

TECHNICAL BULLETIN (O. REG. 419/05)

METHODOLOGY FOR USING “ASSESSMENT VALUES” FOR CONTAMINANTS WITH ANNUAL AIR STANDARDS

Ontario Regulation 419/05: Air Pollution – Local Air Quality (O. Reg. 419/05 or “the Regulation”) made under the *Environmental Protection Act* has been amended to include air standards with annual averaging periods. The ministry is also introducing “assessment values” outside of the Regulation to support the implementation of the annual air standards.

The purpose of this technical bulletin is to provide information on these assessment values and guidance on how to carry out modelling of contaminants for comparison to assessment values. This technical bulletin also provides guidance that explains how this information is to be captured in an Emission Summary and Dispersion Modelling (ESDM) report under O. Reg. 419/05.

Guidance on determining emission rates for annual standards can be found in the Ministry of Environment and Climate Change’s (the “ministry’s”) “Procedure for Preparing an Emission Summary and Dispersion Modelling Report” (PIBs# 3614e04), (ESDM Procedure) as amended.

“Assessment Values” for Annual Standards

Annual air standards are based on effects that occur after a long-term exposure. Assessment of compliance with an annual standard is based on an annual operating scenario and a maximum annual emission rate, which averages out peak emissions over the year. The day-to-day variations in the point of impingement (POI) concentration, which are influenced by the daily emissions and weather, are not of concern for the effect that was used to set the annual air standard. However, they may be concern for other effects, which can occur at higher concentrations over shorter periods of time. Factors influencing these other effects include the nature of the contaminant and the duration and magnitude of the short-term exposure.

To address concerns about the potential for effects occurring during short-term periods of elevated emissions or POI concentrations (e.g., during peak operations), the ministry is introducing “assessment values” for both modelling and monitoring.

Over time, the ministry may also set short-term standards for these contaminants based on an effect other than that used to develop an annual standard. Short-term standards would address concerns about elevated exposures during peak operations and therefore, could replace the need for assessment values.

Assessment Values Used in Modelling

Assessment values used in modelling (see Appendix 1) are based on the same science that underlies annual air standards but are set at concentrations reflective of higher risk. They reflect an upper bound of acceptable short-term risk when the annual standard is met and are used to trigger a toxicological assessment, if exceeded.

Two modelling assessment values have been set for each contaminant with an annual air standard:

- the Daily Assessment Value (DAV) , which represents the maximum daily exposure possible based on the maximum daily emission rate (i.e., highest POI concentrations that could result over a day with the worst weather condition).
- the Annual Assessment Value (AAV), which represents the maximum yearly POI concentrations based on the maximum daily emission rate maintained over a whole year (i.e., peak operations for an entire year).

In this way, the assessment values used in modelling would reflect worst case scenarios: the highest POI concentrations that could result over a day with the worst weather condition (daily assessment value - **DAV**) or the highest POI that could result over a year if a facility was operating at peak capacity each day in the entire year (annual assessment value - **AAV**). Currently, the daily assessment value for a given compound is equivalent to the Upper Risk Threshold (URT) value of that compound (see Schedule 6 of the Regulation); hence, section 30 of the Regulation applies.

Assessment values are not the same as the legally enforceable standards in the Regulation or a guideline limit published in “Summary of Standards and Guidelines to support Ontario Regulation 419: Air Pollution – Local Air Quality”. Exceedence of an assessment value does not mean non-compliance (or non-conformance): rather, it may trigger further analysis to determine if any further action is necessary.

If a facility is required to comply with section 20 of the Regulation (i.e. Schedule 3 standards), and the facility discharges a contaminant which has an annual standard, the facility must assess whether it is meeting the annual standard when it prepares an ESDM report. A facility must also assess against the URT of that contaminant in Schedule 6 of the Regulation which is a 24-hour average value. Assessing emissions for different averaging periods can mean a different operating scenario (see ESDM Procedure). Hence, compliance with the annual standard does not mean that the URT will be met.

Table A below summarizes what information is expected to be included in an ESDM report for a facility that is required to assess against Schedule 3 standards with annual averaging periods.

Table A: Assessment Values for Contaminants with Annual Standards

A contaminant with an annual standard should be compared against the following four values in the ESDM report:

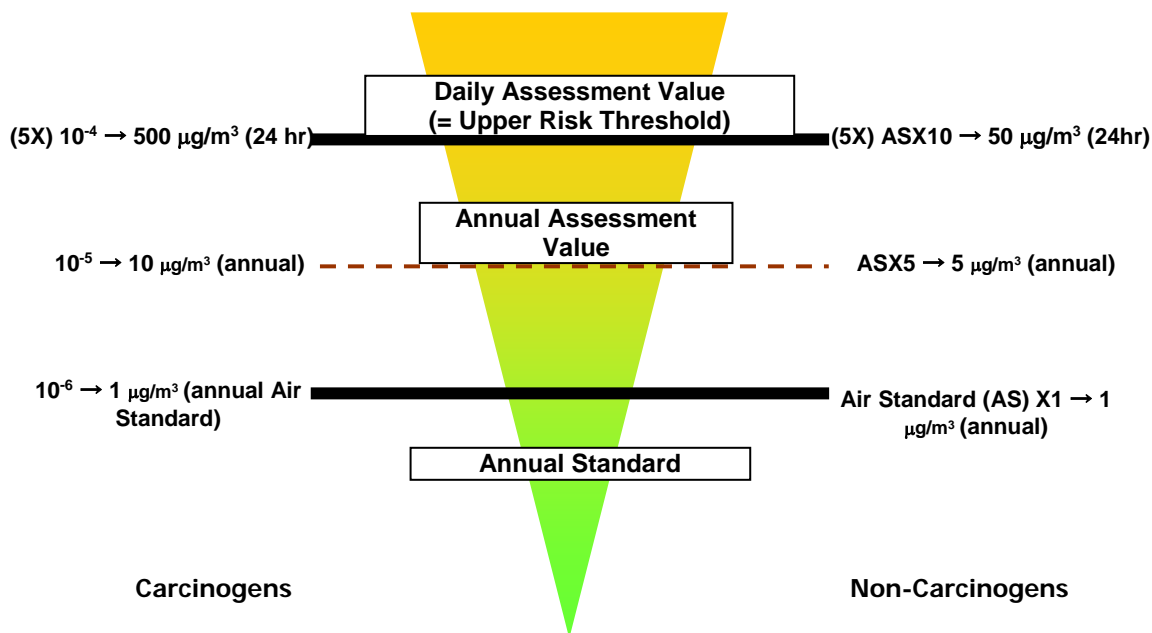
1. **Annual standard** (annual POI) When comparing against the annual standard, model using the highest annual emission rate (i.e. model using emissions from maximum year of operations).
2. **Annual Assessment value (AAV)** (annual POI) When comparing against the AAV, model assuming that the highest daily emission rate occurs every day for the entire year. Note that the AAV is 5 to 10 times the annual standard.
3. **Upper Risk Threshold (URT)** (24-hour POI) When comparing against the URT, model using the highest daily emission rate.
4. **Daily Assessment Value (DAV)** (24-hour POI) When comparing against the DAV, model using the highest daily emission rate. The DAV is based on a risk benchmark (see Figure 1). In many cases, DAV=URT. However, in the future, a DAV for a contaminant may be different than the URT for that contaminant.

The ESDM Procedure contains guidance on operating scenarios that result in the highest emission rates for a contaminant based on its averaging period. This guidance should continue to be followed for all standards and guidelines. This Technical Bulletin is intended to provide additional guidance to clarify expectations for modelling DAVs and AAVs and including the values in the ESDM report.

Figure 1 illustrates examples of the approach to setting assessment values used in modelling annual standards based on cancer and non-cancer effects. *[Note: To date, uranium is the only annual standard that is not based on a carcinogenic effect.]*

A list of assessment values used in modelling is listed in Appendix 1 of this Technical Bulletin.

Figure 1: Framework for Setting Assessment Values Used in Modelling (example: Annual Standard is 1ug/m3)



Daily Assessment Values (DAVs)

The current DAVs are equal to the URT and hence, the method of calculation is the same as that described in the ESDM Procedure. Additional guidance for URTs can be also found in the Guideline for the Implementation of Air Standards (GIASO), as amended (PIBS# 5166e03). However, there may eventually be cases when a DAV for a contaminant may be different than the URT for that contaminant. If so, both would have to be modelled with a maximum daily emission rate.

Emission rate estimates for modelling inputs for DAVs are expected to be conservatively based on a 24-hour operating condition. Determining the maximum 24-hour emission rate for a DAV is similar to how one would determine the maximum 24-hour emission rate for a 24-hour standard or a URT. A facility may determine the 24-hour emission rates following some of the same steps used for standards or guidelines.

Annual Assessment Values (AAVs)

Evaluating an AAV is different from evaluating other ministry POI limits¹. The key difference is that modelling for an AAV is done as if the maximum 24-hour

¹ The generic term "limits" means any numerical concentration limit set by the ministry including standards in the schedules to the Regulation, guidelines and recommended screening levels for chemicals with no standard or guideline. The ministry [Air Contaminants Benchmarks List \(ACB List\)](#) summarizes standards, guidelines and screening levels used for assessing point of impingement concentrations of air contaminants.

average emission rate occurred every day of the year. This results in a very conservative annual POI concentration that is then compared to the AAV (not the standard). *[Note: This approach is significantly different from the methodology for a compliance assessment, where the averaging period of the operating condition and emission rate must be the same as the averaging period of the ministry POI limit.]*

Since the emission rates for both the DAV and the AAV should both be based on a 24-hour worst-case emission rate, the same model run can be used to assess both the DAV and AAV. The only difference is that the AAVs are modelled to yield an annual POI concentration as opposed to the 24-hour POI concentration for the DAV.

Annual Assessment Values: Modelling and Meteorological Data

Currently, AERMOD will average all the meteorological conditions per grid point to produce one maximum POI concentration based on the annual emission rate. In AERMOD versions before 2015, the models do not output the maximum POI for each meteorological year unless each year is modelled separately. The ministry would prefer that proponents evaluate the maximum POI for each year (and then take the maximum from those 5 years to compare against the AAV). This can be done by running each model year individually and evaluating the outputs post processing to determine the maximum annual POI.

However, in order to avoid complex post-processing steps, it may also be acceptable to do one model run, using the appropriate five-year regional meteorological data set or a site-specific meteorological data set approved for that site under s.13 of the Regulation, if applicable. The maximum annual POI could then be multiplied by 140% and this number would be compared to the AAV. This is intended to act as a conservative screening check against the AAV. If 140% of the averaged model result is more than that the AAV, then individual model runs must be conducted for each of the five years of meteorological data or the site-specific meteorological data. The maximum POI from each of those individual years is then to be compared against the AAV.

[Note: if the above approach involving a calculation of 140% of the modelled value is used, this must be highlighted in the Emission Summary Table with a note.]

Compare the maximum annual POI concentration to the AAV and if exceeded, a further assessment is needed. This assessment may also include a review of the 24 hour worst case emission rate for intermittent emissions as opposed to a continuous emission.

Assessment Values Used in Monitoring

For contaminants with annual standards and where there is a monitoring program in place, it is expected that monitoring programs will also take measurements to compare to an assessment value that corresponds to the annual standard. Examples of the assessment values for monitoring for the six annual standards are found in Appendix 2. If exceeded, monitoring assessment values may trigger an assessment of effects due to short-term elevated measured levels. An exceedence of a monitoring assessment value may also indicate a possible exceedence of the annual air standard.

Assessment Values for monitoring are calculated by using the conversion-factor set out in subsection 17 (3) of the Regulation. Assessment values for monitoring could conceivably be based on any averaging period and, therefore, no one averaging period is prescribed. Rather, the monitoring data available dictates the assessment value applied. If monitoring indicates that a facility's discharges have resulted in an exceedence of a monitoring assessment value, the need for further analysis will be triggered.

Exceedence of "Assessment Values"

Assessment values are only intended for use with annual standards. The steps discussed below are intended to address an exceedence of an AAV or a DAV and, if applicable, a monitoring assessment value. This should not be confused with other regulatory requirements to assess compliance with the annual standard and the associated notification requirements for standards under section 28 of the Regulation or notification requirements for URTs under section 30 of the Regulation.

If the DAV is equal to the URT, then there is already a requirement to notify the ministry immediately in writing, as per section 30 of the Regulation. As explained in "Guideline for the Implementation of Air Standards in Ontario" (GIASO) (PIBs 5166e03), exceedences of the URT require a fully "refined" ESDM report to be submitted within three months of the discharge; this report must include an assessment of the frequency of exceedences at the human receptors set out in subsection 30 (8) of the Regulation.

In other situations, or when the DAV is not equal to the URT, the ministry will most likely become aware of an exceedence of an AAV or a DAV in:

- an ESDM report submitted in relation to an Environmental Compliance Approval (ECA) (see s.22 of the Regulation);
- an ESDM report that is required to be prepared, updated and kept available on site in accordance with the Regulation or as part of an ECA condition; or

- data collected or submitted as part of a monitoring program.

If a facility determines an exceedance of an AAV or DAV as part of an ESDM report or exceedance of a monitoring assessment value in reviewing monitoring results, it should conduct further analysis and take action, if necessary.

Step 1: Information to consider when conducting further analysis

For assessment values, the factors and information to consider are similar to what is required to be considered when there is a modelled or monitored URT² exceedance. If an AAV or DAV has been exceeded, the facility should prepare an updated ESDM report that includes the following information:

- the maximum POI concentration;
- potential human receptors that may be affected;
- the frequency of the exceedances (assessed by number of days in exceedance of the DAV) at the maximum POI as well as at human receptors listed in subsection 30 (8) of the Regulation;
- the robustness of emission estimates (determine need for refinement);
and
- obtain and use approved site-specific meteorological data.

Note: it may also be useful to include additional information on the frequency of the operation that caused the exceedance.

Monitored Assessment Values

In the case of monitored exceedances of assessment values, the further analysis may begin with the facility reviewing their ESDM report or preparing and updating their ESDM report if needed to confirm compliance with the annual standards. The facility may also be requested to continue or expand its monitoring program.

If a monitored value shows an exceedance of an AAV or DAV, the facility should also review the following information:

- Based on meteorological conditions at the time of monitoring, determine the sources of contaminant at the facility that likely contributed to the elevated monitored value.
- Determine if the monitor result is consistent with POI concentrations that would be expected to occur based on the operating scenarios assessed in the most recent ESDM report submitted to the ministry to support an application for an ECA.

Step 1 should be undertaken by all facilities that exceed an assessment value.

² If there is any reason to believe based on any relevant modelled, monitored or other information that a DAV that is equal to the URT has been exceeded, the facility must also follow the requirements set out in section 30 of the Regulation.

Step 2: Consideration of Toxicological Information

The information collected and analyzed in Step 1 should then be used along with the substance-specific toxicology to determine if there is a need for further action. The process to determine whether the exceedence of an assessment value is likely to result in an adverse effect will be similar to the process used for contaminants without limits. Depending on the situation, additional information may be requested by the ministry.

Step 2 should be undertaken by facilities in the following cases:

- if further analysis was done as part of an application for an Environmental Compliance Approval (ECA) or amendment;
- if further analysis related to a monitoring assessment value indicates there are additional exceedences or the ESDM report indicates exceedences of the DAV or AAV.

Note: For monitoring assessment values, an additional toxicological assessment would only be needed if the monitor results are expected to be higher in magnitude or frequency than what was assessed as part of the latest ESDM report used for the latest ECA decision.

If there is any reason to believe based on any relevant modelled, monitored or other information that the URT has been exceeded, the facility must follow the requirements set out in section 30 of the Regulation. In other situations, the facility is expected to document the information on the analysis done under Step 1 in the ESDM report that is kept on site. Step 2 can be performed at the next available opportunity for ministry review if:

- the facility is part of a sector listed in Schedules 4 or 5 and the AAV or DAV exceedence was determined during a required update of an ESDM report under sections 23 [Requirement for ESDM report before implementation of Schedule 3 standards] and 25 [Update of ESDM report] of the Regulation;
- the AAV or DAV exceedence was determined during the preparation of an ESDM report required by a section 24 Notice from a ministry Director (or the update of such a report as required by section 25 of the Regulation); or
- the AAV or DAV exceedence was determined during the preparation of an ESDM report prepared for the purpose of requesting a site-specific standard in accordance with section 33 of the Regulation (or the update of such a report as required by section 25 of the Regulation); or
- the AAV or DAV exceedence was determined during the preparation of an ESDM report for the purpose of an ECA in accordance with section 22 of the Regulation.

The next available opportunity for ministry review mentioned above could occur as part of an application for an ECA, or if the ministry requests a copy of the ESDM report.

The ministry may also ask for additional information as required.

Step 3: Follow-up Actions

Decisions on what action may or may not be necessary will be determined on a case-by-case basis. Depending on the analysis, there are a range of possible actions that may result:

- If the analysis shows there are no concerns with the AAV and DAV (or, if applicable, the monitoring assessment value) and compliance with annual standard is certain, then no further action is necessary.
- If the analysis is part of an application for an ECA or amendment and the modelling analysis indicates that air concentrations may approach levels with potential for adverse effects, this may lead to further refinement of emissions or a possible mitigation plan submitted to support the issuance of the ECA.
- If the analysis was done as a result of monitoring and shows an exceedence of a monitoring assessment value and it is determined that POI concentrations may approach levels with potential for adverse effect, follow-up action may involve further refinement of emissions, completion of a refined ESDM report, or the submission of a mitigation plan. The facility may also be requested to continue or expand its monitoring program. The ministry would use the most appropriate compliance tools set out in the ministry's [Compliance Policy](#).
- If the analysis was done when preparing or updating other ESDM reports, the ministry may require a toxicological analysis, similar to the process used for contaminants without limits, as discussed in Step 2. If the toxicological review indicates that POI concentrations may approach levels with potential for adverse effects, follow up action may involve further refinement of emissions, completion of a refined ESDM report, or the submission of a mitigation plan as would be required by using the appropriate compliance tools set out in the ministry's [Compliance Policy](#).

Appendix 1: Modelling Assessment Values

Below is a list of annual and daily assessment values associated with the annual standards to be used with modelling. The Modelling Assessment Values are also listed in sheet 5 of the [Air Contaminants Benchmarks \(ACB\) List](#) workbook.

Modelling Assessment Values and URTs for Annual Standards

Contaminant	Annual Standard ($\mu\text{g}/\text{m}^3$)	Annual Assessment Value* (AAV) ($\mu\text{g}/\text{m}^3$)	Daily Assessment Value ³ (DAV) ($\mu\text{g}/\text{m}^3$)	Upper Risk Threshold (URT) (24 hr) ($\mu\text{g}/\text{m}^3$)
Chromium Compounds (Hexavalent)	0.00014	0.0014	0.07	0.07
Butadiene, 1,3-	2	20	300	300
Benzene	0.45	4.5	100	100
Nickel and Nickel Compounds	0.04	0.4	2	2
Benzo(a)pyrene (as a surrogate for PAHs)	0.00001	0.0001	0.005	0.005
Uranium and Uranium Compounds**	0.03	0.15	1.5	1.5

* The AAV has an annual averaging period based on the highest 24-hr emission rate occurring every day of the year

**For Uranium, applies to particulate matter that is less than 10 μm in diameter.

³ Note: The daily assessment value (DAV) may or may not be equivalent to the URT. For the current contaminants with annual standards, the DAV is equivalent to the URT.

Appendix 2: Examples of Monitoring Assessment Values

The Monitoring Assessment Values are also listed in sheet 6 of the [Air Contaminants Benchmarks \(ACB\) List](#) workbook.

Contaminant	Examples of Assessment Values* based on conversion factor		
	24-hour ($\mu\text{g}/\text{m}^3$) (5X annual)	1-hr ($\mu\text{g}/\text{m}^3$) (12.5X annual)	1/2-hour ($\mu\text{g}/\text{m}^3$) (15X annual)
Chromium Compounds (Hexavalent)	0.0007	0.00175	0.0021
Butadiene, 1,3-	10	25	30
Benzene	2.25	5.6	6.75
Nickel and Nickel Compounds	0.2	0.5	0.6
Benzo(a)pyrene	0.00005	0.000125	0.00015
Uranium and Uranium Compounds**	0.15	0.375	0.45

*monitoring assessment values may be any averaging time and may be selected based on the monitoring data available. See subsection 17 (3) of the Regulation.

** For Uranium, applies to particulate matter that is less than 10 μm in diameter.