Appendix C

Noise Impact Assessment Report

FINAL

CanWhite Vivian Sand Facility Project

Noise Impact Assessment

CanWhite Sands Corp.

Project number: 60625356

June 29, 2020

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AECOM: 2015-04-13

Quality information

Prepared by	Checked by	Verified by	Approved by
Yong Ma, P.Eng. Senior Acoustic Engineer	Atif Bokhari, P.Eng. Acoustic Engineer	Alan Oldfield, MEng, CEng(UK), P.Eng. Manager, Acoustics	Clifton Samoiloff, B.Sc., EP(CEA) Mining Market Sector Lead, Canada Senior Environmental Scientist

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	June 29, 2020	Initial Report			

Distribution List

# Hard Copies	PDF Required	Association / Company Name
	X	CanWhite Sands Corp.

Prepared for:

CanWhite Sands Corp.

Prepared by:

Yong Ma, P.Eng.
Senior Acoustic Engineer
T: (403) 254-3362
E: yong.ma@aecom.com

AECOM Canada Ltd.
#300, 48 Quarry Park Blvd SE
Calgary, AB, T2C 5P2 Canada

www.aecom.com

Table of Contents

Figures

Tables

Glossary

Attenuation	The reduction of sound intensity achieved by various means (e.g. air, humidity, and porous materials) that may be natural or anthropogenic.
Barrier	An obstacle on the propagation path of sound between a source and a receiver. Obstacles may be composed wholly, or by a combination, of berms, walls, or fences; are free of gaps within or below its extents; and of sufficient mass to prevent significant transmission of sound.
Daytime	Defined as the hours from 07:00 to 22:00.
Day-night Sound Level	Describes a receiver's cumulative noise exposure over a 24 hour period, where nighttime events (22:00 to 07:00) are increased by 10 dB to account for humans' greater sensitivity to noise.
Decibel (dB)	The standard unit of measurement for sound levels. Describes the ratio between the sound pressure under consideration and a reference pressure level. Unless otherwise noted, decibel values relate to a reference pressure level of 2 x 10^{-5} Pascals.
Decibel – "A-Weighted [Network]" (dBA)	A frequency weighting network intended to approximate the response of the healthy human ear to sounds of different frequencies. Overall sound levels calculated or measured using the A-weighting network are indicated by dBA rather than dB.
Energy Equivalent Sound Level – $L_{eq,T}$	The equivalent constant sound level over a specified time period "T" that would have the same sound energy as the actual (i.e. unsteady) time-varying sound over the same period of time.
Frequency	The number of times per second that a sine wave of sound repeats itself. It can be expressed in cycles per second, or Hertz (Hz).
Frequency Weighting	A method used to account for changes in sensitivity as a function of frequency. A, B, and C are most commonly used to account for different responses to sound pressure levels. Note: The absence of frequency weighting is referred to as linear weighting.
Hertz (Hz)	A unit of frequency, expressed as cycles per second.
Insertion Loss	The sound level reduction provided by a noise barrier or other noise mitigation measure.
International Organisation for Standardisation (ISO)	An international body that provides scientific standards and guidelines related to various technical subjects and disciplines.

Mitigation	Measures, such as administrative or engineering methods, to reduce, eliminate, or control impacts on the environment.
Night-time	Defined as the hours from 22:00 to 07:00.
Noise Barrier	Same as barrier.
Noise level	Same as sound level.
Octave	The interval for which the upper band frequency is twice the lower band frequency is an octave. For acoustic measurements, octave bands start at a centre frequency of 1,000 Hz and go either up or down from that point at a 2:1 ratio. The next upper centre frequency is 2,000 Hz, followed by 4,000 Hz, etc. The next lower centre frequency is 500 Hz followed by 250 Hz, etc.
Point of Reception (POR) *or* ***Receptor***	A stationary position, at which sound levels are specified, measured or predicted.
Predictable Worst-Case Operation	A planned and predictable mode of operation for stationary noise source(s) when the source generates the greatest noise impact at a point of reception, relative to the applicable limit.
Sound	A pressure-wave motion in a medium, such as air or water. The pressure-wave propagates to distant points through rapid oscillatory compression/rarefaction in the medium.
Sound Level	Generally, refers to the weighted sound pressure level that may be linear or weighted (e.g., A- or C-weighted) and expressed in decibels.
Sound Level Meter	An instrument used to measure noise and sound levels.
Sound Power Level (L_w)	The total sound energy radiated by a source per unit time (i.e. rate of acoustical energy radiation) measured in Watts. The acoustic power radiated from a given sound source as related to a reference power level (i.e., typically $1E^{-12}$ watts, or 1 picowatt) and expressed as decibels. A sound power level of 1 watt = 120 decibels relative to a reference level of 1 picowatt.
Sound Pressure	The root-mean-square of the instantaneous sound pressures over a specified time interval “T” in the frequency band of interest.
Sound Pressure Level (L_p)	Logarithmic ratio of the root-mean square sound pressure to a reference sound pressure. The reference sound pressure of the threshold of human hearing (i.e., 20 micropascals) is used.

1. Introduction

CanWhite Sands Corp. (CanWhite) is proposing to construct and operate a silica sand Processing Facility south of the hamlet of Vivian, Manitoba and approximately 35 km east of the City of Winnipeg. This proposed sand Processing Facility and associated infrastructure, the Vivian Sand Facility Project (the Project), is being developed for the purpose of supplying high-quality silica sand for use in a variety of industrial markets. AECOM was retained by CanWhite to prepare the Environment Act License (License) application that will be submitted to the Manitoba Conservation and Climate (MBCC) Environmental Assessment Branch (EAB). A separate License application will be submitted for the sand extraction activities required to supply sand to the Processing Facility.

AECOM has completed a noise impact assessment of the Project operations in support of the License application. This report summarizes the methods, assumptions, technical data and prediction results of the assessment.

The Project will have a lifespan of 24 years with an initial annual production rate of 1,360,000 tonnes of silica sand per year at full operation. The proposed Project will consist of the following key activities and components:

- A sand wash and dry facility that will include a 'Wet Plant', a 'Dry Plant' and the following associated components:
    - Two outdoor stockpiles of wet sand ready to be processed;
    - One overs/fines sand reject pile (outdoor) associated with the Wet Plant
    - One overs/fines sand reject pile (outdoor) associated with the Dry Plant;
    - Four dry sand product fully enclosed storage silos;
    - Ancillary structures, including permanent office, staff kitchen, washrooms, operator control centre, maintenance building and storage buildings;
- Rail loop track (approximately 3.5 km length) connecting with a Rail Load Out for direct sand product loading to enclosed railcars, and for railcar storage; and
- A 5 m wide single-lane gravel access road approximately 1 km in length to the Project site, with 1 m wide shoulders on either side for passing.

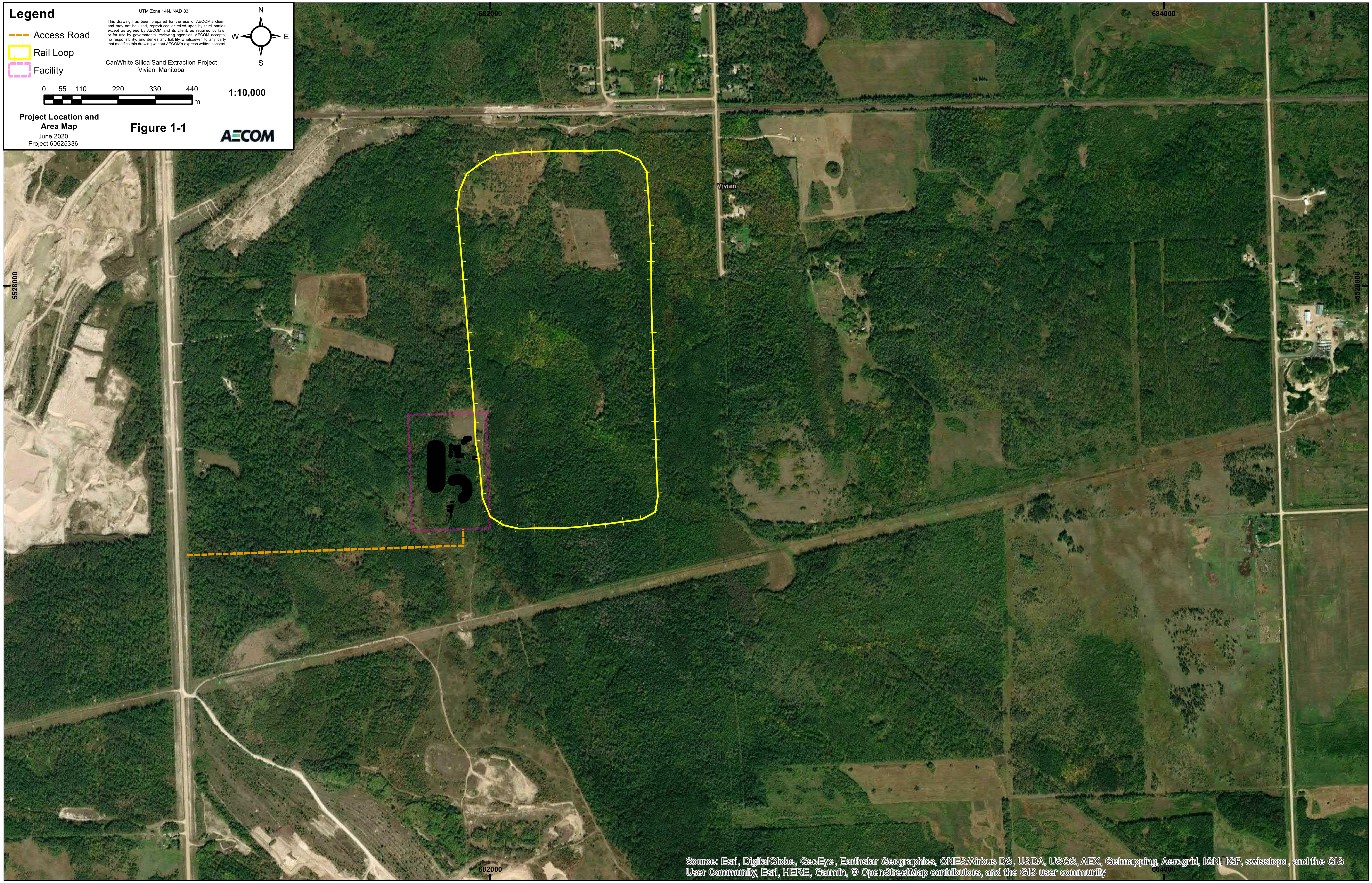
The above-listed components, excluding an existing access road for Project construction and early operation purposes and the above-listed proposed permanent access road, are collectively referred to as the Processing Facility.

Based on the planned equipment use and activities, the Project is not expected to be a source of significant vibration. Therefore, a vibration assessment is not required. Correspondingly, the assessment focuses on the noise effects during the predictable worst-case operation at the most affected point(s) of reception.

The primary sources of noise associated with the Project operations include stationary processing equipment in the Wet Plant and Dry Plant, such as dewatering cyclones/screens and sprays, pumps, dryers and dry screens, and combustion fans, earth-moving equipment (e.g. wheel loader, dozers, grader, and backhoe) and sand transferring and handling equipment including conveyors, trippers and radial stackers.

Project operation activities will occur 24 hours per day, 7 days per week (24/7) for the life of the Project (24 years) except for any shut-down time required for maintenance.

Figure 1-1 provides a scaled area map showing the Project area. Figure 1-2 provides a conceptual sketch of the Wet Plant and Dry Plant site layout.


Legend
Access Road
Rail Loop
Facility
UTM Zone 14N, NAD 83
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Project Location and Area Map
June 2020
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Figure 1-1
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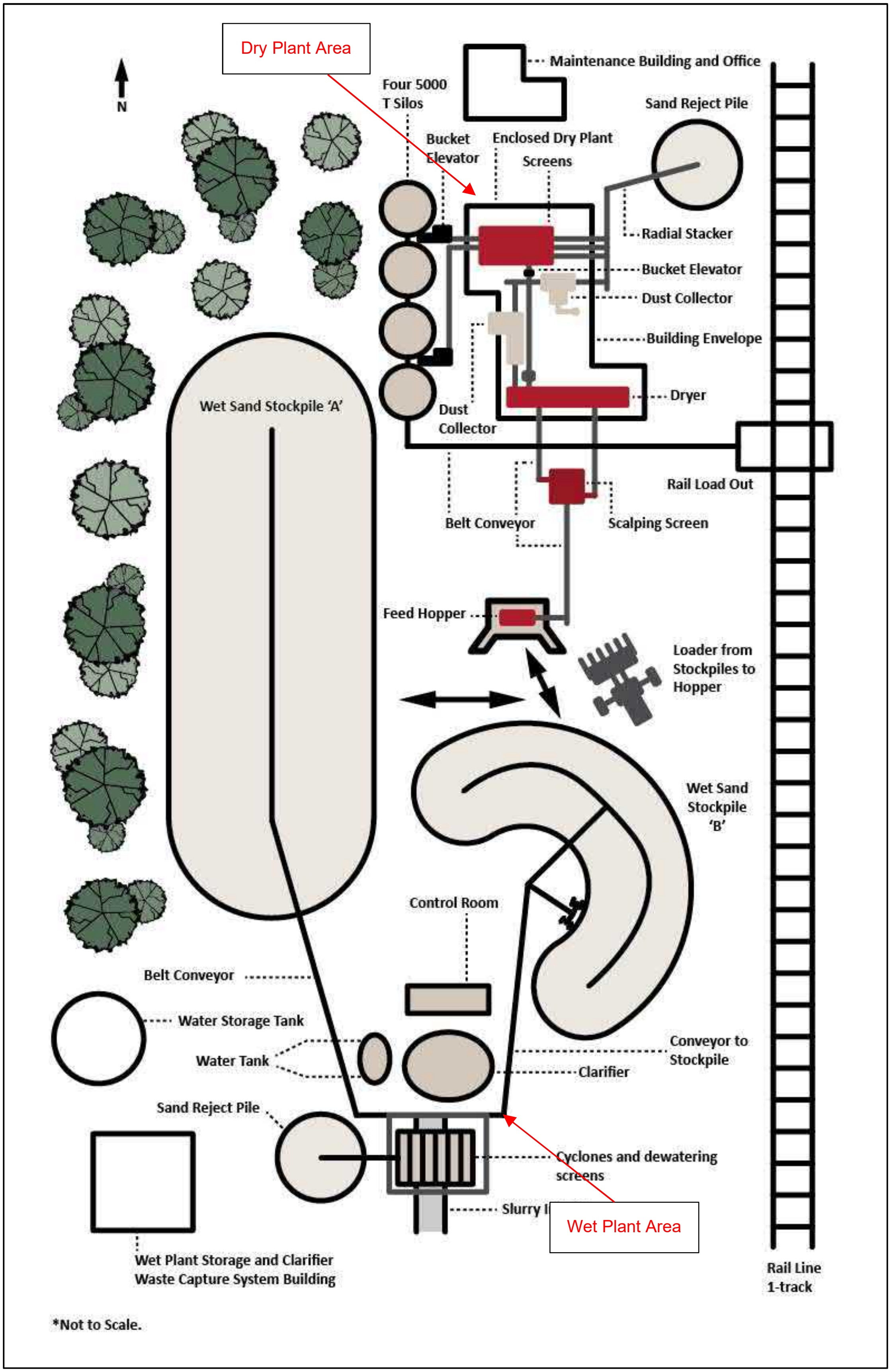
Figure 1-2: Wet Plant and Dry Plant Site Layout



2. Regulatory and Policy Framework

The Province of Manitoba Sustainable Development, Environmental Approvals Branch (previously the Manitoba Environmental Assessment and Licensing Branch) has published the Guidelines for Sound Pollution (MEMD, 2000), which provides quantitative limits on noise emissions to the outdoor environment. These sound level limits have been adopted for this noise impact assessment.

The Guidelines for Sound Pollution (the 'Manitoba Guideline') provides target sound level limits for noise emissions to the outdoor environment at points of reception (PORs). The Manitoba Guideline defines a POR as "any point on the premises of a person where sound originating from other than those premises is received." These target sound level limits are separated by maximum desirable and maximum acceptable sound levels and vary depending on the type of areas including designated residential, commercial and industrial. Table 2-1 presents the Manitoba Guideline sound level objectives for residential areas.

Table 2-1: Manitoba Guideline Sound Level Objectives for Residential Areas – Continuous or Intermittent Sounds

	$L_{eq(24)}$ (dBA)	L_{dn} (dBA)	$L_{eq,(1)}$ (day) 07:00 – 22:00 (dBA)	$L_{eq,(1)}$ (night) 22:00 – 07:00 (dBA)
a) Maximum Desirable Sound Level	-	55	55	45
b) Maximum Acceptable Sound Level				
i) Summer or year-round operations	-	60	60	50
ii) Predominant discrete tone(s) or appreciable impulsive/ impact character	-	55	55	45
iii) Winter operations only or temporary operations	-	65	65	55

The Maximum Desirable Sound Level limits provided above were adopted as the limits for this assessment.

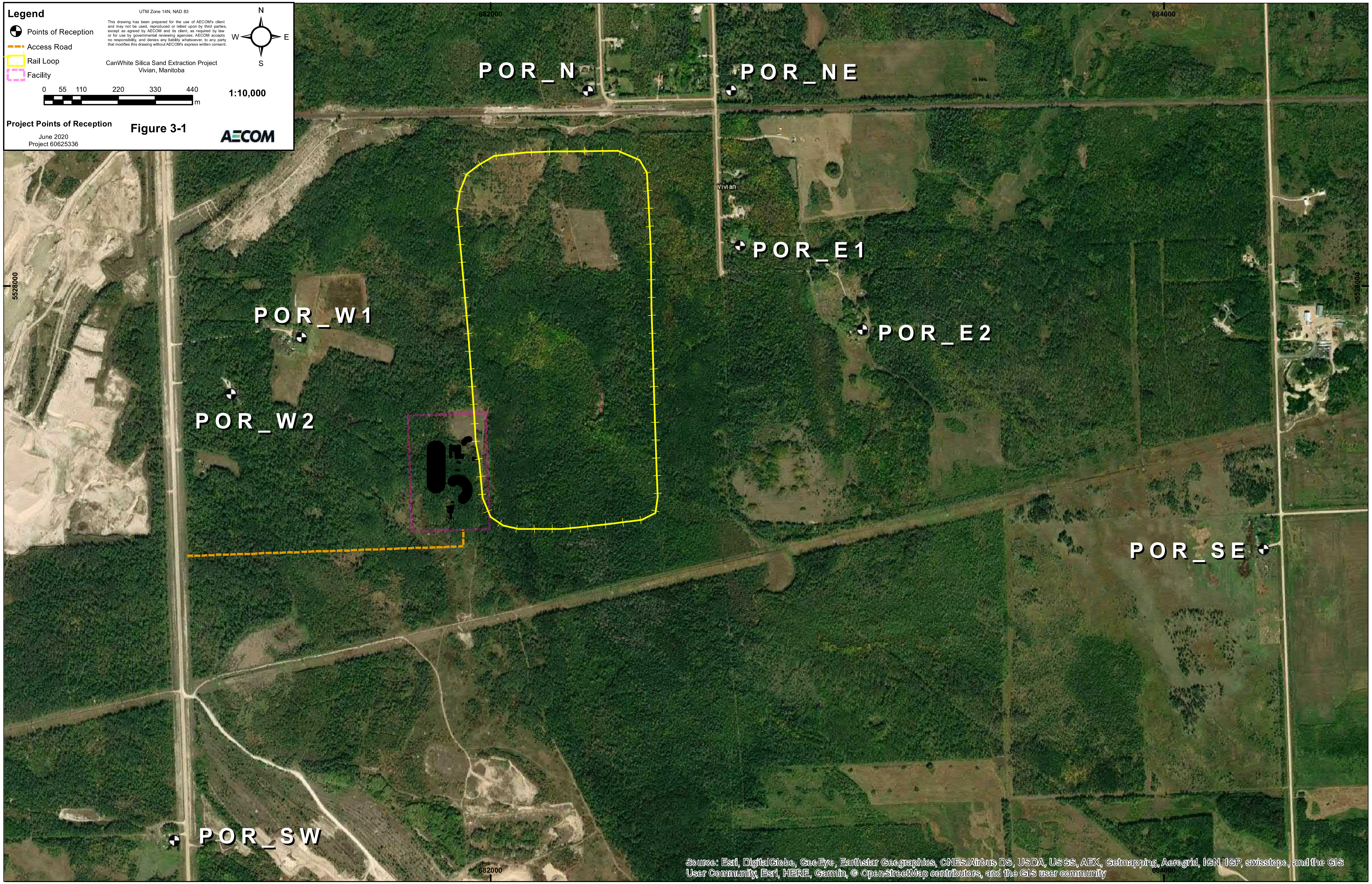
3. Assessment Locations

The nearest points of reception (PORs) were identified based on the planned Project area, operation, and activities and were included in the assessment. These locations are representative of the most exposed noise sensitive residential dwellings surrounding the Project area in each direction. These PORs are summarized in Table 3-1 and illustrated in Figure 3-1.

Table 3-1: Point of Reception Summary Table

POR ID	Location		UTM Coordinates[1]	
	Description	Distance to Center of Processing Area	Easting	Northing
POR_N	Representative of residential dwellings located north of the Project area	1,210 m	682286	5528602
POR_NE	Representative of residential dwellings located northeast of the Project area	1,470 m	682768	5528593
POR_E1	Representative of residential dwellings located east of the Project area	1,130 m	682722	5528139
POR_E2	Single residential dwelling located east of the Project area	1,330 m	683092	5527909
POR_SE	Representative of residential dwellings located southeast of the Project area	2,515 m	684274	5527261
POR_SW	Representative of residential dwellings located southwest of the Project area	1,420 m	681054	5526353
POR_W1	Single residential dwelling located west of the Project area	615 m	681439	5527848
POR_W2	Single residential dwelling located west of the Project area	720 m	681235	5527680

Notes:
1. Reference UTM Zone 14.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Points of Reception
Access Road
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4. Modelling and Data Analysis

Sound propagation calculations were conducted in accordance with International Organisation for Standardisation (ISO) publication Standard 9613-2, Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO, 1996).

Sound propagation predictions were performed using Cadna/A modelling software, authored by DataKustik, which implements the ISO prediction algorithms and is widely used in industrial noise assessment. Sources that emit noise from a stationary position were represented as a point source (e.g. pumps, idling locomotive). Emission sources that emit noise through building facades were represented as vertical or horizontal area sources. Equipment and activities that emit noise along a defined path (e.g. moving trucks and heavy equipment) were included as line sources in the acoustic model. Table 4-1 summarizes the Cadna/A acoustic modelling parameters.

Table 4-1: Modelling Parameters

Item	Model Parameter	Model Setting
1	Temperature	10°C
2	Relative Humidity	70%
3	Propagation Standard	ISO 9613-2
4	Ground Conditions and Attenuation Factor	Ground Absorption (G): • 1.0 (e.g. porous ground covered by grass, trees or other vegetation) outside of Processing Area • 0.2 (e.g. relatively reflective ground) within Processing Area
5	Receptor Height	1.5 m
6	Topography	Generally Flat
7	Foliage Attenuation	Excluded (Conservative Results)
8	Operating Conditions	All equipment operating during day and night-time periods

4.1 Wet Plant

Sand will enter the Wet Plant via the sand and water slurry line from the extraction site where the sand and water will be separated using a dewatering screen which will result in dewatering from 30% solids to approximately 95% solids. Solids that are too large to be used as a final sand product (termed 'overs') will be screened-out, collected on a single conveyor and deposited using a radial stacker to an oversized sand stockpile and stored for future sale to alternate markets.

The equipment and activities anticipated within the Wet Plant were identified and the operating schedules were provided by CanWhite. These operating noise sources were included in the acoustic model predictions. The noise modelling of the wet processing operations incorporated the following conditions or assumptions:

- Activities occur 24 hours in a given day.
- Noise due to the office building HVAC equipment and maintenance building activities will be negligible compared to other noise sources at the Wet Plant.
- The following major stationary equipment will be located outdoors within the Wet Plant area:
  - Eight (8) GIW Slurry Pumps;
  - Four (4) Dewatering Screens and two (2) DW Screen Sprays;
  - One (1) Clarifier Rake Drive and One (1) Clarifier Rake Lift;

- One (1) Underflow Pump, one (1) WG Gland Water Booster Pump, and One (1) Water Supply Pump;
- Chemical System, including one (1) Chemical Batch Pump, one (1) Gland Water Supply, one Hoist, one (1) Chemical Auger, two (2) Floc Tank Mixers, one (1) Floc Pump, and one (1) Air Compressor; and
- One (1) enclosed Filter Belt Press system.

- Conveyors, Tripper and Radial Stacker to transfer sands to the two wet sand stockpiles; Stockpile A and Stockpile B.
- Mobile equipment at the Wet Plant area will operate as follows:
  - One (1) Wheel Loader (CAT 980H) operating 100% of each hour during daytime and nighttime; and
  - One (1) Backhoe Loader (CAT 415F) operating no more than 17% of each hour during daytime and nighttime.
- Mobile sources that may operate within the Wet Plant area have been modelled using corresponding area sources at a source height of 2 m above grade; and
- Stationary sources have been modelled as point sources operating within the Wet Plant area, at a specified source height.

4.2 Dry Plant

A front-end loader will feed stockpiled wet sand that has been through the Wet Plant from the stockpile area to a hopper feeding onto a conveyor which will bring the wet sand into the Dry Plant, starting with the dryer. Once the sand leaves the dryer it moves to screening and quality control where it passes over screens to separate the sand into required product sizes. The different sizes of sand product will then be conveyed to outdoor fully contained (enclosed) storage silos. To control dust, the entire Dry Plant will be enclosed. The dryer is equipped with a baghouse to capture dust generated from the drying process. The fabric dust filters will be changed regularly as per manufacturer specifications, with the used filters properly contained and disposed of in accordance with regulatory requirements. All conveyors after the dryer are enclosed (587 m of conveyance), with all transfer points under negative pressure to control dust along the conveyance system.

The equipment and activities anticipated within the Dry Plant were identified and the operating schedules were provided by CanWhite. These operating noise sources were included in the acoustic model predictions. The noise modelling of the dry processing operations incorporated the following conditions or assumptions:

- Activities occur 24 hours in a given day.
- A Dry Plant building housing one (1) dryer combustion fan with motor, and one (1) Rotex Screener.
- The following major stationary equipment will be located outside the Dry Plant building:
  - One (1) exhaust fan opening for the Dryer Baghouse; and
  - One (1) exhaust fan opening for the Nuisance Baghouse.
- All Vent Dust Collectors are installed outdoor and include:
  - Four (4) Silo Bin Vent Dust Collectors;
  - Five (5) Loadout Bin Vent Duct Collectors; and
  - Four (4) Loadout Spouts.
- All conveyors after the dryer are fully covered as indicated by CanWhite.
- Mobile equipment at the Dry Plant area will operate as follows:

  - One (1) maintenance Wheel Loader (CAT 924H) operating 17% of each hour during daytime and 10% during nighttime;
  - One (1) Skid Steer (CAT 246D3) operating 17% of each hour during daytime and 10% during nighttime;
  - One (1) Dozer (CAT D6) operating 8% of each hour during daytime and nighttime;
  - One (1) Grader (CAT 14G) operating 8% of each hour during daytime and nighttime;
  - Six (6) crew F150 trucks operating 17% of each hour during daytime and 10% during nighttime;
  - Four (4) maintenance F350 trucks operating 25% of each hour during daytime and 17% during nighttime; and
  - One (1) Railcar Mover operating 17% of each hour during daytime and 10% during nighttime.
- Mobile sources that may operate within the Dry Plant area have been modelled using corresponding line sources and area sources at a source height of 2 m above grade; and
- Stationary sources have been modelled as point and area sources operating within the Dry Plant area, at a specified source height.

4.3 Rail Loop

Sand product will be transported out of the Project site to markets by enclosed freight railcars. A single rail loop track approximately 3.5 km in length leading off the existing main CN line will be used for train car storage which will keep trains off the main CN line and will allow for efficient sand product loading of railcars at the Rail Load Out area. Railcars will be brought in by locomotive and pulled through the rail loop while the sand product is loaded into each railcar at the Rail Load Out. The shape of the rail loop will allow the locomotive to pull the train through the Rail Load Out without the need to regularly decouple or couple individual railcars. Loading will take place as trains arrive anytime within a 24-hour, 7 day a week period, with one to four trains leaving per week (annual average of approximately 3 trains per week). A diesel railcar mover, which is much smaller than a locomotive, will be on site if a railcar needs to be removed from the train (e.g. for maintenance). The railcar mover will not be regularly needed to load the railcars.

The dry sand product will be transported on enclosed conveyors from the sand storage silos to a Rail Load Out area and the sand will then be loaded into enclosed grain hopper-type railcars. A train will consist of one (1) diesel locomotive and approximately 100 railcars, with each train length being approximately 1.3 km long.

The loading activities and train anticipated on the rail loop were identified and the operating schedules were provided by CanWhite. These operating noise sources were included in the acoustic model predictions. The noise modelling of the train operations incorporated the following conditions or assumptions:

- Jointed tracks implemented at the rail loop.
- Sand loading will take place continuously throughout the day as trains arrive; 12 to 24 hours will be required to load all railcars in a single freight train. When the railcars are being loaded, the locomotive will idle continuously.
- One (1) train will enter the rail loop during the daytime and one (1) during the nighttime.
- The train will enter the rail loop and proceed along the east leg towards the west leg.
- The average train speed on the rail loop is at 10 km/hr.

- During railcar loading, the locomotive is idling and contributing to noise emission; the railcars are not producing noise.
- The loading process will take approximately 12 to 24 hours per train.
- In accordance with the recommendations from the Canadian Transportation Agency (CTA), noise prediction methods from the US Federal Transit Administration (FTA) were used to calculate the noise contributions from the train. Sound level data from the U.S. Federal Railroad Administration (FRA) and the FTA were also used to represent the noise emissions due to the locomotive and railcars.

4.4 Access Road

An approximately 1 km long gravel access road will connect the southwest corner of the Project site with Provincial Road 302. The access road will be used by employees travelling in/out of the site for daily shift-work; trucks delivering fuel and parts once per week; and water trucks spraying the access road for dust mitigation. The vehicle activities and associated noise sources were included in the acoustic model predictions. The noise modelling of the access road incorporated the following conditions and assumptions:

- The speed limit for the access road is at 30 km/hr.
- A maximum fifty (50) light vehicles (including pickup trucks, part delivery van and employee’s cars) will travel in/out of the site during any given hour period (worst-case scenario, such as an evacuation event), during daytime or nighttime.
- Maximum two (2) rig trucks for delivery of parts travel in/out of the site during a one (1) hour period, during daytime or nighttime.
- One (1) fuel truck travels in/out of the site during a one (1) hour period, during daytime or nighttime.
- One (1) water truck travels at 15 km/hr during a one (1) hour period, during daytime or nighttime.

5. Noise Source Summary

Modelled noise source emissions were established using a combination of past measurements of similar equipment and industry-accepted reference sound level data for rail and construction equipment. Table 5-1 summarizes the noise sources and emissions included in the acoustic modelling.

Table 5-1: Project Noise Sources

Equipment	Sound Power Level (dB) in Octave Band Centre Frequency (Hz)								Overall (dBA)	Quantity per hour	Usage Per Hour (%)	Notes
	63	125	250	500	1000	2000	4000	8000				
Wet Plant - Stationary Sources												
No 1 P04 GIW Slurry Pump	86	84	83	82	80	74	72	69	84	4	100	2,3
No 2 SC04 Dewatering Screens	103	101	104	100	98	94	89	84	103	2	100	2,3
P07 1, 2 Dewatering Screens	103	101	104	100	98	94	89	84	103	2	100	2,3
P05 (A-D) GIW Slurry Pump	81	78	80	78	76	75	69	65	81	4	100	2,3
RD1 Clarifier Rake Drive	81	78	80	78	76	75	69	65	81	1	100	2
RD1 Clarifier Rake Lift	64	61	63	61	59	58	52	48	64	1	2	1,2
P06 Underflow Pump	83	81	80	79	77	71	69	66	81	1	50	1,2
P07 DW Screen Spray	86	84	82	81	78	74	72	68	83	2	100	2,3
P08 Mine Water Supply	89	87	86	83	81	80	77	73	87	1	100	2
P08-1WG Gland Water Booster Pump	80	78	76	73	71	70	67	63	77	1	100	2
P11 Gland Water Supply	86	84	82	81	78	74	72	68	83	1	100	2
P12 Chemical Batch Pump	75	72	74	72	70	69	63	59	75	1	25	1,2
AUG1 Chemical Auger	74	72	70	67	65	64	61	57	71	1	25	1,2
P13 Floc Pump	80	78	76	73	71	70	67	63	77	1	100	2
AG1/AG2 Floc Tank Mixer	75	72	74	72	70	69	63	59	75	2	25	1,2,3
AC4 Air Compressor	69	67	65	62	61	60	57	52	67	1	33	1,2
Hoist	64	61	63	61	59	58	52	48	64	1	2	1,2
Filter Belt Press Building Breakout	86	88	86	83	81	80	70	66	86	1	100	1,4
Wet Plant – Outdoor Conveyors												
Conveyor	65	72	72	81	76	68	54	41	80	2	100	3,4,7
Tripper	65	72	72	81	76	68	54	41	80	1	100	4,7
Radial Stacker A	65	72	72	81	76	68	54	41	80	1	100	4,7
Radial Stacker B	65	72	72	81	76	68	54	41	80	1	50	1,4,7
Wet Plant – Mobile Sources												
Wheel Loader CAT 980H	109	109	98	100	96	94	93	85	103	1	100	4,6
Backhoe Loader CAT 415F	93	98	101	96	94	91	85	79	99	1	17	1,4,6

Equipment	Sound Power Level (dB) in Octave Band Centre Frequency (Hz)								Overall (dBA)	Quantity per hour	Usage Per Hour (%)	Notes
	63	125	250	500	1000	2000	4000	8000				
Dry Plant – Stationary Sources												
Dry Plant Building Walls and Roof	91	88	88	86	83	77	72	68	88	-	100	5,8
Dryer Baghouse Exhaust Fan Stack	107	105	101	99	96	91	86	81	101	1	100	4,8
Nuisance Baghouse Exhaust Fan Stack	105	103	100	98	95	90	84	80	100	1	100	4,8
Silo Bin Vent Dust Collector	88	86	87	85	83	80	75	72	88	4	100	3,4
Loadout Bin Vent Dust Collector	88	86	87	85	83	80	75	72	88	5	100	3,4
Loadout Spout Dust Collector	88	86	87	85	83	80	75	72	88	4	100	3,4
Dry Plant – Partially and Fully Enclosed Conveyors												
Infeed Conveyor – Partially Enclosed	65	71	69	76	71	62	48	35	75	1	100	4,7
Dry Feed Conveyor - Partially Enclosed	65	71	69	76	71	62	48	35	75	2	100	3,4,7
Dryer Discharge Conveyor – Fully Enclosed	63	67	64	70	62	52	34	21	68	2	100	3,4,7
Silo Product Conveyor – Fully Enclosed	63	67	64	70	62	52	34	21	68	3	100	3,4,7
Trash Conveyor – Fully Enclosed	63	67	64	70	62	52	34	21	68	2	100	3,4,7
Radial Stacker – Fully Enclosed	63	67	64	70	62	52	34	21	68	1	100	4,7
Dry Plant – Mobile Sources												
Wheel Loader CAT 924H	101	101	90	92	88	86	85	77	95	1	17/Day	1,4,6
	99	99	88	90	86	84	83	75	93	1	10/Night	1,4,6
Skid Steer CAT 246D3	93	98	92	89	83	79	74	69	91	1	17/Day	1,4,6
	91	96	90	87	81	77	72	67	88	1	10/Night	1,4,6
Dozer CAT D6	93	102	91	91	98	96	89	83	102	1	8 Day & Night	1,4,6
Grader CAT 14G	95	100	103	98	96	93	87	81	101	1	8 Day & Night	1,4,6
F150 Truck	82	87	90	85	83	80	74	68	88	6	17/Day	1,3,4,6
	80	85	88	83	81	78	72	66	86	6	10/Night	1,3,4,6
F350 Truck	84	91	94	89	87	84	78	72	92	4	25/Day	1,3,4,6
	82	89	92	87	85	82	76	70	90	4	17/Night	1,3,4,6
Railcar Mover	90	92	95	90	88	85	79	73	93	1	17/Day	1,4,6

Equipment	Sound Power Level (dB) in Octave Band Centre Frequency (Hz)								Overall (dBA)	Quantity per hour	Usage Per Hour (%)	Notes
	63	125	250	500	1000	2000	4000	8000				
	88	90	93	88	86	83	77	71	91	1	10/Night	1,4,6
Railcar Loading	91	95	97	94	91	89	84	80	97	1	100	4
Access Road												
Light Vehicle	85	90	93	88	86	83	77	71	91	50		3,4,6,12
Rig Truck	92	95	97	93	91	88	82	76	96	2		3,4,6,12
Fuel Trailer	95	93	96	95	92	90	87	83	98	1		3,4,6,12
Water Spray Truck	96	97	91	95	89	90	86	81	97	1		3,4,6,12
Rail Loop												
Locomotive Idling	106	92	86	80	80	88	81	80	92	1	100	4,8,9
Train with 1 Locomotive and 100 Railcars (Lp at 50 ft)									59.9	1		10,11
Freight Train Locomotive (Lp at 50 ft)									57.2	1		10,11
Freight Train Railcars (100 car consist) (Lp at 50 ft)									56.5	1		10,11

Notes:

1. Sound power level includes estimated utilization adjustments.
2. Based on manufacturer specifications provided by CanWhite.
3. Single unit sound power level, unadjusted for quantity.
4. Based on past measurement data or database of similar equipment.
5. Sound power level per square metre.
6. Pass-by sound power level.
7. Sound power level per metre.
8. Acoustic Calculations.
9. Emissions normalized to overall sound power level from FTA.
10. Prediction according to FTA methodology.
11. FRA sound level at 50 ft.
12. Sound power level includes speed adjustments.

6. Modeling Results

6.1 Modeling Scenarios

The Project operations include the Wet Plant and Dry Plant, railcar loading and train movement at the Project site. Therefore, noise emissions from the entire Project will include noise from the Processing Facility operating, railcar loading (including locomotive idling) and train pass-by. Considering the MEMD noise guidelines described in Section 2, which set forth the $L_{eq,1HR}$ sound level limits during the day and night periods, the acoustic assessment evaluated the worst-case scenarios that may occur during one hour of operation to determine the maximum potential noise impact at the PORs. Considering the Project layout, the locations of the PORs and the Project operation arrangements, the following two (2) scenarios were modelled:

1. **Scenario 1 – Train Entering Loop from West Spur and Leaving from West Spur:**

    a) The train would enter the rail loop from the west entry, proceed southbound along the east leg of the loop, and stop such that the last railcar is at the Load Out location. The locomotive would then decouple, travel through the loop and re-couple with the railcar at the Load Out location. This sequence of events was modelled to occur within a one (1) hour period. While these events occur, the Processing Facility would also be in operation.

    b) Once all railcars are loaded, the train would depart travelling northbound along the east leg of the loop, pass POR_E1, then leave the loop from the west entry. While these events occur, the Processing Facility would also be in operation.

    Note that sequences a) and b) described above would not occur within the same one-hour period. Comparing the noise exposure due to each of these sequences, sequence a) represents the worst-case under Scenario 1 and consists of continuous facility noise; one (1) train pass-by; and one (1) locomotive only pass-by after the decoupling described in sequence a).

2. **Scenario 2 – Train Entering Loop from West Spur and Leaving from East Spur**:

    a) The train would enter the rail loop from the west spur, proceed southbound along the east leg and stop such that the first railcar is at the Load Out location. Once a railcar is completely loaded, the locomotive would pull the train forward to load the next railcar. While these events occur, the Processing Facility would also be in operation.

    b) Based on the length of the train, the locomotive would be idling near POR_N when the last railcar is being loaded. Once the last railcar is loaded, the train would depart southbound along the east leg and exit the loop from the east spur. While these events occur, the Processing Facility would also be in operation.

    Note that sequences a) and b) described above would not occur within the same one-hour period. Comparing the noise exposure at POR_N due to each of these sequences, sequence b) represents the worst-case under Scenario 2 and consists of locomotive idling; noise due to one (1) train pass-by; and continuous Processing Facility noise.

Note that the current acoustic modeling evaluates the noise emissions from the access road and Project site activities only; and excludes the existing background noise levels and the noise contributions due to the main CN train line.

6.2 Modeling Results

The daytime and nighttime 1-hour equivalent sound levels L_d and L_n, and day-night equivalent sound levels L_{dn}, were predicted at the identified receptors.

Table 6-1 and Table 6-2 present the acoustic modeling prediction results and compares them to the guideline sound level limits.

Table 6-1 summarizes the results for Scenario 1. The results indicate that the Project noise levels using Scenario 1 are predicted to not exceed the noise guideline limits at all receptors.

Figure 6-1 illustrates the predicted L_d and L_n noise levels and noise propagation contour lines due to the Project for Scenario 1.

Table 6-1: Predicted Noise Levels from Project – Scenario 1

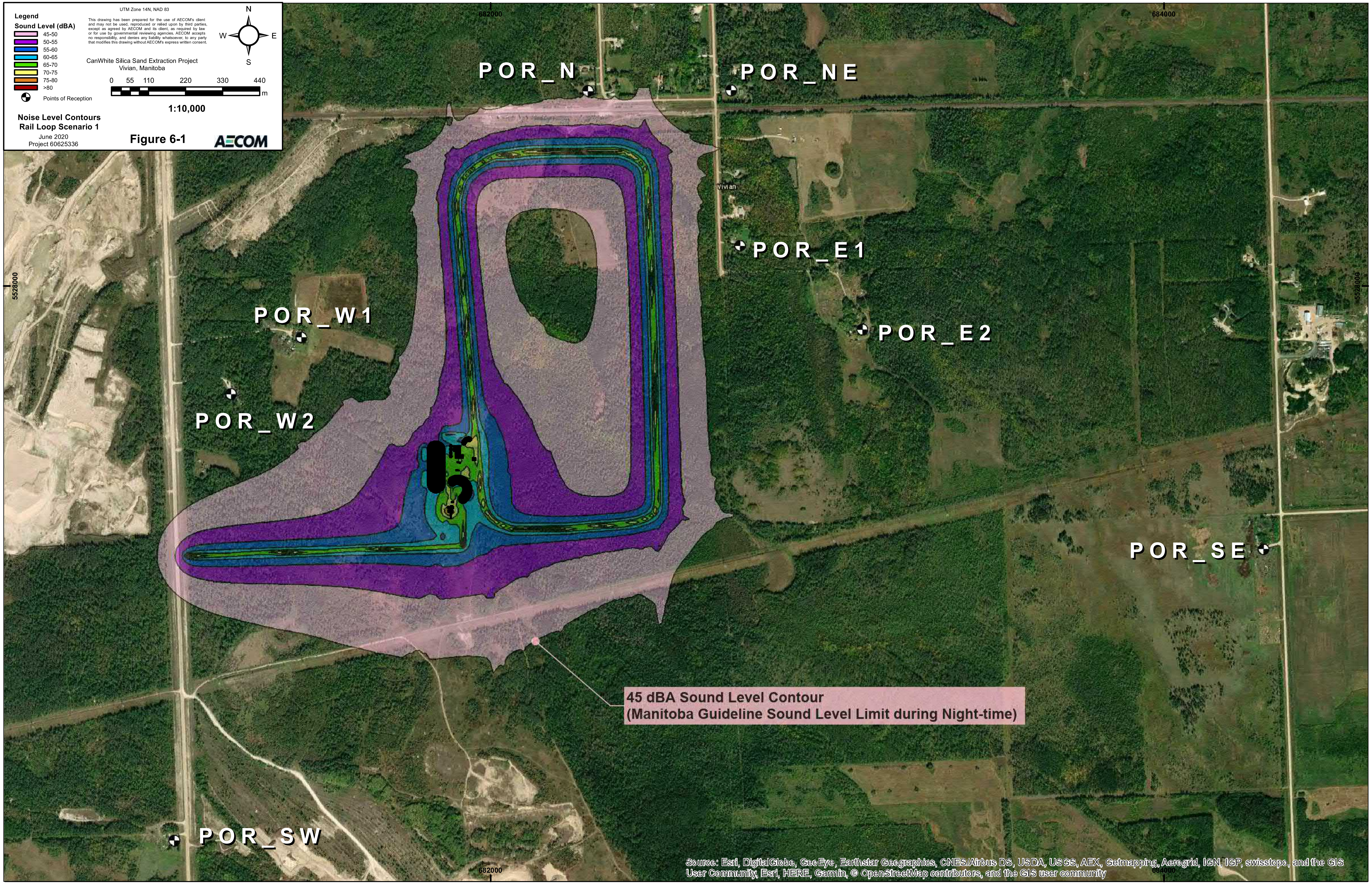
POR ID	Noise Contribution from Project Operation (dBA)			Sound Level Limit (dBA)			Meets Sound Level Limit Criteria? (Y/N)[1]		
	Daytime ($L_{eq,1HR}$)	Nighttime ($L_{eq,1HR}$)	Day-Night Equivalent (L_{dn})	Daytime ($L_{eq,1HR}$)	Nighttime ($L_{eq,1HR}$)	Day-Night Equivalent (L_{dn})	Daytime	Nighttime	Day-Night Equivalent
POR_N	43.9	43.9	50.3	55	45	55	Y	Y	Y
POR_NE	38.5	38.5	44.9	55	45	55	Y	Y	Y
POR_E1	41.0	40.9	47.3	55	45	55	Y	Y	Y
POR_E2	36.2	36.1	42.5	55	45	55	Y	Y	Y
POR_SE	27.7	27.6	34.0	55	45	55	Y	Y	Y
POR_SW	34.2	34.2	40.6	55	45	55	Y	Y	Y
POR_W1	41.1	41.0	47.4	55	45	55	Y	Y	Y
POR_W2	40.7	40.6	47.0	55	45	55	Y	Y	Y

Table 6-2 summarizes the results for Scenario 2. The results indicate that the Project noise levels using Scenario 2 are predicted to not exceed the noise guideline limits at all receptors.

Figure 6-2 illustrates the predicted L_d and L_n noise levels and noise propagation contour lines due to the Project for Scenario 2.

Table 6-2: Predicted Noise Levels from Project – Scenario 2

POR ID	Noise Contribution from Project Operation (dBA)			Sound Level Limit (dBA)			Meets Sound Level Limit Criteria? (Y/N)[1]		
	Daytime ($L_{eq,1HR}$)	Nighttime ($L_{eq,1HR}$)	Day-Night Equivalent (L_{dn})	Daytime ($L_{eq,1HR}$)	Nighttime ($L_{eq,1HR}$)	Day-Night Equivalent (L_{dn})	Daytime	Nighttime	Day-Night Equivalent
POR_N	43.7	43.7	50.1	55	45	55	Y	Y	Y
POR_NE	37.7	37.6	44.0	55	45	55	Y	Y	Y
POR_E1	39.6	39.6	46.0	55	45	55	Y	Y	Y
POR_E2	35.3	35.3	41.7	55	45	55	Y	Y	Y
POR_SE	27.0	26.9	33.3	55	45	55	Y	Y	Y
POR_SW	34.2	34.1	40.5	55	45	55	Y	Y	Y
POR_W1	41.2	41.1	47.5	55	45	55	Y	Y	Y
POR_W2	40.7	40.7	47.1	55	45	55	Y	Y	Y


Legend
Sound Level (dBA)
45-50
50-55
55-60
60-65
65-70
70-75
75-80
>80
Points of Reception
UTM Zone 14N, NAD 83
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CanWhite Silica Sand Extraction Project
Vivian, Manitoba
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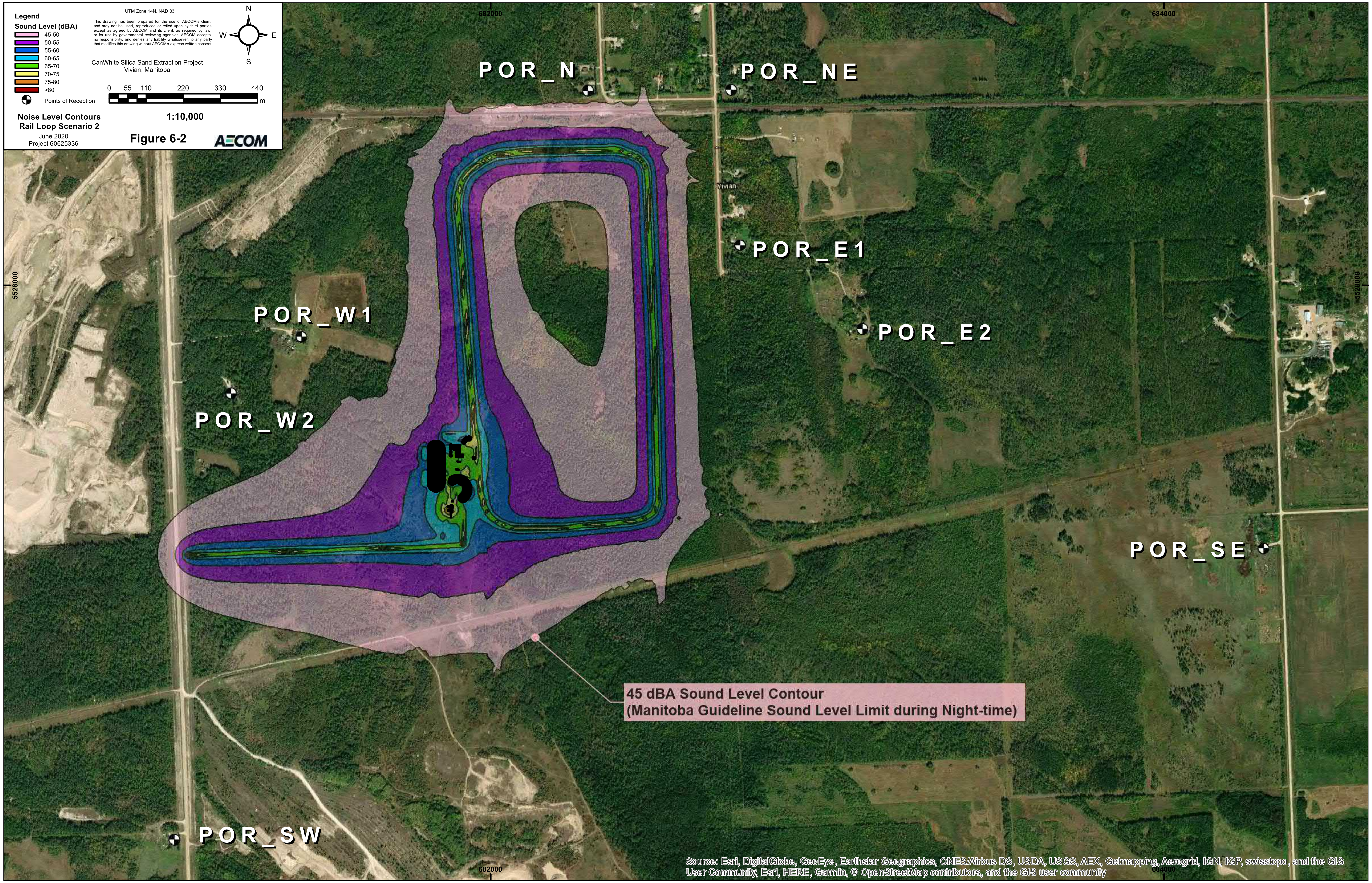
1:10,000
Noise Level Contours
Rail Loop Scenario 1
June 2020
Project 60625336
Figure 6-1
682000
684000
5528000
POR_N
POR_NE
Vivian
POR_E1
POR_E2
POR_W1
POR_W2
POR_SE
POR_SW
45 dBA Sound Level Contour
(Manitoba Guideline Sound Level Limit during Night-time)
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community



Legend
Sound Level (dBA)
45-50
50-55
55-60
60-65
65-70
70-75
75-80
>80
Points of Reception
UTM Zone 14N, NAD 83
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N
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CanWhite Silica Sand Extraction Project
Vivian, Manitoba
0 55 110 220 330 440 m
Noise Level Contours
Rail Loop Scenario 2
June 2020
Project 60625336
1:10,000
Figure 6-2
682000
684000
5528000
POR_N
POR_NE
Vivian
POR_E1
POR_W1
POR_E2
POR_W2
POR_SE
45 dBA Sound Level Contour
(Manitoba Guideline Sound Level Limit during Night-time)
POR_SW
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS user community

7. Mitigation Measures

Based on the assumptions and equipment noise emissions described in Section 4 and Section 5, and noise modeling results in Section 6, the noise impacts due to the Project are predicted to not exceed the Manitoba Guidelines for Sound Pollution limits. No additional noise mitigation measures beyond the current Project description are required for the Project.

The highest noise impacts due to the Project are predicted at dwellings located along Park Street and Station Road. At these dwellings, the rail loop is predicted to be the most significant noise source. To confirm the Project's compliance with the applicable sound level limits at the Park Street and Station Road dwellings, CanWhite will implement a noise monitoring program immediately upon commissioning and operation of the rail loop.

The requirement for mitigation measures should be re-examined during the detailed design stage to maintain Project compliance with the applicable sound level limits.

8. Construction Noise

Construction activities have the potential to generate noise impacts at receptor locations. Noise from construction activities can be controlled in numerous ways, including operational restrictions, source mitigation measures, as well as receptor-based mitigation measures. The following measures may be implemented throughout construction to reduce the noise impacts at sensitive receptors:

- Operate in accordance with local by-laws whenever possible;
- If construction needs to be undertaken outside of the normal daytime hours, local residents shall be informed beforehand of the type of construction planned and the expected duration;
- Keep equipment well-maintained and fitted with efficient muffling devices;
- Idling of equipment will be restricted to the minimum necessary to perform the specified work;
- Vehicles employed continuously on site for extended periods of time (2 to 4 weeks) are fitted with visual warning systems or sound reducing back-up (reversing) alarms;
- Avoid unnecessary revving of engines and switch off equipment when not required (do not idle);
- Minimize drop heights of materials; and

The following additional mitigation measures may be considered and implemented to further reduce noise effects during construction, if required:

- Offset usage of active heavy equipment (schedule non-concurrent use);
- Reroute construction and truck traffic, when possible;
- Coordinate 'noisy' operations such that they will not occur simultaneously, where possible;
- Where possible, investigate and implement the use of alternative construction equipment or methods to reduce noise emissions from construction. Utilize alternative equipment that generates lower noise levels or optimize silencer/muffler/enclosure performance;
- Line chutes and dumpers to reduce impact noise, where needed;
- Investigate enclosures, noise shrouds or noise curtains around noisy equipment, where needed; and

- Investigate temporary noise barriers/solid construction hoarding on site boundary to screen affected locations, where needed.

9. Conclusion

Noise impacts on the surrounding environment due to the Vivian Sand Facility Project were predicted using acoustic modeling. Provided that the Project activities and equipment operate within the assumptions described in this report, the noise impacts due to the Project are predicted to not exceed the Manitoba Guidelines for Sound Pollution limits.

The results of the noise impact assessment incorporate the most recent Project information available for Project operations, as of June 2020. Should any changes to of the Project assumptions occur (e.g. new equipment, facility layout, equipment usage, etc.), the affected Project components and activities should be reassessed to verify that the guidance sound level limits are not exceeded; and develop a suite of noise mitigation measures, if necessary.

10. References

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