consistently above that line and outside of the “factor of two line”, this would indicate a strong bias towards modelling (higher or overpredicted modelled values) and the reverse for points consistently below.

Any consistent bias should trigger further analysis of the data and modelling inputs, which may include:

- the study of other contaminants and their ‘fit’ to the data (ratio analysis: comparison of emission ratios,

modelled concentration and monitored concentrations);
- the study of source characteristics and emission distribution;
- if only a specific monitor is affected, study the location in relation to major sources;
- validity of meteorological data (calms, land use, applicability to site);
- averaging time effects between monitoring and emission estimates;
- uncertainty of emission factors or emission rates used as model inputs.

The resulting hourly or daily average predictions for the inter-comparison time period should be recorded as a new column in the previously created table or spreadsheet. An example data sheet showing the measurements, model predictions and facility production rates for each of the hit days is shown in Figure 5. An initial unpaired Q:Q plot should be prepared over the entire data set. This plot would show whether there were any systematic biases in the data. Points falling outside of a factor of 2X require additional examination.

Differences between the model outputs and observations can generally be attributed to three possible causes. These are: (1) discrepancies in the meteorological data between the tower site and the facility (i.e. winds were in a different direction at the site than what was modelled); (2) errors in the source characteristics used in the model (i.e. incorrect stack or building heights, exhaust temperatures, etc); or (3) discrepancies in the source emission rates that were modelled due to process variations or potentially inaccurate emission rates.

The goal of the combined analysis is to obtain a relatively precise matching between the observations and model predictions (i.e. the points fall approximately on the 1:1 line) on an unpaired basis, for the data selected for inter-comparison (i.e. the "hits"). The elements outlined in (1) and (2) should be reviewed to ensure that they are correct, and the model re-run if errors are determined. Possible uncertainties should be discussed early as part of the proposed modelling/monitoring plan. The data from each monitoring site (paired in space) are then also paired in time for the purposes of (3) emissions refinement. Ideally, the data should show a good 1:1 correlation between the monitored and modeled results. At a minimum, points falling outside a factor of 2X on a *paired* basis require adjustments to the source emission rates of the most uncertain or potentially variable sources, such that the points fall within the 2X zone after re-modelling. Note that upward or downward adjustments may be required. It should also be noted that some points falling within the factor of 2X zone may require adjustment as well, particularly those at the upper end of the measured concentrations or if a bias is clearly visible in the data (i.e. most points fall below the 1:1 line).

A detailed, step-by-step procedure is outlined below.

1) Qualitative Assessment of Facility Operations, Meteorological Data and Ambient Measurements

Objective: Identify monitoring results for the contaminant where facility sources are anticipated to be a primary contributor. Generally, a combined monitoring and modelling analysis should have at least 30 such measurement "hits", where a hit is defined as a distinct threshold above background (i.e. at least 50% above the anticipated background).

i) Identify additional "hit" criteria (e.g., measurements at least 50% above background where the wind direction was from the facility towards the monitor for at least 25% of the monitoring and operating period and very light/calm winds were infrequent).

ii) For each measurement where a "hit" was identified, set-up a "site plan plot". Tabulate the ambient measurements for each monitor in conjunction with the wind rose for the specific monitoring period/day; a site plan (that indicates the key sources of emission, the property-line, the monitor and key receptor locations, the north arrow and a scale); and comments/notes on the facility operation. An example site plan plot is provided in Figure 1.

iii) Analyze the data with respect to the wind directions for the measurement period to check for inconsistencies with identified emission sources. High observed concentrations which are not consistent with identified emission sources could be due to other emission sources that are at the facility but not properly quantified. Additional source specific monitoring could be required to quantify emissions in this case.

2) Initial Unpaired Analysis

Objective: Perform an initial assessment of how well the model predictions match the observations, and address any potential issues with meteorological anomalies or source characteristics.

i) For each monitoring location, rank both the observations and model predictions for the "hits" from highest to lowest and construct an unpaired Q:Q plot.

ii) Examine the plot to identify any systematic biases. For example, if there are points that fall outside of the factor of 2X zone, then model inputs should be checked.

iii) Verify the source characteristics including building downwash impacts and the release locations for fugitive sources. Check the meteorological data for cases with very light wind speeds or inconsistent wind directions. Re-model and re-plot if necessary.

3) Paired Analysis and Emissions Adjustment/Refinement

Objective: for each monitoring "hit" identify the emission rate(s) that result in a relatively precise matching of the atmospheric dispersion modelling with the observations.

i) For each monitoring location, construct a paired Q:Q plot (now paired in space and time) of the observations and model predictions for the "hits".

ii) For each point that falls outside of the factor of 2X zone, identify the air emission sources that are likely the primary contributors to the measurement. MOE staff may be consulted on the selection of the key sources for each monitoring hit but generally factors such as likelihood of contributing to a specific monitored episode; the significance of the source from both an emission rate and dispersion modelling perspective; and the uncertainty in the initial emission rate are factors to consider when selecting the key sources where the emission rate will be varied. For these sources, adjust the emission rates of the selected sources such that there is a match between the monitored and modelled result. This step may take a number of iterations and selection of multiple possibilities to select the "best-fit" scenario. As a first set of iterations, adjust the emissions until the points fall within the factor of 2X line on a paired basis.

It is recommended that the contributions of individual sources or groups of sources be recorded for each hit. This will permit the effect of emissions adjustments to be determined without re-running the model for each hit.

iii) Tabulate the results of the refined emission rates (for the key sources) for each monitored "hit". The result will be a distribution of emission rates for the key sources which reflects the actual variability of emissions from these sources.

4) Verify with Unpaired Q:Q Plot

Objective: Using the emission rates identified in the above analysis, provide a Q-Q plot that demonstrates a relatively precise match between the monitored and modelled results (i.e. the points fall approximately on the 1:1 line).

i) On an unpaired basis, plot the monitored and modelled results on a log-log scale. If the points do not fall approximately along the 1:1 line, or if any systematic biases are apparent in the highest values (i.e. the points trend downwards as the values increase or are well below the 1:1 line, indicating model underprediction) additional analysis and potentially further emission adjustments may be necessary.

ii) Identify the points where a relatively precise match has not been achieved, and examine the meteorology, facility operating conditions and source emission rates used in the modelling. If there are no apparent meteorological conditions that may be contributing to the bias, it is possible that the emission adjustments made in the previous step may not have been representative (i.e, have been over or under-emphasized), such that additional sources may have to be considered for adjustment or the adjustments modified for the selected sources. The use of unitized emissions for each source or group may also be helpful in identifying key sources to adjust. Repeat step 3 above until the selected points now fall within a factor of 1.5X.

5) Update Emissions Data

Objective: determine appropriate emission rates to be used to demonstrate compliance using a five year meteorological data set.

i) Plot the frequency distribution of emission rates for each key source. A sample frequency histogram is shown in Figure 6. If the distribution of emissions resembles a log-normal type distribution, select the mean plus one standard deviation as the emission rates to be used for the key sources. For normally distributed data, select the mean plus two or three standard deviations. All other sources may be run at the mean emission rate. It is strongly recommended that proponents consult with MOE staff prior to the final selection of the emission rates.

ii) Re-run the model using a MOE approved 5-year meteorological data set.

A reasonable test to ensure that the final emission rates are sufficiently conservative would be to model the final emission rates for each of the monitoring days and re-plot on an *unpaired* basis. The results should be above the 1:1 line. If this is not the case, the final run may not be sufficiently conservative, and thus more adjustments may be required. In these cases, it is recommended that proponents seek additional guidance and input from MOE.

4.0 REPORTING

The analysis report should include at a minimum:

- Summary of analysis and findings
- List of known uncertainties and sensitivity analysis results
- Site plan plots and wind roses corresponding to each measurement
- Facility operational/production data for each “hit” day
- Biases graphs with explanations and table
- Pollution rose if created
- Contaminant ratio analysis results and explanations, if performed
- Description of validity of meteorological data used
- Plot of frequency histogram of emission rates from the selected sources
- Model input file in Appendix

A request for approval of the modelling/monitoring plan can be found on the MOE website: Request for Approval under paragraph 3 of s. 11(1) of Regulation 419 of a Plan for Combined Analysis of Modelled and Monitoring Results (PIBs# 6323e).

REFERENCES

1. Ontario Ministry of the Environment, 2008. Air Dispersion Modelling Guideline for Ontario.
2. U.S. Environmental Protection Agency, 2003. *Appendix W to Part 51 Guideline on Air Quality Models*, *40 CFR Part 51*. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.
3. Technical Guidance LAQM TG(03), Part IV of the Environment Act 1995 Local Air Quality Management, 2003, Department for Environment, Food and Rural Affairs, London

Figure 1: Example Site Plan Plot

Date:

Monitor ID	Contaminant	Averaging Period	Measurement ($\mu g/m^3$)

Notes on Facility Production:

Brief Description/Rationale of Anticipated Emissions Sources to Vary:

Figure 2: Modelling approach for comparison of fixed location monitoring

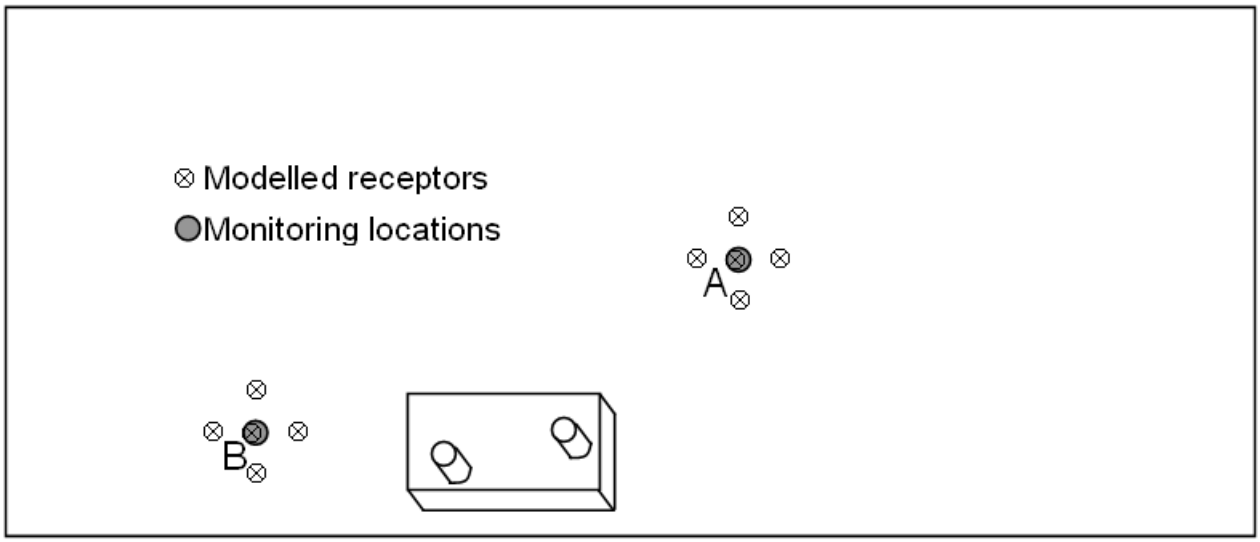


Figure 3: Modelling approach for comparison of variable location or mobile monitoring

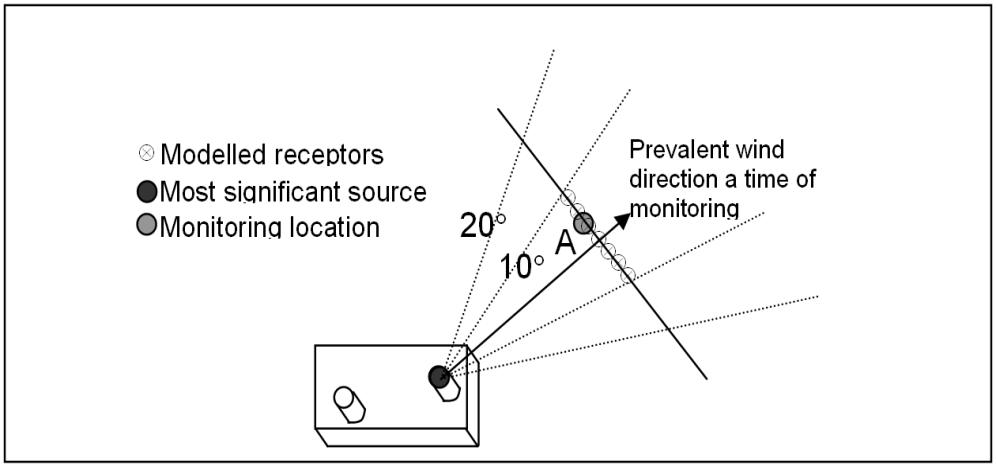


Figure 4: Example Quantile:Quantile (Q:Q) Plot

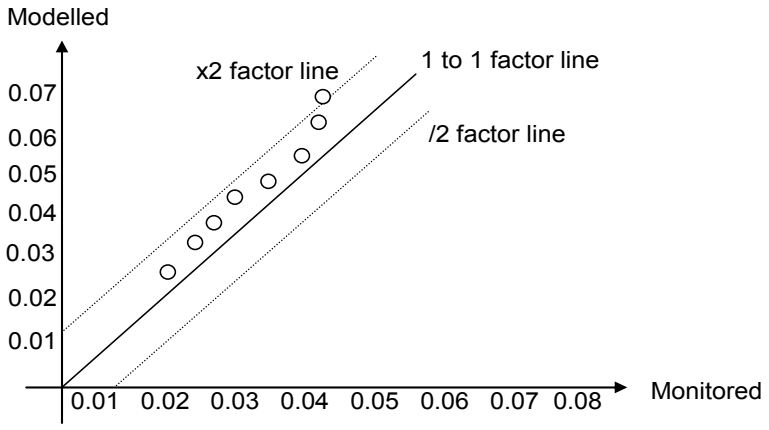
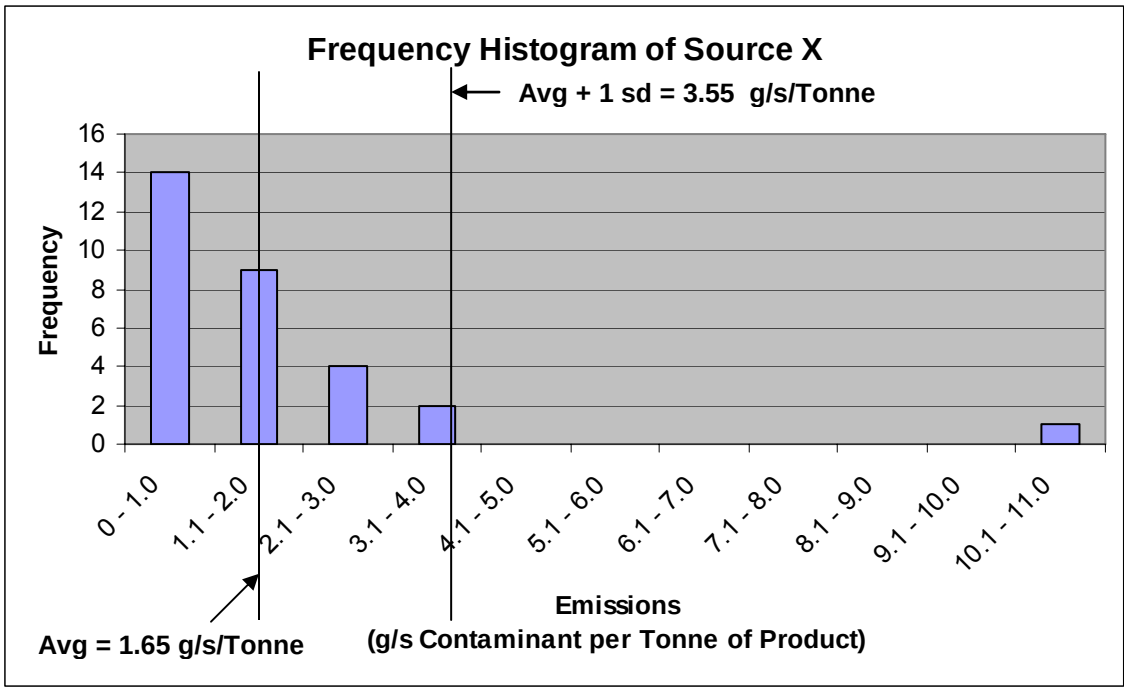


Figure 5: Example Data Tabulation for Hits

Hit Days	Production Data		Location #1		Location #2	
			Monitored	Modelled	Monitored	Modelled
	(kg)	(tonnes/hr)	(µg/m^3)	(µg/m^3)	(µg/m^3)	(µg/m^3)
30-May-07	429	0.027	0.023	0.012	0.023	0.024
05-Jul-07	399	0.025	0.026	0.021	0.010	0.008
16-Aug-07	176	0.022	0.026	0.032	0.025	0.022
24-Aug-07	239	0.030	0.034	0.022	0.044	0.011
07-Sep-07	204	0.025	0.087	0.052	0.040	0.013
11-Sep-07	665	0.083	0.035	0.042	0.026	0.027
19-Sep-07	665	0.083	0.029	0.024	0.012	0.009
25-Sep-07	389	0.049	0.128	0.018	0.063	0.009
03-Oct-07	194	0.024	0.042	0.020	0.028	0.004
19-Oct-07	317	0.040	0.026	0.027	0.009	0.006
27-Oct-07	0	0.000	0.086	0.074	0.031	0.002
31-Oct-07	340	0.043	0.148	0.060	0.030	0.012
06-Nov-07	222	0.028	0.090	0.100	0.282	0.003
08-Nov-07	15	0.002	0.006	0.008	0.013	0.005
14-Nov-07	590	0.074	0.157	0.040	0.068	0.013

Figure 6: Example Emission Frequency Histogram



Appendix F: Review of Approaches to Manage Industrial Fugitive Dust Sources

TECHNICAL BULLETIN

Standards Development Branch

SDB Technical Bulletin
January 2004

REVIEW OF APPROACHES TO MANAGE INDUSTRIAL FUGITIVE DUST SOURCES

This technical bulletin is intended as an overview to the issue of industrial fugitive dust. Information is provided on the typical sources, their impact and on the common abatement technologies and techniques.

1.0 INTRODUCTION

Mechanical disturbance of granular material can generate a significant amount of dust (3). Mechanical disturbance can be in the form of vehicle traffic on paved or unpaved roads (or surface), loading and unloading of materials, transfer of material, screening & classifying, dry sweeping, and wind erosion of storage piles & roads/surface (3,4,5,6,7,8 and 10).

The amount of dust emission is affected by a wide range of factors such as aggregate characteristics (particulate size distribution), climatic conditions (wind and precipitation), control measures in place (wind screen, stabilisation, wet suppression), and the amount and frequency of mechanical disturbance the aggregate is exposed to (5).

Once dust is emitted (put in suspension), it will travel away from the source again affected by various parameters, more importantly climatic conditions and particulate size distribution. Particles larger than 100 μm in diameter are likely to settle within 6 to 9 meters, particles between 30 to 100 μm are likely to settle a few hundred feet from the source. Finer particulates (<30 μm) don't settle as easily and can travel even longer distances before deposition (3). The wind speed and direction will dictate to a large extent the dispersion of the dust.

Fugitive dust emissions are significant and recognized as an issue by regulatory agencies such as the US-EPA (10) and the Ontario Ministry Of The Environment. Fine particulates in ambient air have been linked with a broad range of significant health effects. Their reduction requires addressing precursor pollutants (e.g. SO2, NOx, VOCs, primary particulate matter) as well as process and fugitive sources (e.g. point, area, mobile). The effect of the dust is related again to the size distribution, the composition, the amount emitted and the dispersion pattern. The effects can range from surface staining to health impacts, depending upon the composition of the dust and its size distribution.

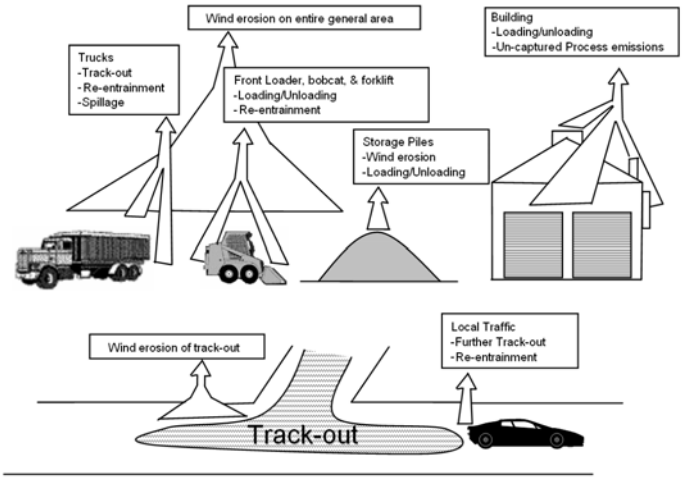
Past reviews of facilities have shown that emissions from fugitive sources are often as important or more important than process sources. Assessment of the off site levels for those facilities (through modelling) resulted in the inclusion of both the process and the fugitive sources as they were both significant sources of the same type of contaminants.

Best Management Practice Plans are normally in place for a wide variety of facilities where particulate matter (PM) is generated and emitted. These plans may include the introduction of control or cleaning equipment and may also include implementation of new procedures. There is significant amount of published material on (or containing information on) the control of fugitive dust emissions (3,4,5,6,7,8 and 10).

2.0 FUGITIVE DUST EMISSION

Fugitive dust can be in emitted from vehicle traffic on paved or unpaved roads (or surface), loading and unloading of materials, transfer of material, screening & classifying, dry sweeping, and wind erosion of storage piles & roads/surface (3,4,5,6,7,8,10).

Figure 1: Some Examples of Sources of Fugitive Dust



Figures 2 to 6 below present some examples of reduction opportunities.

Figure 2: Dry Sweeping

Figure 3: Unprotected Storage Piles

Figure 4: Large un-vegetated surfaces

Figure 5: Poor Housekeeping

Figure 6: Open Loading

3.0 ELEMENTS OF A BEST MANAGEMENT PLAN

A best management plan for fugitive dust should, at a minimum:

i) identify the sources of fugitive dust emissions within the facility;
ii) review the composition and size range of the fugitive dust (assessment of health risks)
iii) describe how fugitive dust will be controlled from each identified source;
iv) contain a schedule by which the plan will be implemented;
v) describe how the plan will be implemented, including training of facility personnel;
vi) describe inspection and maintenance procedures; and
vii) describe methods of monitoring and record-keeping to verify compliance with the plan.

4.0 BEST PRACTICES

Two sources of fugitive dust can occur: process related and yard storage/handling. For both these sources, preventative controls should first be considered in order to reduce the amount of dust emitted and the ensuing secondary fugitives. Often mitigative controls (such as surface vacuum sweeping) may also be required and will allow for easier identification of the primary fugitive contributors.

Process related fugitive dust should be addressed by:

- Reviewing capture efficiencies of air handling systems (Capture hood location, velocities, overall air balancing), ensuring integrity of material transfer equipment and fixing holes when detected and ensuring that doors, windows and other building openings are kept closed.
- Installing process containment where dust is generated, if exhaust is required redirect to dust collection system.
- Maintaining processes under negative pressure.
- Using alternative processes/equipment where possible (Minimize dust generation).
- Wetting material prior to processing where possible.

Yard Storage and Material Handling results in dispersion of the dust to a wider area which is then resuspended by vehicle traffic or wind erosion. The goal is to reduce this primary dispersion so that very little work is required on this secondary dispersion (resuspension):

- All loads should be covered and/or wet when travelling on site, some freeboard should be allowed for when loading trucks.
- Application of dust suppressants on unpaved roads/areas. Frequency of application should be monitored and modified according to needs.
- Covering unpaved area with larger aggregate or paving the area
- Loading/unloading points and storage piles area should be kept as clean as possible.
- Spills to be cleaned expediently.
- Appropriate loading/unloading techniques should be used (minimum drop height, wind shield/containment, spraying).
- Storage piles should be protected from wind erosion (solid fence, cement blocks, or any other wind break), use of “soil cement” or other agents
- Onsite transport through closed (vacuum) conveying systems
- Very fine materials stored in closed vessels/containers or “supersacks”

Secondary dispersion can also be minimized:

- Traffic should be limited to essential uses
- Traffic controlled to low speed
- Trackout minimized (wheel washing if appropriate)
- Wet and/or vacuum sweeping should be considered on paved roads/areas. Frequency of sweepings should be monitored and modified according to needs. Area of high build-up should be investigated to identify root cause. Regular silt loading analysis (11,12) can assist in deciding frequency and area of sweeping. In some cases, sweeping may even be required offsite.
- Use of property solid or “fabric” fence.

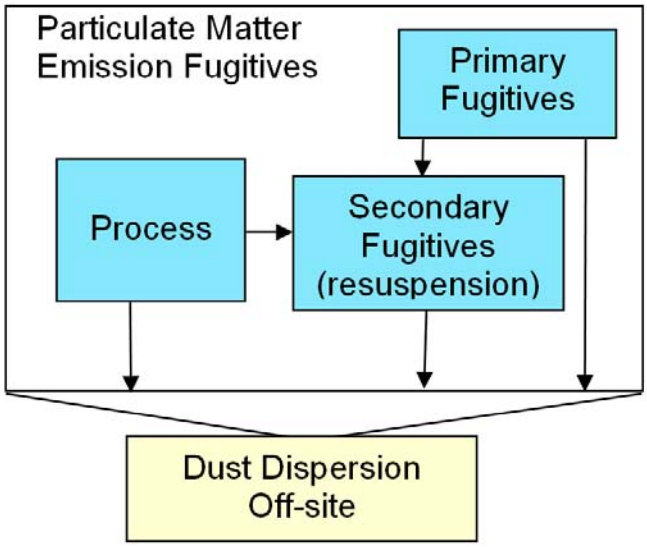


Figure 7. Dust Dispersion Sources

4.1 IMPLEMENTATION ISSUES

Surface mitigative controls play a great role in the reduction of secondary fugitives. There are however a number of factors to consider in the implementation of these:

- Dry sweeping may cause elevated emissions during event and is only appropriate for large aggregate. Should be avoided.
- Sweeping, flushing, and chemical dust suppressants efficiency reduces linearly with time and traffic (vehicle passes). The water evaporation rate will also impact efficiency and vary depending on weather conditions. These must be maintained to be effective.
- Composition and loading of silt varies significantly throughout the year. Decisions should be based on a series of tests, not a single value. The silt analysis should be revisited at a frequency based on possible severity of the health/environmental impacts of the contaminants present. The control plan should be adapted based on these and ongoing visual inspection of the site.
- Sources of the silt being deposited on the surfaces should be studied for feasible preventative measures. As examples: spill prevention, cleanup of loading areas, limiting traffic, and wheel/truck washing.
- For unpaved areas, high traffic areas should be covered with lower silt material (such as gravel) or paved.
- Water flushing should be considered with care and water collected appropriately. It addition, freezing conditions will limit the use of this method. Combined flushing/vacuum sweeping equipment are available, however the efficiency of these is not necessarily better (some wetted materials may not be as readily removed from the surface). Track out may actually increase after wetting of surfaces. Evaporation a major issue in the warm months and cuts efficiency dramatically.

Figures 8 to 15 present some examples of implemented best practices at facilities in Ontario.

Figure 8. Containment of storage areas (piles)

Figure 9. Spills cleaned up rapidly

Figure 10. Addition of an environmental barrier

Figure 11. Wetting of Material (where possible)

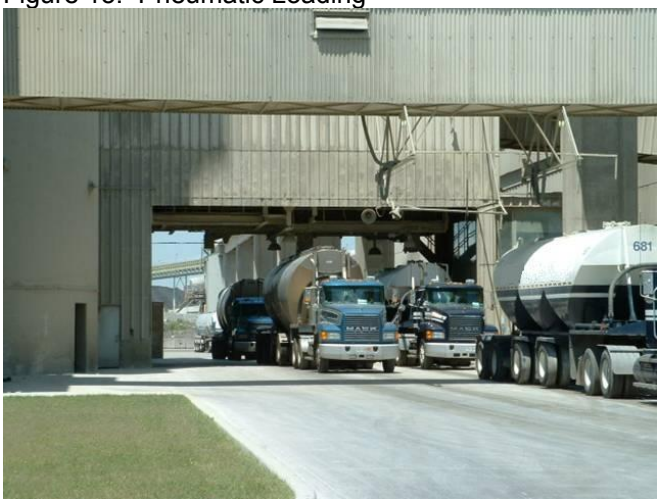
Figure 12. Vacuum Sweeping / Wet Vacuum Sweeping

Figure 13. Unloading of fine PM done in areas protected from wind

Figure 13. Well Vegetated Grounds

Figure 14. Truck Washing

Figure 15. Pneumatic Loading



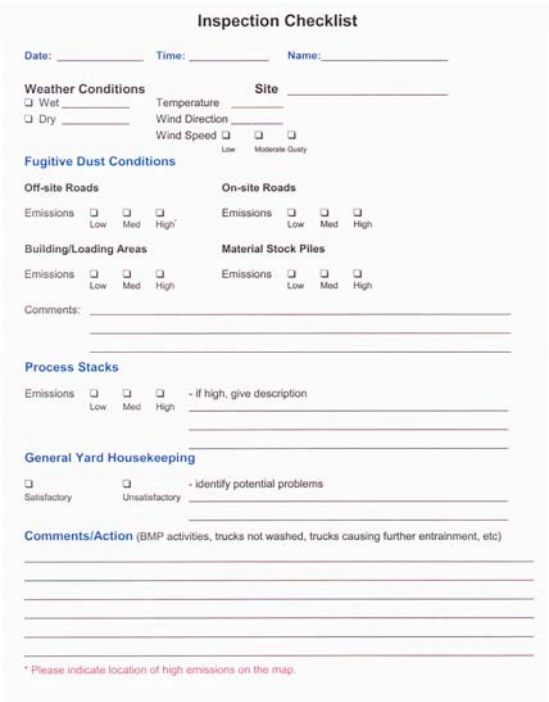


Figure 16. Example of an Inspection Form

4.2 INSPECTIONS AND UPDATING OF MANAGEMENT PLAN

A BMP Plan will be a comprehensive document that will cover all sources of dust emission from a site and will be made up of a number of BMPs. This document should build on current and known practices and commit to continuous improvement. New sources and production or process changes should be considered. Where justified, the plan can be scaled back were improvements in other areas may have made a control measure obsolete.

Site inspections can be done according to need, with special emphasis on the dry season. Issues identified through the site inspection should be addressed and were required lead to a revision to the management plan. A simple inspection form can be used to document the site inspection (Figure 11).

It should be noted that even if a paved area looks relatively free of particulate matter, it can still have a significant amount of dust or contaminant of concern. Any decision or assessment should rely on data acquired through silt loading analysis. The US-EPA provides guidance on appropriate sampling and analysis methodology (11, 12) of paved/unpaved roads and storage piles.

5.0 INCLUSION IN DISPERSION MODELLING

Dispersion modeling can be used to assess the relative importance of fugitive and process sources. When modeled, the fugitive sources can be entered as presented in the following table (recommendations only).

Table 1: Recommended Modelling Approaches

Source of Emission	Regulation 346	AERMOD*
Storage Pile/Material Handling	Virtual Source Dimension set to the same as the base of the pile Height set at ½ of the average pile height	Volume source Dimension set to the same as the base of the pile Height set at ½ of the average pile height
Paved/Unpaved Road	Series of virtual sources following roadway Height set at 1 meter	Series of volume sources following the roadway Height set at 1 meter
Paved/Unpaved Area	Virtual source 1 meter height	Volume source 1 meter height
Surface wind erosion	Virtual source Height set to 0 if ground, or roof height if building.	Area source Height set to 0 if ground, or roof height if building.
Building	Virtual source Roof height	Volume source Roof height

This table contains three columns. The first shows the source of emissions, while the second and third show the corresponding recommended modelling approaches for the Regulation 346 model and the AERMOD model respectively.

Note on Table 1: * In addition: initial lateral/vertical dimension must be set according to US-EPA ISC3 User Guide (13)

REFERENCES

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5. Ministry Of The Environment, Procedure for Preparing an Emission Summary and Dispersion Modelling Report, June 1998
6. United States Environmental Protection Agency, AP-42 Emission Factors Guide, Section 13.2 Fugitive Dust Sources, Section 13.2.1 Paved Roads, Section 13.2.2 Unpaved Roads, Section 13.2.4 Aggregate Handling and Storage Piles, and Section 13.2.5 Industrial Wind Erosion.
7. United States Environmental Protection Agency, EPA/625/6-91/014, June 1991, Handbook: Control Technologies for Hazardous Air Pollutants
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13. Control of Fugitive and Hazardous Dusts, C. Cowherd & all.,1990, ISBN 0-8155-1253-8
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Appendix G: Simplified Assessments for Specific Types of Applications for Certificate of Approval (see Section 22(3) of the Regulation)

1. Combustion Equipment Data Sheet - where there are no other on-site existing sources of emission of nitrogen oxides

   See MOE web-site, publications: www.ene.gov.on.ca/envision/gp/4130e.pdf

2. Emergency Generator Data Sheet - where there are no other on-site existing sources of emission of nitrogen oxides

   See MOE web-site, publications: www.ene.gov.on.ca/envision/gp/4131e.pdf

3. Paint Spray Booth Data Form – Supplement to Application for Approval (Air & Noise) for Automotive Refinishing Operations

   See MOE web-site, publications: www.ene.gov.on.ca/envision/gp/4132e.pdf