Rule 012
Noise Control

The Alberta Utilities Commission approved amendments to this rule on June 5, 2024, which are effective on September 30, 2024. The revised rule applies to facility applications and noise complaints filed after the effective date and does not apply retroactively.

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1 General provisions

1.1 Definitions

In this rule:

(1) "Commission" or "AUC" means the Alberta Utilities Commission

(2) "facility" means a gas utility pipeline, hydro development, power plant, substation, energy storage facility or transmission line

(3) "gas utility pipeline" has the same meaning as in the *Gas Utilities Act*

(4) "hydro development," "power plant," "substation," "energy storage facility" or "transmission line" have the same meaning as in the *Hydro and Electric Energy Act*

(5) "licensee" means (i) the holder of a licence or approval issued by the AUC for a facility or (ii) the owner or operator of a facility that is exempt from the requirement to file an application under Rule 007: *Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations, Hydro Developments and Gas Utility Pipelines* but is required to comply with one or more Rule 012 requirements

Refer to Appendix 1 – Glossary for additional definitions.

1.2 Rule application

(1) The purpose of this rule is to ensure that the noise from a facility, measured cumulatively with noise from other energy-related facilities, does not exceed the permissible sound level determined in accordance with this rule.

(2) The rule provides a process to evaluate noise complaints relating to a facility.

1.3 Compliance

(1) The noise from a facility, measured cumulatively with noise from other energy-related facilities, shall not exceed the permissible sound level determined in accordance with this rule.

(2) At any noise receptor(s), the permissible sound level is determined in accordance with Section 2 of this rule.

A noise receptor is any dwelling located within 1.5 km of the facility property boundary. If there is no dwelling within 1.5 km, a noise receptor is any point at 1.5 km from the facility property boundary. See detailed definition of "noise receptor" in Appendix 1 - Glossary.

1.4 Commission discretion

(1) The Commission may dispense with, vary, or supplement all or any part of this rule if it is satisfied that the circumstances require it.

(2) The Commission's discretion includes, but is not limited to:

(a) Assessing the permissible sound level on a site-specific basis and permitting a permissible sound level in excess of, or below, the permissible sound level as determined in accordance with Section 2.

(b) Conducting, or ordering sound level surveys to be conducted, of any facility for any reason.

(3) The Commission retains the discretion to consider noise compliance at continuous and persistent ceremonial and/or cultural sites that are significant to an Indigenous group and that are within 1.5 kilometres (km) of the project property boundary.

1.5 Conditions for a time extension request

(1) A new noise impact assessment must be filed as part of a time extension request, if one or both of the following conditions is satisfied:

(a) The most affected noise receptor has changed (e.g., due to construction of a new dwelling).

(b) There are new energy-related facilities nearby that may influence compliance at a noise receptor.

(2) If a new noise impact assessment is not included in a time extension application, the applicant must confirm that the most affected noise receptor has not changed and there are no new energy-related facilities that may influence sound levels at noise receptors.

2 Permissible sound level

2.1 Determination of permissible sound level

(1) The permissible sound level shall be determined for a noise receptor, as defined in Appendix 1 – Glossary.

(2) The permissible sound level is based on summertime conditions.

(3) In the case of an emergency, which is an unplanned event requiring immediate action to prevent loss of life or property, the permissible sound level determined under this rule does not apply. However, if an event occurs more than four times a year at a facility, the event is not considered an unplanned event and the facility must comply with its permissible sound level.

(4) Permissible sound levels set out in this rule are for two time periods: daytime and nighttime. As defined in Appendix 1 – Glossary, daytime is from 7 a.m. to 10 p.m. and nighttime is from 10 p.m. to 7 a.m. A noise receptor may have only one

nighttime and one daytime permissible sound level, except where a Class C adjustment applies.

(5) The permissible sound level is calculated as follows:

Permissible sound level	=	Basic sound level (Table 1)	+	Daytime adjustment (Table 1)	+	Class A adjustment (Table 2) (if applicable)	+	Class B adjustment (Table 3) (if applicable)	+	Class C adjustment (Table 4) only for wind turbines (if applicable)

(6) Nighttime basic sound levels are determined from Table 1. The minimum basic sound level used to calculate the permissible sound level is 40 A-weighted decibel (dBA) L_{eq} nighttime with adjustments made for proximity to transportation and population density as indicated in Table 1.

Permissible sound level is determined based on the basic sound level in Table 1 of the rule. If applicable, one or more of the following adjustments may be added:

- 10 dB daytime adjustment
- Class A adjustments for seasonal or ambient sound
- Class B adjustments for temporary noise
- Class C adjustments for wind noise

Table 1 Basic sound level (BSL)

Proximity to transportation	Dwelling density per quarter section of land				
	1 to 8 dwellings	9 to 160 dwellings	161 to 400 dwellings	401 to 1,000 dwellings (Suburban)	>1,000 dwellings (Urban)
Category 1	40	43	46	48	53
Category 2	45	48	51	51	53
Category 3	50	53	56	56	56

Notes:

(1) Category 1—dwelling(s) distance is more than or equal to 500 metres (m) from heavily travelled roads or rail lines and not subject to frequent aircraft flyovers.

(2) Category 2—dwelling(s) distance is more than or equal to 30 m, but less than 500 m from heavily travelled roads or rail lines and not subject to frequent aircraft flyovers.

(3) Category 3—dwelling(s) distance is less than 30 m from heavily travelled roads, or rail lines or subject to frequent aircraft flyovers.

(4) Density per quarter section — refers to a quarter section with the affected dwelling at the centre (a 451-m radius). For quarter sections with various land uses or with mixed densities, the density chosen must be factored for the area under consideration on a prorated basis.

(7) Documentation justifying that a road is heavily travelled must be compiled and submitted with the noise impact assessment to support the use of Category 2 or Category 3 from Table 1.

(8) The daytime adjustment is determined by adding 10 dBA to the nighttime basic sound level.

(9) Assumed ambient sound levels can be derived from the basic sound levels in Table 1.

(a) The assumed nighttime ambient sound level is five dBA less than the applicable basic sound level.

(b) The assumed daytime ambient sound level is five dBA less than the applicable basic sound level plus the daytime adjustment.

(10) Class A adjustments are described and set out in Table 2.

There are two types of Class A adjustments.

- Class A1 adjustments that account for the seasonal nature of the noise source. (A Class A1 adjustment cannot be used for design purposes).
- Class A2 adjustments that account for the actual ambient sound level in an area.
  - A Class A2 adjustment is added to the basic sound level to arrive at the permissible sound level and cannot exceed +/-10 dBA.

Table 2 Class A adjustments

Class	Reason for adjustment	Value (dBA L_{eq})
A1	Seasonal adjustment for wintertime conditions must not be added when determining the permissible sound level for design purposes. In the case of wintertime noise complaint under Section 5 of this rule, this adjustment may be used in determining the permissible sound level.	+5
A2	Ambient monitoring adjustment (or Class A2 adjustment) is applicable only when ambient sound levels assumed according to Table 1 are not representative of the actual acoustic environment. Refer to Section 2.5, Ambient sound level, for further details.	-10 to +10

Note: Class A adjustment = Sum of A1 and A2 (as applicable), is not to exceed +/- 10 dBA L_{eq}.

(a) A Class A2 adjustment is based on the measured ambient sound level in an area measured in accordance with the ambient sound monitoring survey requirements in Section 4 of this rule.

(b) A Class A2 adjustment for one noise receptor may be applied to other noise receptors within the same project study area that have a similar acoustic environment. To be deemed similar, justification must be provided demonstrating that the noise receptors have similar acoustic environments, and in particular, similar background noise, layout, size and type of surrounding vegetation and structures.

(c) The Commission will decide whether to grant a Class A2 adjustment request when it makes its decision on the facility application to which it pertains.

(d) An applicant requesting a Class A2 adjustment must provide all measurements necessary to support the Class A2 adjustment.

(e) A licensee may request a Class A2 adjustment for a facility after it is approved.

(f) If a licensee submits a request for a Class A2 adjustment under (e), it must conduct an ambient sound level survey:

(i) At the noise receptor at which a Class A2 adjustment will apply, when the facility is not operating; or

(ii) At a proxy monitoring location, if shutting down the facility is not feasible. A proxy monitoring location must be similar to the noise receptor at which a Class A2 adjustment will apply, but far enough from the facility that the noise contribution from the facility is negligible. The licensee must submit justification in support of its submission that ambient noise conditions at the proxy monitoring location are similar to those at the noise receptor.

(g) After completing the ambient sound level survey, an applicant or licensee must use Figure 1 to determine the applicable Class A2 adjustment and must follow all these steps:

(i) determine the difference between the basic sound level for the applicable dwelling density and transportation proximity (Table 1) and the measured nighttime and daytime ambient sound level to the nearest whole number

(ii) look up this difference on the horizontal axis of Figure 1

(iii) move up on the figure until the plotted line is intersected

(iv) move left on the figure to the vertical axis and read the applicable Class A2 adjustment value; it may be positive or negative

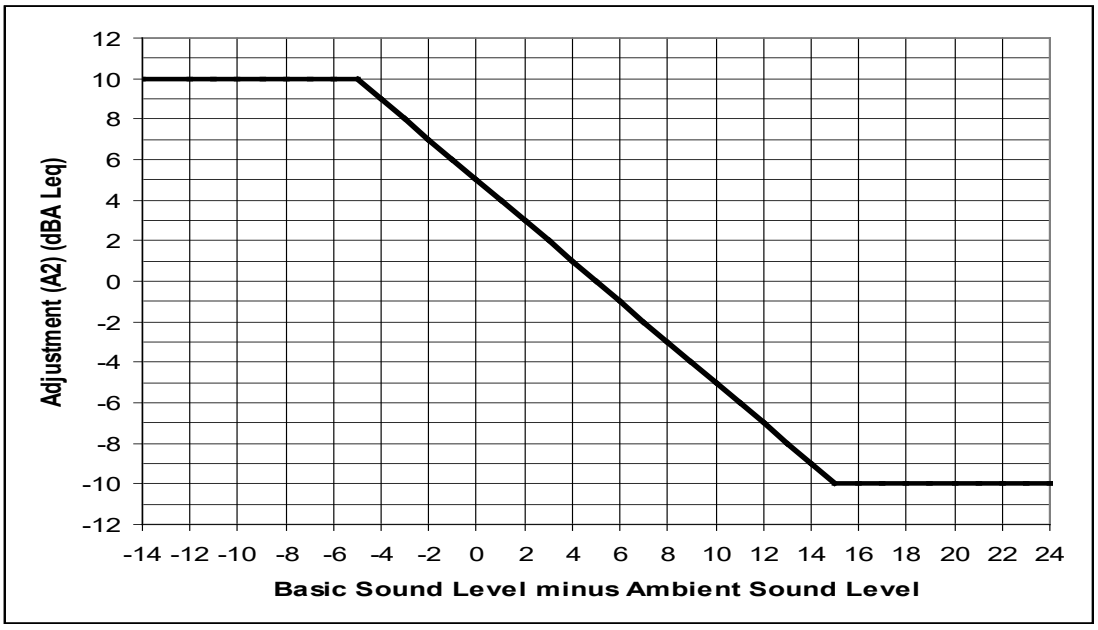


Figure 1 - Ambient monitoring adjustment, Class A2 adjustment

(h) If a Class A2 adjustment is requested, the noise impact assessment must indicate the predicted results with and without the Class A2 adjustment.

(i) An applicant or licensee seeking a Class A2 adjustment must do all the following:

(i) conduct an ambient sound level survey

(ii) include information relating to the Class A2 adjustment request for each location in its participant involvement program for the proposed facility

(iii) identify the noise receptor(s) or area where the Class A2 adjustment is requested

(iv) identify any energy-related facilities in the area

(v) identify whether an area is an urban or country residential location wherein an adjustment applicable for one noise receptor may be applied to other noise receptor(s) within the area because the noise receptor(s) have a similar acoustic environment

(vi) explain if the acoustic environment is influenced by factors such as non-energy related industrial activity, proximity to transportation infrastructures or population density

(vii) identify the multiple acoustic environment areas if requesting multiple adjustments for one proposed facility

(viii) provide justification on the applicability of the same Class A2 adjustment to other noise receptor(s) in the area, if a Class A2 adjustment is requested for an area with more than one noise receptor, but noise measurements were taken at only one location

(11) Class B adjustments are values set out in Table 3 to permit an adjustment to the basic sound level for temporary noise generating activities. Temporary noise generating activities are those lasting up to 60 days and not expected to occur more than once every 12 months. In order to use this adjustment, the licensee must inform the potentially-affected residents of the duration and character of the noise.

A Class B adjustment is an adjustment to the permissible sound level for temporary noise generating activities (lasting 60 or fewer days and no more than once in any 12-month period). The adjustment recognizes that additional noise can be tolerated if it is known that the duration will be limited.

Table 3 Class B adjustments

Class	Duration of activity	Value (dBA L_{eq})
B1	< 1 day	+15
B2	< 7 days	+10
B3	≤ 60 days	+5
B4	> 60 days	0

Note: Only one Class B adjustment may be claimed within a period of 12 months.

(12) The Class C adjustments are described and set out in Table 4.

A Class C adjustment is an adjustment to the permissible sound level for a wind turbine project to account for masking by wind noise.

There are two types of Class C adjustments:

- Class C1 adjustments are fixed adjustments that may be applied to nighttime permissible sound levels when wind speeds are elevated.
- Class C2 adjustments can vary based on measured ambient wind sound levels at different wind speeds.

Table 4 Class C adjustments

Class	Reason for adjustment	Value (dBA L_{eq})
C1	To account for sound caused by wind near a noise receptor resulting in the wind masking the noise level of a wind turbine at certain wind speeds, an operator or licensee may add a Class C1 adjustment to the nighttime permissible sound level, for the noise from the wind turbines only. If the wind speed $WS_{avg,10\ min}$, representative for a noise receptor, reaches a value of 12 metres per second (m/s) or more, an increase to the permissible sound level of five dB over the value determined in accordance with Table 1 may be added to a maximum value of 50 dBA for the nighttime period. This adjustment applies to the noise level from wind turbines, only in the presence of wind speeds of 12 m/s or more near a noise receptor.	+5
C2	To account for sound caused by wind near a noise receptor resulting in the wind masking the noise level of a wind turbine at certain wind speeds, an operator or licensee may apply for a Class C2 adjustment to the permissible sound level for the noise from the wind turbines only. If the measured ambient wind sound level, representative for a noise receptor, increases to values higher than the values for the ambient sound level assumed in Table 1, a Class C2 adjustment to increase the permissible sound level up to a maximum of 10 dB may be requested for that noise receptor for the daytime period or the nighttime period.	+1 to +10

(a) A Class C1 and C2 adjustment to the permissible sound level may not be combined.

(b) A Class C adjustment to the permissible sound level may not be combined with a Class A2 adjustment or Class B adjustment.

(c) An ambient wind sound level survey and wind measurements must be conducted in accordance with this rule. An ambient wind sound level survey must be completed for each integer wind speed to determine the difference between the ambient sound level in accordance with Table 1 and the measured ambient wind sound level.

(d) The wind speed near the noise receptor where the Class C adjustment applies must be documented, together with the time and date. These records must be kept for at least the previous year of operation.

(e) Before an applicant or a licensee of a wind turbine project may add a Class C1 adjustment to the permissible sound level, the applicant or licensee must file with the Commission information indicating how the wind turbine operation may be adjusted when the wind speed of $WS_{avg,10\ min}$, representative at a noise receptor, reaches values of less than 12 m/s.

(f) A Class C1 adjustment applies to the nighttime permissible sound level, but not to the daytime permissible sound level.

(g) An applicant for or a licensee of a wind turbine project must obtain approval of the Commission before adding a Class C1 or Class C2 adjustment to the permissible sound level.

(h) A request for a Class C2 adjustment may be filed as part of an application for a wind turbine project or as an amendment application for a wind turbine project.

(i) If a Class C1 adjustment is added or a Class C2 adjustment is requested, the noise impact assessment from the wind turbine project must be submitted both with the Class C1 or Class C2 adjustment to the permissible sound level and without the Class C1 or Class C2 adjustment to the permissible sound level.

(j) A Class C2 adjustment may only be requested if the operation of the wind turbines may be adjusted for the variability of the wind speed to maintain compliance with the permissible sound level.

(k) The Class C2 adjustment for a wind speed applies to the permissible sound level when that wind speed is present near the noise receptor.

(l) An applicant for a Class C2 adjustment must submit an ambient wind sound level survey and information indicating how the operation of the wind turbines will be adjusted to account for the variability of the wind, representative of that noise receptor.

(m) An applicant or licensee applying for a Class C2 adjustment must include information relating to the Class C2 adjustment request for each location in its participant involvement program for the proposed facility, as required in Rule 007.

(n) The Class C2 adjustment for each wind speed must be calculated according to the following steps:

(i) Determine the basic sound level from Table 1 for the daytime or the nighttime period.

(ii) Subtract five dBA from the basic sound level to determine the assumed ambient sound level; compare this value to the measured ambient wind sound level for each wind speed. If the measured ambient wind sound level is higher, the difference in increments of one dB is the Class C2 adjustment that may be added to the permissible sound level.

(iii) This Class C2 adjustment may be added to the permissible sound level for that specific wind speed.

(iv) A Class C2 adjustment for a lower wind speed may be applied as a Class C2 adjustment for a higher wind speed if the ambient wind sound level survey did not yield enough valid data for establishing the Class C2 adjustment for the higher wind speed.

(o) A Class C2 adjustment for one noise receptor may be applied to other noise receptors within the same project study area that have a similar acoustic environment and ambient wind sound level. For a noise receptor to be deemed similar, justification must be provided by demonstrating that the noise receptors have similar acoustic environments, and in particular, similar background noise, layout, size and type of surrounding vegetation and structures.

(p) A Class C2 adjustment remains in effect until the Commission approves an application to amend the Class C2 adjustment.

2.2 Permissible sound level determination for pre-1988 facilities

(1) Previous versions of Rule 012 considered a facility constructed and in operation before October 17, 1988, to be a deferred facility.

(2) Effective October 17, 2018, the Commission eliminated the deferred status for facilities built and in operation prior to 1988. Permissible sound levels for these facilities must be established in accordance with Section 2 of this rule.

2.3 Permissible sound level at new dwellings in proximity to an existing facility

This rule defines "dwelling" as any permanently or seasonally occupied structure used for habitation for the purpose of human rest.

"New dwelling" refers to a dwelling that is built after the Commission issues an approval or permit and licence for a proposed facility.

(1) Where a person builds a new dwelling or receives a permit to build within 1.5 km from the boundary of an existing and operational facility, the permissible sound level at the new dwelling will be the greater of the sound level existing at the start of the new dwelling construction, or the permissible sound level as determined in Section 2.1 of this rule. If there is a noise impact assessment for the facility, the phrase, "sound levels existing at the start of the dwelling construction," refers to the modelled cumulative sound levels at the new dwelling. If there is no noise impact assessment for the facility, the phrase, "sound levels existing at the start of the new dwelling construction," refers to the measured sound levels at the new dwelling. See example 4 in Appendix 6.

(2) On the application of a person referred to in Section 2.3(1), the Commission may, in exceptional circumstances, grant an exemption from the rule established by that section.

(3) If requested by a person, referred to in Section 2.3(1), the licensee must communicate information on the permissible sound level to that person. If there is a noise impact assessment for the facility, the licensee must provide a copy of the assessment and the modelled cumulative sound levels at the new dwelling to that person. If there is no noise impact assessment for the facility, the licensee must conduct a post-construction noise survey at the new dwelling and provide the noise survey results to that person.

2.4 Permissible sound levels for new dwellings built in proximity to an approved facility

(1) The Commission uses its approval or permit and licence issuance date as a milestone for determining new dwellings. Dwellings constructed after the Commission issues an approval or permit and licence are considered new dwellings, and the method for determining permissible sound levels described in this section apply.

(2) The Commission expects that once it issues an approval in respect of a facility, the licensee will notify impacted stakeholders, including occupants, residents, landowners, Indigenous groups, industrial stakeholders within the Rule 007 notification radius, local jurisdictions and other relevant agencies or stakeholders about the Commission approval, including the construction completion date specified in the approval.

(3) The permissible sound level at the new dwelling will be the greater of the modelled cumulative sound levels predicted by the noise model submitted as part of the facility application, or the permissible sound level as determined in Section 2.1 of this rule.

(4) On the application of a person who builds a new dwelling or receives a building permit within 1.5 km of an approved facility, the Commission may, in exceptional circumstances, grant an exemption from the rule established by Section 2.4(3).

(5) If requested by an owner or resident of the new dwelling, the licensee must provide information on permissible sound levels and modelled cumulative sound levels at the new dwelling to that person. More specifically, the licensee must provide a copy of the noise impact assessment report to that person and provide the modelling data interpolated to the location of the new dwelling.

(6) A licensee must keep documentation of its communication with an owner or resident of the new dwelling, including a copy of the noise impact assessment and any information on the permissible sound levels for the approved facility provided to that person.

(7) If an approved facility is not able to complete construction by the construction completion date indicated in the facility's approval or permit, the licensee must:

(a) On an ongoing basis, make all reasonable efforts to determine if any new dwellings have commenced or completed construction within 1.5 km of the approved facility.

(b) If a new dwelling has commenced or completed construction within 1.5 km of the approved facility, rerun the noise model to determine

whether the approved facility will meet the permissible sound levels at this new dwelling.

(8) If the modelling results obtained pursuant to Section 2.4(7)(b) indicate that the permissible sound levels at any new dwelling will not be met, a licensee:

(a) Must take all necessary steps to ensure compliance with the permissible sound levels, or

(b) May apply for an amendment to the approved facility in accordance with Rule 007.

(9) With respect to amendment applications,

(a) If an applicant submits an amendment application for an approved and already constructed project, the Commission will continue using the date of the original approval for the purpose of defining new dwellings (i.e., any dwelling constructed after the date of the original approval will be considered a new dwelling when establishing permissible sound levels).

(b) If an applicant submits an amendment application for an approved but not yet constructed project, the date in the original approval can no longer be used for the purpose of defining new dwellings. The amendment application approval will become the milestone for the purpose of defining new dwellings (i.e., proponents applying for an amendment must consider dwellings constructed after the date of the original approval, but any dwelling constructed after the amendment application approval will be considered a new dwelling when establishing permissible sound levels). Any dwellings constructed between the milestone date for the approved version of the project and new milestone date for the amended project will be considered existing dwellings when establishing permissible sound levels, and the applicant is required to demonstrate that the amended project will be compliant with the permissible sound levels determined in accordance with Section 2.1 at these dwellings.

2.5 Ambient sound level

(1) The ambient sound level is a composite of different airborne sounds from many sources, from far away and near the point of measurement. It does not include noise from wind and must be determined without contribution from energy-related facilities.

(2) The average nighttime ambient sound level in rural Alberta is approximately 35 dBA. Assumed ambient sound levels can be established based on a noise receptor's dwelling density and proximity to transportation infrastructure in accordance with Table 1. In most circumstances, noise impact assessments should make use of this average value or assumed ambient sound levels calculated based on Table 1.

(3) A Class A2 adjustment is applicable only when basic sound levels in Table 1 are determined not to be representative of the actual sound environment and when ambient sound levels have been measured. An ambient sound level survey to establish representative ambient sound levels may be necessary where:

(a) The proposed facility is in an area with noise sources other than energy-related facilities that may impact ambient sound levels,

(b) The proposed facility is in an area considered to be pristine (defined in Appendix 1 – Glossary), or

Rule 012 defines pristine area in the context of noise, and it is specifically being used in noise impact assessments relating to the rule. The definition of pristine area in this rule does not apply to other assessments.

(c) The noise receptor is in a populated area (i.e., suburban and urban noise receptors) where basic sound levels in Table 1 are not representative of the acoustic environment.

(4) A downward Class A2 adjustment may be considered in the circumstances described in sections 2.5(3)(b) and (c); however, in these cases, a request must be submitted to the Commission before conducting an ambient sound level survey. Upon receiving such a request, the Commission will determine if a Class A2 adjustment is appropriate, and if so, the Commission will specify measurement requirements for the ambient sound level survey.

(5) In any case, if the ambient sound level is established by means of an ambient sound level survey:

(a) The ambient sound level must be determined under representative conditions that portray typical conditions for the area, and not under extreme conditions (e.g., an unusually quiet day); and

(b) The maximum acceptable noise receptor level wind speed is three m/s, in order to exclude contamination from sounds caused by higher wind speeds.

(6) Modelling to calculate traffic noise at a given noise receptor may be used to establish ambient sound levels, in circumstances where values in Table 1 are not representative of the acoustic environment at the noise receptor, traffic noise is dominant (e.g., circumstances described in sections 2.5(3)(a) and (c)), and ambient sound level surveys are not practical.

(a) Traffic noise modelling must be done using a recognized standard/method, such as the U.S. Department of Transportation Federal Highway Administration Traffic Noise Model or comparable North American modelling algorithm.

(b) An explanation of why computer modelling is suitable for establishing ambient sound levels in the circumstances and details of the traffic noise modelling (e.g., traffic volumes and the source of this information) must be provided along with the modelling results.

(7) In the absence of measurement, the nighttime ambient sound level is assumed to be five dB less than the basic sound level and the daytime ambient sound level is assumed to be five dB less than the basic sound level plus the daytime adjustment.

2.6 Cumulative sound level

(1) This rule requires that a noise impact assessment predict compliance for a proposed facility by comparing cumulative sound levels with permissible sound levels applicable at affected noise receptors. Cumulative sound levels include:

(a) assumed or measured ambient sound level,

(b) noise contribution from existing energy-related facilities,

(c) predicted noise contribution from approved but not yet constructed energy--related facilities,

(d) predicted noise contribution from proposed energy-related facilities that have been deemed complete under Rule 007, and,

(e) predicted noise contribution from the applicant's proposed facility.

(2) The cumulative sound levels must include instances of the facility types listed above that are located close enough to the applicant's proposed facility to potentially influence sound levels at affected noise receptors.

(3) Once an application for a proposed facility has been deemed complete under Rule 007, the proposed facility must be accounted for in noise impact assessments prepared for facilities with adjacent or overlapping study areas.

(4) The simplified method to predict sound level by reducing six dBA per doubling of distance is only acceptable for a small, stationary single-source facility without the cumulative effect from any existing energy-related facility and with flat ground between the facility and the noise receptor (see example in Appendix 2 – Section 2.5).

(5) In cases where the simplified method is not acceptable, an applicant or licensee must have an acoustical practitioner to predict the cumulative sound level. When requested by the Commission, an applicant or licensee must provide all noise modelling documentation. Applicants or licensees must demonstrate the suitability of acoustical practices, equipment and techniques when measuring or modelling sound levels.

(6) Predicted and measured sound levels are required to be presented to one decimal precision. However, predicted cumulative sound levels or measured comprehensive sound levels may be rounded to the nearest whole number before a comparison to the applicable permissible sound level is made.

2.7 Noise management plans

(1) For unique cases, if the Commission considers that a comprehensive sound level survey is not practical, a detailed noise management plan approved by the Commission may be used to ensure compliance.

(2) A noise management plan must include:

(a) identification of noise sources

(b) assessment of current noise mitigation programs

(c) performance effectiveness of noise control devices

(d) methods of noise measurement and, if applicable, noise model verification

(e) best practices programs

(f) continuous improvement programs

(3) A licensee must discuss a proposed noise management plan with all affected persons, such as nearby residents, operators of energy-related facilities, other industries and local government. When submitting a noise management plan, the licensee must describe the consultation process and indicate if any affected persons have outstanding concerns with the plan.

2.8 No net increase

(1) The concept of no net increase in relation to noise impact assessments may arise when the sound added by an incremental project to the baseline sound level results in a negligible sound level increase.

(2) In cases where an applicant is proposing development of a facility where it is not practical or efficient to characterize baseline sound levels, the applicant may assume baseline compliance with the permissible sound level and use no net increase to justify that the proposed facility will have a negligible impact on cumulative sound levels. However, the predicted cumulative sound level must not exceed the permissible sound level by more than 0.4 dB.

(3) When baseline sound levels are predicted to exceed the permissible sound level by 0.4 dB or less, the applicant is required to assess compliance for its proposed facility by adding noise contribution from its proposed facility to baseline sound levels.

2.9 Predicted exceedances

(1) When cumulative levels are predicted to exceed the permissible sound level by more than 0.4 dB, but an applicant offers a convincing explanation for why baseline model predictions may be overly conservative, the applicant may be allowed to assume baseline compliance with the permissible sound level and predict noise compliance with permissible sound level for its proposed facility.

(2) If the applicant is unable to provide a convincing argument that it is reasonable to assume that baseline sound levels are compliant with the permissible sound level, the applicant must explain how compliance can be attained by mitigating sound emissions from baseline facilities.

(3) The Commission's acceptance of assumed cumulative level compliance, when predicted cumulative levels exceed permissible sound levels, does not infer that the facilities comply with permissible sound levels when in operation. Notwithstanding the Commission's acceptance of assumed cumulative level compliance in an application approval, the Commission may order comprehensive sound level surveys to determine compliance with permissible sound levels for

baseline facilities and/or the facility proposed in the application. All facilities regulated by the Commission must comply with the permissible sound level determined in accordance with this rule.

2.10 Construction noise

(1) Licensees must manage the impact of construction noise on nearby dwellings. All of the following mitigating measures should be used:

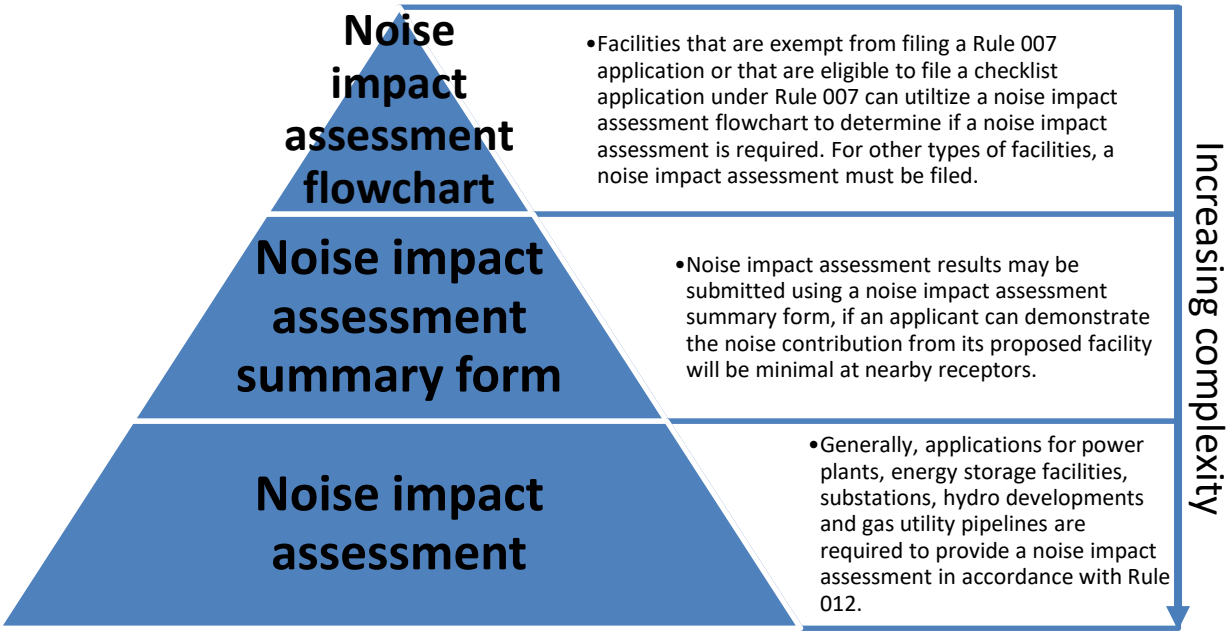
(a) conduct construction activity between the hours of 7 a.m. and 10 p.m. to reduce the duration impact from construction noise

(b) advise nearby residents of significant noise-causing activities and schedule these events to reduce disruption to them

(c) ensure that all internal combustion engines are well maintained with muffler systems

(2) Should a noise complaint be filed during construction, the licensee must respond expeditiously and take prompt action to address the complaint.

3 Noise impact assessments



Section 3.1 addresses whether a noise impact assessment should be prepared for an AUC-regulated facility.

- A flowchart is available for facilities expected to generate minimal noise.
- In some case, a summary form may be submitted to meet the requirements of Rule 012.

Section 3.2 addresses the requirements for preparation of a noise impact assessment.

Section 3.3 addresses the requirements for submission and retention of noise impact assessment records.

3.1 General requirements

(1) An applicant must conduct a noise impact assessment in accordance with this rule for the proposed facility and predict the potential noise impact of the proposed facility under normal facility operating conditions at the most affected noise receptor(s), subject to sections 3.1(4) and 3.1(5) below.

(2) When planning a facility in an area where there is an existing facility or approved energy-related facility, the applicant must ensure that its facility will not cause the cumulative sound levels to exceed the permissible sound level.

(3) The most affected dwelling(s) must be identified for each defined area of similar acoustic environment for inclusion in a noise impact assessment.

(4) If no noise-emitting equipment is proposed to be added or altered, or where a facility is expected to generate negligible noise (e.g., solar panels for household use), a noise impact assessment is not required before the facility commences operation. The facilities that are expected to generate negligible noise may include:

(a) an electric transmission line or substation of 260 kilovolts or less,

(b) a solar power plant with a capacity of less than one megawatt, and

(c) a meter station on a gas utility pipeline installation.

(5) Noise impact assessment flowchart:

(a) When a facility is exempt from the requirement to file a Rule 007 application or is eligible to file a checklist application under Rule 007, the facility must still comply with Rule 012 permissible sound levels. In these cases, and where Section 3.1(4) does not apply to the facility, a proponent may utilize the noise impact assessment flowchart (Appendix 9) to determine if a noise impact assessment is required.

The noise impact assessment flowchart allows proponents to determine if preparation of a noise impact assessment is required where the facility is expected to generate minimal noise.

(b) The noise impact assessment flowchart provides objective criteria for determining if noise impacts are expected to be minimal.

(i) If these criteria are satisfied, then further assessment is not required.

(ii) If these criteria are not satisfied, then the proponent must complete a noise impact assessment.

(6) If a Rule 007 application is required for the facility, the applicant must include text in its application explicitly stating why a noise impact assessment is not required. However, if the Commission receives a noise complaint against a facility that was expected to generate negligible noise, the facility owner may be required to demonstrate compliance with Rule 012 via a comprehensive sound level survey.

(7) Noise impact assessment results may be submitted using a noise impact assessment summary form (Appendix 3) in the following circumstances:

(a) the predicted cumulative sound level at the most affected noise receptor(s) is less than the permissible sound level by at least three dBA, or

(b) it is not practical or efficient to characterize baseline sound levels and the proposed facility qualifies to use the "no net increase" approach in Section 2.8.

3.2 Noise impact assessment requirements

A noise impact assessment summary form is a simplified reporting format. Applications that make use of a summary form must still meet all requirements for modelling and assessment specified in Section 3.2 of this rule.

A noise impact assessment must include:

(1) Permissible sound level:

Determine the permissible sound level for the noise receptor(s).
This includes all details showing how the permissible sound level was determined and any adjustments claimed, including supporting documentation for a Class A2, Class B or Class C adjustment.

(2) Sound source identification:

(a) Identify all major sources of noise such as transformers, heat recovery steam generators, exhaust and pump noise, ventilation openings or other equipment from the energy-related facilities, and their associated sound power or pressure levels in octave bands.

(b) Indicate whether the sound data is from vendors, field measurements, theoretical estimates or another source.

(3) Noise receptor identification:

(a) The noise impact assessment must present direction and distance from the proposed facility to the most affected noise receptor(s), predict

cumulative sound levels and assess noise compliance with the permissible sound levels at the most affected noise receptor(s).

(b) In cases where no dwelling exists within 1.5 km of a facility property and the facility is adjacent to another energy-related facility that does not have a dwelling within 1.5 km such that the 1.5 km radius overlaps, compliance with the permissible sound level should be assessed on the non-overlapping portion of the 1.5 km radius. See Example 3 in Appendix 6.

(c) Consideration of non-dwelling noise receptors is limited to continuous and persistent ceremonial or cultural sites that are significant to an Indigenous group and that are within 1.5 km of the project property boundary.

(d) During the participant involvement program required by Rule 007, the party who requests consideration of a non-dwelling location must explain to the proponent why noise compliance at this location should be predicted and assessed. This information, and the proponent's response to such request, including predicted sound levels and/or rationale as to why the non-dwelling site was included or excluded from the noise assessment, must be submitted to the Commission.

(4) Operating conditions:

It may be necessary to modify the manufacturer's data to account for actual operating conditions. The noise impact assessment must indicate the design conditions, such as operating with open or closed facility building windows and doors or restricted modes of operation.

(5) Factors to be considered and included in the model:

(a) geometric spreading

(b) barrier effects

(c) atmospheric absorption

(d) source size, location and elevation

(e) intermittency of noise

(f) mild downwind from the facility to the noise receptor(s) and/or temperature inversion conditions

(g) source directivity considerations

(h) noise receptor height (to reflect the bedroom height of the dwellings)

(6) The following factors must all be considered and included in the noise impact assessment report:

(a) meteorological parameters such as temperature (zero to 25 degrees Celsius), relative humidity (70 per cent to 90 per cent), wind speed (five to 7.5 kilometres per hour (km/h))

(b) noise source identification

(c) noise receptor identification

(d) baseline facilities identification

(e) sound power level and/or sound pressure level spectral data

(f) type of noise propagation model used (models or hand calculations may be used to obtain the predicted sound level)

(g) standards followed

(h) ground conditions and ground attenuation factor

(i) terrain parameters (terrain resolution)

(j) reflection parameters

(k) any adjustments made (documentation of power level calculation, assumptions made must be provided, e.g., source size considerations)

(7) Outline of study area:

Include a figure, map, area plan or drawing showing the proposed facility property, study area, the most affected noise receptor(s), and any approved and existing energy-related facilities. The figure, map, area plan or drawing must be clearly labelled, include a scale and indicate legal land descriptions. Also, if a Class A2, Class B or a Class C adjustment is requested, indicate the noise receptor(s) for which the adjustment is sought.

A noise impact assessment summary form may be submitted to meet the requirements of Rule 012 if the cumulative sound level is at least 3 dBA below the permissible sound level or "no net increase" in sound level is expected. (see Section 3.1(7)).

(8) If predicted sound levels are determined using the methods as outlined in Section 2.5 of Appendix 2, the noise impact assessment must clearly show that the conditions in that section are met.

(9) Predicted sound level and compliance determination:

(a) Calculate baseline sound levels and cumulative sound levels at the most affected noise receptor(s). If there are differences between daytime and nighttime operations, both levels must be calculated.

(b) Compare baseline sound levels to permissible sound levels and compare cumulative sound levels to permissible sound levels to demonstrate compliance of the proposed facility.

(c) If a noise impact assessment is conducted as part of the amendment process for an approved project, describe the incremental changes in sound levels resulting from the project amendment. In particular:

(i) Provide a comparison of the predicted noise contribution from the amended project and the predicted noise contribution from the approved project.

(ii) Provide a comparison of predicted cumulative sound levels from the amended project and predicted cumulative sound levels from the approved project.

(d) If there is a Class A2 or Class C2 adjustment, provide the ambient (wind) sound monitoring survey information outlined in Section 4.6.

(e) Provide the predicted cumulative sound level with and without the Class A2 or Class C2 adjustment.

(10) Non-compliance determination and attenuation measures:

(a) If the predicted sound level indicates non-compliance with this rule, identify the noise attenuation measures that the applicant or licensee is committing to implement and the timeline to implement measures to attain compliance.

(b) If the predicted sound level indicates non-compliance with this rule and further attenuation measures are not practical, the noise impact assessment must include the reasons why the measures proposed to reduce the impacts are not practical.

(11) Use models that meet accepted protocols and international standards (e.g., ISO 9613, CONCAWE Report No. 4/81).

(12) The predicted sound level for a facility operating intermittently for part of the daytime or nighttime period (e.g., solar project) is based on noise generated for the duration of the operation and must not be an average over the entire daytime or nighttime period.

(13) A-weighting measurements typically discount the lower frequencies. Therefore, when low frequency noise is an issue, the dBA value may not be sufficient to determine if low frequency noise is present. Where data is available, the C-weighted sound pressure level (dBC) minus the A-weighted sound pressure level (dBA) is to be calculated to identify the potential for low frequency noise impacts. A low frequency noise condition may exist when both:

- the time-weighted average dBC – dBA value for the measured daytime or nighttime period is equal to or greater than 20 dB, and
- a clear tonal component exists at a frequency between 20 and 250 hertz (Hz).

(a) Due to the complexity of determining low frequency noise, this is a specialized investigation. The calculation of dBC-dBA in predictive noise impact assessments is for information purposes only. The Commission may consider that further investigation is required when a noise complaint is filed and a post-construction monitoring survey is ordered.

(b) The procedure described in Section 4.5 and Appendix 5 is required only when low frequency noise is identified subsequent to a complaint investigation.

(14) Acoustical practitioner's information:

Provide the name(s) and describe the qualifications of the individual(s) who performed the noise impact assessment or noise survey.

(15) Noise impact assessment for wind turbines – additional requirement:

For noise impact assessments, the sound power level from a wind turbine must correspond to the maximum noise emitted when the wind turbine operates under the planned maximum operating conditions for both the daytime and nighttime period. These operating conditions and restrictions to one or more wind turbines must be documented in the noise impact assessment.

3.3 Submission and retention of noise impact assessment records

(1) A noise impact assessment must be submitted to the Commission as part of the Rule 007 application for a facility except where sections 3.1(4) and 3.1(5) apply.

(2) A facility that is exempt from the requirement to file a Rule 007 application or is eligible to file a checklist application must still comply with Rule 012 permissible sound levels.

(a) If the noise impact assessment flowchart analysis or noise impact assessment concludes that the facility will be compliant with this rule, the proponent is not required to submit its flowchart analysis or noise impact assessment to the Commission.

(b) If a checklist application is filed for the facility, the applicant should clearly specify whether it utilized the noise impact assessment flowchart or completed a noise impact assessment to confirm compliance with Rule 012. The Commission may ask the proponent to provide a copy of its noise impact assessment flowchart analysis or the noise impact assessment as part of the Commission's review of the checklist application.

(3) If a noise impact assessment completed for a facility proposes mitigation measures or establishes a Class A or Class C adjustment, the facility is not eligible for an exemption from the requirement to file a Rule 007 application and cannot file a checklist application.

(4) In all cases, a proponent or licensee must keep all supporting information relating to its noise impact assessment flowchart analysis or noise impact assessment prepared for a facility, including records of any communication between the proponent or licensee and nearby residents, until the facility is decommissioned and salvaged. A copy of the noise impact assessment flowchart analysis or noise impact assessment prepared for a facility and associated communication between the proponent or licensee and stakeholders must be provided to the Commission, in the event of a compliance or complaint investigation process.

4 Noise measurement

Section 4 sets out the requirements for sound level surveys, including ambient sound level or Class A2 adjustment surveys, Class C2 adjustment surveys, and comprehensive sound level surveys.

4.1 General

(1) A facility is in compliance if the comprehensive sound level measured during representative conditions is equal to or lower than the established permissible sound level, taking into consideration any low frequency noise.

(2) For the purpose of determining compliance with this rule, noise is measured at a distance of 15 metres (m) from the most affected noise receptor(s) in the direction of the facility, rather than at the property line of the land on which the noise receptor is located. Other measurement locations may be used if it is physically impracticable or acoustically illogical to measure where specified.

(3) A comprehensive sound level survey consists of sound and weather measurements for at least a full 24-hour period. An extended survey of more than 24 hours may be required to ensure that representative conditions have been met (see Section 4.4).

(4) The number of samples is sufficient in a valid comprehensive sound level survey if:

(a) in the case of a noise complaint or where compliance at a noise receptor is in question, at least three cumulative hours of valid data in each nighttime sampling period (10 p.m. to 7 a.m.) and three cumulative hours in each daytime sampling period (7 a.m. to 10 p.m.) under representative conditions are obtained, or

(b) data from combined multiple nighttime periods or daytime periods are obtained under representative sound levels at a noise receptor where measurement conditions, including weather conditions and nearby sound sources, are

(i) consistent across the measurement periods being combined, and

(ii) after an isolation analysis has been undertaken, the duration of valid data for each nighttime/daytime period to be combined is no less than 30 minutes and the difference in average sound levels from individual nighttime periods or daytime periods is no greater than plus or minus three dBA.

(5) Abnormal noise events not representative of the ambient environment may be isolated and removed from measurement data. The isolation analysis must be documented.

(6) The measured sound level for a facility operating intermittently such as wind turbines or peaking units is based on noise generated for the duration of the operation and must not be an average of the entire nighttime or daytime period.

(7) Noise contribution from existing energy-related facilities must be isolated for ambient sound level surveys. Noise from energy-related facilities is not isolated for comprehensive sound level surveys.

(8) Both daytime and nighttime data are required in a post-construction noise monitoring survey to assess noise at a noise receptor that is affected by neighboring energy-related facilities.

(9) A licensee does not need to include valid daytime data in its post-construction noise monitoring survey if the following conditions are met:

(a) contributing facilities do not operate differently during the daytime and nighttime periods;

(b) there is no complaint about daytime noise from energy-related facilities; and

(c) the licensee demonstrates the efforts that have been made to collect valid data for daytime periods, but insufficient valid data samples have been collected.

4.2 Multiple noise sources

(1) The methodology for assessment of multiple facilities or isolation techniques must rely on the judgment of an acoustical practitioner and must be documented.

(2) A noise model verification approach must only be applied in circumstances where non-compliance might be caused by multiple facilities and the noise contribution from individual facilities must be verified during an investigation related to mitigation measures.

(3) If a noise model verification is used under Section 4.2(2), the purpose of noise model verification is to determine the noise contribution from individual facilities and verify if any of the facilities' noise contribution exceeds the sound levels predicted in the approved noise impact assessments.

(4) If measured results in a post-construction survey indicate that sound levels exceed permissible sound levels and that multiple facility noise sources contribute to the measured comprehensive sound level, the report must explain the relative contributions.

4.3 Isolation analysis

(1) Isolation analysis techniques are used to separate sound sources and obtain the sound level from the source of interest alone.

(2) During a comprehensive sound level survey, all sound sources are recorded during the survey period. However, when monitoring for compliance, noise contributions from the licensee's facility are evaluated.

(3) Invalid or abnormal data can be extracted from the measured comprehensive sound level. Invalid data can include periods with unacceptable meteorological conditions or non-representative ground cover or facility operating conditions. Noise measured during temperature inversions or lapse conditions is excluded

unless the conditions are a frequent occurrence (the condition occurs more than 10 per cent of the time for a particular season) and can be measured at the noise receptor. Such conditions affect the level of noise, but unless the event occurs with regularity due to local topography or other factors, the condition is dismissed. The extraction of data from the measured comprehensive sound level must be documented and supported by a digital or analog audio recording, operational log or event log.

(4) Criteria for removing data may include:

(a) minimum wind speed (for wind turbines) not reached or maximum wind speed exceeded, resulting in contamination from wind-induced noise in the microphone

(b) measurement periods during precipitation

(c) measurement periods where the monitor is not downwind of the noise source. However, for a noise receptor that is affected by noise from more than one wind turbine, measurement data shall be considered valid where the noise receptor is downwind from any of the dominant turbines (i.e., the turbine with maximum predicted noise contribution and nearby turbines for which the predicted noise contribution is within 3 dB of the turbine with maximum noise contribution)

(d) measurement periods when any wind turbine that has a dominant noise impact is operating at a sound power level more than 1 dB below the planned maximum sound power level, as documented in the noise impact assessment, that is filed as part of the application to the Commission for that wind turbine

(e) periods of noise dominated by biological activity such as birdcalls, frogs, typically at dawn or dusk

(f) abnormal noise events, including aircraft flyovers and off-plant site vehicular traffic

(g) other non-energy related sources of noise

(5) The following meteorological data or measurement data represent sufficient justification for the conclusion that downwind conditions are not prevalent:

(a) a minimum of 30 days of wind direction data collected at a location not more than 1.5 km from the noise monitoring receptor

(b) data collected from locally-installed meteorological towers and assessed by a qualified meteorological professional

(6) The meteorological data or measurement data must show that the angle between the wind direction and the line joining source and noise receptor is greater than ±45 degrees (i.e., non-downwind conditions) at least 90 per cent of the time (i.e., representative conditions).

4.4 Multiple nights or single night of monitoring

(1) Multiple nights of monitoring may be required in order to clearly demonstrate that noise has been measured during representative conditions.

(2) If the intention of noise monitoring is to verify modelling predictions, and sufficient valid data under representative conditions has not been recorded after a minimum period of seven days, alternative methods of verification such as sound level measurements to assess the sound power level combined with noise model calculations as described in this rule, may be considered.

(3) The selection of the multiple-night noise monitoring period must reflect efforts to measure under representative conditions, and supporting documentation (e.g., an analysis of historical weather records, production data) may be requested.

(4) The following are some of the reasons to conduct a multiple-night monitoring:

- (a) conditions not representative of the complaint conditions
- (b) requirement for minimal hours of valid data not achieved
- (c) changing weather conditions
- (d) changing atmospheric conditions
- (e) changing plant operating conditions
- (f) variable seasonal effects
- (g) significant noise contamination from distant noise sources
- (h) insufficient local meteorological data
- (i) prior agreement on an extended monitoring period in order to satisfy mutual concerns between residents and licensees

(5) The following are reasons for accepting single-night monitoring or for ending a multiple-night survey:

- (a) favourable weather conditions
- (b) achievement of representative conditions, as described in the noise complaint investigation forms (in Appendix 4)
- (c) agreement from complainant that survey conditions were appropriate
- (d) licensee acknowledgement that compliance is not achieved

(6) Each nighttime result for multiple nights of monitoring must be evaluated against the requirements of this rule. If multiple nights are deemed to be representative, the worst-case condition (highest nighttime L_{eq}) is compared to the permissible sound level.

4.5 Low frequency noise

(1) When low frequency noise is an issue, measurements must be conducted in both C-weighted and A-weighted scales concurrently. Measurements may be made using two monitoring sound level meters, a dual-channel capable sound level meter, or other equipment capable of obtaining both the C-weighted and A-weighted sound levels simultaneously.

(2) The following two criteria indicate the presence of a low frequency noise measured at a noise receptor. Rule 012 requires that both criteria be fulfilled for a low frequency noise issue to potentially exist. Satisfying only one criterion does not result in a finding that low frequency noise is present.

(a) The isolated (e.g., non-facility noise, such as wind noise, has been removed) time-weighted average dBC – dBA value for the measured daytime or nighttime period is equal to or greater than 20 dB, and

(b) A clear tonal component exists at a frequency between 20 and 250 Hz. For the one-third octave frequency bands between 20 and 250 Hz:

(i) the linear sound level of one band must be at least 10 dB or more above one of the adjacent bands within two one-third octave bandwidths, and

(ii) there must be at least a five dB drop in level within two bandwidths on the opposite side of the frequency band exhibiting the high sound level

(3) If a low frequency noise condition as defined above exists, five dBA must be added to the measured comprehensive sound level. If this value exceeds the permissible sound level, the licensee must identify the source of the low frequency noise and implement noise attenuation measure to address the issue in a timely way. Once low frequency noise control measures have been implemented, a follow-up comprehensive sound level and complaint investigation must be conducted to confirm that the low frequency noise condition has successfully been addressed.

(4) Wind generates high levels of low frequency sound that can mask the assessment of low frequency noise. Measurements of low frequency noise should only be taken when atmospheric conditions are favourable for accurate measurement (see Table 8 and Appendix 5).

(5) The Commission may require tonality evaluation for all audible frequencies in a comprehensive sound level survey ordered in response to a noise complaint.

4.6 Sound level surveys report requirements – ambient and comprehensive

(1) The following information must be provided in sound level survey reports (additional requirements applicable to wind turbines are described in sections 4.6.2 and 4.6.3):

(a) an explanation of the noise monitoring procedures and weather measurement methodologies

(b) a map and list of noise monitoring and weather measurement locations

(c) a list of noise monitoring and weather measurement equipment

(d) field calibration records

(e) the response setting for the sound level meter

(f) the time, duration and number of monitoring periods

(g) the averaging period or interval for both noise and weather measurements

(h) the weather and ground conditions: temperature, wind speed, wind direction, humidity, precipitation, topography and ground cover at the monitoring location

(i) graphs showing measured sound level during the measurement period

(j) a tabulated record of duration, description of extraneous noise events, and the methodology used to isolate and remove the noise source of interest

(k) the noise receptor(s) for which a Class A2, Class C1 or Class C2 adjustment is applicable

(l) the distance and direction of noise receptor(s) from the facility

(m) a list of equipment and equipment calibration date

(n) the operating conditions for energy-related facilities included in the survey

(o) graphs showing measured sound levels and any isolation analysis (with noise sources identified)

(p) an analysis of the validation of the samples

(q) a summary table including the permissible sound level for the most affected noise receptor(s), measured sound level, isolation analysis results, valid hours of the survey

(r) in cases where low frequency noise was identified as a potential problem, provide an analysis and the results

(s) acoustical practitioner's information

4.6.1 Comprehensive sound level survey requirements

(1) When ordered to do so by the Commission as a condition of approval, in response to a compliance audit by the Commission, or in response to a noise complaint, a licensee must conduct a post-construction comprehensive sound level survey. The comprehensive sound level survey shall be conducted at:

(a) the noise receptor(s) specified in the condition, when the comprehensive sound level survey is conducted to satisfy an approval condition ordered by the Commission;

(b) the noise receptor(s) identified by the Commission, when the comprehensive sound level survey is conducted in response to a compliance audit by the Commission requiring the licensee to demonstrate its facility's compliance; or

(c) the complainant noise receptor or the nearest complainant noise receptor to the facility (if there are multiple complainants), when the comprehensive sound level survey is conducted in response to a noise complaint;

(i) in cases where a complainant resides more than 1.5 km from a facility and there are no dwellings within 1.5 km of the facility, at the most affected location along a 1.5 km radius from the facility property boundary.

(2) In circumstances where an approval was based on modelling of other nearby noise sources and those nearby noise sources have not been constructed before completion of the post-construction noise survey, the licensee must provide:

(a) measured comprehensive sound levels from the post-construction noise survey, and

(b) total sound levels which are the sum of the measured comprehensive sound levels from the post-construction noise survey and the predicted results for any approved but not constructed facilities considered in the original application.

(3) The data under Section 4.6.1(2)(a) is used to demonstrate compliance of the current operating facility(ies) and the data under Section 4.6.1(2)(b) is used for information purposes (in future investigation).

(4) When determining the comprehensive sound level for monitoring related to a condition in an approval for a wind turbine project, the following constitute representative conditions:

(a) Wind turbines with dominant noise contribution consist of the turbine with maximum predicted noise contribution and nearby turbines for which the predicted noise contribution is within 3 dB of the turbine with maximum noise contribution.

(b) Operation of wind turbines with dominant noise contribution at a sound power level no more than 1 dB below the planned maximum sound power level, as documented in the noise impact assessment.

(c) Downwind conditions from the wind turbines with dominant noise contribution towards the noise receptor(s).

(d) If the signal-to-noise ratio is weak, compliance with the permissible sound level may be demonstrated by determining the sound power level of the dominant wind turbines for the maximum approved operating conditions according to standard International Electrotechnical Commission (IEC 61400-11), combined with noise modelling techniques and standards as described in this rule. Other generally accepted acoustic methods may be used as well.

(e) Noise level measurement conducted at wind speeds higher than five m/s should have consideration for wind induced noise. The validity of noise data during such high wind conditions must be justified by using specially designed wind screens or other industry-accepted methods. The Commission may request supporting documentation.

(5) In a post-construction non-compliance situation, the licensee may be required to reduce the wind turbine noise emitted from the turbine. The operator must indicate how the mitigation plan would result in compliance with the permissible sound level.

4.6.2 Noise measurement specifications for comprehensive sound level surveys for wind power projects

(1) The specifications for conducting comprehensive sound level surveys for wind power projects are provided in Table 5.

Table 5 Noise measurement specifications for comprehensive sound level surveys for wind power projects

#	Description	Specifications
1	Measurement intervals	• Ambient wind sound level 10 minutes • Noise impact 1 to 10 minutes
2	Measurement parameters	• Ambient wind sound level L_{90} • Noise impact L_{eq}
3	Frequency weighting	• A-weighted • C-weighted
4	Frequency content	• Octave band centre frequency • 1/3 octave band for tonality analysis
5	Audio recording	• For identification of abnormal noise event during unattended noise monitoring period
6	Microphone placement	• At least 15 m from a facade or other reflecting surface
7	Microphone height	• 1.5 m above ground • If applicable, 4.5 m above ground in complaint situation (e.g., nighttime complaint with second-storey bedroom)
8	Minimum monitoring duration	• Ambient wind sound level survey: sufficient valid samples in each wind bin so the duration of valid data for each nighttime/daytime period to be combined is no less than 30 minutes and the difference in average sound levels from individual nighttime periods or daytime periods is no greater than plus or minus three dBA.

#	Description	Specifications
		• Comprehensive sound level survey: at least 24-hour duration with a minimum of three cumulative hours of valid data in the daytime and three cumulative hours in the nighttime period after isolation analysis.

(2) Information requirements for comprehensive sound level surveys for wind power projects are listed in Table 6.

Table 6 Information requirements for comprehensive sound level surveys for wind power projects

#	Information requirements
1	Description of sound level meter and other associated equipment
2	Location of the sound level meter including microphone height
3	Description of the anemometry equipment
4	Location of the anemometry equipment including height of wind speed measurement
5	Field equipment calibration records
6	Number of noise measurement data points used in the determination of daytime or nighttime comprehensive sound level
7	Graphs showing measured sound levels and any isolated portion of the measurement data
8	Tabulated record of the time, duration, and description of abnormal noise events isolated
9	Make and model of wind turbine(s)
10	Number of operational wind turbines during the measurement period
11	Power output of each wind turbine during the measurement period
12	Date, time and duration of monitoring period
13	Averaging sample period for noise and wind measurements
14	Wind shear conditions at site, if any
15	Atmospheric conditions (wind speed and direction at the wind turbine location and the monitoring location, precipitation record)
16	Map showing all wind turbines, the noise monitoring location(s), all energy-related facilities, dwellings and any heavily travelled roads, railroads or airports that affect ambient noise levels
17	Acoustical practitioner's information

4.6.3 Measurements required for a Class C2 adjustment

(1) An application for a Class C2 adjustment requires, for each noise receptor (or group of acoustically comparable noise receptors), the measurement of the available wind noise masking for each wind speed of at least 3 m/s, and at the height relevant for that noise receptor, for the nighttime period.

(2) Noise measurements and the simultaneous measurement of meteorological parameters should be executed in 10-minute intervals, with each 10-minute interval resulting in one sound sample and one simultaneously recorded meteorological sample. To account for lulls in wind speed in each 10-minute interval with the associated decrease in available wind noise masking, the acoustical parameter to be established in each 10-minute interval is L_{90} in dBA. The meteorological parameter to be established simultaneously in the same 10-minute interval is the average wind speed in m/s.

(3) The 10-minute sound and meteorological samples will be grouped in wind bins for wind speeds for each noise receptor, with each wind bin representing the average wind speed (± 0.5 m/s). The wind speed bin for an average wind speed of three m/s will thus contain samples for wind speeds ranging from 2.5 m/s up to and including 3.4 m/s. Each bin will contain sufficient samples so that the duration of valid data for each nighttime/daytime period to be combined is no less than 30 minutes and the difference in average sound levels from individual nighttime periods or daytime periods is no greater than plus or minus three dBA. For each bin, the arithmetic average value over the L_{90} values in that bin will be considered to be the representative value.

4.7 Measurement equipment

4.7.1 Sound level meters

(1) Instrumentation used to conduct sound monitoring surveys must be able to measure the A-weighted (dBA) and/or C-weighted (dBC) continuous energy equivalent sound level (L_{eq}) of steady, intermittent, and fluctuating sounds. If used for a survey that includes measurements to determine the ambient wind sound level, the sound monitoring instrumentation must be able to determine statistical parameters L_n, such as L_{90}. It must be able to accumulate the data and calculate the L_{eq} and L_{90} values over the time required and must meet the minimum technical specifications in the IEC 61672 standard or American National Standards Institute (ANSI) S1.4 standard (latest version), for Class 1 sound level meters.

(2) The sound measurement instrumentation necessary to conduct the one-third octave band sound pressure level measurements to characterize the presence of tonal components must meet the minimum technical specification in IEC 61260 standard or ANSI publication S1.11 standard for Class 1 filter sets used in conjunction with conventional sound level meters that meet the minimum technical specifications in IEC publication 61672 standard or ANSI S1.4 standard for Class 1 sound level meters.

4.7.2 Sound level meter calibration requirements

(1) In this section and Section 4.7.4, manufacturer certificate means a certificate indicating the equipment, identified by a serial number, has passed all production tests in a certified facility and that the final tests have been performed using calibrated equipment.

(2) The sound level meters used for noise measurements made under this rule must:

(a) Be field calibrated, or have their calibration tested using a Class 1 calibrator, immediately prior to the measurement using a sound calibrator meeting the requirements of EN/IEC 60942 (latest revision) Class LS, and ANSI S1.40-2006 (latest revision) for Class 1 calibrators.

(b) Have their calibration checked immediately after the measurement using the same calibrator and a record of calibration results must be included in the report.

(c) Be calibrated by the instrument manufacturer, an authorized instrument calibration facility, or another agency acceptable to the Commission within a two-year period immediately preceding the measurements. Records of calibration must be maintained, although formal calibration certificates are not necessary. Meters which fail a pre-use or post-use calibration test (e.g., the meter does not read within plus or minus one dB) must not be used until re-calibrated for accuracy, applicability and the cause of deviation has been removed. Data collected from noise meters that fail a pre-use or post-use field calibration test (e.g., the meter does read within plus or minus one dB) must not be used.

(3) The sound level meter may be used for a two-year period dated from the manufacturer certificate prior to requiring recalibration. The manufacturer certificate must be kept on record, the same as a certificate of calibration. If the sound level meter does not come with a manufacturer certificate as described above, an initial certificate of calibration for the sound level meter is required prior to use.

4.7.3 Instrumentation for wind measurement

The instrumentation settings or specifications for wind measurement are provided in Table 7.

Table 7 Wind measurement instrumentation settings and specifications

#	Description	Setting/specifications
1	Anemometer resolution	0.1 m/s (maximum)
2	Anemometer precision	+/- 0.2 m/s (maximum)
3	Anemometer location	In the direction of the nearest noise sources and within 100 m of the sound level meter with no obstruction in between the anemometer and sound level meter
4	Anemometer height	Same as the microphone of sound level meter
5	Sampling period	10 minutes (maximum)

Note: Allowance for a variance of the location or height specification may be considered. The variance must be documented and justified by the acoustical practitioner in the report.

4.7.4 Calibrator certification requirements

(1) Calibrators must be recertified in accordance with ANSI publication SI.40-1984 (or latest revision), which requires that a calibrator be recalibrated at least once a year. The calibrator may be used for a one-year period dated from the manufacturer certificate prior to requiring recalibration.

(2) The manufacturer certificate must be kept on record, the same as a certificate of calibration. If the calibrator does not come with a manufacturer certificate as described above, an initial certificate of calibration for the calibrator is required prior to use.

4.8 Measurement conditions

4.8.1 Sound level

(1) In the noise impact assessment, if the facility was modelled to operate with doors and windows closed; then this is a condition of operation to ensure that the permissible sound level is met.

(2) If wind turbines are modelled in an operating mode or setting that restricts the sound power level, as documented in the noise impact assessment that was submitted to the Commission as part of an application, then this is the condition to be measured to ensure that the permissible sound level is met and the turbines must operate with their settings restricted as documented in the noise impact assessment.

(3) Representative conditions do not constitute absolute worst-case conditions, or the exact conditions the complainant has identified if those conditions are not easily duplicated. In order to expedite complaint resolution, comprehensive sound level surveys should be conducted at the earliest opportunity when sound propagation towards the complainant's dwelling is likely and representative conditions might exist.

(4) When the measured comprehensive sound level exceeds the permissible sound level, but noise from the facility is not considered to be responsible for the exceedance, isolation analysis to further separate the facility noise contribution may be carried out (see Section 4.3).

(5) Invalid data (except in the case of wind turbine noise monitoring) may result if wind speeds are greater than those shown in Table 8. Wind gradients can greatly affect the sound levels measured. Table 8 is less applicable in situations where hills exist between the facility and the measurement location. Judgment must be used in determining the applicability of the table; short-term wind gusts less than five minutes in duration and up to 20 km/h may be acceptable.

(6) The limits for wind speed and precipitation apply in the vicinity of the measurement, not at a remote sensing position many kilometres away. While data from a nearby meteorological station may serve as an indicator, that data does not guarantee that the same conditions exist at the measurement position.

(7) Table 8 describes favourable summertime weather conditions. The requirements in Table 8 regarding wind speed do not apply for wind turbines. Higher wind speeds during sound level surveys for wind turbines are acceptable, provided measures (e.g., a large diameter windscreen or a second windscreen) have been taken to prevent wind induced noise in the microphone.

Table 8 Favourable summertime weather conditions

Parameter	Preferred condition
Ground cover	No snow, water, or ice (frozen) ground cover
Precipitation	No steady precipitation
Wind speed measured at a height between 1.2 m and 10 m	Wind speed limits (noise data may be invalid if limits are exceeded): **Less than 500 m from noise source:** Downwind: 15 km/h limit **500 – 1,000 m from noise source:** Downwind: 10 km/h limit **Greater than 1,000 m from noise source:** Downwind: 10 km/h limit
Minimum monitoring duration	A 24-hour noise sampling period: unless exceptional circumstances are encountered, there must be at least three cumulative hours of valid data (after isolation analysis) in the nighttime sampling period (10 p.m. to 7 a.m.) and three cumulative hours in the daytime sampling period (7 a.m. to 10 p.m.) If exceptional circumstances are encountered, the licensee must provide details of such circumstances and the reasons that these circumstances justify the use of a lesser amount of valid data, or the use of data during upwind or cross-wind directions.

4.8.2 Wind measurement for wind turbine projects

(1) Wind measurement data recorded during noise monitoring is used to verify representative conditions and to:

- define the wind speed and direction in the vicinity of the sound level meter
- identify wind-induced noise contamination on the microphone
- define wind speed and direction at the operating wind turbine hub height
- determine if downwind conditions are being measured
- identify wind shear conditions

(2) Wind speed and direction information is required at two locations during the survey period. One location is at the wind turbine hub height (either the closest turbine upwind from the sound level meter, or at a meteorological tower present within the project) and the other location is in the vicinity of the sound level meter at the monitoring location. This information must be documented.

4.8.3 Measurement techniques

References for sound measurement techniques are listed in Appendix 7.

5 Noise complaint

Section 5 sets out the process for investigating noise complaints.

5.1 General

(1) If a noise complaint is filed by a resident of a dwelling near the facility after the facility is in operation, the licensee must meet the permissible sound level as determined in accordance with Section 2. This section does not apply where the resident is the person who constructed a dwelling under the circumstances set out in sections 2.3 and 2.4.

(2) When a noise complaint is filed with the Commission, the Commission may require the licensee to conduct a comprehensive sound level survey to determine compliance with this rule.

(3) If a facility is found to be non-compliant, the licensee must provide both a detailed noise control mitigation plan and a timeline as to when compliance will be met.

(4) If the Commission determines that the facility is compliant with this rule at the complainant noise receptor(s), the Commission investigation related to the noise complaint is complete.

(5) If conditions at the facility change, a new complaint may be filed.

5.2 Investigation

(1) When a noise complaint has been filed, licensees must first attempt to resolve the issue through direct contact by way of telephone calls or meetings with the complainant(s) to understand the concerns and establish a dialogue. Licensees must document telephone calls made or meetings held.

(2) Licensees must make every reasonable attempt to resolve any noise complaint in a timely manner. A formal noise complaint should only be filed with the Commission in cases where the complainant and the licensee are unable to resolve the complaint between themselves.

(3) Noise complaint investigation forms (see Appendix 4) must be completed whenever there is a noise complaint, regardless of whether a comprehensive sound level survey is ultimately required to address the complaint.

(4) If the licensee and complainant are able to resolve the complaint between themselves, the noise complaint investigation forms are not required to be submitted; but the licensee must keep all information relating to the complaint including the noise complaint investigation forms.

(5) If the licensee and complainant are unable to resolve the complaint and a formal noise complaint is filed with the Commission, the licensee is required to submit both the noise complaint investigation forms along with any other communication documents for the complaint.

5.3 Investigation form

(1) In the noise complaint investigation form (to be completed by licensee), the licensee must enter information from the complainant(s) about the character of the noise and the weather and ground cover conditions that exist when the noise is most annoying. These and the facility operating conditions (as entered on the form

in Appendix 4) are the representative conditions of the noise complaint when the comprehensive sound level survey should take place.

(2) The noise complaint investigation form event log (to be completed by complainant), is for use by the complainant(s) to record details about environmental and facility operating conditions under which noise adversely affects them. If the complainant(s) does not complete the noise complaint investigation form event log, the licensee must describe efforts to involve the complainant, use its judgment to approximate representative conditions, and explain how those conditions were determined.

(3) A licensee must provide a copy of the completed noise complaint investigation forms to the complainant(s) and include a copy in the comprehensive sound level report to demonstrate that the representative conditions were met.

(4) The completed noise complaint investigation form is used to determine conditions representative of the complaint. If this completed form is not available, Table 8 outlines the favourable summertime weather conditions for noise monitoring.

Appendix 1 – Glossary

Some of the terms used in this rule are defined for this particular context; these definitions are not necessarily the same as the generally accepted broader definitions of the terms.

Abnormal noise events	Noises that are sufficiently infrequent as to be uncharacteristic of an area or that occur so close to the microphone as to dominate the measurements in an unrealistic manner. Consideration must be given to deleting occurrences of abnormal noise from the measurements to obtain a reasonably accurate representation of the sound environment. Examples of abnormal noises include a dog barking close to the microphone, a vehicle passing nearby, people talking in the vicinity of the microphone in a quiet environment, or a passing road grader.
Acoustical practitioner	An acoustical practitioner is an individual with acoustical expertise and knowledge capable of preparing assessments, surveys and reports in accordance with this rule.
Ambient sound level (ASL)	The sound level that is a composite of different airborne sounds from many sources far away from and near the point of measurement. The ambient sound level does not include noise from any energy related facilities or from wind and must be determined without it.
Ambient wind sound level	The ambient sound level L_{90} in dBA near the noise receptor, caused by the sound of the wind through vegetation and around structures such as dwellings in excess of the ambient sound level L_{eq}. The ambient wind sound level is measured in 10-minute intervals. The ambient wind sound level is wind speed dependent.
Approved facility	A facility that has been approved by the Commission, or another regulatory agency, but is not yet constructed.
A-weighted sound level	The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear at levels typical of rural backgrounds in mid frequencies. See Figure 2 below.

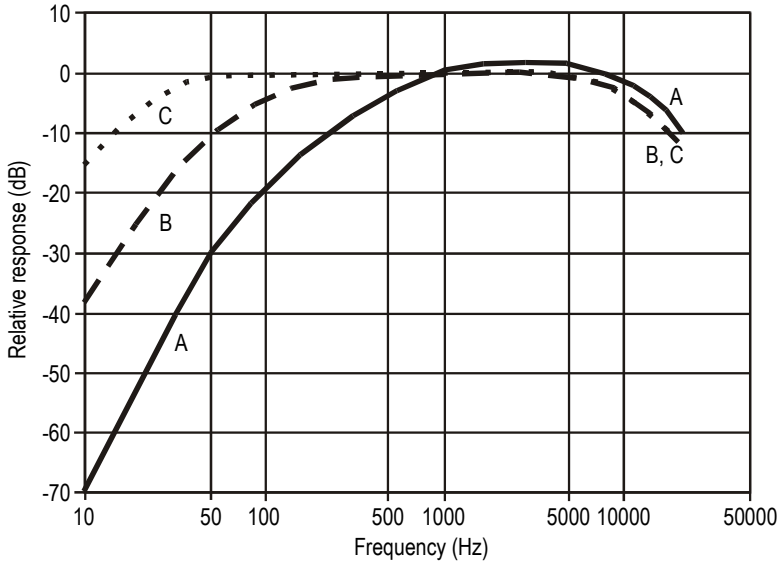


Figure 2 - Weighting network curves

Bands (octave, one-third octave)	A series of electronic filters separate sound into discrete frequency bands, making it possible to know how sound energy is distributed as a function of frequency. Each octave band has a centre frequency that is double the centre frequency of the octave band preceding it. The one-third octave band analysis provides a finer breakdown of sound distribution as a function of frequency.
Baseline sound level	Baseline sound level includes: • ambient sound level, • noise contribution from existing energy-related facilities, • predicted noise contribution from approved energy-related facilities that have not yet been constructed, and • predicted noise contribution from facilities proposed in an application to the AUC that the AUC has deemed complete under Rule 007. The baseline sound level must include instances of the facility types listed above that are located close enough to the applicant's proposed facility to potentially influence sound levels at affected noise receptors.
Basic sound level (BSL)	The nighttime A-weighted L_{eq} sound level commonly observed to occur in the designated land-use categories and is set out in Table 1.
Calibration	The procedure used for the adjustment of a sound level meter using a reference source of a known sound pressure level and frequency. Field calibration must take place before and after the sound level measurements.
Category	A classification of a dwelling in relation to transportation routes used to arrive at a basic sound level, using Table 1 in this rule.
Category 1	Dwelling(s) distance is more than or equal to 500 m from heavily travelled roads or rail lines and not subject to frequent aircraft flyovers.

Category 2	Dwelling(s) distance is more than or equal to 30 m, but less than 500 m from heavily travelled roads or rail lines and not subject to frequent aircraft flyovers.
Category 3	Dwelling(s) distance is less than 30 m from heavily travelled roads or rail lines or subject to frequent aircraft flyovers.
Class A adjustment	Consists of the sum of adjustments that account for the seasonal nature of the noise source (A1 cannot be used for design purposes) and the actual ambient sound level in an area (A2). A Class A2 adjustment is added to the basic sound level to arrive at the permissible sound level and cannot exceed +/- 10 dBA.
Class B adjustment	An adjustment applied for temporary noise generating activities which are activities lasting 60 or fewer days and not expected to occur more than once in any 12-month period. The adjustment recognizes that additional noise can be tolerated if it is known that the duration will be limited.
Class C adjustment	An adjustment to the permissible sound level for a wind turbine project to account for the masking of the noise from wind turbines by the sound of the wind through vegetation and around structures, when the wind reaches a wind speed $WS_{10,avg}$ of three m/s or greater near the noise receptor to which the Class C adjustment pertains.
Comprehensive sound level	The comprehensive sound level includes the ambient sound level, and noise contribution from existing energy-related facilities. The comprehensive sound level should be collected under representative conditions and should exclude abnormal noise events.
Cumulative sound level	The cumulative sound level includes: • ambient sound level • noise contribution from existing energy-related facilities • predicted noise contribution from approved energy--related facilities that have not yet been constructed • predicted noise from facilities proposed in an application to the AUC that the AUC has deemed complete under Rule 007 • predicted noise contribution from the applicant's proposed facility The cumulative sound level must include facilities listed above that are located close enough to the applicant's proposed facility to potentially influence sound levels at affected noise receptors.
C-weighted sound level	The C-weighting approximates the sensitivity of human hearing at industrial noise levels (above about 85 dBA). The C-weighted sound level (e.g., measured with the C-weighting) is more sensitive to sounds at low frequencies than the A-weighted sound level and is sometimes used to assess the low-frequency content of complex sound environments.
Daytime	Defined as the hours from 7 a.m. to 10 p.m.

Daytime adjustment	An adjustment that allows a 10 dBA increase because daytime ambient sound levels are generally about 10 dBA higher than nighttime values.
dB (decibel)	A unit of measure of sound pressure that compresses a large range of numbers into a more meaningful scale. Hearing tests indicate that the lowest audible pressure is about 2 x 10^{-5} Pa (0 dB), while the sensation of pain is about 2 x 10^{2} Pa (140 dB). Generally, an increase of 10 dB is perceived as twice as loud. The decibel is a linear weighting and can also be used when referring to differences in weightings. $Sound\ pressure\ level\ (dB) = 10 \log\left(\frac{p^2}{p_o^2}\right)$ $= 20 \log\left(\frac{p}{p_o}\right)$ p = root-mean-square sound pressure (Pa) p_o = reference root-mean-square-sound pressure, generally 2 x 10^{-5} Pa
dBA	The decibel (dB) sound pressure level filtered through the A filtering network that approximates human hearing response at low intensities. Also see dB and A-weighted sound level.
Deemed complete	As defined in Rule 007, the Commission will issue an application complete letter in a proceeding when it has deemed an application to be complete.
Deferred facility	Energy-related facilities constructed and in operation prior to October 1988. Effective October 17, 2018, the deferred status provision for facilities built and in operation prior to 1988 expired.
Density per quarter section	Refers to a quarter section with the affected dwelling at the centre (a 451-metre radius). For quarter sections with various land uses or with mixed densities, the density chosen must be factored for the area under consideration on a prorated basis.
Downwind	The wind direction from the noise source towards the noise receptor (± 45 degrees), measured at either noise receptor height or source height. The 45 degrees requirement is consistent with the definition for downwind conditions, as included in ISO 9613-1996, Attenuation of Sound During Propagation Outdoors – Part 2: general method of calculation, amongst others.
Dwelling	Any permanently or seasonally occupied structure used for habitation for the purpose of human rest; including a nursing home or hospital with the exception of an employee or worker residence, dormitory, or construction camp located within an energy-related industrial plant boundary. Trailer parks and campgrounds may qualify as a dwelling if it can be demonstrated that they are in regular and consistent use.

	A permanent dwelling is a fixed residence occupied on a full-time basis. In the case of a condominium or apartment complex, each unit is considered a dwelling. A seasonally occupied dwelling is a fixed residence that, while not being occupied on a full-time basis, is occupied on a regular basis. A regular basis does not imply a scheduled occupancy but implies use of six weeks per year or more. The dwelling must not be mobile and should have some sort of foundation or features of permanence (e.g., electrical power, domestic water supply, septic system) associated with it. Summer cottages or manufactured homes are examples of seasonally-occupied dwellings, while a holiday trailer simply pulled onto a site is not. The most affected dwelling(s) are those subject to the highest average weighted sound level relative to the permissible sound level. The nearest dwelling may not necessarily be the one most affected by noise because of factors such as topography or man-made features. For example, the nearest dwelling to a facility may be behind an intervening ridge, while a more distant dwelling may be in direct line of sight of the facility and experience louder noise.
Emergency	An unplanned event requiring immediate action to prevent loss of life or property. Events occurring more than four times a year are not considered unplanned.
Energy equivalent sound level (L_{eq})	The L_{eq} is the average weighted sound level over a specified period of time. It is a single-number representation of the cumulative acoustical energy measured over a time interval. The time interval used should be specified in brackets following the L_{eq}—e.g., L_{eq} (9 hours) is a nine-hour L_{eq}. If a sound level is constant over the measurement period, the L_{eq} will equal the constant sound level. If the sound level shows a variety of constant levels for different intervals, then f_i is the fraction of time the constant level L_i, is present. $L_{eq} = 10 \log\left(\sum_{i=1}^{n} f_i \times 10^{L_i/10}\right)$ See Appendix 2 for more detail on the L_{eq} concept.
Energy-related facility	A facility under the jurisdiction of the Commission or other regulatory agency, used for energy generation, and resource extraction. These include mining, extraction, processing and transportation (except by road or rail line) as well as federally regulated electrical transmission lines and pipelines.
Existing facility	A facility that has been approved by the Commission, or other regulatory agency, for which construction is complete and operations have commenced.
Facility	Facility means a gas utility pipeline, hydro development, power plant, substation or transmission line.

Facility property	The facility property is used to establish the 1.5 km compliance distance from a facility. The boundary of the facility property is defined by the legal interest in the land (e.g., property line, right-of-way, easement or lease), and from the centre point of the tower for wind turbines. Lands optioned for future developments may not be used to define the boundary. The 1.5 km compliance distance from a wind power project should be defined from the centre point of the project's wind turbines or substation boundary.
Fast response	A standardized detector response on a sound level meter. Fast response has a time constant of 1/8 second (125 milliseconds) and is used to assess the ambient wind sound level L_{90}.
Far field	The far field is that area far enough away from the noise source that the noise emissions can be treated as if they come from a single point or line source and the individual components of the noise source are not apparent as separate sources. More specifically, the far field is the region far enough away from the source where the inverse-square law (six dBA loss per doubling of distance for a point source) applies. This is typically at a distance of at least three to five times the largest dimension of the noise source amongst length, width, height or diameter.
Filter	A device separating the components of an incoming noise by its frequencies.
Frequent aircraft flyovers	A location that has a minimum of nine aircraft takeoffs or landings over the nighttime period. A noise receptor must be within five km of the airport to qualify for the BSL adjustment in the assessment of categories as part of a site-specific analysis for noise receptors that lie within a noise exposure forecast contour area with a noise exposure forecast 25 or greater, as designated by Transport Canada. In the absence of any noise exposure forecast contours for a local airport, Transport Canada can be contacted for current air traffic statistics. Also see Noise exposure forecast.
Heavily travelled road	Includes highways and any other road where 90 or more vehicles travel during the nine-hour nighttime period consistently for any one-month period in a year. The following methods to validate the travel volume are acceptable: • traffic count by attended technician for the entire nighttime period with the dates documented • traffic count by audio recording during the sound monitoring period with the dates documented • hourly traffic volume data from Alberta Transportation or other municipalities • Alberta Transportation's Average Annual Summer Daily Traffic (ASDT) value • if the ASDT is not available, the Alberta Transportation's Average Annual Daily Traffic (AADT) value can be used

	The above definition places the traffic count methods in descending order of accuracy and the Commission gives priority to the most accurate traffic data. In the case of using the ASDT or AADT, 10 per cent of the daily traffic volume can be assumed to be the nighttime period traffic.
Isolation analysis techniques	Analytical techniques used to screen extraneous sound measurement data to determine the sound level that is representative of the sound source(s) and acoustic conditions at the location of interest.
L_{eq}	See Energy equivalent sound level.
L_n	A generic notation for the sound level that is exceeded *n*% of the time, e.g., L_{90}, L_{50} or L_{10}.
L_{90}	The sound level that is exceeded 90 per cent of the time. The L_{90} must be measured in the setting "fast" on the sound level meter and is expressed in dBA. This parameter is used to assess the ambient wind sound level in 10-minute intervals, to account for lulls in wind speed and will thus represent the quietest 10 per cent of the time in a 10-minute interval.
Linear weighting (or Z-weighting)	The sound level measured without any adjustment for the sensitivity of human hearing. It is a direct measure in decibels of the variation in air pressure and is often referred to as the "sound pressure level." This level is sometimes called the "linear weighted level" or "the unweighted level," as it includes no frequency weighting beyond the tolerances and limits of the sound level meter being used for the measurements.
Low frequency noise	Where a clear tone is present at or below 250 Hz and the difference between the overall C-weighted sound level (dBC) and the overall A-weighted sound level (dBA) exceeds 20 dB.
Manufacturer's certificate	A certificate issued by the manufacturer indicating that the instrument has passed tests performed in an ISO 9001: 2008 certified facility.
Major facility amendment	Any facility amendment (i.e., revision of project design or location) that could increase the noise contribution from the facility at noise receptors located within 1.5 km of the proposed facility boundary.
Minor facility amendment	Any facility-amendment that will not increase the noise contribution from the facility at noise receptors located within 1.5 km of the proposed facility boundary.
Near field	The region close to the source where the inverse-square law (six dBA loss per doubling of distance for a point source) does not apply. Usually, this region is closer than three to five times the largest dimension of the noise source amongst length, width, height or diameter.

New dwelling	A dwelling that is built after the Commission issues an approval or permit and licence for a proposed facility (i.e., a circumstance in which the noise impact assessment for the proposed facility does not present modelled cumulative sound levels at the new dwelling).
Nighttime	Defined as the hours from 10 p.m. to 7 a.m.
Noise	The unwanted portion of sound.
Noise receptor	A noise receptor is any dwelling located within 1.5 km of the facility property boundary. If there are no dwellings within 1.5 km of the facility property boundary, a noise receptor is any point at 1.5 km from the facility property boundary that is reasonably suitable for habitation. For wind power projects, a noise receptor is any dwelling located within 1.5 km of the centre point of the tower of a wind turbine or within 1.5 km of the substation boundary. If there are no dwellings within 1.5 km of a wind turbine or substation, a noise receptor is any point at 1.5 km from the centre point of the tower of a wind turbine or the substation boundary that is reasonably suitable for habitation. Notwithstanding the above, the Commission retains the discretion to consider noise compliance at continuous and persistent ceremonial and/or cultural sites that are significant to an Indigenous group and that are within 1.5 km of the project property boundary.
Noise exposure forecast	The noise exposure forecast contours are site specific to each airport and take into account such factors as traffic levels, proximity to runways, flight paths, and aircraft type and size.
Noise impact assessment (NIA)	A noise impact assessment predicts the expected sound level emanating from a facility as measured 15 m from the most affected noise receptor(s). It also identifies what the permissible sound level is and how it was calculated. This rule requires that a noise impact assessment predict compliance for a facility by comparing cumulative sound levels with permissible sound levels applicable at affected noise receptors.
Permissible sound level (PSL)	The maximum daytime or nighttime sound level as set out in Table 1 at a point 15 m from the noise receptor(s) in the direction of the facility. The permissible sound level is the sum of the basic sound level, daytime adjustment, Class A adjustments and Class B adjustments or Class C adjustments.
Pristine area	A natural area that might have a dwelling but no industrial presence, including energy, agricultural, forestry, manufacturing, recreational or other industries that affect the noise environment.
Proposed facility	A facility for which an application has been submitted to the Commission or another regulatory agency, but is not yet approved.
Rail lines	Includes any rail line where there is a minimum of one train passage during every nighttime period consisting of 25 cars.

Representative conditions	For ambient sound levels, these are conditions that portray the typical activities for an area, do not include an unusually quiet or noisy time, and exclude any non-frequent occurrence that takes place less than 10 per cent of the time during a particular season.
Signal to noise ratio	Signal to noise ratio (SNR) is the ratio of the sound level generated by the source of interest to the sound level generated by other sources. A weak signal to noise ratio will depend on many conditions, but as a rule of thumb, if the signal from the source of interest is less than 3 dB louder than the combined other sources, the SNR can be considered weak.
Slow response	A standardized detector response on a sound level meter that dampens the movement of displays so that rapidly fluctuating sound levels may be read. Slow response has a time constant of one second.
Sound level meter	An instrument designed and calibrated to respond to sound and to give objective, reproducible measurements of sound pressure level. Its frequency response and averaging times may be adjusted to simulate the response of the human ear.
Sound monitoring survey	The measurement and recording of sound levels and pertinent related information over a given time period.
Sound power level	The decibel equivalent of the rate of energy emitted in the form of sound. The sound power level is given by: $Sound\ Power\ Level = 10 \log\left(\frac{sound\ as\ power\ (watts)}{W_o}\right)$ By international agreement, W_0 = 10^{-12} watts (W) The sound power level is an inherent property of a sound source.
Sound pressure level	The decibel equivalent of the pressure of sound waves at a specific location, which is measured with a sound level meter. The sound pressure level depends on the noise sources, as well as the location and environment of the measurement path.
Spectrum	A wide range or sequence of frequencies. Octave band center frequency 31.5 Hz to 8,000 Hz. One-third octave band frequency 16 Hz to 250 Hz.
Summertime conditions	Ground cover and temperatures that do not meet the definition for wintertime conditions. These can occur at any time of the year.
Tonal components	For the one-third octave frequency bands between 20 and 250 Hz, the following criteria must be fulfilled to verify a tonal component: • the linear sound level of one band must be at least 10 dB or more above one of the adjacent bands within two one-third octave bandwidths, and

	• there must be at least a five dB drop within two bandwidths on the opposite side of the frequency band exhibiting the high sound level.
Temperature inversions or lapse conditions	Temperature inversions or lapse conditions occur when temperatures in the atmosphere (usually measured at a height of 10 metres) are one degree Celsius or more above the temperatures at ground level (usually measured at a height of two metres).
The most affected noise receptor	The noise receptor subject to the highest cumulative sound level relative to the permissible sound level.
Valid sound sample	An individual sample of measurement data, which is representative of the noise source(s) and conditions of interest and meets the requirements of this rule. Isolation analysis may be performed to determine if a sample is valid or not. Rejected (not valid) samples must be listed, together with the reason for their rejection.
Wind bin (for wind speeds)	Wind bin or bin refers to the grouping of sound samples according to wind speed. For instance, all sound samples collected at wind speeds between 3.5 m/s and 4.4 m/s are grouped in the four m/s bin.
Wind noise masking	The masking of the sound from wind turbines due to the sound of the wind through vegetation and around structures near a noise receptor. Masking results in a decreased audibility of the wind turbines.
Wind speed	The speed of the wind, expressed in metres per second (m/s). For purposes of determining the amount of wind for wind noise masking, the speed of the wind is measured in and averaged over 10-minute intervals at the same height as the microphone, but not more than 10 metres above ground level and not more than 100 metres away from the noise receptor or group of noise receptors to which it applies, unless the Commission has granted permission to establish the wind speed at a different location and/or height. This wind speed is referred to in this rule as $WS_{avg,10min}$. To assure compliance with a Class C adjusted permissible sound level, the $WS_{avg,10\ min}$ is typically assessed as the average wind speed in the preceding 10 minutes.
Wind turbine	A machine for converting the kinetic energy in wind into mechanical energy, which is then converted into electricity.
Wintertime conditions	There is snow, ice, or frozen ground cover and temperatures are typically below minus 10 degrees Celsius.

Appendix 2 – Sound level descriptors

2.1 dB and dBA

The human ear is capable of hearing a large range of levels of sound pressure from 2 x 10^{-5} pascals (Pa) (just audible, 0 dB) to 2 x 10^{2} Pa (sensation of pain, 140 dB)—a difference of seven orders of magnitude. The decibel is a logarithmic scale and is used to compress the range of sound pressure levels into a more meaningful scale. The symbol used to represent the linear decibel scale is dB (Lin), or simply dB.

The subjective or perceived loudness of a sound is determined by several factors, including the fact that the human ear is not equally sensitive to all frequency ranges. The ear emphasizes middle frequency sounds. The A-weighted decibel scale approximates the way the human ear hears different frequencies and is represented by dB(A) or dBA (see Appendix 1 - Glossary for A-weighted sound level and Figure 2 - Weighting network curves).

Low frequency sounds (hum) are harder for the human ear to hear than higher frequency sounds (whine). This means a low frequency sound has a higher sound pressure level on the linear scale (dB) than a high frequency sound and is perceived to be equally loud to the ear. These two sounds have the same dBA rating on the A-weighting scale because they are perceived to be equally loud.

2.2 L_{eq} concept

This rule uses L_{eq} measurements, which represent energy-equivalent sound levels. The L_{eq} is the average weighted sound level over a specified period of time — a single-number representation of the cumulative acoustical energy measured over the interval. The time interval used should be specified in brackets following the L_{eq} (e.g., L_{eq} (nine hours) is a 9-hour L_{eq}). If a sound level is constant over the measurement period, the L_{eq} will equal the constant sound level. Figure 3 illustrates this concept.

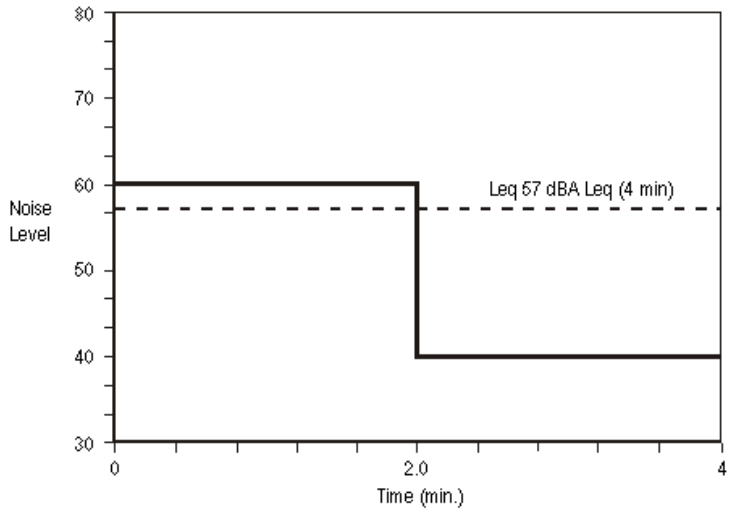


Figure 3 - Illustration of L_{eq} concept

In Figure 3, the equivalent energy during the four-minute period is not 50 dBA, as one might expect, but 57 dBA. This is due to the way in which sound energies are added, which is logarithmical rather than arithmetic. A quick look at the mathematics shows this:

$$L_{eq} = 10\log\left(\sum_{i=1}^{n} f_i \times 10^{L_i/10}\right)$$

$$= 10\log\left(\sum_{1}^{240} f_i \times 10^{L_i/10}\right)$$

$$= 10\log\left(\frac{120}{240}\times 10^{60/10} + \frac{120}{240}\times 10^{40/10}\right)$$

$$= 10\log\ (505\,000)$$

$$= 57\ dBA\ L_{eq}\ (4\,min)$$

where: f_i = fraction of total time the constant level L_i is present

L_i = sound level in dBA

In these calculations, we are adding numbers that are proportional to the corresponding sound energies. For example, the energy associated with the 60 dBA level is 100 times greater than the energy associated with the 40 dBA level (10^6 versus 10^4).

Another example of a L_{eq} calculation is useful in demonstrating how a loud noise event, such as a train passing by, can alter the L_{eq} value. Assume the sound level is measured for one hour. For 59 minutes, the sound level is 40 dBA (fairly quiet), and for one minute it is 90 dBA while a train passes:

$$L_{eq} = 10\log\ (f_1 \times 10^{L_1/10} + f_2 \times 10^{L_2/10})$$

$$= 10\log\left(\frac{59}{60}\times 10^{40/10} + \frac{1}{60}\times 10^{90/10}\right)$$

$$= 10\log\ (0.98\times 10^4 + 0.02\times 10^9)$$

$$= 73\ dBA\ L_{eq}\ (1\ hr)$$

This example demonstrates how loud noise events, such as trains passing, can dominate the L_{eq} values.

2.3 Sound power and sound pressure levels

A sound source radiates power, which results in a sound pressure. Sound power is a physical property of the source alone and is an important absolute parameter used for rating and comparing sound sources. Sound power levels for specific equipment may be obtained from the manufacturer or by modelling the source using near-field sound pressure level measurements.

Sound pressure levels can be calculated using sound power levels. For sound levels in a free field, the formula is:

$$L_{pressure} = L_{power} + 10 \log_{10} Q - 20 \log_{10} r - 10.8 - A_{NC} - A_{air} - A_{ground} - ....$$

Where r = distance in metres

Q = directivity factor of source, composed of inherent directivity of the source, Q_s, and the geometry of location, Q_g

A = attenuation from noise control, air absorption, ground effects, etc.

For simplicity, with an exposed source in a free field (e.g., the distance, r, is greater than five times the size of the source and there are no significant reflections of sound) where additional attenuation factors are to be neglected, this calculation can be done using A-weighted power and pressure levels. This gives a conservative estimate of the sound pressure level at a distance, but not necessarily the worst-case level that may occur under weather conditions favouring noise propagation in a given direction, which can be considered as a negative attenuation.

If any noise control measures are to be added to the source (such as a silencer or a building that will enclose the source) or if environmental conditions (such as the barrier effect of the topography) are to be included, the calculations must be done using octave or one-third octave frequency bands and the sound pressure levels added together and A-weighted afterwards. Noise controls and environmental effects are strongly frequency dependent, and a calculation using A-weighted data is not adequate.

The directivity factor, Q, can be thought of as the portion of a sphere into which the source radiates its sound energy. Some sources radiate uniformly in all directions, while others, notably fans, are very directional. For example, a fan in a vertical plane radiates most of the sound energy in a narrow beam to the front: ($Q_s \approx 5 - 8$).

The directionality of the source is also affected by the geometry of its immediate surroundings, largely due to the presence of reflecting surfaces. The directivity of the location may or may not be significant due to the inherent directivity of the source. How the directivity factors Q_s and Q_g combine depends on the layout of the equipment and its surroundings. Table 9 gives examples of values of Q for a variety of location geometries.

Table 9 Directivity factor Q values

Q	Radiation pattern	Examples
1	Spherical	Elevated sources, flares, aircraft
2	Hemispherical	Source near or on ground surface
4	¼-spherical	Source on ground beside taller building
8	1/8-spherical	In a corner of three surfaces

2.4 Addition of sound power or sound pressure levels

A similar formula to the one used in Section 2.2 of the Appendix 2, L_{eq} concept, can be used to add sound levels together both for the A-weighted levels and by the different frequency bands. This formula is useful for adding together sound power or sound pressure levels from different components of a facility, for example, to arrive at a composite sound level for the facility. See Example 2 in Appendix 6.

Sound pressure levels can be added together in this way only if they are measured or calculated for the same location.

Sound power levels can be added together, and the composite source can be thought of as being at the acoustic centre of the individual sources (similar to the concept of the centre of mass of an object).

The formula for the addition of sound levels is:

$$L_{total} = 10\log\left(10^{L_1/10} + 10^{L_2/10} + \cdots + 10^{L_n/10}\right)$$

where L_i = individual component sound levels (power or pressure).

Example calculation of addition of sound power levels

A facility will be constructed and the manufacturer stated that the A-weighted sound power levels (referred to as 10^{-12} watts, also written 1 picowatt, or 1 pW) for the different components are as follows:

Engine exhaust, with muffler 106 dBA

Aerial cooler (non-directional) 113 dBA

Piping noise 79 dBA

$$L_{power,total} = 10\log\left(10^{L_1/10} + 10^{L_2/10} + \cdots + 10^{L_n/10}\right) L_{power,total} = 10\log\left(10^{L_1/10} + 10^{L_2/10} + \cdots + 10^{L_n/10}\right)$$

$= 10 \times \log_{10}\left(10^{106/10} + 10^{113/10} + 10^{79/10}\right)$

$= 10 \times \log_{10}\left(10^{10.6} + 10^{11.3} + 10^{7.9}\right)$

$= 10 \times \log_{10}\left(2.394 \times 10^{11}\right)$

$= 10 \times 11.38$

$= 113.8$ dBA (ref 1 pW)

When adding sound pressure levels, these levels are only valid for the specific location. To add the sound pressure levels, they must all be calculated or measured at the same location.

2.5 Estimate of sound pressure levels for different distances

2.5.1 Point sources

This estimate assumes hemispherical spreading of the sound waves and equates to a six-dB loss per doubling of distance from the sound source. The calculation does not account for any attenuation (or loss) due to atmospheric or ground absorption.

This method of calculation can only be used in the following circumstances:

(1) Simplified or other informal calculations are only acceptable for a smaller stationary single source facility without any existing industrial infrastructure and with flat ground between the facility and a single dwelling at a close distance or in remote areas where there are no dwellings within 1.5 km of the facility property.

(2) An acceptable distance for applying the inverse square law depends on the sound source dimensions and the wavelength of the sound. The formula is usually safe to use as long as R_1 and R_2 are about five times the size of the source. Alternatively, a minimum distance of R_1=50 metres can be used as a rule of thumb.

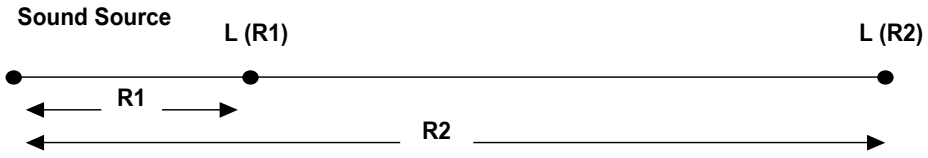
(3) The inverse square law (six-dB loss per doubling of distance) for sound dissipation over distance does not apply for near-field measurements. The near field is the area where the dimensions of the source are significant; it applies to sound pressure levels measured at distances less than about five times the size of the source object. The data supplied by manufacturers is often provided as sound pressure levels measured very close to the equipment (e.g., in the near field) and is intended for use under occupational hearing requirements rather than for environmental assessment. Note that such measurements are often conducted using conditions that may not reflect field or operational conditions. Therefore, this type of measurement cannot be used in the equation below. However, given additional information about the dimensions of the equipment and the conditions of the measurement, the sound power level of the equipment can be determined, and the equation from Appendix 2 – Section 2.3, Sound power and sound pressure levels, can be used instead.

In other circumstances, it may be advisable to contact an acoustical practitioner.

The basic equation is:

$$L(R_2) = L(R_1) - 20\log\left(\frac{R_2}{R_1}\right)$$

with R_1 = distance R_1 in metres
R_2 = distance R_2 in metres
L = sound level in dBA



Note that the second term in the equation is negative if R_2 is less than R_1, and $L(R_2)$ is higher than $L(R_1)$. Also, under certain source-receiver configurations, the loss per doubling of distance can be less than six dB.

Example: calculation of the sound level at a different distance

The sound level measured at 50 m from the source is 75 dBA. A dwelling is located 800 m away from the facility. What is the sound level calculated at the dwelling?

Measured L (50 m) = 75 dBA.

$$L(R_2) = L(R_1) - 20\log\left(\frac{R_2}{R_1}\right)$$

$$L(800\ m) = L(50\ m) - 20\log\left(\frac{800}{50}\right)$$

$$L(800\ m) = 75\ dBA - 20\log\left(\frac{800}{50}\right)$$

$$L(800\ m) = 75\ dBA - 24\ dBA$$

$$L(800\ m) = 51\ dBA$$

So the sound level contribution due to the facility is 51 dBA at 800 m.

Alternative method of determining the sound level at a different distance — the simple table approach

A simplified way to estimate the sound level is to use the rule of six dB lost per doubling of distance. With this method, subtract six dB each time the distance from the noise source is doubled.

If the measured sound level is 75 dBA at 50 m from the source:

Distance (m)	Sound level (dBA)
50	75
100	69
200	63
400	57
800	51
1600	45

This method results in 51 dBA at 800 m. This result matches the calculation above. The simple table method only estimates sound values at discrete distance points. If sound values between the distance points are required, use the formula calculation method.

2.5.2 Line sources

Where a long, narrow source radiates noise, the radiation pattern is that of a cylinder, not a sphere. Examples include pipes, conveyor belts, and transportation corridors, such as roads. Calculations using the spherical spreading of sound from point-like sources would involve a final step of integration over the length of the sound. It is more convenient to treat the sound as a line radiating into a cylinder. The pressure level at distance R is considered below if the length, L, of the line source is limited, once the distance, R, exceeds three to five times the length, the source can be considered as a point source, and the equations in Appendix 2 – Section 2.3 and Appendix 2 – Section 2.5.1 can be used.

For a line source, the sound spread equates to a three-dB loss per doubling of distance. Similar conditions apply for the line source equation as for the point source equation. The formula for noise levels at different distances from a line source is as follows:

$$L(R_2) = L(R_1) - 10\log\left(\frac{R_2}{R_1}\right)$$

with R_1 = distance R_1, in metres

R_2 = distance R_2, in metres, and

L = sound level in dB (for octave bands) or dBA

Note that if $R_2 < R_1$, the second term in the equation is negative, and $L(R_2)$ is higher than $L(R_1)$.

Appendix 3 – Noise impact assessment summary form

(Please retain detailed records for compliance purposes)

Licensee: _____

Facility name: _____ Type: _____

Legal location: _____

Contact: _____ Telephone: _____

1. Permissible Sound Level (PSL) determination (Rule 012, Section 2)

Complete the following for the most affected noise receptor(s):

Noise receptor	Distance from facility to noise receptor (m)	Direction from facility to noise receptor	BSL (dBA)	Daytime adjustment (dBA)	Nighttime PSL (dBA)	Daytime PSL (dBA)

2. Sound source identification

2.1 Identify baseline facilities in the project area, including existing, approved, and proposed (deemed complete) facilities, and describe their PWL or SPL. When the "no net increase" approach is used, the baseline case may be assumed to be compliant with the permissible sound level.

Baseline facilities (include make and model, power rating)	Predicted □ PWL (dBA) Or □ SPL (dBA)	Measured □ PWL (dBA) Or □ SPL (dBA)	Data source (vendor, measurement, theoretical, etc.)	Distance SPL measured from the noise source (m)

2.2 For the new and existing equipment, identify the modelled major sources of noise from the facility, and describe their associated sound power level (PWL) or sound pressure level (SPL).

New and/or existing equipment noise sources (include make and model, power rating)	Predicted □ PWL (dBA) Or □ SPL (dBA)	Measured □ PWL (dBA) Or □ SPL (dBA)	Data source (vendor, measurement, theoretical, etc.)	Distance SPL measured from the noise source (m)

2.3 Provide a tentative schedule and timing for the operation, maintenance and testing of the equipment.

_____

_____

_____

3. Normal operating conditions

When using manufacturer's data for expected performance, it may be necessary to modify the data to account for actual operating conditions (for example, indicate conditions such as operating with window/doors open or closed, load, RPM). Describe any considerations and assumptions used in preparing estimates:

_____

_____

_____

4. Noise modelling parameters

If modelling was conducted, identify the model input parameters used (see Section 3.2 of Rule 012):

_____

_____

_____

_____

5. Predicted sound level/compliance determination

Predict the cumulative sound level at the most affected noise receptor(s). Typically, only the nighttime sound level is necessary, as levels do not often change from daytime to nighttime. However, if there are differences between day and night operations, both levels must be calculated.

Predicted Nighttime Cumulative Sound Level Including the New or Modified Facility (dBA)						
Noise receptor	Ambient sound level	Sound level from baseline case facilities	Baseline sound level	Predicted sound level from new or modified facility alone	Cumulative sound level	Permissible sound level

Predicted Daytime Cumulative Sound Level Including the New or Modified Facility (dBA)						
Noise receptor	Ambient sound level	Sound level from baseline case facilities	Baseline sound level	Predicted sound level from new or modified facility alone	Cumulative sound level	Permissible sound level

6. Explain why the proposed facility qualifies to use a noise impact assessment summary form.

_____

_____

_____

7. Supply any other relevant information you want to provide to the AUC. Submit additional pages if required.

_____

_____

_____

8. If the nighttime permissible sound level is higher than 40 dBA L_{eq}, provide supplementary information to support the use of such permissible sound level.

_____

_____

_____

9. Explain what measures would be taken to address construction noise.

_____

_____

_____

10. Acoustical practitioner's information (See Section 3.2(14) of Rule 012):

Company:_____

Name:_____ Title: _____

Experience:_____

_____

_____

Telephone:_____ Date: _____

Appendix 4 – Noise complaint investigation forms

Noise complaint investigation form 1 (To be completed by licensee)

Date (DD/MM/YYYY):_____

Complainant: _____ Licensee representative: _____

Legal location: _____ Licensee: _____

Address: _____ Address: _____

_____ _____

Telephone:_____ Telephone:_____

Noise characterization

Identify the quality and characteristics of the noise.

Distance to source:_____ (m) When is noise a problem (day/night)? _____

Pitch (high/low): _____ Where is noise most annoying (inside/outside)? _____

Is there a noticeable tone? _____ Describe: _____

Is noise steady/intermittent/pulsating? _____ Describe: _____

Is the noise heard and/or a vibration felt? _____ Describe: _____

What is noise comparable to?_____

Other comments:_____

Weather conditions

Identify the weather conditions when the noise is most noticeable.

Temperature: _____Direction wind is coming from: _____

Wind speed (km/h): _____Cloud cover: _____Precipitation: _____

Ground cover between dwelling and facility (snow, water, grass, crop, trees, ice, etc.):

_____

Other comments:

_____

_____

_____

Representative conditions

From the above, identify the conditions that should exist as closely as possible during a comprehensive sound level survey.

_____

_____

Noise complaint investigation form 2 – Event log (To be completed by complainant)

Complainant: _____ Licensee representative:_____

Telephone: _____ Telephone: _____

List any details related to the sound from the facility that concerns you. Refer to the descriptions at the bottom for assistance in providing information.

Category		Noise event 1	Noise event 2	Noise event 3
Date noise heard (DD/MM/YYYY)				
Time noise heard (a.m./p.m.)				
Duration				
Noise characteristics	**Pitch**	O High O Low	O High O Low	O High O Low
	Noticeable tone	O Rumble O Sizzle	O Rumble O Sizzle	O Rumble O Sizzle
	Occurrence frequency	O Steady O Intermittent O Pulsating	O Steady O Intermittent O Pulsating	O Steady O Intermittent O Pulsating
	Noticeability	O Noise heard O Vibration felt	O Noise heard O Vibration felt	O Noise heard O Vibration felt
Weather conditions	**Wind Speed**	O Strong O Moderate O Mild	O Strong O Moderate O Mild	O Strong O Moderate O Mild
	Wind direction	O East O South O West O North	O East O South O West O North	O East O South O West O North
	Precipitation	O Snow O Rain O None	O Snow O Rain O None	O Snow O Rain O None
	Temperature	O Cold O Warm O Hot	O Cold O Warm O Hot	O Cold O Warm O Hot
	Cloud Cover	O Clear O Partly Cloudy O Cloudy	O Clear O Partly Cloudy O Cloudy	O Clear O Partly Cloudy O Cloudy
Ground cover		O Vegetation O Snow O Water	O Vegetation O Snow O Water	O Vegetation O Snow O Water
Other noise heard during the noise event?		O Vegetation rustling O Wildlife O Traffic	O Vegetation rustling O Wildlife O Traffic	O Vegetation rustling O Wildlife O Traffic
Location				
Other notes				

Noise characteristics: Describe the sound as, for example, a high or low tone, steady, intermittent or pulsating, noise heard or vibration felt.

Weather conditions: To the extent possible, provide details on temperature, wind direction and speed, cloud conditions (clear or cloudy), and existence of precipitation when the sound is a problem.

Ground cover: Describe what is covering the ground around the facility; for example, snow, water, grass, crop, trees, ice, etc.

Location: Note where you were when the sound was concerning (outdoors, such as on the deck or in the yard or corrals, or indoors, such as in the bedroom or living room). Identify the person who heard the noise if different than complainant.

Appendix 5 – Determination of low frequency tonal component

5.1 The methodologies

The methodologies shown below are intended as guidelines only and should not restrict the methods of an acoustical practitioner. The Commission will review the proposed methodology and approve the techniques or require other methods, as deemed appropriate. As the permissible sound levels are typically higher in the daytime than during the night, the methods described focus on the nighttime periods. However, the low frequency noise concerns may be due to activities during the daytime only. The methodologies remain similar.

As part of the pre-evaluation of a potential issue with low frequency noise, the acoustical practitioner should determine the quality of the noise that has raised concerns from the affected resident(s) and assess whether the noise issue is intermittent or continuous.

5.1.1 Continuous low frequency noise

If there is a low frequency noise concern and it is continuous, the levels should be measured over the entire nighttime period in terms of the one-third octave L_{eq} and statistical levels (L_{10}, L_{50}, L_{90}, or some combination). The difference in the L_{eq} (equivalent-continuous) levels for adjacent spectral bands should be graphed in order to demonstrate whether there is a pure tone, as defined in Section 4.5. If the difference in the levels varies over the nighttime, this will be evident from such a graph.

When measurements are taken over the entire period of the nighttime, the measurement interval should be a maximum of one minute. In this case, the statistical levels are valuable to show any shorter-term fluctuations in levels.

5.1.2 Intermittent low frequency noise

If the suspected low frequency noise is intermittent, then short-term measurements should be taken at times when the low frequency sound is present, and the assessment of the presence of a tone should be restricted to times when the sound is present. A high-quality audio recording of the sound over the period of concern may need to be taken for later analysis and identification of the duration and intensity of the low frequency noise. If the timing of the intermittent periods is not regular, a continuous measurement may be required to obtain sufficient evidence of the presence or absence of a pure tone.

In this case, the spectral analysis can be done in terms of a short-term L_{eq} or a “slow” weighted sound level. Many instruments do allow simultaneous measurements of the one-third octave L_{eq} levels. If meters cannot track all the one-third octave frequency bands at the same time, the tonal components can be assessed by running a signal through an analyzer a number of times to get the levels of all the frequency bands of interest. The analyzer would be for “slow response” and the recordings run with different one-third octave band settings until all bands between 20 and 250 Hz have been analyzed.

5.1.3 Importance of wind conditions

In all cases where low frequency noise may be a consideration, measurements of the local wind conditions must be taken throughout the assessment period at the same height as the microphone above ground in the vicinity of the sound monitoring location(s). Wind generates high levels of low-frequency (and infrasonic) sound energy, which can mask or confuse the assessment of facility low frequency noise.

Example

The Table 10 below shows how the presence of low frequency tonal components is determined. For example, a tonal component is evident at 250 Hz (≥10 dB within two bandwidths on one side and five dB or greater drop within two bandwidths on the other side, in addition to being pronounced within the spectrum).

Table 10 One-third octave band frequency spectrum analysis for tonal components

		Part 1		Part 2
Band (Hz)	Sound level (dB)	Maximum Δ dB within 2 bandwidths	≥5 dB on other side?	Pronounced within the spectrum
20	10	-4	n/a	n/a
25	12	-2	n/a	n/a
31.5	14	4	n/a	n/a
40	13	-4	n/a	n/a
50	14	-3	n/a	n/a
63	17	4	n/a	n/a
80	14	-6	n/a	n/a
100	15	-8	n/a	n/a
125	20	-8	n/a	n/a
160	23	-11	n/a	n/a
200	28	8	n/a	n/a
250	34	11	**yes**	**yes**
315	31	3	n/a	n/a
400	28	-6	n/a	n/a

Figure 4 below shows some examples of tonal components. There is clearly a tonal component (pronounced peak) within the spectrum at 250 Hz and 2000 Hz (≥10 dB within two bandwidths on one side and five dB or greater drop within two bandwidths on the other side); however, the second is at a frequency greater than 250 Hz and would not be considered low frequency noise.

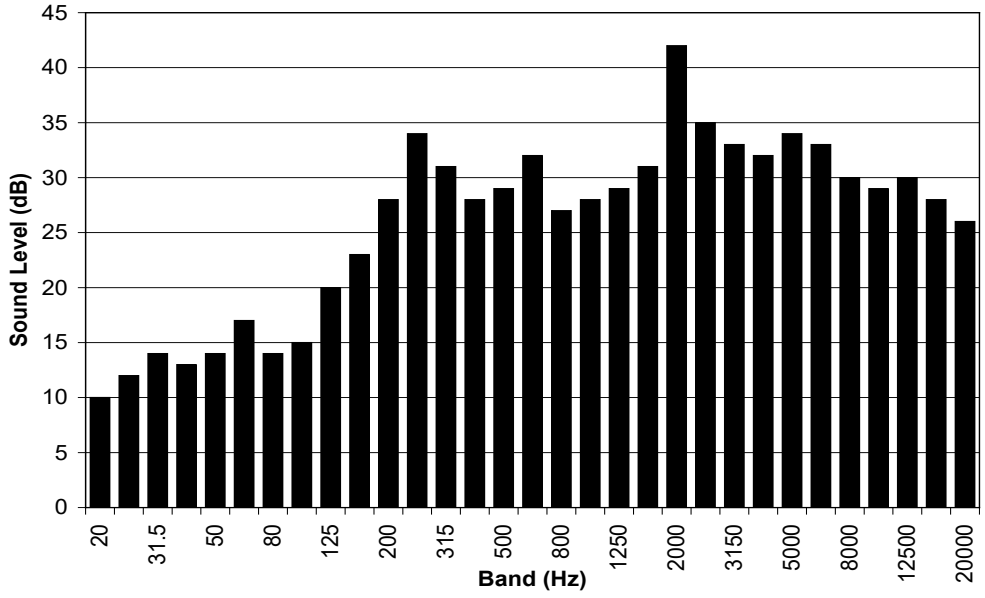


Figure 4 - One-third octave band centre frequency (Hz)

Appendix 6 – Examples

The examples below show a step-by-step process to determine compliance or non-compliance for proposed or existing facilities that: may request an A2 adjustment (Example 1); use the simplified calculation described in Appendix 2 - Section 2.5 (Example 2); or may require consideration of cumulative effects (Example 3).

Example 1

A facility is proposed for the area shown in Figure 5. What sound levels should the facility be designed for?

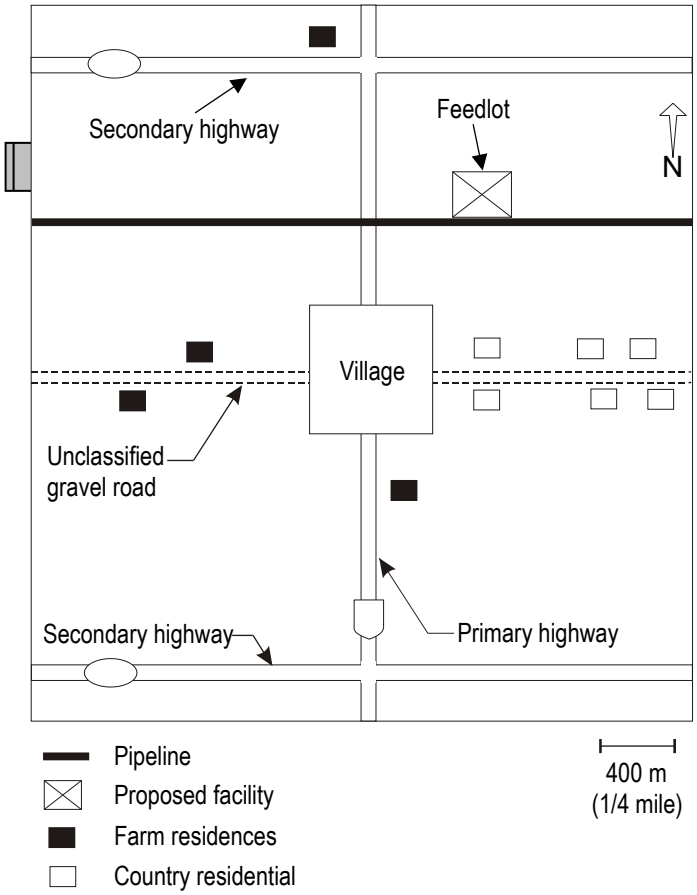


Figure 5 - Area sketch for example1

Example 1 – Solution

Step 1 Determine BSL.

All three possible dwelling densities are represented in this study area. The four 8.1 hectares (20 acre) country residential dwellings factored over a quarter section fall into the 1 to 8 dwellings density, as do the farmhouses. The two country residential dwellings closest to the village and a portion of the village are in the 9 to 160 dwellings density, while the body of the village is in the >160 (greater than) dwellings density.

Regarding the proximity to transportation Category: the primary and secondary highways in this example are heavily travelled which causes the adjacent farmhouses to fall into Category 2, while the dwellings in the village would fall into Category 2 or Category 3, based on population density and depending on the distance from the highway. The two

country dwellings in closest proximity to the village fall into Category 2, while other four country dwellings that are east of the village further along the gravel road (which in this example is not a heavily travelled road), fall into Category 1 The farmhouses along the gravel road fall into Category 1.

It appears that the Category 1 country dwellings to the south of the proposed facility are probably the nearest and most affected, with a nighttime BSL of 40 dBA L_{eq}, from Table 1-Basic Sound Levels for nighttime. However, each dwelling is assigned its own site specific BSL. Where there is more than one category and dwelling density in a study area it may be difficult to ascertain the most affected dwelling as it may not be the nearest dwelling to the proposed facility. The difference between the determined permissible sound level and predicted sound level will assist in the determination of the most affected dwelling.

Step 2 What is the daytime sound level adjustment?

The daytime sound level adjustment is 10 dBA above the BSL. (For a continuous facility noise source where there is no difference in operational noise level between the daytime and nighttime period, the facility sound level must be designed to comply with the most stringent criteria which is usually the lower nighttime permissible sound level.)

Step 3 Is a Class A1 Seasonal Adjustment appropriate?

No, because this adjustment cannot be added when determining the permissible sound level for design purposes.

Step 4 Is the BSL appropriate for this area?

In this example assume no, because of presence of a non-energy related noise source in area (feedlot that operates 24-hours). The licensee of the proposed facility has taken some spot measurements with a hand-held sound meter. The levels recorded ranged from 42 dBA at night to 55 dBA during the day.

Step 5 Is the use of a Class A2 monitoring adjustment proposed in the noise impact assessment?

As per Section 2.1(10) of Rule 012, the Class A2 adjustment is not to be deemed held in reserve before the application is deemed completed. In addition, if the Class A2 adjustment is requested, the noise impact assessment must indicate the predicted noise level with a Class A2 adjustment and without a Class A2 adjustment. The remaining steps (step 6 to step 11) represent the determination of permissible sound level in the former case of a noise impact assessment with a Class A2 adjustment.

Step 6 An A2 adjustment is based on the measured ambient sound level at a dwelling. A 24-hour ambient sound monitoring study measured at 15 m from the nearest country dwelling is conducted. The results of the survey are:

Daytime ASL: 53 dBA L_{eq}

Nighttime ASL: 37 dBA L_{eq}

Claim the appropriate daytime and nighttime A2 monitoring adjustment for the applicable dwelling (in this example the country dwelling nearest the facility and the feedlot) specific dwelling from Figure 1 - Ambient monitoring adjustment. First, subtract the appropriate daytime and nighttime ASL measured during the monitoring study from the BSL determined in step 2. In this example:

Daytime BSL - daytime ASL = 50 - 53 = -3

Nighttime BSL - nighttime ASL = 40 - 37 = +3

For each in turn, locate this difference on the horizontal axis of Figure 1, read upward until the adjustment line is intersected, and read to the left to find the applicable A2

adjustment that will apply to the daytime and nighttime periods. The A2 adjustment that apply in this example are:

Daytime adjustment: A2 = +8 dBA L_{eq}

Nighttime adjustment: A2 = +2 dBA L_{eq}

Step 7 Sum of the Class A adjustments: (A1 + A2 (call it A))

Daytime: 0 + 8 = 8 dBA L_{eq}

Nighttime: 0 + 2 = 2 dBA L_{eq}

Step 8 Is the Class A adjustment greater than 10 dBA L_{eq} (only a maximum of 10 is allowed)?

In either case, no.

Class A ambient adjustment = 8 dBA daytime

Class A ambient adjustment = 2 dBA nighttime

Step 9 Is noise temporary in nature?

In this example assume no; the facility will operate all year (more than 60 days).

Class B adjustment: B = 0 dBA

Step 10

Daytime	Nighttime
PSL = BSL + Day + A + B	PSL = BSL + Day + A + B
PSL = 40 + 10 + 8 + 0	PSL = 40 + 0 + 2 + 0
PSL = 58 dBA L_{eq}	PSL = 42 dBA L_{eq}

Step 11 Daytime PSL = 58 dBA L_{eq}

Nighttime PSL = 42 dBA L_{eq}

as measured 15 m from the nearest country dwelling.

Example 2 – Noise impact assessment (simple calculation)

A facility is proposed for the area shown in Figure 6. The most affected dwelling is located 800 m northeast of the facility along a road not heavily travelled; therefore, it is a Category 1 proximity to transportation. The density of dwelling is in the 1 to 8 range. From Table 1, the BSL at nighttime is 40 dBA and since no additional adjustments are required, the PSL is 40 dBA L_{eq} nighttime. The sources of noise from the facility are the cooler fans and exhaust noise. The manufacturer has stated that the maximum sound level emitted from this equipment is 55 dBA measured at 50 m in front of the cooler fans.

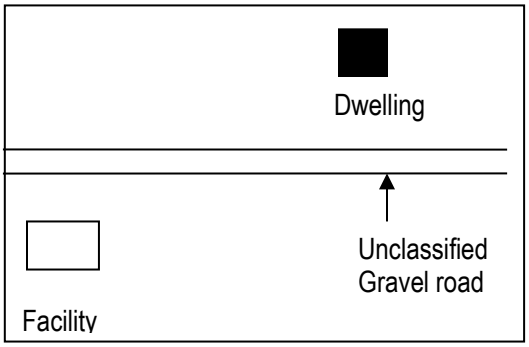


Figure 6 - Area sketch for example 2

Example 2 - Solution

The table below demonstrates the use of the doubling of distance method to estimate the sound level from the source:

Distance (m)	Sound level(dBA)
50	55
100	49
200	43
400	37
800	31

Note that this is a small, stationary, single-source facility without any existing energy-related facility in the proximity and with flat ground between the facility and a single dwelling.

The six dBA loss per doubling of distance is a rough estimate. A more accurate way to determine the sound attenuation with distance is to measure similar equipment at a topographically similar location. The sound levels would be measured at specified distances away from the facility (for example, 100 m, 200 m, 400 m, etc.) to determine the actual attenuation with distance.

The nighttime permissible sound level must be met. Many permanent facilities create the same amount of noise whether it is daytime or nighttime, and so the most stringent criterion is the nighttime permissible sound level.

The noise impact assessment developed for this example would include the following:

(1) The major sources of noise in this facility include cooler fans and exhaust noise.

(2) The sound levels at the nearest dwelling have been predicted using the six dBA loss per doubling of distance calculation method. Sound level losses for air absorption, ground attenuation, or cooler fan orientation away from the dwelling have not been included. The only noise source input is the 55 dBA at 50 m.

(3) The distance to the most affected dwelling is 800 m northeast of the facility. This also happens to be the closest dwelling. If we extrapolate the 55 dBA value out to 800 m, using the theoretical six dBA loss per doubling of distance:

L is sound level at distance R

$L(R2) = L(R1) - 20 \log (R2/R1)$

$L(800) = 55 - 20 \log (800/50)$

$L(800) = 30.9$

The predicted sound level at the dwelling from the facility alone is 30.9 dBA. Adding this to the assumed rural ambient sound level (35 dBA L_{eq}) results in a combined predicted sound level of 36.3 dBA L_{eq}. With this result, the Appendix 3 noise impact assessment summary form can be submitted in the application as a substitute for the noise impact assessment.

(4) This noise impact assessment was conducted by Acoustical Practitioner, of XYZ Company. Also see other requirements set out in sections 3.2 and 3.3 of Rule 012.

Example 3 - Noise impact assessment

A facility is proposed for the area shown in Figure 7. For what location(s) should compliance be determined? How should the existing facility be considered?

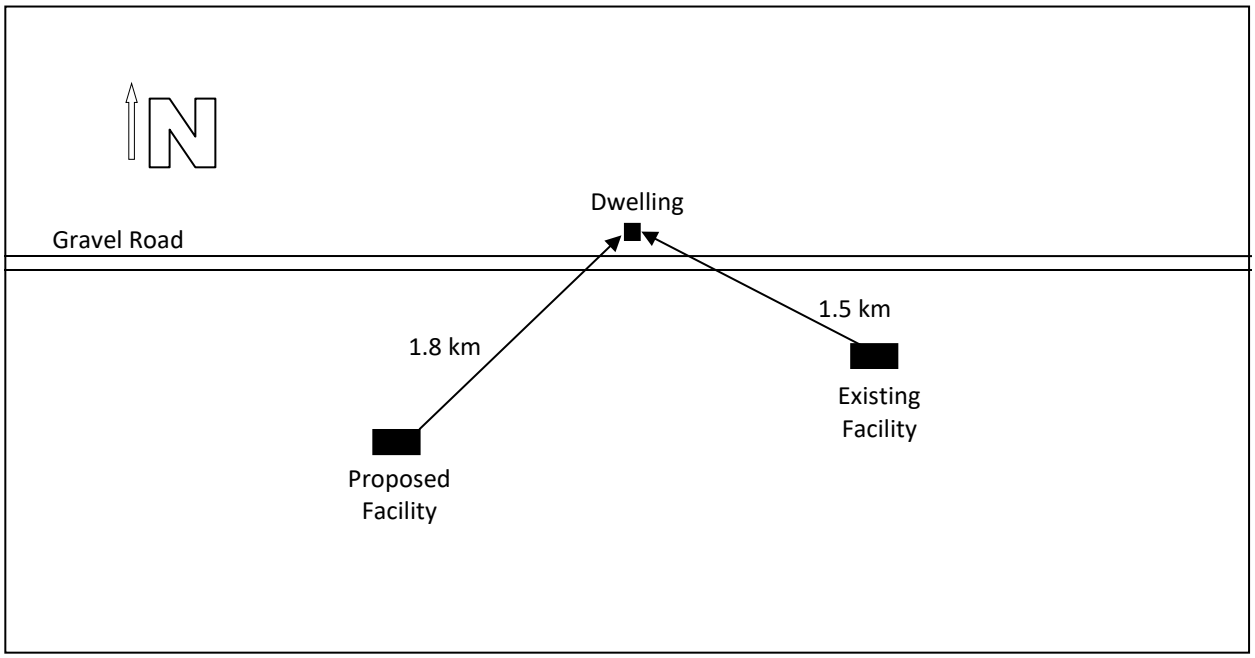


Figure 7 - Area sketch for example 3

Example 3 – Solution

A proposed facility is planned for an area where another regulated energy-related facility is present. AUC Rule 012 requires that cumulative effects be considered for all potentially affected dwellings in a study area and/or at 1.5 km from the facility property boundary where there are no dwellings in the study area. The acoustical practitioner must determine whether dwellings are present within the 1.5 km distance or if there is potential for cumulative effects to occur at dwellings beyond the 1.5 km facility property boundary. The example presented examines two situations: one where the proposed facility is a simple noise source and the situation where there is a dwelling beyond the proposed facility property boundary. The example demonstrates the concept of the area of overlap of two energy-related facilities at their respective 1.5 km facility property boundaries, and compliance with the PSL.

(1) The PSL based on Section 2.1 of the AUC Rule 012 is 40 dBA L_{eq} nighttime at a distance of 1.5 km from the proposed facility property boundary where there are no affected dwellings closer to the facility. The corresponding assumed nighttime ASL from Section 2.1 is 35 dBA L_{eq}.

(2) Where there is no noise data available for the existing energy-related facility, the existing energy-facility may be assumed to be compliant with the PSL so that it meets a noise level of 40 dBA L_{eq} at a distance of 1.5 km from its own facility property boundary. This means the existing energy-related facility contribution is assumed to be 38.3 dBA, with an assumed ASL of 35 dBA L_{eq} nighttime. (38.3 dBA + 35 dBA = 40 dBA).

(3) Compliance of the proposed facility is assessed at the points of intersection of the 1.5 km facility property boundaries of the existing and proposed energy-related facilities (see points A and B in Figure 8).

(4) The sound emission from the proposed facility needs to be established. The measurements from a similar facility indicate that it is a simple source that emits a sound level of 56.5 dBA at 25 m from the facility. Using the standard distance attenuation formulae (Appendix 2 - Section 2.5), 56.5 dBA at 25 m results in a noise contribution at Point A or Point B of 20.9 dBA. (For more complex sources or situations, the acoustical practitioner must conduct the calculations using modelling software or more detailed calculations).

(5) Point A and Point B are the points of interest where the two facility property boundaries meet and where compliance must be demonstrated (in the absence of an affected dwelling in the area). The PSL is determined to be 40 dBA L_{eq} nighttime at these two points. The cumulative effects assessment at Point A and Point B considers the contributions of all energy-related regulated facilities plus the assumed ASL. In this situation the noise level at Point A and Point B is predicted to be:

Proposed Facility contribution + Existing facility contribution + assumed ASL = dBA at Point A

which is:

20.9 dBA + 38.3 dBA + 35.0 dBA = 40.0 dBA at Point A and Point B

(6) In the situation where a dwelling is located beyond the 1.5 km proposed facility property (at 1.8 km), but the noise impact may be affected due to cumulative effects from multiple facilities, the noise impact needs to be assessed at those dwellings. Using the standard distance attenuation formulae (Appendix 2 - Section 2.5 if applicable), the proposed facility noise contribution at the dwelling is predicted to be 19.4 dBA.

(7) Compliance at the dwelling is determined by adding the proposed facility noise contribution to the existing energy-related facility noise contribution (based on the assumption the existing energy-related facility complies with the PSL of 40 dBA L_{eq} nighttime and its noise contribution is 38.3 dBA at the dwelling, and the assumed ambient sound level of 35 dBA L_{eq} nighttime), then comparing the result to the nighttime PSL:

Proposed Facility contribution + Existing facility contribution + assumed ASL = noise level dBA at the dwelling

which is:

19.4 dBA + 38.3 dBA + 35.0 dBA = 40.0 dBA at the dwelling.

The PSL is not exceeded; both facilities are predicted to be in compliance.

Summary

If there are no dwellings in the study area that will be affected by the cumulative effects of noise from energy-related facilities, AUC Rule 012 limits the nighttime permissible sound level in this example along the 1.5 km facility property boundaries and at the intersecting points (Point A and Point B) of the proposed and existing facility boundaries.

The proposed facility which meets the permissible sound level at the 1.5 km facility property boundary intersection points (points A and B) is expected to have less noise impact at a dwelling located further from the intersection points but may have a cumulative noise impact at that dwelling. With a dwelling in the study area at a distance of 1.8 km from the proposed facility, it is determined through the calculations that the proposed facility demonstrates a no net increase in noise level at the dwelling.

(8) The noise assessment supplied in the example provides the details required and outlines the assumptions made and data sources and formulae used to determine compliance with the PSL at a distance of 1.5 km from the proposed facility property boundary with and without a dwelling in the study area. The example demonstrates a no net increase in noise level as defined in Appendix 1.

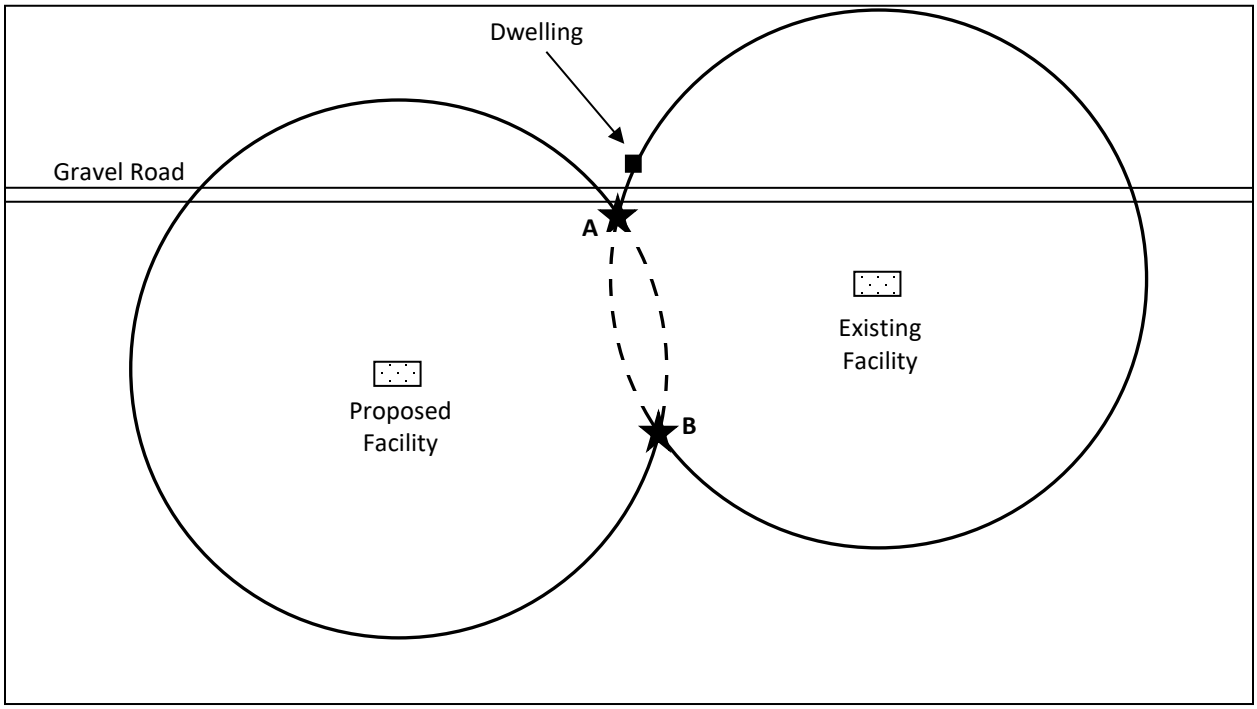


Figure 8 - 1.5 km criteria boundary for example 3

Appendix 7 – References

Document Reference	Title
ANSI S1.11-2004	Octave-Band and Fractional-Octave-Band Analog and Digital Filters
ANSI S1.40-2006	American National Standard Specifications and Verification Procedures for Sound Calibrators
ANSI S1.4-1983/ANSI S1.4a-1985	American National Standard Specification for Sound Level Meters
ANSI S1.26-1995	Calculation of the Absorption of Sound by the Atmosphere
ANSI S1.13-2005	Measurement of Sound Pressure Levels in Air
ANSI S12.18	Outdoor Measurement of Sound Pressure Level
ASTM E1014 – 08	Standard Guide for Measurement of Outdoor A-Weighted Sound Levels
ASTM E1686 – 10	Standard Guide for Applying Environmental Noise Measurement Methods and Criteria
ISO 1996-1:2016	Acoustics -- Description, measurement and assessment of environmental noise -- Part 1: Basic quantities and assessment procedures
ISO 1996-2:2017	Acoustics -- Description, measurement and assessment of environmental noise -- Part 2: Determination of environmental noise levels
ISO 9613-1:1993	Acoustics -- Attenuation of sound during propagation outdoors – Part 1 Calculation of the Absorption of Sound by the Atmosphere;
ISO 9613-2:2024	Acoustics -- Attenuation of sound during propagation outdoors – Part 2 General method of calculation
IEC 61260-1:2014	Electroacoustics - Octave-band and fractional-octave-band filters - Part 1: Specifications
IEC 61260-2:2016	Electroacoustics - Octave-band and fractional-octave-band filters - Part 2: Pattern-evaluation tests
IEC 61260-3:2016	Electroacoustics - Octave-band and fractional-octave-band filters - Part 3: Periodic tests
IEC 61672-1:2013	Electroacoustics – Sound level meters – Part 1: Specifications
IEC 61672-2:2013	Electroacoustics – Sound level meters – Part 2: Pattern evaluation tests
IEC 61400-11:2012 + AMD1:2018 CSV Consolidated version	Wind turbine systems - Part 11: Acoustic noise measurement techniques Amendment 1 - Wind turbine systems - Part 11: Acoustic noise measurement techniques
IEEE C57.12.90-2010	IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers
CONCAWE (Conservation of Clean Air and Water in Europe) Report No. 4/81	The propagation of noise from petroleum and petrochemical complexes to neighbouring communities

Note: The references listing provided in the table is not a comprehensive listing of all available references accepted by the AUC. The proponent should verify that **the latest version** of the reference is used.

Appendix 8 – Sound definitions table

The following table depicts the sound definitions.

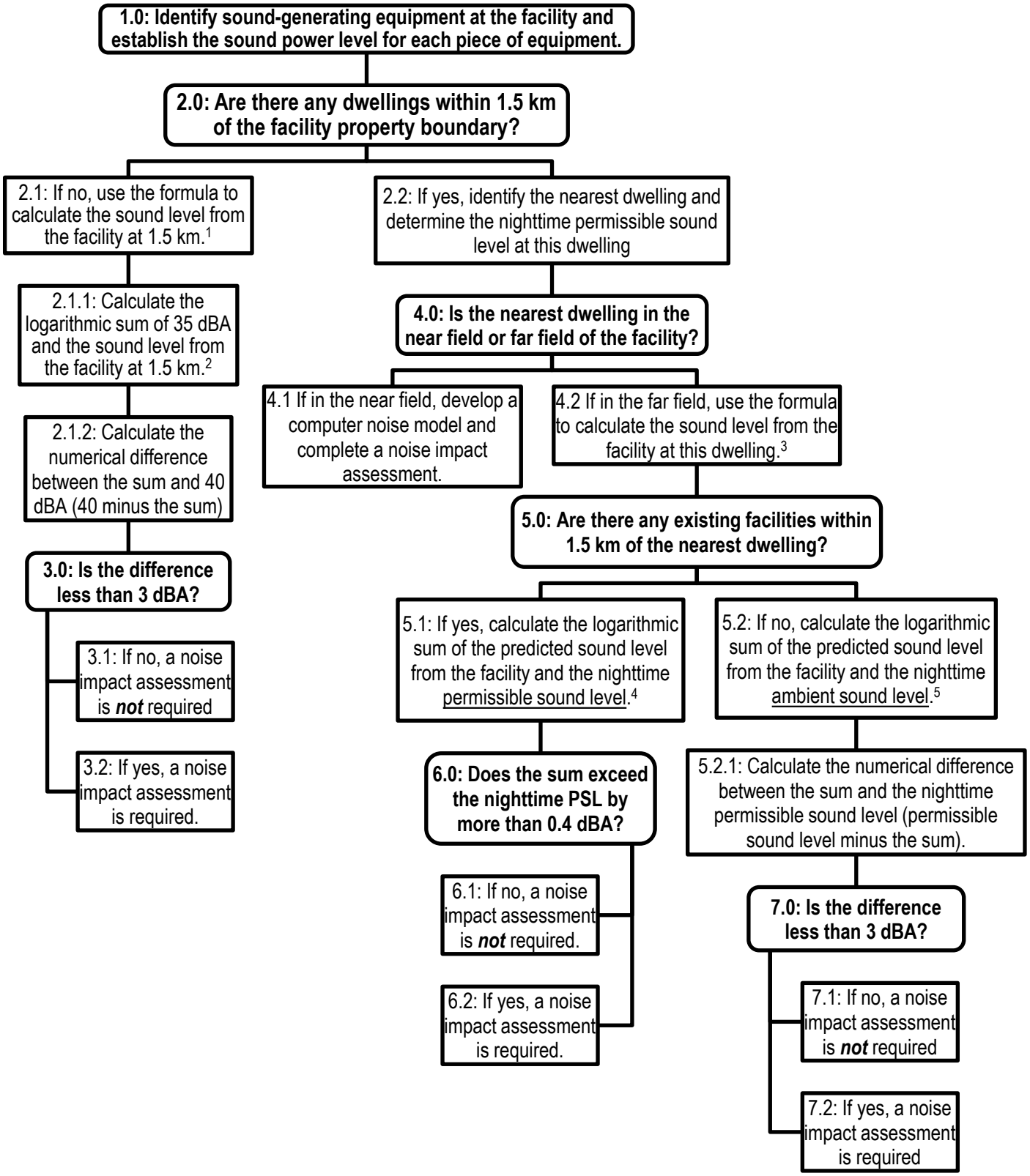
Noise room remaining (if any) to the Permissible sound level (permissible sound level see Table 1 and 2)	**Nighttime permissible sound level** range from 30 dBA to 66 dBA (Table 1 and 2)	**Daytime permissible sound level** range from 40 dBA to 76 dBA (Table 1 and 2)
Cumulative sound level (includes baseline)	**Noise sources**	**Examples**
	Facility proposed in application to AUC	- power plants incl. wind turbine projects, cogeneration - power transformer station - gas compressor station
Baseline sound level (includes comprehensive)	Proposed and deemed complete energy-related facilities regulated by the AUC	- power plants incl. wind turbine projects, cogeneration - power transformer station - gas compressor station
	Approved but not yet constructed energy-related facilities (all authorities)	- oil & gas processing plant - oil battery, pump jack - oil pump station - coal mine - gas compressor station
Comprehensive sound level (includes ambient)	Existing facilities approved by AUC	- power plants incl. wind farms, cogeneration - power transformer station - gas compressor station
	Existing energy-related facilities (all authorities)	- oil & gas processing plant - oil battery, pump jack - oil pump station - coal mine - gas compressor station
Ambient sound level (Energy-related noise is isolated out of measured noise)	Non-energy related facilities	- manufacturing plants - gravel pit operations - commercial plants
	Non-industrial noise sources	- vehicular traffic - dwelling density - rail lines - aircraft flyover

BASIC SOUND LEVEL

- Assumed ambient plus five dBA allowed for existing and approved energy-related facilities.
- If the measured ambient is higher or lower than the assumed ambient, an A2 adjustment may be applicable per Table 2.
- Noise from wind is not included in the ambient sound level.

Appendix 9 – Noise impact assessment flowchart

The noise impact assessment flowchart is a tool that provides objective criteria for determining if a noise impact assessment is required for a facility before it commences operations. A noise impact assessment flowchart may be utilized to determine if a noise impact assessment is required for a facility that is exempt from filing a Rule 007 application or that is eligible to file to a checklist application under Rule 007. For other types of facilities, a noise impact assessment must be filed.


1.0: Identify sound-generating equipment at the facility and establish the sound power level for each piece of equipment.
2.0: Are there any dwellings within 1.5 km of the facility property boundary?
2.1: If no, use the formula to calculate the sound level from the facility at 1.5 km.[1]
2.2: If yes, identify the nearest dwelling and determine the nighttime permissible sound level at this dwelling
2.1.1: Calculate the logarithmic sum of 35 dBA and the sound level from the facility at 1.5 km.[2]
4.0: Is the nearest dwelling in the near field or far field of the facility?
2.1.2: Calculate the numerical difference between the sum and 40 dBA (40 minus the sum)
4.1 If in the near field, develop a computer noise model and complete a noise impact assessment.
4.2 If in the far field, use the formula to calculate the sound level from the facility at this dwelling.[3]
3.0: Is the difference less than 3 dBA?
5.0: Are there any existing facilities within 1.5 km of the nearest dwelling?
3.1: If no, a noise impact assessment is *not* required
5.1: If yes, calculate the logarithmic sum of the predicted sound level from the facility and the nighttime permissible sound level.[4]
5.2: If no, calculate the logarithmic sum of the predicted sound level from the facility and the nighttime ambient sound level.[5]
3.2: If yes, a noise impact assessment is required.
6.0: Does the sum exceed the nighttime PSL by more than 0.4 dBA?
5.2.1: Calculate the numerical difference between the sum and the nighttime permissible sound level (permissible sound level minus the sum).
6.1: If no, a noise impact assessment is *not* required.
7.0: Is the difference less than 3 dBA?
6.2: If yes, a noise impact assessment is required.
7.1: If no, a noise impact assessment is *not* required
7.2: If yes, a noise impact assessment is required

Notes for noise impact assessment flowchart:

1, 3:

Formula to calculate sound pressure level (L_p) based on sound power level (L_w):

$L_p = L_w - 20\log_{10}(R) - 5$ (assuming half sphere radiation)

$L_p = L_w - 20\log_{10}(R) - 8$ (assuming full sphere radiation)

Formula to calculate sound pressure level (L_{p2}) at a distance R_1 based on sound pressure level (L_{p1}) at a distance R_2:

$$L_{p2} = L_{p1} - 20\log_{10}\left(\frac{R_1}{R_2}\right)$$

R: distance between sound source and noise receptor in metres

L: sound level in dBA

2, 4, 5:

Formula to add two sound pressure levels (L_{p1}, L_{p2}):

$$L_{p,sum} = 10\log_{10}(10^{(\frac{L_{p1}}{10})} + 10^{(\frac{L_{p1}}{10})})$$