REPORT

Wild Rose 2 Wind Power Project

Noise Impact Assessment

Submitted to:

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Distribution List

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1.0 INTRODUCTION

Wild Rose 2 Wind Inc. (Wild Rose 2) are owners of the approved but not yet constructed Wild Rose 2 Wind Power Project (the Approved Project), which will be located in Cypress County, Alberta, approximately 30 km southeast of Medicine Hat. The Alberta Utilities Commission decision on the Approved Project was issued in July 2024 (AUC 2024a). The Approved Project consists of 36 Siemens Gamesa Renewable Energy SGRE 5.2-145 wind turbines, each with a power rating of 5.2 megawatts (MW), a collector system, and an electrical substation consisting of one step-up transformer with a nominal power rating of 275 megavolt-amperes (MVA).

Wild Rose 2 is proposing to permit two new wind turbines. The two wind turbines will hereafter be referred to as the Project. The Project will make use of Siemens Gamesa Renewable Energy SGRE 5.2-145 wind turbines, identical to the units used in the Approved Project. Please note that the Project will not result in any changes to the electrical substation associated with the Approved Project.

Power generating facilities in Alberta are regulated by the AUC through Rule 007 (AUC 2024b) and Rule 012 (AUC 2024c). Rule 007 sets out general requirements for regulatory applications and Rule 012 provides specific methods and criteria for the assessment of potential environmental noise impacts.

Wild Rose 2 retained WSP Canada Inc. (WSP) to prepare a noise impact assessment (NIA) for the Project, in accordance with Rule 012. The results of WSP's Project NIA are presented in this report. This report is structured as follows:

- Section 1 provides an introduction to the Project NIA.
- Section 2 provides a brief description of the Project equipment and planned operations.
- Section 3 outlines the assessment approach used in the Project NIA, including a description of:
  - assessment cases considered in the Project NIA
  - study area and relevant receptor locations
  - applicable broadband and low frequency noise (LFN) compliance criteria
  - methodology used to predict Project noise levels
- Section 4 presents noise emissions values for equipment considered in the Project NIA.
- Section 5 presents results for each assessment case, including a comparison of noise level predictions to Rule 012 compliance criteria.
- Section 6 summarizes the results of the Project NIA.
- Section 7 provides information about the acoustical practitioners that completed the Project NIA.

2.0 PROJECT DESCRIPTION

The Project will consist of two Siemens Gamesa Renewable Energy SGRE 5.2-145 wind turbines. The Project wind turbines will have a hub height of 95.5 m. Both Project wind turbines will operate in AM+1 (i.e., 5.2 MW) operating mode during the daytime period, defined by Rule 012 as 7 a.m. to 10 p.m., and during the nighttime period, defined by Rule 012 as 10 p.m. to 7 a.m. (AUC 2024c).

Table 1 presents locations and operating modes for the Project noise sources. Both Project wind turbines will have their operating modes configured to match the operating plan described in Table 1. As required by Rule 012, the operating modes specified in Table 1 correspond to *"…the maximum noise emitted when the wind turbine operates under the planned maximum operating conditions for both the daytime and the nighttime period…"* (AUC 2024c).

Table 1: Project Noise Sources and Operating Modes

Source Identification Code	Source Description	Universal Transverse Mercator Coordinates (Zone 12)		Source Operating Mode[(a)]	
		Easting (m)	Northing (m)	Daytime	Nighttime
T10	Simens Gamesa Renewable Energy SGRE 5.2-145 wind turbine	531156	5516351	AM+1	AM+1
T11	Simens Gamesa Renewable Energy SGRE 5.2-145 wind turbine	531510	5515837	AM+1	AM+1

(a) Planned operating mode corresponding to maximum noise emissions.

A map showing the locations of Project noise sources is presented in Section 3.2 of this report (see Figure 1). Additional details on noise emissions from Project noise sources are provided in Section 4.2 of this report.

3.0 ASSESSMENT APPROACH

The purpose of the Project NIA is to assess potential environmental noise impacts from the Project within the context of regulatory requirements specified in Rule 012. Specific regulatory requirements are described in detail in Section 3.3 of this report. In general, to demonstrate regulatory compliance, Rule 012 requires that cumulative noise levels at receptors be compared to a mandated permissible sound level (PSL) limit. Rule 012 considers relevant receptors to be *"…the most affected dwelling(s) located within 1.5 km from the centre of the tower of the closest wind turbine…"* (AUC 2024c). Rule 012 indicates that cumulative noise levels should be calculated as the sum of:

- an ambient sound level (ASL) meant to represent the contribution from natural noise sources, non-industrial noise sources, and industrial facilities that are not regulated by the AUC or Alberta Energy Regulator (AER)
- the noise contribution from existing facilities that are regulated by the AUC or AER
- the noise contribution from approved but not yet constructed facilities that are regulated by the AUC or AER
- the noise contribution from proposed facilities that have been deemed complete by the AUC in accordance with Rule 007
- the noise contribution from the Project under *"…planned maximum operating conditions…"* (AUC 2024c)

3.1 Assessment Cases

The Project NIA considered two assessment cases:

- Baseline Case, which consists of cumulative noise levels associated with natural sources, non-industrial sources, industrial facilities that are not regulated by the AUC or AER, existing AUC/AER-regulated facilities, approved but not constructed AUC/AER-regulated facilities (including the Approved Project), and proposed facilities that have been deemed complete by the AUC.

- Application Case, which consists of cumulative noise levels associated with the Baseline Case in combination with the predicted noise contribution from the Project.

For both assessment cases, the cumulative noise level at each relevant receptor was compared to the applicable Rule 012 PSL. Noise contributions from existing, approved, and proposed industrial facilities were established using information presented in the Approved Project NIA (WSP Golder 2022) and in a supplemental noise study filed with the AUC as part of the regulatory process for the Approved Project (WSP 2023). Noise contributions from the Project were predicted using a computer model developed in accordance with the same widely accepted calculation standard for the propagation of environmental noise (ISO 1996) that was used in the Approved Project NIA (WSP Golder 2022) and the supplemental noise study (WSP 2023). Project noise sources were modelled under *"…planned maximum operating conditions…"* (AUC 2024c).

Section 4.1 of this report provides additional detail on existing, approved, and proposed industrial facilities considered in the Project NIA. Section 2.0 and Section 4.2 of this report provide additional detail on the Project noise sources considered in the Application Case. Section 3.4 of this report provides additional detail on the computer modelling conducted for the Project NIA.

3.2 Study Area and Receptors

Rule 012 regulates noise from a receptor perspective and considers relevant receptors to be *"…the most affected dwelling(s) located within 1.5 km from the centre point of the tower of the closest wind turbine…"* (AUC 2024c). In accordance with Rule 012, the Project NIA established a Study Area as a 1.5 km buffer on the Project noise sources and assessed potential noise impacts at all occupied dwellings located within this Study Area.

Potential receptors within the Study Area were identified using information presented in the Approved Project NIA (WSP Golder 2022) and information gathered by Wild Rose 2 as part of their stakeholder consultation efforts. Likewise, existing, approved, and proposed industrial facilities with the potential to influence cumulative noise levels at receptors in the Study Area were identified using information presented in the Approved Project NIA (WSP Golder 2022).

Two occupied dwellings were identified within 1.5 km of Project noise sources and treated as receptors in the Project NIA. Based on direction from Wild Rose 2, the Little Plume Church was also treated as a receptor in the Project NIA. Please note the Little Plume Church is not a noise receptor based on the definition provided in Rule 012 (AUC 2024c). However, the Little Plume Church is located within 1.5 km of the Project and the potential for impacts to the Little Plume Church was one of the key topics discussed during the AUC hearing for the Approved Project (AUC 2024a).

Table 2 presents locations and heights for the three receptors considered in the Project NIA. For each receptor, Table 2 also identifies and provides the distance to the closest Project wind turbine.

Rule 012 does not specify appropriate receptor heights to use in noise assessments but does indicate that the height of receptors should *"…reflect the bedroom height of the dwellings"* (AUC 2024c). Both dwelling receptors in the Study Area are one-storey tall. Therefore, in accordance with Rule 012 guidance, the Project NIA modelled the dwelling receptors at 1.5 m above ground to match the height at which bedroom noise exposure is expected to occur. WSP understands there are no bedrooms at the Little Plume Church but expects that most activities at the church take place on the ground floor. Therefore, the Project NIA also modelled the Little Plume Church with a receptor height of 1.5 m above ground.

Figure 1 presents a map showing the Project noise sources (i.e., wind turbines), the Study Area (i.e., a 1.5 km buffer on Project noise sources), and the three receptors located within the Study Area. Figure 1 also shows the location of existing, approved, and proposed industrial facilities with the potential to influence cumulative noise levels at receptors in the Study Area. Additional detail on these facilities is presented in Section 4.1 of this report.

Table 2: Noise Receptors

Receptor Identification Code[a],[b]	Receptor Description	Universal Transverse Mercator Coordinates (Zone 12)		Receptor Height (m)	Closest Project Wind Turbine	Distance to Closest Project Wind Turbine (m)
		Easting (m)	Northing (m)			
R26	occupied one-storey dwelling	532750	5515539	1.5	T11	1,275
R27	occupied one-storey dwelling	532807	5515430	1.5	T11	1,359
Church	Little Plume Church[c]	531077	5514769	1.5	T11	1,152

(a) Receptor identification codes are consistent with the Approved Project NIA (WSP Golder 2022) and the supplemental noise study for the Approved Project (WSP 2023).

(b) The Approved Project NIA included an additional receptor, R23, located within the Study Area for the Project NIA. WSP understands this structure has been purchased by Wild Rose 2 and will be used as an office once the Approved Project and Project commence operations. Therefore, R23 no longer qualifies as a noise receptor.

(c) The Little Plume Church is not an occupied dwelling and does not qualify as a noise receptor based on the definition provided in Rule 012 (AUC 2024c). Nevertheless, the Little Plume Church has been treated as a noise receptor based on direction from Wild Rose 2.

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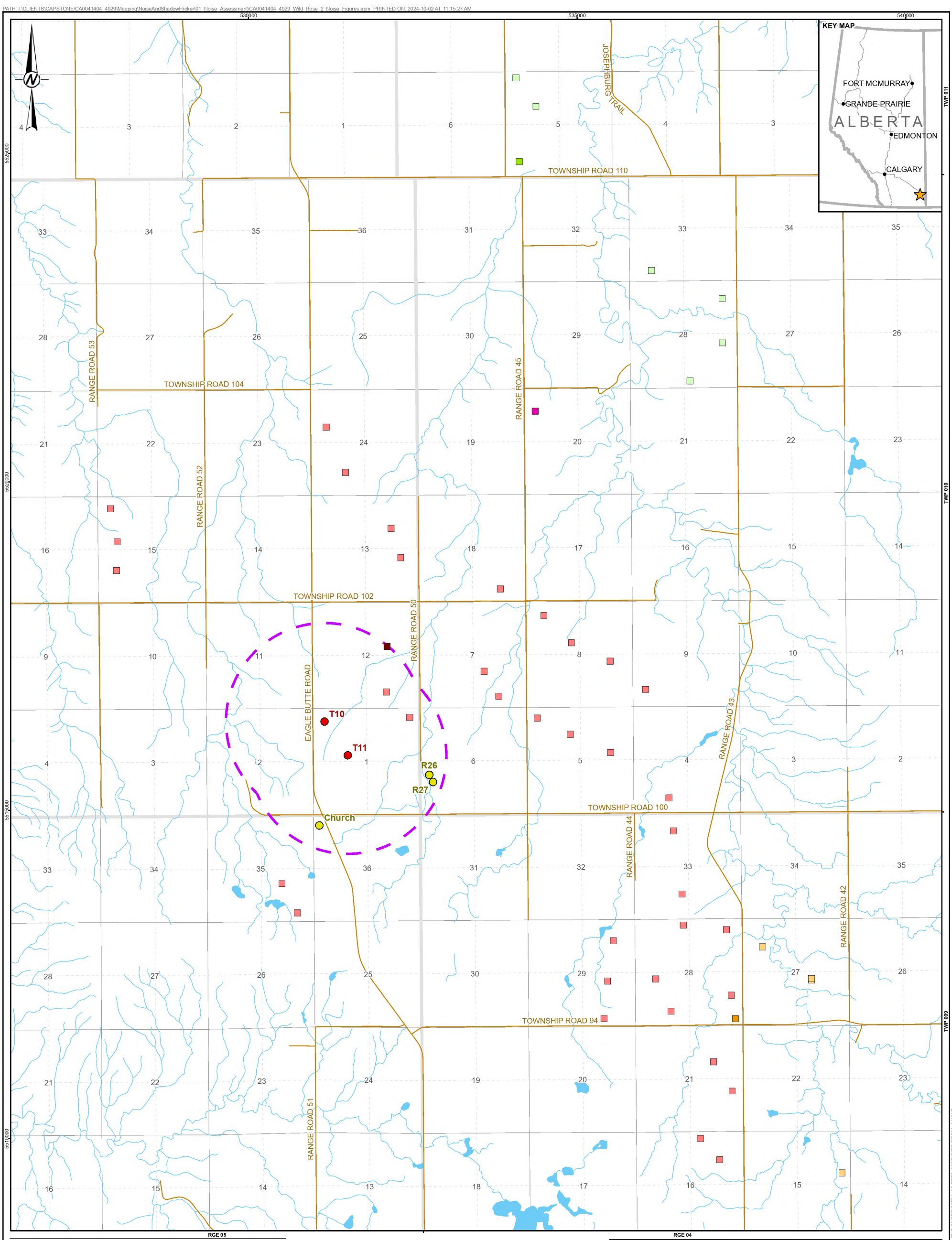

LEGEND

- LOCAL ROAD
- WATERCOURSE
- WATERBODY
- NOISE RECEPTOR
- PROJECT WIND TURBINE
- STUDY AREA

BASELINE FACILITIES

- AER FACILITY
- AER WELL
- APPROVED PROJECT SUBSTATION
- APPROVED PROJECT TURBINE
- BUFFALO TRAIL SUBSTATION
- BUFFALO TRAIL TURBINE
- CYPRESS SUBSTATION

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1:55,000 KILOMETRES

REFERENCE(S)

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PROJECTED COORDINATE SYSTEM: NAD 1983 UTM ZONE 12N

CLIENT
WILD ROSE 2 WIND INC.

PROJECT
WILD ROSE 2 WIND POWER PROJECT

TITLE
STUDY AREA

CONSULTANT

wsp

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PREPARED	BS
REVIEWED	VY
APPROVED	AF

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3.3 Compliance Criteria

3.3.1 Broadband Noise

Rule 012 requires that broadband noise compliance be assessed by comparing cumulative noise levels to a mandated PSL limit. Appropriate PSL limits for individual receptors are calculated using a desktop technique outlined in Rule 012. The Rule 012 calculation technique accounts for time of day, population density, and proximity to transportation infrastructure such as heavily travelled roads and railways.

For receptors located in areas with population density less than nine dwellings per quarter section and more than 500 m from heavily travelled roads and railways, Rule 012 sets the daytime PSL at 50 A-weighted decibels (dBA) and the nighttime PSL at 40 dBA. These PSL limits are consistent with a quiet rural environment.

The quiet rural environment PSL limits are applicable at both dwelling receptors considered in the Project NIA (i.e., R26 and R27). As noted in Section 3.2 of this report, the Little Plume Church does not qualify as a receptor based on the definition provided in Rule 012. As such, there are no PSL limits appliable to the Little Plume Church. Notwithstanding, the Project NIA treats the Little Plume Church as if it were a dwelling receptor located in a quiet rural environment and applies PSL limits accordingly.

Cumulative noise levels consist of the contribution from:

- natural sources
- non-industrial sources
- industrial facilities that are not regulated by the AUC or AER
- existing AUC/AER-regulated facilities
- approved but not yet constructed AUC/AER-regulated facilities (including the Approved Project)
- proposed facilities that have been deemed complete by the AUC
- the Project

The combined noise contribution from natural sources, non-industrial sources, and unregulated industrial facilities is characterized via an ASL. Although Rule 012 *"…does not require the use of a specific [ASL]…"*, Rule 012 does indicate that *"…[t]he assumed [ASL] is five dBA less than the applicable [PSL]…"* (AUC 2024c).

There are no unregulated industrial facilities with the potential to influence cumulative noise levels in the Study Area. As such, the ASL at receptors considered in the Project NIA is primarily influenced by natural and non-industrial sources (e.g., birds, insects, rustling vegetation, agricultural activities, road traffic). Based on this analysis, it is reasonable for the Project NIA to make use of the assumed ASL values from Rule 012. Please note the Approved Project NIA (WSP Golder 2022) and the supplement noise study for the Approved Project (WSP 2023) both made use of assume ASL values when estimating cumulative noise levels at receptors. Table 3 presents Rule 012 PSL limits and assumed ASL values applicable at each receptor considered in the Project NIA.

Table 3: Permissible Sound Level Limits and Ambient Sound Levels

Receptor Identification Code	Rule 012 Permissible Sound Level (dBA)		Assumed Ambient Sound Level[(a)] (dBA)	
	Daytime	Nighttime	Daytime	Nighttime
R26	50	40	45	35
R27	50	40	45	35
Church	n/a[(b)]	n/a[(b)]	45	35

(a) In accordance with Rule 012, the assumed ASL is 5 dBA less than the applicable PSL.

(b) The Little Plume Church is not a dwelling receptor and thus PSL limits do not apply. However, the Project NIA provides results for the church as if it were a dwelling receptor, based on direction from Wild Rose 2.

n/a = not applicable.

3.3.2 Low Frequency Noise

Low frequency noise (LFN) can be an issue even when broadband noise levels are otherwise acceptable. Consequently, Rule 012 requires a separate assessment of potential LFN impacts. Rule 012 indicates that an LFN issue exists if both of the following conditions are met:

- the value of the cumulative noise level, expressed in C-weighted decibels (dBC), minus the value of the cumulative noise level, expressed in dBA, is greater than or equal to 20
- a clear tone is present in a one-third octave band between 20 Hz and 250 Hz

Rule 012 (AUC 2024c) provides the following definition of a clear tone:

> *"For the one-third octave frequency bands between 20 and 250 Hz and below:*
>
> *a) the linear sound level in one band must be at least 10 dB [decibels] or more above the adjacent bands within two one-third octave band widths*
>
> *b) 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"*

To be clear, Rule 012 requires that both of the above conditions (i.e., a dBC minus dBA difference ≥20 and a clear tone at or below 250 Hz) be present for an LFN issue to exist. Satisfaction of one condition does not result in an LFN issue.

3.4 Noise Prediction Methodology

Computer noise models for the Baseline Case and Application Case were developed using the CadnaA® software package. Consistent with noise modelling conducted for the Approved Project (WSP Golder 2022; WSP 2023), the Baseline Case and Application Case computer models made use of the noise propagation algorithm described in the International Organization for Standardization (ISO) 9613-2 technical standard (ISO 1996).

The computer models were used to calculate Baseline Case and Application Case cumulative noise levels at the receptors listed in Table 2. Inputs to the computer models consisted of source emissions in the form of octave band sound power levels and environmental conditions that are known to influence noise propagation (e.g., ground cover, temperature, humidity, wind conditions).

Noise source emissions for the Baseline Case and the Application Case are discussed in detail in Section 4.1 and Section 4.2 of this report, respectively. A summary of environmental inputs to the computer models is provided in Table 4. Noise modelling parameters in Table 4 are consistent with noise modelling parameters used in the Approved Project NIA (WSP Golder 2022) and in a supplemental noise study filed with the AUC as part of the regulatory process for the Approved Project (WSP 2023).

Table 4: Noise Model Inputs

Parameter	Model Setting[(a)]	Description / Notes
Standard	ISO 9613-2 (ISO 1996)	Models treated noise sources and noise propagation in accordance with this standard.
Ground Factor	0.7 – throughout the Study Area	This value represents the acoustic properties of the ground in accordance with ISO 9613-2.
Temperature / Humidity	10°C / 70% relative humidity	These are typical default conditions for ISO 9613-2 intended to represent nighttime summer conditions.
Wind Conditions	1 to 5 m/s from source to receptor	These represent default ISO 9613-2 wind conditions – moderate temperature inversion, wind from source to receptor 100% of the time.
Terrain	Included	Ground elevation contours at 5 m intervals were included in the models.

(a) Modelling parameters selected for consistency with the Approved Project NIA (WSP Golder 2022) and supplemental noise study for the Approved Project (WSP 2023).

When calculating noise levels at receptors, the ISO 9613-2 algorithm used the environmental inputs listed in Table 4 to account for four noise attenuation mechanisms:

- geometric divergence
- atmospheric absorption
- ground absorption
- screening by barriers

Geometric divergence accounts for the fact that a given noise source radiates a finite amount of acoustic energy and as this finite amount of energy propagates into the environment it is spread out over a larger and larger area (i.e., the surface of an ever-expanding sphere). This geometric spreading means that the farther away a receptor is located from a source, the less energy will be received (i.e., the lower the observed noise level).

Atmospheric absorption accounts for the fact that the acoustic energy associated with a given noise source is absorbed via interaction with molecules in the air through which it propagates. Attenuation effects associated with atmospheric absorption are most substantial at high frequencies but can be important at lower frequencies for large propagation distances.

Ground absorption accounts for the fact that each time the acoustic energy emitted by a noise source interacts with the ground some of it is absorbed. The amount of energy absorbed depends on the type of ground surface. During interactions with the hard ground very little energy is absorbed but during interactions with porous ground a substantial amount of energy is absorbed. As a result, if all other factors are held constant, observed noise levels associated with sources operating in an area of hard ground will be higher than observed noise levels associated with sources operating in an area of porous ground.

Screening by barriers accounts for the fact that a physical object (either terrain-based or anthropogenic) placed between a noise source and receptor can block acoustic energy and reduce observed noise levels at the receptor.

According to the ISO 9613-2 standard (ISO 1996), the overall accuracy of the propagation algorithm used in the Project NIA computer models is ±3 dBA for distances between source and receptor up to 1 km. The accuracy for propagation distances greater than 1 km is not stated in the standard. Model accuracy also depends on the accuracy of the noise emissions inputs, which is often ±2 dBA. Accounting for both these sources of uncertainty, the overall accuracy of the noise level predictions presented in the Project NIA is expected to be ±3.6 dBA. A number of conservative assumptions regarding propagation conditions, Project operations, and Project noise emissions were made to account for the level of uncertainty inherent in the noise level predictions.

Each receptor was assumed to be downwind from each source 100% of the time. Because downwind conditions tend to enhance noise propagation, this assumption is conservative and likely overestimates the noise impact of the Project.

Ground conditions in most of the Study Area meet the definition of porous ground provided in ISO 9613-2: "…ground covered by grass, trees or other vegetation, and all other ground surfaces suitable for the growth of vegetation, such as farming land" (ISO 1996). Visual review of satellite imagery suggests that roads, waterbodies, and other reflective surfaces make up a very small fraction of the Study Area. As such, for consistency with ISO 9613-2 (ISO 1996), a ground factor of 1.0 (or very close to 1.0) should be used in the computer models. Instead, the computer models used a substantially more reflective ground factor of 0.7 to represent conditions in the Study Area. Because reflective ground tends to enhance noise propagation, this approach is conservative and likely overestimates the noise impact of the Project.

The Project wind turbines were modelled with maximum noise emissions 100% of the time. Because Project wind turbines will often operate with less than maximum noise emissions, this modelling approach is conservative and likely overestimates the noise impact of the Project.

Terrain features were the only acoustical screening elements considered in the noise model. Acoustical screening from anthropogenic features (e.g., buildings) and acoustical screening from vegetation were not considered in the computer model. This is a conservative approach to modelling potential Project noise impacts.

4.0 NOISE EMISSIONS

4.1 Baseline Case

Existing, approved, and proposed AER-regulated and AUC-regulated facilities with the potential to influence cumulative noise levels at receptors in the Study Area were identified using information presented in the Approved Project NIA (WSP Golder 2022) and information presented in a supplemental noise study filed with the AUC as part of the regulatory process for the Approved Project (WSP 2023).

There are five AER-regulated facilities with the potential to influence cumulative noise levels at receptors considered in the Project NIA:

- the Pine Cliff Energy Ltd. compressor station located in 01-28-009-04W4
- a Pine Cliff Energy Ltd. well located in 09-15-009-04W4
- two Pine Cliff Energy Ltd. wells located in 07-27-009-04W4
- a Houston Oil & Gas Ltd. well located in 12-27-009-04W4

There are three AUC-regulated facilities with the potential to influence cumulative noise levels at receptors considered in the Project NIA:

- the Approved Project
- the Cypress Wind Power Project
- the Buffalo Trail Wind Power Project

The noise contribution from existing, approved, and proposed AER-regulated and AUC-regulated facilities was modelled using information (i.e., noise emissions and source locations) presented the Approved Project NIA (WSP Golder 2022) and in a supplemental noise study filed with the AUC as part of the regulatory process for the Approved Project (WSP 2023).

Table 5 identifies Baseline Case facilities located considered in the Project NIA and provides corresponding noise emissions in the form of total sound power levels, expressed in dBA. Baseline Case facilities from Table 5 are also shown in Figure 1.

Table 5: Baseline Case Noise Emissions

Baseline Case Facility	Source	Universal Transverse Mercator Coordinates[a] (Zone 12)		Sound Power Level[b] (dBA)
		Easting (m)	Northing (m)	
Pine Cliff Energy Ltd. Compressor Station – AER-Regulated Facility	Filter Building	537403	5511854	69.0
	Inlet Building	537403	5511840	81.0
	Building K420	537403	5511825	103.0
	Building K400	537428	5511831	106.0
	Building K440	537404	5511810	106.0
	Dehydrator	537399	5511802	88.0
	Water Injection Building	537432	5511801	82.0
	Air Compressor	537403	5511854	87.0
Pine Cliff Energy Ltd. Well in 09-15-009-04W4 – AER-Regulated Well	Well	539030	5509479	94.3
Pine Cliff Energy Ltd. Wells in 07-27-009-04W4 – AER-Regulated Well	Well	538568	5512418	94.3
	Well	538568	5512438	94.3
Houston Oil & Gas Ltd. Well in 12-27-009-04W4 – AER-Regulated Well	Well	537822	5512923	94.3
Cypress Wind Power Project – AUC-Regulated Wind Project	56 MVA Substation Transformer	534363	5521077	94.7
	234 MVA Substation Transformer	534358	5521077	103.8

Baseline Case Facility	Source	Universal Transverse Mercator Coordinates[a] (Zone 12)		Sound Power Level[b] (dBA)
		Easting (m)	Northing (m)	
Buffalo Trail Wind Power Project – AUC-Regulated Wind Project	225 MVA Substation Transformer	534121	5524874	103.5
	Turbine #51 (SGRE 5.0/5.2-145)	534067	5526153	106.3
	Turbine #52 (SGRE 5.0/5.2-145)	534373	5525716	106.3
	Turbine #55 (SGRE 5.0/5.2-145)	537205	5522791	106.3
	Turbine #56 (SGRE 5.0/5.2-145)	537210	5522116	106.3
	Turbine #57 (SGRE 5.0/5.2-145)	536716	5521536	106.3
	Turbine #59 (SGRE 5.0/5.2-145)	536130	5523218	106.3
Approved Project – AUC-Regulated Wind Project	275 MVA Substation Transformer	532109	5517493	102.4
	Turbine A05 (SGRE 5.2-145)	536429	5511941	106.3
	Turbine A07 (SGRE 5.2-145)	536041	5516840	106.3
	Turbine A09 (SGRE 5.2-145)	533831	5518370	106.3
	Turbine T01 (SGRE 5.2-145)	527899	5519590	106.3
	Turbine T02 (SGRE 5.2-145)	528000	5519087	106.3
	Turbine T03 (SGRE 5.2-145)	527991	5518649	106.3
	Turbine T04 (SGRE 5.2-145)	531182	5520833	106.3
	Turbine T05 (SGRE 5.2-145)	531474	5520144	106.3
	Turbine T06 (SGRE 5.2-145)	532168	5519290	106.3
	Turbine T07 (SGRE 5.2-145)	532315	5518843	106.3
	Turbine T12 (SGRE 5.2-145)	532098	5516799	106.3
	Turbine T13 (SGRE 5.2-145)	532453	5516414	106.3
	Turbine T15 (SGRE 5.2-145)	533583	5517116	106.3
	Turbine T16 (SGRE 5.2-145)	533808	5516737	106.3
	Turbine T17 (SGRE 5.2-145)	534395	5516405	106.3

Baseline Case Facility	Source	Universal Transverse Mercator Coordinates[a] (Zone 12)		Sound Power Level[b] (dBA)
		Easting (m)	Northing (m)	
	Turbine T18 (SGRE 5.2-145)	534896	5516156	106.3
	Turbine T19 (SGRE 5.2-145)	535510	5515878	106.3
	Turbine T20 (SGRE 5.2-145)	534494	5517964	106.3
	Turbine T21 (SGRE 5.2-145)	534913	5517550	106.3
	Turbine T22 (SGRE 5.2-145)	535503	5517270	106.3
	Turbine T23 (SGRE 5.2-145)	530508	5513883	106.3
	Turbine T24 (SGRE 5.2-145)	536398	5515188	106.3
	Turbine T25 (SGRE 5.2-145)	536468	5514686	106.3
	Turbine T26 (SGRE 5.2-145)	536598	5513725	106.3
	Turbine T27 (SGRE 5.2-145)	536614	5513253	106.3
	Turbine T28 (SGRE 5.2-145)	537273	5513183	106.3
	Turbine T29 (SGRE 5.2-145)	535551	5513016	106.3
	Turbine T30 (SGRE 5.2-145)	536197	5512433	106.3
	Turbine T31 (SGRE 5.2-145)	537348	5512184	106.3
	Turbine T32 (SGRE 5.2-145)	535463	5512398	106.3
	Turbine T33 (SGRE 5.2-145)	535409	5511832	106.3
	Turbine T34 (SGRE 5.2-145)	530743	5513437	106.3
	Turbine T35 (SGRE 5.2-145)	537076	5511169	106.3
	Turbine T36 (SGRE 5.2-145)	537358	5510726	106.3
	Turbine T37 (SGRE 5.2-145)	536875	5510002	106.3
	Turbine T38 (SGRE 5.2-145)	537171	5509679	106.3

(a) Source locations taken from the Approved Project NIA (WSP Golder 2022) and from a supplemental noise study filed with the AUC as part of the regulatory process for the Approved Project (WSP 2023).

(b) Sound power levels taken from the Approved Project NIA (WSP Golder 2022) and from a supplemental noise study filed with the AUC as part of the regulatory process for the Approved Project (WSP 2023).

4.2 Application Case

Project noise sources considered in the Application Case consist of two Siemens Gamesa Renewable Energy SGRE 5.2-145 wind turbines. In accordance with Rule 012, both Project noise sources were modelled using *"…the maximum noise emitted… under the planned maximum operating conditions for both the daytime and nighttime period"* (AUC 2024c).

Noise emissions data for the Project wind turbines were provided by Siemens Gamesa Renewable Energy, the manufacturer. Table 6 presents noise emissions from the Project wind turbines. Noise emissions values are presented in the form of octave band sound power levels, expressed in unweighted decibels (dBZ), and total sound power levels, expressed in dBA. In accordance with Rule 012, noise emissions values presented in Table 6 represent the *"…the maximum noise emitted when the wind turbine operates under the planned maximum operating conditions…"* (AUC 2024c).

Table 6: Application Case Noise Emissions - Project Wind Turbines

Noise Source	Octave Band Sound Power Level (dBZ)									Total Sound Power Level (dBA)
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Siemens Gamesa Renewable Energy SGRE 5.2-145 wind turbine; operating mode AM+1	117.3	115.9	110.9	106.4	102.1	100.7	99.1	93.1	81.7	106.3

As discussed in Section 3.3.2 of this report, Rule 012 sets out a two-part test for LFN issues. The second part of the LFN test requires the presence of a clear tone in a one-third octave band between 20 Hz and 250 Hz. Rule 012 sets out a specific procedure for testing for a clear tone. If there is no such tone, then no LFN issues can exist.

The Rule 012 procedure for identifying a clear tone was applied to the manufacturer-supplied one-third octave band noise emissions for the Project wind turbines. Based on the Rule 012 definition, noise emissions from the Siemens Gamesa SG 5.0-145 wind turbines do not include a clear tone. As such, Project noise sources are not expected to produce LFN issues, regardless of the outcome of the first part of the LFN test. In other words, even if the difference between dBC and dBA noise levels was found to be greater than 20, the absence of a clear tone in the Project noise emissions precludes the presence of a LFN issue related to the Project.

5.0 ASSESSMENT RESULTS

5.1 Baseline Case

5.1.1 Broadband Noise

Baseline Case cumulative noise levels consist of the ASL, which represents noise from natural and non-industrial sources, and noise from AER-regulated and AUC-regulated facilities. AER-regulated and AUC-regulated Baseline Case facilities were characterized using the information summarized in Section 4.1 of this report. Baseline Case cumulative noise levels are presented in Table 7 for all receptors considered in the Project NIA.

Table 7: Baseline Case Cumulative Noise Levels

Receptor Identification Code	Ambient Sound Level (dBA)		Baseline Case Facility Contribution (dBA)				Baseline Case Cumulative Noise Level (dBA)	
	Daytime	Nighttime	AER-Regulated	Cypress Wind Power Project	Buffalo Trail Wind Power Project	Approved Project	Daytime	Nighttime
R26	45	35	nil[(a)]	nil[(a)]	nil[(a)]	35.7	45.5	38.4
R27	45	35	nil[(a)]	nil[(a)]	nil[(a)]	34.9	45.4	38.0
Church	45	35	nil[(a)]	nil[(a)]	nil[(a)]	33.3	45.3	37.2

(a) Noise level too small to be meaningfully quantified.

Baseline Case compliance with Rule 012 is assessed in Table 8 by comparing cumulative noise levels to applicable PSL limits. Table 8 shows that Baseline Case cumulative noise levels at all receptors are predicted to comply with Rule 012 during the daytime period and the nighttime period.

Table 8: Baseline Case Broadband Noise Assessment

Receptor Identification Code	Baseline Case Cumulative Noise Level[(a)] (dBA)		Permissible Sound Level (dBA)		Margin of Compliance[(b)] (dBA)		Compliance Assessment
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	
R26	46	38	50	40	4	2	compliant
R27	45	38	50	40	5	2	compliant
Church	45	37	n/a[(c)]	n/a[(c)]	n/a[(c)]	n/a[(c)]	n/a[(c)]

(a) In accordance with Rule 012, Baseline Case cumulative noise levels from Table 7 have been rounded to the nearest whole number before comparison to applicable PSL limits.

(b) Margin of compliance calculated as PSL minus Baseline Case cumulative noise level.

(c) The Little Plume Church is not a dwelling receptor and thus PSL limits do not apply. However, the Project NIA treats the church as if it were a dwelling receptor, based on direction from Wild Rose 2.

n/a = not applicable.

5.1.2 Low Frequency Noise

As discussed in Section 3.3.2 of this report, Rule 012 sets out a two-part test for LFN issues. The first part of the LFN test compares noise levels expressed in dBA to noise levels expressed in dBC. It is understood that the first part of the LFN test should be applied to cumulative noise levels (i.e., noise levels that include the contribution from natural and non-industrial sources and from industrial facilities); however, Rule 012 does not provide ASL values in dBC. Therefore, when applying the first part of the LFN test, it is necessary to omit the noise contribution from natural and non-industrial sources.

Table 9 presents a Baseline Case LFN analysis based on the first part of two-part LFN test and omitting the contribution from natural and non-industrial sources. Noise emissions from all Baseline Case facilities are understood to be consistent 24 hours per day; as such, there is no need to perform separate LFN analyses for the daytime and nighttime periods.

Results from Table 9 indicate the difference between Baseline Case noise levels expressed in dBC and dBA is greater than 20 for all three receptors considered in the Project NIA. At these receptors, a potential for Baseline Case LFN issues could exist based on the first part of the Rule 012 LFN test. However, it is likely that the difference between Baseline Case dBA and dBC noise levels would be reduced if ASL values were included in the LFN analysis.

More importantly, the first part of the LFN test only identifies potential LFN issues. As discussed in Section 3.3.2 of this report, both the first part and the second part of the Rule 012 LFN test must be satisfied for a LFN issue to exist. Table 9 indicates that the Approved Project is most important contributor to Baseline Case noise levels, and detailed analysis of one-third octave band noise emissions data for the wind turbines associated with the Approved Project showed no clear tones that would satisfy the second part of the Rule 012 LFN test (WSP Golder 2022). As such, there is no potential for LFN issues associated with Baseline Case facilities, regardless of the outcome of the first part of the LFN test.

Table 9: Baseline Case Low Frequency Noise Analysis

Receptor Identification Code	A-Weighted Noise Levels (dBA)					C-Weighted Noise Levels (dBC)					Difference: dBC minus dBA	Rule 012 LFN Threshold
	AER-Regulated	Cypress Wind Power Project	Buffalo Trail Wind Power Project	Approved Project	Total	AER-Regulated	Cypress Wind Power Project	Buffalo Trail Wind Power Project	Approved Project	Total		
R26	nil[(a)]	nil[(a)]	nil[(a)]	35.7	35.7	nil[(a)]	nil[(a)]	nil[(a)]	56.4	56.4	20.7	20
R27	nil[(a)]	nil[(a)]	nil[(a)]	34.9	34.9	nil[(a)]	nil[(a)]	nil[(a)]	55.8	55.8	20.9	20
Church	nil[(a)]	nil[(a)]	nil[(a)]	33.3	33.3	nil[(a)]	nil[(a)]	nil[(a)]	54.1	54.1	20.8	n/a[(b)]

(a) Noise contribution too small to be meaningfully quantified.

(b) The Little Plume Church is not a dwelling receptor and thus the LFN threshold does not apply. However, the Project NIA provides results for the church as if it were a dwelling receptor, based on direction from Wild Rose 2.

n/a = not applicable.

5.2 Application Case

5.2.1 Broadband Noise

Application Case cumulative noise levels were calculated by summing Baseline Case cumulative noise levels with the predicted noise contribution from the Project under planned maximum operating conditions. The noise contribution from the Project was predicted using a computer noise model, which is described in Section 3.4 of this report, and noise emissions values presented in Section 4.2 of this report. Application Case cumulative noise levels are presented in Table 10 for all receptors considered in the Project NIA. Figure 2 presents noise level contours for the Project in isolation from other sources.

Table 10: Application Case Cumulative Noise Levels

Receptor Identification Code	Baseline Case Cumulative Noise Level (dBA)		Project Noise Level (dBA)	Application Case Cumulative Noise Level (dBA)	
	Daytime	Nighttime		Daytime	Nighttime
R26	45.5	38.4	29.3	45.6	38.9
R27	45.4	38.0	28.6	45.5	38.5
Church	45.3	37.2	30.6	45.4	38.1

530000 531000 532000 533000

5518000 5517000 5516000 5515000 5514000

TOWNSHIP ROAD 102

TOWNSHIP ROAD 100

RANGE ROAD 50

EAGLE BUTTE ROAD

TWP 010

TWP 009

RGE 05

RGE 04

11 12 2 1 35 36

KEY MAP

FORT MCMURRAY
GRANDE PRAIRIE
ALBERTA
EDMONTON
CALGARY

T10
T11
R26
R27
Church

LEGEND

- LOCAL ROAD
- WATERCOURSE
- WATERBODY
- NOISE RECEPTOR
- PROJECT WIND TURBINE
- STUDY AREA

BASELINE FACILITIES

- APPROVED PROJECT SUBSTATION
- APPROVED PROJECT TURBINE

PREDICTED PROJECT NOISE LEVELS [dBA]

- 30-35
- 35-40
- 40-45
- 45-50
- >50

0 0.25 0.5
1:15,000 KILOMETRES

REFERENCE(S)

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PROJECTED COORDINATE SYSTEM: NAD 1983 UTM ZONE 12N

CLIENT
WILD ROSE 2 WIND INC.

PROJECT
WILD ROSE 2 WIND POWER PROJECT

TITLE
PROJECT NOISE LEVELS

CONSULTANT
wsp

YYYY-MM-DD	2024-10-02
DESIGNED	VY
PREPARED	BS
REVIEWED	VY
APPROVED	AF

PROJECT NO. CA0041404.4929 | CONTROL | REV. 0 | FIGURE 2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

Application Case compliance with Rule 012 is assessed in Table 11 by comparing cumulative noise levels to applicable PSL limits. Table 11 shows that Application Case cumulative noise levels at all receptors are predicted to comply with Rule 012 during the daytime period and the nighttime period.

Table 11: Application Case Broadband Noise Assessment

Receptor Identification Code	Application Case Cumulative Noise Level[a] (dBA)		Permissible Sound Level (dBA)		Margin of Compliance[b] (dBA)		Compliance Assessment
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime	
R26	46	39	50	40	4	1	compliant
R27	46	39	50	40	4	1	compliant
Church	45	38	n/a[c]	n/a[c]	n/a[c]	n/a[c]	n/a[c]

(a) In accordance with Rule 012, Application Case cumulative noise levels from Table 10 have been rounded to the nearest whole number before comparison to applicable PSL limits.

(b) Margin of compliance calculated as PSL minus Application Case cumulative noise level.

(c) The Little Plume Church is not a dwelling receptor and thus PSL limits do not apply. However, the Project NIA provided results for the church as if it were a dwelling receptor, based on direction from Wild Rose 2.

n/a = not applicable.

5.2.2 Low Frequency Noise

As discussed in Section 4.2 of this report, there are no clear tones in the noise emissions spectra of the Project wind turbines that satisfy the second part of the Rule 012 LFN test. As such, the Project is not expected to produce LFN issues, regardless of the outcome of the first part of the LFN test.

Notwithstanding the fact that the Project is not expected to produce LFN issues, Application Case LFN analysis was completed based on the first part of the Rule 012 LFN test. Table 12 presents the difference between dBA and dBC noise levels for each receptor. Natural and non-industrial sources must be omitted from the LFN analysis because Rule 012 does not provide ASL values in dBC.

Results from Table 12 suggest the difference between predicted Application Case noise levels expressed in dBA and dBC is greater than or equal to 20 for all three receptors. It should be noted the LFN analysis presented in Table 12 omits the ASL (i.e., the noise contribution from natural and non-industrial sources). If the ASL could be included in the LFN analysis, it is likely the predicted difference between dBA and dBC noise levels would be reduced. Moreover, Rule 012 explicitly states that the LFN analysis *"…in predictive noise impact assessments is for information purposes only"* (AUC 2024c). Most importantly, the absence of a clear tone in the noise emissions spectra for the Project wind turbines precludes the presence of a LFN issue for the Project.

Table 12: Application Case Low Frequency Noise Analysis

Receptor Identification Code	A-Weighted Noise Level (dBA)			C-Weighted Noise Level (dBC)			Difference: dBC minus dBA	Rule 012 LFN Threshold
	Baseline Case	Project	Total	Baseline Case	Project	Total		
R26	35.7	29.3	36.6	56.4	49.5	57.2	20.6	20
R27	34.9	28.6	35.8	55.8	49.0	56.6	20.8	20
Church	33.3	30.6	35.2	54.1	50.5	55.7	20.5	n/a[a]

(a) The Little Plume Church is not a dwelling receptor and thus the LFN threshold does not apply. However, the Project NIA treats the church as if it were a dwelling receptor, based on direction from Wild Rose 2.

n/a = not applicable.

6.0 SUMMARY AND DISUCSSION

A NIA was conducted for the Project to meet the requirements of Rule 007. The Project NIA was conducted in accordance with assessment methods presented in Rule 012. The NIA characterized potential noise impacts from the Project in the context of broadband and LFN compliance criteria specified by Rule 012. As required by Rule 012, the Project NIA assessed *"…the maximum noise emitted when the wind turbine operates under the planned maximum operating conditions for both the daytime and nighttime period"* (AUC 2024c).

For both the daytime period and the nighttime period, the Project NIA predicts that Application Case cumulative noise levels (which include the contribution from natural and non-industrial sources, existing, approved, and proposed industrial facilities, and the Project) will comply with applicable Rule 012 PSL limits for all receptors. The Project NIA also predicts there will be no LFN issues at any receptors. In other words, the Project NIA predicts daytime and nighttime compliance with applicable broadband and LFN criteria for all receptors.

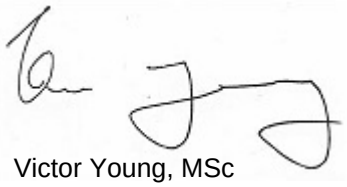
7.0 ACOUSTICAL PRACTITIONER INFORMATION

Andrew Faszer, PEng, INCE, was responsible for senior technical review of emissions calculations, modelling, and reporting related to the Project NIA. Andrew is a senior engineer with a broad environmental and industrial background, and over 20 years of consulting experience. Andrew's experience includes noise studies for oil and gas developments, conventional and wind power projects, industrial, and mining projects.

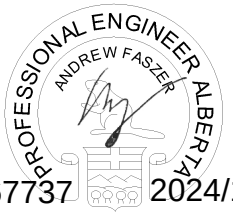
Victor Young, MSc, performed noise emissions calculations, developed computer noise models, and authored the Project NIA report. Victor has worked as an acoustic scientist in Alberta for more than 13 years. During this time, Victor has been involved in a variety of energy, utilities, and mining projects throughout Western Canada. Victor's experience includes field measurements and data analysis, computer noise modelling, and preparation of noise assessment reports.

Signature Page

WSP Canada Inc.



Victor Young, MSc
Acoustic Scientist



67737 2024/10/02

Andrew Faszer, PEng, INCE
Senior Engineer

VY/AF/jr

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8.0 REFERENCES

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