REPORT

Wild Rose 2 Wind Power Project

Noise Impact Assessment Update

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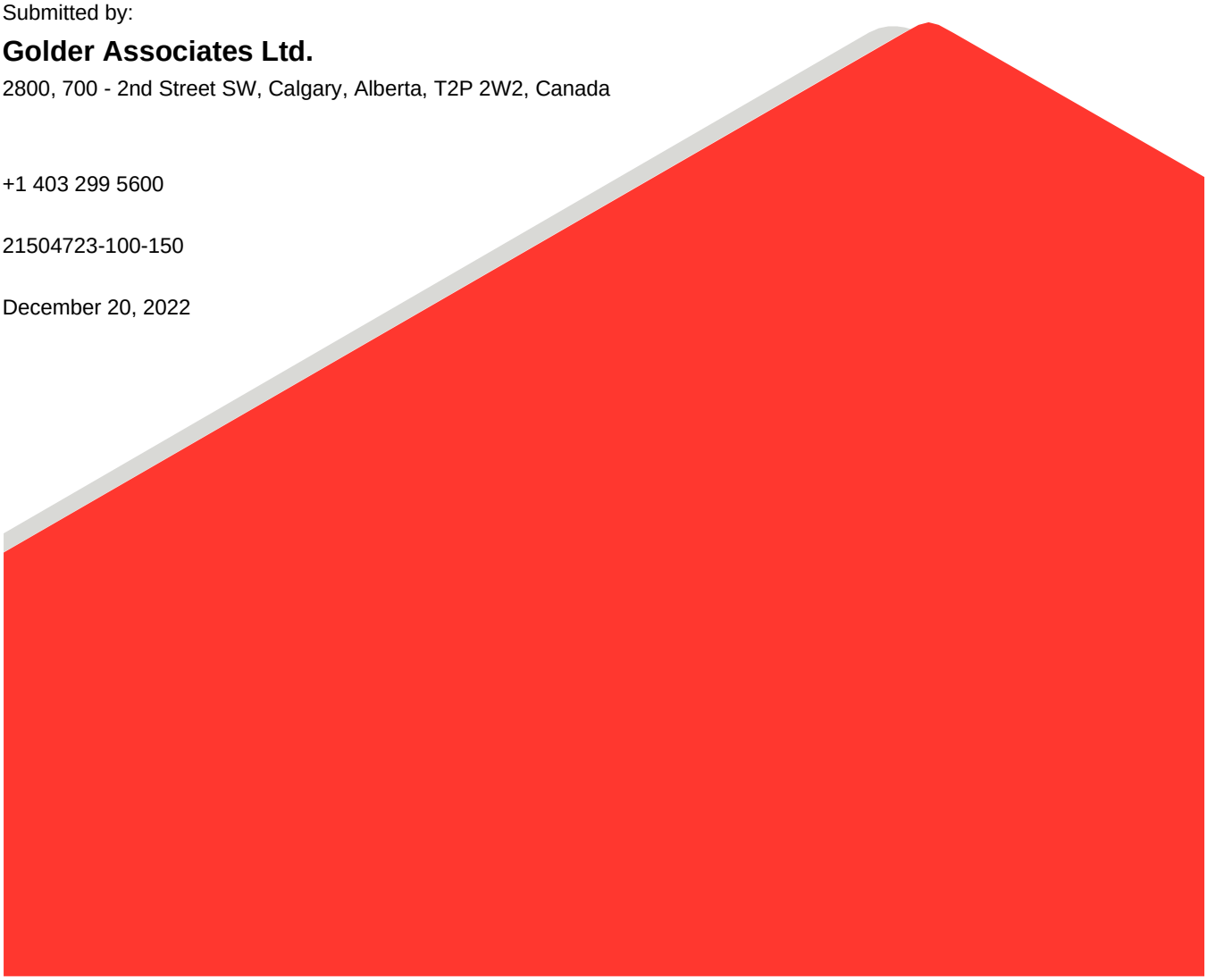
December 20, 2022



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1.0 INTRODUCTION

Wild Rose 2 Wind LP (Wild Rose 2) are owners of the approved by not yet constructed Wild Rose 2 Wind Power Project (the Project), which will be located in Cypress County, Alberta, approximately 30 km southeast of Medicine Hat. The Alberta Utilities Commission (AUC) approved the Project in April 2017 (AUC 2017), and approved requests to extend the Project development schedule in October 2019 (AUC 2019) and November 2020 (AUC 2020).

The version of the Project approved by the AUC (the Approved Project) consists of 60 Siemens SWT 3.2-113 wind turbine generators, each with a nominal power rating of 3.2 MW, a collector system, and an electrical substation consisting of two step-up transformers, each with a nominal power rating of 115 megavolt-amperes (MVA) (AUC 2017).

Wild Rose 2 is now proposing changes to the Approved Project design (the Updated Project). The Updated Project will consist of 38 Siemens Gamesa SG 5.0-145 wind turbine generators, each with a nominal power rating of 5.2 MW, a collector system, and an electrical substation consisting of one step-up transformer with a nominal power rating of 275 MVA.

Power generating facilities in Alberta are regulated by the AUC through Rule 007 (AUC 2022) and Rule 012 (AUC 2021a). Rule 007 sets out general requirements for regulatory applications and Rule 012 provides specific methods and criteria for assessment potential environmental noise impacts.

A noise impact assessment (NIA) for the Approved Project was prepared GL Garrad Hassan Canada Inc. in October 2016 (DNV-GL 2016). Wild Rose 2 has now retained Golder Associates Ltd. (WSP Golder) to prepare a NIA for the Updated Project, in accordance with Rule 012.

The results of WSP Golder's NIA for the Updated Project are presented in this report. This report is structured as follows:

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

- Appendix A consists of manufacturer-supplied tables showing total and one-third octave band noise emissions for the Updated Project wind turbine generators.
- Appendix B compares noise levels predicted for the Updated Project to noise levels predicted for the Approved Project.

2.0 PROJECT DESCRIPTION

The Updated Project will consist of 38 Siemens Gamesa SG 5.0-145 wind turbine generators, along with a collector system and electrical substation. The Updated Project wind turbine generators will have a hub height of 95.5 m. Each Updated Project wind turbine generator will operate in AM+1 (i.e., 5.2 MW) operating mode during the daytime period, defined by Rule 012 as 7 am to 10 pm, and during the nighttime period, defined by Rule 012 as 10 pm to 7 am (AUC 2021a).

The major noise source associated with the Updated Project substation will be a step-up transformer with a power rating of 275 MVA. Maximum noise emissions from the Updated Project substation will occur when the transformer operates in Oil Natural Air-Forced 2nd-Stage Cooling (ONAF2) mode.

Table 1 presents locations and operating modes for Updated Project noise sources. Each Updated Project wind turbine generator will have its operating mode configured to match the operating plan described in Table 1. As required by Rule 012, the operating modes specific 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 2021a).

Table 1: Updated 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
Substation	One 275 MVA transformer	532109	5517493	ONAF2	ONAF2
T01	Siemens Gamesa SG 5.0-145 wind turbine generator	527898	5519590	AM+1	AM+1
T02	Siemens Gamesa SG 5.0-145 wind turbine generator	527999	5519088	AM+1	AM+1
T03	Siemens Gamesa SG 5.0-145 wind turbine generator	528388	5518746	AM+1	AM+1
T04	Siemens Gamesa SG 5.0-145 wind turbine generator	531181	5520834	AM+1	AM+1
T05	Siemens Gamesa SG 5.0-145 wind turbine generator	531473	5520144	AM+1	AM+1
T06	Siemens Gamesa SG 5.0-145 wind turbine generator	532100	5519290	AM+1	AM+1
T07	Siemens Gamesa SG 5.0-145 wind turbine generator	532347	5518691	AM+1	AM+1
T10	Siemens Gamesa SG 5.0-145 wind turbine generator	531124	5515547	AM+1	AM+1
T11	Siemens Gamesa SG 5.0-145 wind turbine generator	531514	5515106	AM+1	AM+1

Table 1: Updated 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
T12	Siemens Gamesa SG 5.0-145 wind turbine generator	532098	5516799	AM+1	AM+1
T13	Siemens Gamesa SG 5.0-145 wind turbine generator	532453	5516414	AM+1	AM+1
T15	Siemens Gamesa SG 5.0-145 wind turbine generator	533515	5517273	AM+1	AM+1
T16	Siemens Gamesa SG 5.0-145 wind turbine generator	533823	5516805	AM+1	AM+1
T17	Siemens Gamesa SG 5.0-145 wind turbine generator	534395	5516406	AM+1	AM+1
T18	Siemens Gamesa SG 5.0-145 wind turbine generator	534895	5516156	AM+1	AM+1
T19	Siemens Gamesa SG 5.0-145 wind turbine generator	535509	5515879	AM+1	AM+1
T20	Siemens Gamesa SG 5.0-145 wind turbine generator	534493	5517965	AM+1	AM+1
T21	Siemens Gamesa SG 5.0-145 wind turbine generator	534912	5517550	AM+1	AM+1
T22	Siemens Gamesa SG 5.0-145 wind turbine generator	535579	5517271	AM+1	AM+1
T23	Siemens Gamesa SG 5.0-145 wind turbine generator	530509	5513883	AM+1	AM+1
T24	Siemens Gamesa SG 5.0-145 wind turbine generator	536397	5515189	AM+1	AM+1
T25	Siemens Gamesa SG 5.0-145 wind turbine generator	536467	5514687	AM+1	AM+1
T26	Siemens Gamesa SG 5.0-145 wind turbine generator	536358	5513664	AM+1	AM+1
T27	Siemens Gamesa SG 5.0-145 wind turbine generator	536613	5513254	AM+1	AM+1
T28	Siemens Gamesa SG 5.0-145 wind turbine generator	537272	5513184	AM+1	AM+1
T29	Siemens Gamesa SG 5.0-145 wind turbine generator	535550	5513017	AM+1	AM+1
T30	Siemens Gamesa SG 5.0-145 wind turbine generator	536196	5512434	AM+1	AM+1
T31	Siemens Gamesa SG 5.0-145 wind turbine generator	537348	5512185	AM+1	AM+1
T32	Siemens Gamesa SG 5.0-145 wind turbine generator	535462	5512399	AM+1	AM+1
T33	Siemens Gamesa SG 5.0-145 wind turbine generator	535408	5511832	AM+1	AM+1
T34	Siemens Gamesa SG 5.0-145 wind turbine generator	530743	5513437	AM+1	AM+1

Table 1: Updated 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
T35	Siemens Gamesa SG 5.0-145 wind turbine generator	537076	5511170	AM+1	AM+1
T36	Siemens Gamesa SG 5.0-145 wind turbine generator	537357	5510727	AM+1	AM+1
T37	Siemens Gamesa SG 5.0-145 wind turbine generator	536874	5510003	AM+1	AM+1
T38	Siemens Gamesa SG 5.0-145 wind turbine generator	537170	5509680	AM+1	AM+1
A05	Siemens Gamesa SG 5.0-145 wind turbine generator	536428	5511942	AM+1	AM+1
A07	Siemens Gamesa SG 5.0-145 wind turbine generator	533095	5517640	AM+1	AM+1
A09	Siemens Gamesa SG 5.0-145 wind turbine generator	533671	5518360	AM+1	AM+1

a) Planned operating mode corresponding to maximum noise emissions.

A map showing the locations of Updated Project noise sources is presented in Section 3.2 of this report (see Figure 1). Additional details on noise emissions from Updated Project noise sources are provided in Section 4.2 and Appendix A of this report. The noise emissions data in Appendix A were provided by Siemens Gamesa, the manufacturer of the Updated Project wind turbine generators.

3.0 ASSESSMENT APPROACH

The purpose of the Updated Project NIA is to assess potential environmental noise impacts from the Updated 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, or from the boundary of [the] substation…"* (AUC 2021a). 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 Updated Project under "…planned maximum operating conditions…" (AUC 2021a)

3.1 Assessment Cases

The Updated 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, 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 Updated 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 (DNV-GL 2016), information from publicly available regulatory applications (RWDI 2021a; RWDI 2021b), information from AER databases (AER 2022a; AER 2022b), and WSP Golder's professional judgment. Noise contributions from the Updated Project were predicted using a computer model developed in accordance with a widely accepted calculation standard for the propagation of environmental noise (ISO 1996). Updated Project noise sources were modelled under *"…planned maximum operating conditions…"* (AUC 2021a).

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

3.2 Noise 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, or from the boundary of [the] substation…"* (AUC 2021a). In accordance with Rule 012, the Updated Project NIA established a Receptor Search Area using a 1.5 km buffer on Updated Project noise sources and assessed potential noise impacts at all occupied dwellings located within this Receptor Search Area.

Potential receptors within the Receptor Search Area were identified using publicly available satellite imagery, information presented in the NIA for the Approved Project (DNV-GL 2016), information presented in regulatory applications for existing, approved, and proposed industrial facilities in the area (RWDI 2021a; RWDI 2021b), and information provided by Wild Rose 2. A total of 21 occupied dwellings were identified within the 1.5 km of Updated Project noise sources and treated as receptors in the Updated Project NIA. Note that because the Approved Project consists of a larger number of wind turbine generators spread across a larger spatial area than the Updated Project, the Approved Project NIA included a larger number of receptors than the Updated Project NIA (i.e., 49 receptors in the Approved Project NIA vs. 21 receptors in the Updated Project NIA).

A 5 km buffer on the 21 receptors was established as the Noise Study Area for the Updated Project NIA. As discussed in more detail in Section 4.1 of this report, the Noise Study Area was used to identify existing, approved, and proposed industrial facilities with the potential to influence cumulative noise levels at receptors considered in the Updated Project NIA.

Table 2 presents locations and heights for the 21 receptors considered in the Updated Project NIA. For each receptor, Table 2 also identifies and provides the distance to the closest Updated Project wind turbine generator. Please note that receptors that were included in the Approved Project NIA but are beyond the Receptor Search Area for the Updated Project NIA are addressed in Appendix B of this report.

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 2021a). In accordance with this guidance, the Updated Project NIA modelled the 20 receptors corresponding to one-storey dwellings at 1.5 m above ground and modelled the one receptor corresponding to a two-storey dwelling at 4.5 m above ground to match the height at which bedroom noise exposure is expected to occur.

Figure 1 presents a map showing the Updated Project noise sources (wind turbine generators and substation), the Receptor Search Area (i.e., a 1.5 km buffer on Updated Project noise sources), the 21 receptors located within the Receptor Search Area, and the Noise Study Area (i.e., a 5 km buffer on the noise receptors). Figure 1 also shows the existing, approved, and proposed industrial facilities that are located within the Noise Study Area. Additional detail on these facilities is presented in Section 4.1 of this report.

Table 2: Noise Receptors

Receptor Identification Code[a]	Receptor Description	Universal Transverse Mercator Coordinates (Zone 12)		Receptor Height (m)	Closest Updated Project Wind Turbine	Distance to Closest Updated Project Wind Turbine (m)
		Easting (m)	Northing (m)			
R01	occupied one-storey dwelling	531357	5522150	1.5	T04	1,328
R03	occupied one-storey dwelling	530032	5520760	1.5	T04	1,151
R04	occupied one-storey dwelling	530025	5520370	1.5	T04	1,246
R05	occupied one-storey dwelling	532473	5519970	1.5	T06	776
R07	occupied one-storey dwelling	529165	5519210	1.5	T03	905
R08	occupied one-storey dwelling	534431	5519140	1.5	A09	1,089
R09	occupied one-storey dwelling	533361	5519060	1.5	A09	766
R12[b]	occupied one-storey dwelling	531072	5518040	1.5	T07	1,432
R13[c]	occupied two-storey dwelling	531085	5518010	4.5	T07	1,434
R14	occupied one-storey dwelling	528246	5517920	1.5	T03	838
R17	occupied one-storey dwelling	527856	5517720	1.5	T03	1,156
R23	occupied one-storey dwelling	531251	5516250	1.5	T10	714

Table 2: Noise Receptors

Receptor Identification Code[a]	Receptor Description	Universal Transverse Mercator Coordinates (Zone 12)		Receptor Height (m)	Closest Updated Project Wind Turbine	Distance to Closest Updated Project Wind Turbine (m)
		Easting (m)	Northing (m)			
R25	occupied one-storey dwelling	529829	5515580	1.5	T10	1,295
R26	occupied one-storey dwelling	532750	5515539	1.5	T13	924
R27	occupied one-storey dwelling	532807	5515430	1.5	T13	1,046
R28	occupied one-storey dwelling	537446	5515420	1.5	T24	1,074
R29	occupied one-storey dwelling	534057	5515050	1.5	T18	1,388
R30	occupied one-storey dwelling	534830	5514990	1.5	T19	1,119
R33	occupied one-storey dwelling	531330	5514040	1.5	T23	836
R34	occupied one-storey dwelling	538605	5513840	1.5	T28	1,486
R47	occupied one-storey dwelling	537417	5508850	1.5	T38	866

a) Receptor identification codes are consistent with the Approved Project NIA (DNV-GL 2016). Receptor identification codes in Table 2 are non-continuous because the Approved Project NIA included a larger number of receptors (49) than the Updated Project NIA (21).

b) This receptor is 1,172 m from the Updated Project substation.

c) This receptor is 1,147 m from the Updated Project substation.

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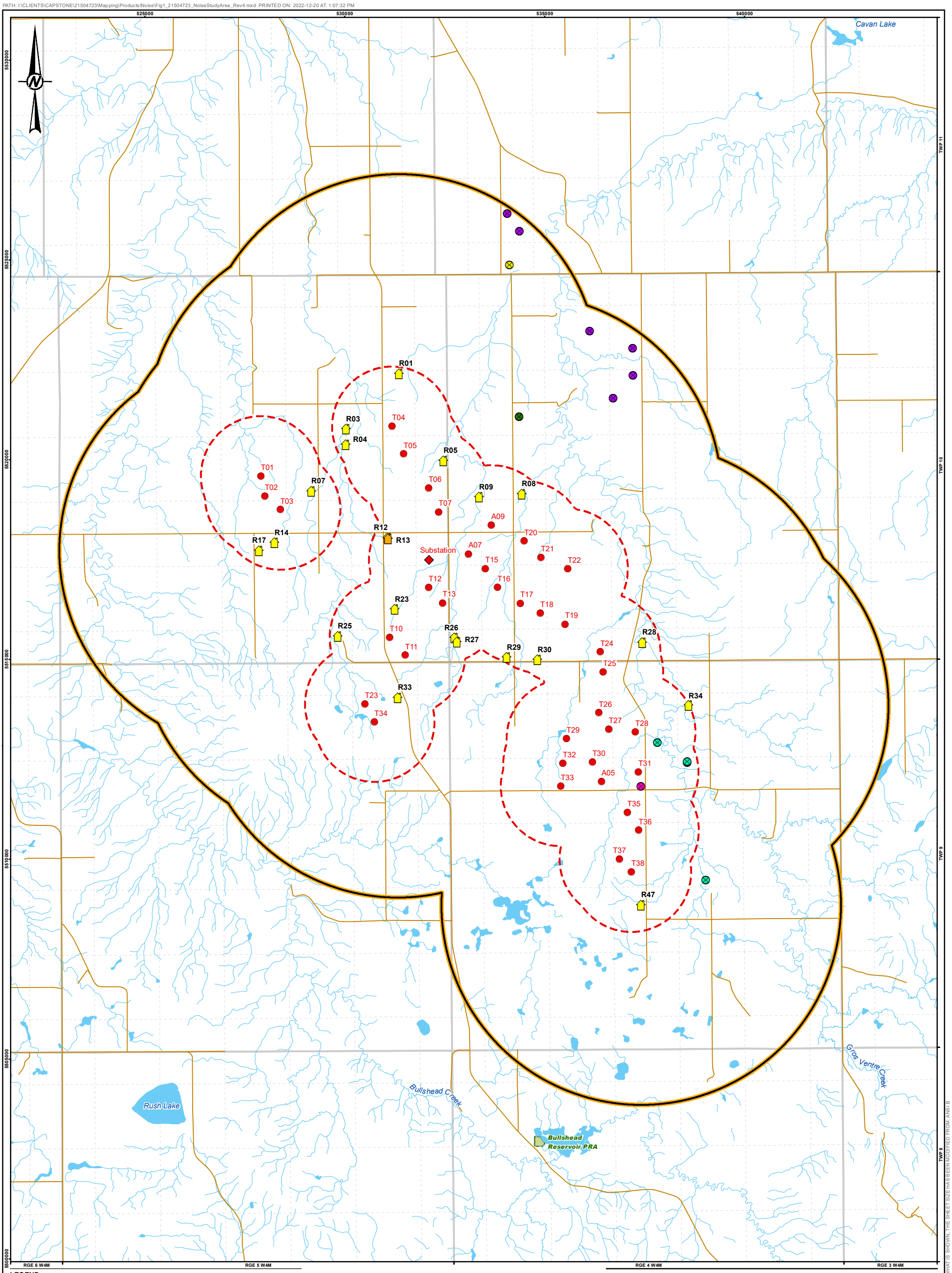

LEGEND

- LOCAL ROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- WATERBODY

BASELINE FACILITIES

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

NOISE RECEPTORS

- ONE-STOREY
- TWO-STOREY

PROJECT NOISE SOURCES

- SUBSTATION
- TURBINE
- NOISE STUDY AREA
- RECEPTOR SEARCH AREA

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1:90,000 KILOMETRES

REFERENCE(S)

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PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT
WILD ROSE 2 WIND LP

PROJECT
WILD ROSE 2 WIND POWER PROJECT

TITLE
NOISE STUDY AREA

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-12-20
DESIGNED	VY
PREPARED	LB
REVIEWED	VY
APPROVED	AF

PROJECT NO.	PHASE	REV.	FIGURE
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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 all 21 noise receptors considered in the Updated Project NIA.

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
- proposed facilities that have been deemed complete by the AUC
- the Updated 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 2021a).

There are no unregulated industrial facilities within the Noise Study Area (i.e., no unregulated industrial facilities within 5 km of the 21 receptors considered in the Updated Project NIA). As such, the ASL at receptors considered in the Updated 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 Updated Project NIA to make use of the assumed ASL values from Rule 012. Table 3 presents Rule 012 PSL limits and assumed ASL values applicable at each receptor considered in the Updated Project NIA.

Table 3: Permissible Sound Levels and Ambient Sound Levels

Receptor Identification Code	Rule 012 Permissible Sound Level (dBA)		Assumed Ambient Sound Level[(a)] (dBA)	
	Daytime	Nighttime	Daytime	Nighttime
R01	50	40	45	35
R03	50	40	45	35
R04	50	40	45	35
R05	50	40	45	35
R07	50	40	45	35
R08	50	40	45	35

Table 3: Permissible Sound Levels and Ambient Sound Levels

Receptor Identification Code	Rule 012 Permissible Sound Level (dBA)		Assumed Ambient Sound Level[a] (dBA)	
	Daytime	Nighttime	Daytime	Nighttime
R09	50	40	45	35
R12	50	40	45	35
R13	50	40	45	35
R14	50	40	45	35
R17	50	40	45	35
R23	50	40	45	35
R25	50	40	45	35
R26	50	40	45	35
R27	50	40	45	35
R28	50	40	45	35
R29	50	40	45	35
R30	50	40	45	35
R33	50	40	45	35
R34	50	40	45	35
R47	50	40	45	35

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

3.3.2 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 at or below 250 Hz

Rule 012 (AUC 2021a) 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 (version 4.6.155). In accordance with Rule 012, CadnaA® implements 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 (DNV-GL 2016).

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 Noise Study Area	This value represents the acoustic properties of the ground in accordance with ISO 9613-2.
Temperature / Humidity	10^0C / 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 (DNV-GL 2016).

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, the overall accuracy of the propagation algorithm used in the Updated 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 this Updated 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 Updated Project.

Ground conditions in most of the Noise 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 Noise Study Area. As such, for consistency with ISO 9613-2, 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 Noise Study Area. Because reflective ground tends to enhance noise propagation, this approach is conservative and likely overestimates the noise impact of the Updated Project.

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

4.0 NOISE EMISSIONS

4.1 Baseline Case

AER-regulated facilities within the noise study area for the Updated Project NIA were identified using AER databases (AER 2022a; AER 2022b) and information presented in the Approved Project NIA (DNV-GL 2016). There are a total of five AER-regulated facilities with the potential to influence cumulative noise levels at receptors considered in the Updated Project NIA:

- the Pine Cliff Energy Ltd. compressor station located in 01-28-009-04W4:
  - this facility was included in the Approved Project NIA (DNV-GL 2016) as the “Encana Eagle Butte Compressor Facility”
  - WSP Golder’s review of AER databases (AER 2022a; AER 2022b) confirmed this facility is still active
- a Pine Cliff Energy Ltd. well located in 09-15-009-04W4:
  - this well was not included in the Approved Project NIA (DNV-GL 2016)
  - this well was identified during WSP Golder’s review of AER databases (AER 2022a; AER 2022b)
- two Pine Cliff Energy Ltd. wells located in 07-27-009-04W4:
  - these wells were not included in the Approved Project NIA (DNV-GL 2016)
  - these wells were identified during WSP Golder’s review of AER databases (AER 2022a; AER 2022b)
- a Houston Oil & Gas Ltd. well located in 12-27-009-04W4:
  - this well was not included in the Approved Project NIA (DNV-GL 2016)
  - this well was identified during WSP Golder’s review of AER databases (AER 2022a; AER 2022b)

AUC-regulated facilities within the Noise Study Area for the Updated Project NIA were identified using the AUC eFiling system. Two potentially relevant AUC-regulated facilities were identified:

- the approved but not yet constructed Cypress Wind Power Project:
  - the noise contribution from the Cypress Wind Power Project was modelled using information (i.e., noise emissions and source locations) presented the most recent NIA available on AUC eFiling (RWDI 2021a)
  - the Cypress Wind Power Project substation is located within the Noise Study Area for the Updated Project NIA but none of the Cypress Wind Power Project wind turbine generators are located within the Noise Study Area for the Updated Project NIA
- the proposed Buffalo Trail Wind Power Project:
  - the AUC has closed the application for this facility without issuing an approval (AUC 2021b), so this facility need not be considered when assessing cumulative noise levels
  - nevertheless, because the AUC has given the applicant leave to resubmit their application without prejudice, the noise contribution from the Buffalo Trail Wind Power Project was modelled using information (i.e., noise emission and source locations) presented in the most recent NIA available on AUC eFiling (RWDI 2021b)

- including the Buffalo Trail Wind Power Project in the cumulative noise levels represents a conservative approach to assessing compliance for the Wild Rose 2 Wind Power Project
- the Buffalo Trail Wind Power Project substation and the six of the Buffalo Trail Wind Power Project wind turbine generators are located within the Noise Study Area for the Updated Project NIA

Note the 2016 NIA for the Approved Project included the noise contribution from the Peace Butte Wind Power Project. Based on the most recent information available on AUC eFiling (Stantec 2021; AUC 2021c), there are no noise sources associated with Peace Butte Wind Power Project located within the Noise Study Area for the Updated Project NIA (i.e., within 5 km of the 21 receptors considered in the Updated Project NIA). As such, the Peace Butte Wind Power Project was not considered in the Updated Project NIA.

Table 5 identifies Baseline Case third-party facilities located within the Noise Study Area for the Updated Project NIA and provides corresponding noise emissions. Baseline Case third-party facilities from Table 1 are also shown in Figure 1.

Table 5: Baseline Case Noise Emissions

Baseline Case Facility	Source	Universal Transverse Mercator Coordinates (Zone 12)		Sound Power Level (dBA)
		Easting (m)	Northing (m)	
Pine Cliff Energy Ltd. Compressor Station[a] – 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[b] – AER-Regulated Well	Well	539030	5509479	94.3
Pine Cliff Energy Ltd. Wells in 07-27-009-04W4[b] – AER-Regulated Well	Well	538568	5512418	94.3
	Well	538568	5512438	94.3
Houston Oil & Gas Ltd. Well in 12-27-009-04W4[b] – AER-Regulated Well	Well	537822	5512923	94.3
Cypress Wind Power Project[c] – AUC-Regulated Wind Project	56 MVA Substation Transformer	534363	5521077	94.7
	234 MVA Substation Transformer	534358	5521077	103.8

Table 5: Baseline Case Noise Emissions

Baseline Case Facility	Source	Universal Transverse Mercator Coordinates (Zone 12)		Sound Power Level (dBA)
		Easting (m)	Northing (m)	
Buffalo Trail Wind Power Project[(d)] – AUC-Regulated Wind Project	225 MVA Substation Transformer	534121	5524874	103.5
	Turbine #51 (SG 5.0-145)	534067	5526153	106.3
	Turbine #52 (SG 5.0-145)	534373	5525716	106.3
	Turbine #55 (SG 5.0-145)	537205	5522791	106.3
	Turbine #56 (SG 5.0-145)	537210	5522116	106.3
	Turbine #57 (SG 5.0-145)	536716	5521536	106.3
	Turbine #59 (SG 5.0-145)	536130	5523218	106.3

a) Source locations and noise emissions taken from Approved Project NIA (DNV-GL 2016).

b) Source locations taken from AER databases (AER 2022a; AER 2022b); noise emissions estimated based on professional judgment.

c) Source location and noise emissions taken from most recent NIA available on AUC eFiling (RWDI 2021a).

d) Source locations and noise emissions taken from most recent NIA available on AUC eFiling (RWDI 2021b).

4.2 Application Case

Updated Project noise sources considered in the Application Case consist of 38 Siemens Gamesa SG 5.0-145 wind turbine generators and one electrical substation. In accordance with Rule 012, all Updated Project noise sources were modelled using *"…the maximum noise emitted… under the planned maximum operating conditions for both the daytime and nighttime period"* (AUC 2021a).

Noise emissions data for the Updated Project wind turbine generators were provided by Siemens Gamesa, the manufacturer. Noise emissions data provided by Siemens Gamesa are attached as Appendix A of this report. Note the data sheet in Appendix A provides noise emissions for standard 5.0 MW operating mode, but the manufacturer has informed Wild Rose 2 that these emissions data are also valid for the AM+1 (5.2 MW) operating mode.

Table 6 presents noise emissions from the Updated Project wind turbine generators. 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. These noise emissions values were calculated from the manufacturer-supplied data attached as Appendix A of this report. 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 2021a).

Table 6: Application Case Noise Emissions - Updated Project Wind Turbine Generators

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 SG 5.0-145 wind turbine generator; AM+1 operating mode	117.3	115.9	110.9	106.4	102.1	100.7	99.1	93.1	81.7	106.3

The major noise source associated with the Updated Project substation will be one 275 MVA electrical transformer. Noise emissions from the transformer operating in ONAF2 (i.e., the operating mode corresponding to maximum noise emissions) were established based on vendor data. Table 7 presents noise emissions used to model the Updated Project substation. Noise emissions are presented in the form of octave band sound power levels, expressed in dBZ, and total sound power level, expressed in dBA.

Table 7: Application Case Noise Emissions - Updated Project Substation

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	
Substation – One 275 MVA Transformer; ONAF2 operating mode	99.0	105.0	107.0	102.0	102.0	96.0	91.0	86.0	79.0	102.4

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 at or below 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 from Appendix A of this report. Based on the Rule 012 definition, noise emissions from the Siemens Gamesa SG 5.0-145 wind turbine generators do not include a clear tone at or below 250 Hz. As such, Updated 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 Updated Project noise emissions precludes the presence of a LFN issue related to the Updated 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 8 for all 21 receptors considered in the Updated Project NIA.

Table 8: 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	Daytime	Nighttime
R01	45	35	n/a[a]	12.1	18.3	45.0	35.1
R03	45	35	n/a[a]	7.9	n/a[a]	45.0	35.0
R04	45	35	n/a[a]	7.7	n/a[a]	45.0	35.0
R05	45	35	n/a[a]	17.0	15.8	45.0	35.1
R07	45	35	n/a[a]	n/a[a]	n/a[a]	45.0	35.0
R08	45	35	n/a[a]	18.4	20.7	45.0	35.2
R09	45	35	n/a[a]	16.6	17.7	45.0	35.1
R12	45	35	n/a[a]	7.4	n/a[a]	45.0	35.0
R13	45	35	n/a[a]	7.5	n/a[a]	45.0	35.0
R14	45	35	n/a[a]	n/a[a]	n/a[a]	45.0	35.0
R17	45	35	n/a[a]	n/a[a]	n/a[a]	45.0	35.0
R23	45	35	n/a[a]	n/a[a]	n/a[a]	45.0	35.0
R25	45	35	n/a[a]	n/a[a]	n/a[a]	45.0	35.0
R26	45	35	n/a[a]	n/a[a]	n/a[a]	45.0	35.0
R27	45	35	n/a[a]	n/a[a]	n/a[a]	45.0	35.0
R28	45	35	19.3	n/a[a]	n/a[a]	45.0	35.1
R29	45	35	16.3	n/a[a]	n/a[a]	45.0	35.1
R30	45	35	17.8	n/a[a]	n/a[a]	45.0	35.1
R33	45	35	n/a[a]	n/a[a]	n/a[a]	45.0	35.0
R34	45	35	26.1	n/a[a]	n/a[a]	45.1	35.5
R47	45	35	21.7	n/a[a]	n/a[a]	45.0	35.2

a) Noise contribution too small to be meaningfully quantified.

Baseline Case compliance with Rule 012 is assessed in Table 9 by comparing cumulative noise levels to applicable PSL limits. Table 9 shows that Baseline Case cumulative noise levels at all 21 receptors are predicted to comply with Rule 012 during the daytime period and the nighttime period.

Table 9: 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	
R01	45	35	50	40	5	5	compliant
R03	45	35	50	40	5	5	compliant
R04	45	35	50	40	5	5	compliant
R05	45	35	50	40	5	5	compliant
R07	45	35	50	40	5	5	compliant
R08	45	35	50	40	5	5	compliant

Table 9: 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	
R09	45	35	50	40	5	5	compliant
R12	45	35	50	40	5	5	compliant
R13	45	35	50	40	5	5	compliant
R14	45	35	50	40	5	5	compliant
R17	45	35	50	40	5	5	compliant
R23	45	35	50	40	5	5	compliant
R25	45	35	50	40	5	5	compliant
R26	45	35	50	40	5	5	compliant
R27	45	35	50	40	5	5	compliant
R28	45	35	50	40	5	5	compliant
R29	45	35	50	40	5	5	compliant
R30	45	35	50	40	5	5	compliant
R33	45	35	50	40	5	5	compliant
R34	45	36	50	40	5	4	compliant
R47	45	35	50	40	5	5	compliant

a) In accordance with Rule 012, Baseline Case cumulative noise levels from Table 8 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.

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 10 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 10 indicate the difference between Baseline Case noise levels expressed in dBC and dBA is greater than 20 for five of the 21 receptors considered in the Updated Project NIA (R01, R05, R08, R09, and R34). At these five receptors, a potential for Baseline Case LFN issue 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. Detailed analysis of one-third octave band noise emissions data for the wind turbine generators associated with the Cypress Wind Power Project (RWDI 2021a) and Buffalo Trail Wind Power Project (RWDI 2021b) showed no clear tones that would satisfy the second part of the Rule 012 LFN test. As such, there is no potential for LFN issues associated with these Baseline Case facilities, regardless of the outcome of the first part of the LFN test.

Table 10: 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	Total	AER-Regulated	Cypress Wind Power Project	Buffalo Trail Wind Power Project	Total		
R01	n/a[a]	12.1	18.3	19.2	n/a[a]	24.7	42.3	42.4	23.2	20
R03	n/a[a]	7.9	n/a[a]	7.9	n/a[a]	21.6	n/a[a]	21.6	13.7	20
R04	n/a[a]	7.7	n/a[a]	7.7	n/a[a]	21.4	n/a[a]	21.4	13.7	20
R05	n/a[a]	17.0	15.8	19.5	n/a[a]	28.5	40.5	40.8	21.3	20
R07	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[b]	20
R08	n/a[a]	18.4	20.7	22.7	n/a[a]	29.6	44.7	44.8	22.1	20
R09	n/a[a]	16.6	17.7	20.2	n/a[a]	28.2	42.3	42.5	22.3	20
R12	n/a[a]	7.4	n/a[a]	7.4	n/a[a]	21.2	n/a[a]	21.2	13.8	20
R13	n/a[a]	7.5	n/a[a]	7.5	n/a[a]	21.3	n/a[a]	21.3	13.8	20
R14	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[b]	20
R17	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[b]	20
R23	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[b]	20
R25	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[b]	20
R26	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[b]	20
R27	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[b]	20
R28	19.3	n/a[a]	n/a[a]	19.3	36.7	n/a[a]	n/a[a]	36.7	17.4	20
R29	16.3	n/a[a]	n/a[a]	16.3	34.1	n/a[a]	n/a[a]	34.1	17.8	20
R30	17.8	n/a[a]	n/a[a]	17.8	35.5	n/a[a]	n/a[a]	35.5	17.7	20
R33	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[a]	n/a[b]	20
R34	26.1	n/a[a]	n/a[a]	26.1	48.2	n/a[a]	n/a[a]	48.2	22.1	20
R47	21.7	n/a[a]	n/a[a]	21.7	39.3	n/a[a]	n/a[a]	39.3	17.6	20

a) Noise contribution too small to be meaningfully quantified.

b) There is no data available to support this calculation.

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 Updated Project under planned maximum operating conditions. The noise contribution from the Updated 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 11 for all 21 receptors considered in the Updated Project NIA.

Table 11: Application Case Cumulative Noise Levels

Receptor Identification Code	Baseline Case Cumulative Noise Level (dBA)		Updated Project Noise Level (dBA)	Application Case Cumulative Noise Level (dBA)	
	Daytime	Nighttime		Daytime	Nighttime
R01	45.0	35.1	29.7	45.1	36.2
R03	45.0	35.0	32.2	45.2	36.8
R04	45.0	35.0	32.4	45.2	36.9
R05	45.0	35.1	37.1	45.7	39.2
R07	45.0	35.0	35.2	45.4	38.1
R08	45.0	35.2	35.1	45.4	38.2
R09	45.0	35.1	37.7	45.8	39.6
R12	45.0	35.0	34.0	45.3	37.5
R13	45.0	35.0	35.9	45.5	38.5
R14	45.0	35.0	35.0	45.4	38.0
R17	45.0	35.0	32.4	45.2	36.9
R23	45.0	35.0	38.1	45.8	39.8
R25	45.0	35.0	32.1	45.2	36.8
R26	45.0	35.0	36.6	45.6	38.9
R27	45.0	35.0	35.9	45.5	38.5
R28	45.0	35.1	34.6	45.4	37.9
R29	45.0	35.1	35.0	45.4	38.0
R30	45.0	35.1	36.4	45.6	38.8
R33	45.0	35.0	37.4	45.7	39.4
R34	45.1	35.5	31.9	45.3	37.1
R47	45.0	35.2	34.7	45.4	38.0

Application Case compliance with Rule 012 is assessed in Table 12 by comparing cumulative noise levels to applicable PSL limits. Table 12 shows that Application Case cumulative noise levels at all 21 receptors are predicted to comply with Rule 012 during the daytime period and the nighttime period.

Table 12: 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	
R01	45	36	50	40	5	4	compliant
R03	45	37	50	40	5	3	compliant
R04	45	37	50	40	5	3	compliant
R05	46	39	50	40	4	1	compliant
R07	45	38	50	40	5	2	compliant
R08	45	38	50	40	5	2	compliant
R09	46	40	50	40	4	0	compliant
R12	45	38	50	40	5	2	compliant
R13	46	39	50	40	4	1	compliant
R14	45	38	50	40	5	2	compliant
R17	45	37	50	40	5	3	compliant
R23	46	40	50	40	4	0	compliant
R25	45	37	50	40	5	3	compliant
R26	46	39	50	40	4	1	compliant
R27	46	39	50	40	4	1	compliant
R28	45	38	50	40	5	2	compliant
R29	45	38	50	40	5	2	compliant
R30	46	39	50	40	4	1	compliant
R33	46	39	50	40	4	1	compliant
R34	45	37	50	40	5	3	compliant
R47	45	38	50	40	5	2	compliant

a) In accordance with Rule 012, Application Case cumulative noise levels from Table 11 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.

Figure 2 presents Updated Project noise level contours at a height of 1.5 m above ground (i.e., corresponding to the receptor height for a one-storey dwelling). Figure 3 presents Updated Project noise level contours at a height of 4.5 m above ground (i.e., corresponding to the receptor height for a two-storey dwelling).

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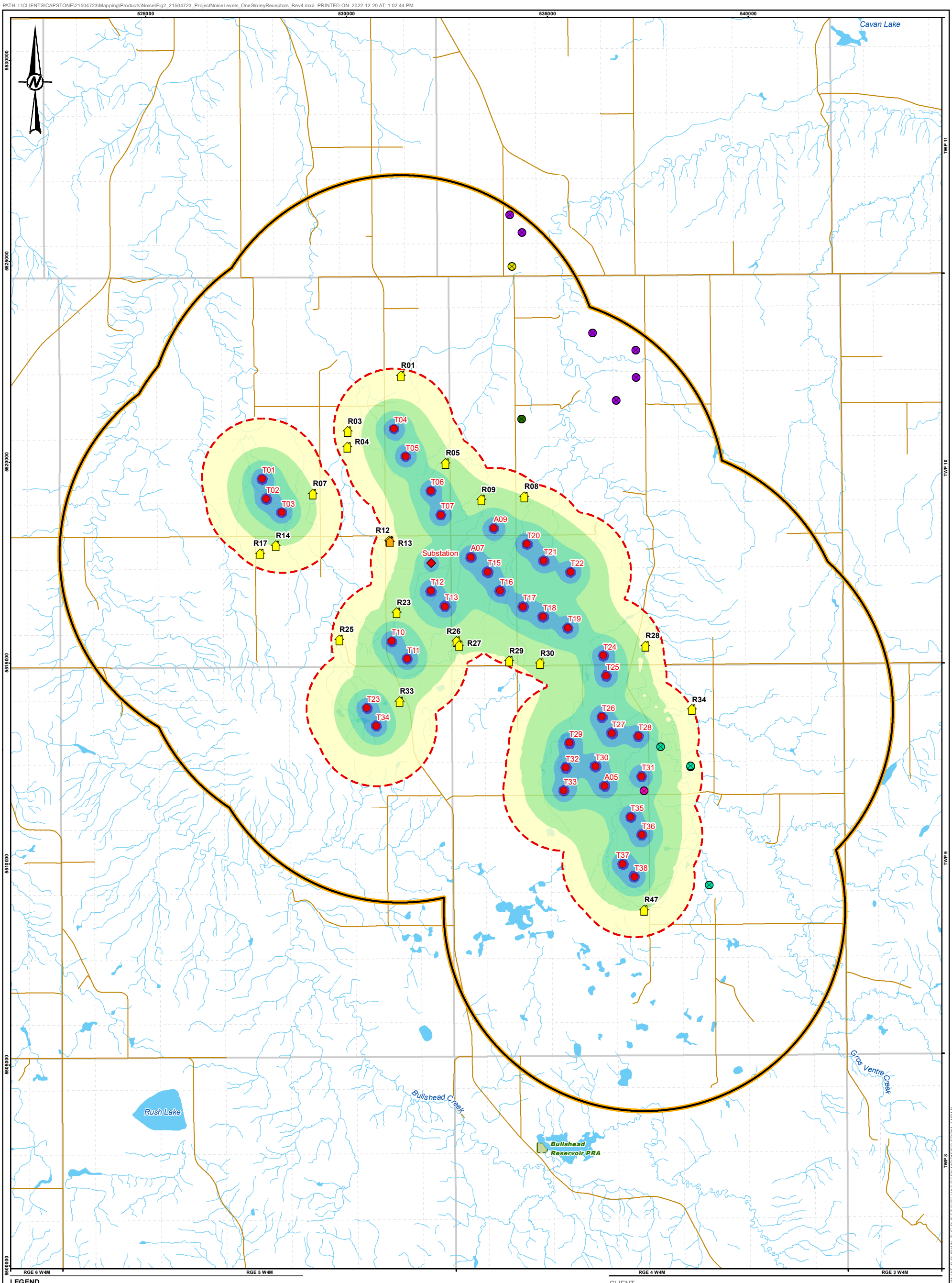

LEGEND

- LOCAL ROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- WATERBODY

BASELINE FACILITIES

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

NOISE RECEPTORS

- ONE-STOREY
- TWO-STOREY

PROJECT NOISE SOURCES

- SUBSTATION
- TURBINE
- NOISE STUDY AREA
- RECEPTOR SEARCH AREA

PREDICTED PROJECT NOISE LEVELS [dBA]

- <35
- 35 to 40
- 40 to 45
- 45 to 50
- >50

0 2 4

1:90,000 KILOMETRES

REFERENCE(S)

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PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT
WILD ROSE 2 WIND LP

PROJECT
WILD ROSE 2 WIND POWER PROJECT

TITLE
PROJECT NOISE LEVELS; ONE-STOREY RECEPTORS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-12-20
DESIGNED	VY
PREPARED	LB
REVIEWED	VY
APPROVED	AF

PROJECT NO.	PHASE	REV.	FIGURE
21504723	100	4	2

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

25mm
0

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525000 530000 535000 540000

5530000 5525000 5520000 5515000 5510000 5505000 5500000

TWP 11 TWP 10 TWP 9 TWP 8

RGE 6 W4M RGE 5 W4M RGE 4 W4M RGE 3 W4M

Cavan Lake

Rush Lake

Bullshead Creek

Gros Ventre Creek

Bullshead Reservoir PRA

R01 R03 R04 R05 R07 R08 R09 R12 R13 R14 R17 R23 R25 R26 R27 R28 R29 R30 R33 R34 R47

T01 T02 T03 T04 T05 T06 T07 A09 T20 T21 T22 A07 T15 T16 T17 T18 T19 T12 T13 T10 T11 T24 T25 T23 T34 T26 T27 T28 T29 T32 T30 T31 T33 A05 T35 T36 T37 T38

Substation

LEGEND

- LOCAL ROAD
- WATERCOURSE
- PARK / PROTECTED AREA
- WATERBODY

BASELINE FACILITIES

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

NOISE RECEPTORS

- ONE-STOREY
- TWO-STOREY

PROJECT NOISE SOURCES

- SUBSTATION
- TURBINE
- NOISE STUDY AREA
- RECEPTOR SEARCH AREA

PREDICTED PROJECT NOISE LEVELS [dBA]

- <35
- 35 to 40
- 40 to 45
- 45 to 50
- >50

0 2 4

1:90,000 KILOMETRES

REFERENCE(S)

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PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT
WILD ROSE 2 WIND LP

PROJECT
WILD ROSE 2 WIND POWER PROJECT

TITLE
PROJECT NOISE LEVELS; TWO-STOREY RECEPTORS

CONSULTANT
WSP GOLDER

YYYY-MM-DD	2022-12-20
DESIGNED	VY
PREPARED	LB
REVIEWED	VY
APPROVED	AF

PROJECT NO.	PHASE	REV.	FIGURE
21504723	100	4	3

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

0 25mm

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 Updated Project wind turbine generators that satisfy the second part of the Rule 012 LFN test. As such, the Updated 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 Updated 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 13 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 13 suggest the difference between predicted Application Case noise levels expressed in dBA and dBC is greater than or equal to 20 for 15 receptors. It should be noted the LFN analysis presented in Table 13 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 2021a). Most importantly, the absence of a clear tone in the noise emissions spectra for the Updated Project wind turbine generators precludes the presence of a LFN issue for the Updated Project.

Table 13: 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	Updated Project	Total	Baseline Case	Updated Project	Total		
R01	19.2	29.7	30.1	42.4	51.0	51.6	21.5	20
R03	7.9	32.2	32.2	21.6	53.2	53.2	21.0	20
R04	7.7	32.4	32.4	21.4	53.5	53.5	21.1	20
R05	19.5	37.1	37.2	40.8	56.8	56.9	19.7	20
R07	n/a[(a)]	35.2	35.2	n/a[(a)]	55.3	55.3	20.1	20
R08	22.7	35.1	35.3	44.8	56.0	56.3	21.0	20
R09	20.2	37.7	37.8	42.5	57.7	57.8	20.0	20
R12	7.4	34.0	34.0	21.2	55.2	55.2	21.2	20
R13	7.5	35.9	35.9	21.3	55.5	55.5	19.6	20
R14	n/a[(a)]	35.0	35.0	n/a[(a)]	54.9	54.9	19.9	20
R17	n/a[(a)]	32.4	32.4	n/a[(a)]	53.1	53.1	20.7	20
R23	n/a[(a)]	38.1	38.1	n/a[(a)]	57.7	57.7	19.6	20
R25	n/a[(a)]	32.1	32.1	n/a[(a)]	53.7	53.7	21.6	20
R26	n/a[(a)]	36.6	36.6	n/a[(a)]	57.3	57.3	20.7	20
R27	n/a[(a)]	35.9	35.9	n/a[(a)]	56.8	56.8	20.9	20
R28	19.3	34.6	34.7	36.7	55.7	55.8	21.1	20
R29	16.3	35.0	35.1	34.1	56.5	56.5	21.4	20
R30	17.8	36.4	36.5	35.5	57.4	57.4	20.9	20
R33	n/a[(a)]	37.4	37.4	n/a[(a)]	57.0	57.0	19.6	20
R34	26.1	31.9	32.9	48.2	53.9	54.9	22.0	20
R47	21.7	34.7	34.9	39.3	54.7	54.8	19.9	20

a) Noise contribution too small to be meaningfully quantified.

6.0 SUMMARY AND DISCUSSION

A NIA was conducted for the Updated Project to meet the requirements of Rule 007. The Updated Project NIA was conducted in accordance with assessment methods presented in Rule 012. The NIA characterized potential noise impacts from the Updated Project in the context of broadband and LFN compliance criteria specified by Rule 012. As required by Rule 012, the Updated 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 2021).

For both the daytime period and the nighttime period, the Updated 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 Updated Project) will comply with applicable Rule 012 PSL limits for all receptors. The Updated Project NIA also predicts there will be no LFN issues at any receptors. In other words, the Updated Project NIA predicts daytime and nighttime compliance with applicable broadband and LFN criteria for all receptors.

7.0 ACOUSTICAL PRACTITIONER INFORMATION

Andrew Faszer, BSc, INCE, PEng, was responsible for senior technical review of emissions calculations, modelling, and reporting related to the Updated 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 Updated Project NIA report. Victor has worked as an acoustic scientist in the Golder Calgary office for more than 11 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

Golder Associates Ltd.

Victor Young, MSc
Acoustic Scientist

Andrew Faszer, INCE, PEng
Senior Engineer

VY/AF/rd/jr

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APPENDIX A

Manufacturer-Supplied Noise Emissions for Siemens Gamesa SG 5.0-145 Wind Turbine

Standard Acoustic Emission

Noise Level (LW): Values reported correspond to the average estimated Sound Power Level emitted by the WTG at hub height, called LW in TS IEC-61400-14. LW values are expressed in dB(A). To obtain LWd value, as defined in IEC-61400-14, it must be applied a 2 dB increase to LW.

dB(A): LW is expressed in decibels applying the "A" filter as required by IEC.

Noise generated at standard power operation mode LW is **106.3 dB(A).**

SG 5.0-145	
Wind Speed [m/s]	**LW [dB(A)]**
3.0	95.1
3.5	95.1
4.0	95.1
4.5	95.1
5.0	95.1
5.5	97.2
6.0	99.2
6.5	101.1
7.0	102.7
7.5	104.3
8.0	105.7
8.5	106.3
9.0	106.3
9.5	106.3
10.0	106.3
10.5	106.3
11.0	106.3
11.5	106.3
12.0	106.3
12.5	106.3
13.0	106.3
13.5	106.3
14.0	106.3
14.5	106.3
Up to cut out	≤106.3

Noise values included in the present document correspond to the wind turbine configuration equipped with noise reduction add-ons attached to the blade.

Noise Reduction System (NRS) operational modes

The Noise Reduction System NRS is an optional module available with the basic SCADA configuration and it therefore requires the presence of a SGRE SCADA system to work.

The purpose of this system is to limit the noise emitted by any of the functioning turbines and thereby comply with local regulations regarding noise emissions. This allows wind farms to be located close to urban areas, limiting the environmental impact that they imply.

Noise control is achieved through reducing the active power and rotational speed of the wind turbine. This reduction is dependent on the wind speed.

The task of the Noise Reduction System is to control the noise settings of each turbine to the most appropriate level at all times, in order to keep the noise emissions within the limits allowed.

In order to do this, the SCADA control has to consider the wind speed of each turbine, its direction, and a configured schedule/calendar.

There can be up to 8 low noise modes, besides the full operation one. Noise levels corresponding to each mode are the following:

Mode:	FP	N1	N2	N3	N4	N5	N6	N7	N8
Noise Level [dB(A)]	106.3	105.7	105.2	103.7	102.7	101.7	99.9	99	98

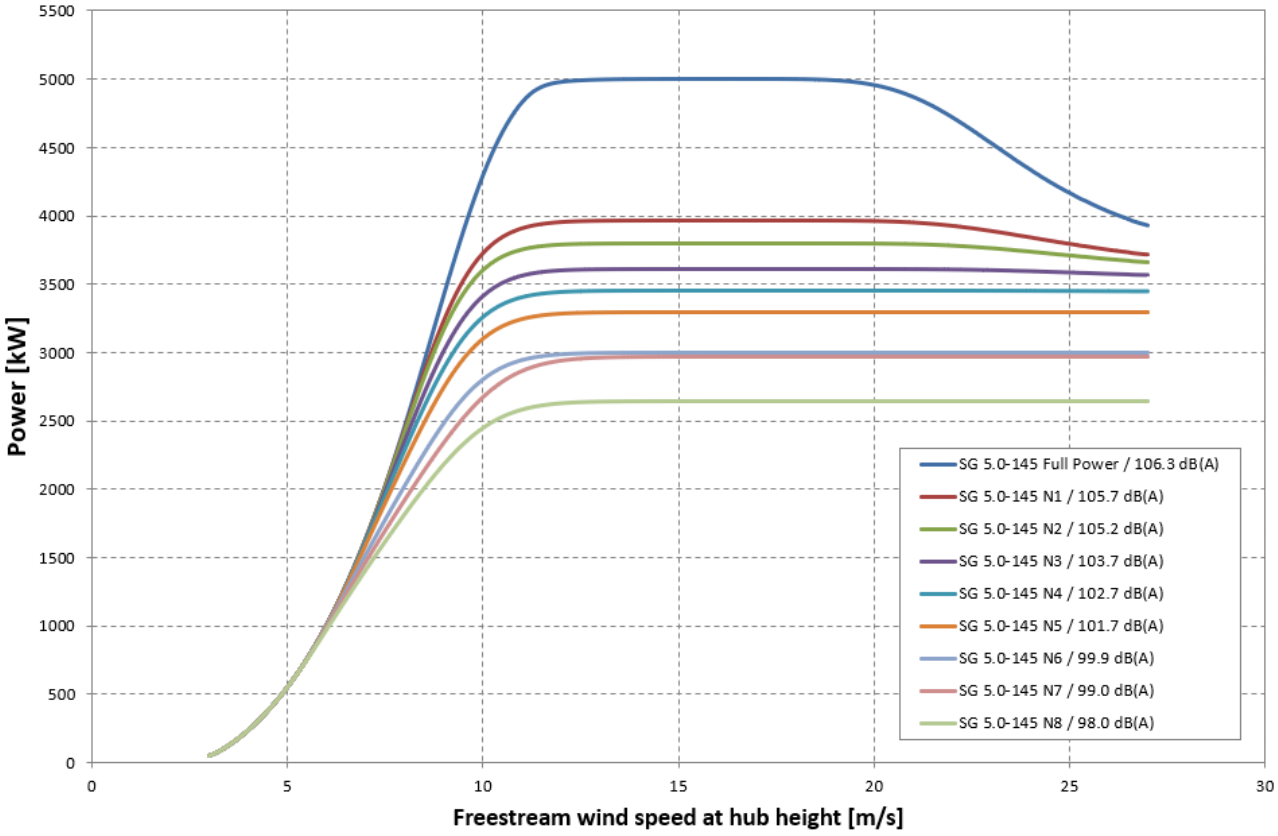
Noise values included in the present document correspond to the wind turbine configuration equipped with noise reduction add-ons attached to the blade.

Depending on the type of tower selected, some of the low noise modes defined above may not be compatible. In the following table, feasibility of low noise modes vs tower is presented. Low noise modes feasibility vs other tower designs will be analyzed upon request.

SG 5.0-145	N1	N2	N3	N4	N5	N6	N7	N8
H= 79.5 m (Steel, baseline design)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H= 90 m (Steel, baseline design)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H= 102.5 m (Steel, baseline design)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H= 127.5 m (Steel, baseline design)	No	No	No	No	Yes	Yes	Yes	Yes

Next table presents the power production as a function of the horizontal wind speed measured at hub height for different noise reduction mode settings.

P [kW]	***Low Noise Operation Mode***							
Wind Speed [m/s]	**N1 105.7 dB(A)**	**N2 105.2 dB(A)**	**N3 103.7 dB(A)**	**N4 102.7 dB(A)**	**N5 101.7 dB(A)**	**N6 99.9 dB(A)**	**N7 99.0 dB(A)**	**N8 98.0 dB(A)**
3	56	56	56	56	56	56	56	56
4	241	241	241	241	241	241	241	241
5	555	555	555	555	555	555	555	554
6	1009	1009	1009	1008	1007	1000	990	974
7	1637	1636	1629	1615	1592	1521	1470	1410
8	2437	2422	2355	2286	2203	2027	1925	1819
9	3232	3170	3016	2884	2747	2484	2344	2183
10	3725	3604	3416	3257	3101	2803	2677	2449
11	3907	3755	3567	3402	3246	2946	2869	2583
12	3952	3791	3605	3440	3286	2988	2945	2630
13	3962	3798	3613	3448	3294	2998	2967	2642
14	3963	3800	3615	3450	3296	3000	2973	2644
15	3964	3800	3615	3450	3296	3000	2974	2645
16	3964	3800	3615	3450	3296	3000	2974	2645
17	3964	3800	3615	3450	3296	3000	2974	2645
18	3964	3800	3615	3450	3296	3000	2974	2645
19	3963	3800	3615	3450	3296	3000	2974	2645
20	3960	3799	3615	3450	3296	3000	2974	2645
21	3949	3795	3614	3450	3296	3000	2974	2645
22	3925	3784	3612	3450	3296	3000	2974	2645
23	3887	3765	3607	3449	3296	3000	2974	2645
24	3841	3740	3599	3449	3296	3000	2974	2645
25	3794	3713	3590	3448	3296	3000	2974	2645
26	3750	3685	3580	3446	3296	3000	2974	2645
27	3715	3663	3571	3445	3296	3000	2974	2645



Next table presents the Ct as a function of the horizontal wind speed measured at hub height for different noise reduction mode settings. The calculated Ct curve data are valid for clean rotor blades, substantially horizontal, undisturbed air flow, normal turbulence intensity and normal wind shear.

C_T [-]	*Low Noise Operation Mode*							
Wind Speed [m/s]	**N1 105.7 dB(A)**	**N2 105.2 dB(A)**	**N3 103.7 dB(A)**	**N4 102.7 dB(A)**	**N5 101.7 dB(A)**	**N6 99.9 dB(A)**	**N7 99.0 dB(A)**	**N8 98.0 dB(A)**
3	0.8948	0.8948	0.8948	0.8948	0.8948	0.8948	0.8948	0.8948
4	0.8438	0.8438	0.8438	0.8438	0.8438	0.8438	0.8438	0.8438
5	0.8207	0.8207	0.8207	0.8207	0.8207	0.8204	0.8197	0.8176
6	0.8185	0.8184	0.8182	0.8171	0.8138	0.7952	0.7753	0.7472
7	0.8174	0.8158	0.8027	0.7844	0.7575	0.6907	0.6501	0.6081
8	0.7860	0.7747	0.7256	0.6846	0.6412	0.5631	0.5240	0.4862
9	0.6836	0.6616	0.6032	0.5618	0.5229	0.4570	0.4249	0.3909
10	0.5319	0.5084	0.4675	0.4376	0.4103	0.3623	0.3420	0.3102
11	0.3933	0.3747	0.3496	0.3297	0.3117	0.2785	0.2694	0.2412
12	0.2938	0.2802	0.2636	0.2498	0.2372	0.2136	0.2098	0.1867
13	0.2261	0.2160	0.2039	0.1937	0.1843	0.1666	0.1646	0.1464
14	0.1788	0.1710	0.1617	0.1538	0.1465	0.1328	0.1314	0.1170
15	0.1445	0.1384	0.1310	0.1247	0.1189	0.1079	0.1068	0.0953
16	0.1190	0.1140	0.1079	0.1028	0.0981	0.0891	0.0882	0.0788
17	0.0994	0.0953	0.0903	0.0860	0.0821	0.0747	0.0739	0.0661
18	0.0841	0.0807	0.0764	0.0728	0.0696	0.0633	0.0626	0.0561
19	0.0719	0.0690	0.0654	0.0624	0.0596	0.0543	0.0537	0.0481
20	0.0621	0.0597	0.0565	0.0539	0.0515	0.0470	0.0464	0.0417
21	0.0540	0.0520	0.0493	0.0471	0.0450	0.0410	0.0405	0.0364
22	0.0473	0.0456	0.0434	0.0414	0.0396	0.0361	0.0357	0.0321
23	0.0416	0.0404	0.0385	0.0368	0.0352	0.0321	0.0317	0.0286
24	0.0369	0.0360	0.0345	0.0330	0.0316	0.0289	0.0285	0.0257
25	0.0330	0.0323	0.0312	0.0299	0.0286	0.0261	0.0258	0.0233
26	0.0298	0.0293	0.0284	0.0273	0.0261	0.0239	0.0235	0.0212
27	0.0271	0.0267	0.0260	0.0251	0.0240	0.0219	0.0216	0.0195

The table below contains the noise levels as a function of the horizontal wind speed measured at hub height for different noise reduction mode settings.

Noise [dB(A)]	***Low Noise Operation Mode***							
Wind Speed [m/s]	**N1 105.7 dB(A)**	**N2 105.2 dB(A)**	**N3 103.7 dB(A)**	**N4 102.7 dB(A)**	**N5 101.7 dB(A)**	**N6 99.9 dB(A)**	**N7 99.0 dB(A)**	**N8 98.0 dB(A)**
3.0	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1
3.5	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1
4.0	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1
4.5	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1
5.0	95.1	95.1	95.1	95.1	95.1	95.1	95.1	95.1
5.5	97.2	97.2	97.2	97.2	97.2	97.2	97.2	97.2
6.0	99.2	99.2	99.2	99.2	99.2	99.2	99.0	98.0
6.5	101.1	101.1	101.1	101.1	101.1	99.9	99.0	98.0
7.0	102.7	102.7	102.7	102.7	101.7	99.9	99.0	98.0
7.5	104.3	104.3	103.7	102.7	101.7	99.9	99.0	98.0
8.0	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
8.5	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
9.0	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
9.5	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
10.0	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
10.5	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
11.0	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
11.5	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
12.0	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
12.5	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
13.0	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
13.5	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
14.0	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
14.5	105.7	105.2	103.7	102.7	101.7	99.9	99.0	98.0
Up to cut out	≤105.7	≤105.2	≤103.7	≤102.7	≤101.7	≤99.9	≤99.0	≤98.0

Noise values included in the present document correspond to the wind turbine configuration equipped with noise reduction add-ons attached to the blade.

The 1/3 octave band noise spectra expressed as A-weighted sound power level for a given frequency band is shown below for 12m/s at hub height, for the standard power operation setting as well as the low noise modes.

	Noise [dB(A)]								
1/3 octave band, center frequency [Hz]	**Standard Power 5.0MW**	**N1**	**N2**	**N3**	**N4**	**N5**	**N6**	**N7**	**N8**
	106.3 dB(A)	**105.7 dB(A)**	**105.2 dB(A)**	**103.7 dB(A)**	**102.7 dB(A)**	**101.7 dB(A)**	**99.9 dB(A)**	**99.0 dB(A)**	**98.0 dB(A)**
10	46.1	46.1	46.1	46.1	46.1	46.1	46.1	46.1	46.1
12.5	51.8	51.8	51.8	51.8	51.8	51.8	51.8	51.7	51.7
16	57.5	57.4	57.4	57.4	57.4	57.4	57.3	57.3	57.3
20	62.8	62.8	62.8	62.7	62.6	62.6	62.5	62.4	62.3
25	67.4	67.3	67.3	67.1	67.0	66.9	66.7	66.6	66.5
31.5	72.0	71.9	71.8	71.6	71.4	71.3	71.0	70.8	70.7
40	76.1	75.9	75.8	75.5	75.3	75.1	74.6	74.4	74.2
50	80.6	80.4	80.2	79.8	79.5	79.2	78.6	78.3	78.0
63	84.7	84.5	84.3	83.7	83.3	82.9	82.2	81.8	81.4
80	87.1	86.8	86.5	85.8	85.3	84.8	83.8	83.4	82.8
100	88.8	88.4	88.1	87.2	86.6	86.0	84.8	84.2	83.6
125	90.1	89.7	89.3	88.2	87.5	86.7	85.3	84.6	83.8
160	90.9	90.4	90.0	88.6	87.7	86.8	85.2	84.3	83.4
200	91.9	91.2	90.7	89.2	88.1	87.1	85.2	84.2	83.2
250	93.4	92.7	92.2	90.7	89.6	88.6	86.7	85.7	84.7
315	93.7	93.1	92.6	91.0	90.0	89.0	87.1	86.1	85.0
400	93.5	92.8	92.3	90.8	89.7	88.7	86.8	85.8	84.7
500	93.6	92.9	92.4	90.9	89.8	88.8	86.9	85.9	84.8
630	95.2	94.5	94.0	92.5	91.4	90.4	88.5	87.5	86.4
800	95.0	94.3	93.8	92.3	91.2	90.2	88.3	87.3	86.3
1000	96.0	95.3	94.8	93.3	92.2	91.2	89.3	88.3	87.3
1250	96.7	96.0	95.5	94.0	92.9	91.9	90.0	89.0	88.0
1600	96.6	95.9	95.4	93.9	92.8	91.8	89.9	88.9	87.9
2000	95.5	94.8	94.3	92.8	91.7	90.7	88.8	87.8	86.8
2500	94.1	93.4	92.9	91.4	90.3	89.3	87.4	86.4	85.4
3150	91.9	91.2	90.7	89.2	88.1	87.1	85.2	84.2	83.2
4000	88.8	88.1	87.6	86.1	85.0	84.0	82.1	81.1	80.1
5000	84.5	83.8	83.3	81.8	80.7	79.7	77.8	76.8	75.8
6300	79.3	78.6	78.1	76.6	75.5	74.5	72.6	71.6	70.6
8000	73.5	72.8	72.3	70.8	69.7	68.7	66.8	65.8	64.8
10000	68.9	68.2	67.7	66.2	65.1	64.1	62.2	61.2	60.2

Further information about noise spectra, including other wind speeds, is available upon request.
Noise values included in the present document correspond to the wind turbine configuration equipped with noise reduction add-ons attached to the blade.

APPENDIX B

Comparison of Noise Levels from Updated and Approved Project

This appendix compares Application Case cumulative noise levels for the Approved Project and Updated Project. Because the Approved Project consists of a larger number of wind turbine generators spread across a larger spatial area than the Updated Project, the Approved Project NIA included a larger number of receptors than the Updated Project NIA. In this appendix, results are presented for all receptors considered in the Approved Project NIA and all receptors considered in the Updated Project NIIA.

Table B-1 presents Application Case cumulative noise levels for the Approved Project and for the Updated Project.

Table B-1: Application Case Cumulative Noise Levels

Receptor Identification Code	Ambient Sound Level (dBA)		Baseline Case Facility Contribution (dBA)			Project Noise Contribution (dBA)		Approved Project Cumulative Noise Level (dBA)		Updated Project Cumulative Noise Level (dBA)	
	Daytime	Nighttime	AER-Regulated	Cypress Wind Power Project	Buffalo Trail Wind Power Project	Approved Project	Updated Project	Daytime	Nighttime	Daytime	Nighttime
R01	45	35	n/a[(a)]	12.1	18.3	27.4	29.7	45.1	35.8	45.1	36.2
R02A	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	26.7	26.1	45.1	35.6	45.1	35.5
R02B	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	27.2	26.7	45.1	35.7	45.1	35.6
R02C	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	24.5	23.9	45.0	35.4	45.0	35.3
R02D	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	24.8	24.3	45.0	35.4	45.0	35.4
R03	45	35	n/a[(a)]	7.9	n/a[(a)]	32.1	32.2	45.2	36.8	45.2	36.8
R04	45	35	n/a[(a)]	7.7	n/a[(a)]	33.0	32.4	45.3	37.1	45.2	36.9
R05	45	35	n/a[(a)]	17.0	15.8	34.6	37.1	45.4	37.9	45.7	39.2
R06	45	35	n/a[(a)]	20.7	23.7	32.5	27.9	45.3	37.2	45.1	36.2
R07	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	35.8	35.2	45.5	38.4	45.4	38.1
R08	45	35	n/a[(a)]	18.4	20.7	35.8	35.1	45.5	38.5	45.4	38.2
R09	45	35	n/a[(a)]	16.6	17.7	36.1	37.7	45.5	38.7	45.8	39.6
R10	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	34.9	23.7	45.4	38.0	45.0	35.3
R12	45	35	n/a[(a)]	7.4	n/a[(a)]	34.2	34.0	45.3	37.6	45.3	37.5
R13	45	35	n/a[(a)]	7.5	n/a[(a)]	35.6	35.9	45.5	38.3	45.5	38.5
R14	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	36.4	35.0	45.6	38.8	45.4	38.0
R15	45	35	n/a[(a)]	17.7	16.8	31.3	25.9	45.2	36.6	45.1	35.6
R16	45	35	n/a[(a)]	18.1	16.0	31.7	25.8	45.2	36.8	45.1	35.6
R17	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	35.4	32.4	45.5	38.2	45.2	36.9
R18	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	32.4	30.5	45.2	36.9	45.2	36.3
R19	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	33.2	29.3	45.3	37.2	45.1	36.0
R21	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	36.4	25.6	45.6	38.8	45.0	35.5
R22	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	28.1	12.0	45.1	35.8	45.0	35.0
R23[(b)]	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	32.5	38.1	45.2	36.9	45.8	39.8
R24	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	35.8	24.4	45.5	38.4	45.0	35.4
R25	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	34.1	32.1	45.3	37.6	45.2	36.8

Table B-1: Application Case Cumulative Noise Levels

Receptor Identification Code	Ambient Sound Level (dBA)		Baseline Case Facility Contribution (dBA)			Project Noise Contribution (dBA)		Approved Project Cumulative Noise Level (dBA)		Updated Project Cumulative Noise Level (dBA)	
	Daytime	Nighttime	AER-Regulated	Cypress Wind Power Project	Buffalo Trail Wind Power Project	Approved Project	Updated Project	Daytime	Nighttime	Daytime	Nighttime
R26	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	35.1	36.6	45.4	38.1	45.6	38.9
R27	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	34.6	35.9	45.4	37.8	45.5	38.5
R28	45	35	19.3	n/a[(a)]	n/a[(a)]	36.2	34.6	45.5	38.7	45.4	37.9
R29	45	35	16.3	n/a[(a)]	n/a[(a)]	35.8	35.0	45.5	38.5	45.4	38.0
R30	45	35	17.8	n/a[(a)]	n/a[(a)]	36.8	36.4	45.6	39.0	45.6	38.8
R31	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	36.5	24.9	45.6	38.8	45.0	35.4
R32	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	25.4	n/a[(a)]	45.0	35.5	45.0	35.0
R33	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	29.1	37.4	45.1	36.0	45.7	39.4
R34	45	35	26.1	n/a[(a)]	n/a[(a)]	32.9	31.9	45.3	37.4	45.3	37.1
R36	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	20.4	n/a[(a)]	45.0	35.1	45.0	35.0
R39	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	22.1	24.8	45.0	35.2	45.0	35.4
R40	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	26.9	24.7	45.1	35.6	45.0	35.4
R42.1	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	33.4	22.7	45.3	37.3	45.0	35.2
R43	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	26.7	16.4	45.1	35.6	45.0	35.1
R45	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	27.1	16.2	45.1	35.7	45.0	35.1
R46	45	35	24.5	n/a[(a)]	n/a[(a)]	27.3	26.7	45.1	36.0	45.1	35.9
R47	45	35	21.7	n/a[(a)]	n/a[(a)]	35.6	34.7	45.5	38.4	45.4	38.0
R48	45	35	16.4	n/a[(a)]	n/a[(a)]	25.7	22.3	45.1	35.5	45.0	35.3
R50	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	28.5	n/a[(a)]	45.1	35.9	45.0	35.0
R51	45	35	n/a[(a)]	n/a[(a)]	n/a[(a)]	20.2	n/a[(a)]	45.0	35.1	45.0	35.0
R52	45	35	n/a[(a)]	7.1	5.4	25.3	26.3	45.0	35.5	45.1	35.6
R53	45	35	n/a[(a)]	27.3	30.1	27.8	23.2	45.3	37.3	45.2	36.9
R54	45	35	n/a[(a)]	6.7	5.3	24.8	25.7	45.0	35.4	45.1	35.5

a) Noise contribution too small to be meaningfully quantified.

b) Wild Rose 2 has indicated this former dwelling will be converted to a Project office before the Project commences operations. As such, this location no longer qualifies as a receptor in accordance with Rule 012, but this location was included for information purposes.

Table B-2 presents the change in Application Case cumulative noise levels resulting from the proposed updates to the Approved Project (i.e., the difference between Application Case cumulative noise levels for the Updated Project and Approved Project). Table B-2 demonstrates that at most receptors Application Case cumulative noise levels will be decreased or remain unchanged as a result of the proposed updates to the Approved Project. An increase in Application Case cumulative noise levels is predicted at 11 receptors. The largest increase is predicted to be 3.4 dBA, for receptor R33 during the nighttime period.

Table B-2: Change in Application Case Cumulative Noise Levels from Project Update

Receptor Identification Code	Approved Project Cumulative Noise Level [dBA]		Updated Project Cumulative Noise Level [dBA]		Difference: Updated minus Approved [dBA]	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
R01	45.1	35.8	45.1	36.2	0.0	0.4
R02A	45.1	35.6	45.1	35.5	0.0	-0.1
R02B	45.1	35.7	45.1	35.6	0.0	-0.1
R02C	45.0	35.4	45.0	35.3	0.0	-0.1
R02D	45.0	35.4	45.0	35.4	0.0	0.0
R03	45.2	36.8	45.2	36.8	0.0	0.0
R04	45.3	37.1	45.2	36.9	-0.1	-0.2
R05	45.4	37.9	45.7	39.2	0.3	1.3
R06	45.3	37.2	45.1	36.2	-0.2	-1.0
R07	45.5	38.4	45.4	38.1	-0.1	-0.3
R08	45.5	38.5	45.4	38.2	-0.1	-0.3
R09	45.5	38.7	45.8	39.6	0.3	0.9
R10	45.4	38.0	45.0	35.3	-0.4	-2.7
R12	45.3	37.6	45.3	37.5	0.0	-0.1
R13	45.5	38.3	45.5	38.5	0.0	0.2
R14	45.6	38.8	45.4	38.0	-0.2	-0.8
R15	45.2	36.6	45.1	35.6	-0.1	-1.0
R16	45.2	36.8	45.1	35.6	-0.1	-1.2
R17	45.5	38.2	45.2	36.9	-0.3	-1.3
R18	45.2	36.9	45.2	36.3	0.0	-0.6
R19	45.3	37.2	45.1	36.0	-0.2	-1.2
R21	45.6	38.8	45.0	35.5	-0.6	-3.3
R22	45.1	35.8	45.0	35.0	-0.1	-0.8
R23[(a)]	45.2	36.9	45.8	39.8	0.6	2.9
R24	45.5	38.4	45.0	35.4	-0.5	-3.0
R25	45.3	37.6	45.2	36.8	-0.1	-0.8
R26	45.4	38.1	45.6	38.9	0.2	0.8
R27	45.4	37.8	45.5	38.5	0.1	0.7

Table B-2: Change in Application Case Cumulative Noise Levels from Project Update

Receptor Identification Code	Approved Project Cumulative Noise Level [dBA]		Updated Project Cumulative Noise Level [dBA]		Difference: Updated minus Approved [dBA]	
	Daytime	Nighttime	Daytime	Nighttime	Daytime	Nighttime
R28	45.5	38.7	45.4	37.9	-0.1	-0.8
R29	45.5	38.5	45.4	38.0	-0.1	-0.5
R30	45.6	39.0	45.6	38.8	0.0	-0.2
R31	45.6	38.8	45.0	35.4	-0.6	-3.4
R32	45.0	35.5	45.0	35.0	0.0	-0.5
R33	45.1	36.0	45.7	39.4	0.6	3.4
R34	45.3	37.4	45.3	37.1	0.0	-0.3
R36	45.0	35.1	45.0	35.0	0.0	-0.1
R39	45.0	35.2	45.0	35.4	0.0	0.2
R40	45.1	35.6	45.0	35.4	-0.1	-0.2
R42.1	45.3	37.3	45.0	35.2	-0.3	-2.1
R43	45.1	35.6	45.0	35.1	-0.1	-0.5
R45	45.1	35.7	45.0	35.1	-0.1	-0.6
R46	45.1	36.0	45.1	35.9	0.0	-0.1
R47	45.5	38.4	45.4	38.0	-0.1	-0.4
R48	45.1	35.5	45.0	35.3	-0.1	-0.2
R50	45.1	35.9	45.0	35.0	-0.1	-0.9
R51	45.0	35.1	45.0	35.0	0.0	-0.1
R52	45.0	35.5	45.1	35.6	0.1	0.1
R53	45.3	37.3	45.2	36.9	-0.1	-0.4
R54	45.0	35.4	45.1	35.5	0.1	0.1

a) Wild Rose 2 has indicated this former dwelling will be converted to a Project office before the Project commences operations. As such, this location no longer qualifies as a receptor in accordance with Rule 012, but this location was included for information purposes.

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