

# Overview of the Regulatory Modelling in Ontario and Ministry's Observations



AWMA Ontario Section Modelling Air Quality and Environmental Acoustics Conference

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## Local Air Quality Regulation Compliance Approaches

There are currently **three** compliance approaches for industrial facilities:

**1** Demonstrate compliance with the air standards by the phase-in period.

Assessed using approved air dispersion models or through modelling and monitoring.

OR

**2** Request and meet a site-specific standard.

Available to eligible facilities affected by new or existing requirements. Assessed using approved air dispersion models or through modelling and monitoring.

OR

**3** Register and meet the requirements under a technical standard for specified contaminants.

Available if the Ministry of the Environment has developed a technical standard that applies to the sector and those contaminants.

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## Highlights Air Standards Compliance approach under O. Regulation 419/05

- As of Feb 1, 2010 - 33 new or more stringent standards (all sectors);
- As of Feb 1, 2013 - additional 18 new or more stringent standards (all sectors);
- Phase-in of 9 new or more stringent air standards by July 1, 2016 (all sectors);
- Phase-in of new models based on groups of industrial sectors based on risk;

|                           |  |
|---------------------------|--|
| <b>Schedule 4 Sectors</b> | <b>Feb 1, 2010 (~300 facilities)</b>     |
| <b>Schedule 5 Sectors</b> | <b>Feb 1, 2013 (~3000 facilities)</b>    |
| <b>All other sectors</b>  | <b>Feb 1, 2020 (1000s of facilities)</b> |

- Notification requirements to report a modelled or monitored exceedence of a standard or guideline to the MOE (s. 28);
- Notification requirements to report a modelled or monitored exceedence of an Upper Risk Threshold (URT) to the MOE - need more timely assessment (s. 30).

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## Phase-in Periods for New Models

- Sectors Phased-in by 2010 (Schedule 4)

| No | NAICS Code | North American Industry Classification System Description                |
|----|------------|--|
| 1. | 2122       | Metal Ore Mining   |
| 2. | 221112     | Fossil-Fuel Electric Power Generation (>25 MW)                           |
| 3. | 324110     | Petroleum Refineries   |
| 4. | 3251       | Basic Chemical Manufacturing   |
| 5. | 3252       | Resin, Synthetic Rubber, & Artificial & Synthetic Fibres & Filaments Mfg |
| 6. | 3311       | Iron and Steel Mills and Ferro-Alloy Manufacturing                       |
| 7. | 331410     | Non-Ferrous Metal (except Aluminum) Smelting and Refining                |

- Sectors Phased-in by 2013 (Schedule 5)

| No  | 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) Mfg                      |
| 5.  | 3279       | Other Non-Metallic Mineral Product Manufacturing                              |
| 6.  | 331        | Primary Metal Manufacturing   |
| 7.  | 332810     | Coating, Engraving, heat Treating and Allied Activities <sup>MEX</sup>        |
| 7.1 | 332999     | All Other Miscellaneous Fabricated Metal Product Manufacturing <sup>MEX</sup> |
| 8.  | 336        | Transportation Equipment Manufacturing  |
| 9.  | 5622       | Waste Treatment and Disposal  |

- All other sectors to be phased-in by 2020

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## Clarification of NAICS Code 5622 Waste Treatment and Disposal

(2) For the purposes of this Regulation 419/05,

...

- (b) 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
- (c) subject to clause (b), a facility shall be deemed not to be part of the class identified by NAICS code 5622 (Waste Treatment and Disposal) unless the facility,
- (i) is a solid waste combustor or is used to subject solid waste to another method of thermal treatment, or
  - (ii) is used for hazardous waste treatment or disposal. O. Reg. 419/05, s. 1 (2).

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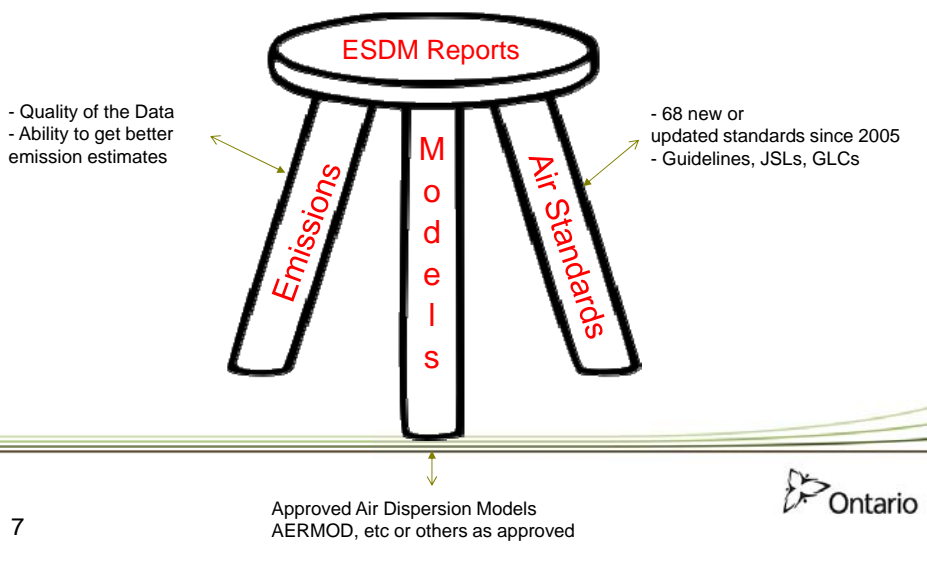
## Approved Dispersion Models

- Compliance with air standards have to be assessed with one of the following "approved dispersion models" under O. Reg. 419/05:
  - O. Reg. 346 model (existing)
    - this is the model that applies unless newer models have been phased-in or facilities have requested other models
  - SCREEN3
  - AERMOD
  - ASHRAE
    - used to assess points of impingement that are located on the same structure as the source of contaminant.
  - Alternative models may also be requested by proponents for approval or MOE may specify a model under section 7

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## Emission Summary and Dispersion Modelling (ESDM) Reports for Reg 419/05



## When is an ESDM Report Required?

- ESDM reports are required:
  - For Environmental Compliance Approval applications (**s. 22**)
  - For facilities listed in Schedule 4 (by 2010) and 5 (by 2013), site wide ESDMs with annual updates to be kept on site (**s.23**)
  - If the Director gives notice that an ESDM report must be done because there are reasonable grounds to believe that (s.24)
    - An exceedence may be occurring
    - An adverse effect may be occurring; or
    - And ESDM has not been completed in accordance with s. 26.
  - To assess exceedences of the Upper Risk Thresholds (**s.30**)
  - As part of a request for a Site-Specific Standard (**s.32**)

### **Excerpt: Paragraph 1 of Subsection 11(1) of Regulation 419/05**

“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 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.”

Note: See also sections 10 and 12 of O. Reg. 419/05.



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### **Excerpt: March 2009 Procedure Document (Example, Pg 50, Chapter 8.3)**

“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.”



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## Questions Related to Par. 1 of S. 11(1)

1. Why is it important that the maximum emission rate be used in the context of satisfying paragraph 1 of subsection 11(1) of Regulation 419/05?
2. Why does subsection 11(1) reference the relevant averaging period of the standard?

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## Other Model Uses

- In development of proposed Technical Standards, models used for “significance analysis”.
- The objective is to identify the sources that are the most significant contributors to exceedences:
  - not only to the point of maximum concentration but the most significant contributors within the entire exceedence zone; and
  - Including a focus on sensitive receptors within the exceedence zone.

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## Summary of Steps for a Significance Analysis

- Step 1: Run model for a facility using full receptor set to identify exceedence zone.
- Step 2: Re-run models using a much smaller receptor set within the exceedence zone.
- Step 3: Identify significance by a combination of contribution within the exceedence zone and source-specific dispersion factors ( $\mu\text{g}/\text{m}^3$  per  $\text{g}/\text{s}$  emission) at the point of maximum.
- Step 4: Complete similar analysis for other sources within the sector.
- Step 5: identify any commonality between source types for different facilities within a sector.

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## Basic Steps in a Modelling Review

- **Identify what model(s) or modelling approaches were used**
  - Reg. 346 model
  - Screening approaches
  - AERMOD
  - Alternative models
  - Modelling/monitoring assessment
- **Check that all of the information needed for the review is included in the application**

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## Basic Steps in a Modelling Review

- **Check all of the input data and identify any problems/errors**
- **Verify that**
  - the input data has been correctly entered into the model
  - any use of non-default options has been justified and approved
  - the output files contain sufficient information for the assessment
- **Verify the model results**

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## Identify What Model(s) or Modelling Approaches Were Used

### Approved Dispersion Models

Section 6 (1) of O.Reg. 419/05 includes the following approved models

- *O. Reg. 346 model*
- *SCREEN3*
- *AERMOD*
- *ASHRAE*

**Common Question:** Can I use different approved models for different contaminants in a single ESDM?

**Answer:** Yes

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## Identify What Model(s) or Modelling Approaches Were Used

### Specified Dispersion Models

- Section 7(1) of O.Reg. 419/05 allows for the specification of an alternative model to be used
- Important note:
  - Section 7(1) - request for a specified model must be approved prior to submitting your application
  - Must include details of the site specific conditions which warrant the use of the alternative model
- AERSCREEN requires a Section 7(1) Notice

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## Check That All of the Information Needed for the Review is Included in the Application

- **Application should include a complete electronic copy of the dispersion model**
  - Input and output files related to the application
  - All meteorological files
  - All terrain files
  - Building Profile Input Program (BPIP) files
  - Any additional files used in the model
- **Review Engineer should be able to duplicate the results presented in the ESDM with the files provided**

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## Verification of Dispersion Modelling

### Common issues

- Modelling files missing
- Discrepancies between the model input, ESDM tables and supporting information
- Supporting information justifying model setup not provided
  - Urban versus rural
  - Elevated versus flat terrain
  - Use of non-default options

### General rule

Decision making process used when applying the model should be reflected in the ESDM

## Model Set-up

### Air Dispersion Modelling Guideline for Ontario (ADMGO), Version 2.0, March 2009 (PIBs # 5165e02)

#### Common issues

- **Urban versus Rural**
  - Land Use Procedure: The land use within a 3 km radius around the facility sources is examined. If more than 50% of the area is accounted for by land use categories ranging from multi-family dwelling to commercial and industrial use it is classified as urban. Otherwise the site is classified as rural
- **Use of Non-Default Options**
  - Use of Non-Default option requires Ministry concurrence prior to use
  - MOE concurrence is not necessary to use Capped and Horizontal Stack Releases option
- **Defining Source Types**
  - Properly using volume and area sources
  - Incorrectly combining individual sources into volume, area and single point sources

## Meteorological Data

- **The MOE has prepared regional meteorological data sets for use in Tier 2 modelling using AERMOD. These are standard data sets and are available in two formats**
  - Regional pre-processed model ready data for AERMOD, with land characteristics for CROP, RURAL and URBAN conditions
  - Pre-processed hourly surface data and upper air data files for processing through AERMET using site specific local land use conditions
- **Common Issues**
  - Incorrect data set selected
  - Non-standard data sets used without approval
  - Inappropriate modifications to the standard data sets
- **s13(1) approval is required prior to using any other meteorological data set**

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## Frequency of Exceedence

**Methodology for Modelling Assessments of Contaminants with 10-Minute Average Standards and Guidelines under O.Reg. 419/05  
Technical Bulletin, April 2008**

- **Tiered approach to assessing 10 minute average concentrations**
- **Allows for**
  - Refinement
  - Assessing at a specific point of impingement
  - Frequency of exceedence

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## Frequency of Exceedence

### • Important notes

- Frequency of exceedence procedure requires “representative meteorological data” to be used (local met data set), thus a s13(1) approval may be required
- s13(1) approval is required in order to use the representative data set
- Elimination of meteorological anomalies is acceptable
- Anomalous 8 hours per year of meteorology identified over the full modelling grid using the site specific data set

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## ASHRAE

### • ASHRAE method of calculation

- *based on copyrighted equations that are available in the chapter on building air intake and exhaust design in the ASHRAE HVAC Handbook*

### • ASHRAE Handbook

- *presents both a conservative screening and a more comprehensive methodology*
- Complete documentation of the calculation must be submitted, including a site plan showing all dimensions used in the calculation.
- Verification requires being able to replicate the calculations

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## Contact Information

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