

Rook I Project

Environmental Impact Statement

Annex II: Noise and Light Baseline Report



NOISE AND LIGHT CHARACTERIZATION BASELINE REPORT FOR THE ROOK I PROJECT

Prepared for:

NexGen Energy Ltd.

Prepared by:

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March 2022

Executive Summary

Potential changes to noise and light conditions resulting from mining and milling operations can create adverse effects to both the social and biophysical environments. For the Rook I Project, Indigenous Peoples have expressed concerns about sensory disturbance from industrial facilities, including noise and light effects on cultural practices and wildlife. In consideration of these potential changes and concerns, a baseline study on noise and light was conducted for the Rook I Project.

The objective of the noise and light baseline study was to gather information on representative existing environmental noise and light levels in the anticipated area of the Rook I Project. Information gathered during the field study provided a baseline against which potential noise and light effects from the Rook I Project could be assessed.

Saskatchewan does not have regulations or guidelines for the assessment of environmental noise from mining or industrial developments. Similarly, there are no specific federal or provincial regulatory requirements to assess potential light effects from mining or industrial developments. In addition, there is no existing information about representative environmental noise and light levels in the anticipated area of the Rook I Project.

In the absence of Saskatchewan-specific guidance, baseline noise levels were characterized using thresholds from Environment Canada, Health Canada, and the Alberta Energy Regulator. In the absence of federal or provincial guidance, baseline light trespass and sky glow levels were characterized using thresholds from light assessment literature published by the Illuminating Engineering Society of North America, the International Commission on Illumination, and the Institution of Lighting Professionals.

The baseline study was conducted in September 2018 and March 2020. Baseline noise levels were measured at three stations, and baseline light trespass and sky glow levels were measured at nine stations. Noise and light levels measured during the field study were post-processed, as required, to exclude influence from Rook I exploration activities and other unrepresentative data sources (i.e., to establish representative existing baseline conditions).

Baseline noise levels for all three measurement stations were observed to be less than thresholds set out in the Environment Canada, Health Canada, and Alberta Energy Regulator guidance documents. Baseline noise levels were generally observed to be higher and more variable at the measurement stations located close to waterbodies than at the measurement station located in a forested area. This suggests that wave action and other water-related sources have an influence on baseline noise levels near waterbodies.

Baseline light trespass levels for all nine measurement stations were observed to be less than thresholds from light assessment literature. Baseline sky glow at two of the nine measurement stations were observed to exceed thresholds from light assessment literature. Baseline sky glow at the other seven measurement stations were observed to be less than thresholds from light assessment literature. Elevated sky glow observed in the baseline data likely results from the combined influence of aurora activity during the field study and the presence of Fort McMurray approximately 150 km southwest of the Rook I Project.

The baseline study achieved the objective of characterizing existing environmental noise and light levels in the anticipated area of the Rook I Project. Specifically, noise and light levels measured during the field study provided a representative baseline against which potential noise and light effects from the Rook I Project could be assessed.

If referencing this report, please use for the following citation:

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Prepared for NexGen Energy Ltd.

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Abbreviations and Units of Measure

Acronym	Definition
%HA	percent highly annoyed
AER	Alberta Energy Regulator
CIE	International Commission on Illumination
CST	Central Standard Time
EA	Environmental Assessment
EIS	Environmental Impact Statement
IESNA	Illuminating Engineering Society of North America
ILP	Institution of Lighting Professionals
$L_{eq,1min}$	energy equivalent sound levels over a one-minute averaging period
$L_{eq,day}$	energy equivalent sound levels for each daytime period
$L_{eq,night}$	energy equivalent sound levels for each nighttime period
LFN	low frequency noise
LSA	local study area
NexGen	NexGen Energy Ltd.
Project	Rook I Project
RSA	regional study area
SLM	sound level meter
TSD	technical support document

Unit/Symbol	Definition
%	percent
dBA	A-weighted decibel
dBC	C-weighted decibel
h	hour
Hz	hertz
km	kilometres
m	metres
$mag/arcsec^2$	magnitude per square second of arc
mlux	millilux

1.0 INTRODUCTION

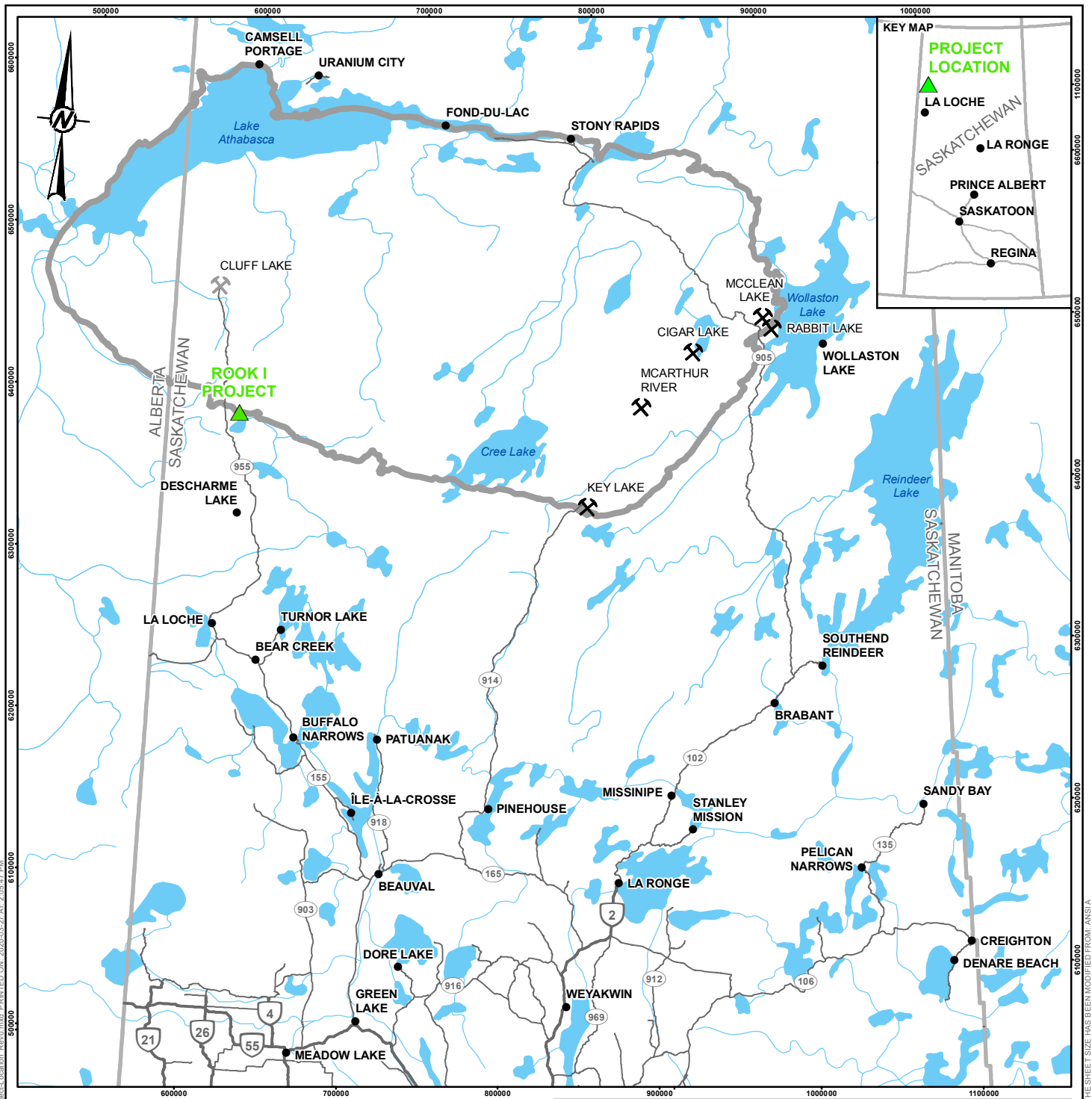
The Rook I Project (Project) is a proposed new uranium mining and milling operation that is 100% owned by NexGen Energy Ltd. (NexGen). The Project is located in northwestern Saskatchewan, approximately 40 km east of the Saskatchewan-Alberta border, 130 km north of the town of La Loche, and 640 km northwest of the city of Saskatoon (Figure 1). The Project resides within Treaty 8 territory and within the Métis Homeland. At a regional scale, the Project is situated within the southern Athabasca Basin adjacent to Patterson Lake, and along the upper Clearwater River system (Figure 2). Access to the Project will be from an existing road off Highway 955. The Project would include underground and surface facilities to support the extraction and processing of uranium ore from the Arrow deposit, a land-based, basement-hosted, high-grade uranium deposit.

The noise and light baseline report represents a component of a comprehensive baseline program that documents the natural and socio-economic environments in the anticipated area of the Project. The noise and light baseline program was undertaken to provide context from which Project environmental noise and light effects could be assessed in the Environmental Impact Statement (EIS).

Since exploration at the Project commenced in 2013, NexGen has engaged regularly and established relationships with local First Nation and Métis Groups (collectively referred to as Indigenous Groups), specifically those closest and with greatest access to the proposed Project. NexGen respects the rights of Indigenous Peoples, the unique relationship Indigenous Peoples have with the environment, and recognizes the importance of full and open discussion with interested or potentially affected Indigenous Groups regarding the development, operation, and decommissioning of the proposed Project. Engagement activities to date, as well as future planned engagement activities, reflect the value NexGen places on meaningful engagement with Indigenous Groups who could be potentially affected by the proposed Project. Engagement mechanisms have included, but are not limited to: meetings with leadership, workshops and community information sessions, Project site tours, establishing Joint Working Groups to support the gathering and incorporation of Indigenous and Local Knowledge throughout the Environmental Assessment (EA) process, and providing funding for traditional land use studies¹ to understand how the proposed Project may interact with the Indigenous Groups' traditional use of the anticipated area of the Project.

Feedback received during engagement activities was documented for contribution to the EIS for the Project; examples of feedback received include discussion of concerns, interests, potential adverse effects, mitigation, and design alternatives. Many baseline studies were initiated in advance of formal engagement on the EA for the Project; however, engagement during the execution of baseline studies has helped inform the understanding of baseline conditions and confirmed components of the natural and socio-economic environments that required study. A summary of feedback related to the noise and light baseline program is presented in Appendix A.

¹ Traditional Land Use (TLU) Studies include all land use studies developed by the Project's affected Indigenous Groups, including Traditional Land Use and Occupancy studies, Traditional Knowledge and Use studies, and Indigenous Rights and Knowledge studies, henceforth referred collectively as TLU Studies.



LEGEND

- POPULATED PLACE
- ▲ PROJECT LOCATION
- ⌵ URANIUM MINING FACILITY (ACTIVE)
- ⌵ URANIUM MINING FACILITY (DECOMMISSIONED)
- PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- WATERCOURSE
- WATERBODY
- ▭ ATHABASCA BASIN BOUNDARY



REFERENCE(S)

1. BASE DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
 PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT



PROJECT
ROOK I PROJECT

TITLE
LOCATION OF THE ROOK I PROJECT, SASKATCHEWAN

CONSULTANT

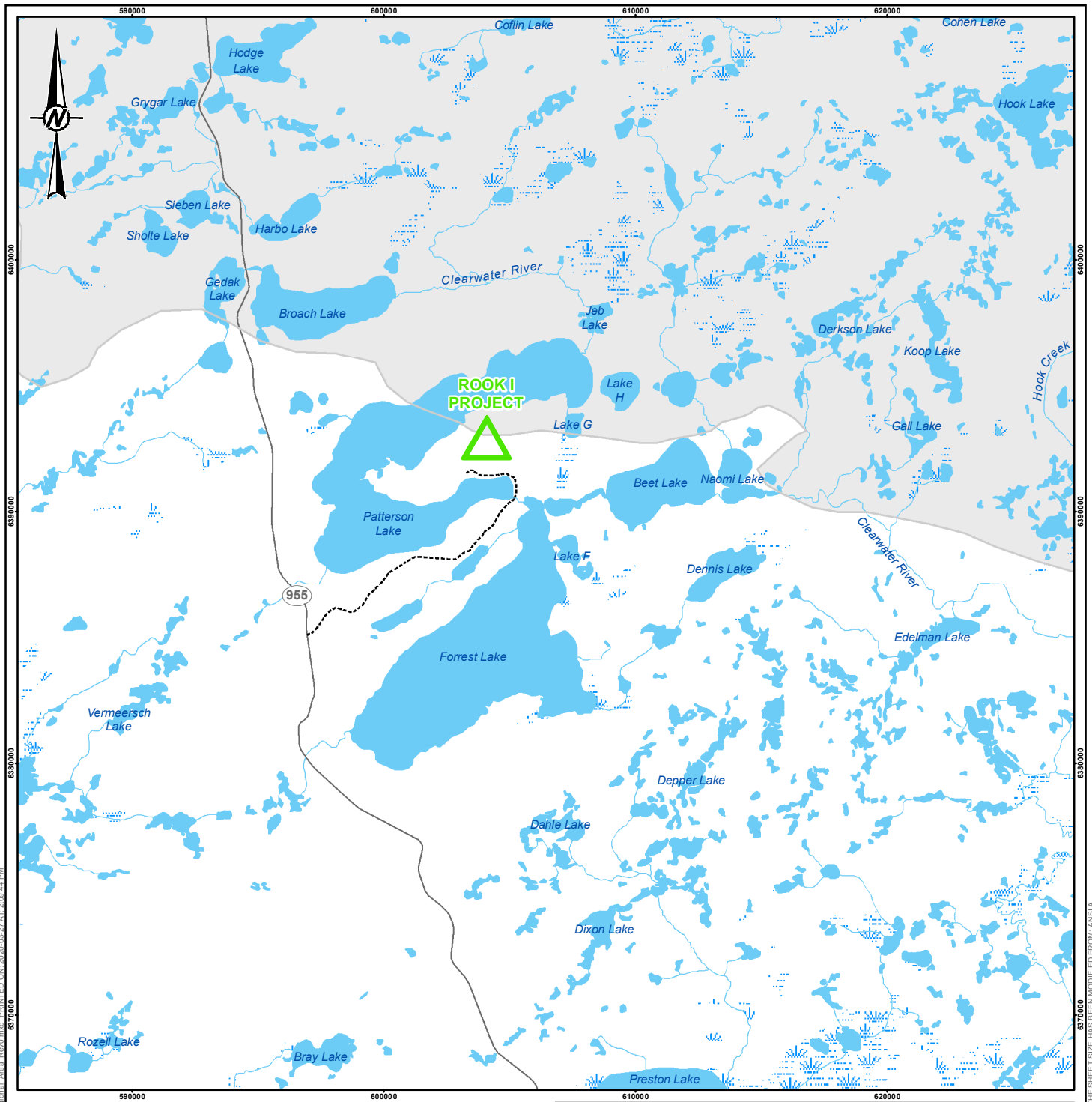


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APPROVED	MM

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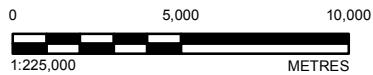
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LEGEND

- SECONDARY HIGHWAY
- WATERCOURSE
- WATERBODY
- WETLAND
- ATHABASCA BASIN
- PROJECT LOCATION
- EXISTING ACCESS ROAD



REFERENCE(S)

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 PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT



PROJECT

ROOK I PROJECT

TITLE

REGIONAL AREA OF THE ROOK I PROJECT

CONSULTANT



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2.0 STUDY OBJECTIVE

The objective of the noise and light baseline study was to gather information on representative existing environmental noise and light levels in the anticipated area of the Project. The gathered information could then be used to support assessments of Project effects.

2.1 Program Guidance

2.1.1 Noise

Saskatchewan does not have regulations or guidelines for the assessment of environmental noise from industrial facilities. As such, noise assessments for industrial facilities in Saskatchewan often utilize federal guidance documents, including Environment Canada's Environmental Code of Practice for Metal Mines (Environment Canada 2009) and Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment – Noise (Health Canada 2017). To supplement this federal guidance, noise assessments for industrial facilities in Saskatchewan often also make use of regulations and guidelines applicable in other Canadian provinces, including Alberta Energy Regulator (AER) Directive 038: Noise Control (AER 2007). Consistent with the practices used for other industrial facilities in Saskatchewan, the noise baseline study applied guidance from the Environment Canada, Health Canada, and AER documents. In particular, the baseline study:

- identified potential noise receptors in accordance with the Health Canada guidance document (Health Canada 2017);
- measured noise levels using methods set out in AER Directive 038 (AER 2007); and
- compared measured noise levels to thresholds from all three guidance documents (Environment Canada 2009; Health Canada 2017; AER 2007).

For the Project, Indigenous Peoples have expressed concerns about sensory disturbance from industrial facilities, including noise effects on cultural practices and wildlife (Birch Narrows Dene Nation [TSD II: BNDN]; Buffalo River Dene Nation [TSD III: BRDN]; Clearwater River Dene Nation [TSD V.1: CRDN]; Métis Nation – Saskatchewan [TSD IV: MN-S]; Ya'thi Néné Lands and Resources Office [TSD VI: YNLRO]; Appendix A). This feedback reinforces the importance of using the guidance outlined above.

2.1.2 Light

There are no specific regulatory requirements to assess potential light effects from mining or industrial developments; however, there are general increased concerns about the effects of light from industrial facilities on migratory birds and other wildlife species (Canada 2015; Horton et al. 2019; Adams et al. 2019). In addition, through NexGen's engagement with local Indigenous communities and groups, Indigenous Peoples have expressed concerns about the effect of industrial facilities on nighttime light levels and the wilderness experience (Appendix A).

In the absence of federal or provincial regulatory guidance, the light baseline study applied guidance from the Illuminating Engineering Society of North America (IESNA 2000), the International Commission on Illumination (CIE 1997, 2017), and the Institution of Lighting Professionals (ILP 2020). The IESNA, CIE, and ILP recommend that light effects be characterized in the context of:

- light trespass, which refers to light or illuminance that strays from its intended purposes onto neighbouring areas where lighting may be undesirable; and
- sky glow, which refers to stray light scattered in the atmosphere, brightening the natural sky and reducing star visibility.

The light baseline study measured representative existing light trespass and sky glow levels using methods set out in the IESNA and CIE guidance documents, and compared measured levels to light trespass and sky glow thresholds recommended by the CIE and ILP.

3.0 STUDY AREAS

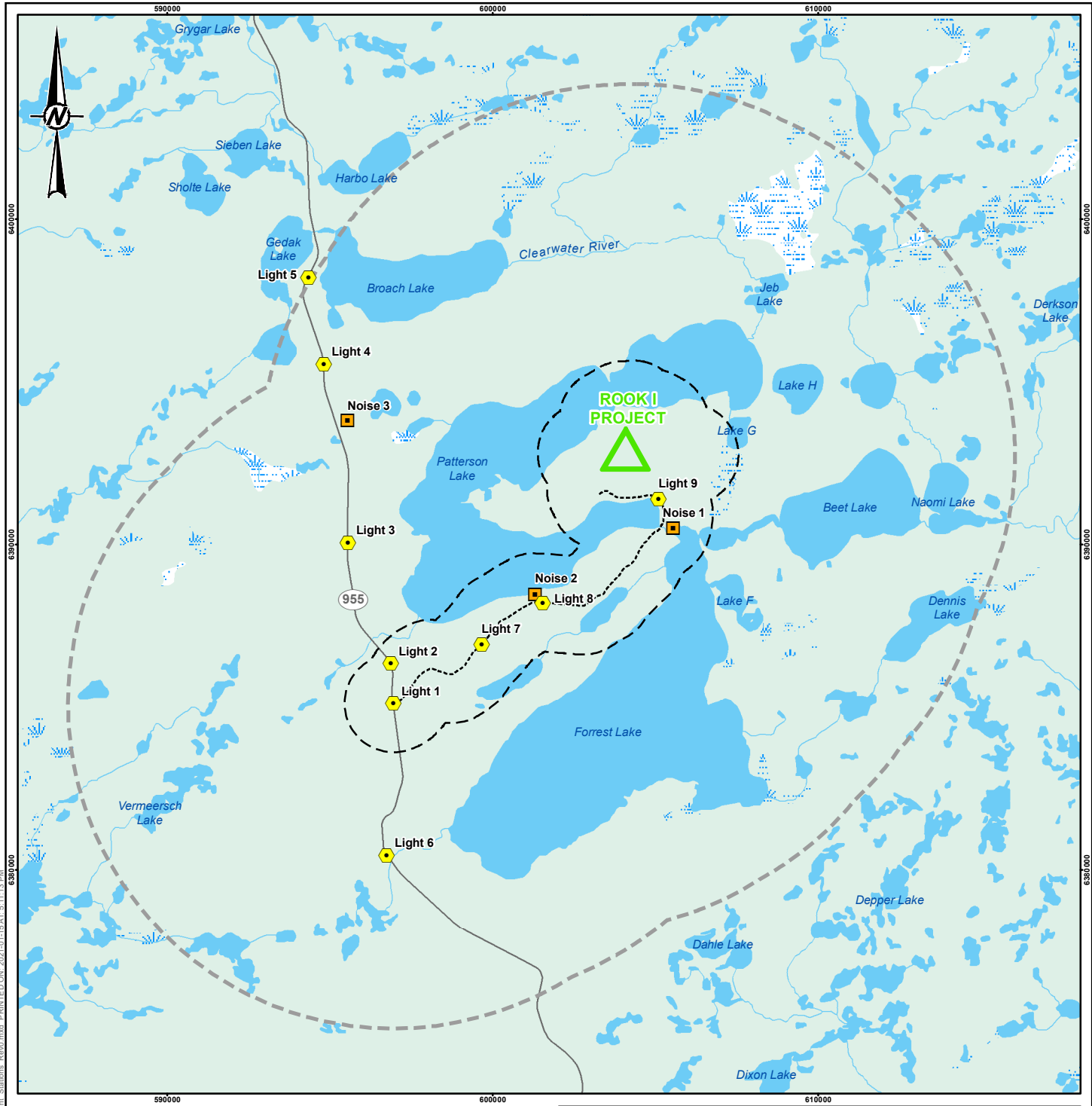
The noise and light baseline study characterized existing conditions at discrete stations located within a local study area (LSA) and regional study area (RSA).

3.1 Local Study Area

The Environment Canada, Health Canada, IESNA, CIE, and ILP guidance documents do not provide recommendations for establishing suitable study areas for noise and light assessments; however, AER Directive 038 requires that environmental noise be assessed at occupied dwellings located within 1.5 km of a development boundary. In the absence of any such dwellings, AER Directive 038 requires that environmental noise be assessed at the most affected unoccupied location(s) 1.5 km from the development boundary. In accordance with guidance from AER Directive 038, the LSA for the noise baseline was defined as a 1.5 km buffer surrounding the anticipated area of the Project (Figure 3). Based on professional experience, the same LSA was used for the light baseline.

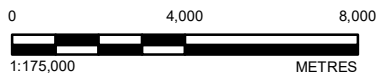
3.2 Regional Study Area

Because environmental noise attenuates with propagation distance, research suggests that industrial facilities are unlikely to contribute to cumulative noise levels at distances greater than 5 km (Drew and South 2009). Although environmental light may propagate to greater distances than noise, light also attenuates with propagation distance and terrain features and forest are effective barriers to light propagation. In recognition of propagation differences for noise and light, the RSA for the noise and light baseline was conservatively defined as a 10 km buffer surrounding the anticipated area of the Project (Figure 3). This RSA is expected to be large enough to characterize any potential noise or light effects from the Project.



LEGEND

- SECONDARY HIGHWAY
- WATERCOURSE
- WATERBODY
- WETLAND
- WOODED AREA
- EXISTING ACCESS ROAD
- ▲ PROJECT LOCATION
- LIGHT STATION
- NOISE STATION
- NOISE AND LIGHT LOCAL STUDY AREA
- NOISE AND LIGHT REGIONAL STUDY AREA



REFERENCE(S)

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 PROJECTION: UTM ZONE 12 DATUM: NAD 83

CLIENT



PROJECT
ROOK I PROJECT

TITLE
NOISE AND LIGHT STUDY AREAS AND MEASUREMENT STATIONS

CONSULTANT



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PREPARED	LMS/NO
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4.0 METHODS

4.1 Review of Existing Information

There was no existing information available regarding representative environmental noise and light levels in the LSA or RSA.

4.2 Approach

4.2.1 Noise

Noise thresholds were taken from Environment Canada, Health Canada, and AER guidance documents (Environment Canada 2009; Health Canada 2017; AER 2007). These noise thresholds provide an instructive framework for gathering and contextualizing baseline noise data.

The Environment Canada guidance document states:

“In residential areas adjacent to mine sites, the [noise level] from mining activities should not exceed 55 dBA [A-weighted decibels] during the day and 45 dBA at night. Ambient noise can also affect wildlife, so sites in remote locations should also work to meet these objectives for off-site ambient noise levels.” (Environment Canada 2009).

The Health Canada guidance document identifies potential adverse effects from noise, including hearing loss, sleep disturbance, interference with speech comprehension, and general annoyance. The noise thresholds associated with hearing loss and interference with speech comprehension are much higher than the noise thresholds associated with sleep disturbance and annoyance. As such, the noise baseline program only considered Health Canada sleep disturbance and annoyance thresholds. Focusing on these lower threshold values represents a conservative approach to contextualizing the baseline noise data.

To protect the public from adverse health effects associated with sleep disturbance, the Health Canada guidance document recommends that the annual average nighttime noise level at receptors be maintained below 40 dBA (Health Canada 2017). The Health Canada guidance also provides a mathematical formula for estimating the percentage of a typical community that would report being highly annoyed (%HA) by given daytime and nighttime noise levels. The Health Canada guidance document indicates that, where practical, increases in %HA should not exceed 6.5% (Health Canada 2017). Note that the Health Canada guidance document defines daytime as the 15-hour period between 7:00 and 22:00 and defines nighttime as the nine-hour period between 22:00 and 7:00 (Health Canada 2017).

For receptors in quiet rural environments (like the LSA and RSA), AER Directive 038 indicates that cumulative noise levels should not exceed 50 dBA during the daytime period and should not exceed 40 dBA during the nighttime period (AER 2007). The AER Directive 038 defines daytime as the 15-hour period between 7:00 and 22:00 and defines nighttime as the nine-hour period between 22:00 and 7:00 (AER 2007).

The AER Directive 038 provides a second set of criteria for identifying potential effects from low frequency noise (LFN). According to AER Directive 038, an LFN issue exists if the difference between the measured C-weighted (dBC) noise level and the dBA noise level is greater than or equal to 20 and a clear tonal component is present at a frequency below 250 hertz (Hz) (AER 2007). To be clear, AER Directive 038 requires that both conditions be present for an LFN issue to exist. Satisfaction of one condition does not result in an LFN issue. Alberta Energy

Regulator Directive 038 provides a numerical technique for identifying clear tonal components as part of the second LFN condition.

The noise monitoring field work was conducted from 12 September 2018 to 15 September 2018. Monitoring data were collected in accordance with methods set out in AER Directive 038. The duration of the monitoring study was greater than 24 hours. Noise monitoring of this duration provides information about the daily variability in noise levels, as well as the typical or average daily condition.

Model 2250 Brüel and Kjær Type I integrating sound level meters (SLMs) were used to collect noise measurements and audio recordings. Data logged by the SLMs included:

- energy equivalent sound levels over a one-minute averaging period ($L_{eq,1min}$) in dBA; and
- one-third octave-band $L_{eq,1min}$ noise levels in unweighted decibels, which were used to calculate dBC levels and identify tonal components in accordance with the LFN analysis from AER Directive 038 (AER 2007).

Each SLM was calibrated with a Model 4231 Brüel and Kjær Type I field calibrator immediately before and after each monitoring period to confirm data validity. The calibration data were logged by the SLM and calibration results were also described in field notes.

The AER Directive 038 requires that monitoring be conducted under environmental conditions acceptable for noise measurement, which includes restrictions on wind speed and the absence of precipitation. Weather data were collected using a Nielsen-Kellerman Kestrel pocket weather meter. The weather meter logged wind speed, wind direction, temperature, and relative humidity data every minute for the duration of the monitoring study. Data from the weather meters were used, as required, for interpretation of the noise data logged by the SLMs. Direct observations of precipitation, cloud cover, wind direction, and audible noise sources were recorded in field notes and were also used, as required, for interpretation of the noise data.

The SLM microphones were deployed at a height of 1.5 m above ground, which is consistent with the height at which human exposure to noise typically occurs in undeveloped natural areas (ISO 1987). The weather meters were deployed at the same height above ground and separated from the SLMs by approximately 15 m. This separation distance was small enough that weather conditions were effectively identical at the two locations but large enough that the weather meters spinning wind sensor was inaudible at the SLM.

Noise and weather data were downloaded to a computer for analysis with the Brüel and Kjær 7820 Evaluator software program. The AER Directive 038 specifies explicit weather conditions that must be met during noise monitoring studies. One-minute data samples that were not recorded under weather conditions specified in AER Directive 038 were excluded from the analysis. In particular, data samples collected during periods when the wind speed exceeded 15 km/h were excluded.

As the objective of the noise monitoring study was to characterize representative existing noise levels in the absence of Project-related factors, one-minute data samples that were influenced by noise from Rook I exploration activities were excluded from the analysis. Noise from traffic on the existing access road and noise from helicopter activities associated with exploration field programs were occasionally audible. Data samples influenced by these activities were excluded when calculating representative baseline noise levels.

Other data samples were also excluded where noise sources occurred that were inconsistent with the representative background environment. Noise from public traffic on Highway 955 was occasionally audible. Since the objective of the baseline study was to obtain baseline noise levels that are generally representative of the LSA and RSA, and Highway 955 is inaudible in most parts of the study areas, this data was excluded. Also, noise sources associated with technician activities, which were clearly audible during deployment and recovery of the monitoring equipment at all three measurement stations, were excluded.

The remaining valid one-minute data samples were used to calculate energy equivalent sound levels for each daytime period ($L_{eq,day}$) and each nighttime period ($L_{eq,night}$), where more than 180 minutes of valid data were available (AER 2007). The daytime and nighttime noise levels were then used to characterize the baseline noise environment in the context of thresholds from the Environment Canada, Health Canada, and AER guidance documents (Environment Canada 2009; Health Canada 2017; AER 2007).

4.2.2 Light

In the absence of federal or provincial guidance, the light baseline study applies guidance from the IESNA, CIE, and ILP. In recognition of the fact that some areas are more sensitive to potential light effects than others (e.g., lighting considered acceptable and appropriate in a busy urban centre may not be acceptable in a remote national park), light assessment literature establishes light trespass and sky glow limits based on environmental lighting zones. The CIE defines five environmental lighting zones:

- E0 – starlight reserves, dark sky parks, and astronomical observatories (intrinsically dark);
- E1 – relatively uninhabited rural areas (dark);
- E2 – sparsely inhabited rural areas (low district brightness);
- E3 – well inhabited rural and urban settlements (medium district brightness); and
- E4 – town and city centres and other commercial areas (high district brightness).

As a remote forested area with very few artificial light sources, the environmental lighting zone for the LSA and RSA is best classified as E1. Note that an E0 classification would not be appropriate since there are no parks or other specially protected areas within the LSA or RSA. Environmental lighting zone E0 is only appropriate in cases where there is a special requirement to reduce light effects, or a specific need for low light levels (e.g., close to an astronomical observatory).

Light trespass levels are typically measured in units of lux, the SI unit of illuminance, which is equal to one lumen per square metre. One thousandth of a lux is referred to as a millilux (mlux). Light assessment literature suggests that 100 mlux is an appropriate light trespass limit for environmental lighting zone E1 (CIE 2017). The light baseline study uses this light trespass limit as a threshold for contextualizing existing light trespass levels in the LSA and RSA.

Sky glow levels are typically measured in units of magnitude per square second of arc ($\text{mag}/\text{arcsec}^2$). These units reflect “sky quality” relative to a theoretical condition in which there is zero sky glow. In other words, larger values represent better “sky quality” and less sky glow. For example, a sky glow value of $18 \text{ mag}/\text{arcsec}^2$ is representative of a clear night with a full moon, while a sky glow value of $3 \text{ mag}/\text{arcsec}^2$ is representative of a clear daytime sky (i.e., full sunshine).

Light assessment literature suggests that 20 mag/arcsec² is an appropriate sky glow limit for environmental lighting zone E1 (ILP 2020). The baseline study uses this sky glow limit as a threshold for contextualizing existing sky glow levels in the LSA and RSA. It should be noted that this sky glow limit assumes summertime conditions (i.e., no snow on the ground), clear skies (i.e., no cloud cover), with no moon, and no aurora activity. The presence of snow cover, cloud cover, the moon, and/or aurora activity can reduce “sky quality” and result in measured sky glow levels lower than would be observed in the absence of these factors.

The light baseline study was conducted overnight on:

- 13 September 2018 and 14 September 2018;
- 14 September 2018 and 15 September 2018;
- 18 March 2020 and 19 March 2020;
- 22 March 2020 and 23 March 2020; and
- 23 March 2020 and 24 March 2020.

All measurement data were collected during periods when the night sky was dark (i.e., both sun and moon below the horizon). Measurement data were collected over multiple nighttime periods to capture a variety of environmental conditions: summertime cloudy skies, summertime clear skies, wintertime cloudy skies, and wintertime clear skies.

Measurement data were collected in general accordance with guidance from the IESNA (IESNA 2000) and the CIE (CIE 1997, 2017). Baseline light trespass levels were measured using a Solar Light PMA2010 photometer, outfitted with a PMA2131 scotopic detector. Baseline sky glow levels were measured using a Unihedron sky quality meter.

4.3 Measurement Stations

4.3.1 Noise

Existing noise levels were monitored at three measurement stations. The noise measurement stations were selected to characterize baseline noise conditions experienced by human receptors and terrestrial wildlife in the LSA and RSA. Coordinates for each of the noise measurement stations and rationale for their inclusion in the baseline noise study are provided in Table 1. The three noise measurement stations are also shown in Figure 3.

The AER Directive 038 requires that environmental noise be assessed at occupied dwellings within 1.5 km of a development boundary. There are no occupied dwellings within the LSA (i.e., within 1.5 km of the anticipated area of the Project) or within the RSA. Therefore, occupied dwellings were not considered when selecting noise monitoring stations for the baseline study.

The Environment Canada guidance document indicates that environmental noise should be assessed for “residential areas adjacent to mine sites” (Environment Canada 2009). There are no residential areas adjacent to the LSA. The closest population centre to the anticipated area of the Project is the community of Descharme Lake, which is located approximately 60 km to the south (i.e., beyond the LSA and RSA). Therefore, residential areas were not considered when selecting noise monitoring stations for the baseline study.

The Health Canada guidance document indicates that environmental noise should be assessed at a wide range of receptors, including passive recreation areas, which are described as “[o]utdoor grounds used for hunting, fishing, teaching, etc. ... includes locations where Indigenous Peoples may hunt, fish or gather country foods”, and seasonal residences, which are described as “[c]ottages, campgrounds and RV parks ... includes Indigenous hunting and fishing cabins, and seasonal camping places” (Health Canada 2017). One hunting and fishing outfitter is located on Beet Lake and another located on Jeb Lake. Both outfitters are located beyond the LSA but within the RSA, and both outfitters qualify as noise receptors based on the Health Canada guidance. To characterize representative existing noise levels experienced by outfitters and their clients, the baseline study made use of two measurement stations located adjacent to waterbodies.

Table 1: Noise Measurement Stations

Noise Measurement Station	Description	Universal Transverse Mercator Coordinates (NAD83, Zone 12)		Rationale for Inclusion
		Easting (m)	Northing (m)	
Noise 1	Swampy area on north shore of Forrest Lake	605549	6390528	Conditions at this station are representative of baseline noise levels in swampy areas near waterbodies within the LSA/RSA. Measurements reflect noise levels currently experienced by wildlife, Indigenous Peoples, and recreational fishermen that make use of these waterbodies (including the Beet Lake and Jeb Lake outfitters).
Noise 2	Rocky area on south shore of Patterson Lake	601311	6388505	Conditions at this station are representative of baseline noise levels in rocky areas near waterbodies within the LSA/RSA. Measurements reflect noise levels currently experienced by wildlife, Indigenous Peoples, and recreational fishermen that make use of these waterbodies (including the Beet Lake and Jeb Lake outfitters).
Noise 3	Forested area northwest of Patterson Lake; far from the nearest waterbody	595537	6393834	Conditions at this station are representative of baseline noise levels in forest environments within the LSA/RSA. Measurements reflect noise levels currently experienced by wildlife, Indigenous Peoples, and recreational hunters that make use of these forest environments.

NAD = North American Datum; LSA = local study area; RSA = regional study area

4.3.2 Light

Light trespass and sky glow effects are typically assessed at points of reception corresponding to dwellings, hotels/motels, hospitals, and viewpoints used by sightseers (CIE 2017). As discussed in Section 4.3.1, with the exception of hunting/fishing outfitters located on Beet Lake and Jeb Lake, none of these types of point receptor are present in the anticipated area of the Project. Therefore, dwellings, hotels/motels, hospitals, and viewpoints used by sightseers were not considered when selecting light measurement stations.

The Beet Lake and Jeb Lake outfitters are understood to be the only potential points of reception corresponding to hotels/motels in RSA; however, both outfitters are located in remote areas that were not accessible during nighttime hours when light measurements must be collected. Consequently, existing light trespass and sky glow levels were measured at nine stations along the existing access road and Highway 955 (i.e., stations that were

readily accessible during nighttime hours). These nine measurement stations were selected because they were readily accessible via existing roads. Because there are very few sources of artificial light within the LSA and RSA, light trespass and sky glow levels measured at the nine roadside stations can be considered generally representative of baseline conditions throughout the study areas. The measurement data are representative of light levels currently experienced by wildlife, Indigenous Peoples, and recreational hunters and fisherman that make use of waterbodies and forest environments within the LSA and RSA. In addition, the measurement data are representative of light levels currently experienced by drivers travelling along the section of Highway 955 west of Patterson Lake.

Coordinates for each of the nine light measurement stations are presented in Table 2. The nine light measurement stations are also shown in Figure 3.

Table 2: Light Measurement Stations

Light Measurement Station	Description	Universal Transverse Mercator Coordinates (NAD83, Zone 12)	
		Easting (m)	Northing (m)
Light 1	Junction of existing access road and Highway 955	596945	6385116
Light 2	Highway 955, north of existing access road	596866	6386346
Light 3	Highway 955, north of existing access road	595559	6390063
Light 4	Highway 955, north of existing access road	594807	6395560
Light 5	Highway 955, north of existing access road	594334	6398202
Light 6	Highway 955, south of existing access road	596741	6380461
Light 7	Existing access road	599663	6386938
Light 8	Existing access road	601548	6388206
Light 9	Existing access road	605103	6391406

NAD = North American Datum

5.0 RESULTS

5.1 Noise

Existing noise levels were monitored at three measurement stations. The noise measurement stations were selected to characterize baseline noise conditions experienced by human receptors and terrestrial wildlife in the LSA and RSA.

5.1.1 Noise 1

Monitoring was conducted at measurement station Noise 1 from 10:20 Central Standard Time (CST) on 12 September 2018 until 18:18 CST on 14 September 2018. A photograph showing the monitoring equipment deployed at Noise 1 is presented in Figure 4. Forrest Lake is visible in the background of this photograph.

Representative noise sources audible at Noise 1 included:

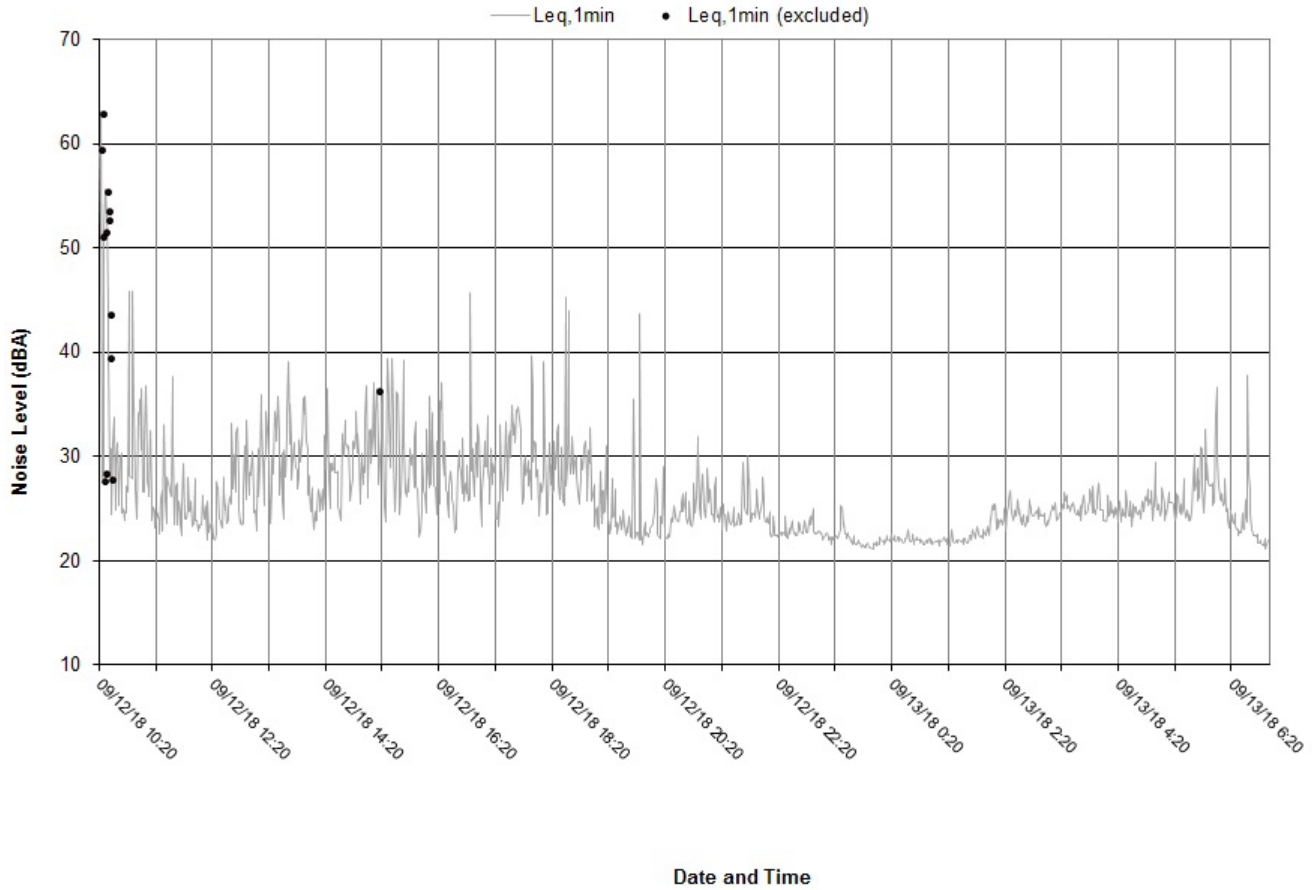
- birds;
- wave action from Forrest Lake;
- wind in vegetation;
- power boat and fishermen on Forrest Lake (afternoon of 13 September 2018);
- animal footsteps and breathing; and
- animal howling and vocalizing.

Graphs of one-minute noise levels measured at Noise 1 are presented in Figure 5, Figure 6, and Figure 7. These figures show the valid data samples that were used in the calculation of representative $L_{eq,day}$ and $L_{eq,night}$ average noise levels, and the data samples that were excluded because they were logged under unacceptable weather conditions or influenced by noise from exploration or other activities unrepresentative of the existing environment. The excluded data samples have been highlighted using black dots. Appendix B provides a complete list of each data sample that was excluded when establishing representative noise levels for measurement station Noise 1. Appendix B also provides an explanation for why each data sample was excluded.

Figure 4: Monitoring Equipment Deployed at Measurement Station Noise 1

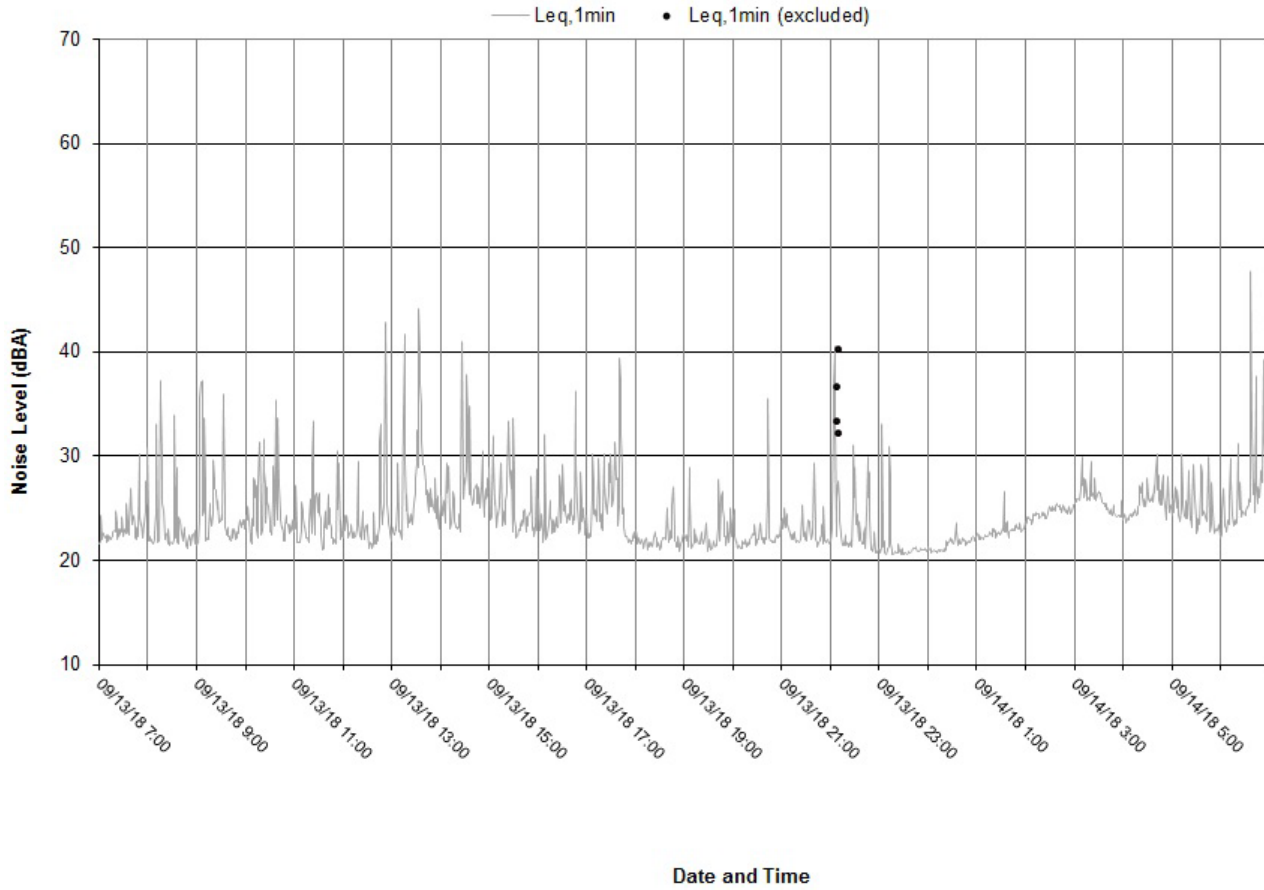


Figure 5: Monitoring Data Recorded at Measurement Station Noise 1 (12 Sep 10:20 CST through 13 Sep 6:59 CST)



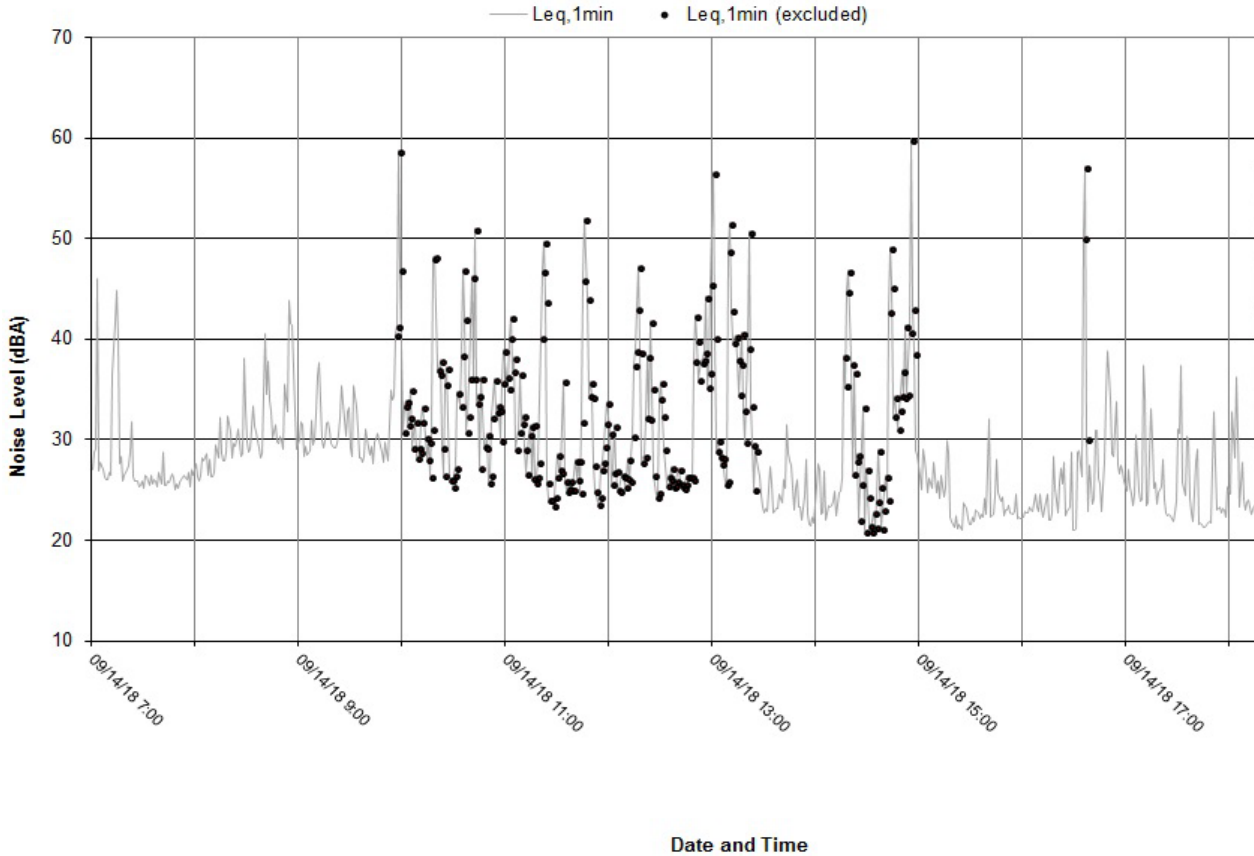
Leq = energy equivalent sound level; dBA = A-weighted decibel

Figure 6: Monitoring Data Recorded at Measurement Station Noise 1 (13 Sep 7:00 CST through 14 Sep 6:59 CST)



Leq = energy equivalent sound level; dBA = A-weighted decibel

Figure 7: Monitoring Data Recorded at Measurement Station Noise 1 (14 Sep 7:00 CST through 14 Sep 18:18 CST)



Leq = energy equivalent sound level; dBA = A-weighted decibel

Representative baseline noise levels (i.e., $L_{eq,day}$ and $L_{eq,night}$) for measurement station Noise 1 are presented in Table 3. These representative values have been calculated by averaging valid one-minute data samples.

Table 3: Representative Baseline Noise Levels for Station Noise 1

Measurement Station	Period ^(a)	Baseline Noise Level (dBA)
Noise 1	12 September 2018 Daytime ($L_{eq,day}$)	31
	12/13 September 2018 Nighttime ($L_{eq,night}$)	25
	13 September 2018 Daytime ($L_{eq,day}$)	27
	13/14 September 2018 Nighttime ($L_{eq,night}$)	26
	14 September 2018 Daytime ($L_{eq,day}$)	30
	Average Daytime ($L_{eq,day}$)	30
	Average Nighttime ($L_{eq,night}$)	26

a) For consistency with the Health Canada and AER guidance documents, daytime is defined as the 15-hour period from 7:00 to 22:00 and nighttime is defined as the nine-hour period from 22:00 to 7:00 (Health Canada 2017; AER 2007).

dBA = A-weighted decibel;

Table 4, Table 5, and Table 6 characterize the representative baseline noise levels measured at station Noise 1 in the context of relevant thresholds. Table 4 compares average daytime and nighttime noise levels measured at Noise 1 to thresholds from the Environment Canada, Health Canada, and AER guidance documents (Environment Canada 2009; Health Canada 2017; AER 2007). Table 5 presents the average%HA value calculated for Noise 1 using a mathematical formula from the Health Canada guidance document (Health Canada 2017). Table 6 presents LFN analysis of data from Noise 1 in the context of the two-part LFN test set out in AER Directive 038 (AER 2007).

Table 4: Comparison of Baseline Noise Levels to Thresholds for Station Noise 1

Measurement Station	Period ^(a)	Average Baseline Noise Level (dBA)	Noise Threshold (dBA)		
			Environment Canada ^(b)	Health Canada ^(c)	AER Directive 038 ^(d)
Noise 1	Daytime (L _{eq,day})	30	55	n/a ^(e)	50
	Nighttime (L _{eq,night})	26	45	40	40

a) For consistency with the Health Canada and AER guidance documents, daytime is defined as the 15-hour period from 7:00 to 22:00 and nighttime is defined as the nine-hour period from 22:00 to 7:00 (Health Canada 2017; AER 2007).

b) General noise thresholds from the Environment Canada guidance document (Environment Canada 2009).

c) Sleep disturbance threshold from the Health Canada guidance document (Health Canada 2017).

d) General noise thresholds from AER Directive 038 (AER 2007).

e) The Health Canada sleep disturbance threshold only applies during the nighttime period (Health Canada 2017).

dBA = A-weighted decibel; AER = Alberta Energy Regulator

Table 5: Baseline Percentage Highly Annoyed Values for Station Noise 1

Measurement Station	Average Baseline%HA ^(a)
Noise 1	0.9%

a) Average baseline%HA value calculated using the average daytime and nighttime noise levels measured at Noise 1 and a formula presented in the Health Canada guidance document (Health Canada 2017).

%HA = percent highly annoyed

Table 6: Baseline Low Frequency Noise Analysis for Station Noise 1

Measurement Station	Period	Baseline Noise Level		Difference: dBC minus dBA	Number of Clear Tonal Components below 250 Hz ^(a)
		(dBA)	(dBC)		
Noise 1	12 September 2018 Daytime (L _{eq,day})	31	51	20	0
	12/13 September 2018 Nighttime (L _{eq,night})	25	33	8	0
	13 September 2018 Daytime (L _{eq,day})	27	38	11	0
	13/14 September 2018 Nighttime (L _{eq,night})	26	38	12	0
	14 September 2018 Daytime (L _{eq,day})	30	42	12	0

a) Tonal components were identified using a technique described in AER Directive 038 (AER 2007).

dBA = A-weighted decibel; dBC = C-weighted decibel

The results presented in Table 4 indicate that average baseline noise levels measured at station Noise 1 do not exceed any of the thresholds set out in the Environment Canada, Health Canada, or AER guidance documents (Environment Canada 2009; Health Canada 2017; AER 2007). The results presented in Table 5 indicate that 0.9% of a typical community would report being highly annoyed by the baseline noise levels measured at station Noise 1. Based on the two-part test set out in AER Directive 038 (AER 2007), the results presented in Table 6 indicate that there is no LFN issue present in the baseline noise levels measured at station Noise 1. Specifically, the difference between noise levels expressed in dBA and noise levels expressed in dBC is less than 20 for all but one of the measurement periods, and a low frequency tone was not observed for any of the measurement periods.

5.1.2 Noise 2

Monitoring was conducted at measurement station Noise 2 from 11:28 CST on 12 September 2018 until 6:59 CST on 15 September 2018. A photograph showing the monitoring equipment deployed at Noise 2 is presented in Figure 8. Patterson Lake is visible in the background of this photograph.

Representative noise sources audible at Noise 2 included:

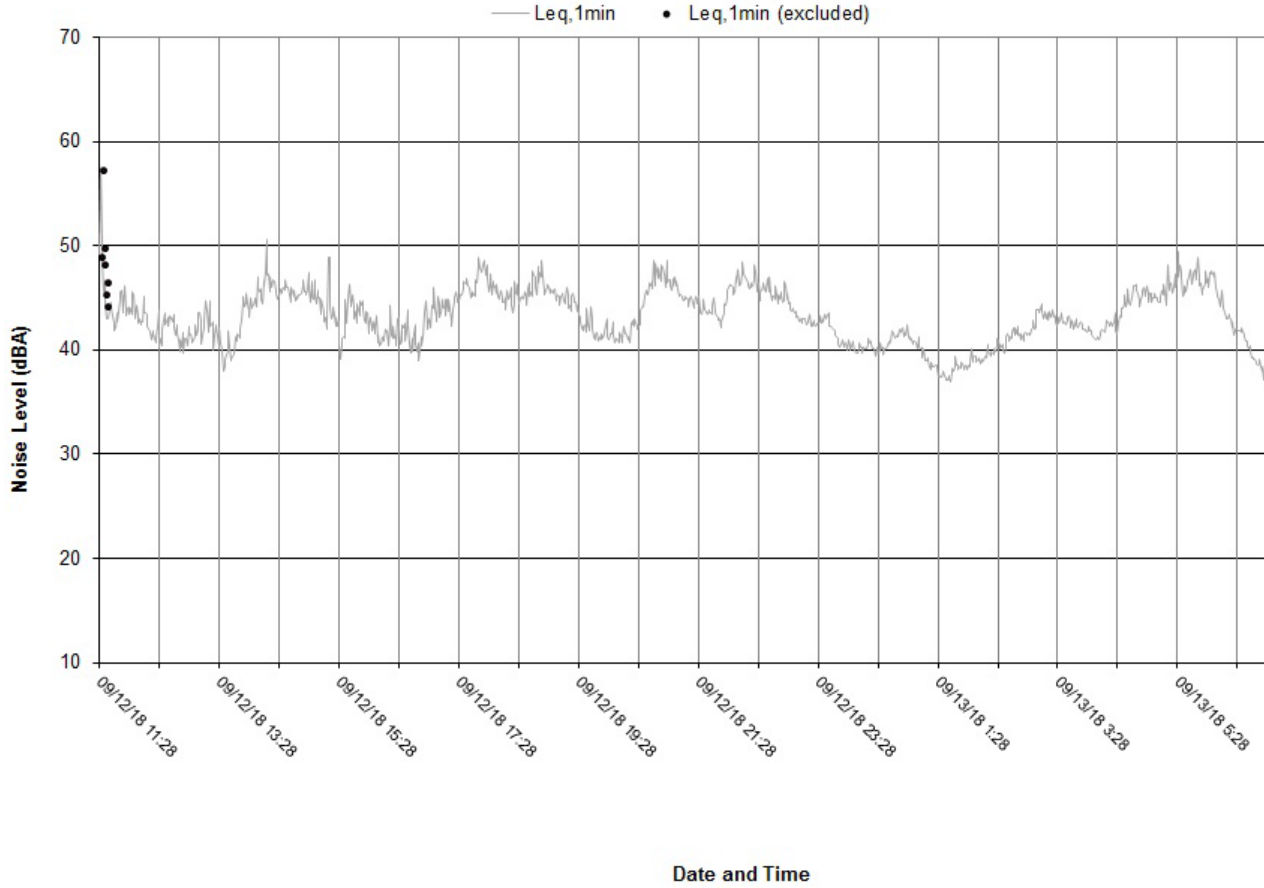
- wave action from Patterson Lake;
- wind in vegetation; and
- birds.

Graphs of one-minute noise levels measured at Noise 2 are presented in Figure 9, Figure 10, and Figure 11. These figures show the valid data samples that were used in the calculation of representative $L_{eq,day}$ and $L_{eq,night}$ average noise levels, and the data samples that were excluded because they were logged under unacceptable weather conditions or influenced by noise from exploration activities. The excluded data samples have been highlighted using black dots. Appendix C provides a complete list of each data sample that was excluded when establishing representative noise levels for measurement station Noise 2. Appendix C also provides an explanation for why each data sample was excluded.

Figure 8: Monitoring Equipment Deployed at Measurement Station Noise 2

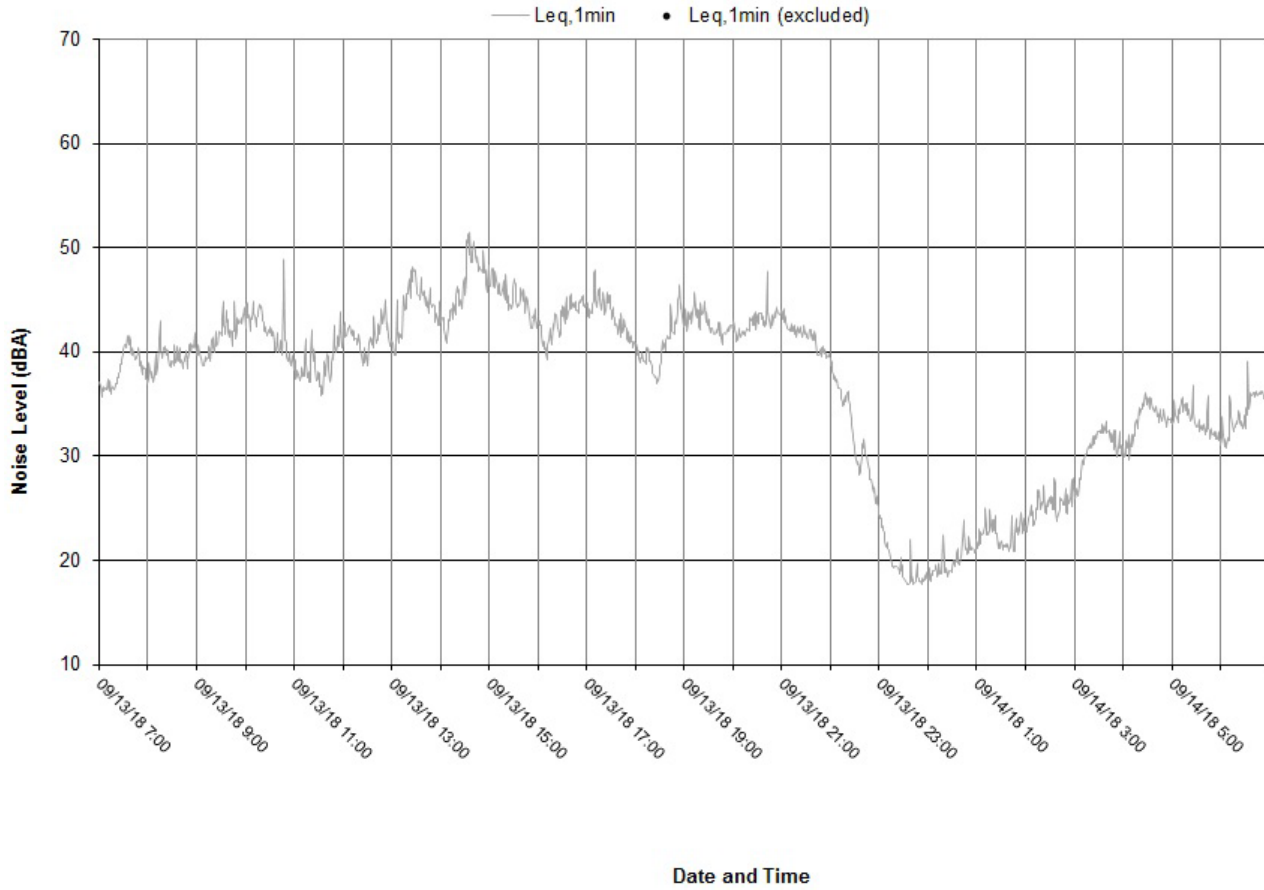


Figure 9: Monitoring Data Recorded at Measurement Station Noise 2 (12 Sep 11:28 CST through 13 Sep 6:59 CST)



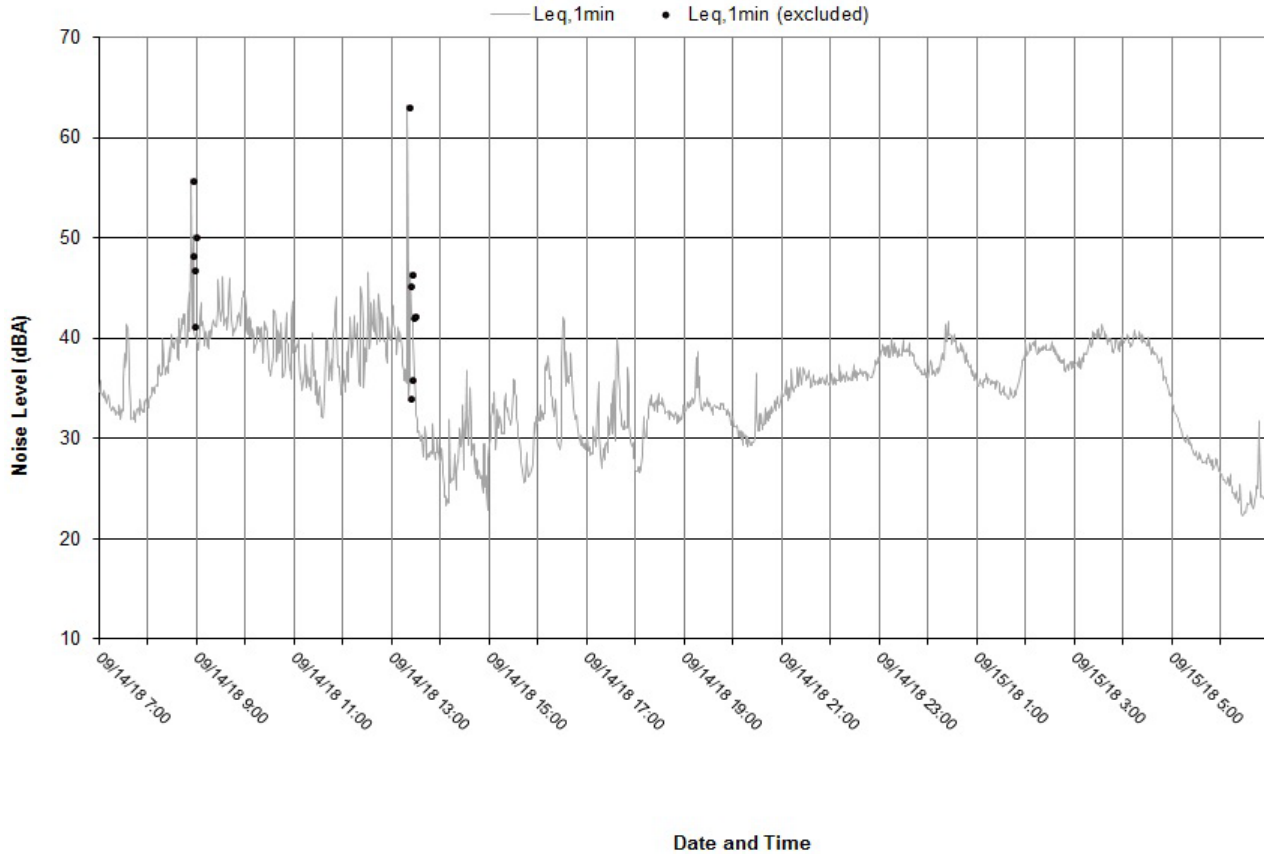
Leq = energy equivalent sound level; dBA = A-weighted decibel

Figure 10: Monitoring Data Recorded at Measurement Station Noise 2 (13 Sep 7:00 CST through 14 Sep 6:59 CST)



Leq = energy equivalent sound level; dBA = A-weighted decibel

Figure 11: Monitoring Data Recorded at Measurement Station Noise 2 (14 Sep 7:00 CST through 15 Sep 6:59 CST)



Leq = energy equivalent sound level; dBA = A-weighted decibel

Table 7 presents representative baseline noise levels (i.e., $L_{eq,day}$ and $L_{eq,night}$) for measurement station Noise 2. These representative values have been calculated by averaging valid one-minute data samples.

Table 7: Representative Baseline Noise Levels for Station Noise 2

Measurement Station	Period ^(a)	Baseline Noise Level (dBA)
Noise 2	12 September 2018 Daytime ($L_{eq,day}$)	44
	12/13 September 2018 Nighttime ($L_{eq,night}$)	43
	13 September 2018 Daytime ($L_{eq,day}$)	43
	13/14 September 2018 Nighttime ($L_{eq,night}$)	31
	14 September 2018 Daytime ($L_{eq,day}$)	37
	14/15 September 2018 Nighttime ($L_{eq,night}$)	37
	Average Daytime ($L_{eq,day}$)	42
	Average Nighttime ($L_{eq,night}$)	39

a) For consistency with the Health Canada and AER guidance documents, daytime is defined as the 15-hour period from 7:00 to 22:00 and nighttime is defined as the nine-hour period from 22:00 to 7:00 (Health Canada 2017; AER 2007).

dBA = A-weighted decibel

Table 8, Table 9, and Table 10 characterize the representative baseline noise levels measured at station Noise 2 in the context of relevant thresholds. Table 8 compares average daytime and nighttime noise levels measured at Noise 2 to thresholds from the Environment Canada, Health Canada, and AER guidance documents (Environment Canada 2009; Health Canada 2017; AER 2007). Table 9 presents the average%HA value calculated for Noise 2 using a mathematical formula from the Health Canada guidance document (Health Canada 2017). Table 10 presents LFN analysis of data from Noise 2 in the context of the two-part LFN test set out in AER Directive 038 (AER 2007).

Table 8: Comparison of Baseline Noise Levels to Thresholds for Station Noise 2

Measurement Station	Period ^(a)	Average Baseline Noise Level (dBA)	Noise Threshold (dBA)		
			Environment Canada ^(b)	Health Canada ^(c)	AER Directive 038 ^(d)
Noise 2	Daytime (Leq,day)	42	55	n/a ^(e)	50
	Nighttime (Leq,night)	39	45	40	40

a) For consistency with the Health Canada and AER guidance documents, daytime is defined as the 15-hour period from 7:00 to 22:00 and nighttime is defined as the nine-hour period from 22:00 to 7:00 (Health Canada 2017; AER 2007).

b) General noise thresholds from the Environment Canada guidance document (Environment Canada 2009).

c) Sleep disturbance threshold from the Health Canada guidance document (Health Canada 2017).

d) General noise thresholds from AER Directive 038 (AER 2007).

e) The Health Canada sleep disturbance threshold only applies during the nighttime period (Health Canada 2017).

dBA = A-weighted decibel; AER = Alberta Energy Regulator

Table 9: Baseline Percentage Highly Annoyed Values for Station Noise 2

Measurement Station	Average Baseline%HA ^(a)
Noise 2	4.7%

a) Average baseline%HA value calculated using the average daytime and nighttime noise levels measured at Noise 2 and a formula presented in the Health Canada guidance document (Health Canada 2017).

%HA = percent highly annoyed

Table 10: Baseline Low Frequency Noise Analysis for Station Noise 2

Measurement Station	Period	Baseline Noise Level		Difference: dBC minus dBA	Number of Clear Tonal Components below 250 Hz ^(a)
		(dBA)	(dBC)		
Noise 2	12 September 2018 Daytime (Leq,day)	44	48	4	0
	12/13 September 2018 Nighttime (Leq,night)	43	46	3	0
	13 September 2018 Daytime (Leq,day)	43	45	2	0
	13/14 September 2018 Nighttime (Leq,night)	31	34	3	0
	14 September 2018 Daytime (Leq,day)	37	41	4	0
	14/15 September 2018 Nighttime (Leq,night)	37	40	3	0

a) Tonal components were identified using a technique described in AER Directive 038 (AER 2007).

dBA = A-weighted decibel; dBC = C-weighted decibel

The results presented in Table 8 indicate that average baseline noise levels measured at station Noise 2 do not exceed any of the thresholds set out in the Environment Canada, Health Canada, or AER guidance documents (Environment Canada 2009; Health Canada 2017; AER 2007). The results presented in Table 9 indicate that 4.7% of a typical community would report being highly annoyed by the baseline noise levels measured at station Noise 2. Based on the two-part test set out in AER Directive 038 (AER 2007), the results presented in Table 10 indicate that there is no LFN issue present in the baseline noise levels measured at station Noise 2. Specifically, the difference between noise levels expressed in dBA and noise levels expressed in dBC is less than 20 for all measurement periods, and a low frequency tone was not observed for any of the measurement periods.

5.1.3 Noise 3

Monitoring was conducted at measurement station Noise 3 from 12:46 CST on 12 September 2018 until 6:29 CST on 15 September 2018. A photograph showing the monitoring equipment deployed at Noise 3 is presented in Figure 12.

Representative noise sources audible at Noise 3 included:

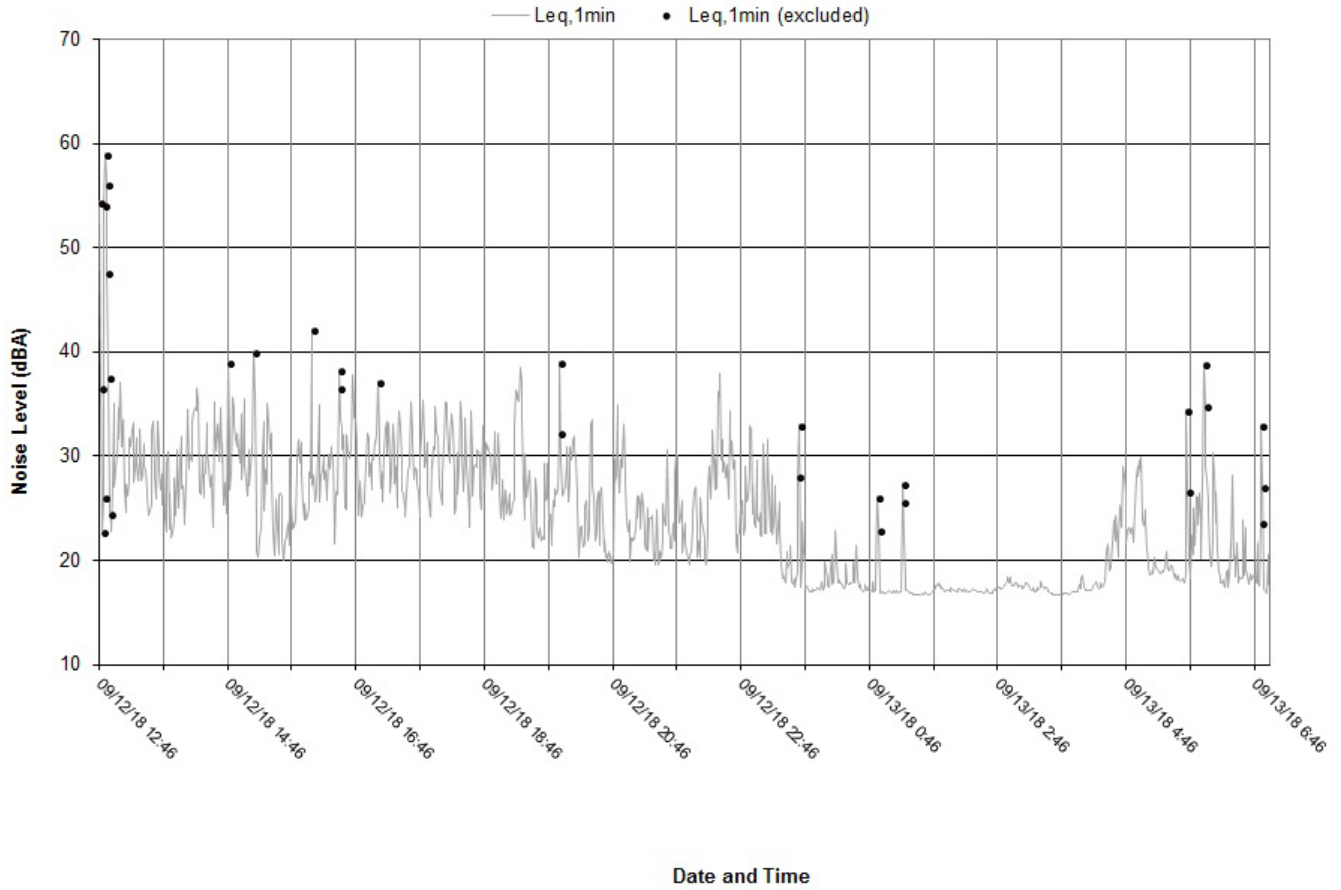
- wind in vegetation; and
- birds.

Graphs of one-minute noise levels measured at Noise 3 are presented in Figure 13, Figure 14, and Figure 15. These figures show the valid data samples that were used in the calculation of representative $L_{eq,day}$ and $L_{eq,night}$ average noise levels, and the data samples that were excluded because they were logged under unacceptable weather conditions or influenced by noise from exploration activities or by vehicles from Highway 955. The excluded data samples have been highlighted using black dots. Appendix D provides a complete list of each data sample that was excluded when establishing representative noise levels for measurement station Noise 3. Appendix D also provides an explanation for why each data sample was excluded.

Figure 12: Monitoring Equipment Deployed at Measurement Station Noise 3



Figure 13: Monitoring Data Recorded at Measurement Station Noise 3 (12 Sep 12:46 CST through 13 Sep 6:59 CST)



Leq = energy equivalent sound level; dBA = A-weighted decibel

Figure 14: Monitoring Data Recorded at Measurement Station Noise 3 (13 Sep 7:00 CST through 14 Sep 6:59 CST)

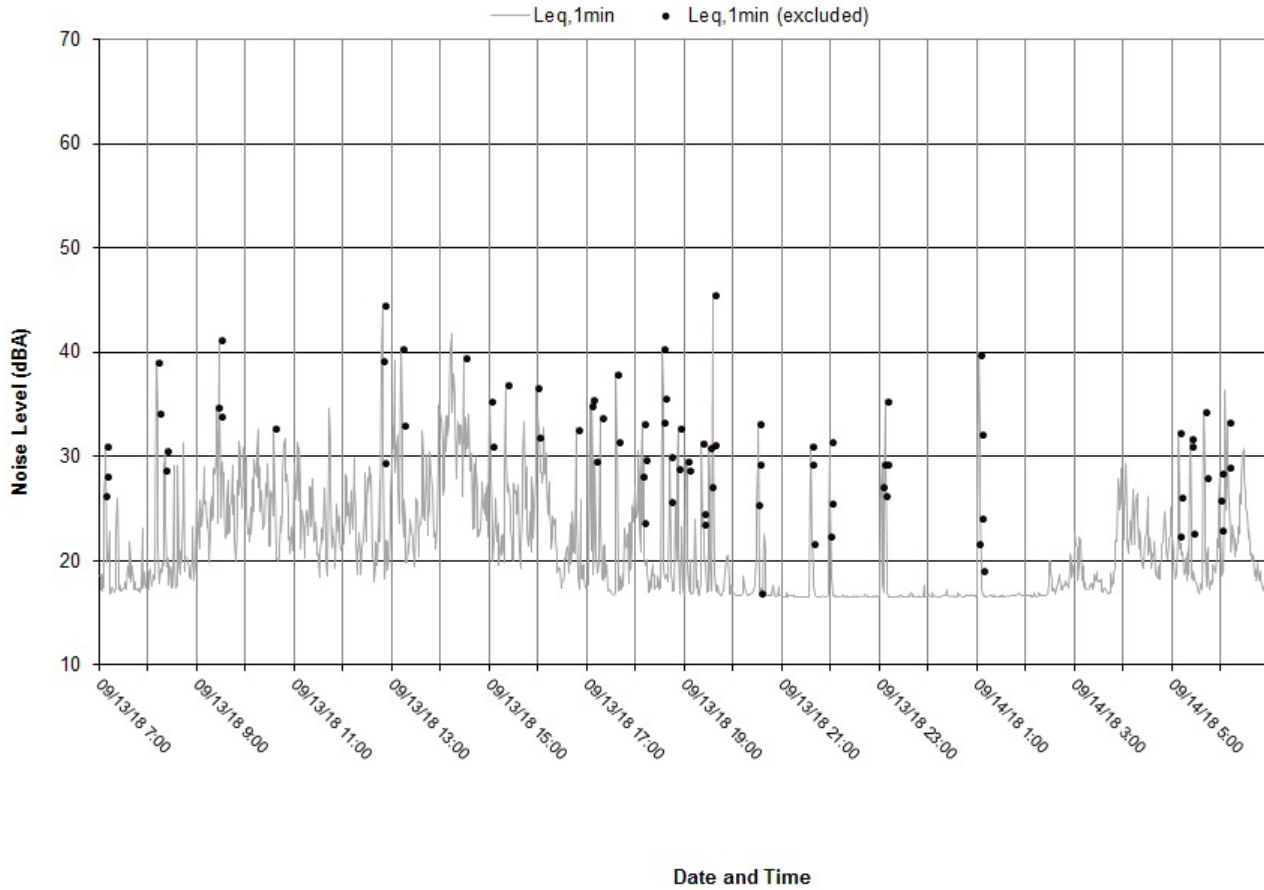
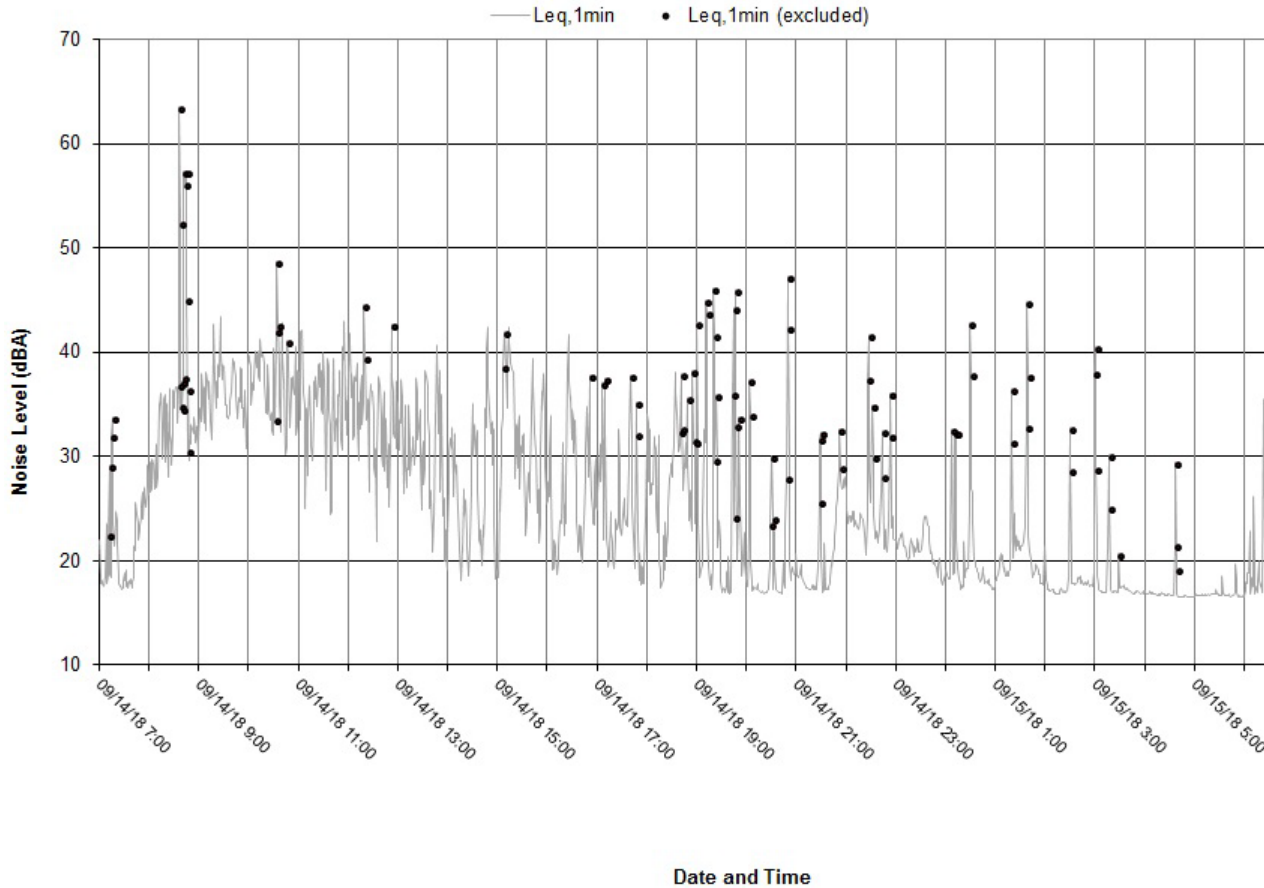


Figure 15: Monitoring Data Recorded at Measurement Station Noise 3 (14 Sep 7:00 CST through 15 Sep 6:29 CST)



Representative baseline noise levels (i.e., $L_{eq,day}$ and $L_{eq,night}$) for measurement station Noise 3 are presented in Table 11. These representative values have been calculated by averaging valid one-minute data samples.

Table 11: Representative Baseline Noise Levels for Station Noise 3

Measurement Station	Period ^(a)	Baseline Noise Level (dBA)
Noise 3	12 September 2018 Daytime ($L_{eq,day}$)	29
	12/13 September 2018 Nighttime ($L_{eq,night}$)	23
	13 September 2018 Daytime ($L_{eq,day}$)	26
	13/14 September 2018 Nighttime ($L_{eq,night}$)	20
	14 September 2018 Daytime ($L_{eq,day}$)	33
	14/15 September 2018 Nighttime ($L_{eq,night}$)	20
	Average Daytime ($L_{eq,day}$)	30
	Average Nighttime ($L_{eq,night}$)	21

a) For consistency with the Health Canada and AER guidance documents, daytime is defined as the 15-hour period from 7:00 to 22:00 and nighttime is defined as the nine-hour period from 22:00 to 7:00 (Health Canada 2017; AER 2007).

dBA = A-weighted decibel

Table 12, Table 13, and Table 14 characterize the representative baseline noise levels measured at station Noise 3 in the context of relevant thresholds. Table 12 compares average daytime and nighttime noise levels measured at Noise 3 to thresholds from the Environment Canada, Health Canada, and AER guidance documents (Environment Canada 2009; Health Canada 2017; AER 2007). Table 13 presents the average%HA value calculated for Noise 3 using a mathematical formula from the Health Canada guidance document (Health Canada 2017). Table 14 presents LFN analysis of data from Noise 3 in the context of the two-part LFN test set out in AER Directive 038 (AER 2007).

Table 12: Comparison of Baseline Noise Levels to Thresholds for Station Noise 3

Measurement Station	Period ^(a)	Average Baseline Noise Level (dBA)	Noise Threshold (dBA)		
			Environment Canada ^(b)	Health Canada ^(c)	AER Directive 038 ^(d)
Noise 3	Daytime (L _{eq,day})	30	55	n/a ^(e)	50
	Nighttime (L _{eq,night})	21	45	40	40

a) For consistency with the Health Canada and AER guidance documents, daytime is defined as the 15-hour period from 7:00 to 22:00 and nighttime is defined as the nine-hour period from 22:00 to 7:00 (Health Canada 2017; AER 2007).

b) General noise thresholds from the Environment Canada guidance document (Environment Canada 2009).

c) Sleep disturbance threshold from the Health Canada guidance document (Health Canada 2017).

d) General noise thresholds from AER Directive 038 (AER 2007).

e) The Health Canada sleep disturbance threshold only applies during the nighttime period (Health Canada 2017).

dBA = A-weighted decibel

Table 13: Baseline Percentage Highly Annoyed Values for Station Noise 3

Measurement Station	Average Baseline%HA ^(a)
Noise 3	0.6%

a) Average baseline%HA value calculated using the average daytime and nighttime noise levels measured at Noise 3 and a formula presented in the Health Canada guidance document (Health Canada 2017).

%HA = percent highly annoyed

Table 14: Baseline Low Frequency Noise Analysis for Station Noise 3

Measurement Station	Period	Baseline Noise Level		Difference: dBC minus dBA	Number of Clear Tonal Components below 250 Hz ^(a)
		(dBA)	(dBC)		
Noise 3	12 September 2018 Daytime (L _{eq,day})	29	39	10	0
	12/13 September 2018 Nighttime (L _{eq,night})	23	32	9	0
	13 September 2018 Daytime (L _{eq,day})	26	34	8	0
	13/14 September 2018 Nighttime (L _{eq,night})	20	29	9	0
	14 September 2018 Daytime (L _{eq,day})	33	44	11	0
	14/15 September 2018 Nighttime (L _{eq,night})	20	30	10	0

a) Tonal components were identified using a technique described in AER Directive 038 (AER 2007).

dBA = A-weighted decibel; dBC = C-weighted decibel; Hz = hertz

The results presented in Table 12 indicate that average baseline noise levels measured at station Noise 3 do not exceed any of the thresholds set out in the Environment Canada, Health Canada, or AER guidance documents (Environment Canada 2009; Health Canada 2017; AER 2007). The results presented in Table 13 indicate that 0.6% of a typical community would report being highly annoyed by the baseline noise levels measured at station Noise 3. Based on the two-part test set out in AER Directive 038 (AER 2007), the results presented in Table 14 indicate that there is no LFN issue present in the baseline noise levels measured at station Noise 3. Specifically, the difference between noise levels expressed in dBA and noise levels expressed in dBC is less than 20 for all measurement periods, and a low frequency tone was not observed for any of the measurement periods.

5.2 Light

5.2.1 Light Trespass

Table 15 presents baseline light trespass levels measured at each of the nine light stations. Table 15 also compares baseline light trespass levels to the light trespass threshold for environmental lighting zone E1 (CIE 2017).

Table 15: Baseline Light Trespass Levels

Measurement Station	Environmental Condition	Baseline Light Trespass Level (mlux)	Light Trespass Threshold: Zone E1 ^(a) (mlux)
Light 1	summertime cloudy skies	3	100
	summertime clear skies	6	
	wintertime cloudy skies	2	
	wintertime clear skies	3	
Light 2	summertime cloudy skies	5	100
	summertime clear skies	5	
	wintertime cloudy skies	1	
	wintertime clear skies	4	
Light 3	summertime cloudy skies	4	100
	summertime clear skies	1	
	wintertime cloudy skies	3	
	wintertime clear skies	3	
Light 4	summertime cloudy skies	3	100
	summertime clear skies	3	
	wintertime cloudy skies	1	
	wintertime clear skies	3	
Light 5	summertime cloudy skies	6	100
	summertime clear skies	3	
	wintertime cloudy skies	1	
	wintertime clear skies	3	
Light 6	summertime cloudy skies	3	100
	summertime clear skies	7	
	wintertime cloudy skies	1	
	wintertime clear skies	3	

Table 15: Baseline Light Trespass Levels

Measurement Station	Environmental Condition	Baseline Light Trespass Level (mlux)	Light Trespass Threshold: Zone E1 ^(a) (mlux)
Light 7	summertime cloudy skies	4	100
	summertime clear skies	4	
	wintertime cloudy skies	4	
	wintertime clear skies	3	
Light 8	summertime cloudy skies	0	100
	summertime clear skies	0	
	wintertime cloudy skies	1	
	wintertime clear skies	3	
Light 9	summertime cloudy skies	3	100
	summertime clear skies	4	
	wintertime cloudy skies	22	
	wintertime clear skies	4	

a) Light trespass limit suggested by light assessment literature for environmental lighting zone E1 (CIE 2017).
mlux = millilux

The results presented in Table 15 indicate that baseline light trespass levels at all nine measurement stations are below the light trespass threshold recommended in light assessment literature (CIE 2017). This result is consistent with the field team’s observation that there are very few artificial light sources within the LSA and RSA and that dense forest effectively screens light trespass from these sources.

5.2.2 Sky Glow

Table 16 presents baseline sky glow levels measured at each of the nine light stations, along with the degree of cloud cover observed during each measurement. For the summertime clear skies measurement condition, Table 16 compares baseline sky glow levels to the sky glow threshold for environmental lighting zone E1 (ILP 2020).

Table 16: Baseline Sky Glow Levels

Measurement Station	Environmental Condition	Observed Cloud Cover ^(a)	Baseline Sky Glow Level (mag/arcsec ²)	Sky Glow Threshold: Zone E1 ^(b) (mag/arcsec ²)
Light 1	summertime cloudy skies	8/8	19.5	n/a ^(c)
	summertime clear skies	0/8	20.5	20
	wintertime cloudy skies	3/8	21.6	n/a ^(c)
	wintertime clear skies	0/8	20.7	n/a ^(c)
Light 2	summertime cloudy skies	8/8	21.0	n/a ^(c)
	summertime clear skies	0/8	20.9	20
	wintertime cloudy skies	7/8	21.0	n/a ^(c)
	wintertime clear skies	0/8	20.1	n/a ^(c)

Table 16: Baseline Sky Glow Levels

Measurement Station	Environmental Condition	Observed Cloud Cover ^(a)	Baseline Sky Glow Level (mag/arcsec ²)	Sky Glow Threshold: Zone E1 ^(b) (mag/arcsec ²)
Light 3	summertime cloudy skies	8/8	20.0	n/a ^(c)
	summertime clear skies	0/8	21.0	20
	wintertime cloudy skies	8/8	20.6	n/a ^(c)
	wintertime clear skies	0/8	20.0	n/a ^(c)
Light 4	summertime cloudy skies	8/8	19.9	n/a ^(c)
	summertime clear skies	2/8	20.6	20
	wintertime cloudy skies	8/8	20.5	n/a ^(c)
	wintertime clear skies	0/8	20.1	n/a ^(c)
Light 5	summertime cloudy skies	8/8	19.8	n/a ^(c)
	summertime clear skies	2/8	20.5	20
	wintertime cloudy skies	8/8	20.8	n/a ^(c)
	wintertime clear skies	0/8	20.1	n/a ^(c)
Light 6	summertime cloudy skies	8/8	20.2	n/a ^(c)
	summertime clear skies	2/8	20.5	20
	wintertime cloudy skies	5/8	21.3	n/a ^(c)
	wintertime clear skies	0/8	20.2	n/a ^(c)
Light 7	summertime cloudy skies	8/8	20.0	n/a ^(c)
	summertime clear skies	2/8	19.7	20
	wintertime cloudy skies	7/8	21.7	n/a ^(c)
	wintertime clear skies	0/8	19.9	n/a ^(c)
Light 8	summertime cloudy skies	8/8	20.6	n/a ^(c)
	summertime clear skies	2/8	19.9	20
	wintertime cloudy skies	8/8	21.6	n/a ^(c)
	wintertime clear skies	0/8	20.3	n/a ^(c)
Light 9	summertime cloudy skies	8/8	20.7	n/a ^(c)
	summertime clear skies	2/8	20.1	20
	wintertime cloudy skies	3/8	20.8	n/a ^(c)
	wintertime clear skies	0/8	20.7	n/a ^(c)

a) Field observation of cloud cover; Note: 0/8 indicates clear skies and 8/8 indicates completely overcast skies.

b) Sky glow limit suggested by light assessment literature for environmental lighting zone E1 (ILP 2020). Sky glow limit applies under summertime conditions (i.e., no snow on the ground), clear skies (i.e., no cloud cover), with no moon, and no aurora activity.

c) There are no relevant sky glow limits for cloudy skies or wintertime conditions.

mag/arcsec² = magnitude per square second of arc

Although there are no relevant sky glow limits for cloudy skies or wintertime conditions, Table 16 presents sky glow measurements for summertime cloudy skies, wintertime cloudy skies, and wintertime clear skies. These measurement data show the variability in sky glow conditions in the LSA and RSA and will be used to establish a baseline against which potential sky glow effects from the Project can be assessed in the EIS.

For the summertime clear skies condition, the results presented in Table 16 show that baseline sky glow levels at seven measurement stations (Light 1 through 6 and Light 9) are greater than the sky glow threshold (20 mag/arcsec^2), which means baseline sky glow conditions at these stations are considered acceptable for environmental lighting zone E1. Baseline sky glow levels at the other two measurement stations (Light 7 and 8) are less than the sky glow threshold (20 mag/arcsec^2), which means that baseline sky glow conditions at these stations are brighter than suggested for environmental lighting zone E1. For the summertime clear skies condition, the greatest sky glow effect is observed for measurement station Light 7, where the difference between the baseline sky glow level and the E1 threshold is 0.3 mag/arcsec^2 .

Aurora activity was present during the summertime clear skies sky glow measurements. Because it was not possible to account for or exclude the influence of this aurora activity, it likely influenced the baseline sky glow measurements. In particular, aurora activity may be partially responsible for elevated sky glow at two of the nine measurement stations (i.e., aurora activity reduced measured mag/arcsec^2 values).

It should also be noted that baseline sky glow levels presented in this report for summertime clear skies conditions do not include the contribution from Rook I exploration activities in the LSA. The field crew observed that sky glow from exploration activities was effectively undetectable during the summertime clear skies measurements. In contrast, the field crew observed obvious sky glow when looking towards the southwest, in the approximate direction of Fort McMurray. Sky glow from Fort McMurray is likely influencing baseline conditions in the LSA and RSA and may be contributing to elevated sky glow at two of the nine measurement stations.

6.0 SUMMARY

Potential changes to noise and light conditions resulting from mining and milling operations can create adverse effects to both the social and biophysical environment. For example, Indigenous Peoples often express concerns about sensory disturbance from industrial facilities, including noise and light effects on cultural practices and wildlife (Appendix A). In consideration of these potential changes and concerns, a baseline study was conducted for the Project.

The objective of the noise and light baseline study was to gather information on representative existing environmental noise and light levels in the anticipated area of the Project. Information gathered during the field study provided a baseline against which potential noise and light effects from the Project were assessed.

Saskatchewan does not have regulations or guidelines for the assessment of environmental noise from mining or industrial developments. Similarly, there are no specific federal or provincial regulatory requirements to assess potential light effects from mining or industrial developments. In addition, there is no existing information about representative environmental noise and light levels in the anticipated area of the Project.

In the absence of Saskatchewan-specific guidance, baseline noise levels were characterized using thresholds from Environment Canada (Environment Canada 2009), Health Canada (Health Canada 2017), and the AER (AER 2007). In the absence of federal or provincial guidance, baseline light trespass and sky glow levels were characterized using thresholds from light assessment literature (IESNA 2000; CIE 1997, 2017; ILP 2020).

The baseline study was conducted in September 2018 and March 2020. Baseline noise levels were measured at three stations (Noise 1, Noise 2, Noise 3) and baseline light trespass and sky glow levels were measured at nine stations (Light 1 through 9). Noise and light levels measured during the field study were post-processed, as required, to exclude influence from Rook I exploration activities and other unrepresentative data sources (i.e., to establish representative existing baseline conditions).

Baseline noise levels for all three measurement stations were observed to be less than thresholds set out in the Environment Canada, Health Canada, and AER guidance documents. Baseline noise levels were generally observed to be higher and more variable at the measurement stations located close to waterbodies (Noise 1 and Noise 2) than at the measurement station located in a forested area (Noise 3). This suggests that wave action and other water-related sources have an influence on baseline noise levels near waterbodies.

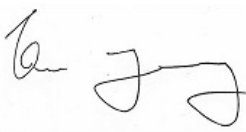
Baseline light trespass levels for all nine measurement stations were observed to be less than thresholds from light assessment literature. Baseline sky glow at two of the nine measurement stations (Light 7 and Light 8) were observed to exceed thresholds from light assessment literature. Baseline sky glow at the other seven measurement stations (Light 1 through 6 and Light 9) were observed to be less than thresholds from light assessment literature. Elevated sky glow observed in the baseline data likely results from the combined influence of aurora activity during the field study and the presence of Fort McMurray approximately 150 km southwest of the Project.

The baseline study achieved the objective of characterizing existing environmental noise and light levels in the anticipated area of the Project. Specifically, noise and light levels measured during the field study provided a representative baseline against which potential noise and light effects from the Project were assessed.

CLOSING

Golder is pleased to submit this report to NexGen in support of the environmental assessment for the Rook I Project. For details on the limitations and use of information presented in this report, please refer to the Study Limitations section following this page. If you have any questions or require additional details related to this study, please contact the undersigned.

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VY/AF/rd/pls

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The passage of time affects the information and assessment provided in this report. Golder's opinions are based upon information that existed at the time of the production of the report. The Services provided allowed Golder to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

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The information, recommendations and opinions expressed in this report are for the sole benefit of the Client and were prepared for the specific purpose set out herein. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

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APPENDIX A

**Joint Working Group Feedback
Applicable to Noise and Light
Baseline**

Table 1A presents the comments and feedback NexGen has received from members of local Indigenous communities through established Joint Working Group meetings. NexGen continues to engage with communities, and the feedback presented in Table 1A reflects comments and feedback received through March 2020 that were related to baseline noise and light or the comprehensive baseline program generally.

Table 1A: Joint Working Group Feedback - Noise and Light

Community	Comment
Birch Narrows Dene Nation (BNDN)	Are you aware of any huge adverse environmental impacts in any of the current mine sites?
	Important topics for the Joint Working Group (JWG) moving forward are Indigenous Knowledge, traditional land use, the species discussion, water quality, environmental monitoring, employment and business opportunities.
	Could we ask that you take samples here? That way we can see changes into the future. Even if it isn't affected by the mine. Respectfully, I request that samples are taken here.
Buffalo River Dene Nation (BRDN)	Have you gone to communities to show what you are doing? If so, what was the feedback?
	It's important to explain the Project to elders in a way that they can then explain it to other elders in the communities.
	Near Barney Lake, you can hear the Alberta loggers working. When we went down 2-3 years ago, we went to the border (showed on map) and you could hear the machines in the middle of nowhere. There is noise everywhere. We didn't see caribou, but we saw tracks.
Clearwater River Dene Nation (CRDN)	Remember we're trying to implement a plain speak document because of visual concepts of understanding. That is what the Chief is talking about.
	In terms of baseline studies, are there any opportunities for community involvement with any of your residual baseline work, from fish, terrestrial, etc.?
	We will eventually throw in our environmental monitors. I don't know if you knew that. We want to train our own people because of lack of trust of government and industry.
	The interim CRDN Rights and Knowledge study will come out of the CRDN-defined initial list of valued components (VCs) that we want to talk to you about. As we go through there may be additional ones. We know there's a certain window, but we'll try to be as comprehensive as possible. It may not be as linear as moose; it might be having undisturbed places on waterbodies. They might be more complex.
	Not on the old or existing mines that are sitting there?
	Golder does the same thing – hires three or four band members to do the interviews, then takes the notes and puts the document together. When you find the stuff it's not always based on the relationship to the stuff. It's based on what the government's qualifications are on the environmental assessment's impacts, and not the actual concerns of it. I'm trying to reach what [CRDN member] is saying between traditional and modern ways.
	When we started looking at the strategy process, there is that interpretation of cumulative effects. Then we define and introduce an interpretation for that. It's not just one side, western science, we're doing the traditional side as well. That's what the Chief's referring to.
	Both traditional and western science are very important.
	Will we see the results of those studies?
	How many other projects are in that square box (referring to map)?
Do other companies have mineral holdings in that box on the map – like for oil and gas?	
I think it's really important to compare Cluff Lake to what's happening in the baseline studies. It's a good question.	

Table 1A: Joint Working Group Feedback - Noise and Light

Community	Comment
Clearwater River Dene Nation (CRDN)	<p>Are there any herds you've worked on in mitigation, creating an environment – I haven't seen any caribou increasing in Alberta at all. I don't see companies cleaning up another area to mitigate. You're just the first part; there will be another mine and another mine. The biggest thing was the noise; they found out a year or two ago that the humming from the buildings affected them. They're just starting to realize that, so it's not like they're going to come back, or go to another area that's been cleaned up. They'll never come back, just get smaller and smaller.</p> <p>What's the purpose of trying to gather all this information?</p>
Métis Nation – Saskatchewan (MN-S)	<p>We have to understand all living and non-living things.</p> <p>Are any community members involved in the establishment of the baseline for environmental monitoring, so can they verify their accuracy? Would the results be released and reviewed by the community? From a trust point of view, our people will want to know that those numbers are accurate now, not later. Just a comment to think about.</p> <p>How would this group know – is there a way for the people involved in the studies to inform the group of what they saw and if they are confident, they are accurate? Once the stuff hits the Environmental Impact Statement (EIS), how do we know that it is good? If community folks that were involved in that process and they can validate the results, that brings comfort to community members.</p> <p>How often are you monitoring?</p> <p>It's that validation we're looking for. When I had to involve community members in monitoring, I would get them to write a report if they couldn't speak to the broader community in general. If they didn't feel like writing it, they could talk so someone who would transcribe it. That report could give a summary of how things went, what they saw, were the readings accurate; that could come back to this group, if they couldn't present themselves. The point [MN-S member's] trying to make is, we need some connection to that community resource that's out there doing the monitoring and seeing this stuff. We know who they are, and we're confident in the results. That builds trust.</p> <p>Do you have instruments or people taking samples? What does an instrument look like?</p> <p>The studies we did a few years back, these guys don't want to use them. That's what I heard.</p> <p>I had feedback on community engagement, and I'm trying to figure out how we can move forward in a responsible way where people have their input without being offended. We're working towards a bigger goal than what is currently perceived. We need a discussion on how we can approach it. I can offer some high-level thinking to help bring my community around.</p> <p>Aircrafts are considered a disturbance? You see survey planes often.</p> <p>We should have more of these meetings with other companies like this. I'd like to get a Métis community member to work side by side with you guys and report the environmental side to the community instead of you guys doing it, so we know where we are and how much damage is being done to the land.</p> <p>This is general – the same information will come back to all the JWGs?</p> <p>You live here and you listen to all the cars, horns etc. There's no peace. Out in the wilderness you hear the grass rustling, the wind blowing. The only disturbance is the rumbling jets that fly over. It was so quiet during 9-11! The animals are not scared of you because they don't know you, they're isolated from the human factor so you can get close and communicate with them, and they become your friend. Semi-isolation is a good word, because we do have the jets that break the isolation.</p>

Table 1A: Joint Working Group Feedback - Noise and Light

Community	Comment
Métis Nation – Saskatchewan (MN-S)	The mine site at NexGen is only about one km – very small site; I don't know about the noise level on the ground. They do the aerial geological surveys; I didn't know anything about that until we were hunting one fall and a plane kept going back and forth. It's not remote any more. There's noise day and night.

BNDN = Birch Narrows Dene Nation; BRDN = Buffalo River Dene Nation; CRDN = Clearwater River Dene Nation; EIS = Environmental Impact Statement; JWG = Joint Working Group; MNS = Métis Nation – Saskatchewan; VC = valued component

APPENDIX B

**Data Samples Excluded from
Measurement Station Noise 1**

This appendix identifies data samples logged at measurement station Noise 1 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/12/18 10:20 am	technician
09/12/18 10:21 am	technician
09/12/18 10:22 am	technician
09/12/18 10:23 am	technician
09/12/18 10:24 am	technician
09/12/18 10:25 am	technician
09/12/18 10:26 am	technician
09/12/18 10:27 am	technician
09/12/18 10:28 am	technician
09/12/18 10:29 am	technician
09/12/18 10:30 am	technician
09/12/18 10:31 am	technician
09/12/18 3:14 pm	elevated wind speed
09/13/18 10:03 pm	traffic on access road
09/13/18 10:04 pm	traffic on access road
09/13/18 10:05 pm	traffic on access road
09/13/18 10:06 pm	traffic on access road
09/14/18 9:56 am	helicopter nearby
09/14/18 9:57 am	helicopter nearby
09/14/18 9:58 am	helicopter nearby
09/14/18 9:59 am	helicopter nearby
09/14/18 10:00 am	helicopter nearby
09/14/18 10:01 am	helicopter nearby
09/14/18 10:02 am	helicopter nearby
09/14/18 10:03 am	helicopter nearby
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09/14/18 10:16 am	helicopter nearby
09/14/18 10:17 am	helicopter nearby
09/14/18 10:18 am	helicopter nearby

This appendix identifies data samples logged at measurement station Noise 1 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/14/18 10:19 am	helicopter nearby
09/14/18 10:20 am	helicopter nearby
09/14/18 10:21 am	helicopter nearby
09/14/18 10:22 am	helicopter nearby
09/14/18 10:23 am	helicopter nearby
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09/14/18 10:56 am	helicopter nearby
09/14/18 10:57 am	helicopter nearby
09/14/18 10:58 am	helicopter nearby

This appendix identifies data samples logged at measurement station Noise 1 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
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09/14/18 11:01 am	helicopter nearby
09/14/18 11:02 am	helicopter nearby
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09/14/18 11:05 am	helicopter nearby
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09/14/18 11:36 am	helicopter nearby
09/14/18 11:37 am	helicopter nearby
09/14/18 11:38 am	helicopter nearby

This appendix identifies data samples logged at measurement station Noise 1 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/14/18 11:39 am	helicopter nearby
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09/14/18 11:41 am	helicopter nearby
09/14/18 11:42 am	helicopter nearby
09/14/18 11:43 am	helicopter nearby
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09/14/18 12:02 pm	helicopter nearby
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09/14/18 12:10 pm	helicopter nearby
09/14/18 12:11 pm	helicopter nearby
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09/14/18 12:13 pm	helicopter nearby
09/14/18 12:14 pm	helicopter nearby
09/14/18 12:15 pm	helicopter nearby
09/14/18 12:16 pm	helicopter nearby
09/14/18 12:17 pm	helicopter nearby
09/14/18 12:18 pm	helicopter nearby

This appendix identifies data samples logged at measurement station Noise 1 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/14/18 12:19 pm	helicopter nearby
09/14/18 12:20 pm	helicopter nearby
09/14/18 12:21 pm	helicopter nearby
09/14/18 12:22 pm	helicopter nearby
09/14/18 12:23 pm	helicopter nearby
09/14/18 12:24 pm	helicopter nearby
09/14/18 12:25 pm	helicopter nearby
09/14/18 12:26 pm	helicopter nearby
09/14/18 12:27 pm	helicopter nearby
09/14/18 12:28 pm	helicopter nearby
09/14/18 12:29 pm	helicopter nearby
09/14/18 12:30 pm	helicopter nearby
09/14/18 12:31 pm	helicopter nearby
09/14/18 12:32 pm	helicopter nearby
09/14/18 12:33 pm	helicopter nearby
09/14/18 12:34 pm	helicopter nearby
09/14/18 12:35 pm	helicopter nearby
09/14/18 12:36 pm	helicopter nearby
09/14/18 12:37 pm	helicopter nearby
09/14/18 12:38 pm	helicopter nearby
09/14/18 12:39 pm	helicopter nearby
09/14/18 12:40 pm	helicopter nearby
09/14/18 12:41 pm	helicopter nearby
09/14/18 12:42 pm	helicopter nearby
09/14/18 12:43 pm	helicopter nearby
09/14/18 12:44 pm	helicopter nearby
09/14/18 12:45 pm	helicopter nearby
09/14/18 12:46 pm	helicopter nearby
09/14/18 12:47 pm	helicopter nearby
09/14/18 12:48 pm	helicopter nearby
09/14/18 12:49 pm	helicopter nearby
09/14/18 12:50 pm	helicopter nearby
09/14/18 12:51 pm	helicopter nearby
09/14/18 12:52 pm	helicopter nearby
09/14/18 12:53 pm	helicopter nearby
09/14/18 12:54 pm	helicopter nearby
09/14/18 12:55 pm	helicopter nearby
09/14/18 12:56 pm	helicopter nearby
09/14/18 12:57 pm	helicopter nearby
09/14/18 12:58 pm	helicopter nearby

This appendix identifies data samples logged at measurement station Noise 1 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/14/18 12:59 pm	helicopter nearby
09/14/18 1:00 pm	helicopter nearby
09/14/18 1:01 pm	helicopter nearby
09/14/18 1:02 pm	helicopter nearby
09/14/18 1:03 pm	helicopter nearby
09/14/18 1:04 pm	helicopter nearby
09/14/18 1:05 pm	helicopter nearby
09/14/18 1:06 pm	helicopter nearby
09/14/18 1:07 pm	helicopter nearby
09/14/18 1:08 pm	helicopter nearby
09/14/18 1:09 pm	helicopter nearby
09/14/18 1:10 pm	helicopter nearby
09/14/18 1:11 pm	helicopter nearby
09/14/18 1:12 pm	helicopter nearby
09/14/18 1:13 pm	helicopter nearby
09/14/18 1:14 pm	helicopter nearby
09/14/18 1:15 pm	helicopter nearby
09/14/18 1:16 pm	helicopter nearby
09/14/18 1:17 pm	helicopter nearby
09/14/18 1:18 pm	helicopter nearby
09/14/18 1:19 pm	helicopter nearby
09/14/18 1:20 pm	helicopter nearby
09/14/18 1:21 pm	helicopter nearby
09/14/18 1:22 pm	helicopter nearby
09/14/18 1:23 pm	helicopter nearby
09/14/18 1:24 pm	helicopter nearby
09/14/18 1:25 pm	helicopter nearby
09/14/18 2:16 pm	helicopter nearby
09/14/18 2:17 pm	helicopter nearby
09/14/18 2:18 pm	helicopter nearby
09/14/18 2:19 pm	helicopter nearby
09/14/18 2:20 pm	helicopter nearby
09/14/18 2:21 pm	helicopter nearby
09/14/18 2:22 pm	helicopter nearby
09/14/18 2:23 pm	helicopter nearby
09/14/18 2:24 pm	helicopter nearby
09/14/18 2:25 pm	helicopter nearby
09/14/18 2:26 pm	helicopter nearby
09/14/18 2:27 pm	helicopter nearby
09/14/18 2:28 pm	helicopter nearby

This appendix identifies data samples logged at measurement station Noise 1 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/14/18 2:29 pm	helicopter nearby
09/14/18 2:30 pm	helicopter nearby
09/14/18 2:31 pm	helicopter nearby
09/14/18 2:32 pm	helicopter nearby
09/14/18 2:33 pm	helicopter nearby
09/14/18 2:34 pm	helicopter nearby
09/14/18 2:35 pm	helicopter nearby
09/14/18 2:36 pm	helicopter nearby
09/14/18 2:37 pm	helicopter nearby
09/14/18 2:38 pm	helicopter nearby
09/14/18 2:39 pm	helicopter nearby
09/14/18 2:40 pm	helicopter nearby
09/14/18 2:41 pm	helicopter nearby
09/14/18 2:42 pm	helicopter nearby
09/14/18 2:43 pm	helicopter nearby
09/14/18 2:44 pm	helicopter nearby
09/14/18 2:45 pm	helicopter nearby
09/14/18 2:46 pm	helicopter nearby
09/14/18 2:47 pm	helicopter nearby
09/14/18 2:48 pm	helicopter nearby
09/14/18 2:49 pm	helicopter nearby
09/14/18 2:50 pm	helicopter nearby
09/14/18 2:51 pm	helicopter nearby
09/14/18 2:52 pm	helicopter nearby
09/14/18 2:53 pm	helicopter nearby
09/14/18 2:54 pm	helicopter nearby
09/14/18 2:55 pm	helicopter nearby
09/14/18 2:56 pm	helicopter nearby
09/14/18 2:57 pm	helicopter nearby
09/14/18 4:35 pm	helicopter nearby
09/14/18 4:36 pm	helicopter nearby
09/14/18 4:37 pm	helicopter nearby
09/14/18 6:17 pm	technician
09/14/18 6:18 pm	technician

APPENDIX C

**Data Samples Excluded from
Measurement Station Noise 2**

This appendix identifies data samples logged at measurement station Noise 2 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/12/18 11:28 am	technician
09/12/18 11:29 am	technician
09/12/18 11:30 am	technician
09/12/18 11:31 am	technician
09/12/18 11:32 am	technician
09/12/18 11:33 am	technician
09/12/18 11:34 am	technician
09/14/18 8:52 am	helicopter nearby
09/14/18 8:53 am	helicopter nearby
09/14/18 8:54 am	helicopter nearby
09/14/18 8:55 am	helicopter nearby
09/14/18 8:56 am	helicopter nearby
09/14/18 1:19 pm	helicopter nearby
09/14/18 1:20 pm	helicopter nearby
09/14/18 1:21 pm	helicopter nearby
09/14/18 1:22 pm	helicopter nearby
09/14/18 1:23 pm	helicopter nearby
09/14/18 1:24 pm	helicopter nearby
09/14/18 1:25 pm	helicopter nearby

APPENDIX D

**Data Samples Excluded from
Measurement Station Noise 3**

This appendix identifies data samples logged at measurement station Noise 3 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/12/18 12:46 pm	technician
09/12/18 12:47 pm	technician
09/12/18 12:48 pm	technician
09/12/18 12:49 pm	technician
09/12/18 12:50 pm	technician
09/12/18 12:51 pm	technician
09/12/18 12:52 pm	technician
09/12/18 12:53 pm	technician
09/12/18 12:54 pm	technician
09/12/18 12:55 pm	technician
09/12/18 2:46 pm	vehicle on Hwy 955
09/12/18 3:10 pm	vehicle on Hwy 955
09/12/18 4:04 pm	vehicle on Hwy 955
09/12/18 4:29 pm	vehicle on Hwy 955
09/12/18 4:30 pm	vehicle on Hwy 955
09/12/18 5:06 pm	vehicle on Hwy 955
09/12/18 7:55 pm	vehicle on Hwy 955
09/12/18 7:56 pm	vehicle on Hwy 955
09/12/18 11:39 pm	vehicle on Hwy 955
09/12/18 11:40 pm	vehicle on Hwy 955
09/13/18 12:53 am	vehicle on Hwy 955
09/13/18 12:54 am	vehicle on Hwy 955
09/13/18 1:16 am	vehicle on Hwy 955
09/13/18 1:17 am	vehicle on Hwy 955
09/13/18 5:42 am	vehicle on Hwy 955
09/13/18 5:43 am	vehicle on Hwy 955
09/13/18 5:58 am	vehicle on Hwy 955
09/13/18 5:59 am	vehicle on Hwy 955
09/13/18 6:51 am	vehicle on Hwy 955
09/13/18 6:52 am	vehicle on Hwy 955
09/13/18 6:53 am	vehicle on Hwy 955
09/13/18 7:06 am	vehicle on Hwy 955
09/13/18 7:07 am	vehicle on Hwy 955
09/13/18 7:08 am	vehicle on Hwy 955
09/13/18 8:10 am	vehicle on Hwy 955
09/13/18 8:11 am	vehicle on Hwy 955
09/13/18 8:20 am	vehicle on Hwy 955
09/13/18 8:21 am	vehicle on Hwy 955
09/13/18 9:24 am	vehicle on Hwy 955
09/13/18 9:27 am	vehicle on Hwy 955
09/13/18 9:28 am	vehicle on Hwy 955
09/13/18 10:35 am	vehicle on Hwy 955
09/13/18 12:47 pm	vehicle on Hwy 955
09/13/18 12:48 pm	vehicle on Hwy 955
09/13/18 12:49 pm	vehicle on Hwy 955
09/13/18 1:11 pm	vehicle on Hwy 955
09/13/18 1:12 pm	vehicle on Hwy 955
09/13/18 2:28 pm	vehicle on Hwy 955
09/13/18 3:00 pm	vehicle on Hwy 955
09/13/18 3:01 pm	vehicle on Hwy 955

This appendix identifies data samples logged at measurement station Noise 3 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/13/18 3:20 pm	vehicle on Hwy 955
09/13/18 3:58 pm	vehicle on Hwy 955
09/13/18 3:59 pm	vehicle on Hwy 955
09/13/18 4:47 pm	vehicle on Hwy 955
09/13/18 5:03 pm	vehicle on Hwy 955
09/13/18 5:06 pm	vehicle on Hwy 955
09/13/18 5:10 pm	vehicle on Hwy 955
09/13/18 5:16 pm	vehicle on Hwy 955
09/13/18 5:36 pm	vehicle on Hwy 955
09/13/18 5:37 pm	vehicle on Hwy 955
09/13/18 6:07 pm	people/vehicles nearby
09/13/18 6:08 pm	people/vehicles nearby
09/13/18 6:09 pm	people/vehicles nearby
09/13/18 6:10 pm	people/vehicles nearby
09/13/18 6:32 pm	vehicle on Hwy 955
09/13/18 6:33 pm	vehicle on Hwy 955
09/13/18 6:34 pm	vehicle on Hwy 955
09/13/18 6:41 pm	vehicle on Hwy 955
09/13/18 6:42 pm	vehicle on Hwy 955
09/13/18 6:51 pm	vehicle on Hwy 955
09/13/18 6:52 pm	vehicle on Hwy 955
09/13/18 7:02 pm	vehicle on Hwy 955
09/13/18 7:03 pm	vehicle on Hwy 955
09/13/18 7:21 pm	vehicle on Hwy 955
09/13/18 7:22 pm	vehicle on Hwy 955
09/13/18 7:23 pm	vehicle on Hwy 955
09/13/18 7:30 pm	vehicle on Hwy 955
09/13/18 7:31 pm	vehicle on Hwy 955
09/13/18 7:35 pm	vehicle on Hwy 955
09/13/18 7:36 pm	vehicle on Hwy 955
09/13/18 8:29 pm	vehicle on Hwy 955
09/13/18 8:30 pm	vehicle on Hwy 955
09/13/18 8:31 pm	vehicle on Hwy 955
09/13/18 8:32 pm	vehicle on Hwy 955
09/13/18 9:35 pm	vehicle on Hwy 955
09/13/18 9:36 pm	vehicle on Hwy 955
09/13/18 9:37 pm	vehicle on Hwy 955
09/13/18 9:58 pm	vehicle on Hwy 955
09/13/18 9:59 pm	vehicle on Hwy 955
09/13/18 10:00 pm	vehicle on Hwy 955
09/13/18 11:02 pm	vehicle on Hwy 955
09/13/18 11:03 pm	vehicle on Hwy 955
09/13/18 11:06 pm	vehicle on Hwy 955
09/13/18 11:07 pm	vehicle on Hwy 955
09/13/18 11:08 pm	vehicle on Hwy 955
09/14/18 1:01 am	vehicle on Hwy 955
09/14/18 1:02 am	vehicle on Hwy 955
09/14/18 1:03 am	vehicle on Hwy 955
09/14/18 1:04 am	vehicle on Hwy 955
09/14/18 1:05 am	vehicle on Hwy 955

This appendix identifies data samples logged at measurement station Noise 3 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/14/18 5:07 am	vehicle on Hwy 955
09/14/18 5:08 am	vehicle on Hwy 955
09/14/18 5:09 am	vehicle on Hwy 955
09/14/18 5:22 am	vehicle on Hwy 955
09/14/18 5:23 am	vehicle on Hwy 955
09/14/18 5:24 am	vehicle on Hwy 955
09/14/18 5:39 am	vehicle on Hwy 955
09/14/18 5:40 am	vehicle on Hwy 955
09/14/18 5:58 am	vehicle on Hwy 955
09/14/18 5:59 am	vehicle on Hwy 955
09/14/18 6:00 am	vehicle on Hwy 955
09/14/18 6:08 am	vehicle on Hwy 955
09/14/18 6:09 am	vehicle on Hwy 955
09/14/18 6:57 am	vehicle on Hwy 955
09/14/18 6:58 am	vehicle on Hwy 955
09/14/18 6:59 am	vehicle on Hwy 955
09/14/18 7:11 am	vehicle on Hwy 955
09/14/18 7:12 am	vehicle on Hwy 955
09/14/18 7:15 am	vehicle on Hwy 955
09/14/18 7:16 am	vehicle on Hwy 955
09/14/18 8:35 am	helicopter nearby
09/14/18 8:36 am	helicopter nearby
09/14/18 8:37 am	helicopter nearby
09/14/18 8:38 am	helicopter nearby
09/14/18 8:39 am	helicopter nearby
09/14/18 8:40 am	helicopter nearby
09/14/18 8:41 am	helicopter nearby
09/14/18 8:42 am	helicopter nearby
09/14/18 8:43 am	helicopter nearby
09/14/18 8:44 am	helicopter nearby
09/14/18 8:45 am	helicopter nearby
09/14/18 8:46 am	helicopter nearby
09/14/18 8:47 am	helicopter nearby
09/14/18 10:32 am	helicopter nearby
09/14/18 10:33 am	helicopter nearby
09/14/18 10:34 am	helicopter nearby
09/14/18 10:35 am	helicopter nearby
09/14/18 10:46 am	elevated wind speed
09/14/18 12:19 pm	vehicle on Hwy 955
09/14/18 12:20 pm	vehicle on Hwy 955
09/14/18 12:52 pm	vehicle on Hwy 955
09/14/18 3:07 pm	vehicle on Hwy 955
09/14/18 3:08 pm	vehicle on Hwy 955
09/14/18 4:51 pm	vehicle on Hwy 955
09/14/18 5:06 pm	vehicle on Hwy 955
09/14/18 5:09 pm	vehicle on Hwy 955
09/14/18 5:40 pm	vehicle on Hwy 955
09/14/18 5:47 pm	vehicle on Hwy 955
09/14/18 5:48 pm	vehicle on Hwy 955
09/14/18 6:40 pm	vehicle on Hwy 955

This appendix identifies data samples logged at measurement station Noise 3 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/14/18 6:41 pm	vehicle on Hwy 955
09/14/18 6:42 pm	vehicle on Hwy 955
09/14/18 6:48 pm	vehicle on Hwy 955
09/14/18 6:55 pm	vehicle on Hwy 955
09/14/18 6:56 pm	vehicle on Hwy 955
09/14/18 6:57 pm	vehicle on Hwy 955
09/14/18 7:00 pm	vehicle on Hwy 955
09/14/18 7:11 pm	vehicle on Hwy 955
09/14/18 7:12 pm	vehicle on Hwy 955
09/14/18 7:20 pm	vehicle on Hwy 955
09/14/18 7:21 pm	vehicle on Hwy 955
09/14/18 7:22 pm	vehicle on Hwy 955
09/14/18 7:23 pm	vehicle on Hwy 955
09/14/18 7:43 pm	vehicle on Hwy 955
09/14/18 7:44 pm	vehicle on Hwy 955
09/14/18 7:45 pm	vehicle on Hwy 955
09/14/18 7:46 pm	vehicle on Hwy 955
09/14/18 7:47 pm	vehicle on Hwy 955
09/14/18 7:51 pm	vehicle on Hwy 955
09/14/18 8:03 pm	vehicle on Hwy 955
09/14/18 8:04 pm	vehicle on Hwy 955
09/14/18 8:29 pm	vehicle on Hwy 955
09/14/18 8:30 pm	vehicle on Hwy 955
09/14/18 8:31 pm	vehicle on Hwy 955
09/14/18 8:48 pm	vehicle on Hwy 955
09/14/18 8:49 pm	vehicle on Hwy 955
09/14/18 8:50 pm	vehicle on Hwy 955
09/14/18 9:27 pm	vehicle on Hwy 955
09/14/18 9:28 pm	vehicle on Hwy 955
09/14/18 9:29 pm	vehicle on Hwy 955
09/14/18 9:52 pm	vehicle on Hwy 955
09/14/18 9:53 pm	vehicle on Hwy 955
09/14/18 10:26 pm	vehicle on Hwy 955
09/14/18 10:27 pm	vehicle on Hwy 955
09/14/18 10:31 pm	vehicle on Hwy 955
09/14/18 10:32 pm	vehicle on Hwy 955
09/14/18 10:43 pm	vehicle on Hwy 955
09/14/18 10:44 pm	vehicle on Hwy 955
09/14/18 10:52 pm	vehicle on Hwy 955
09/14/18 10:53 pm	vehicle on Hwy 955
09/15/18 12:07 am	vehicle on Hwy 955
09/15/18 12:11 am	vehicle on Hwy 955
09/15/18 12:12 am	vehicle on Hwy 955
09/15/18 12:29 am	vehicle on Hwy 955
09/15/18 12:30 am	vehicle on Hwy 955
09/15/18 1:19 am	vehicle on Hwy 955
09/15/18 1:20 am	vehicle on Hwy 955
09/15/18 1:37 am	vehicle on Hwy 955
09/15/18 1:38 am	vehicle on Hwy 955
09/15/18 1:39 am	vehicle on Hwy 955

This appendix identifies data samples logged at measurement station Noise 3 that were excluded when calculating representative noise levels.

Measurement Date / Time [CST]	Reason for Elimination
09/15/18 2:29 am	vehicle on Hwy 955
09/15/18 2:30 am	vehicle on Hwy 955
09/15/18 2:59 am	vehicle on Hwy 955
09/15/18 3:00 am	vehicle on Hwy 955
09/15/18 3:01 am	vehicle on Hwy 955
09/15/18 3:16 am	vehicle on Hwy 955
09/15/18 3:17 am	vehicle on Hwy 955
09/15/18 3:28 am	vehicle on Hwy 955
09/15/18 4:36 am	vehicle on Hwy 955
09/15/18 4:37 am	vehicle on Hwy 955
09/15/18 4:38 am	vehicle on Hwy 955