(Draft) Interpretation of Air Quality Modelling Results for Regulatory Applications in Alberta

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Acronyms

AAAQO – Alberta Ambient Air Quality Objective

AAAQOGS – Alberta Ambient Air Quality Objectives and Guidelines Summary

AAAQG – Alberta Ambient Air Quality Guideline

ADMF – Acid Deposition Management Framework

ADMZP – Acid Deposition Management Zone Plan

AEP – Alberta Environment and Parks

AER – Alberta Energy Regulator

AE – Alberta Environment

AMD – Air Monitoring Directive

AQMG – Air Quality Model Guideline

AQMS – Air Quality Management System

CL – soil critical load

D60 – Directive 60

EIA – Environmental Impact Assessment

EPEA – *Environment Protection and Enhancement Act*

ESRD – Environment and Sustainable Resource Development

GCEPA – Guide to Content for Energy Project Applications

GCIAA – Guide to Content for Industrial Approval Applications

GEPEARA – Guide for Environmental Protection and Enhancement Act Renewal Applications

GPEIARA – Guide to Preparing Environmental Impact Assessment Reports in Alberta IAQMS – Industrial Air Quality Management System

IH-DIZ – Industrial Heartland – Designated Industrial Zone

IRLP – Industrial Release Limits Policy

LUF – Land-use Framework

$PM_{2.5}$ – fine particle matter smaller than 25 μm

US EPA – United States Environmental Protection Agency

1.0 Introduction

Air quality modelling is an important component of Alberta's air quality management system as it provides a means for establishing the causal relationship between source and receptor in a regulatory application. Given this relationship, it allows the regulator to assess the impact of industrial emissions on air quality from facilities that are new, undergoing a renewal or an amendment.

The impact on air quality is determined relative to Alberta's Ambient Air Quality Objectives (AAAQOs) or Ambient Air Quality Guidelines (AAAQGs), as set out in the Alberta Ambient Air Quality Objectives and Guidelines Summary (AAAQOGS) (AEP 2019, or as amended)[i], or, if deposition of acidifying species exceeds a soil's critical load (CL) as set out in Alberta's Acid Deposition Management Framework (ADMF) (AEP 2022, or as amended). Modelling may also be used to demonstrate the likelihood of reaching AAAQG levels designated for odour management. Finally, modelling helps the statutory decision maker set regulatory emission limits, and allows the flexibility to model different pollution abatement equipment and process controls in order to select an option that will meet the regulatory requirements of an application before a facility is built or a redesign of an existing facility is undertaken.

The technical details for undertaking an air quality modelling assessment for regulatory applications is provided in Alberta's Air Quality Model Guideline (AQMG) (AEP 2021, or as amended), and the Alberta Energy Regulator's Directive 60 (D60) (AER 2022, or as amended) for modelling flares and incinerators. Additional requirements for the preparation of an assessment for specific regions may also be available through other policy documents, e.g., the Supplementary Guideline for the Preparation of Air Quality Modelling for Regulatory Applications and Resolving Model Predicted Exceedances of Alberta Ambient Air Quality Objectives and Guidelines for applications in Alberta's Industrial Heartland Designated Industrial Zone (IH-DIZ) (AEP 2022a, or as amended). Regardless of the application these assessments can be complex and their correct interpretation requires a holistic approach that considers the following needs:

- Managing the cumulative effects of many contributing (regulated and non-regulated) emission sources when regulatory approvals are typically focused on a single application;
- Improving Alberta's ambient air quality by reducing emissions at contributing industrial sources while still allowing for sustainable growth;
- Simple and clear requirements that are relatively fast to implement and uniformly applied while still allowing flexibility in an approval when warranted, noting that flexibility may require considerable professional judgement and more time to assess; and
- Requirements unique to a particular approval application.

Purpose

The intent of this document is to provide clear guidance for both the applicant and statutory decision maker on how to properly interpret air quality modelling results submitted as part of a regulatory application, in the context of Alberta's air quality management system. It is not intended as guidance for determining the suitability of air quality models (Perry et al., 2005) nor the acceptable levels of ambient air quality specified by the AAAQOs, nor acceptable CLs as specified in the ADMF. These are determined elsewhere in the management system.

Section 2 provides a brief summary of Alberta's air management system.

[i] AAAQOs are revised from time to time. If an AAAQO has been recently revised then it is appropriate to use this revised AAAQO in the demonstration of acceptability in a modelling assessment. Revised AAAQOs are posted with an effective date of at least 60 days following the date of posting. Air quality modelling commenced after the effective date of the revised AAAQO must used the revised AAAQO in the modelling assessment. If modelling for an assessment has commenced and the proponent can demonstrate that considerable work has been undertaken before the effective date of the revised AAAQO the proponent should, at the discretion of the Director, complete the assessment and make any necessary comparisons to the AAAQO that was in effect when the modelling commenced. The proponent should confirm this is acceptable to the Director before proceeding to avoid costly delays.

Section 3 provides guidance for interpreting modelling results, particularly when additional modelling may be required to address concerns about elevated baseline concentrations and/or a significant contribution to predicted ground level concentration of pollutants from nearby facilities. Section 3 also provides information on the interpretation of modelling results related to odour management and acid deposition management.

Section 4 lists the supporting references for this document.

Appendix A provides details of an acceptable monitoring plan, when one is used to verify the results of a modelling assessment. Appendix B provides details of an acceptable management plan if one is needed beyond the initial AQMG modelling assessment in order to reduce the likelihood of causing an exceedance. Appendix C provides a flow chart for the interpretation process contained within this document.

This guidance is issued under the authority of Section 14(4) of the *Environmental Protection and Enhancement Act* (EPEA).

This guidance document is subject to *Environmental Protection and Enhancement Act* approval terms and conditions. Where this guidance does not align with approval requirements, the approval is paramount and the approval holder must comply with the approval requirements.

2.0 Alberta's Air Quality Management System (AQMS)

Alberta's Air Quality Management System (AQMS) is multi-tiered management system (provincial, regional and local) that considers air quality from a number of different perspectives with different requirements and processes. Within this context, regulatory approval applications are developed using an industrial air quality management system. A complete description of Alberta's system can be found elsewhere (AE 2009, or amended). Section 2.1 provides a summary of the components of the AQMS dealing with industrial activity that provides the approval context suitable for interpreting an air quality model assessment (hereafter, simply, assessment).

2.1 Alberta's Industrial Air Quality Management System (IAQMS)

Alberta's Industrial Air Quality Management System (IAQMS) is a mature and robust regulatory system. It provides all the necessary information to complete a regulatory application, including an air quality model assessment when needed. Figure 1 illustrates the major components of this system. This document explains the use of AAAQOs when interpreting an air quality model assessment for an approval. Other elements of the system serve other essential purposes for the provincial AQMS but they are not necessary for use of this document.

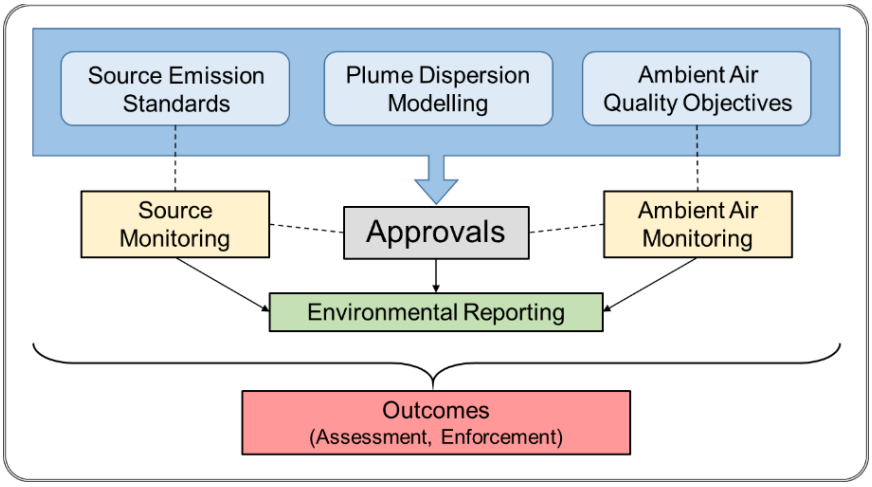

Figure 1. Alberta's Industrial Air Quality Management System

Activities requiring an authorization in Alberta are specified in the Activities Designation Regulation under *EPEA*. When preparing an application for a facility that requires an approval the proponent should consult The Guide to Content for Industrial Approval Applications (GCIAA) (ESRD 2014, or as amended) or, for AER regulated facilities, The Guide to Content for Energy Project Applications (GCEPA) (AER 2014, or as amended), for details on the information required in their application. The Director, in following the GCIAA or GCEPA, may require the proponent to prepare an assessment to determine the impact of the facility on the environment. This impact is evaluated by the ability of the facility to meet any applicable ambient objectives, guidelines or standards as specified by the Director.

Note: In the IH-DIZ the Guide for Environmental Protection and Enhancement Act Renewal Applications (GEPEARA) (AEP, 2022b, or as amended) fulfills the role of the GCIAA for renewal and amendment applications and should be referenced for direction with respect to any necessary approval requirements.

Additional guidance for the Director when authorizing an approval may be provided by other policy documents. In particular, the Industrial Release Limits Policy (IRLP) (AE 2000, or as amended) provides additional direction for the Director to establish release limits using the most effective demonstrated pollution prevention/control technology, or release limits based on meeting ambient

environmental quality guidelines, whichever is more stringent. Air quality modelling is used in this context to set release limits based on meeting acceptable ambient environmental quality levels, i.e., AAAQOs and/or AAAQGs.

When authorizing an assessment the Director may also consider additional requirements as stipulated in the Guide to Preparing Environmental Impact Assessment Reports in Alberta (GPEIARA) (ESRD 2013, or as amended), or regional air quality management actions as required under Alberta's Land-use Framework (LUF) (AE 2008, or as amended) or ADMF. The proponent should work closely with the Director through the assessment process if they are not sure how these requirements may impact the assessment.

3.0 Interpreting and Acting on Results of Air Quality Modelling Assessments

Technical requirements regarding how assessments are to be conducted in Alberta are detailed in the AQMG. Several scenarios may be required in an assessment, as per Section 4 of the AQMG, but the essential breakdown of this approach is to consider:

1. Facilities without upsets (normal operations):
   a. Facilities where the maximum and typical emissions for any facility source do not differ by more than 0.4 tonnes/day for any substance. It is expected that most facilities in Alberta will fall within this category.
   b. Facilities where the maximum and typical emissions for at least one facility source differs by more than 0.4 tonnes/day for at least one substance.
   Note: Start ups and shutdowns must follow a Standard Operating Procedure (SOP) and as such are considered part of normal operations.

2. Facilities with upsets (sources are operating outside of normal stable operating conditions):
   a. Facilities that do not rely on non-routine flaring to address an upset.
   b. Facilities that do rely on non-routine flaring to address an upset.
   c. Facilities that may rely on both methods to address an upset.

It is expected most assessments can be completed in one modelling scenario after including emissions from the proponent's facility, as per one of the paths provided above, as well as nearby facilities and baseline monitored concentrations (which will capture all non-modelled contributions). Examples of these scenarios are provided in Section 5 of the AQMG and will not be repeated here. However, the next sections will provide general guidance on the interpretation of these scenarios. Some examples of the interpretation of assessment results are included in this document but this is not an exhaustive list and is only offered to support the guidance provided here.

3.1 General Considerations

3.1.1 Completeness of Assessment

Regardless of the scenarios modelled for an assessment, the complete details of the assessment must be included in a companion report as required in Appendix B of the AQMG. It is important for the Director to be able to review this report and have a complete and clear understanding of the impact of the facility on the environment so they can assess the ability of the application to meet applicable ambient air quality objectives, guidelines or standards. If this information is not included in the assessment, the assessment may be deemed incomplete leading to unnecessary delays and additional requests for information in order to complete the application.

3.1.2 Interpreting and Acting on Modelling Results Related to AAAQOs and AAAQGs (excluding AAAQGs for Odour Management)

3.1.2.1 Normal Operations

When modelling a new facility or an amendment to an existing facility the proponent should, as per the directions provided in the AQMG, incorporate any necessary redesign and remodel to demonstrate achievement of the AAAQOs or AAAQGs (excluding AAAQGs for Odour Management – these will be dealt with in Section 3.3.2) before submitting the assessment to the Director. In some cases where the proponent must justify why the modelling may not be representative due to an unusual source configuration or complex dispersion process, a proponent may wish to delay implementing the proposed changes until they can confirm the modelling results are correct with suitable ambient air quality monitoring. To exercise this option the proponent must:

1. Develop and implement an ambient air monitoring plan (hereafter, simply monitoring plan) to demonstrate emissions from the facility will not lead to the exceedance of any AAAQOs or AAAQGs (excluding AAAQGs for Odour Management). A successful demonstration that no ambient AAAQOs or AAAQGs were exceeded would be acceptable to demonstrate compliance with ambient air quality requirements. Details of the requirements for an acceptable monitoring plan can be found in Appendix A.

2. In conjunction with the monitoring plan, the proponent must develop an air quality management plan (hereafter, simply management plan) that must be implemented if the monitoring does show exceedances of any AAAQOs or AAAQGs. The management plan must demonstrate via additional modelling and/or monitoring that any proposed changes to the facility will be sufficient to meet the AAAQOs or AAAQGs. Details of the requirements for an acceptable management plan can be found in Appendix B.

Note: Both plans must be approved by the Director in writing before proceeding with implementing either plan. Submission of a monitoring and management plan does not guarantee this option will be acceptable; upon review the Director may determine there is no justification for additional monitoring and a management plan in which case the original assessment stands as submitted.

While the option to use monitoring to confirm modelling results is available it should only be exercised with care. Required changes in any accompanying approved management plan to meet any needed redesign will, at the discretion of the Director, be written into the approval conditions and will need to be implemented as soon as the monitoring is complete and any predicted exceedances of the AAAQOs or AAAQGs (excluding AAAQGs for Odour Management) are confirmed. This is an inefficient iterative approach that may cost the proponent additional time and resources to implement. Redesigns are best implemented as part of the original construction.

For a renewal where there are no changes to the facility the proponent should follow the guidance provided above for new facilities or amendments to existing facilities, with the option to use historical ambient air quality monitoring provided this monitoring fulfils all of the requirements of a monitoring plan as specified in Appendix A.

Note: In cases where a suitable monitor to confirm modelled exceedances is not available it is not possible to develop an acceptable monitoring plan and the modelling assessment will be accepted as is.

Example 1. Simple assessment – new facility
A proponent undertakes an assessment for a new facility. On the initial assessment hourly and 24-hour exceedances were predicted for $PM_{2.5}$. As part of the assessment the proponent explored various technology options to reduce the likelihood of exceeding the $PM_{2.5}$ AAAQO and settled on the use of a baghouse that significantly reduced the $PM_{2.5}$ emissions, which resulted in the predicted maximum ground level concentrations of $PM_{2.5}$ being well below the relevant $PM_{2.5}$ AAAQOs. This option was put forward in the assessment for approval by the Director.

Example 2. Simple assessment, with options – new facility
In a similar assessment as Example 1, $PM_{2.5}$ was also predicted to exceed AAAQOs. However, the nature of the $PM_{2.5}$ emissions (temperature, particle size) at this source made their management more difficult. In this case, the proponent prepared a management plan that included three options, with a detailed review of each option (including the predicted impacts from modelling, cost of each technology, reliability, maintenance schedule, etc.) and the rationale for their preferred choice of technology as required in Appendix B. Upon review the Director did not approve the proponent's choice of technology given the technology had a history of having a high failure rate. However, the Director did approve the second choice of technology proposed in the management plan and this was incorporated into their approval.

Example 3. Monitoring/management plan – new facility

In this third example $PM_{2.5}$ is again an issue but in this case there was some concern expressed by the proponent that the modelling may not have been representative given the complexity of the terrain in the immediate vicinity of the facility and the proponent proposed a monitoring/management plan approach. As such, the proponent prepared both a management plan and monitoring plan that was approved by the Director and incorporated into their approval. The management plan, as per the requirements specified in Appendix B, detailed the necessary changes that would be implemented at the facility if the monitoring did show exceedances were occurring. The monitoring plan, based on the modelling assessment for the facility as built, correctly sampled all required locations for sufficiently long to meet the monitoring requirements specified in Appendix A. In this particular example the monitoring confirmed that exceedances were occurring. As part of the approval the proponent must now implement the changes, as required and as scheduled in the management plan incorporated into their approval.

Example 4. Monitoring/management plan – renewal
In this example an existing facility's approval is up for renewal and the proponent wishes to use existing historical ambient air quality monitoring data as part of their assessment to demonstrate exceedances of an AAAQO attributable to the facility are not occurring. However, when reviewing the historical monitoring data it was noted the monitoring was not adequate (the monitoring did not sample the predicted maximum ground level concentration nor all locations where an exceedance of an AAAQO was predicted in the air quality modelling assessment) nor completeness criteria (there were several months of data missing for each of the last two years of the facility's operation) to be acceptable in a monitoring plan. Hence, this option is not available for this facility.

Example 5. Monitoring/management plan – renewal
As another example an existing facility's approval is up for renewal and existing historical ambient air quality monitoring is available that satisfies the requirements for monitoring as specified in Appendix A. In this case, the monitoring plan is deemed complete and the results may be used in the approval application in lieu of their assessment. The Director may now complete their review in the broader context of a renewal application.

Example 6. Monitoring/management plan – renewal
As a last example in this section, a facility's approval is up for renewal but their modelling assessment shows predicted exceedances of an AAAQO. The proponent proposes to create a monitoring plan in conjunction with a management as per the guidance above. However, upon investigating monitoring options it was determined there was no suitable monitoring technology available that could meet the requirements of a monitoring plan. In this case monitoring is not an option and the proponent must use the most recent modelling assessment in their application.

3.1.2.2 Non-routine Operations

For non-routine flaring events the proponent should follow the risk assessment provided in AER's D60. These events are typically sub-hourly events and are not considered cumulatively but rather as a worst case scenario where AAAQOs must not be exceeded.

For upsets <u>not</u> addressed though non-routine flaring, the impact of the upsets should be based on the maximum upset emission rates. The Director may allow some additional tolerance for these events if:

1. The upset occurs less than 1% of a given averaging time. For hourly AAAQOs, this would provide an allowance of 87 hours in a calendar year; for 24-hour averaged AAAQOs this would provide an allowance of four 24-hour periods in a calendar year. For averaging periods longer than 24-hours there is no allowance.

   Note: As part of a management plan the hours of operation may be restricted on the basis of the modelling assessment. In this case the % allowance is maintained but now is to be applied

to the total operating time in a calendar year, not the total hours in a calendar year. See Appendix B for more details.

2. The modelled exceedances for these types of events are less than 1.5 x [AAAQO] for any substances predicted to exceed an AAAQO.

3. The upset is not impacting a sensitive receptor (as defined in the AQMG), i.e., modelled sensitive receptor values are < 1.0 x [AAAQO]. This requirement is intended as a precaution while still allowing for operational flexibility to manage an upset.

When any of these conditions are not met the proponent, as part of an application will be required to develop and implement a management plan (Appendix B), or a monitoring plan (Appendix A) in conjunction with a management plan, to reduce the likelihood of causing an exceedance.

Note: While there is some additional tolerance allowed for modelling exceedances due to non-routine events the proponent will still be required to fully comply with any additional requirements specified in their approval to manage these events, e.g., compliance reporting if an AAAQO is exceeded. Facilities with a history of frequent non-routine events may also be required, at the discretion of the Director, to undertake additional management actions to reduce emissions from these sources beyond those actions proposed in the assessment.

Example 7. Additional modelling to assess impact of non-flaring upsets
In an assessment modelling for normal conditions were undertaken as per the AQMG. An additional modelling scenario was also required as the facility had several non-flaring sources with upset limits. In this part of the assessment it was shown there were 123 hourly and six 24-hour AAAQOs exceedances. This would be an unacceptable risk of causing an adverse effect for both the hourly and 24-hour averaging periods so this assessment would not be acceptable. The proponent must either redesign the non-flaring upset sources to meet the AAAQOs (preferred) or develop and implement an air quality monitoring/management plan as a condition of the approval to reduce the likelihood of causing an exceedance.

Example 8. Additional modelling to assess impact of non-flaring upsets
In an assessment modelling for normal conditions were undertaken as per the AQMG. An additional modelling scenario was also required as the facility had several non-flaring sources with upset limits. In this part of the assessment it was shown there were 67 hourly AAAQOs and five 24-hour AAAQOs exceedances. This would be an unacceptable risk of causing an adverse effect for the 24-hour averaging period. The proponent must either redesign to meet the AAAQOs (preferred) or develop and implement an air quality monitoring/management plan as a condition of the approval to reduce the likelihood of causing an exceedance.

Example 9. Additional modelling to assess impact of non-flaring upsets
In an assessment modelling for normal conditions were undertaken as per the AQMG. An additional modelling scenario was also required as the facility had several non-flaring sources with upset limits. In this part of the assessment 18 hourly and one 24-hour AAAQOs exceedances occurred. However, the 24-hour AAAQO exceedance was > 1.5 x [AAAQO] 24-hour value so this would not be acceptable. A similar outcome would have occurred if any of the hourly values exceeded 1.5 x [AAAQO] hourly value. The proponent must either redesign to meet the AAAQOs (preferred) or develop and implement an air quality monitoring/management plan as a condition of the approval to reduce the likelihood of causing an exceedance.

Example 10. Additional modelling to assess impact of non-flaring upsets
In an assessment modelling for normal conditions were undertaken as per the AQMG. An additional modelling scenario was also required as the facility had several non-flaring sources with upset limits. In this part of the assessment 43 hourly and three 24-hour AAAQOs exceedances occurred with all exceedances ≤ 1.5 x [AAAQO]. However, it was noted there was a sensitive receptor near to the peak of the one of the 24-hour exceedances. An analysis of the concentration isopleth of this event showed the receptor ≥ 1.0x [AAAQO] for 24-hour averaging period so this would not be an acceptable risk. The proponent must either redesign the non-flaring upset sources

to meet the AAAQOs (preferred) or develop and implement an air quality monitoring/management plan as a condition of the approval to reduce the likelihood of causing an exceedance.

Example 11. Additional modelling to assess impact of non-flaring upsets
In an assessment modelling for normal conditions were undertaken as per the AQMG. An additional modelling scenario was also required as the facility had several non-flaring sources with upset limits. In this part of the assessment 61 hourly and three 24-hour AAAQOs exceedances occurred with all exceedances ≤ 1.5 x [AAAQO]. Furthermore, there no sensitive receptors being impacted by the upsets. In this case, the likelihood of causing an adverse effect would be judged to be minimal. This scenario would be deemed complete and incorporated into the assessment for approval by the Director.

Example 12. Additional modelling to address non-flaring upsets – restricted hours
In an assessment modelling for normal conditions were undertaken as per the AQMG. An additional modelling scenario was also required as the facility had several non-flaring sources with upset limits. Upon review of the assessment it was determined that the facility only operated during the week and not on public holidays. In this case the facility was operating for 240 days in a year for a total of 5760 hrs. In this case the prorated tolerance for hourly exceedances would be the removal of the top 5 hourly values, while the tolerance for 24-hour exceedances would be the removal of the top 3 24-hour values.

3.2 Special Considerations

In addition to the general guidance for interpreting assessments provided above, the proponent may need to revisit the assessment to provide additional information. In particular, two areas of common concern are: the influence of a high baseline concentration and the influence of nearby facilities on the modelling assessment. When preparing or reviewing an assessment where these issues may be a concern the proponent should prepare, or the Director may require, the following:

1. Create concentration isopleth maps that includes <u>all</u> sources (proponent's facility, nearby facilities (as specified in the AQMG), baseline concentrations) for all substances and averaging periods predicted to have an exceedance. These isopleths should clearly show:
   a. Closed isopleth levels surrounding the maximum ground level concentration as well as closed isopleth levels surrounding any other predicted exceedances other than the maximum ground level concentration. Make sure to include the 0.9 x [AAAQO] level as this may be used in determining an acceptable placement for a monitor (Appendix A).
   b. For scenarios modelling normal operations make sure to include a closed 0.9 x [AAAQO] isopleth level surrounding any sensitive receptors, if the 0.9 x [AAAQO] level is exceeded.
   c. For scenarios modelling upsets (not non-routine flaring) make sure to include the 1.5 x [AAAQO] isopleth level around the location of any AAAQO or AAAQG (except AAAQG for Odour Management) exceedances as well as the 0.9 x [AAAQO] isopleth level surrounding any sensitive receptors, if the 0.9 x [AAAQO] level is exceeded.

   Note: For all scenarios be sure to model nearby sources at non-upset maximum emission rates. If a nearby source only operates during upsets do not include it in the modelling.

2. Repeat Step 1 but now only include the proponent's sources for both normal and upset conditions, as needed. Be sure to include all of the facility sources not just sources that have been modified, or have been added, as may occur in an amendment. Be sure the isopleths extend to include any exceedances as identified in Step 1. Do not add the baseline concentrations to this map.

3. Repeat Step 1 but now only include the nearby sources. These can be grouped by individual facilities but a concentration isopleth map based on the sum of predicted concentrations for all of the neighbouring facilities should be constructed. Be sure the isopleths extend to include any exceedances identified in Step 1. Do not add the baseline concentrations to this map.

Note: As was the case for the all source scenarios in Step 1, be sure to model nearby sources at non-upset maximum emission rates. If a nearby source only operates during upsets do not include it in the modelling.

4. For each exceedance identified in Step 1 determine the contribution at the maximum ground level concentration, contained within the closed isopleth defining the exceedance, from:
   a. The proponent's facility from the isopleth map created in Step 2,
   b. The nearby facilities (all facilities) from the isopleth map created in Step 3, and
   c. The baseline concentration.

   On the basis of the values determined in Step 4.a, b and c, the proponent should determine the % contribution by each of these sources relative to the total found in Step 4.a, b and c to form an estimate of the % contribution from all sources found in Step 1.

Note: For all of the above scenarios, non-routine flaring should not be included as it does not consider cumulative effects when modelling. Interpretation of non-routing flaring should be undertaken as per the direction provided in D60.

3.2.1 Addressing Exceedances Influenced by High Baseline Concentrations

The AQMG does provide guidance for determining suitable monitoring to provide ambient concentrations of substances that may be present but not explicitly modelled in an assessment. These can be anthropogenic sources, e.g., transportation, residential and commercial heating, etc. and biogenic sources, e.g., wildfire smoke. The selection of the appropriate air quality monitors and the treatment of the data from these monitors to capture representative baseline concentrations requires considerable professional judgement.

In some assessments there may be a concern, regarding the impact of high baseline concentrations, i.e., baseline concentrations > 0.3 x [AAAQO] where an AAAQO is predicted to be exceeded. In these cases, the proponent should:

1. Double check the validity of their choice of baseline monitors. In particular, the proponent should confirm the chosen monitor:
   a. Is suitably located to capture representative non-modelled emissions upwind of the facility.
   b. Is working properly and has been well maintained. The proponent should consult the AMD for any additional guidance in this regard.
   c. Its instrumentation has not been changed or, if changed, there is no obvious offset or drift in the monitored values.

2. If the proponent is satisfied that the baseline monitoring is representative, they should try to determine the contributing sources to these baseline concentrations. This may be available through regional studies or special monitoring studies. If it can be determined what exactly is contributing to the baseline concentrations, it is important for the proponent to consider whether or not these contributions will increase, decrease or remain the same in the foreseeable future. If this cannot be easily determined then the assumption should be made that the baseline concentrations will remain the same.

Upon the completion of any recalculations of the baseline concentration if predicted exceedances persist, the proponent will need to develop a monitoring plan as per Appendix A in conjunction with a management plan as per Appendix B, or a management plan alone as per Appendix B in order to reduce the likelihood of causing an exceedance.

Note: The threshold of 0.3 x [AAAQO] as a significant contributor is intended to guide the management response to the influence of relatively small, and possibly noisy contributions to modelled exceedances, while still ensuring any required management action will result in a meaningful improvement in air quality.

For assessments where the baseline concentration is already above the AAAQO the airshed is already at capacity. In this case the Director may require a very stringent management plan that takes into account any regional plans/frameworks or additional regulatory requirements to demonstrate a reduction in the likelihood of causing an exceedance. This must be discussed with the Director before proceeding.

Example 13. Assessing influence of high baselines – poor baseline monitoring data
In an assessment for a facility under normal operating conditions it was predicted there were two locations where 24-hour $PM_{2.5}$ AAAQO exceedances where occurring and one location with an exceedance of the annual $PM_{2.5}$ AAAQO. There were no nearby facilities contributing to the exceedances and the facility was operating using normal maximums. There was some concern high baseline values may be making a significant contribution to the exceedances given a simple source apportion analysis (see the next section for more detailed examples of this analysis) showed the baseline values were contributing ~0.40 x [AAAQO] to the 24-hour exceedances and ~0.35 x [AAAQO] for the annual exceedance. Upon further review, it was observed that one of the years of monitoring data used to construct the baseline showed evidence of unusual behaviour (a jump in the hourly averaged reported concentration part way through the year followed by noticeably increased variability compared to before the jump). In addition, this behaviour was not seen in nearby monitors in the region so this year of data was deemed anomalous and an earlier stable year was used to remake the baseline concentration as per the guidance provided in the AQMG. Using the newly formed baseline removed all predicted exceedances and the assessment can be completed for review by the Director.

Example 14. Assessing influence of high baselines – high baseline concentrations
In an assessment for a facility under normal operating conditions a facility it was predicted there were three locations where exceedances of the 24-hour $PM_{2.5}$ AAAQO where occurring and one location with an annual exceedance of the $PM_{2.5}$ AAAQO. There were no nearby facilities contributing to the exceedances and the facility was operating using normal maximums. A simple source apportion analysis of the contributing sources revealed a very high baseline concentration with a baseline contribution of ~0.60 x [AAAQO] for the 24-hour exceedances and ~0.70 x [AAAQO] for the annual exceedance so the baseline is a significant contributor to all of the exceedances, A careful reanalysis of the monitoring data used to construct the baseline concentrations did not reveal anomalous behaviour. The proponent will need to prepare a management plan to reduce the likelihood of exceeding an AAAQO. As part of this plan the proponent will have to determine the probable cause of the high baseline concentrations and any changes that may occur to it in the foreseeable future. If it is expected the high baseline will persist the proponent may need to consider very stringent process controls and/or technology that will reduce the likelihood of causing an exceedance.

3.2.2 Addressing an Exceedance Influenced by Nearby Facilities

As noted in the AQMG, it is expected that most assessments will require one modelling scenario where nearby facilities and a representative baseline are included. However, when an assessment predicts exceedances of the AAAQOs and there is reason to believe that nearby facilities may be contributing to the likelihood of causing an exceedance it is important for the Director to understand this impact. Nearby facilities, like baseline contributions, are considered to be making a significant contribution to an exceedance if they are collectively contributing > 0.3 x [AAAQO] where an AAAQO is exceeded.

Before any further action, based on an assessment with an exceedance with a significant contribution from nearby facilities, is undertaken the proponent should confirm representative emission rates were used when modelling the nearby facilities. In particular:

1. Did the proponent use any unusually high maximum emission rates for any nearby facility sources operating under normal conditions? Determining whether or not a source operating under normal conditions has an unusually high limit is described in the AQMG. If this is the

case, these sources should be remodeled with more realistic maximum emissions. If the remodeled scenario still shows nearby facilities are a significant contributor to an exceedance this should be noted by the Director[ii] in the approval records for all nearby facilities identified as making a significant contribution to an exceedance.

2. Did the proponent use upset limits in modelling any of the nearby facility sources? If this was the case the proponent should remodel these sources using more realistic limits, or if these sources are only used for upsets remove them from the modelling. If the remodeled scenario still shows nearby facilities are a significant contributor to an exceedance this should be noted by the Director[ii] in the approval records for all nearby facilities identified as making a significant contribution to an exceedance.

Upon the completion of any remodeling if exceedances persist, the proponent will need to develop a monitoring plan as per Appendix A in conjunction with a management plan as per Appendix B, or a management plan as per Appendix B in order to reduce the likelihood of causing an exceedance.

For assessments where the total contribution from nearby facilities is already above the AAAQO the facility is in a location that is already at capacity. In this case the Director may require a very stringent management plan that takes into account any regional plans or additional regulatory requirements to demonstrate a reduction in the likelihood of causing an exceedance. This must be discussed with the Director before proceeding.

Assessments with a significant contribution from both the baseline concentrations and nearby facilities should follow the guidance for managing an assessment with a high baseline first, and then follow the guidance for nearby facilities.

[ii] A note regarding the impact of neighbouring facilities should be included in the Director's notes on the proponent's approval as well as noted in the approval records of neighbouring facilities who are indicated as potentially contributing to an exceedance. These notes should be reviewed and taken into consideration as part of the holistic approach to cumulative effects management when neighbouring facilities require an approval.

Example 15. Nearby facility being a significant contributor to an exceedance
In an assessment for a facility under normal operating conditions a location with an hourly NO_2 AAAQO exceedances and a second location with an annual NO_2 AAAQO exceedance using the OLM method as per the AQMG were predicted. An initial examination of the results did not suggest any additional relief due to any upsets or unusually high limits at the facility. However, it was noted there were two nearby facilities (Facilities A and B) that may be a significant contributors to these exceedances. A source apportionment study was undertaken to determine the relative contribution of the nearby facilities and background as per the guidance provided in Section 3.2 and is summarized as follows:

Exceedance 1: 24-hour NO_2 [AAAQO]					
Contribution by Each Source, no Baseline (Source Apportionment)					
	Proponent Alone	Facility A	Facility B	Baseline	Total***
Modelled Concentration [$\mu g/m^3$]	285	35	150	NA	470
% Contribution	60.6	7.5	31.9	NA	100
Estimated Contribution by Each Source from All Source Scenario					
Modelled Concentration [$\mu g/m^3$]	?	?	?	20	447
Estimated Concentration [$\mu g/m^3$]	0.606x(447-20) = 258.8	32.0	136.2	NA	
Estimated % [AAAQO]*	86.3	10.7	45.4	6.7	
Exceedance 2: Annual NO_2 [AAAQO]					
Contribution by Each Source, no Baseline (Source Apportionment)					
	Proponent Alone	Facility A	Facility B	Baseline	Total
Modelled Concentration [$\mu g/m^3$]	37	4	16	NA	57
% Contribution	64.9	7.0	28.1	NA	100
Estimated Contribution by Each Source from All Source Scenario					
Modelled Concentration [$\mu g/m^3$]	?	?	?	7.5	51
Estimated Concentration [$\mu g/m^3$]	0.649x(51-7.5) = 28.2	3.1	12.2	NA	
Estimated % [AAAQO]**	62.3	6.9	27.1	16.6	

*Assuming an hourly [AAAQO] = 300 $\mu g/m^3$.
** Assuming an annual [AAAQO] = 45 $\mu g/m^3$.
*** The total for each contributing source appears greater than the one scenario with all sources due to the shared titration of NOx when all sources are considered together. However, the relative contribution of these sources when all sources are modelled together in one scenario can be derived from relative contributions of the individual sources when considered alone. The baseline is not considered in the contribution from the individual sources as it is added after modelling as a fixed value.

From the assessment it can be seen the proponent is a significant contributor to all exceedances while Facility B is a significant contributor to the 24-hour exceedance. A check of the emissions used for modelling Facility B represented normal maximum emissions. The proponent will need to prepare a management plan and/or management/monitoring plan to minimize the likelihood of causing an exceedance. The Director should note in Facility B's approval file that they have been identified as being a potential significant contributor to exceedances in the region.

Example 16. Nearby facility and baseline both being a significant contributor to an exceedance
In a similar assessment to that provided in Example 15 there was a 1-hour exceedance of the NO_2 [AAAQO] at one location with an exceedance of the annual NO_2 [AAAQO] at the same location. In this cases there was a concern that two nearby facilities (Facility A and B) as well as a high baseline value may be contributing significantly to these exceedances. A source apportionment analysis of the contribution to these is summarized as follows:

Exceedance 1: 24-hour NO_2 [AAAQO]					
Contribution by Each Source, no Baseline (Source Apportionment)					
	Proponent Alone	Facility A	Facility B	Baseline	Total***
Modelled Concentration [$\mu g/m^3$]	257	31	154	NA	442
% Contribution	58.1	7.0	34.9	NA	100
Estimated Contribution by Each Source from All Source Scenario					
Modelled Concentration [$\mu g/m^3$]	?	?	?	123	517
Estimated Concentration [$\mu g/m^3$]	0.581x(517-123) = 228.9	27.6	137.5	NA	
Estimated % [AAAQO]*	76.3	9.2	45.8	41.0	
Exceedance 2: Annual NO_2 [AAAQO]					
Contribution by Each Source, no Baseline (Source Apportionment)					
	Proponent Alone	Facility A	Facility B	Baseline	Total
Modelled Concentration [$\mu g/m^3$]	31	5	17	NA	53
% Contribution	58.5	9.4	32.1	NA	100
Estimated Contribution by Each Source from All Source Scenario					
Modelled Concentration [$\mu g/m^3$]	?	?	?	17.4	46
Estimated Concentration [$\mu g/m^3$]	0.585x(46-17.4) = 16.7	2.7	9.2	NA	
Estimated % [AAAQO]**	37.1	6.0	20.4	38.7	

*Assuming an hourly [AAAQO] = 300 $\mu g/m^3$.
** Assuming an annual [AAAQO] = 45 $\mu g/m^3$.
*** The total for each contributing source appears greater than the one scenario with all sources due to the shared titration of NOx when all sources are considered together. However, the relative contribution of these sources when all sources are modelled together in one scenario can be derived from relative contributions of the individual sources when considered alone. The baseline is not considered in the contribution from the individual sources as it is added after modelling as a fixed value.

In this assessment the proponent is clearly a significant contributor to both exceedances and will have to develop a management plan or a monitoring/management plan to minimize the likelihood of causing an exceedance. It can also be seen that Facility B and the baseline are both significant contributors to the 24-hour exceedance while the baseline is also a significant contributor to the annual exceedance. A check of the emissions used for modelling Facility B confirmed normal maximum emissions were used. The Director should note in Facility B's approval file that they have been identified as being a potential significant contributor to exceedances in the region. As part of this plan the proponent will have to determine the probable cause of the high baseline concentrations and any changes that may occur to it in the foreseeable future. If it is expected the high baseline concentration will persist the proponent may need to consider very stringent process controls and/or technology in their management plan.

3.3 Exceedances of Air Quality not measured by AAAQOs

AAAQOs are not the only metric for measuring ambient air quality. Acidification of soils is determined by the deposition rate of acidifying and neutralizing species as well as the natural

sensitivity or buffering capacity of the soils to acidification. AAAQGs for Odour Management are developed through a stakeholder process to set acceptable air quality levels of odourous substances. However, the effective management of odours from a facility may require ongoing monitoring and engagement with effected stakeholders in order to minimize the frequency of these exceedances and reduce the number of complaints.

3.3.1 Acid Deposition

The AQMG provides the technical details for undertaking an acid deposition assessment that may be required for an approval or EIA. If an assessment indicates there is an exceedance of the CLs, as specified in the ADMF, within the modelling study area the proponent will be required to participate in an Acid Deposition Management Zone Plan (ADMZP), if one has been created by the ADMF.

In the absence of an ADMZP, the proponent will need to develop a monitoring and/or management plan to reduce the likelihood of causing an exceedance of a CL. In particular, the proponent can either:

1. Develop and undertake an acid deposition monitoring plan as per Appendix A in conjunction with a management plan as per Appendix B to determine if there is any evidence of acidification occurring as per Appendix A.
2. Develop and implement an acid deposition management plan as per Appendix B

Example 17. Need for acid deposition assessment when no ADMZP is in place
In an assessment a facility exceeded the emission levels of acidifying species, as described in the AQMG, triggering the need for an acid deposition assessment. No ADMZP exists that includes the proponent's study area. The proponent may develop and implement a management plan as per Appendix B to reduce the likelihood of exceeding a CL or develop and implement a monitoring plan as per Appendix A, and companion management plan as per Appendix B, with the requirement to immediately implement the management plan if evidence of soil acidification is found.

Example 18. Need for acid deposition assessment when an ADMZP is in place
In an assessment a facility exceeded the emission levels of acidifying species, as described in the AQMG, triggering the need for an acid deposition assessment. The region impacted by the facility had been previously identified by the ADMF as containing sensitive soils that were at risk of exceeding their CL. The ADMF had created an ADMZP, in consultation with effected stakeholders that should have included the proponent, to reduce the likelihood of exceeding a CL. If the proponent has not done so already, they will have to develop and implement a monitoring plan as per Appendix A, with the requirement to immediately implement a management plan as per Appendix B, that aligns with the outcomes specified in the ADMZP to reduce the likelihood of exceeding an CL. If the proponent is already participating in the ADMZP this will serve as the process to reduce the likelihood of exceeding the soil CL.

3.3.2 Odour

Odour is the most common air quality complaint in Alberta. AAAQGs for Odour Management are developed for management of an odourous substance through a stakeholder engagement process. AAAQGs for Odour Management set the acceptable ambient air quality levels for the concentration of an odourous substance for a specified (half-hour) averaging period. The number of exceedances of this metric, derived from modelled hourly concentrations, as well as the allowed frequency of these exceedances in an assessment is specified in the AQMG.

When modelling predicts an ambient air quality concentrations for a substance above an AAAQG for Odour Management air quality level for the allowed frequency, the proponent should work with the Director to reduce the likelihood of exceeding these levels. In particular, the proponent can either:

1. Develop and implement an odour monitoring plan as per Appendix A in conjunction with an odour management plan as per Appendix B to reduce the likelihood of exceeding an AAAQG for Odour Management.

2. Develop and implement an odour management plan as per Appendix B to reduce the likelihood of exceeding an AAAQG for Odour Management.

Example 19. Odour assessment when frequency of predicted concentrations above the AAAQG for Odour Management is less than allowed frequency
An assessment for a new facility shows a maximum of 32 hourly instances of the air quality in a calendar year being above of an AAAQG for Odour Management. This is less frequent than the accepted frequency for odour management, as specified in the AQMG, so this closes this part of the assessment.

Example 20. Odour assessment when frequency of predicted concentrations above the AAAQG for Odour Management is greater than allowed frequency
An assessment for a new facility shows a maximum of 62 hourly instances of the air quality in a calendar year being above of an AAAQG for Odour Management. This exceeds the allowed frequency for odour management, as specified in the AQMG, so the proponent will need to develop and implement a monitoring and/or management plan to reduce the likelihood of causing concentrations greater than the AAAQG for Odour Management.

Example 21. Odour assessment when frequency of predicted concentrations above the AAAQG for Odour Management is greater than allowed frequency for a facility with a history of odour complaints
An assessment for a renewal by a facility shows the frequency of hourly instances is above the allowed tolerance for an AAAQG for Odour Management, as specified in the AQMG. When preparing the assessment the proponent also noted a history of odour complaints from the public regarding odour emanating from the facility. The proponent will need to develop an odour management plan to reduce the likelihood of causing concentrations greater than the AAAQG for Odour Management. This plan should include identification of the source of odourous emissions by the facility as well as an engagement plan with the local community to keep them informed of ongoing odour management activity at the facility, e.g., monthly meetings with stakeholders describing any complaints received during the previous month, how they were resolved, etc. If an odour management plan already exists for the facility the proponent should address any shortcomings in the existing plan as part of their assessment.

4.0 References

Alberta Environment (AE), 2000. Industrial Release Limits Policy

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Alberta Environment and Parks (AEP), 2016. Air Monitoring Directive

Alberta Environment and Parks (AEP), 2019. Alberta Ambient Air Quality Objectives and Guidelines Summary

Alberta Environment and Parks (AEP), 2021. Continuous Emission Monitoring System (CEMS) Code

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Alberta Environment and Parks (AEP), 2022b. Industrial Heartland Designated Industrial Zone Guide for Environmental Protection and Enhancement Act Renewal Applications

Alberta Environmental Protection (AEP), 1995. Alberta Stack Sampling Code

Perry, S.G., Cimorelli, A.J., Paine, R.J., Brode, R.W., Weil, J.C., Venkatram, A., Wilson, R.B., Lee, R.F and Peters, W.D. 2005. AERMOD: A Dispersion Model for Industrial Applications. Part II: Model Performance against 17 Field Study Databases. Journal of Applied Meteorology and Climatology, 44, 5, pp. 694-708.

US Environmental Protection Agency (US EPA), 2017. Appendix W, 40 CFR Part 51.

Appendix A: Monitoring to Assess Modelling Results

Given the complexity of the air dispersion process, an assessment provides the most expedient method for obtaining comprehensive information on the impact of industrial activity on air quality relative to AAAQOs and AAAQGs, as well as the impact of the deposition of acidifying species relative to CLs. However in some cases, appropriate monitoring may be available to demonstrate an exceedance of any of these values is not occurring for an existing facility, or a predicted exceedance of any of these values for a new facility or an amendment.

The intent of the monitoring plan is to demonstrate an exceedance of any AAAQOs, AAAQGs or CLs is not occurring, rather than to demonstrate source attribution, which is the function of the modelling assessment. Furthermore, the use of a monitoring plan does not preclude the proponent from meeting other requirements, e.g., requirements specified under the IRLP. The environmental goals and outcomes and methodology for achieving these goals and outcomes must be clearly specified in the monitoring plan.

Before implementing a monitoring plan both the monitoring plan and a management plan detailing what changes would be made to the facility if necessary, based on a modelling assessment, must be approved in writing by the Director. These monitoring and management requirements may, at the discretion of the Director, be written into the approval.

A.1 Monitoring Plan to Assess AAAQO or AAAQG (excluding AAAQGs for Odour Management) Exceedances

A monitoring plan should include, at a minimum, the following:

1. Monitoring of all substances predicted to exceed an AAAQO or AAAQG in an assessment.

2. Monitoring must be suitably placed. The location of monitors must be based on the current modelling assessment. These should include:
   a. Monitoring at the location of the maximum ground level concentration for all substances predicted to exceed an AAAQO or AAAQG in the assessment.
   b. Monitoring at the location of all other peak ground level concentrations of any substances predicted to be above an AAAQO or AAAQG.
   c. Monitoring at the location of any sensitive receptors predicted to exceed an AAAQO or AAAQG in the assessment.
   d. Any combination or permutation of the above monitoring or additional monitoring, at the discretion of the Director.

   In all cases monitors should be placed as close as is practicable to the location of interest (location of maximum ground level concentration, any exceedances, sensitive receptors) taking into consideration any requirements for power and/or access. In any case, the monitors should be suitably placed to adequately measure the air quality levels of interest and should be located within the 0.9 x [concentration level] isopleth for the locations of interest, i.e., within 0.9 x [maximum predicted concentration level] for the maximum exceedance, within the 0.9 x [predicted concentration level] for any exceedances of the AAAQOs or AAAQGs (not for Odour Management) or sensitive receptors (provided the predicted values for the sensitive receptors were above 0.9 x [AAAQO] concentration.

   When a monitor cannot be located at the location of interest (maximum, location of AAAQ or AAAQG exceedance or sensitive receptor) the reported monitored values must be scaled to reflect what would have been recorded at the location of interest on the basis of the relative model assessment values of the two locations.

3. Monitoring must follow the requirements specified in the Air Monitoring Directive (AMD). In particular:
   i. The monitoring site must be properly prepared.

   ii. Monitors must be fit for purpose, i.e., continuous monitors, passive monitors, canisters, etc., and must be used appropriately.
   iii. The monitors must be properly calibrated and maintained.
   iv. Any problems with the monitors must be documented as well as any necessary changes made to address these problems.

4. Monitoring must have sufficient temporal coverage to ensure all realistic operational situations are adequately sampled. In particular:
   a. For new facilities or an amendment:
      i. Monitoring must commence within six months of submission of the modelling assessment.
      ii. If more than one site must be monitored this must be done concurrently and not sequentially.
      iii. Monitoring must be undertaken for at least two calendar years from commencement.
      iv. Monitoring must be available for at least 90% of the monitoring period.
      v. Monitoring must be completed within three years of commencement. If the monitoring plan cannot be completed within this time the original findings from the modelling assessment will stand.
   b. For existing facilities:
      i. If sufficient historical monitoring data already exists to meet the temporal coverage requirements specified for new facilities or an amendment then monitoring is complete.
      ii. If additional or new monitoring is required then this must be completed as per the requirements for new facilities or amendments.

5. Any other monitoring requirements specified by the Director.

When any of these conditions cannot be met a monitoring plan may not be sufficient to demonstrate exceedances of AAAQOs or AAAQGs (excluding AAAQGs for Odour Management) are occurring and may not be used as such. When a monitoring plan cannot be completed in the prescribed time the original findings of the modelling assessment will stand and the proponent will need to implement the previously agreed upon management plan.

Example 22: Unable to locate monitor in suitable location.
In an assessment a sensitive receptor was predicted to have a maximum ground level concentration of 1.3 x [AAAQO] for $PM_{2.5}$ but it was not possible to locate a monitor at this location nor within the 0.9 x [AAAQO] isopleth centred on this location. In this situation it would not be possible to adequately sample the air quality at the sensitive receptor so it would not be possible to make a monitoring plan suitable for regulatory purposes.

Example 23: Adjustment to monitoring values when monitor not located at maximum ground level concentration.
In this example modelling predicted 1.3 x [AAAQO] for 24-hour $PM_{2.5}$ at a sensitive receptor. However, the closest practical location for a monitor within the 0.9 x [AAAQO] isopleth enclosing the location of interest (sensitive receptor). The modelled maximum 24-hour value at the monitor location was 0.93 x [AAAQO] hence, the corrected monitor value at the location of interest would be give by:

$$\text{Corrected monitor value}_{(\text{location of interest})} = \text{Measured monitor value}_{(\text{location of interest})} \times (1.3/0.9)$$

A.2 Monitoring Acid Deposition

When monitoring is required as part of an Acid Deposition Management Zone Plan (ADMZP) under the ADMF the proponent should follow instructions for any monitoring provided as part of that plan. In the absence of an ADMZP if a proponent wants to monitor to confirm a CL is being exceeded they will need to develop a monitoring plan for this purpose, with an associated management plan to reduce acidifying deposition as needed. For acid deposition monitoring there are two options available:

1. Monitoring may be undertaken in a similar manner as required for monitoring exceedances of AAAQOs in Section A.1 but now measuring the wet and dry deposition rates of acidifying species on soils identified as potentially undergoing acidification.

2. Soil sampling of soils in areas where modelling indicates acidification may be occurring. This soil sampling must be undertaken for at least three years to determine if there is any indication of acidification occurring now or over the time period of the study.

When monitoring confirms acid deposition is exceeding the CL or soil sampling shows evidence of acidification the component will need to implement the management plan previously authorized by the Director.

A.3 Odour Monitoring

Odour monitoring undertaken by a proponent to assess whether or not air quality concentrations are above an AAAQG for Odour Management have slightly different requirements than that for managing AAAQOs and acid deposition.

For new facilities or amendments the proponent should include, at a minimum, the following:

1. Monitoring should follow the guidance provided for AAAQGs provided in Section A.1.

2. Monitoring may continue beyond 2 calendar years and be incorporated into an ongoing management plan.

3. Complaints may also form part of a monitoring plan, particularly where odour is an issue. When complaints arise the proponent should:
   a. Prepare information on the frequency, intensity, duration, offensiveness and location (FIDOL) characterization of the complaints.
   b. Report any actions taken to mitigate these complaints.
   c. Correlate any monitored values of the substance with an AAAQG for Odour Management with the complaints noting the expected impact of any proposed mitigation strategies.

For renewals the proponent should include, at a minimum, the following:

1. If a monitoring plan for odour is already in place for the facility the proponent should note how well it complies with the requirements specified for a new facility. This monitoring plan, at the discretion of the Director, may be revised to include any apparent deficiencies.

2. If a monitoring plan does not exist the proponent should prepare a similar plan as required for a new facility.

See the Air Quality and Odour Response Process fact sheet for more information on how to characterize odour.

A.4 Reporting Monitoring Results

At the end of the required monitoring period when a monitoring plan has been implemented the proponent must prepare a summary report of the results of the monitoring and submit this to the Director. This report must be submitted within one month of completion of the monitoring, or as specified by the Director. Failure to submit this report within the specified time period may result in the monitoring being deemed invalid and unacceptable, in which case the associated management plan previously approved by the Director must be implemented.

This report must include:

1. Confirmation that the monitoring was acceptable and passed all requirements contained in the monitoring plan.

2. For acceptable monitoring plans the proponent should report whether or not any exceedances were detected:
   a. If monitoring detected an exceedance the proponent will be required to immediately implement the previously approved management plan.
   b. If monitoring did not detect an exceedance the monitoring should be deemed complete unless otherwise directed by the Director.

Appendix B: Management Plan to Reduce the Likelihood of Causing an Exceedance

In a cumulative effects management system it is important for the proponent to have a good understanding of how their facility will impact air quality and how this will change as a result of changes at the facility, as well as changes to its surroundings. The modelling assessment should provide very good insight into this and it should be taken into account when imposing any regulatory requirements on the proponent.

When an assessment indicates either through modelling or monitoring that there is a likelihood of exceeding an AAAQO or an AAAQG for Odour Management, or a CL due to deposition of acidifying species the proponent will need to take steps to reduce this risk. The Director will work with the proponent to develop an orderly approach to improving relevant source process, pollution abatement equipment or any necessary redesign necessary to ensure the likelihood is minimized.

If a sensitive receptor is being impacted by the proponent's activity the Director may exercise their discretion to accelerate the implementation of any necessary changes, or impose any necessary operational restrictions, to ensure this likelihood is minimized.

Before implementing any management plan the plan must be approved in writing by the Director. This plan may, at the discretion of the Director, be specified in the approval.

B.1 Management Plan to Manage AAAQO or AAAQG (excluding AAAQGs for Odour Management) Exceedances

As a first step in preparing a management plan to reduce the likelihood of causing an exceedance of an AAAQO or AAAQG (excluding AAAQGs for Odour Management) the proponent should provide all of the relevant operational information the Director will need to approve any regulatory requirements. This should include, at a minimum:

1. A summary of any modelled or monitored exceedances found in their assessment. This should include, at a minimum:
   a. The degree to which the proponent, nearby facilities and/or baseline contributed to these exceedances.
   b. The operational modes (typical, upset) under which these exceedances occurred.
   c. All relevant information related to the frequency, duration and location of these exceedances.
   d. The meteorological conditions under which any exceedances occurred.
   e. The presence of any sensitive receptors impacted by any exceedances in the assessment.
   f. The history of any complaints attributed to the proponent.

2. Any requirements specified in a regional plan or provincial policy that may impact the proponent's options for reducing emissions, e.g., source standards specified for a sector or region.

3. Anticipated growth in the area considered in the modelling assessment in the foreseeable future.

4. Any additional information requested by the Director.

On the basis of the relevant information provided above the proponent should prepare a management plan that will clearly demonstrate that the plan will reduce the likelihood of exceeding and AAAQO, AAAQG or CL, as appropriate. This plan, at a minimum should include:

1. Any proposed changes to operational procedures, e.g., changes to SOCs for startups, changes to operating times, etc.

2. Any proposed changes to pollution abatement technology, e.g., baghouses, ultra-low NOx burners, SCR, cyclones, etc., to be employed at the facility. The proponent should consult the IRLP for guidance on the how to consider this technology review in terms of sector-specific or case-by-case basis. These changes should consider:
   a. The age and state of the current equipment.
   b. The reduction in emissions.
   c. The reliability and robustness of the choice in technology.
   d. Operational and capital costs, including consideration of how changes can be implemented as part of their business/maintenance cycle to minimize these costs.
   e. Rationale for the choice of technology.

3. A clear demonstration through a modelling assessment the effectiveness of any proposed changes. This effectiveness should be measured by:
   a. A meaningful reduction in the likelihood of causing an exceedance.
   b. A meaningful reduction that reduces cumulative effects and provides room for future growth.

5. Any additional information requested by the Director.

B.2 Acid Deposition Management

When the ADMF has created an ADMZP that includes the proponent's facility the proponent should follow it when undertaking acid deposition management. In the absence of an ADMZP the proponent has the option of managing any exceedances of the CL predicted in the assessment in a similar manner as described for managing exceedances of AAAQOs but now with the intent of reducing the likelihood of exceeding a CL.

B.3 Odour Management

Given the perception basis of odour an effective odour management plan will have different requirements than what is need for management against an exceedance of an AAAQO or CL. In particular, the odour management plan must include meaningful community engagement with impacted neighbours with the desired goal to reduce the likelihood of causing a concentration above an AAAQG for Odour Management. This plan should include:

1. Development of an odour management plan to reduce the amount of released odourous substances, particularly substances with an AAAQG for Odour Management, to reduce the likelihood of causing a concentration above an AAAQG for Odour Management. The effectiveness of this plan should be demonstrated through:
   a. The impact of any proposed changes on the Frequency, Intensity, Duration, Offensiveness and Location (FIDOL) of any exceedances of these AAAQGs for Odour Management. Special attention should be paid to any sensitive receptors that may be impacted.

See the Air Quality and Odour Response Process fact sheet for more information on how to characterize odour

b. Reductions in the number of complaints related to odour.

2. Regular meetings or sharing of information with impacted stakeholders regarding the state of the current management plan including:
   a. Identified sources of odourous material.
   b. Reporting on any monitoring activity related to odour management using AAAQGs for Odour Management.
   c. Proposed and current action to reduce odour from sources identified above.
   d. Reporting on the success of previously identified action in managing odour.
   e. Any foreseeable future activity at the facility that may cause a concentration above an AAAQG for Odour Management or odour complaints and how this will be managed to mitigate the risk of causing an odour complaint.

3. Any additional action required by the Director.

B.4 Implementing a Management Plan

The schedule for implementing any required changes should be undertaken in a timely manner and should consider the following:

1. The relative contribution of the facility to any exceedances. Facilities that have been identified as being a significant contributor to an exceedance may be expected to accelerate any proposed changes in their management plan.

2. Future growth in the area. Facilities operating in a high growth area may be expected to accelerate any proposed changes in their management plan. Particular attention should be paid to any requirements in regional plans for completing changes to equipment or processes, as applicable.

3. The impact on sensitive receptors. When the likelihood of an exceedance at a sensitive receptor is high a facility may be expected to accelerate any proposed changes.

The management plan must include a proposed timeline for completion of any required changes approved by the Director. If the management plan does not include a timeline the Director, at their discretion, may impose a timeline for completing an approved management plan.

For management of acceptable levels of AAAQOs, AAAQGs (excluding AAAQGs for Odour Management) or CLs the management plan should be deemed complete once all approved requirements specified in the management plan are deemed complete. For the management of AAAQGs for Odour Management specified actions should be implemented at the time of issuing the approval and may, at the discretion of the Director, be active for the duration of the approval.

Appendix C: Flow Chart for Interpretation of Air Quality Modelling Results

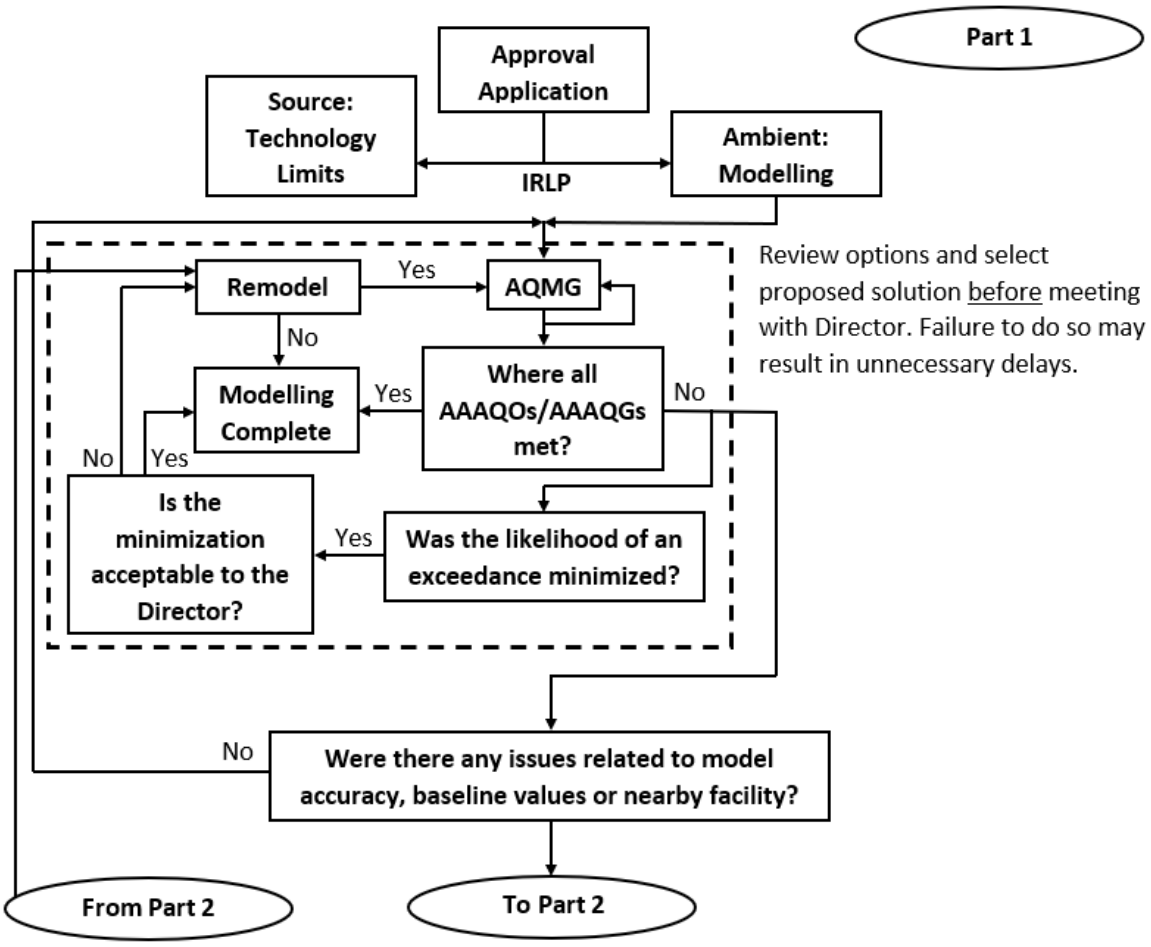

Figure C1. Part 1 of flowchart for interpreting air quality modelling results. The dashed box indicates the guidance necessary to complete most assessments with additional guidance, when necessary, provided in Part 2 (Figure C2) of the flow chart.

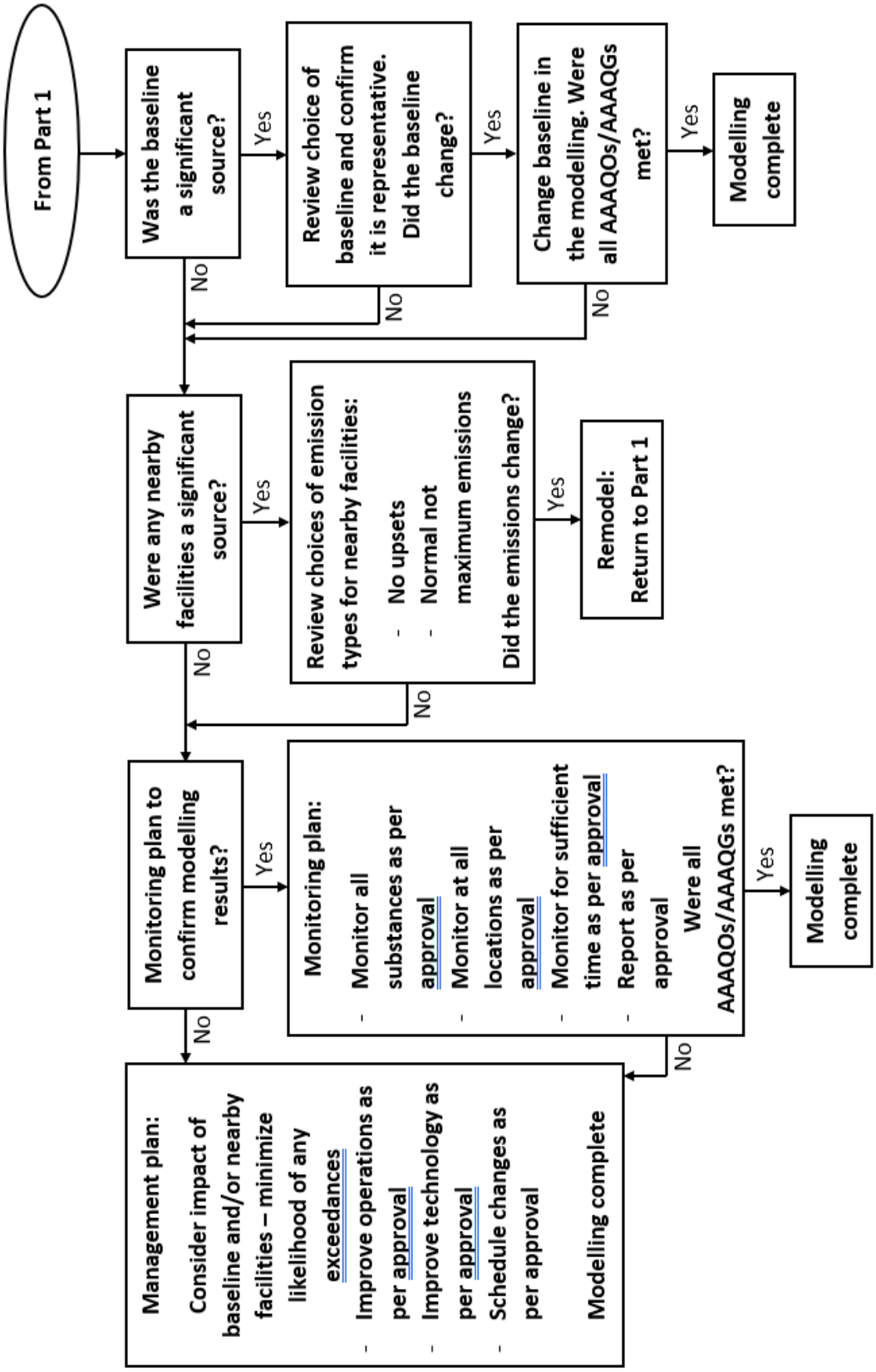

Figure C2. Part 2 of flowchart for interpreting air quality modelling results. This flowchart should be used in conjunction with Part 1 (Figure C1).