REPORT

Buffalo Atlee Wind Power Projects - Noise Impact Assessment

Capstone Infrastructure Corporation on behalf of Buffalo Atlee 1 Wind LP, Buffalo Atlee 2 Wind LP, and Buffalo Atlee 3 Wind LP

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Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION 2

3.0 ASSESSMENT APPROACH 3

3.1 Assessment Cases 3

3.2 Noise Study Area and Receptors 4

3.3 Compliance Criteria 6

3.3.1 Broadband Noise 6

3.3.2 Low Frequency Noise 7

3.4 Noise Prediction Methodology 7

4.0 NOISE EMISSIONS 9

4.1 Baseline Case 9

4.1.1 AUC-Regulated Facilities 9

4.1.2 AER-Regulated Facilities and Wells 12

4.2 Application Case 12

5.0 ASSESSMENT RESULTS 15

5.1 Baseline Case 15

5.1.1 Broadband Noise 15

5.1.2 Low Frequency Noise 15

5.2 Application Case 16

5.2.1 Broadband Noise 16

5.2.2 Low Frequency Noise 18

6.0 SUMMARY AND DISCUSSION 20

7.0 ACOUSTICAL PRACTITIONER INFORMATION 20

8.0 REFERENCES 22

TABLES

Table 1: Project Wind Turbines and Operating Modes 2
Table 2: Noise Receptors 4
Table 3: Permissible Sound Levels and Ambient Sound Levels 7
Table 4: Environmental Inputs to Computer Noise Models 8
Table 5: Baseline Case Noise Emissions - AUC-Regulated Facilities 11
Table 6: Application Case Noise Emissions - Project Wind Turbines 14
Table 7: Baseline Case Cumulative Noise Levels 15
Table 8: Baseline Case Broadband Noise Assessment 15
Table 9: Baseline Case Low Frequency Noise Analysis 16
Table 10: Application Case Cumulative Noise Levels 16
Table 11: Application Case Broadband Noise Assessment 18
Table 12: Application Case Low Frequency Noise Analysis 19

FIGURES

Figure 1: Noise Study Area 5
Figure 2: Project Noise Levels 17

APPENDICES

APPENDIX A
Total and One-Third Octave Band Noise Emissions for Project Wind Turbines

APPENDIX B
Baseline Case Noise Emissions - AER-Regulated Facilities and Wells

1.0 INTRODUCTION

Capstone Infrastructure Corporation (Capstone) and Sawridge First Nation, through their subsidiaries Buffalo Atlee 1 Wind LP, Buffalo Atlee 2 Wind LP, and Buffalo Atlee 3 Wind LP, are developing the Buffalo Atlee 1, 2, and 3 Wind Power Projects east and southeast of the Hamlet of Jenner, Alberta, in Special Areas No. 2. The three Buffalo Atlee Projects will hereafter be referred to collectively as “the Project”.

The Project will consist of eleven Siemens Gamesa SG 4.5-145 wind turbines. The total installed nominal capacity of the Project will be 48.30 megawatts (MW): 17.25 MW from Buffalo Atlee 1, 13.80 MW from Buffalo Atlee 2, and 17.25 MW from Buffalo Atlee 3. The Project will not require development of a new electrical substation.

Power generating facilities in Alberta are regulated by the Alberta Utilities Commission (AUC). In particular, the AUC regulates power generating facilities through R*ule 007: Applications for Power Plants, Substations, Transmission Lines, Industrial System Designations, and Hydro Developments* (AUC 2016), which will hereafter be referred to as Rule 007, and through *Rule 012: Noise Control* (AUC 2019), which will hereafter be referred to as Rule 012. Rule 007 lays out general requirements for regulatory applications and Rule 012 provides specific methods and criteria for assessing potential environmental noise impacts.

Capstone retained Golder Associates Ltd. (Golder) to complete a noise impact assessment (NIA) for the Project. Golder conducted the Project NIA in accordance with guidance and methodology specified in Rule 012. The results of the Project NIA are summarized in this report.

The Project NIA report is structured as follows:

- Section 1 provides an introduction to the Project NIA
- Section 2 presents a brief description of 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
  - noise 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 sources 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 and discusses the results of the Project NIA
- Section 7 provides information about the acoustical practitioners that completed the Project NIA
- Appendix A consists of manufacturer-supplied tables showing total and one-third octave band noise emissions from the Project wind turbines
- Appendix B presents noise emissions values for some of the sources/facilities considered in the Project NIA

2.0 PROJECT DESCRIPTION

The Project will consist of eleven Siemens Gamesa SG 4.5-145 wind turbines. The Project wind turbines will have a hub height of 127.5 m. Individual Project wind turbines will operate in one of two different modes:

- AM+1, with a nominal power rating of 4.6 MW
- AM-3, with a nominal power rating for 4.2 MW

Table 1 presents locations and operating modes for the Project wind turbines. Each Project wind turbine will have its operating mode configured to match the operation 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 2019), where daytime is the period from 7 am to 10 pm and nighttime is the period from 10 pm to 7 am. As indicated in Table 1, the Project wind turbines will operate in the same modes during the daytime period and the nighttime period.

Table 1: Project Wind Turbines and Operating Modes

Project Phase	Turbine Identification Code	Description	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Turbine Operating Mode[(a)]	
			Easting [m]	Northing [m]	Daytime	Nighttime
Buffalo Atlee 1	BA1_T1	Siemens Gamesa SG 4.5-145 wind turbine	497102	5621225	AM+1	AM+1
	BA1_T2	Siemens Gamesa SG 4.5-145 wind turbine	497071	5620759	AM-3	AM-3
	BA1_T3	Siemens Gamesa SG 4.5-145 wind turbine	497608	5620272	AM-3	AM-3
	BA1_T4	Siemens Gamesa SG 4.5-145 wind turbine	497028	5620141	AM-3	AM-3
Buffalo Atlee 2	BA2_T1	Siemens Gamesa SG 4.5-145 wind turbine	491659	5618204	AM+1	AM+1
	BA2_T2	Siemens Gamesa SG 4.5-145 wind turbine	492341	5617440	AM+1	AM+1
	BA2_T3	Siemens Gamesa SG 4.5-145 wind turbine	492205	5617009	AM+1	AM+1
Buffalo Atlee 3	BA3_T1	Siemens Gamesa SG 4.5-145 wind turbine	495426	5619890	AM-3	AM-3
	BA3_T2	Siemens Gamesa SG 4.5-145 wind turbine	495586	5619388	AM-3	AM-3
	BA3_T3	Siemens Gamesa SG 4.5-145 wind turbine	496402	5619369	AM-3	AM-3
	BA3_T4	Siemens Gamesa SG 4.5-145 wind turbine	496556	5619899	AM+1	AM+1

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

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

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 relevant 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 [kilometres] from the centre point of the tower of the closest wind turbine…"* (AUC 2019). 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 2019)

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, 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 Baseline Case industrial facilities were estimated using information presented in NIAs prepared for these facilities (Innova 2016; RWDI 2018; RWDI 2019; Stantec 2019), in combination with a computer model developed in accordance with a widely-accepted calculation standard for the propagation of environmental noise (ISO 1996). The contribution from Project wind turbines to Application Case cumulative noise levels was predicted using a computer model that made use of same calculation standard as the Baseline Case computer model (ISO 1996). In accordance with Rule 012, the Application Case modelled Project wind turbines under *"…planned maximum operating conditions…"* (AUC 2019).

Section 4.1 and Appendix B of this report provide additional detail on the Baseline Case industrial facilities considered in the Project NIA. Section 2.0, Section 4.2, and Appendix A of this report provide additional detail on the Project wind turbines included in the Application Case. Section 3.4 of this report provides additional detail on the computer modelling conducted for the Baseline Case and the Application Case.

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…"* (AUC 2019). The Project NIA established a 2 km buffer surrounding the Project wind turbines and assessed potential Project noise impacts at all occupied dwellings located within this buffer. Note that a 2 km receptor buffer was selected instead of a 1.5 km receptor buffer based on the Rule 007 requirement that proponents notify all residents living within 2 km of a proposed facility (AUC 2016). In other words, specific receptors for the Project NIA were selected such that discrete noise level predictions and assessment results would be available for all residents that Capstone was required to notify as part of the AUC regulatory process for the Project.

Receptors were initially identified using satellite imagery of the Project area. Golder subsequently verified receptor locations, heights (e.g., one-storey, two-storey), and occupancy status during a site visit on April 4, 2019. Two occupied dwellings were identified within 2 km of the Project wind turbines. These two occupied dwellings were considered receptors in the Project NIA.

Table 2 presents locations and heights for the two receptors considered in the Project NIA. 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 2019). Golder's site visit of April 4, 2019 confirmed that both receptors are one-storey dwellings. As such, both receptors were modelled at a height of 1.5 m above ground to match the height at which noise exposure will typically occur.

Figure 1 presents a map showing the noise study area (i.e., a 2 km buffer surrounding the Project wind turbines). The map in Figure 1 includes receptors, Project wind turbines, and Baseline Case facilities considered in the Project NIA. Section 4.1 and Appendix B of this report provide additional detail on the Baseline Case facilities.

Table 2: Noise Receptors

Receptor Identification Code	Receptor Description	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Receptor Height [m]	Closest Project Wind Turbine	Distance to Closest Project Wind Turbine [m]
		Easting [m]	Northing [m]			
R1[(a)(b)]	occupied dwelling; one-storey	498270	5621337	1.5	BA1_T1	1,173
R2	occupied dwelling; one-storey	490484	5619719	1.5	BA2_T1	1,917

(a) This receptor is identified as "R4" in the NIA for the Jenner Wind Power Project (RWDI 2019). The Jenner Wind Power Project uses slightly different coordinates to represent the location of this receptor. Golder confirmed the precise location of this receptor as provided in the table during a site visit on April 4, 2019.

(b) The NIA for the Jenner Wind Power Project identifies a second occupied dwelling, "R11", in the same yard site as this receptor (RWDI 2019). During a site visit on April 4, 2019, Golder spoke directly to the owner/occupant of this yard site and confirmed there is only one occupied dwelling.

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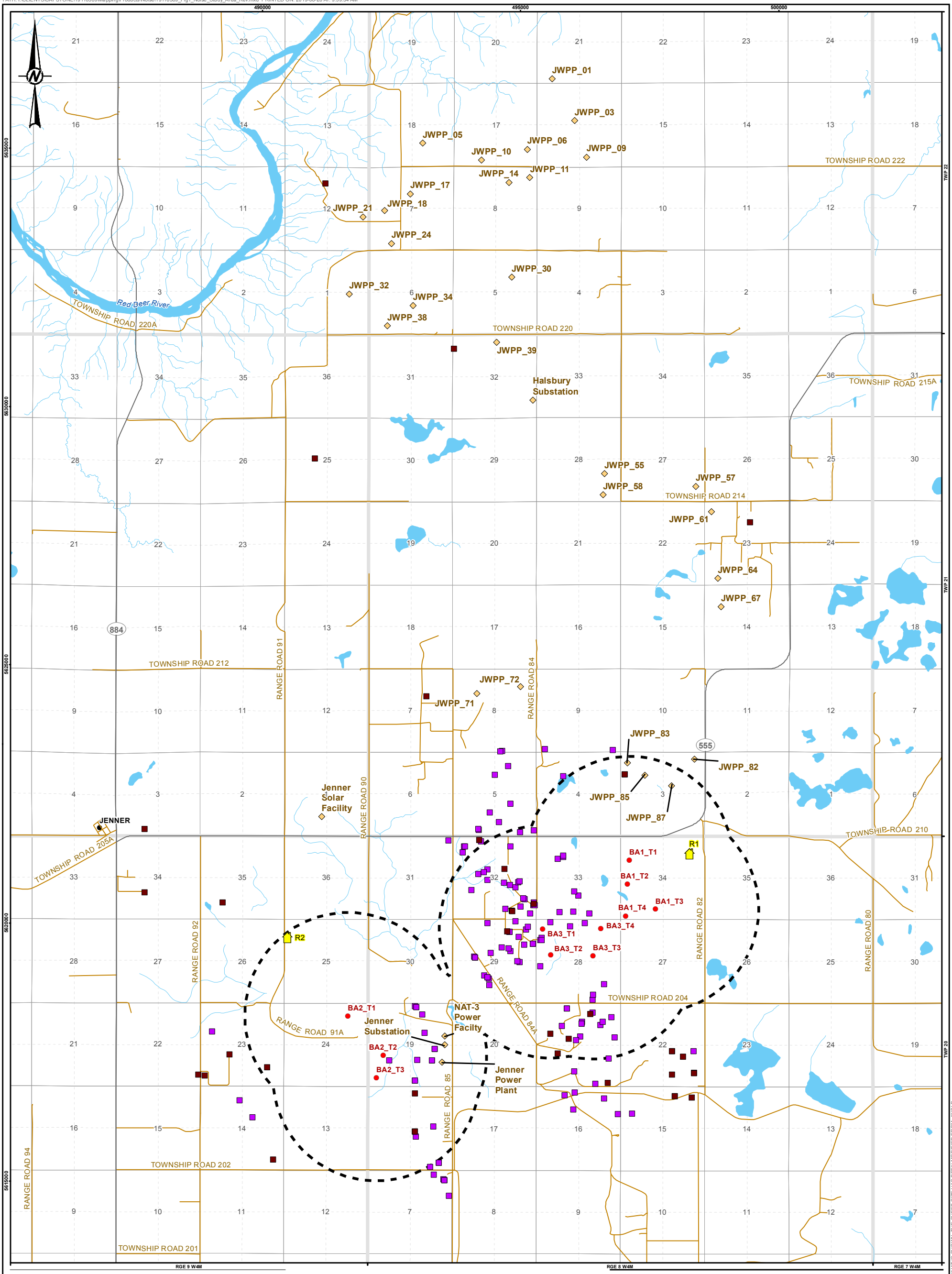

LEGEND

- TURBINE
- DWELLING RECEPTOR
- NOISE STUDY AREA

BASELINE CASE FACILITIES

- AER-REGULATED FACILITIES
- AER-REGULATED WELLS
- AUC-REGULATED FACILITIES
- HAMLET
- SECONDARY HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

0 1,500 3,000
1:70,000 METRES

REFERENCE(S)

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PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT
CAPSTONE

PROJECT
BUFFALO ATLEE

TITLE
NOISE STUDY AREA

CONSULTANT
GOLDER

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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)
- 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 R1 and R2.

Cumulative noise levels include 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 constructed AUC/AER-regulated facilities
- 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 average nighttime [ASL] in rural Alberta is approximately 35 dBA…"* and further indicates that *"…[t]he assumed [ASL] is five dBA less than the applicable [PSL]…"* (AUC 2019).

There are no heavily-travelled roads (i.e., roads with traffic volumes greater than or equal to 90 vehicles per nighttime period) or railways with the potential to influence the ASL at receptors R1 or R2. Similarly, there are no unregulated industrial facilities with the potential to influence the ASL at receptors R1 or R2. As such, the ASL at receptors R1 and R2 is primarily influenced by natural and non-industrial sources typical of a rural area (e.g., birds, insects, rustling vegetation, traffic on small/local roads, agricultural activities).

Based on the analysis above, it is reasonable for the Project NIA to make use of the assumed ASL values from Rule 012. Use of assumed ASL values in the Project NIA is further justified by the fact that all of the NIAs completed for existing, approved, and proposed AUC-regulated facilities with the potential to influence cumulative noise levels at R1 and R2 have also made use of assumed ASL values (Innova 2016; RWDI 2018; RWDI 2019; Stantec 2019).

Table 3 presents Rule 012 PSL limits and assumed ASL values applicable at each receptor considered in the 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
R1	50	40	45	35
R2	50	40	45	35

[(a)] In accordance with Rule 012, the assumed ambient sound level is 5 dBA less than the applicable permissible sound level.

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 a 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 (the “Cumulative Noise Test”); and
- a clear tone is present in a one-third octave band at or below 250 hertz (Hz) (the “Tonal Test”)

Rule 012 provides the following definition of a clear tone for use in the Tonal Test:

> *“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”* (AUC 2019)

The guidelines under Rule 012 require that both the Cumulative Noise Test and Tonal Test be satisfied for a LFN issue to exist. Satisfaction of one of the two tests does not result in a 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. The noise modelling parameters identified in Table 4 have been selected for consistency with the most-recent NIA prepared for the Jenner Wind Power Project (JWPP), which is located immediately north of the Project (RWDI 2019). Aligning modelling parameters will provide the AUC with assessment results that are generally consistent for the JWPP and the Project and facilitate a direct comparison of the two NIAs.

Table 4: Environmental Inputs to Computer Noise Models

Parameter	Model Setting[(a)]	Description / Notes
Standard	ISO 9613-2 (ISO 1996)	Models treated noise sources, noise attenuation, and noise propagation in accordance with this standard.
Ground Factor	0.7 – throughout the noise study area	This value represents the acoustic properties of the ground in accordance with ISO 9613-2.
Maximum Radius of Influence (also called “search radius” or “fetching radius”)	10 km	This value represents the maximum distance at which a source can contribute to noise levels at a receptor.
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 m/s 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	Terrain modelled using Altalis Ltd. database	Ground elevation contours at 5 m intervals were included in the models.

[(a)] Modelling parameters were selected for consistency with the NIA for the Jenner Wind Power Project (RWDI 2019).

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 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 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 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 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 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

As discussed in Section 3.1 of this report, the Baseline Case 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. As discussed in Section 3.3.1 of this report, there are no unregulated industrial facilities with the potential to influence cumulative noise levels at receptors R1 or R2. As such, the Project NIA characterized the noise contribution form natural and non-industrial noise sources using assumed ASL values from Rule 012 (see Table 3 of this report).

4.1.1 AUC-Regulated Facilities

Golder used the AUC eFiling system to identify AUC-regulated facilities with the potential to influence cumulative noise levels at receptor R1 and receptor R2 (i.e., AUC-regulated facilities located within approximately 3 km of the Project). A total of six such facilities were identified:

- JWPP, an approved but not constructed wind power facility located north of the Project
- Halsbury Substation, an approved but not constructed electrical substation located north of the Project
- Jenner Solar, an approved but not constructed solar power facility located northwest of the Project
- NAT-3 Power Facility, an approved but not constructed natural gas power plant located west of the Project

- Jenner Substation, an existing electrical substation located west of the Project
- Jenner Power Plant, an approved but not constructed natural gas power plant located west of the Project

The locations of these AUC-regulated Baseline Case facilities are shown in Figure 1 of this report. The Project NIA characterized the noise contribution from these six Baseline Case facilities using information provided in the NIAs prepared for these facilities.

The noise contributions from the JWPP and from the Halsbury Substation were characterized using information provided in the most-recent NIA prepared for the JWPP (RWDI 2019). In particular, the JWPP noise contribution at receptor R1 was taken directly from the JWPP NIA (since this receptor is included in the JWPP NIA as “R4”). To estimate the JWPP’s noise contribution at receptor R2 (which is not included in the JWPP NIA) and to estimate the Halsbury Substation’s noise contribution at receptors R1 and R2, Golder developed a computer noise model using source locations and emissions inputs provided in the JWPP NIA. This computer noise model made use of the modelling parameters listed in Table 4 of this report.

The noise contribution from the Jenner Solar facility was characterized using information provided in the most-recent NIA prepared for this facility (Stantec 2019). In particular, to estimate the noise contribution from the Jenner Solar facility at receptors R1 and R2, Golder developed a computer noise model using source locations and emissions inputs provided in the Jenner Solar NIA. This computer noise model made use of the modelling parameters listed in Table 4 of this report.

The noise contributions from the NAT-3 Power Facility and from the Jenner Substation were characterized using information provided in the most-recent NIA prepared for the NAT-3 facility (Innova 2016). In particular, the noise contribution from the NAT-3 facility at receptors R1 and R2 was estimated by superimposing these receptor locations on the noise contour map presented in the NAT-3 NIA. Given the relative complexity of the NAT-3 facility (i.e., multiple noise sources and onsite buildings) this approach was considered more appropriate than trying to develop a computer model of the NAT-3 facility based on the limited information available in the NIA for this facility. To estimate the noise contribution from the considerably simpler Jenner Substation at receptors R1 and R2, Golder developed a computer noise model using source location and noise emissions inputs provided in the NAT-3 NIA. This computer noise model made use of the modelling parameters listed in Table 4 of this report.

The noise contribution from the Jenner Power Plant was characterized using information provided in the most-recent NIA prepared for this facility (RWDI 2018). In particular, the noise contribution from the Jenner Power Plant at receptors R1 and R2 was estimated by superimposing these receptor locations on the noise contour map presented in the Jenner Power Plant NIA. Given the relative complexity of the Jenner Power Plant (i.e., multiple noise sources and onsite buildings) this approach was considered more appropriate than trying to develop a computer model of the Jenner Power Plant based on the limited information available in the NIA for this facility.

Based on the Rule 012 definition of proposed facilities (i.e., facilities whose application has been deemed complete by the AUC), there are no proposed facilities with the potential to influence cumulative noise levels at receptors R1 or R2. Note that an application has been filed with the AUC for the Jenner Wind Power Project Expansion (JWPPE), which is located north of the Project. However, the JWPPE application has been placed into abeyance by the applicant (Potentia 2019). As such, JWPPE is not a proposed facility in the context of Rule 012, and the noise contribution from JWPPE was not considered in the Project NIA.

Table 5 presents noise emissions values used in the Project NIA to represent the six AUC-regulated Baseline Case facilities. 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.

Table 5: Baseline Case Noise Emissions - AUC-Regulated Facilities

Facility	Noise Source	Quantity	Octave Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
JWPP[a]	Wind Turbine	29	117.8	111.4	109.7	107.0	106.1	103.0	97.0	84.4	64.8	107.5	(RWDI 2019)
	Pad-Mounted Transformer	29	62.5	74.5	80.5	79.5	79.5	71.5	64.5	56.5	44.5	78.8	(RWDI 2019)
Halsbury Substation	Transformer	3	95.2	101.2	103.2	98.2	98.2	92.2	87.2	82.2	75.2	98.6	(RWDI 2019)
Jenner Substation	All Sources	1	100.0	100.0	102.0	91.0	88.0	86.0	81.0	80.0	79.0	92.2	(Innova 2016)
Jenner Solar	Inverter Unit	9	99.8	98.5	97.1	103.7	96.9	90.6	84.8	79.0	71.6	98.7	(Stantec 2019)
	Transformer	9	71.4	77.4	79.4	74.4	74.4	68.4	63.4	58.4	51.4	74.8	(Stantec 2019)
NAT-3 Power Facility	All Sources	1	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	n/a[b]	(Innova 2016)
Jenner Power Plant	All Sources	1	n/a[c]	n/a[c]	n/a[c]	n/a[c]	n/a[c]	n/a[c]	n/a[c]	n/a[c]	n/a[c]	n/a[c]	(RWDI 2018)

[a] JWPP noise emissions presented in this table were only used to model the JWPP's noise contribution at R2. The JWPP's noise contribution at R1 was taken directly from the JWPP NIA (RWDI 2019).

[b] The NAT-3 facility was not modelled for the Project NIA. Instead, the noise contribution from the NAT-3 facility was estimated by superimposing receptors R1 and R2 on the noise contour map presented in the NAT-3 NIA (Innova 2016).

[c] The Jenner Power Plant was not modelled for the Project NIA. Instead, the noise contribution from the Jenner Power Plant was estimated by superimposing receptors R1 and R2 on the noise contour map presented in the Jenner Power Plant NIA (RWDI 2018).

4.1.2 AER-Regulated Facilities and Wells

Golder used information presented in the most-recent NIAs for the JWPP (RWDI 2019), Jenner Solar facility (Stantec 2019), NAT-3 facility (Innova 2016), and Jenner Power Plant (RWDI 2018) to identify AER-regulated facilities and wells with the potential to influence cumulative noise levels at receptors R1 and R2. To supplement the information presented in these third-party NIAs, Golder also reviewed AER databases ST102 (AER 2019a) and ST37 (AER 2019b) to identify additional AER-regulated facilities and wells that may contribute to cumulative noise levels at receptors R1 and R2 (i.e., facilities and wells located within approximately 3 km of the Project).

This review identified a total of 32 potentially-relevant AER-regulated facilities and 139 potentially-relevant AER-regulated wells. Golder developed a computer noise model to estimate the noise contributions from these 32 facilities and 139 wells at receptors R1 and R2. The computer noise model made use of the modelling parameters listed in Table 4 of this report.

Noise emissions from the AER-regulated facilities and wells were established using information presented in the most-recent NIAs for the JWPP (RWDI 2019), Jenner Solar facility (Stantec 2019), NAT-3 facility (Innova 2016), and Jenner Power Plant (RWDI 2018). Where a particular AER-regulated facility or well appeared in one of these third-party NIAs, the Project NIA made use of noise emissions taken directly from the third-party NIA. Where a particular AER-regulated facility or well appeared in more than one of these third-party NIAs, the Project NIA made use of the highest/loudest noise emissions from the among the third-party NIAs. Where a particular AER-regulated facility or well did not appear in any of the third-party NIAs (i.e., facilities or wells identified by Golder using the AER ST102 or ST37 databases), the Project NIA used representative noise emissions for a comparable facility or well from one of the third-party NIAs. This approach to estimating noise emissions from AER-regulated facilities and wells means the Baseline Case for the Project NIA is largely consistent with the most-recent NIAs prepared for nearby facilities (i.e., JWPP, Jenner Solar, NAT-3, and Jenner Power Plant).

Appendix B presents noise emissions values used in the Project NIA to represent the 32 AER-regulated Baseline Case facilities and the 139 AER-regulated Baseline Case wells.

4.2 Application Case

Project noise sources considered in the Application Case consist of eleven Siemens Gamesa SG 4.5-145 wind turbines. In accordance with Rule 012, all Project wind turbines were modelled using *"…the maximum noise emitted when the wind turbine operates under the planned maximum operating conditions for both the daytime and nighttime period"* (AUC 2019).

Noise emissions data for the Project wind turbines were provided by Siemens Gamesa, the manufacturer. Noise emissions data provided by Siemens Gamesa are attached as Appendix A of this report. Noise emissions from Project wind turbines will increase with hub height wind speed, until hub height wind speed reaches 9 metres per second (m/s). Noise emissions from the Project wind turbines will remain constant for all hub height wind speeds greater than or equal to 9 m/s. Furthermore, the shape of the noise emissions spectrum will not change for hub wind speeds greater than or equal to 9 m/s.

As discussed in Section 2.0 of this report, five of the Project wind turbines will operate in AM+1 mode for both the daytime period and nighttime period. The remaining six Project wind turbines will operate in AM-3 mode for the both the daytime period and nighttime period. Table 6 presents noise emissions from the Project wind turbines for each relevant operating mode. Noise emissions values are presented in the form of octave band sound power levels, expressed in dBZ, and total sound power levels, expressed in dBA. These noise emissions values were calculated directly from the manufacturer-supplied data attached as Appendix A to this report. Noise emissions

values presented in Table 6 correspond to hub height wind speeds greater than or equal to 9 m/s and represent the *"…the maximum noise emitted when the wind turbine operates under the planned maximum operating conditions…"* (AUC 2019).

As discussed in Section 3.3.2 of this report, Rule 012 sets out a two-part test for LFN issues (the Cumulative Noise Test and the Tonal Test). The Tonal 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 4.5-145 wind turbines do not include a clear tone at or below 250 Hz. As such, based on the manufacturer noise specifications, Project noise sources are not able to produce LFN issues, regardless of the outcome of the Cumulative Noise Test for LFN. 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 Project-related LFN issue.

Table 6: Application Case Noise Emissions - Project Wind Turbines

Turbine Identification Code	Turbine Operating Mode	Hub Height Wind Speed [m/s]	Octave Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
BA1_T1; BA2_T1; BA2_T2; BA2_T3; BA3_T4	AM+1	≥9	117.9	116.8	112.3	108.3	103.9	102.5	100.9	94.9	83.5	108.1	Manufacturer-supplied noise specification (see Appendix A of this report)
BA1_T2; BA1_T3; BA1_T4; BA3_T1; BA3_T2; BA3_T3	AM-3	≥9	117.4	116.1	111.4	107.1	102.7	101.3	99.7	93.7	82.3	106.9	Manufacturer-supplied noise specification (see Appendix A of this report)

5.0 ASSESSMENT RESULTS

5.1 Baseline Case

5.1.1 Broadband Noise

As discussed in Section 3.1 of this report, Baseline Case cumulative noise levels include 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 constructed AUC/AER-regulated facilities, and proposed facilities that have been deemed complete by the AUC. There are no unregulated industrial facilities or proposed AUC facilities with the potential to influence cumulative noise levels at receptor R1 or R2. The noise contribution from natural and non-industrial sources was characterized using assumed ASL values from Rule 012 (see Table 3 of this report). The noise contributions from AUC/AER-regulated Baseline Case facilities were characterized using the information summarized in Section 4.1 and Appendix B of this report. Baseline Case cumulative noise levels for receptors R1 and R2 are presented in Table 7.

Table 7: Baseline Case Cumulative Noise Levels

Receptor Identification Code	Period	Ambient Sound Level [dBA]	Noise Contribution from AUC/AER-Regulated Facilities and Wells [dBA]	Baseline Case Cumulative Noise Level [dBA]
R1	daytime	45	32.6	45.2
	nighttime	35	32.6	37.0
R2	daytime	45	30.5	45.2
	nighttime	35	30.5	36.3

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 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
R1	45	50	5	compliant
	37	40	3	compliant
R2	45	50	5	compliant
	36	40	4	compliant

(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.

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 (Cumulative Noise Test and Tonal Test). The Cumulative Noise Test compares noise levels expressed in dBA to noise levels expressed in dBC. It is understood that this first LFN test should be applied to cumulative noise levels (i.e., noise levels that include the contribution from natural and non-industrial noise sources and from industrial facilities). Rule 012 provides assumed ASL values to represent the noise contribution from natural and non-industrial sources, but these ASL values are only specified in dBA. There is no accepted method of representing ASL values in dBC. Therefore, when applying the Cumulative Noise Test, it was necessary to omit the noise contribution from the natural and non-industrial sources. In addition, the NIAs for the NAT-3 Power Plant (Innova 2016) and the Jenner Power Plant (RWDI 2018) do not include noise contour maps in dBC. Therefore,

when evaluating the Cumulative Noise Test, it was also necessary to omit the noise contribution from these two facilities.

Table 9 presents a Baseline Case LFN analysis based on the Cumulative Noise Test while omitting the noise contribution from natural and non-industrial sources and from the NAT-3 and Jenner Power Plant facilities. Because all of the facilities considered in the Baseline Case are assumed to operate continuously 24 hours per day, there is no need to conduct separate LFN analyses for the daytime and nighttime periods.

Table 9: Baseline Case Low Frequency Noise Analysis

Receptor Identification Code	Noise Contribution from AUC/AER-Regulated Facilities and Wells[(a)] [dBA]	Noise Contribution from AUC/AER-Regulated Facilities and Wells[(a)] [dBC]	Difference: dBC minus dBA	Rule 012 LFN Threshold	Potential for LFN Issue
R1	32.6	50.8	18.2	20	no
R2	28.5	51.4	22.9	20	yes

(a) The noise contributions from the NAT-3 and Jenner Power Plant facilities have been omitted from the LFN analysis, because information about dBC noise levels is not available for these facilities.

Results from Table 9 suggest the difference between Baseline Case noise levels expressed in dBA and dBC is less than 20 for receptor R1. As such, based on the LFN criteria set out in Rule 012, there is no potential Baseline Case LFN issue at receptor R1.

Results from Table 9 suggest the difference between Baseline Case noise levels expressed in dBA and dBC is greater than 20 for receptor R2. As such, based on the LFN criteria set out in Rule 012, there is a potential Baseline Case LFN issue at receptor R2. It is again noted that the Cumulative Noise Test for LFN, as presented in Table 9, 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 values would be reduced. Moreover, Rule 012 explicitly states that the LFN analysis *"…in predictive noise impact assessments is for information purposes only"* (AUC 2019). Therefore, the potential Baseline Case LFN issue predicted for receptor R2 ultimately has no bearing on compliance with Rule 012.

5.2 Application Case

5.2.1 Broadband Noise

As discussed in Section 3.1 of this report, Application Case cumulative noise levels were calculated by summing Baseline Case cumulative noise levels with the predicted noise contribution from the Project itself under planned maximum operating conditions. Baseline Case cumulative noise levels are presented in Table 7. The noise contribution from the Project itself was predicted using a computer model developed using modelling parameters from Table 4 and noise emissions from Table 6. Application Case cumulative noise levels for receptors R1 and R2 are presented in Table 10. Figure 2 presents Project noise level contours.

Table 10: Application Case Cumulative Noise Levels

Receptor Identification Code	Period	Baseline Case Cumulative Noise Level [dBA]	Project Noise Contribution [dBA]	Application Case Cumulative Noise Level [dBA]
R1	daytime	45.2	35.0	45.6
	nighttime	37.0	35.0	39.1
R2	daytime	45.2	27.2	45.3
	nighttime	36.3	27.2	36.8

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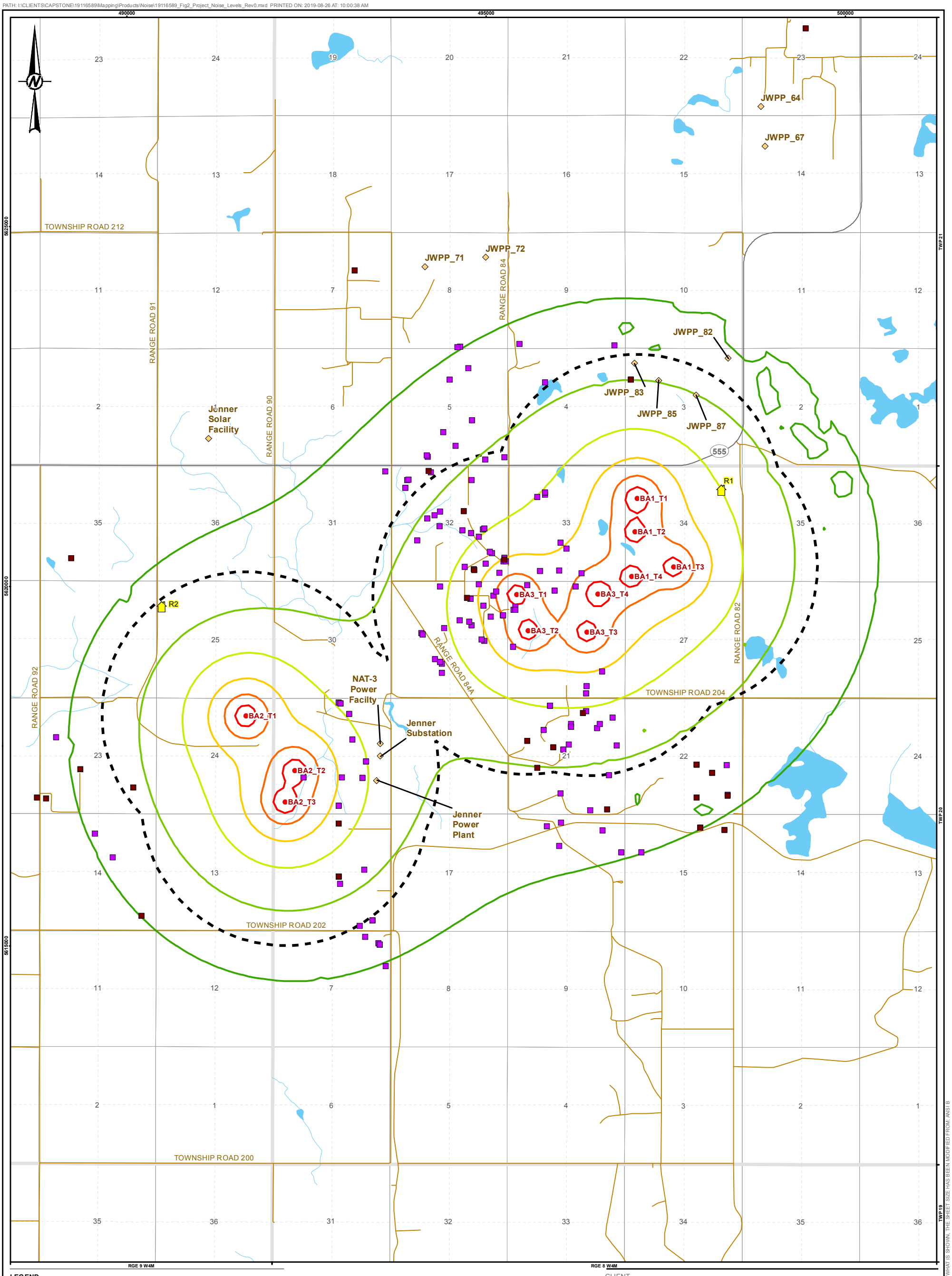

LEGEND

- TURBINE
- DWELLING RECEPTOR
- NOISE STUDY AREA

BASELINE CASE FACILITIES

- AER-REGULATED FACILITIES
- AER-REGULATED WELLS
- AUC-REGULATED FACILITIES

PROJECT NOISE LEVEL [DBA]

- 25
- 30
- 35
- 40
- 45
- 50

- SECONDARY HIGHWAY
- LOCAL ROAD
- WATERCOURSE
- WATERBODY

0 1,000 2,000
1:50,000 METRES

REFERENCE(S)

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PROJECT
BUFFALO ATLEE

TITLE
PROJECT NOISE LEVELS

CONSULTANT
GOLDER

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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 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
R1	46	50	4	compliant
	39	40	1	compliant
R2	45	50	5	compliant
	37	40	3	compliant

(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.

5.2.2 Low Frequency Noise

As discussed in Section 4.2, 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 (referred to as the Tonal Test herein). As such, the Project is compliant with Rule 012 requirements and is not expected to produce LFN issues.

Notwithstanding the fact that the Project is not expected to produce LFN issues, an Application Case LFN analysis was completed based on the Cumulative Noise Test for LFN. Results of this analysis are presented in Table 12. Because all of the facilities considered in the Application Case are assumed to operate continuously 24 hours per day, there is no need to conduct separate LFN analyses for the daytime and nighttime periods.

Results from Table 12 suggest the difference between Application Case noise levels expressed in dBA and dBC is less than 20 for receptor R1. This result further confirms that the Project is complaint with Rule 012, and there is no potential LFN issue at receptor R1.

Results from Table 12 suggest the difference between Application Case noise levels expressed in dBA and dBC is greater than 20 for receptor R2, similar to the results in Table 9 for the Baseline Case. It should again be noted that 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 values would be reduced. Moreover, Rule 012 explicitly states that the LFN analysis *"…in predictive noise impact assessments is for information purposes only"* (AUC 2019). Most importantly, the absence of LFN through the Tonal Test precludes the presence of a Project-related LFN issue at receptor R2 (or anywhere else).

Table 12: Application Case Low Frequency Noise Analysis

Receptor Identification Code	A-Weighted Noise Level [dBA]			C-Weighed Noise Level [dBC]			Difference: dBC minus dBA	Rule 012 LFN Threshold	Potential for LFN Issue
	Noise Contribution from AUC/AER-Regulated Facilities and Wells[(a)]	Project Noise Contribution	Total	Noise Contribution from AUC/AER-Regulated Facilities and Wells[(a)]	Project Noise Contribution	Total			
R1	32.6	35.0	37.0	50.8	54.8	56.3	19.3	20	no
R2	28.5	27.2	30.9	51.4	49.1	53.4	22.5	20	no[(b)]

(a) The noise contributions from the NAT-3 and Jenner Power Plant facilities have been omitted from the LFN analysis, because information about dBC noise levels is not available for these facilities.

(b) Notwithstanding the difference between dBC and dBA noise levels is predicted to be greater than 20, there can be no Project-related LFN issue at this receptor because there is no clear tone in the Project noise emissions.

6.0 SUMMARY AND DISCUSSION

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 2019).

For both the daytime period and the nighttime period, the Project NIA predicts that Application Case cumulative noise levels will comply with applicable Rule 012 PSL limits for all receptors.

Based on detailed analysis of the noise emissions spectra for the Project wind turbines, the Project NIA also predicts that there will be no Project-related LFN issues at any receptors.

In summary, the 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 Project NIA. Andrew also conducted the receptor-verification field work (i.e., the Project site visit of April 4, 2019). 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 the computer noise model, and authored the Project NIA report. Victor has worked as an acoustic scientist in the Golder Calgary office for more than eight 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

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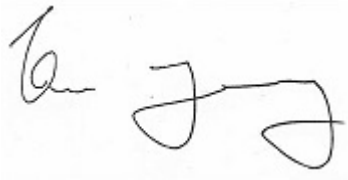

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VY/AF/jlb/al/pls

https://golderassociates.sharepoint.com/sites/103641/deliverables/noise impact assessment/buffaloatlee noiseimpactassessment final.docx

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APPENDIX A

Total and One-Third Octave Band Noise Emissions for Project Wind Turbines

INDEX

INDEX 1
1 AIM 2
2 SCOPE 2
3 ABBREVIATIONS, DEFINITIONS 2
4 DESCRIPTION 2
5 NOISE SPECTRA 3

RECORD OF CHANGES

Rev.	Date	Author	Description
0	29/06/2018	SNOVO/MASHEIM	Initial Version (noise spectra for 12m/s included).
1	13/07/2018	SNOVO/MASHEIM	Table 3 included with noise curves. Noise spectra for additional wind speeds included (6,7,8,9,10 & 11m/s).
2	18/07/2018	SNOVO/MASHEIM	Misprint corrections.
3	17/06/2019	SNOVO/MASHEIM	Additional Flexible Rating Application Moddes included.

1 AIM

This document aims to give an estimation of the noise spectra for the SG 4.5-145 wind turbine.

2 SCOPE

The values in the present document are applicable to all the existing configurations for SG 4.5-145 wind turbine, for standard and low noise operation modes.

3 ABBREVIATIONS, DEFINITIONS

- **WT**: Wind turbine.
- **Wind speed ($W_{S.}$):** Expressed in m/s, it is the horizontal wind component value at the height of the hub averaged every 10 minutes.
- **Frequency (f):** Central frequency of a given band spectra, expressed in Hz.
- **L_{WA}:** A-weighted sound power level, expressed in dB(A).
- **Noise level:** The expected sound power level values, expressed in dB(A), represent the sound power that the WT emits at the height of the hub for a given wind speed.
  The noise levels shown in this document are average expected values, called Lw in IEC-61400-14. To obtain the Lwd value, as defined in IEC-61400-14, an increase of 2 dB(A) shall be considered over said Lw values.
- **dB(A):** An A type frequency filter is applied, in accordance with the IEC standard.

4 DESCRIPTION

When not specified otherwise, data in following sections is calculated using the parameters from **Table 1**. All noise values in this document are subject to the validity ranges presented in **Table 2**.

Rated power	Flexible Rating 4.0MW to 5.0MW
Frequency	50 Hz/60 Hz
Rotor Diameter	145m
Angle of blade tip	Pitch control regulation
Air density reference	1.225 kg/m^3

Table 1 Calculation parameter values for the SG 4.5-145 noise spectra.

Wind Shear (10min average)	≤ 0.3
Turbulence intensity TI [%] for bin i	$5\%\frac{(0.75v_i+5.6)}{v_i} < TI_i < 12\%\frac{(0.75v_i+5.6)}{v_i}$
Terrain	Not complex according to IEC 61400-12-1
Upflow β [º]	-2º ≤ β ≤ +2º
Grid frequency [Hz]	± 0.5 Hz

Table 2 Validity ranges of the noise spectra for the SG 4.5-145.

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

5 NOISE SPECTRA

Table 3 shows the noise curves for the SG 4.5-145 MW expressed as A-weighted sound power level in function of wind speed at hub height, for the standard, Flexible Rating and Noise Reduction System operation and application modes.

Wind Speed [m/s]	6	7	8	9	10	11	12	13	Up to cut-out
SG 4.5-145 Baseline AM0 @ 4.5MW	99.7	103.2	106.2	107.8	107.8	107.8	107.8	107.8	107.8
SG 4.5-145 AM+5 @ 5.0MW	99.7	103.2	106.2	109.0	109.3	109.3	109.3	109.3	109.3
SG 4.5-145 AM+4 @ 4.9MW	99.7	103.2	106.2	109.0	109.0	109.0	109.0	109.0	109.0
SG 4.5-145 AM+3 @ 4.8MW	99.7	103.2	106.2	108.7	108.7	108.7	108.7	108.7	108.7
SG 4.5-145 AM+2 @ 4.7MW	99.7	103.2	106.2	108.4	108.4	108.4	108.4	108.4	108.4
SG 4.5-145 AM+1 @ 4.6MW	99.7	103.2	106.2	108.1	108.1	108.1	108.1	108.1	108.1
SG 4.5-145 AM-1 @ 4.4MW	99.7	103.2	106.2	107.5	107.5	107.5	107.5	107.5	107.5
SG 4.5-145 AM-2 @ 4.3MW	99.7	103.2	106.2	107.2	107.2	107.2	107.2	107.2	107.2
SG 4.5-145 AM-3 @ 4.2MW	99.7	103.2	106.2	106.9	106.9	106.9	106.9	106.9	106.9
SG 4.5-145 AM-3 @ 4.1MW	99.7	103.2	106.2	106.6	106.6	106.6	106.6	106.6	106.6
SG 4.5-145 AM-3 @ 4.0MW	99.7	103.2	106.2	106.3	106.3	106.3	106.3	106.3	106.3
SG 4.5-145 NRS Mode N1	99.7	103.2	105.7	105.7	105.7	105.7	105.7	105.7	105.7
SG 4.5-145 NRS Mode N2	99.7	103.2	105.2	105.2	105.2	105.2	105.2	105.2	105.2
SG 4.5-145 NRS Mode N3	99.7	103.2	103.7	103.7	103.7	103.7	103.7	103.7	103.7
SG 4.5-145 NRS Mode N4	99.7	102.7	102.7	102.7	102.7	102.7	102.7	102.7	102.7
SG 4.5-145 NRS Mode N5	99.7	101.7	101.7	101.7	101.7	101.7	101.7	101.7	101.7
SG 4.5-145 NRS Mode N6	99.7	99.9	99.9	99.9	99.9	99.9	99.9	99.9	99.9
SG 4.5-145 NRS Mode N7	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0	99.0
SG 4.5-145 NRS Mode N8	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0

Table 3 Noise curves for the SG 4.5-145 MW for the standard, Flexible Rating and Noise Reduction System operation and application modes (ref: *SG145spectra_4500KW_R03_17062018*).

Tables 4 to 11 show the 1/3 octave band noise spectra for the SG 4.5-145 MW expressed as A-weighted sound power level for a given frequency band, for the standard, Flexible Rating and Noise Reduction System operation and application modes, at different wind speeds at hub height.

Central Frequency [Hz]	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**
SG 4.5-145 Baseline AM0 @ 4.5MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM+5 @ 5.0MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM+4 @ 4.9MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM+3 @ 4.8MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM+2 @ 4.7MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM+1 @ 4.6MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM-1 @ 4.4MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM-2 @ 4.3MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM-3 @ 4.2MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM-3 @ 4.1MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 AM-3 @ 4.0MW	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 NRS Mode N1	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 NRS Mode N2	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 NRS Mode N3	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 NRS Mode N4	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 NRS Mode N5	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 NRS Mode N6	38.0	43.7	49.4	54.8	59.4	64.1	68.3	72.9	77.2	79.7	81.6
SG 4.5-145 NRS Mode N7	38.0	43.7	49.4	54.8	59.3	64.0	68.2	72.7	76.9	79.4	81.2
SG 4.5-145 NRS Mode N8	38.0	43.7	49.4	54.7	59.2	63.8	67.9	72.4	76.6	78.9	80.6
Central Frequency [Hz]	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**
SG 4.5-145 Baseline AM0 @ 4.5MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM+5 @ 5.0MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM+4 @ 4.9MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM+3 @ 4.8MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM+2 @ 4.7MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM+1 @ 4.6MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM-1 @ 4.4MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM-2 @ 4.3MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM-3 @ 4.2MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM-3 @ 4.1MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 AM-3 @ 4.0MW	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 NRS Mode N1	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 NRS Mode N2	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 NRS Mode N3	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 NRS Mode N4	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 NRS Mode N5	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 NRS Mode N6	83.1	84.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 NRS Mode N7	82.6	83.5	84.6	86.1	86.5	86.2	86.3	87.9	87.7	88.7	89.4
SG 4.5-145 NRS Mode N8	81.9	82.6	83.5	85.0	85.4	85.1	85.2	86.8	86.6	87.6	88.3

Central Frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
SG 4.5-145 Baseline AM0 @ 4.5MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM+5 @ 5.0MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM+4 @ 4.9MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM+3 @ 4.8MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM+2 @ 4.7MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM+1 @ 4.6MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM-1 @ 4.4MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM-2 @ 4.3MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM-3 @ 4.2MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM-3 @ 4.1MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 AM-3 @ 4.0MW	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 NRS Mode N1	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 NRS Mode N2	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 NRS Mode N3	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 NRS Mode N4	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 NRS Mode N5	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 NRS Mode N6	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 NRS Mode N7	89.3	88.2	86.8	84.6	81.5	77.2	72.0	66.2	61.6
SG 4.5-145 NRS Mode N8	88.2	87.1	85.7	83.5	80.4	76.1	70.9	65.1	60.5

Table 4 One-third octave band noise spectra of SG 4.5-145 @ 6 m/s
(*ref: SG145spectra_4500KW_R03_17062018*)

Central Frequency [Hz]	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**
SG 4.5-145 Baseline AM0 @ 4.5MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM+5 @ 5.0MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM+4 @ 4.9MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM+3 @ 4.8MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM+2 @ 4.7MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM+1 @ 4.6MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM-1 @ 4.4MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM-2 @ 4.3MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM-3 @ 4.2MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM-3 @ 4.1MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 AM-3 @ 4.0MW	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 NRS Mode N1	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 NRS Mode N2	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 NRS Mode N3	41.5	47.2	52.9	58.3	62.9	67.6	71.8	76.4	80.7	83.2	85.1
SG 4.5-145 NRS Mode N4	41.5	47.2	52.9	58.3	62.9	67.5	71.7	76.3	80.5	83.0	84.8
SG 4.5-145 NRS Mode N5	41.5	47.2	52.9	58.2	62.8	67.4	71.5	76.0	80.1	82.5	84.2
SG 4.5-145 NRS Mode N6	41.5	47.2	52.8	58.1	62.6	67.1	71.1	75.4	79.4	81.6	83.1
SG 4.5-145 NRS Mode N7	41.5	47.2	52.8	58.1	62.5	67.0	70.9	75.2	79.1	81.1	82.6
SG 4.5-145 NRS Mode N8	41.5	47.2	52.8	58.0	62.4	66.8	70.7	74.9	78.7	80.6	81.9
Central Frequency [Hz]	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**
SG 4.5-145 Baseline AM0 @ 4.5MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM+5 @ 5.0MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM+4 @ 4.9MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM+3 @ 4.8MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM+2 @ 4.7MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM+1 @ 4.6MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM-1 @ 4.4MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM-2 @ 4.3MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM-3 @ 4.2MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM-3 @ 4.1MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 AM-3 @ 4.0MW	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 NRS Mode N1	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 NRS Mode N2	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 NRS Mode N3	86.6	87.6	88.8	90.3	90.7	90.4	90.5	92.1	91.9	92.9	93.6
SG 4.5-145 NRS Mode N4	86.2	87.2	88.3	89.8	90.2	89.9	90.0	91.6	91.4	92.4	93.1
SG 4.5-145 NRS Mode N5	85.5	86.3	87.3	88.8	89.2	88.9	89.0	90.6	90.4	91.4	92.1
SG 4.5-145 NRS Mode N6	84.2	84.7	85.4	86.9	87.3	87.0	87.1	88.7	88.5	89.5	90.2
SG 4.5-145 NRS Mode N7	83.5	84.0	84.5	86.0	86.4	86.1	86.2	87.8	87.6	88.6	89.3
SG 4.5-145 NRS Mode N8	82.8	83.1	83.4	84.9	85.3	85.0	85.1	86.7	86.5	87.5	88.2

Central Frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
SG 4.5-145 Baseline AM0 @ 4.5MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM+5 @ 5.0MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM+4 @ 4.9MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM+3 @ 4.8MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM+2 @ 4.7MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM+1 @ 4.6MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM-1 @ 4.4MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM-2 @ 4.3MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM-3 @ 4.2MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM-3 @ 4.1MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 AM-3 @ 4.0MW	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 NRS Mode N1	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 NRS Mode N2	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 NRS Mode N3	93.5	92.4	91.0	88.8	85.7	81.4	76.2	70.4	65.8
SG 4.5-145 NRS Mode N4	93.0	91.9	90.5	88.3	85.2	80.9	75.7	69.9	65.3
SG 4.5-145 NRS Mode N5	92.0	90.9	89.5	87.3	84.2	79.9	74.7	68.9	64.3
SG 4.5-145 NRS Mode N6	90.1	89.0	87.6	85.4	82.3	78.0	72.8	67.0	62.4
SG 4.5-145 NRS Mode N7	89.2	88.1	86.7	84.5	81.4	77.1	71.9	66.1	61.5
SG 4.5-145 NRS Mode N8	88.1	87.0	85.6	83.4	80.3	76.0	70.8	65.0	60.4

Table 5 One-third octave band noise spectra of SG 4.5-145 @ 7 m/s
(*ref: SG145spectra_4500KW_R03_17062018*)

Central Frequency [Hz]	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**
SG 4.5-145 Baseline AM0 @ 4.5MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM+5 @ 5.0MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM+4 @ 4.9MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM+3 @ 4.8MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM+2 @ 4.7MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM+1 @ 4.6MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM-1 @ 4.4MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM-2 @ 4.3MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM-3 @ 4.2MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM-3 @ 4.1MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 AM-3 @ 4.0MW	44.5	50.2	55.9	61.3	65.9	70.6	74.8	79.4	83.7	86.2	88.1
SG 4.5-145 NRS Mode N1	44.5	50.2	55.9	61.3	65.9	70.5	74.7	79.3	83.5	86.0	87.8
SG 4.5-145 NRS Mode N2	44.5	50.2	55.9	61.2	65.8	70.5	74.6	79.1	83.3	85.7	87.5
SG 4.5-145 NRS Mode N3	44.5	50.2	55.8	61.2	65.7	70.2	74.3	78.7	82.7	85.0	86.6
SG 4.5-145 NRS Mode N4	44.5	50.2	55.8	61.1	65.6	70.1	74.0	78.4	82.4	84.5	86.0
SG 4.5-145 NRS Mode N5	44.5	50.2	55.8	61.1	65.5	69.9	73.8	78.1	82.0	84.0	85.4
SG 4.5-145 NRS Mode N6	44.5	50.2	55.7	61.0	65.3	69.6	73.4	77.5	81.2	83.1	84.3
SG 4.5-145 NRS Mode N7	44.5	50.2	55.7	60.9	65.2	69.5	73.2	77.2	80.9	82.6	83.7
SG 4.5-145 NRS Mode N8	44.5	50.1	55.7	60.8	65.1	69.3	73.0	76.9	80.5	82.1	83.0
Central Frequency [Hz]	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**
SG 4.5-145 Baseline AM0 @ 4.5MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM+5 @ 5.0MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM+4 @ 4.9MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM+3 @ 4.8MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM+2 @ 4.7MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM+1 @ 4.6MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM-1 @ 4.4MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM-2 @ 4.3MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM-3 @ 4.2MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM-3 @ 4.1MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 AM-3 @ 4.0MW	89.6	90.6	91.8	93.3	93.7	93.4	93.5	95.1	94.9	95.9	96.6
SG 4.5-145 NRS Mode N1	89.2	90.2	91.3	92.8	93.2	92.9	93.0	94.6	94.4	95.4	96.1
SG 4.5-145 NRS Mode N2	88.9	89.7	90.8	92.3	92.7	92.4	92.5	94.1	93.9	94.9	95.6
SG 4.5-145 NRS Mode N3	87.8	88.4	89.2	90.7	91.1	90.8	90.9	92.5	92.3	93.3	94.0
SG 4.5-145 NRS Mode N4	87.1	87.6	88.2	89.7	90.1	89.8	89.9	91.5	91.3	92.3	93.0
SG 4.5-145 NRS Mode N5	86.3	86.7	87.1	88.6	89.0	88.7	88.8	90.4	90.2	91.2	91.9
SG 4.5-145 NRS Mode N6	84.9	85.1	85.3	86.8	87.2	86.9	87.0	88.6	88.4	89.4	90.1
SG 4.5-145 NRS Mode N7	84.2	84.2	84.3	85.8	86.2	85.9	86.0	87.6	87.4	88.4	89.1
SG 4.5-145 NRS Mode N8	83.5	83.3	83.3	84.8	85.2	84.9	85.0	86.6	86.4	87.4	88.1

Central Frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
SG 4.5-145 Baseline AM0 @ 4.5MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM+5 @ 5.0MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM+4 @ 4.9MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM+3 @ 4.8MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM+2 @ 4.7MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM+1 @ 4.6MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM-1 @ 4.4MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM-2 @ 4.3MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM-3 @ 4.2MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM-3 @ 4.1MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 AM-3 @ 4.0MW	96.5	95.4	94.0	91.8	88.7	84.4	79.2	73.4	68.8
SG 4.5-145 NRS Mode N1	96.0	94.9	93.5	91.3	88.2	83.9	78.7	72.9	68.3
SG 4.5-145 NRS Mode N2	95.5	94.4	93.0	90.8	87.7	83.4	78.2	72.4	67.8
SG 4.5-145 NRS Mode N3	93.9	92.8	91.4	89.2	86.1	81.8	76.6	70.8	66.2
SG 4.5-145 NRS Mode N4	92.9	91.8	90.4	88.2	85.1	80.8	75.6	69.8	65.2
SG 4.5-145 NRS Mode N5	91.8	90.7	89.3	87.1	84.0	79.7	74.5	68.7	64.1
SG 4.5-145 NRS Mode N6	90.0	88.9	87.5	85.3	82.2	77.9	72.7	66.9	62.3
SG 4.5-145 NRS Mode N7	89.0	87.9	86.5	84.3	81.2	76.9	71.7	65.9	61.3
SG 4.5-145 NRS Mode N8	88.0	86.9	85.5	83.3	80.2	75.9	70.7	64.9	60.3

Table 6 One-third octave band noise spectra of SG 4.5-145 @ 8 m/s
(*ref SG145spectra_4500KW_R03_17062018*)

Central Frequency [Hz]	10	12.5	16	20	25	31.5	40	50	63	80	100
SG 4.5-145 Baseline AM0 @ 4.5MW	46.1	51.8	57.5	62.9	67.5	72.2	76.4	81.0	85.3	87.8	89.7
SG 4.5-145 AM+5 @ 5.0MW	47.3	53.0	58.7	64.1	68.7	73.4	77.6	82.2	86.5	89.0	90.9
SG 4.5-145 AM+4 @ 4.9MW	47.3	53.0	58.7	64.1	68.7	73.4	77.6	82.2	86.5	89.0	90.9
SG 4.5-145 AM+3 @ 4.8MW	47.0	52.7	58.4	63.8	68.4	73.1	77.3	81.9	86.2	88.7	90.6
SG 4.5-145 AM+2 @ 4.7MW	46.7	52.4	58.1	63.5	68.1	72.8	77.0	81.6	85.9	88.4	90.3
SG 4.5-145 AM+1 @ 4.6MW	46.4	52.1	57.8	63.2	67.8	72.5	76.7	81.3	85.6	88.1	90.0
SG 4.5-145 AM-1 @ 4.4MW	46.1	51.8	57.5	62.9	67.5	72.2	76.3	80.9	85.2	87.7	89.5
SG 4.5-145 AM-2 @ 4.3MW	46.1	51.8	57.5	62.9	67.4	72.1	76.3	80.8	85.1	87.5	89.3
SG 4.5-145 AM-3 @ 4.2MW	46.1	51.8	57.5	62.9	67.4	72.1	76.2	80.7	85.0	87.4	89.2
SG 4.5-145 AM-3 @ 4.1MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.7	84.8	87.2	89.0
SG 4.5-145 AM-3 @ 4.0MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.6	84.7	87.1	88.8
SG 4.5-145 NRS Mode N1	46.1	51.8	57.4	62.8	67.3	71.9	75.9	80.4	84.5	86.8	88.4
SG 4.5-145 NRS Mode N2	46.1	51.8	57.4	62.8	67.3	71.8	75.8	80.2	84.3	86.5	88.1
SG 4.5-145 NRS Mode N3	46.1	51.8	57.4	62.7	67.1	71.6	75.5	79.8	83.7	85.8	87.2
SG 4.5-145 NRS Mode N4	46.1	51.8	57.4	62.6	67.0	71.4	75.3	79.5	83.3	85.3	86.6
SG 4.5-145 NRS Mode N5	46.1	51.8	57.4	62.6	66.9	71.3	75.1	79.2	82.9	84.8	86.0
SG 4.5-145 NRS Mode N6	46.1	51.8	57.3	62.5	66.7	71.0	74.6	78.6	82.2	83.8	84.8
SG 4.5-145 NRS Mode N7	46.1	51.7	57.3	62.4	66.6	70.8	74.4	78.3	81.8	83.4	84.2
SG 4.5-145 NRS Mode N8	46.1	51.7	57.3	62.3	66.5	70.7	74.2	78.0	81.4	82.8	83.6
Central Frequency [Hz]	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**
SG 4.5-145 Baseline AM0 @ 4.5MW	91.2	92.2	93.4	94.9	95.3	95.0	95.1	96.7	96.5	97.5	98.2
SG 4.5-145 AM+5 @ 5.0MW	92.4	93.4	94.6	96.1	96.5	96.2	96.3	97.9	97.7	98.7	99.4
SG 4.5-145 AM+4 @ 4.9MW	92.4	93.4	94.6	96.1	96.5	96.2	96.3	97.9	97.7	98.7	99.4
SG 4.5-145 AM+3 @ 4.8MW	92.1	93.1	94.3	95.8	96.2	95.9	96.0	97.6	97.4	98.4	99.1
SG 4.5-145 AM+2 @ 4.7MW	91.8	92.8	94.0	95.5	95.9	95.6	95.7	97.3	97.1	98.1	98.8
SG 4.5-145 AM+1 @ 4.6MW	91.5	92.5	93.7	95.2	95.6	95.3	95.4	97.0	96.8	97.8	98.5
SG 4.5-145 AM-1 @ 4.4MW	91.0	91.9	93.1	94.6	95.0	94.7	94.8	96.4	96.2	97.2	97.9
SG 4.5-145 AM-2 @ 4.3MW	90.8	91.7	92.8	94.3	94.7	94.4	94.5	96.1	95.9	96.9	97.6
SG 4.5-145 AM-3 @ 4.2MW	90.6	91.4	92.5	94.0	94.4	94.1	94.2	95.8	95.6	96.6	97.3
SG 4.5-145 AM-3 @ 4.1MW	90.3	91.2	92.2	93.7	94.1	93.8	93.9	95.5	95.3	96.3	97.0
SG 4.5-145 AM-3 @ 4.0MW	90.1	90.9	91.9	93.4	93.8	93.5	93.6	95.2	95.0	96.0	96.7
SG 4.5-145 NRS Mode N1	89.7	90.4	91.2	92.7	93.1	92.8	92.9	94.5	94.3	95.3	96.0
SG 4.5-145 NRS Mode N2	89.3	90.0	90.7	92.2	92.6	92.3	92.4	94.0	93.8	94.8	95.5
SG 4.5-145 NRS Mode N3	88.2	88.6	89.2	90.7	91.1	90.8	90.9	92.5	92.3	93.3	94.0
SG 4.5-145 NRS Mode N4	87.5	87.7	88.1	89.6	90.0	89.7	89.8	91.4	91.2	92.2	92.9
SG 4.5-145 NRS Mode N5	86.7	86.8	87.1	88.6	89.0	88.7	88.8	90.4	90.2	91.2	91.9
SG 4.5-145 NRS Mode N6	85.3	85.2	85.2	86.7	87.1	86.8	86.9	88.5	88.3	89.3	90.0
SG 4.5-145 NRS Mode N7	84.6	84.3	84.2	85.7	86.1	85.8	85.9	87.5	87.3	88.3	89.0
SG 4.5-145 NRS Mode N8	83.8	83.4	83.2	84.7	85.1	84.8	84.9	86.5	86.3	87.3	88.0

Central Frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
SG 4.5-145 Baseline AM0 @ 4.5MW	98.1	97.0	95.6	93.4	90.3	86.0	80.8	75.0	70.4
SG 4.5-145 AM+5 @ 5.0MW	99.3	98.2	96.8	94.6	91.5	87.2	82.0	76.2	71.6
SG 4.5-145 AM+4 @ 4.9MW	99.3	98.2	96.8	94.6	91.5	87.2	82.0	76.2	71.6
SG 4.5-145 AM+3 @ 4.8MW	99.0	97.9	96.5	94.3	91.2	86.9	81.7	75.9	71.3
SG 4.5-145 AM+2 @ 4.7MW	98.7	97.6	96.2	94.0	90.9	86.6	81.4	75.6	71.0
SG 4.5-145 AM+1 @ 4.6MW	98.4	97.3	95.9	93.7	90.6	86.3	81.1	75.3	70.7
SG 4.5-145 AM-1 @ 4.4MW	97.8	96.7	95.3	93.1	90.0	85.7	80.5	74.7	70.1
SG 4.5-145 AM-2 @ 4.3MW	97.5	96.4	95.0	92.8	89.7	85.4	80.2	74.4	69.8
SG 4.5-145 AM-3 @ 4.2MW	97.2	96.1	94.7	92.5	89.4	85.1	79.9	74.1	69.5
SG 4.5-145 AM-3 @ 4.1MW	96.9	95.8	94.4	92.2	89.1	84.8	79.6	73.8	69.2
SG 4.5-145 AM-3 @ 4.0MW	96.6	95.5	94.1	91.9	88.8	84.5	79.3	73.5	68.9
SG 4.5-145 NRS Mode N1	95.9	94.8	93.4	91.2	88.1	83.8	78.6	72.8	68.2
SG 4.5-145 NRS Mode N2	95.4	94.3	92.9	90.7	87.6	83.3	78.1	72.3	67.7
SG 4.5-145 NRS Mode N3	93.9	92.8	91.4	89.2	86.1	81.8	76.6	70.8	66.2
SG 4.5-145 NRS Mode N4	92.8	91.7	90.3	88.1	85.0	80.7	75.5	69.7	65.1
SG 4.5-145 NRS Mode N5	91.8	90.7	89.3	87.1	84.0	79.7	74.5	68.7	64.1
SG 4.5-145 NRS Mode N6	89.9	88.8	87.4	85.2	82.1	77.8	72.6	66.8	62.2
SG 4.5-145 NRS Mode N7	88.9	87.8	86.4	84.2	81.1	76.8	71.6	65.8	61.2
SG 4.5-145 NRS Mode N8	87.9	86.8	85.4	83.2	80.1	75.8	70.6	64.8	60.2

Table 7 One-third octave band noise spectra of SG 4.5-145 @ 9 m/s
(*ref SG145spectra_4500KW_R03_17062018*)

Central Frequency [Hz]	10	12.5	16	20	25	31.5	40	50	63	80	100
SG 4.5-145 Baseline AM0 @ 4.5MW	46.1	51.8	57.5	62.9	67.5	72.2	76.4	81.0	85.3	87.8	89.7
SG 4.5-145 AM+5 @ 5.0MW	47.6	53.3	59.0	64.4	69.0	73.7	77.9	82.5	86.8	89.3	91.2
SG 4.5-145 AM+4 @ 4.9MW	47.3	53.0	58.7	64.1	68.7	73.4	77.6	82.2	86.5	89.0	90.9
SG 4.5-145 AM+3 @ 4.8MW	47.0	52.7	58.4	63.8	68.4	73.1	77.3	81.9	86.2	88.7	90.6
SG 4.5-145 AM+2 @ 4.7MW	46.7	52.4	58.1	63.5	68.1	72.8	77.0	81.6	85.9	88.4	90.3
SG 4.5-145 AM+1 @ 4.6MW	46.4	52.1	57.8	63.2	67.8	72.5	76.7	81.3	85.6	88.1	90.0
SG 4.5-145 AM-1 @ 4.4MW	46.1	51.8	57.5	62.9	67.5	72.2	76.3	80.9	85.2	87.7	89.5
SG 4.5-145 AM-2 @ 4.3MW	46.1	51.8	57.5	62.9	67.4	72.1	76.3	80.8	85.1	87.5	89.3
SG 4.5-145 AM-3 @ 4.2MW	46.1	51.8	57.5	62.9	67.4	72.1	76.2	80.7	85.0	87.4	89.2
SG 4.5-145 AM-3 @ 4.1MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.7	84.8	87.2	89.0
SG 4.5-145 AM-3 @ 4.0MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.6	84.7	87.1	88.8
SG 4.5-145 NRS Mode N1	46.1	51.8	57.4	62.8	67.3	71.9	75.9	80.4	84.5	86.8	88.4
SG 4.5-145 NRS Mode N2	46.1	51.8	57.4	62.8	67.3	71.8	75.8	80.2	84.3	86.5	88.1
SG 4.5-145 NRS Mode N3	46.1	51.8	57.4	62.7	67.1	71.6	75.5	79.8	83.7	85.8	87.2
SG 4.5-145 NRS Mode N4	46.1	51.8	57.4	62.6	67.0	71.4	75.3	79.5	83.3	85.3	86.6
SG 4.5-145 NRS Mode N5	46.1	51.8	57.4	62.6	66.9	71.3	75.1	79.2	82.9	84.8	86.0
SG 4.5-145 NRS Mode N6	46.1	51.8	57.3	62.5	66.7	71.0	74.6	78.6	82.2	83.8	84.8
SG 4.5-145 NRS Mode N7	46.1	51.7	57.3	62.4	66.6	70.8	74.4	78.3	81.8	83.4	84.2
SG 4.5-145 NRS Mode N8	46.1	51.7	57.3	62.3	66.5	70.7	74.2	78.0	81.4	82.8	83.6
Central Frequency [Hz]	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**
SG 4.5-145 Baseline AM0 @ 4.5MW	91.2	92.2	93.4	94.9	95.3	95.0	95.1	96.7	96.5	97.5	98.2
SG 4.5-145 AM+5 @ 5.0MW	92.7	93.7	94.9	96.4	96.8	96.5	96.6	98.2	98.0	99.0	99.7
SG 4.5-145 AM+4 @ 4.9MW	92.4	93.4	94.6	96.1	96.5	96.2	96.3	97.9	97.7	98.7	99.4
SG 4.5-145 AM+3 @ 4.8MW	92.1	93.1	94.3	95.8	96.2	95.9	96.0	97.6	97.4	98.4	99.1
SG 4.5-145 AM+2 @ 4.7MW	91.8	92.8	94.0	95.5	95.9	95.6	95.7	97.3	97.1	98.1	98.8
SG 4.5-145 AM+1 @ 4.6MW	91.5	92.5	93.7	95.2	95.6	95.3	95.4	97.0	96.8	97.8	98.5
SG 4.5-145 AM-1 @ 4.4MW	91.0	91.9	93.1	94.6	95.0	94.7	94.8	96.4	96.2	97.2	97.9
SG 4.5-145 AM-2 @ 4.3MW	90.8	91.7	92.8	94.3	94.7	94.4	94.5	96.1	95.9	96.9	97.6
SG 4.5-145 AM-3 @ 4.2MW	90.6	91.4	92.5	94.0	94.4	94.1	94.2	95.8	95.6	96.6	97.3
SG 4.5-145 AM-3 @ 4.1MW	90.3	91.2	92.2	93.7	94.1	93.8	93.9	95.5	95.3	96.3	97.0
SG 4.5-145 AM-3 @ 4.0MW	90.1	90.9	91.9	93.4	93.8	93.5	93.6	95.2	95.0	96.0	96.7
SG 4.5-145 NRS Mode N1	89.7	90.4	91.2	92.7	93.1	92.8	92.9	94.5	94.3	95.3	96.0
SG 4.5-145 NRS Mode N2	89.3	90.0	90.7	92.2	92.6	92.3	92.4	94.0	93.8	94.8	95.5
SG 4.5-145 NRS Mode N3	88.2	88.6	89.2	90.7	91.1	90.8	90.9	92.5	92.3	93.3	94.0
SG 4.5-145 NRS Mode N4	87.5	87.7	88.1	89.6	90.0	89.7	89.8	91.4	91.2	92.2	92.9
SG 4.5-145 NRS Mode N5	86.7	86.8	87.1	88.6	89.0	88.7	88.8	90.4	90.2	91.2	91.9
SG 4.5-145 NRS Mode N6	85.3	85.2	85.2	86.7	87.1	86.8	86.9	88.5	88.3	89.3	90.0
SG 4.5-145 NRS Mode N7	84.6	84.3	84.2	85.7	86.1	85.8	85.9	87.5	87.3	88.3	89.0
SG 4.5-145 NRS Mode N8	83.8	83.4	83.2	84.7	85.1	84.8	84.9	86.5	86.3	87.3	88.0

Central Frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
SG 4.5-145 Baseline AM0 @ 4.5MW	98.1	97.0	95.6	93.4	90.3	86.0	80.8	75.0	70.4
SG 4.5-145 AM+5 @ 5.0MW	99.6	98.5	97.1	94.9	91.8	87.5	82.3	76.5	71.9
SG 4.5-145 AM+4 @ 4.9MW	99.3	98.2	96.8	94.6	91.5	87.2	82.0	76.2	71.6
SG 4.5-145 AM+3 @ 4.8MW	99.0	97.9	96.5	94.3	91.2	86.9	81.7	75.9	71.3
SG 4.5-145 AM+2 @ 4.7MW	98.7	97.6	96.2	94.0	90.9	86.6	81.4	75.6	71.0
SG 4.5-145 AM+1 @ 4.6MW	98.4	97.3	95.9	93.7	90.6	86.3	81.1	75.3	70.7
SG 4.5-145 AM-1 @ 4.4MW	97.8	96.7	95.3	93.1	90.0	85.7	80.5	74.7	70.1
SG 4.5-145 AM-2 @ 4.3MW	97.5	96.4	95.0	92.8	89.7	85.4	80.2	74.4	69.8
SG 4.5-145 AM-3 @ 4.2MW	97.2	96.1	94.7	92.5	89.4	85.1	79.9	74.1	69.5
SG 4.5-145 AM-3 @ 4.1MW	96.9	95.8	94.4	92.2	89.1	84.8	79.6	73.8	69.2
SG 4.5-145 AM-3 @ 4.0MW	96.6	95.5	94.1	91.9	88.8	84.5	79.3	73.5	68.9
SG 4.5-145 NRS Mode N1	95.9	94.8	93.4	91.2	88.1	83.8	78.6	72.8	68.2
SG 4.5-145 NRS Mode N2	95.4	94.3	92.9	90.7	87.6	83.3	78.1	72.3	67.7
SG 4.5-145 NRS Mode N3	93.9	92.8	91.4	89.2	86.1	81.8	76.6	70.8	66.2
SG 4.5-145 NRS Mode N4	92.8	91.7	90.3	88.1	85.0	80.7	75.5	69.7	65.1
SG 4.5-145 NRS Mode N5	91.8	90.7	89.3	87.1	84.0	79.7	74.5	68.7	64.1
SG 4.5-145 NRS Mode N6	89.9	88.8	87.4	85.2	82.1	77.8	72.6	66.8	62.2
SG 4.5-145 NRS Mode N7	88.9	87.8	86.4	84.2	81.1	76.8	71.6	65.8	61.2
SG 4.5-145 NRS Mode N8	87.9	86.8	85.4	83.2	80.1	75.8	70.6	64.8	60.2

Table 8 One-third octave band noise spectra of SG 4.5-145 @ 10 m/s
(*ref SG145spectra_4500KW_R03_17062018*)

Central Frequency [Hz]	10	12.5	16	20	25	31.5	40	50	63	80	100
SG 4.5-145 Baseline AM0 @ 4.5MW	46.1	51.8	57.5	62.9	67.5	72.2	76.4	81.0	85.3	87.8	89.7
SG 4.5-145 AM+5 @ 5.0MW	47.6	53.3	59.0	64.4	69.0	73.7	77.9	82.5	86.8	89.3	91.2
SG 4.5-145 AM+4 @ 4.9MW	47.3	53.0	58.7	64.1	68.7	73.4	77.6	82.2	86.5	89.0	90.9
SG 4.5-145 AM+3 @ 4.8MW	47.0	52.7	58.4	63.8	68.4	73.1	77.3	81.9	86.2	88.7	90.6
SG 4.5-145 AM+2 @ 4.7MW	46.7	52.4	58.1	63.5	68.1	72.8	77.0	81.6	85.9	88.4	90.3
SG 4.5-145 AM+1 @ 4.6MW	46.4	52.1	57.8	63.2	67.8	72.5	76.7	81.3	85.6	88.1	90.0
SG 4.5-145 AM-1 @ 4.4MW	46.1	51.8	57.5	62.9	67.5	72.2	76.3	80.9	85.2	87.7	89.5
SG 4.5-145 AM-2 @ 4.3MW	46.1	51.8	57.5	62.9	67.4	72.1	76.3	80.8	85.1	87.5	89.3
SG 4.5-145 AM-3 @ 4.2MW	46.1	51.8	57.5	62.9	67.4	72.1	76.2	80.7	85.0	87.4	89.2
SG 4.5-145 AM-3 @ 4.1MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.7	84.8	87.2	89.0
SG 4.5-145 AM-3 @ 4.0MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.6	84.7	87.1	88.8
SG 4.5-145 NRS Mode N1	46.1	51.8	57.4	62.8	67.3	71.9	75.9	80.4	84.5	86.8	88.4
SG 4.5-145 NRS Mode N2	46.1	51.8	57.4	62.8	67.3	71.8	75.8	80.2	84.3	86.5	88.1
SG 4.5-145 NRS Mode N3	46.1	51.8	57.4	62.7	67.1	71.6	75.5	79.8	83.7	85.8	87.2
SG 4.5-145 NRS Mode N4	46.1	51.8	57.4	62.6	67.0	71.4	75.3	79.5	83.3	85.3	86.6
SG 4.5-145 NRS Mode N5	46.1	51.8	57.4	62.6	66.9	71.3	75.1	79.2	82.9	84.8	86.0
SG 4.5-145 NRS Mode N6	46.1	51.8	57.3	62.5	66.7	71.0	74.6	78.6	82.2	83.8	84.8
SG 4.5-145 NRS Mode N7	46.1	51.7	57.3	62.4	66.6	70.8	74.4	78.3	81.8	83.4	84.2
SG 4.5-145 NRS Mode N8	46.1	51.7	57.3	62.3	66.5	70.7	74.2	78.0	81.4	82.8	83.6
Central Frequency [Hz]	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**
SG 4.5-145 Baseline AM0 @ 4.5MW	91.2	92.2	93.4	94.9	95.3	95.0	95.1	96.7	96.5	97.5	98.2
SG 4.5-145 AM+5 @ 5.0MW	92.7	93.7	94.9	96.4	96.8	96.5	96.6	98.2	98.0	99.0	99.7
SG 4.5-145 AM+4 @ 4.9MW	92.4	93.4	94.6	96.1	96.5	96.2	96.3	97.9	97.7	98.7	99.4
SG 4.5-145 AM+3 @ 4.8MW	92.1	93.1	94.3	95.8	96.2	95.9	96.0	97.6	97.4	98.4	99.1
SG 4.5-145 AM+2 @ 4.7MW	91.8	92.8	94.0	95.5	95.9	95.6	95.7	97.3	97.1	98.1	98.8
SG 4.5-145 AM+1 @ 4.6MW	91.5	92.5	93.7	95.2	95.6	95.3	95.4	97.0	96.8	97.8	98.5
SG 4.5-145 AM-1 @ 4.4MW	91.0	91.9	93.1	94.6	95.0	94.7	94.8	96.4	96.2	97.2	97.9
SG 4.5-145 AM-2 @ 4.3MW	90.8	91.7	92.8	94.3	94.7	94.4	94.5	96.1	95.9	96.9	97.6
SG 4.5-145 AM-3 @ 4.2MW	90.6	91.4	92.5	94.0	94.4	94.1	94.2	95.8	95.6	96.6	97.3
SG 4.5-145 AM-3 @ 4.1MW	90.3	91.2	92.2	93.7	94.1	93.8	93.9	95.5	95.3	96.3	97.0
SG 4.5-145 AM-3 @ 4.0MW	90.1	90.9	91.9	93.4	93.8	93.5	93.6	95.2	95.0	96.0	96.7
SG 4.5-145 NRS Mode N1	89.7	90.4	91.2	92.7	93.1	92.8	92.9	94.5	94.3	95.3	96.0
SG 4.5-145 NRS Mode N2	89.3	90.0	90.7	92.2	92.6	92.3	92.4	94.0	93.8	94.8	95.5
SG 4.5-145 NRS Mode N3	88.2	88.6	89.2	90.7	91.1	90.8	90.9	92.5	92.3	93.3	94.0
SG 4.5-145 NRS Mode N4	87.5	87.7	88.1	89.6	90.0	89.7	89.8	91.4	91.2	92.2	92.9
SG 4.5-145 NRS Mode N5	86.7	86.8	87.1	88.6	89.0	88.7	88.8	90.4	90.2	91.2	91.9
SG 4.5-145 NRS Mode N6	85.3	85.2	85.2	86.7	87.1	86.8	86.9	88.5	88.3	89.3	90.0
SG 4.5-145 NRS Mode N7	84.6	84.3	84.2	85.7	86.1	85.8	85.9	87.5	87.3	88.3	89.0
SG 4.5-145 NRS Mode N8	83.8	83.4	83.2	84.7	85.1	84.8	84.9	86.5	86.3	87.3	88.0

Central Frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
SG 4.5-145 Baseline AM0 @ 4.5MW	98.1	97.0	95.6	93.4	90.3	86.0	80.8	75.0	70.4
SG 4.5-145 AM+5 @ 5.0MW	99.6	98.5	97.1	94.9	91.8	87.5	82.3	76.5	71.9
SG 4.5-145 AM+4 @ 4.9MW	99.3	98.2	96.8	94.6	91.5	87.2	82.0	76.2	71.6
SG 4.5-145 AM+3 @ 4.8MW	99.0	97.9	96.5	94.3	91.2	86.9	81.7	75.9	71.3
SG 4.5-145 AM+2 @ 4.7MW	98.7	97.6	96.2	94.0	90.9	86.6	81.4	75.6	71.0
SG 4.5-145 AM+1 @ 4.6MW	98.4	97.3	95.9	93.7	90.6	86.3	81.1	75.3	70.7
SG 4.5-145 AM-1 @ 4.4MW	97.8	96.7	95.3	93.1	90.0	85.7	80.5	74.7	70.1
SG 4.5-145 AM-2 @ 4.3MW	97.5	96.4	95.0	92.8	89.7	85.4	80.2	74.4	69.8
SG 4.5-145 AM-3 @ 4.2MW	97.2	96.1	94.7	92.5	89.4	85.1	79.9	74.1	69.5
SG 4.5-145 AM-3 @ 4.1MW	96.9	95.8	94.4	92.2	89.1	84.8	79.6	73.8	69.2
SG 4.5-145 AM-3 @ 4.0MW	96.6	95.5	94.1	91.9	88.8	84.5	79.3	73.5	68.9
SG 4.5-145 NRS Mode N1	95.9	94.8	93.4	91.2	88.1	83.8	78.6	72.8	68.2
SG 4.5-145 NRS Mode N2	95.4	94.3	92.9	90.7	87.6	83.3	78.1	72.3	67.7
SG 4.5-145 NRS Mode N3	93.9	92.8	91.4	89.2	86.1	81.8	76.6	70.8	66.2
SG 4.5-145 NRS Mode N4	92.8	91.7	90.3	88.1	85.0	80.7	75.5	69.7	65.1
SG 4.5-145 NRS Mode N5	91.8	90.7	89.3	87.1	84.0	79.7	74.5	68.7	64.1
SG 4.5-145 NRS Mode N6	89.9	88.8	87.4	85.2	82.1	77.8	72.6	66.8	62.2
SG 4.5-145 NRS Mode N7	88.9	87.8	86.4	84.2	81.1	76.8	71.6	65.8	61.2
SG 4.5-145 NRS Mode N8	87.9	86.8	85.4	83.2	80.1	75.8	70.6	64.8	60.2

Table 9 One-third octave band noise spectra of SG 4.5-145 @ 11 m/s
(*ref SG145spectra_4500KW_R03_17062018*)

Central Frequency [Hz]	10	12.5	16	20	25	31.5	40	50	63	80	100
SG 4.5-145 Baseline AM0 @ 4.5MW	46.1	51.8	57.5	62.9	67.5	72.2	76.4	81.0	85.3	87.8	89.7
SG 4.5-145 AM+5 @ 5.0MW	47.6	53.3	59.0	64.4	69.0	73.7	77.9	82.5	86.8	89.3	91.2
SG 4.5-145 AM+4 @ 4.9MW	47.3	53.0	58.7	64.1	68.7	73.4	77.6	82.2	86.5	89.0	90.9
SG 4.5-145 AM+3 @ 4.8MW	47.0	52.7	58.4	63.8	68.4	73.1	77.3	81.9	86.2	88.7	90.6
SG 4.5-145 AM+2 @ 4.7MW	46.7	52.4	58.1	63.5	68.1	72.8	77.0	81.6	85.9	88.4	90.3
SG 4.5-145 AM+1 @ 4.6MW	46.4	52.1	57.8	63.2	67.8	72.5	76.7	81.3	85.6	88.1	90.0
SG 4.5-145 AM-1 @ 4.4MW	46.1	51.8	57.5	62.9	67.5	72.2	76.3	80.9	85.2	87.7	89.5
SG 4.5-145 AM-2 @ 4.3MW	46.1	51.8	57.5	62.9	67.4	72.1	76.3	80.8	85.1	87.5	89.3
SG 4.5-145 AM-3 @ 4.2MW	46.1	51.8	57.5	62.9	67.4	72.1	76.2	80.7	85.0	87.4	89.2
SG 4.5-145 AM-3 @ 4.1MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.7	84.8	87.2	89.0
SG 4.5-145 AM-3 @ 4.0MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.6	84.7	87.1	88.8
SG 4.5-145 NRS Mode N1	46.1	51.8	57.4	62.8	67.3	71.9	75.9	80.4	84.5	86.8	88.4
SG 4.5-145 NRS Mode N2	46.1	51.8	57.4	62.8	67.3	71.8	75.8	80.2	84.3	86.5	88.1
SG 4.5-145 NRS Mode N3	46.1	51.8	57.4	62.7	67.1	71.6	75.5	79.8	83.7	85.8	87.2
SG 4.5-145 NRS Mode N4	46.1	51.8	57.4	62.6	67.0	71.4	75.3	79.5	83.3	85.3	86.6
SG 4.5-145 NRS Mode N5	46.1	51.8	57.4	62.6	66.9	71.3	75.1	79.2	82.9	84.8	86.0
SG 4.5-145 NRS Mode N6	46.1	51.8	57.3	62.5	66.7	71.0	74.6	78.6	82.2	83.8	84.8
SG 4.5-145 NRS Mode N7	46.1	51.7	57.3	62.4	66.6	70.8	74.4	78.3	81.8	83.4	84.2
SG 4.5-145 NRS Mode N8	46.1	51.7	57.3	62.3	66.5	70.7	74.2	78.0	81.4	82.8	83.6
Central Frequency [Hz]	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**
SG 4.5-145 Baseline AM0 @ 4.5MW	91.2	92.2	93.4	94.9	95.3	95.0	95.1	96.7	96.5	97.5	98.2
SG 4.5-145 AM+5 @ 5.0MW	92.7	93.7	94.9	96.4	96.8	96.5	96.6	98.2	98.0	99.0	99.7
SG 4.5-145 AM+4 @ 4.9MW	92.4	93.4	94.6	96.1	96.5	96.2	96.3	97.9	97.7	98.7	99.4
SG 4.5-145 AM+3 @ 4.8MW	92.1	93.1	94.3	95.8	96.2	95.9	96.0	97.6	97.4	98.4	99.1
SG 4.5-145 AM+2 @ 4.7MW	91.8	92.8	94.0	95.5	95.9	95.6	95.7	97.3	97.1	98.1	98.8
SG 4.5-145 AM+1 @ 4.6MW	91.5	92.5	93.7	95.2	95.6	95.3	95.4	97.0	96.8	97.8	98.5
SG 4.5-145 AM-1 @ 4.4MW	91.0	91.9	93.1	94.6	95.0	94.7	94.8	96.4	96.2	97.2	97.9
SG 4.5-145 AM-2 @ 4.3MW	90.8	91.7	92.8	94.3	94.7	94.4	94.5	96.1	95.9	96.9	97.6
SG 4.5-145 AM-3 @ 4.2MW	90.6	91.4	92.5	94.0	94.4	94.1	94.2	95.8	95.6	96.6	97.3
SG 4.5-145 AM-3 @ 4.1MW	90.3	91.2	92.2	93.7	94.1	93.8	93.9	95.5	95.3	96.3	97.0
SG 4.5-145 AM-3 @ 4.0MW	90.1	90.9	91.9	93.4	93.8	93.5	93.6	95.2	95.0	96.0	96.7
SG 4.5-145 NRS Mode N1	89.7	90.4	91.2	92.7	93.1	92.8	92.9	94.5	94.3	95.3	96.0
SG 4.5-145 NRS Mode N2	89.3	90.0	90.7	92.2	92.6	92.3	92.4	94.0	93.8	94.8	95.5
SG 4.5-145 NRS Mode N3	88.2	88.6	89.2	90.7	91.1	90.8	90.9	92.5	92.3	93.3	94.0
SG 4.5-145 NRS Mode N4	87.5	87.7	88.1	89.6	90.0	89.7	89.8	91.4	91.2	92.2	92.9
SG 4.5-145 NRS Mode N5	86.7	86.8	87.1	88.6	89.0	88.7	88.8	90.4	90.2	91.2	91.9
SG 4.5-145 NRS Mode N6	85.3	85.2	85.2	86.7	87.1	86.8	86.9	88.5	88.3	89.3	90.0
SG 4.5-145 NRS Mode N7	84.6	84.3	84.2	85.7	86.1	85.8	85.9	87.5	87.3	88.3	89.0
SG 4.5-145 NRS Mode N8	83.8	83.4	83.2	84.7	85.1	84.8	84.9	86.5	86.3	87.3	88.0

Central Frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
SG 4.5-145 Baseline AM0 @ 4.5MW	98.1	97.0	95.6	93.4	90.3	86.0	80.8	75.0	70.4
SG 4.5-145 AM+5 @ 5.0MW	99.6	98.5	97.1	94.9	91.8	87.5	82.3	76.5	71.9
SG 4.5-145 AM+4 @ 4.9MW	99.3	98.2	96.8	94.6	91.5	87.2	82.0	76.2	71.6
SG 4.5-145 AM+3 @ 4.8MW	99.0	97.9	96.5	94.3	91.2	86.9	81.7	75.9	71.3
SG 4.5-145 AM+2 @ 4.7MW	98.7	97.6	96.2	94.0	90.9	86.6	81.4	75.6	71.0
SG 4.5-145 AM+1 @ 4.6MW	98.4	97.3	95.9	93.7	90.6	86.3	81.1	75.3	70.7
SG 4.5-145 AM-1 @ 4.4MW	97.8	96.7	95.3	93.1	90.0	85.7	80.5	74.7	70.1
SG 4.5-145 AM-2 @ 4.3MW	97.5	96.4	95.0	92.8	89.7	85.4	80.2	74.4	69.8
SG 4.5-145 AM-3 @ 4.2MW	97.2	96.1	94.7	92.5	89.4	85.1	79.9	74.1	69.5
SG 4.5-145 AM-3 @ 4.1MW	96.9	95.8	94.4	92.2	89.1	84.8	79.6	73.8	69.2
SG 4.5-145 AM-3 @ 4.0MW	96.6	95.5	94.1	91.9	88.8	84.5	79.3	73.5	68.9
SG 4.5-145 NRS Mode N1	95.9	94.8	93.4	91.2	88.1	83.8	78.6	72.8	68.2
SG 4.5-145 NRS Mode N2	95.4	94.3	92.9	90.7	87.6	83.3	78.1	72.3	67.7
SG 4.5-145 NRS Mode N3	93.9	92.8	91.4	89.2	86.1	81.8	76.6	70.8	66.2
SG 4.5-145 NRS Mode N4	92.8	91.7	90.3	88.1	85.0	80.7	75.5	69.7	65.1
SG 4.5-145 NRS Mode N5	91.8	90.7	89.3	87.1	84.0	79.7	74.5	68.7	64.1
SG 4.5-145 NRS Mode N6	89.9	88.8	87.4	85.2	82.1	77.8	72.6	66.8	62.2
SG 4.5-145 NRS Mode N7	88.9	87.8	86.4	84.2	81.1	76.8	71.6	65.8	61.2
SG 4.5-145 NRS Mode N8	87.9	86.8	85.4	83.2	80.1	75.8	70.6	64.8	60.2

Table 10 One-third octave band noise spectra of SG 4.5-145 @ 12 m/s
(*ref SG145spectra_4500KW_R03_17062018*)

Central Frequency [Hz]	10	12.5	16	20	25	31.5	40	50	63	80	100
SG 4.5-145 Baseline AM0 @ 4.5MW	46.1	51.8	57.5	62.9	67.5	72.2	76.4	81.0	85.3	87.8	89.7
SG 4.5-145 AM+5 @ 5.0MW	47.6	53.3	59.0	64.4	69.0	73.7	77.9	82.5	86.8	89.3	91.2
SG 4.5-145 AM+4 @ 4.9MW	47.3	53.0	58.7	64.1	68.7	73.4	77.6	82.2	86.5	89.0	90.9
SG 4.5-145 AM+3 @ 4.8MW	47.0	52.7	58.4	63.8	68.4	73.1	77.3	81.9	86.2	88.7	90.6
SG 4.5-145 AM+2 @ 4.7MW	46.7	52.4	58.1	63.5	68.1	72.8	77.0	81.6	85.9	88.4	90.3
SG 4.5-145 AM+1 @ 4.6MW	46.4	52.1	57.8	63.2	67.8	72.5	76.7	81.3	85.6	88.1	90.0
SG 4.5-145 AM-1 @ 4.4MW	46.1	51.8	57.5	62.9	67.5	72.2	76.3	80.9	85.2	87.7	89.5
SG 4.5-145 AM-2 @ 4.3MW	46.1	51.8	57.5	62.9	67.4	72.1	76.3	80.8	85.1	87.5	89.3
SG 4.5-145 AM-3 @ 4.2MW	46.1	51.8	57.5	62.9	67.4	72.1	76.2	80.7	85.0	87.4	89.2
SG 4.5-145 AM-3 @ 4.1MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.7	84.8	87.2	89.0
SG 4.5-145 AM-3 @ 4.0MW	46.1	51.8	57.5	62.8	67.4	72.0	76.1	80.6	84.7	87.1	88.8
SG 4.5-145 NRS Mode N1	46.1	51.8	57.4	62.8	67.3	71.9	75.9	80.4	84.5	86.8	88.4
SG 4.5-145 NRS Mode N2	46.1	51.8	57.4	62.8	67.3	71.8	75.8	80.2	84.3	86.5	88.1
SG 4.5-145 NRS Mode N3	46.1	51.8	57.4	62.7	67.1	71.6	75.5	79.8	83.7	85.8	87.2
SG 4.5-145 NRS Mode N4	46.1	51.8	57.4	62.6	67.0	71.4	75.3	79.5	83.3	85.3	86.6
SG 4.5-145 NRS Mode N5	46.1	51.8	57.4	62.6	66.9	71.3	75.1	79.2	82.9	84.8	86.0
SG 4.5-145 NRS Mode N6	46.1	51.8	57.3	62.5	66.7	71.0	74.6	78.6	82.2	83.8	84.8
SG 4.5-145 NRS Mode N7	46.1	51.7	57.3	62.4	66.6	70.8	74.4	78.3	81.8	83.4	84.2
SG 4.5-145 NRS Mode N8	46.1	51.7	57.3	62.3	66.5	70.7	74.2	78.0	81.4	82.8	83.6
Central Frequency [Hz]	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1000**	**1250**
SG 4.5-145 Baseline AM0 @ 4.5MW	91.2	92.2	93.4	94.9	95.3	95.0	95.1	96.7	96.5	97.5	98.2
SG 4.5-145 AM+5 @ 5.0MW	92.7	93.7	94.9	96.4	96.8	96.5	96.6	98.2	98.0	99.0	99.7
SG 4.5-145 AM+4 @ 4.9MW	92.4	93.4	94.6	96.1	96.5	96.2	96.3	97.9	97.7	98.7	99.4
SG 4.5-145 AM+3 @ 4.8MW	92.1	93.1	94.3	95.8	96.2	95.9	96.0	97.6	97.4	98.4	99.1
SG 4.5-145 AM+2 @ 4.7MW	91.8	92.8	94.0	95.5	95.9	95.6	95.7	97.3	97.1	98.1	98.8
SG 4.5-145 AM+1 @ 4.6MW	91.5	92.5	93.7	95.2	95.6	95.3	95.4	97.0	96.8	97.8	98.5
SG 4.5-145 AM-1 @ 4.4MW	91.0	91.9	93.1	94.6	95.0	94.7	94.8	96.4	96.2	97.2	97.9
SG 4.5-145 AM-2 @ 4.3MW	90.8	91.7	92.8	94.3	94.7	94.4	94.5	96.1	95.9	96.9	97.6
SG 4.5-145 AM-3 @ 4.2MW	90.6	91.4	92.5	94.0	94.4	94.1	94.2	95.8	95.6	96.6	97.3
SG 4.5-145 AM-3 @ 4.1MW	90.3	91.2	92.2	93.7	94.1	93.8	93.9	95.5	95.3	96.3	97.0
SG 4.5-145 AM-3 @ 4.0MW	90.1	90.9	91.9	93.4	93.8	93.5	93.6	95.2	95.0	96.0	96.7
SG 4.5-145 NRS Mode N1	89.7	90.4	91.2	92.7	93.1	92.8	92.9	94.5	94.3	95.3	96.0
SG 4.5-145 NRS Mode N2	89.3	90.0	90.7	92.2	92.6	92.3	92.4	94.0	93.8	94.8	95.5
SG 4.5-145 NRS Mode N3	88.2	88.6	89.2	90.7	91.1	90.8	90.9	92.5	92.3	93.3	94.0
SG 4.5-145 NRS Mode N4	87.5	87.7	88.1	89.6	90.0	89.7	89.8	91.4	91.2	92.2	92.9
SG 4.5-145 NRS Mode N5	86.7	86.8	87.1	88.6	89.0	88.7	88.8	90.4	90.2	91.2	91.9
SG 4.5-145 NRS Mode N6	85.3	85.2	85.2	86.7	87.1	86.8	86.9	88.5	88.3	89.3	90.0
SG 4.5-145 NRS Mode N7	84.6	84.3	84.2	85.7	86.1	85.8	85.9	87.5	87.3	88.3	89.0
SG 4.5-145 NRS Mode N8	83.8	83.4	83.2	84.7	85.1	84.8	84.9	86.5	86.3	87.3	88.0

Central Frequency [Hz]	1600	2000	2500	3150	4000	5000	6300	8000	10000
SG 4.5-145 Baseline AM0 @ 4.5MW	98.1	97.0	95.6	93.4	90.3	86.0	80.8	75.0	70.4
SG 4.5-145 AM+5 @ 5.0MW	99.6	98.5	97.1	94.9	91.8	87.5	82.3	76.5	71.9
SG 4.5-145 AM+4 @ 4.9MW	99.3	98.2	96.8	94.6	91.5	87.2	82.0	76.2	71.6
SG 4.5-145 AM+3 @ 4.8MW	99.0	97.9	96.5	94.3	91.2	86.9	81.7	75.9	71.3
SG 4.5-145 AM+2 @ 4.7MW	98.7	97.6	96.2	94.0	90.9	86.6	81.4	75.6	71.0
SG 4.5-145 AM+1 @ 4.6MW	98.4	97.3	95.9	93.7	90.6	86.3	81.1	75.3	70.7
SG 4.5-145 AM-1 @ 4.4MW	97.8	96.7	95.3	93.1	90.0	85.7	80.5	74.7	70.1
SG 4.5-145 AM-2 @ 4.3MW	97.5	96.4	95.0	92.8	89.7	85.4	80.2	74.4	69.8
SG 4.5-145 AM-3 @ 4.2MW	97.2	96.1	94.7	92.5	89.4	85.1	79.9	74.1	69.5
SG 4.5-145 AM-3 @ 4.1MW	96.9	95.8	94.4	92.2	89.1	84.8	79.6	73.8	69.2
SG 4.5-145 AM-3 @ 4.0MW	96.6	95.5	94.1	91.9	88.8	84.5	79.3	73.5	68.9
SG 4.5-145 NRS Mode N1	95.9	94.8	93.4	91.2	88.1	83.8	78.6	72.8	68.2
SG 4.5-145 NRS Mode N2	95.4	94.3	92.9	90.7	87.6	83.3	78.1	72.3	67.7
SG 4.5-145 NRS Mode N3	93.9	92.8	91.4	89.2	86.1	81.8	76.6	70.8	66.2
SG 4.5-145 NRS Mode N4	92.8	91.7	90.3	88.1	85.0	80.7	75.5	69.7	65.1
SG 4.5-145 NRS Mode N5	91.8	90.7	89.3	87.1	84.0	79.7	74.5	68.7	64.1
SG 4.5-145 NRS Mode N6	89.9	88.8	87.4	85.2	82.1	77.8	72.6	66.8	62.2
SG 4.5-145 NRS Mode N7	88.9	87.8	86.4	84.2	81.1	76.8	71.6	65.8	61.2
SG 4.5-145 NRS Mode N8	87.9	86.8	85.4	83.2	80.1	75.8	70.6	64.8	60.2

Table 11 One-third octave band noise spectra of SG 4.5-145 @ 13 m/s and up to cut out wind speed (*ref SG145spectra_4500KW_R03_17062018*)

APPENDIX B

Baseline Case Noise Emissions - AER-Regulated Facilities and Wells

Table 1 presents noise emissions values used in the Project NIA to represent AER-regulated Baseline Case facilities. Table 2 presents noise emission values used in the Project NIA to represent AER-regulated Baseline Case wells. Noise emissions values are presented in the form of octave band sound power levels, expressed in dBZ, and total sound power levels, expressed in dBA.

Table 1: Baseline Case Noise Emissions - AER-Regulated Facilities

Facility Identification Code[a]	Operator/Licensee (or Description from Third-Party NIA)	Type of Facility (or Description from Third-Party NIA)	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Octave-Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			Easting [m]	Northing [m]	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
AER Facility MF025	Cardinal/Interpipline Oil Treating	Cardinal/Interpipline Oil Treating	495932	5617763	113.0	116.0	113.0	110.0	105.0	105.0	108.0	97.0	82.0	111.9	Facility location and noise emissions from (Innova 2016)
AER Facility GF160	CONOCOPHILLIPS WESTERN CANADA PARTNERSHIP	Compressor Station & Battery	488753	5617065	122.0	122.0	116.0	107.0	96.0	98.0	94.0	91.0	89.0	105.4	Facility location from (AER 2019a); noise emissions from (Innova 2016)
AER Facility MF024	TransCanada Compressor Station	TransCanada Compressor Station	492951	5616706	122.0	122.0	116.0	107.0	96.0	98.0	94.0	91.0	89.0	105.4	Facility location and noise emissions from (Innova 2016)
AER Facility GF120	ALTAGAS LTD.	Battery & Meter Station	498360	5617093	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF001	CANADIAN NATURAL RESOURCES LIMITED	Battery	497011	5622876	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF213	CANADIAN NATURAL RESOURCES LIMITED	Battery	489228	5620395	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF016	CARDINAL ENERGY LTD.	Battery	498144	5617409	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF023	CARDINAL ENERGY LTD.	Battery	496347	5618240	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF070	CARDINAL ENERGY LTD.	Battery	497928	5617067	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF167	CARDINAL ENERGY LTD.	Battery	489359	5617461	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF128	CARDINAL ENERGY LTD.	Satellite	492952	5615965	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF008	COR4 OIL CORP.	Satellite	494836	5620228	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF011	COR4 OIL CORP.	Satellite	494736	5619842	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF203	COR4 OIL CORP.	Satellite	495254	5620372	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility MF002	Crestar Jenner "p" Pool 15-23	Crestar Jenner "p" Pool 15-23	499443	5627755	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location and noise emissions from (RWDI 2019)
AER Facility MF004	Crestar Jenner 10-32-20-8	Crestar Jenner 10-32-20-8	494689	5621048	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location and noise emissions from (RWDI 2019)
AER Facility MF005	Crestar Jenner 10-7-21-8	Crestar Jenner 10-7-21-8	493175	5624391	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location and noise emissions from (RWDI 2019)
AER Facility MF003	Hemisphere Jenner 11-25	Hemisphere Jenner 11-25	491011	5628996	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location and noise emissions from (RWDI 2019)
AER Facility MF006	Hemisphere Jenner 16-31	Hemisphere Jenner 16-31	493705	5631117	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location and noise emissions from (RWDI 2019)
AER Facility GF058	IPC ALBERTA LTD.	Battery	497979	5616650	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF004	IPC ALBERTA LTD.	Battery & Gas Gathering System	498316	5616618	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)

Table 1: Baseline Case Noise Emissions - AER-Regulated Facilities

Facility Identification Code[(a)]	Operator/Licensee (or Description from Third-Party NIA)	Type of Facility (or Description from Third-Party NIA)	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Octave-Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			Easting [m]	Northing [m]	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
AER Facility GF072	NOVA GAS TRANSMISSION LTD.	Battery & Meter Station	497930	5617520	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility GF056	PENGROWTH ENERGY CORPORATION	Battery	494201	5621604	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location from (AER 2019a); noise emissions from (RWDI 2019)
AER Facility MF001	Pinnacle Jenner 14-12	Pinnacle Jenner 14-12	491223	5634314	104.2	106.2	104.1	101.7	100.3	100.0	97.3	96.2	93.8	105.1	Facility location and noise emissions from (RWDI 2019)
AER Facility MF027	Imaginea Compressor Station	Imaginea Compressor Station	495574	5617854	114.7	114.0	110.7	104.5	101.0	98.6	97.1	92.6	86.6	104.8	Facility location and noise emissions from (RWDI 2018)
AER Facility MF010	Crude Oil Battery & Enhanced Recovery Scheme	Crude Oil Battery & Enhanced Recovery Scheme	487714	5621818	101.7	103.7	101.6	99.2	97.8	97.5	94.8	93.7	91.3	102.4	Facility location and noise emissions from (Stantec 2019)
AER Facility GF081	NOVA GAS TRANSMISSION LTD.	Meter Station	495714	5617479	80.6	80.6	80.6	80.6	80.6	80.6	80.6	80.6	80.6	89.5	Facility location from (AER 2019a); noise emissions from (RWDI 2018)
AER Facility MF009	Enhanced Recovery Scheme	Enhanced Recovery Scheme	487718	5620598	87.4	89.4	87.3	84.9	83.5	83.2	80.5	79.4	77.0	88.3	Facility location and noise emissions from (Stantec 2019)
AER Facility GF021	NOVA GAS TRANSMISSION LTD.	Meter Station	490091	5617206	87.4	89.4	87.3	84.9	83.5	83.2	80.5	79.4	77.0	88.3	Facility location from (AER 2019a); noise emissions from (Stantec 2019)
AER Facility GF153	NOVA GAS TRANSMISSION LTD.	Meter Station	496686	5616902	87.4	89.4	87.3	84.9	83.5	83.2	80.5	79.4	77.0	88.3	Facility location from (AER 2019a); noise emissions from (Stantec 2019)
AER Facility GF165	NOVA GAS TRANSMISSION LTD.	Meter Station	490210	5615423	87.4	89.4	87.3	84.9	83.5	83.2	80.5	79.4	77.0	88.3	Facility location from (AER 2019a); noise emissions from (Stantec 2019)
AER Facility GF199	NOVA GAS TRANSMISSION LTD.	Meter Station	488882	5617050	87.4	89.4	87.3	84.9	83.5	83.2	80.5	79.4	77.0	88.3	Facility location from (AER 2019a); noise emissions from (Stantec 2019)

[(a)] A facility code that includes “MF” (e.g., “AER Facility MF025”) indicates this facility was identified in a third-party NIA. A facility code that includes “GF” (e.g., “AER Facility GF160”) indicates this facility was identified from the ST102 database (AER 2019a).

Table 2: Baseline Case Noise Emissions - AER-Regulated Wells

Well Identification Code[a]	Operator/Licensee (or Description from Third-Party NIA)	Type of Well (or Description from Third-Party NIA)	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Octave-Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			Easting [m]	Northing [m]	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
AER Well GW483	CANADIAN NATURAL RESOURCES LIMITED	PUMPING OIL	497012	5622876	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW778	CARDINAL ENERGY LTD.	PUMPING OIL	495799	5618004	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW745	CARDINAL ENERGY LTD.	PUMPING OIL	496584	5618090	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW725	CARDINAL ENERGY LTD.	PUMPING OIL	496151	5617804	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW599	CARDINAL ENERGY LTD.	PUMPING OIL	496706	5617380	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW494	CARDINAL ENERGY LTD.	PUMPING OIL	496613	5618815	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW452	CARDINAL ENERGY LTD.	PUMPING OIL	498345	5617519	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW419	CARDINAL ENERGY LTD.	PUMPING OIL	496761	5618180	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW412	CARDINAL ENERGY LTD.	PUMPING OIL	496399	5618616	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW394	CARDINAL ENERGY LTD.	PUMPING OIL	496817	5617790	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW393	CARDINAL ENERGY LTD.	PUMPING OIL	498358	5617104	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW357	CARDINAL ENERGY LTD.	PUMPING OIL	493307	5616062	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW321	CARDINAL ENERGY LTD.	PUMPING OIL	492972	5615868	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW303	CARDINAL ENERGY LTD.	PUMPING OIL	496184	5618091	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW207	CARDINAL ENERGY LTD.	PUMPING OIL	496449	5616887	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW206	CARDINAL ENERGY LTD.	PUMPING OIL	496391	5618513	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW162	CARDINAL ENERGY LTD.	PUMPING OIL	496393	5618265	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW155	CARDINAL ENERGY LTD.	PUMPING OIL	497930	5617520	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW154	CARDINAL ENERGY LTD.	PUMPING OIL	489022	5617905	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW091	CARDINAL ENERGY LTD.	PUMPING OIL	496541	5618030	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well MW069	CARDINAL JENNER 10-18-20-8	PUMPING OIL	492952	5615965	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW038	CARDINAL JENNER 10-18-20-8	PUMPING OIL	492952	5615965	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW039	CARDINAL JENNER 1-18-20-8	PUMPING OIL	493244	5615280	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)

Table 2: Baseline Case Noise Emissions - AER-Regulated Wells

Well Identification Code[a]	Operator/Licensee (or Description from Third-Party NIA)	Type of Well (or Description from Third-Party NIA)	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Octave-Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			Easting [m]	Northing [m]	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
AER Well MW070	CARDINAL JENNER 15-18-20-8	PUMPING OIL	492952	5616954	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW037	CARDINAL JENNER 15-18-20-8	PUMPING OIL	492952	5616954	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW041	CARDINAL JENNER 7-18-20-8	PUMPING OIL	493318	5615132	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW034	CARDINAL SUFFIELD 10-21-20-8	PUMPING OIL	496072	5617733	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW030	CARDINAL SUFFIELD 11-21-20-8	PUMPING OIL	496181	5618050	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW028	CARDINAL SUFFIELD 11-21-20-8	PUMPING OIL	496181	5618050	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW036	CARDINAL SUFFIELD 14-21-20-8	PUMPING OIL	495893	5618343	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW029	CARDINAL SUFFIELD 14-21-20-8	PUMPING OIL	495893	5618343	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW040	CARDINAL SUFFIELD 7-21-20-8	PUMPING OIL	496039	5617126	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well GW779	COR4 OIL CORP.	PUMPING OIL	494978	5620806	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW775	COR4 OIL CORP.	PUMPING OIL	492993	5617347	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW771	COR4 OIL CORP.	PUMPING OIL	494994	5620319	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW769	COR4 OIL CORP.	PUMPING OIL	496782	5623353	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW742	COR4 OIL CORP.	PUMPING OIL	496018	5620221	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW730	COR4 OIL CORP.	PUMPING OIL	494496	5622872	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW729	COR4 OIL CORP.	PUMPING OIL	493598	5621597	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW715	COR4 OIL CORP.	PUMPING OIL	495142	5619930	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW711	COR4 OIL CORP.	PUMPING OIL	495273	5620346	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW703	COR4 OIL CORP.	PUMPING OIL	494674	5620779	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW683	COR4 OIL CORP.	PUMPING OIL	495054	5620482	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW673	COR4 OIL CORP.	PUMPING OIL	493877	5621372	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW665	COR4 OIL CORP.	PUMPING OIL	494388	5618796	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW663	COR4 OIL CORP.	PUMPING OIL	494356	5620836	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)

Table 2: Baseline Case Noise Emissions - AER-Regulated Wells

Well Identification Code[a]	Operator/Licensee (or Description from Third-Party NIA)	Type of Well (or Description from Third-Party NIA)	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Octave-Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			Easting [m]	Northing [m]	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
AER Well GW661	COR4 OIL CORP.	PUMPING OIL	495244	5620345	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW641	COR4 OIL CORP.	PUMPING OIL	495955	5619940	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW630	COR4 OIL CORP.	PUMPING OIL	493923	5621484	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW601	COR4 OIL CORP.	PUMPING OIL	494800	5621481	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW574	COR4 OIL CORP.	PUMPING OIL	495254	5620397	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW547	COR4 OIL CORP.	PUMPING OIL	489561	5616564	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW537	COR4 OIL CORP.	PUMPING OIL	495573	5620021	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW529	COR4 OIL CORP.	PUMPING OIL	494991	5621763	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW524	COR4 OIL CORP.	PUMPING OIL	496037	5620609	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW518	COR4 OIL CORP.	PUMPING OIL	494700	5620273	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW516	COR4 OIL CORP.	PUMPING OIL	494387	5618928	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW513	COR4 OIL CORP.	PUMPING OIL	493606	5614722	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW512	COR4 OIL CORP.	PUMPING OIL	494043	5620641	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW491	COR4 OIL CORP.	PUMPING OIL	494285	5620989	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW489	COR4 OIL CORP.	PUMPING OIL	495407	5619674	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW465	COR4 OIL CORP.	PUMPING OIL	494604	5623324	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW449	COR4 OIL CORP.	PUMPING OIL	496119	5620529	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW439	COR4 OIL CORP.	PUMPING OIL	493901	5621480	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW420	COR4 OIL CORP.	PUMPING OIL	496245	5619998	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW400	COR4 OIL CORP.	PUMPING OIL	495252	5621793	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW389	COR4 OIL CORP.	PUMPING OIL	494964	5619733	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW386	COR4 OIL CORP.	PUMPING OIL	494802	5622310	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW337	COR4 OIL CORP.	PUMPING OIL	495466	5623371	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)

Table 2: Baseline Case Noise Emissions - AER-Regulated Wells

Well Identification Code[a]	Operator/Licensee (or Description from Third-Party NIA)	Type of Well (or Description from Third-Party NIA)	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Octave-Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			Easting [m]	Northing [m]	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
AER Well GW333	COR4 OIL CORP.	PUMPING OIL	495102	5619872	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW332	COR4 OIL CORP.	PUMPING OIL	494419	5619420	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW327	COR4 OIL CORP.	PUMPING OIL	494404	5622144	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW317	COR4 OIL CORP.	PUMPING OIL	494358	5621039	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW310	COR4 OIL CORP.	PUMPING OIL	494178	5621818	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW309	COR4 OIL CORP.	PUMPING OIL	494956	5620792	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW276	COR4 OIL CORP.	PUMPING OIL	495081	5620462	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW275	COR4 OIL CORP.	PUMPING OIL	494181	5620947	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW274	COR4 OIL CORP.	PUMPING OIL	495821	5621306	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW272	COR4 OIL CORP.	PUMPING OIL	493500	5615040	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW256	COR4 OIL CORP.	PUMPING OIL	489809	5616237	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW228	COR4 OIL CORP.	PUMPING OIL	494100	5619351	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW227	COR4 OIL CORP.	PUMPING OIL	495752	5620215	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW221	COR4 OIL CORP.	PUMPING OIL	494232	5621583	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW219	COR4 OIL CORP.	PUMPING OIL	495821	5621276	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW194	COR4 OIL CORP.	PUMPING OIL	492459	5617345	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW192	COR4 OIL CORP.	PUMPING OIL	494753	5623035	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW178	COR4 OIL CORP.	PUMPING OIL	494576	5621952	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW176	COR4 OIL CORP.	PUMPING OIL	495407	5619719	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW163	COR4 OIL CORP.	PUMPING OIL	496328	5620185	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW160	COR4 OIL CORP.	PUMPING OIL	494291	5618987	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW153	COR4 OIL CORP.	PUMPING OIL	492951	5618386	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW141	COR4 OIL CORP.	PUMPING OIL	495714	5621242	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)

Table 2: Baseline Case Noise Emissions - AER-Regulated Wells

Well Identification Code[a]	Operator/Licensee (or Description from Third-Party NIA)	Type of Well (or Description from Third-Party NIA)	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Octave-Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			Easting [m]	Northing [m]	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
AER Well GW140	COR4 OIL CORP.	PUMPING OIL	494899	5620032	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW137	COR4 OIL CORP.	PUMPING OIL	494639	5623329	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW131	COR4 OIL CORP.	PUMPING OIL	494190	5621801	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW123	COR4 OIL CORP.	PUMPING OIL	495187	5620189	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW113	COR4 OIL CORP.	PUMPING OIL	495383	5619674	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW110	COR4 OIL CORP.	PUMPING OIL	494794	5620739	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW109	COR4 OIL CORP.	PUMPING OIL	495820	5622840	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW108	COR4 OIL CORP.	PUMPING OIL	494829	5620239	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW083	COR4 OIL CORP.	PUMPING OIL	494900	5620690	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well MW065	CVE 11A-16 SUFFIELD 15-16-20-8	PUMPING OIL	496017	5616394	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW067	IMAGINEA JENNER 10-29-20-8	PUMPING OIL	494358	5618951	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW062	IMAGINEA JENNER 10-29-20-8	PUMPING OIL	494358	5618951	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW066	IMAGINEA JENNER 12-28-20-8	PUMPING OIL	494769	5619508	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW046	IMAGINEA JENNER 13-19-20-8	PUMPING OIL	492976	5618376	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW042	IMAGINEA JENNER 13-19-20-8	PUMPING OIL	492976	5618376	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW051	IMAGINEA JENNER 13-29-20-8	PUMPING OIL	494118	5619333	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW050	IMAGINEA JENNER 13-29-20-8	PUMPING OIL	494118	5619333	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW048	IMAGINEA JENNER 14-19-20-8	PUMPING OIL	493094	5618226	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW056	IMAGINEA JENNER 14-29-20-8	PUMPING OIL	494635	5619531	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW064	IMAGINEA JENNER 15-29-20-8	PUMPING OIL	494787	5619827	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW055	IMAGINEA JENNER 15-29-20-8	PUMPING OIL	494787	5619827	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW032	IMAGINEA JENNER 15-29-20-8	PUMPING OIL	494787	5619827	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW035	IMAGINEA JENNER 16-29-20-8	PUMPING OIL	494798	5619458	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)

Table 2: Baseline Case Noise Emissions - AER-Regulated Wells

Well Identification Code[a]	Operator/Licensee (or Description from Third-Party NIA)	Type of Well (or Description from Third-Party NIA)	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Octave-Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			Easting [m]	Northing [m]	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
AER Well MW058	IMAGINEA JENNER 16-7-20-8	PUMPING OIL	493419	5615361	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW057	IMAGINEA JENNER 16-7-20-8	PUMPING OIL	493419	5615361	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW060	IMAGINEA JENNER 2-32-20-8	PUMPING OIL	494361	5620001	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW049	IMAGINEA JENNER 3-19-20-8	PUMPING OIL	493278	5617341	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW045	IMAGINEA JENNER 3-19-20-8	PUMPING OIL	493278	5617341	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW061	IMAGINEA JENNER 3-29-20-8	PUMPING OIL	494937	5619261	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW071	IMAGINEA JENNER 5-28-20-8	PUMPING OIL	495377	5619162	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW044	IMAGINEA JENNER 6-19-20-8	PUMPING OIL	493140	5617871	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW047	IMAGINEA JENNER 7-19-20-8	PUMPING OIL	493334	5617566	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW043	IMAGINEA JENNER 7-19-20-8	PUMPING OIL	493334	5617566	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW068	IMAGINEA JENNER 7-29-20-8	PUMPING OIL	495236	5619599	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW063	IMAGINEA JENNER 7-29-20-8	PUMPING OIL	495236	5619599	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW054	IMAGINEA JENNER 7-29-20-8	PUMPING OIL	495236	5619599	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW033	IMAGINEA JENNER 8-29-20-8	PUMPING OIL	494977	5619242	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW059	IMAGINEA JENNER 8-7-20-8	PUMPING OIL	493525	5615019	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW053	IMAGINEA JENNER 8-7-20-8	PUMPING OIL	493525	5615019	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW052	IMAGINEA JENNER 8-7-20-8	PUMPING OIL	493525	5615019	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well MW031	IMAGINEA JENNER 9-29-20-8	PUMPING OIL	495066	5619583	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location and noise emissions from (RWDI 2018)
AER Well GW764	IPC ALBERTA LTD.	PUMPING OIL	496882	5616302	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW438	IPC ALBERTA LTD.	PUMPING OIL	497979	5616650	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW497	IPC ALBERTA LTD.	PUMPING OIL / WATER INJECTOR	497160	5616307	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW733	IPC ALBERTA LTD.	WATER INJECTOR	496618	5616607	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)
AER Well GW669	IPC ALBERTA LTD.	WATER INJECTOR	496042	5616718	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)

Table 2: Baseline Case Noise Emissions - AER-Regulated Wells

Well Identification Code[a]	Operator/Licensee (or Description from Third-Party NIA)	Type of Well (or Description from Third-Party NIA)	Universal Transverse Mercator Coordinates [NAD83, Zone 12]		Octave-Band Sound Power Level [dBZ]									Total Sound Power Level [dBA]	Reference
			Easting [m]	Northing [m]	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz		
AER Well GW405	IPC ALBERTA LTD.	WATER INJECTOR	495848	5616666	77.6	91.8	85.4	81.8	79.1	84.4	75.4	75.9	67.4	86.5	Well location from (AER 2019b); noise emissions from (RWDI 2018)

[a] A well code that includes “MW” (e.g., “AER Well MW069”) indicates this well was identified in a third-party NIA. A well code that includes “GW” (e.g., “AER Well GW483”) indicates this well was identified from the ST37 database (AER 2019b).

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