Sunrise Solar Project

Noise Impact Assessment

Client: Sunrise Solar Project LP
Reference: 23-023
Version 1.0

February 2024

Evolugen

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Report Prepared for:
Sunrise Solar Project LP

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Checked by	Merlin Garnett	Date	January 30, 2024
Reviewed and Approved by	Cameron Sutherland	Date	January 30, 2024
Issued by	Jason Mah	Date	February 14, 2024

Issue History	Date	Details
V1.0	February 14, 2024	Final for Issue

Executive Summary

Sunrise Solar Project LP (Sunrise) is developing a solar photovoltaic (PV) project called the Sunrise Solar Project (the Project). The Project site is located directly northwest of the town of Pincher Creek, Alberta. The Project is expected to have a total capacity of up to 75-megawatts (MW_{AC}).

Sunrise retained Green Cat Renewables Canada Corporation (GCR) to conduct a noise impact assessment (NIA) of the Project that considered ground mounted PV panels, single-axis trackers and associated motors, twenty-one inverter/transformer stations, and a Project substation. The inverter/transformer stations and Project substation are expected to be the only significant noise producing Project elements. As such, no other Project elements were considered in this assessment.

GCR reviewed aerial imagery of the site, identifying sixty-six receptors within the study area. GCR conducted a site visit in June 2023 to field verify details of the receptors included in the assessment. Of the sixty-six receptors identified within the study area, only seventeen were selected and considered within this assessment. These receptors are considered representative of the receptors expected to be the most impacted by noise from the proposed Project. The area was also checked for regulated third-party energy-related facilities that may produce noise within the vicinity of the Project.

A software model was used to predict sound levels from the Project to determine compliance with the Alberta Utilities Commission (AUC) Rule 012: Noise Control requirements. The cumulative sound level was found to be more than 3dB below the Permissible Sound Level (PSL) for night-time periods which qualifies the noise assessment work to be limited to an Appendix 3 summary. Nevertheless, a detailed noise assessment was carried out following a request by Sunrise who wished to understand all potential noise impacts; as determined through AUC Rule 012.

Where applicable, cumulative sound levels incorporated sound from: existing regulated third-party energy-related facilities; third-party projects; the proposed Project; and ambient sources. The assessment concluded that cumulative sound levels would be compliant with PSLs at all assessed receptors. A Low Frequency Noise (LFN) assessment determined that sound from the proposed Project was not likely to produce any significant LFN effects.

The proposed Sunrise Solar Project was therefore assessed to meet the requirements of AUC Rule 012.

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1 Introduction

Sunrise Solar Project LP (Sunrise) retained Green Cat Renewables Canada Corporation (GCR) to conduct a noise impact assessment (NIA) for the proposed Sunrise Solar Project (the Project). The Project, a solar photovoltaic (PV) electricity generating facility of up to 75-megawatts (MW_{AC}), will be located directly northwest of the town of Pincher Creek, Alberta. The Project location is shown in **Figure 1-1** below. The assessment considered the cumulative impact of existing energy related facilities and the proposed solar Project noise sources on nearby receptors.

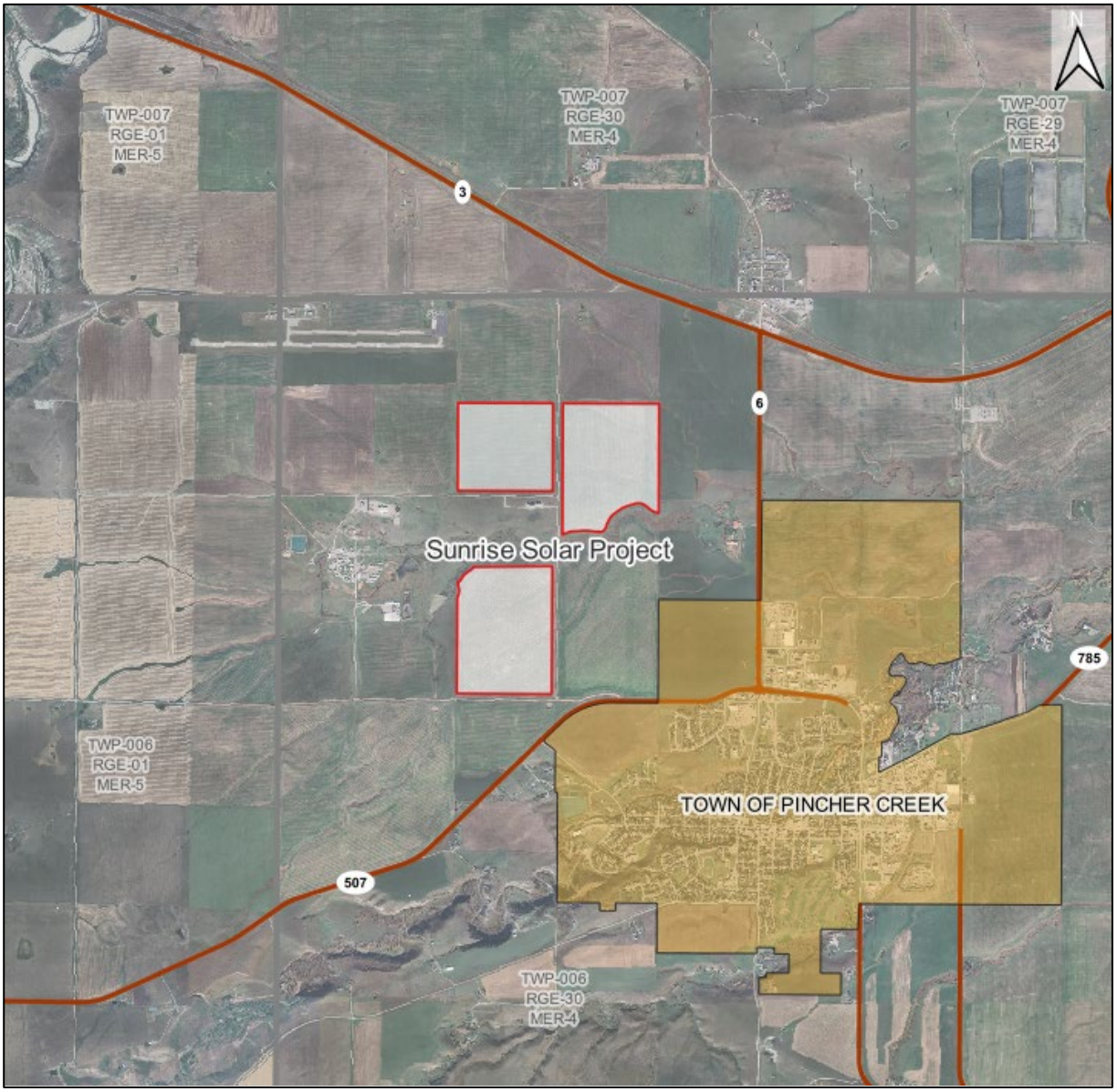


Figure 1-1 – Sunrise Solar Project Location

2 Rule 012 Assessment Process

The assessment process follows Alberta Utilities Commission (AUC) Rule 012 guidelines. The International Standard 'ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors', was followed in the prediction of noise levels at nearby receptors. A glossary of relevant AUC Rule 012 terms is reproduced in Appendix A.

The following steps give an overview of the process followed in identifying potential noise impacts on the most affected receptors.

- Define study area (distance contour at site boundary + 3km)
- Identify active and approved third party regulated energy-related facilities (AUC or Alberta Energy Regulator (AER)) within the study area
- Identify noise receptor(s) within 1.5km of the site boundary, or along the 1.5km boundary criteria (where no noise receptors exist).

For each noise receptor:

- Determine Basic Sound Level (BSL) and Ambient Sound Level (ASL)
- Predict sound level from existing and approved third party regulated energy-related facilities
- Combine facility and Ambient Sound Levels to give baseline sound levels
- Predict sound level from the proposed project
- Assess for Low Frequency Noise (LFN) content due to project
- Calculate Permissible Sound Levels (PSLs)
- Calculate Cumulative Sound Levels
- Assess compliance with AUC Rule 012 requirements

3 Noise Model

All noise propagation calculations were performed using CadnaA V2023 Software from DataKustik GmbH. This is quality assured software that includes an implementation of the ISO 9613 method that was the basis for all calculations.

3.1 Model Parameters

Summer-time climatic conditions were assumed as required by Rule 012. Table 3-1 shows the modelling parameters that were adopted for all calculations.

Table 3-1 – Model Parameters

Modelling Parameter	Setting
Terrain of Site Area	3m Height Contours[1]
Barrier Effects Included	None
Temperature	10°C
Relative Humidity	70%
Wind	1 – 5ms^{-1} from facility to receptor as per ISO-9613
Ground Attenuation	0.5 (default throughout the study area) 0.0 (for water bodies)
Number of Sound Reflections	1
Receptor Height	1.5m (one-storey) 4.5m (two-storey)
Operation Condition	Full load
Source Height	2.3m for Inverter Stations 1.7m for Transformer Stations 4.0m for Substation Transformers

[1] Data obtained from AltaLIS.

4 Baseline

4.1 Study Area

The development site has a total fenced area of approximately 500 acres. The study area consists of all land within 3km of the Project boundary. The study area for the Project includes a significant portion of the Town of Pincher Creek, the Pincher Creek Colony, several detached dwellings in the surrounding area, waterbodies, rural/agricultural land, the Pincher Creek Airport, several regulated third-party energy-related facilities, portions of a Canadian Pacific (CP) Railway, and portions of Highway 3, Highway 6, and Highway 507.

Within the guidelines of AUC Rule 012, sixty-six (66) dwellings within 1.5km from the Project boundary were identified. Receptor field verification was conducted by GCR in June 2023 to verify details of the receptors included in this assessment. Of the sixty-six receptors identified within the study area, only seventeen were selected and considered within this assessment. These receptors are considered representative of the receptors expected to be the most impacted by noise from the proposed Project and have been included in this assessment. These dwellings have been assessed for cumulative noise impacts from the Project and other nearby facilities, as required by AUC Rule 012.

4.2 Project Description

The Project will encompass an area of approximately 500 acres of land, with a total generating capacity of up to 75 MW_{AC}. The solar arrays will utilize ground mounted, single-axis tracker modules, which will feed twenty-one (21) inverter/transformer stations. A Project substation containing one (1) 90MVA high-voltage (HV) transformer has also been included. The inverters/transformer stations and the Project substation are assessed to be the only significant sources of noise from the Project. As such, no other Project elements are considered in this assessment.

Daytime periods are defined as occurring between 07:00-22:00, while night-time periods fall between 22:00-07:00. The Project will largely operate during the defined daytime hours; however, sunrise on the longest days of the year (during summer months) will occur at approximately 05:00, which falls within the night-time period. Therefore, the assessment considers both daytime and night-time operational impacts (i.e., operating 24/7).

4.3 Sensitive Receptors

Sixty-six (66) receptors located within the 1.5km study area were identified by GCR as potentially being the most impacted by the Project. Receptor field verification was conducted by GCR in June 2023 to verify details of the receptors included in this assessment. Of the sixty-six receptors identified within the study area, seventeen were selected and considered within this assessment. These receptors are considered representative of the receptors expected to be the most impacted by the noise from the proposed Project. Table 4-1 shows the location details and the height of each receptor.

Table 4-1 – Receptor Details

Receptor ID	UTM Coordinates (NAD 83, Zone 12N)		Receptor Type	Receptor Height (m)	Relative location from site boundary
	Easting	Northing			
R05	286514	5490027	One-Storey	1.5	1190m NE
R11	286349	5488014	Two-Storey	4.5	590m E
R12	283303	5487777	One-Storey	1.5	850m W
R23	284081	5485897	One-Storey	1.5	900m S
R24	284436	5485950	Two-Storey	4.5	830m S
R25	284545	5485966	Two-Storey	4.5	810m S
R26	284687	5486024	Two-Storey	4.5	740m S
R29	284807	5486131	Two-Storey	4.5	630m S
R31	285363	5486022	Two-Storey	4.5	880m SE
R33	285585	5486167	Two-Storey	4.5	920m SE
R35	285837	5486292	One-Storey	1.5	1070m SE
R36	285845	5486459	Two-Storey	4.5	1010m E
R37	285849	5486551	Two-Storey	4.5	1000m E
R38	285888	5486585	Two-Storey	4.5	1030m E
R50	286055	5486602	Two-Storey	1.5	1190m E
R63	283306	5487865	One-Storey	1.5	870m W
R66	286830	5489941	Two-Storey	4.5	1340m NE

4.4 Existing Third-Party Regulated Energy-Related Facilities

A search for active and approved regulated energy-related facilities and pumping wells within 3km of the Project boundary was conducted in June 2023. The AER's Facilities list (ST102) and Wells list (ST037) were consulted for the AER regulated facilities and wells, and AUC eFiling portal was used to identify any existing and approved AUC regulated facilities. GCR did not identify any active or approved AER regulated facilities or AER regulated pumping wells. Five (5) AUC regulated facilities have been identified within the assessment area, including Castle Rock Ridge Phase 1 Wind Farm, Riverview Wind Power Plant, and Sinnott Wind Farm.

Table 4-2 lists the third-party energy-related facilities identified within 3km of the Project that have the potential to influence cumulative sound levels. Information was gathered using the AUC eFiling portal.

Table 4-2 – Third-Party Sound Sources

Map Label	Name	Type	Operator Name	UTM Coordinates (NAD 83, Zone 12N)	
				Easting	Northing
AUC1	Goose Lake 103S Substation	Electrical Substation	AltaLink Management Ltd.	288427	5488853
AUC2	Pincher Creek 396S Substation	Electrical Substation	AltaLink Management Ltd.	288209	5488988
AUC3[2]	Castle Rock Ridge Phase 1 Wind Farm	Wind Turbine Generating Facility	ENEL Green Power Canada	-	-
AUC4[3]	Riverview Wind Power Plant	Wind Turbine Generating Facility	ENEL Green Power Canada	-	-
AUC5[4]	Sinnott Wind Farm	Wind Turbine Generating Facility	TransAlta Corporation	-	-

All third-party noise sources as well as the 1.5km and 3km study area boundaries are shown on Figure 4-1.

[2] See Figure 4-1 for the location of Castle Rock Ridge Wind Phase 1.
[3] See Figure 4-1 for the location of the Riverview Wind Power Plant.
[4] See Figure 4-1 for the location of the Sinnott Wind Farm.

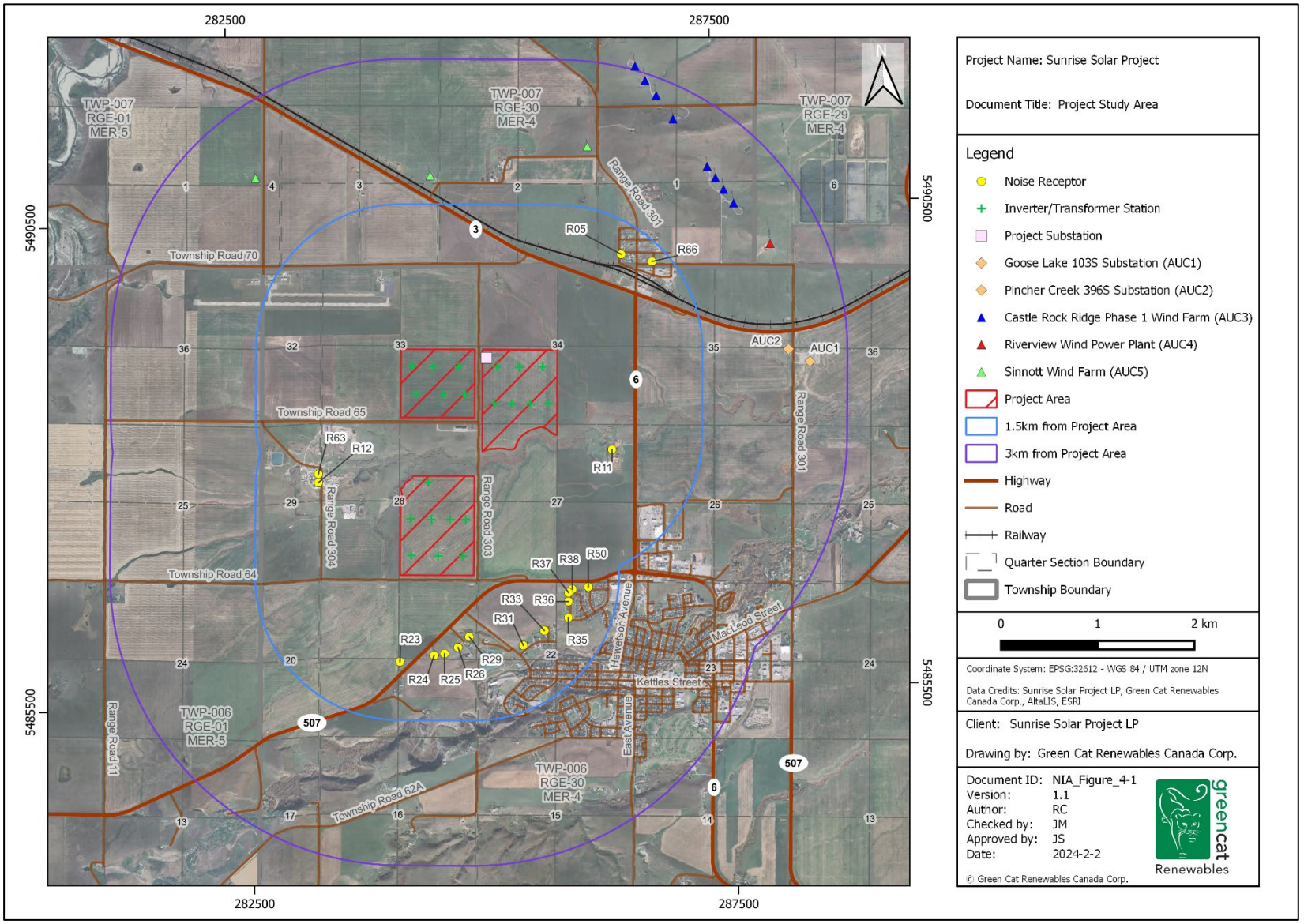


Figure 4-1 – Project Study Area

4.5 Baseline Sound Levels

Baseline sound levels for each receptor should incorporate a contribution from all existing and approved AER and AUC facilities with the addition of the Ambient Sound Level (ASL). ASL is determined from the Basic Sound Level (BSL).

4.5.1 Determination of Basic Sound Level (BSL)

Rule 012 criteria for the determination of BSL include: dwelling density; road and rail traffic noise; and aircraft flyovers. In this case, dwelling density and road/rail traffic noise are the determining factors. Criteria are given in **Table 4-3**.

Table 4-3 – Rule 012 Criteria for determination of Basic Sound Levels (BSL)

Proximity to transportation	Dwelling density per quarter section of land		
	(1) 1 to 8 dwellings; 22:00 - 07:00 (night-time) (dBA Leq)	(2) 9 to 160 dwellings; 22:00 - 07:00 (night-time) (dBA Leq)	(3) >160 dwellings; 22:00 - 07:00 (night-time) (dBA Leq)
Category 1[5]	40	43	46
Category 2[6]	45	48	51
Category 3[7]	50	53	56

The assessed receptors in the study area have been evaluated for both dwelling density and proximity to transportation. **Table 4-4** identifies the categories for the assessed receptors.

Traffic data collected for Highway 3, Highway 6, and Highway 507, collected at major intersections, indicates a level of traffic flow that well exceeds the Rule 012 'Heavily Travelled Road' criteria of '90 or more vehicles travel during the nine-hour night-time period consistently for any one-month period in a year'. Therefore, receptors located between 30m and 500m from these routes have been assessed as category 2 for transportation.

A rail line was identified on the south side of Pincher Station. GCR consulted with CP Railway personnel and confirmed that the rail traffic present in this area exceeds the minimum requirements for a 'Rail Line' as defined in Rule 012. Therefore, receptors located between 30m and 500m from these routes have been assessed as category 2 for transportation.

Receptors close to the main urban area of Pincher Creek and Pincher Station are located in an area with 9 to 160 dwellings per quarter section of land. Therefore, these receptors have been assessed as category 2 for dwelling density.

Traffic Data is shown in **Appendix B**.

[5] Category 1—dwelling(s) distance is more than or equal to 500 metres (m) from heavily travelled roads or rail lines and not subject to frequent aircraft flyovers.
[6] Category 2—dwelling(s) distance is more than or equal to 30 m, but less than 500 m from heavily travelled roads or rail lines and not subject to frequent aircraft flyovers.
[7] Category 3—dwelling(s) distance is less than 30 m from heavily travelled roads, or rail lines or subject to frequent aircraft flyovers.

4.5.2 Determination of Ambient Sound Level (ASL)

The Project is located in an area typical of rural Alberta (including agricultural and oil & gas industries). Rule 012 states that 'In the absence of measurement, the night-time ambient sound level is assumed to be five dB less than the basic sound level and the daytime ambient sound level is assumed to be five dB less than the basic sound level plus the daytime adjustment'.[8] This results in a night-time ASL between 35-43dB(A) and a daytime ASL of 45-53dB(A) for the assessed receptors. BSL and ASL for night-times and daytimes for each receptor are given in Table 4-4.

4.5.3 Determination of Permissible Sound Level (PSL)

For each receptor, the PSL is determined using Basic Sound Level (BSL) plus any allowed adjustments. In this case, as no special conditions exist, the PSL is determined as:

Night-Time (NT) Permissible Sound Level = Basic Sound Level

Daytime (DT) Permissible Sound Level = Basic Sound Level + Daytime Adjustment (10dB)

BSLs, ASL, and PSLs for night-times and daytimes and for each location are given in Table 4-4.

Table 4-4 – Daytime and Night-Time BSL, ASL, and PSL

Receptor ID	Transportation Category	Dwelling Category	BSL	ASL		PSL	
			NT/DT	NT	DT	NT	DT
R05	2	2	48	43	53	48	58
R11	2	1	45	40	50	45	55
R12	1	1	40	35	45	40	50
R23	2	1	45	40	50	45	55
R24	2	1	45	40	50	45	55
R25	2	1	45	40	50	45	55
R26	2	1	45	40	50	45	55
R29	2	1	45	40	50	45	55
R31	1	2	43	38	48	43	53
R33	1	2	43	38	48	43	53
R35	2	2	48	43	53	48	58
R36	2	2	48	43	53	48	58
R37	2	2	48	43	53	48	58
R38	2	2	48	43	53	48	58
R50	2	2	48	43	53	48	58

[8] The daytime ASL accounts for the addition of the standard 10db(A) daytime adjustment to the night-time ASL for the hours between 7 a.m. and 10 p.m., without any further adjustments, i.e., Class A, B, and C adjustments were not applied.

Receptor ID	Transportation Category	Dwelling Category	BSL	ASL		PSL	
			NT/DT	NT	DT	NT	DT
R63	1	1	40	35	45	40	50
R66	2	2	48	43	53	48	58

4.5.4 Third-Party Facility Sound Power Levels

Baseline sound levels include the noise contributions from existing adjacent sound sources and the ambient sound level assessed for the local environment.

There are five (5) existing AUC facilities within 3km of the proposed site boundary. These are the Goose Lake 103S Substation, Pincher Creek 396S Substation, Castle Rock Ridge Phase 1 Wind Farm, Riverview Wind Power Plant, and Sinnott Wind Farm.

The sound power levels of the above facilities were used to calculate the baseline sound levels for both daytime and night-time periods.

4.5.4.1 Goose Lake 103S Substation

One 400MVA HV transformer and one 200MVAR Dynamic Reactive Power Controller (DRPC) were identified at the Goose Lake 103S Substation, which are assumed to be the only significant noise producing elements at this facility.

The transformer has been modelled in Oil Natural Air Forced (ONAF) conditions for a conservative prediction. ONAF is an operation that uses second stage cooling for the transformer when there are higher ambient temperatures. Typically, in ONAF mode, the cooling fan is the source of the loudest noise emissions from the transformer. Octave band levels for the transformers were derived using published ONAF spectral data.

Sound spectra for the DRPC was approximated using third-party field measurements of comparable equipment. Third-party field measurements of two (2) 54MVAR capacitor banks were extrapolated to a similar MVAR rating as the DRPC to provide a reasonable prediction of sound power level.

Octave band sound power spectra for the noise producing equipment at the Goose Lake 103S Substation is shown in Table 4-5.

Table 4-5 – Octave Band Sound Power Levels for the Goose Lake 103S Substation[9,10]

Map Label	Facility	UTM Coordinates (NAD 83, Zone 12N)		Octave Band Centre Frequency, Hz									Total	
		Easting	Northing	31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AUC1	Goose Lake 103S Substation	-	-	-	-	-	-	-	-	-	-	-	-	-
-	Transformer 245/145 kV, 230/320/400 MVA	288430	5488850	101.5	105.5	108.5	106.5	106.5	100.5	95.5	90.5	82.5	113.6	106.7
-	200MVAR DRPC	288433	5488883	-	-	95.0	82.0	84.0	77.0	70.0	65.0	63.0	95.6	84.6

4.5.4.2 Pincher Creek 396S Substation

A 50MVA and 25MVA HV transformer, as well as one (1) 5MVA medium-voltage (MV) transformer, a 27MVAR capacitor bank, and a 25MVA voltage regulator were identified at the Pincher Creek 396S Substation. This equipment was assumed to be the only significant noise producing elements at this substation.

The transformers have been modelled in Oil Natural Air Forced (ONAF) conditions for a conservative prediction. ONAF is an operation that uses second stage cooling for the transformer when there are higher ambient temperatures. Typically, in ONAF mode, the cooling fan is the source of the loudest noise emissions from the transformer. Octave band levels for the transformers were derived using published ONAF spectral data.

Sound power levels for the capacitor bank were gathered from third-party NIAs that considered similar equipment.

Sound power levels for the voltage regulator were conservatively assumed to be equivalent to that of the capacitor banks.

Octave band sound power spectra for the noise producing equipment at the Pincher Creek 396S Substation is shown in Table 4-6.

[9] Sound spectra for the 400MVA transformer is based on a theoretical prediction method (Crocker, 2007).

[10] Sound spectra for the 200MVAR DRPC was approximated using third-party measurements of comparable facilities. See the East Calgary 5S Substation Noise Impact Assessment (Proceeding 1229, Exhibit 0012.00.EPC-1229, PDF Page 14)

Table 4-6 – Octave Band Sound Power Levels for the Pincher Creek 396S Substation[11,12]

Map Label	Facility	UTM Coordinates (NAD 83, Zone 12N)		Octave Band Centre Frequency, Hz									Total	
		Easting	Northing	31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AUC2	Pincher Creek 396S Substation	-	-	-	-	-	-	-	-	-	-	-	-	-
-	Transformer 138/69 kV, 30/40/50 MVA	288218	5488966	88.4	92.4	95.4	93.4	93.4	87.4	82.4	77.4	69.4	100.5	93.6
-	Transformer 138/25 kV, 15/20/25 MVA	288217	5488945	84.1	88.1	91.1	89.1	89.1	83.1	78.1	73.1	65.1	96.1	89.3
-	Transformer 69/25 kV, 5MVA	288202	5488941	73.9	77.9	80.9	78.9	78.9	72.9	67.9	62.9	54.9	86.0	79.1
-	Capacitor Bank 27MVAR	288218	5489027	-	-	91.0	78.0	78.0	67.0	58.0	55.0	55.0	91.4	78.8
-	Voltage Regulator 25kV, 25MVA	288198	5488952	-	-	91.0	78.0	78.0	67.0	58.0	55.0	55.0	91.4	78.8

4.5.4.3 Castle Rock Ridge Phase 1 Wind Farm

Eight (8) Enercon E-70 E4 wind turbine generators (WTGs) at the Castle Rock Ridge Phase 1 Wind Farm were identified within or bordering the Project's assessment area. Locations of the Castle Rock Ridge Phase 1 WTGs within or bordering the Project's assessment area are provided in Table 4-7.

[11] Sound spectra for the transformers is based on a theoretical prediction method (Crocker, 2007).

[12] Sound spectra for the capacitor bank was approximated using third-party measurements of comparable facilities. See the East Calgary 5S Substation Noise Impact Assessment (Proceeding 1229, Exhibit 0012.00.EPC-1229, PDF Page 14).

Table 4-7 – Locations of Castle Rock Ridge Phase 1 WTGs Within or Bordering the Project's Assessment Area

Map Label	Facility/Turbine ID	UTM Coordinates (NAD 83, Zone 12N)	
		Easting	Northing
AUC3	Castle Rock Ridge Phase 1 Wind Farm – Enercon E-70 E4	-	-
-	CRR1_39	286725	5491966
-	CRR1_40	286824	5491814
-	CRR1_41	286933	5491654
-	CRR1_42	287098	5491405
-	CRR1_46	287434	5490904
-	CRR1_47	287515	5490783
-	CRR1_48	287595	5490661
-	CRR1_49	287694	5490514

The Enercon E-70 E4 WTGs have a hub height of 64m. As described in the Castle Rock Ridge Wind Project Updated NIA[13], separate sound power levels were prescribed for the daytime and night-time periods. The daytime sound power level of 101.6 dBA and the night-time sound power level of 100.5 dBA represent the predicted turbine sound power levels at a hub height wind speed of 7.8 m/s and 7.3 m/s, respectively. Daytime and night-time octave band data used for the Enercon E-70 E4 WTGs were gathered from a third-party NIA[14] and are shown in Table 4-8.

Table 4-8 – Daytime & Night-Time Octave Band Sound Power Levels for the Enercon E-70 E4 WTGs at Castle Rock Ridge Phase 1

Map Label	Facility	Octave Band Centre Frequency, Hz									Total	
		31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AUC3	Castle Rock Ridge Phase 1 Wind Farm	-	-	-	-	-	-	-	-	-	-	-
-	Enercon E-70 E4 (Daytime)	-	111.7	109.7	105.5	99.2	93.1	87.8	81.8	78.1	114.6	101.6
-	Enercon E-70 E4 (Night-Time)	-	110.5	108.0	104.6	98.6	91.5	85.6	81.1	79.2	113.3	100.6

[13] Castle Rock Ridge Wind Power Development Updated Noise Impact Assessment, HFP Acoustical Consultants (HFP), December 3, 2009.

[14] Castle Rock Ridge Wind Power Project Phase 2 Noise Impact Assessment, SLR Consultants (Canada) Ltd., July 19, 2018 (Proceeding 23753, Exhibit 23753_X0002).

4.5.4.4 Riverview Wind Power Plant

One (1) Vestas V136-4.2 MW WTG at the Riverview Wind Power Plant (Turbine 'RIV_09') was identified within the Project's assessment area. The Vestas V136-4.2MW WTG has a hub height of 82m and the turbine is assumed to operate in Mode P01. Octave band sound power data corresponding to the broadband sound power level of 103.9 dBA at a hub height wind speed of 9 m/s was gathered from a third-party NIA[15] and is shown in Table 4-9.

Table 4-9 – Octave Band Sound Power Levels for the Vestas V136-4.2MW WTGs at the Riverview Wind Power Plant

Map Label	Facility	UTM Coordinates (NAD 83, Zone 12N)		Octave Band Centre Frequency, Hz									Total	
		Easting	Northing	31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AUC4	Riverview Wind Power Plant	-	-	-	-	-	-	-	-	-	-	-	-	-
-	Vestas V136-4.2MW *Mode P01* (RIV_09)	288057	5490085	115.1	111.8	108.9	105.8	102.1	97.9	93.0	83.8	79.8	117.9	103.9

4.5.4.5 Sinnott Wind Farm

Three (3) Nordex N60 WTGs at the Sinnott Wind Farm were identified within the Project's assessment area. The Nordex N60 WTGs have a hub height of 46m. Octave band sound power data corresponding to the broadband sound power level of 107.5 dBA at a hub height wind speed of 12 m/s was gathered from a third-party NIA[16] and is shown in Table 4-10.

[15] WindCharger Battery Energy Storage Project Noise Impact Assessment, AECOM Canada Ltd., March 14, 2019 (Proceeding 24454, Exhibit 24454_X0003).
[16] Addendum to Riverview Noise Impact Assessment, SLR Consulting (Canada) Ltd., November 9, 2020 (Proceeding 26066, Exhibit 26066_X0008).

Table 4-10 – Octave Band Sound Power Levels for the Nordex N60 WTGs at the Sinnott Wind Farm

Map Label	Facility	UTM Coordinates (NAD 83, Zone 12N)		Octave Band Centre Frequency, Hz									Total	
		Easting	Northing	31.5	63	125	250	500	1000	2000	4000	8000	dB	dB(A)
AUC4	Sinnott Wind Farm	-	-	-	-	-	-	-	-	-	-	-	-	-
-	Nordex N60 (SIN_01)	282763	5490942	-	119.8	114.0	107.8	103.0	101.1	99.7	95.3	86.7	121.2	107.5
-	Nordex N60 (SIN_03)	284569	5490908	"	"	"	"	"	"	"	"	"	"	"
-	Nordex N60 (SIN_05)	286203	5491153	"	"	"	"	"	"	"	"	"	"	"

4.6 Modelling Results

Table 4-11 shows the predicted sound levels at each receptor from the existing regulated facilities included in this assessment.

Table 4-11 – Predicted Sound Levels from Existing Third-Party Regulated Facilities[17,18]

Receptor ID	Goose Lake 103S Substation (dBA)		Pincher Creek 396S Substation (dBA)		Castle Rock Ridge Phase 1 Wind Farm (dBA)		Riverview Wind Power Plant (dBA)		Sinnott Wind Farm (dBA)		Total Regulated Facilities (dBA)	
	NT	DT	NT	DT	NT	DT	NT	DT	NT	DT	NT	DT
R05	18.9	18.9	9.0	9.0	32.2	33.3	25.1	25.1	32.7	32.7	35.9	36.4
R11	19.3	19.3	15.3	15.3	25.3	26.4	20.3	20.3	25.9	25.9	29.8	30.2
R12	-	-	-	-	-	-	-	-	24.8	24.8	24.8	24.8
R23	-	-	-	-	-	-	-	-	-	-	-	-
R24	7.9	7.9	-	-	-	-	-	-	17.4	17.4	17.9	17.9
R25	8.2	8.2	-	-	-	-	-	-	17.4	17.4	17.9	17.9
R26	8.7	8.7	-	-	-	-	-	-	11.3	11.3	13.3	13.3
R29	9.2	9.2	-	-	-	-	-	-	10.8	10.8	13.2	13.2
R31	10.4	10.4	-	-	-	-	6.7	6.7	10.2	10.2	14.3	14.3
R33	11.4	11.4	0.5	0.5	8.0	9.2	7.4	7.4	10.4	10.4	15.8	16.0
R35	17.1	17.1	6.0	6.0	16.4	17.6	12.8	12.8	19.8	19.8	23.3	23.6
R36	19.7	19.7	8.6	8.6	18.4	19.5	14.9	14.9	21.1	21.1	25.2	25.4
R37	20.0	20.0	8.9	8.9	18.6	19.7	15.2	15.2	21.3	21.3	25.4	25.7
R38	20.2	20.2	9.1	9.1	19.5	20.6	15.3	15.3	21.4	21.4	25.7	26.0
R50	20.8	20.8	9.7	9.7	19.6	20.8	15.6	15.6	21.4	21.4	26.0	26.3
R63	-	-	-	-	-	-	-	-	25.1	25.1	25.1	25.1
R66	20.9	20.9	11.7	11.7	35.0	36.0	29.4	29.4	32.3	32.3	37.7	38.3

[17] Baseline sound level contributions less than 0dBA are represented by '-'.
[18] No active or approved AER facilities have been identified within the study area. Thus, the predicted sound levels from AER facilities are also denoted with a '-'.

4.7 Total Baseline Sound Levels

Baseline sound levels include the noise contributions from existing adjacent sound sources and the ambient sound level assessed for the local environment. Table 4-12 shows the cumulative baseline sound levels for night-time (NT) and daytime (DT) periods.

Table 4-12 – Cumulative Baseline Sound Levels for Night-Time and Daytime Periods

Receptor ID	Total Regulated Facilities		ASL		Baseline	
	NT	DT	NT	DT	NT	DT
R05	35.9	36.4	43	53	43.8	53.1
R11	29.8	30.2	40	50	40.4	50.0
R12	24.8	24.8	35	45	35.4	45.0
R23	-	-	40	50	40.0	50.0
R24	17.9	17.9	40	50	40.0	50.0
R25	17.9	17.9	40	50	40.0	50.0
R26	13.3	13.3	40	50	40.0	50.0
R29	13.2	13.2	40	50	40.0	50.0
R31	14.3	14.3	38	48	38.0	48.0
R33	15.8	16.0	38	48	38.0	48.0
R35	23.3	23.6	43	53	43.0	53.0
R36	25.2	25.4	43	53	43.1	53.0
R37	25.4	25.7	43	53	43.1	53.0
R38	25.7	26.0	43	53	43.1	53.0
R50	26.0	26.3	43	53	43.1	53.0
R63	25.1	25.1	35	45	35.4	45.0
R66	37.7	38.3	43	53	44.1	53.1

Supplemental noise source information for each receptor is provided in Appendix C.

5 Project Sound Levels

The Project will consist of solar PV arrays using ground-mounted single-axis trackers. The solar arrays will be connected to twenty-one (21) inverter/transformer stations, with a total capacity of up to 75 MW_{AC}. A Project substation has been proposed to be included in the Project area, consisting of one (1) 90MVA high-voltage (HV) transformer.

For the purposes of the noise assessment, it has been assessed that the only significant noise producing Project elements are the inverter/transformer stations and the Project substation.

In general, each single-axis tracker is expected to be quieter than the inverter/transformer stations. The single-axis trackers will operate asynchronously across the site for a few seconds every few minutes to adjust the tilt angle of the modules (adjustment frequency is dependent on time of year). Due to the trackers' infrequent and asynchronous operation, and their uniform distribution across solar sites, it was assessed that they would have limited potential to contribute to overall Project sound levels and would not be considered significant noise producing Project elements.

The sound power level data for the significant noise producing Project elements was used to model sound emissions for both daytime and night-time periods. The inverter/transformer stations and Project substation were assumed to operate at full load, which is an inherently conservative modelling approach for night-time periods at a solar farm.

5.1 Inverters

The inverter stations proposed for the PV electricity generating facility are the Sungrow SG4400UD-MV units. An assessment of the sound power levels for these units was conducted using the manufacturer's noise test report. The sound data measurements for these inverters provided by the equipment manufacturer are shown in Appendix D.

Table 5-1 shows the linear, 'A', and 'C' frequency weighted octave band sound power spectra derived for the Sungrow SG4400UD-MV inverters.

Table 5-1 – Octave Band Sound Power Levels for Sungrow SG4400UD-MV Inverters

Octave Band Frequency (Hz)	Sound Power (dB)	Sound Power (dBA)	Sound Power (dBC)
31.5	95.9	56.5	92.9
63	91.5	65.3	90.7
125	91.3	75.2	91.1
250	91.8	83.2	91.8
500	93.3	90.1	93.3
1000	89.9	89.9	89.9
2000	90.3	91.5	90.1
4000	94.2	95.2	93.4
8000	82.6	81.5	79.6
Sum	**101.8**	**98.5**	**100.9**

5.2 Transformers

The proposed MV transformers for the PV electricity generating facility are 4.4MVA each and the manufacturer is yet to specify transformer sound level. The transformers have been modelled in Oil Natural Air Natural (ONAN) conditions. Transformer sound levels are expected to be an order of magnitude lower than the equivalent inverters, thereby contributing a negligible amount to cumulative sound levels. Nevertheless, a typical transformer of a suitable type was modelled. The linear 'A' and 'C' frequency weighted octave band sound power spectra for the 4.4MVA transformers used in the Project area is shown in **Table 5-2.**

Table 5-2 – Octave Band Sound Power Levels for the 4.4MVA Transformers[19]

Octave Band Frequency (Hz)	Sound Power (dB)	Sound Power (dBA)	Sound Power (dBC)
31.5	87.0	47.6	84.0
63	82.0	55.8	81.2
125	84.0	67.9	83.8
250	80.0	71.4	80.0
500	79.0	75.8	79.0
1000	68.0	68.0	68.0
2000	61.0	62.2	60.8
4000	56.0	57.0	55.2
8000	50.0	48.9	47.0
Sum	**90.4**	**78.3**	**89.1**

5.3 Substation

The Project substation will be comprised of one (1) 90MVA HV transformer that will be used to transform electricity generated from the PV system to grid voltage. The transformer has been modelled under Oil Natural Air Forced (ONAF) conditions for a conservative prediction. ONAF is an operation that uses second stage cooling for the transformers when there are higher ambient temperatures. Typically, in ONAF mode, the cooling fan is the source of the loudest noise emissions from the transformer. When operating under ONAF conditions, the 90MVA HV transformer has a two-winding equivalent rating of 106MVA. As such, octave band levels for a 106MVA transformer were derived using published ONAF spectral data. The linear 'A' and 'C' frequency weighted octave band sound power spectra for the 106MVA two-winding equivalent rated transformer used in the Project area is shown in Table 5-3.

[19] Based on theoretical prediction method (Crocker, 2007).

Table 5-3 – Octave Band Sound Power Levels for the Substation Transformer (106MVA two-winding equivalent rating)[20]

Octave Band Frequency (Hz)	Sound Power (dB)	Sound Power (dBA)	Sound Power (dBC)
31.5	93.2	53.8	90.2
63	97.2	71.0	96.4
125	100.2	84.1	100.0
250	98.2	89.6	98.2
500	98.2	95.0	98.2
1000	92.2	92.2	92.2
2000	87.2	88.4	87.0
4000	82.2	83.2	81.4
8000	74.2	73.1	71.2
Sum	**105.2**	**98.4**	**104.9**

5.4 Modelling Results

Predicted sound levels for the Project are shown in Table 5-4. The results assume full operation 24 hours a day, and they are applicable to night-time and daytime periods.

Table 5-4 – Predicted Project Case Sound Levels

Receptor ID	Project Sound Level (dBA)
R05	25.6
R11	30.7
R12	24.8
R23	23.8
R24	22.9
R25	23.1
R26	23.6
R29	24.4
R31	21.4
R33	21.3

[20] Based on theoretical prediction method (Crocker, 2007).

Receptor ID	Project Sound Level (dBA)
R35	21.8
R36	23.9
R37	24.3
R38	24.3
R50	23.7
R63	25.8
R66	26.0

R11 is expected to be the receptor most impacted by noise from the Project, having a maximum sound pressure level of 30.7dB(A). Project sound level contours are shown in Appendix E.

5.5 Low Frequency Assessment

Table 5-5 shows the difference between A and C weighted predicted sound levels at each of the receptors modelled. The results show that the C-weighted and A-weighted receptor levels have differences well below the Rule 012 criterion of 20dB. This indicates that low frequency noise is not expected to be an issue.

Table 5-5 – Low Frequency Noise Assessment

Receptor ID	Predicted Sound Level (dBA)	Predicted Sound Level (dBC)	Difference dBC – dBA
R05	25.6	37.6	12.0
R11	30.7	39.5	8.8
R12	24.8	33.7	8.9
R23	23.8	33.9	10.1
R24	22.9	31.2	8.3
R25	23.1	31.3	8.2
R26	23.6	31.7	8.1
R29	24.4	32.4	8.0
R31	21.4	30.3	8.9
R33	21.3	30.3	9.0
R35	21.8	31.4	9.6
R36	23.9	34.1	10.2
R37	24.3	34.4	10.1
R38	24.3	34.5	10.2
R50	23.7	34.1	10.4

Receptor ID	Predicted Sound Level (dBA)	Predicted Sound Level (dBC)	Difference dBC – dBA
R63	25.8	35.1	9.3
R66	26.0	37.1	11.1

6 Cumulative Impact Assessment

The cumulative impact assessment incorporates sound level contributions from the baseline and Project case assessments. Compliance with AUC Rule 012 is determined through comparison of cumulative sound levels with PSLs. Table 6-1 shows the results of the cumulative impact and compliance assessment.

Table 6-1 – Cumulative Sound Level Assessment for Night-Time (NT) and Daytime (DT) Periods

Receptor ID	Baseline Sound Level (dBA)		Project Sound Level (dBA)		Cumulative Sound Level (dBA)		PSL (dBA)		PSL Compliance Margin (dB)	
	NT	DT	NT	DT	NT	DT	NT	DT	NT	DT
R05	43.8	53.1	25.6	25.6	43.8	53.1	48	58	4	5
R11	40.4	50.0	30.7	30.7	40.8	50.1	45	55	4	5
R12	35.4	45.0	24.8	24.8	35.8	45.1	40	50	4	5
R23	40.0	50.0	23.8	23.8	40.1	50.0	45	55	5	5
R24	40.0	50.0	22.9	22.9	40.1	50.0	45	55	5	5
R25	40.0	50.0	23.1	23.1	40.1	50.0	45	55	5	5
R26	40.0	50.0	23.6	23.6	40.1	50.0	45	55	5	5
R29	40.0	50.0	24.4	24.4	40.1	50.0	45	55	5	5
R31	38.0	48.0	21.4	21.4	38.1	48.0	43	53	5	5
R33	38.0	48.0	21.3	21.3	38.1	48.0	43	53	5	5
R35	43.0	53.0	21.8	21.8	43.1	53.0	48	58	5	5
R36	43.1	53.0	23.9	23.9	43.1	53.0	48	58	5	5
R37	43.1	53.0	24.3	24.3	43.1	53.0	48	58	5	5
R38	43.1	53.0	24.3	24.3	43.1	53.0	48	58	5	5
R50	43.1	53.0	23.7	23.7	43.1	53.0	48	58	5	5
R63	35.4	45.0	25.8	25.8	35.9	45.1	40	50	4	5
R66	44.1	53.1	26.0	26.0	44.2	53.2	48	58	4	5

The cumulative sound levels at all receptors are shown to be below the PSL by a minimum margin of 4dB during the night-time periods and by at least 5dB for the daytime periods. R11 was identified as being most impacted by Project sound levels. The highest baseline sound levels were predicted at R66; however, the Project's contribution is relatively low at this location. Worst-case Project impacts are assessed to be compliant with the requirements of AUC Rule 012.

7 Conclusions

Seventeen (17) receptors, within 1.5km of the Project boundary, were selected to assess potential noise impacts arising from the Project. Worst-case sound power levels were used to model sound emissions from the Project during day and night periods.

The Project will generally operate when the sun is out during daytime hours; however, AUC Rule 012 defines night-time hours to be from 22:00 to 07:00 all year long. Due to the sun rising prior to 07:00 during summer months, the solar PV electricity generating facility may operate during the defined night-time period. Therefore, the assessment also considered worst-case (full load operation) noise emission levels 24 hours a day. In practice, there will be periods when the Project operates in standby mode where sound emissions are much lower than the peak sound output levels assumed throughout this assessment.

Cumulative sound levels at the receptors considered in this NIA were assessed to be below PSLs at all receptors by a minimum margin of 4dB. R11 was identified as being most impacted by Project sound levels. The highest baseline sound levels were predicted at R66; however, the Project's contribution is relatively low at this location. A LFN assessment determined that sound from the proposed Project is not expected to produce any significant LFN effects.

It is therefore concluded that the proposed Sunrise Solar Project would operate in compliance with AUC Rule 012 requirements at all assessed receptors.

8 Acoustic Practitioners' Information

Table 8-1 summarizes the information of the authors and technical reviewer.

Table 8-1 – Summary of Practitioners' Information

Name	Riley Corrigan	Justin Lee	Merlin Garnett	Cameron Sutherland
Title	Renewable Energy (E.I.T)	Renewable Energy (E.I.T)	Principal Noise Consultant	Technical Director
Role	• Acoustic noise modelling • Noise Impact Assessment (NIA) co-author	• Acoustic noise modelling • Noise Impact Assessment (NIA) co-author	• Discipline lead • Acoustic noise modelling • Fieldwork lead • Noise Impact Assessment (NIA) Technical Reviewer	• Technical Assessment Lead • Noise Impact Assessment (NIA) Technical Reviewer and Approver
Experience	• Experience with acoustic modelling (iNoise & CadnaA) of renewable energy projects in Alberta.	• Experience with acoustic modelling (iNoise & CadnaA) of renewable energy projects in Alberta. • Analyst on multiple noise assessments for renewable energy projects in Alberta. • Current INCE associate.	• Over 11 years of acoustic and environmental consultancy for projects in the U.K. and Alberta. • Completed the UK Institute of Acoustics (IOA) diploma in 2015. • Full member of the IOA. • Author and reviewer of NIAs for multiple renewable energy projects in Alberta (2020-Present).	• 19 years of acoustic and environmental consultancy. • Acoustics (IOA) diploma (2012). • Expert witness experience in wind turbine noise in the UK (2017/18). • Expert witness experience in technical solar development in Canada (2019-23).

Appendix A: Rule 012 Glossary

Ambient sound level (ASL)

The sound level that is a composite of different airborne sounds from many sources far away from and near the point of measurement. The ambient sound level does not include noise from any energy-related facilities or from wind and must be determined without it. The average night-time ambient sound level in rural Alberta is 35 dBA. The ambient sound level can be measured when the sound level in an area is not believed to be represented by the basic sound levels in Table 1[21]. The ambient sound level must be determined under representative conditions and does not constitute absolute worst-case conditions (e.g., an unusually quiet day) but conditions that portray typical conditions for the area.

In the absence of measurement, the night-time ambient sound level is assumed to be 5 dBA less than the basic sound level and the daytime ambient sound level is assumed to be 5 dBA less than the basic sound level plus the daytime adjustment.

A-weighted sound level

The sound level as measured on a sound level meter using a setting that emphasizes the middle frequency components similar to the frequency response of the human ear at levels typical of rural backgrounds in mid frequencies. Sound levels are denoted: dB(A).

Basic sound level (BSL)

The night-time A-weighted Leq sound level commonly observed to occur in the designated land-use categories with industrial presence and is assumed to be five dB(A) above the ambient sound level, as set out in Table 1 of Rule 012.

Comprehensive sound level

The comprehensive sound level includes ambient sound level, noise from existing facilities and energy-related facilities.

Cumulative sound level

The cumulative sound level includes the comprehensive sound level, noise from proposed facilities, energy-related facilities approved but not yet constructed, and the predicted noise from the applicant's proposed facility.

C-weighted sound level

The C-weighting approximates the sensitivity of human hearing at industrial noise levels (above about 85 dBA). The C-weighted sound level (e.g., measured with the C-weighting) is more sensitive to sounds at low frequencies than the A-weighted sound level and is sometimes used to assess the low-frequency content of complex sound environments.

Daytime

Defined as the hours from 7 a.m. to 10 p.m.

Daytime adjustment

An adjustment that allows a 10 dBA increase because daytime ambient sound levels are generally about 10 dBA higher than night-time values.

[21] Table 1. Basic sound levels (BSL) for night-time (AUC Rule 12, Page 5, http://www.auc.ab.ca/Shared%20Documents/Rules/Rule012.pdf)

Density per quarter section

Refers to a quarter section with the affected dwelling at the centre (a 451-metre radius). For quarter sections with various land uses or with mixed densities, the density chosen must be factored for the area under consideration.

Down wind

The wind direction from the noise source towards the receiver (± 45 degrees), measured at either dwelling height or source height. The 45 degrees requirement is consistent with the definition for downwind conditions, as included in ISO 9613-1996, Attenuation of Sound During Propagation Outdoors – Part 2: general method of calculation.

Dwelling

Any permanently or seasonally occupied structure used for habitation for the purpose of human rest; including a nursing home or hospital with the exception of an employee or worker residence, dormitory, or construction camp located within an energy-related industrial plant boundary. Trailer parks and campgrounds may qualify as a dwelling if it can be demonstrated that they are in regular and consistent use.

A permanent dwelling is a fixed residence occupied on a full-time basis.

The most impacted dwelling(s) are those subject to the highest average weighted sound level relative to the permissible sound level.

Energy equivalent sound level (Leq)

The Leq is the average weighted sound level over a specified period of time. It is a single-number representation of the cumulative acoustical energy measured over a time interval. The time interval used should be specified in brackets following the Leq—e.g., Leq (9 hours) is a nine-hour Leq.

Energy-related facility

A facility under the jurisdiction of the Commission or other regulatory agency, used for energy generation, transport (except by road or rail line) and resource extraction. These include mining, extraction, processing, and transportation (except by road or rail line) as well as federally regulated electrical transmission lines and pipelines.

Far field

The far field is that area far enough away from the noise source that the noise emissions can be treated as if they come from a single point or line source and the individual components of the noise source are not apparent as separate sources. This is typically at a distance of at least three to five times the major dimensions of the noise source, such as length, width, height, or diameter.

Heavily travelled road

Includes highways and any other road where 90 or more vehicles travel during the nine-hour night-time period consistently for any one-month period in a year. The following methods to validate the travel volume are acceptable:

Alberta Transportation's Average Annual Summer Daily Traffic (ASDT) value. If the ASDT is not available, the Alberta Transportation's Average Annual Daily Traffic (AADT) value can be used. In the case of using the ASDT or AADT, 10 per cent of the daily traffic volume can be assumed to be the night-time period traffic.

Linear weighting (or Z-weighting)

The sound level measured without any adjustment for the sensitivity of human hearing. It is a direct measure in decibels of the variation in air pressure and is often referred to as the "sound pressure level". This level is sometimes

called the "linear weighted level" or "the unweighted level," as it includes no frequency weighting beyond the tolerances and limits of the sound level meter being used for the measurements.

Low frequency noise

Where a clear tone is present below and including 250 Hz and the difference between the overall C-weighted sound level and the overall A-weighted sound level exceeds 20 dB.

Night-time

Defined as the hours from 10 p.m. to 7 a.m.

No net increase

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

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

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

Noise

The unwanted portion of sound.

Permissible sound level (PSL)

The maximum daytime or nighttime sound level as determined in Table 1 at a point 15 m from the dwelling(s) in the direction of the facility. The permissible sound level is the sum of the basic sound level, daytime adjustment, Class A adjustments and Class B adjustment, or Class C adjustments.

Proposed facility

A proposed facility is a facility for which an application has been deemed complete by the Commission but is not yet approved or for which an approval has been issued, but is not yet constructed.

Sound power level

The decibel equivalent of the rate of energy (or power) emitted in the form of noise. The sound power level is an inherent property of a noise source.

Sound pressure level

The decibel equivalent of the pressure of sound waves at a specific location, which is measured with a microphone. Since human reaction and material behaviours vary with frequency, the sound pressure level may be measured using frequency bands or with an overall weighting scale such as the A-weighting system. The sound pressure level depends on the noise sources, as well as the location and environment of the measurement path.

Summertime conditions

Ground cover and temperatures that do not meet the definition for wintertime conditions. These can occur at any time of the year.

Tonal components

The test for the presence of tonal components consists of two parts. The first must demonstrate that the sound pressure level of any one of the slow-response, linear, one-third octave bands between 20 and 250 Hz is 10 dBA or more than the sound pressure level of at least one of the adjacent bands within two one-third octave bandwidths. In addition, there must be a minimum of a 5 dBA drop from the band containing the tone within two bandwidths on the opposite side.

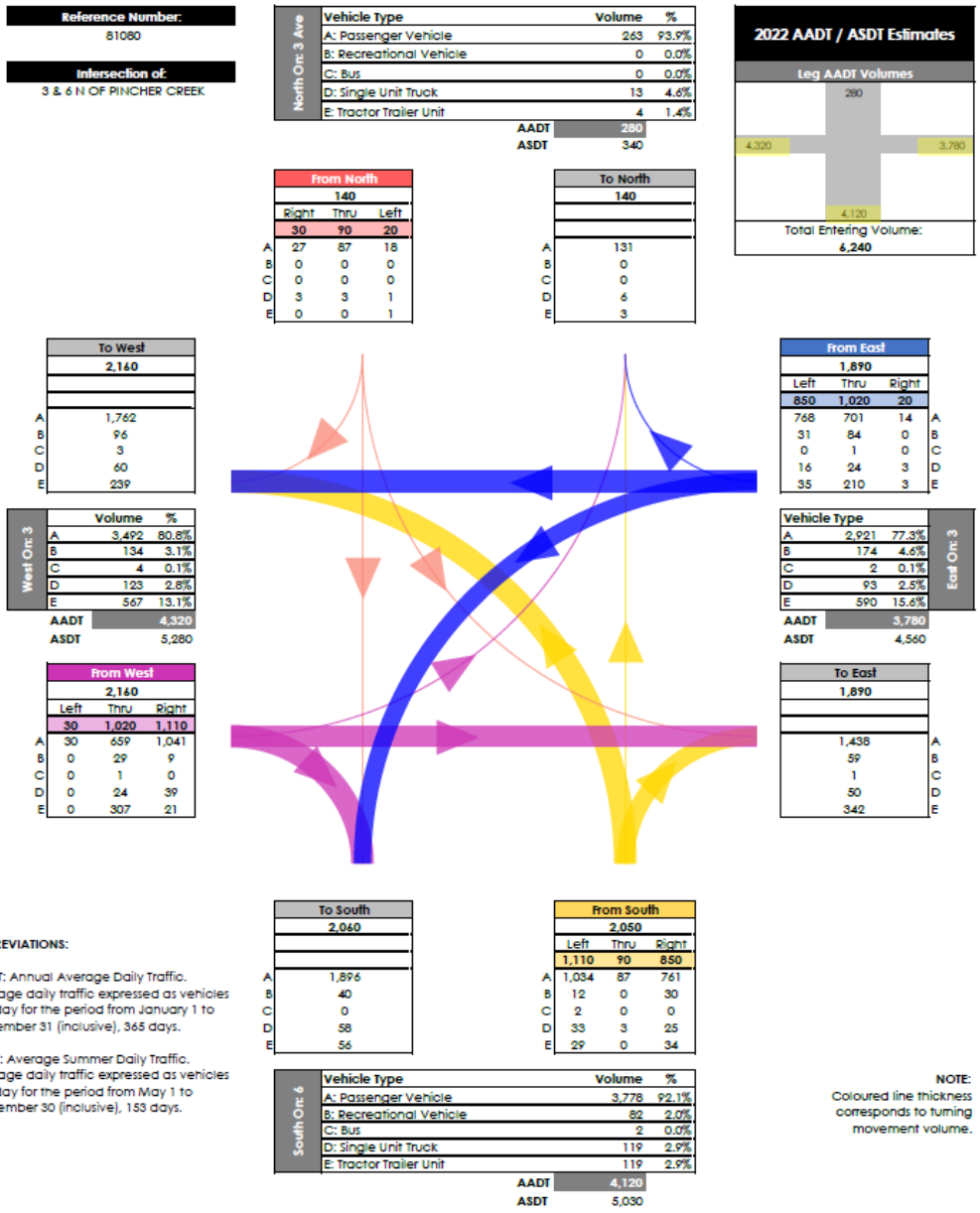
The second part is that the tonal component must be a pronounced peak clearly obvious within the spectrum.

Wind speed

The speed of the wind, expressed in metres per second (m/s), measured in and averaged over 10-minute intervals at the same height as the microphone, but not more than 10 metres above ground level

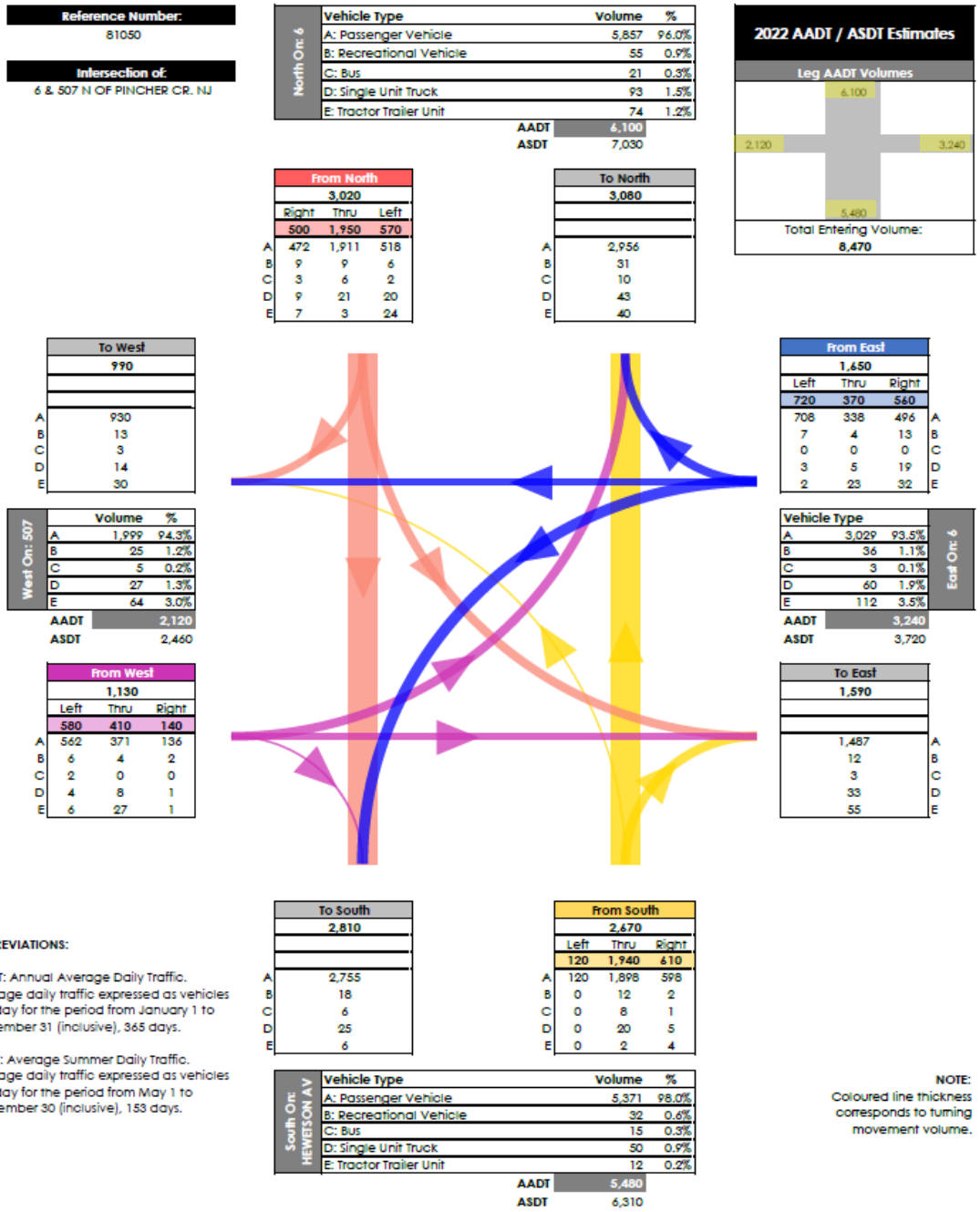
Appendix B: Alberta Traffic Volume History

The following chart[22] shows the relevant section of the traffic volume history for the intersection of Highway 3 and Highway 6 in the proximity of the site. Using the '10% of ASDT' calculation to determine whether the highway is a 'Heavily Travelled Road', the available data shows that the Rule 012 criteria of '90 or more vehicles travel during the nine-hour night-time period consistently for any one-month period in a year' is exceeded for vehicles travelling both east and west on Highway 3, and is also exceeded for vehicles travelling south on Highway 6.



[22] https://www.transportation.alberta.ca/mapping/2022/TM/00081080.pdf

The following chart[23] shows the relevant section of the traffic volume history for the intersection of Highway 6 and Highway 507 in the proximity of the site. Using the '10% of ASDT' calculation to determine whether the highway is a 'Heavily Travelled Road', the available data shows that the Rule 012 criteria of '90 or more vehicles travel during the nine-hour night-time period consistently for any one-month period in a year' is exceeded for vehicles travelling north and east on Highway 6 as well as west on Highway 507 and south on Hewetson Avenue.



[23] https://www.transportation.alberta.ca/mapping/2022/TM/00081050.pdf

Appendix C: Supplemental Noise Source Information

Receptor ID	Project		Third-Party	
	Nearest Significant Project Noise Source	Distance to Nearest Significant Project Noise Source	Nearest Third-Party Facility Noise Source	Distance to Nearest Third-Party Facility Noise Source
R05	Inverter/Transformer Station	1420m SW	AUC5	1170m NW
R11	Inverter/Transformer Station	810m NW	AUC2	2100m NE
R12	Inverter/Transformer Station	1030m E	AUC5	3210m N
R23	Inverter/Transformer Station	1100m N	AUC5	5030m N
R24	Inverter/Transformer Station	1030m N	AUC2	4840m NE
R25	Inverter/Transformer Station	1010m N	AUC2	4750m NE
R26	Inverter/Transformer Station	940m N	AUC2	4600m NE
R29	Inverter/Transformer Station	830m N	AUC2	4440m NE
R31	Inverter/Transformer Station	1110m NW	AUC2	4110m NE
R33	Inverter/Transformer Station	1140m NW	AUC2	3850m NE
R35	Inverter/Transformer Station	1260m NW	AUC2	3590m NE
R36	Inverter/Transformer Station	1190m NW	AUC2	3460m NE
R37	Inverter/Transformer Station	1160m NW	AUC2	3390m NE
R38	Inverter/Transformer Station	1180m NW	AUC2	3340m NE
R50	Inverter/Transformer Station	1340m W	AUC2	3210m NE
R63	Inverter/Transformer Station	1060m SE	AUC5	3120m NW
R66	Inverter/Transformer Station	1570m SW	AUC3	1040m NE

Appendix D: Sungrow SG4400UD-MV Manufacturer's Sound Data

SUNGROW Public Clean power for all

SUNGROW POWER SUPPLY CO., LTD
No.1699 Xiyou Rd.,New & High Technology Industrial Development Zone, 230088, Hefei, P. R. China.
Tel: +86-551-65327878
E-mail:_____
www.sungrowpower.com

Noise Test Report

TYPE TEST SHEET

This Type Test sheet shall be used to record the results of the type testing of Generating Unit			
Report reference number	RZ2023040702		
Report version	V1.0		
Date of issue	2023-04-07		
Standard reference	IEC 62109-1_2010		
Generating Unit technology	Grid-connected PV Inverter		
Inverter Type	SG4400UD-MV		
Rated power (KW)	4400		
Rated AC voltage (V)	630		
System supplier name	Sungrow Power Supply Co., Ltd.		
Address	No.1699 Xiyou Rd., New & High Technology Industrial Development Zone, Hefei, P.R. China		
Compiled by	张之翔	Approved by	

Note that testing can be done by the manufacturer of an individual component, by an external test house, or by the supplier of the complete system, or any combination of them as appropriate.

Where parts of the testing are carried out by persons or organisations other than the supplier then the supplier shall keep copies of all test records and results supplied to them to verify that the testing has been carried out by people with sufficient technical competency to carry out the tests.

Report Version	Description
V1.0	Initial

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The aim of this test is to determine the noise level when the PV Grid inverter in rated working condition.

Standard requirements: If equipment produces noise at a level that could cause a hazard, the noise shall be measured to determine the maximum sound pressure level that the equipment can produce (except that sound from alarms and from parts located remotely is not included). If the measured sound pressure exceeds 80dBA above a reference sound pressure of 20 μP, at a measurement distance of 1 m, the instructions shall include information regarding the sound pressure level and how to reduce the risk of hearing damage to safe levels, and the product shall be marked with symbol 22 of Annex C.

- **Used settings of the measurement device for Noise measurement:**

Measurement device	Calibration Date	Expire Date
AWA6228+	2023-01-02	2024-01-01

- **The conditions during testing are specified below:**

PV inverter operation mode	Actual operation condition （4839KW）
Voltage range	895-1300V
Grid frequency range	50Hz
Distance	1m、5m、10 m
Testing duration	10min
Date	2023-04-07

- **The system noise level please check the table below:**

1）Actual operation condition（1m@4839KW）

Orientation	Noise (dB)_1m
Front	85.0
Behind	85.0
Left	85.0
Right	84.0
Maximum Noise	85.0

2）Actual operation condition（5m@4839KW）

Orientation	Noise (dB)_5m
Front	73.0
Behind	76.0
Left	73.0
Right	69.0
Maximum Noise	76.0

3）Actual operation condition（10m@4839KW）

Orientation	Noise (dB)_10m
Front	64.0
Behind	72.0
Left	66.0
Right	63.0
Maximum Noise	72.0

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Site photos:
Actual operation condition

Actual operation condition	Background noise

1）1m noise photo

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Front

Behind

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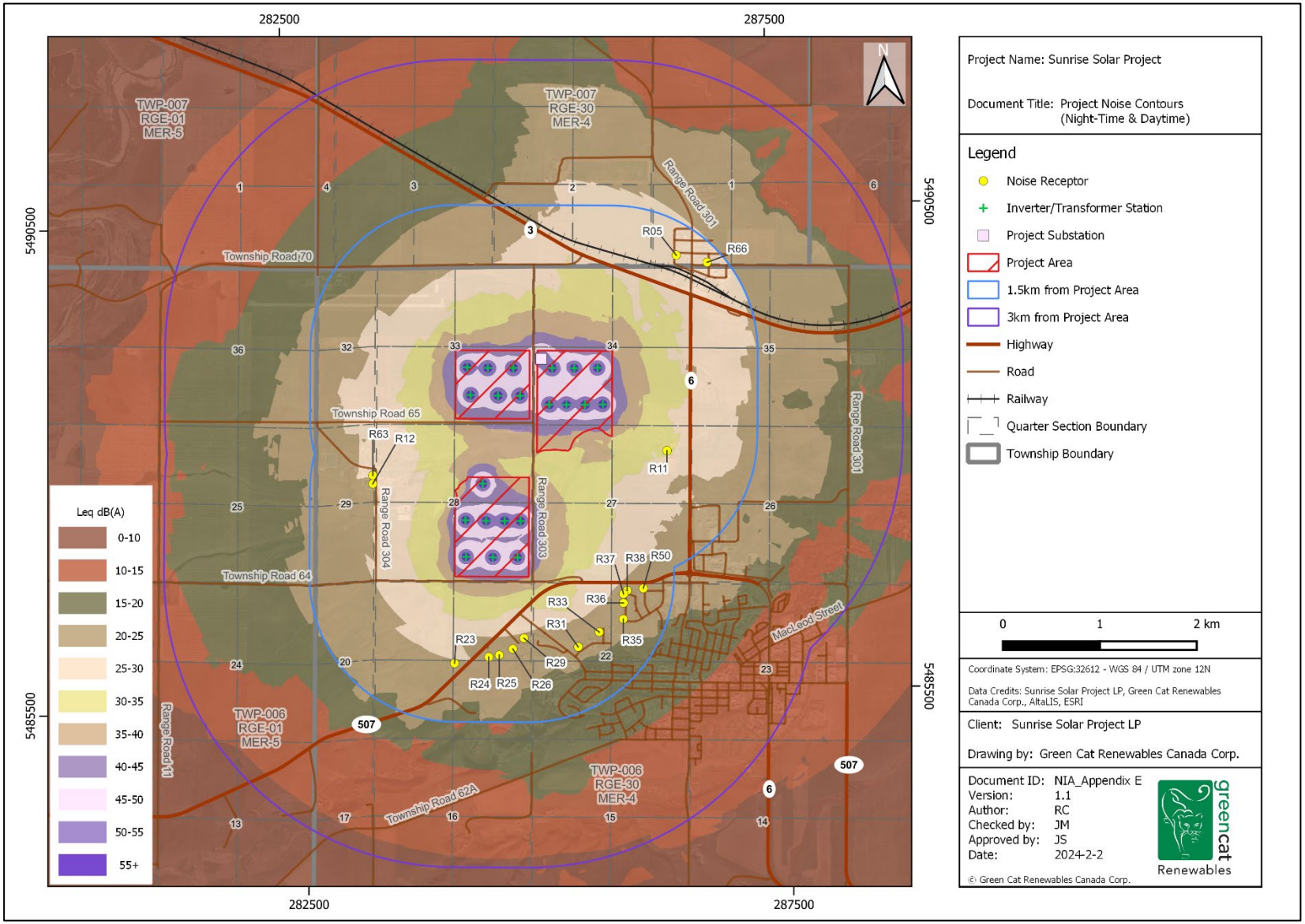
Left

Right

Appendix E: Project Sound Level Contours



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