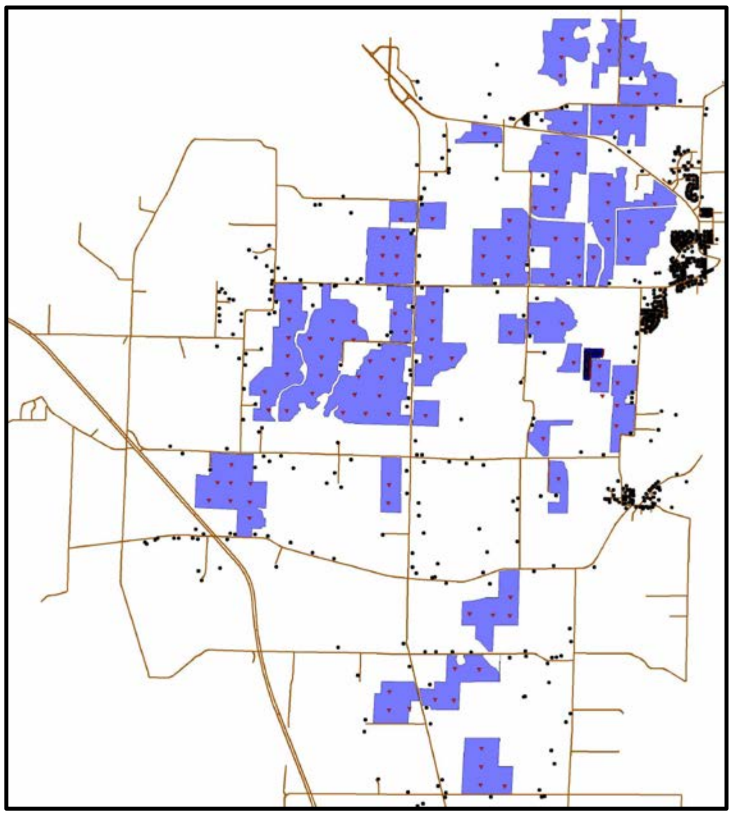
Pre-Construction Noise Analysis

for the proposed

Koshkonong Solar Energy Center

April 9, 2021



Prepared for:

Koshkonong Solar Energy Center LLC
Chicago, Illinois

Prepared by:

Hankard Environmental, Inc.
Verona, Wisconsin

HANKARD ENVIRONMENTAL
ACOUSTICS AND VIBRATION CONSULTING

Contents

Figures

Tables

Executive Summary

Koshkonong Solar Energy Center LLC (Koshkonong Solar), a wholly-owned subsidiary of Invenergy Solar Development North America LLC and an affiliate of Invenergy LLC (Invenergy), is preparing an application for a Certificate of Public Convenience and Necessity (CPCN) to the Public Service Commission of Wisconsin (PSC) to construct and place in utility service the Koshkonong Solar Energy Center (Project). The Project is a photovoltaic solar electric generation facility with a generation potential of 300 megawatts (MW) and on-site facilities are expected to include a Battery Energy Storage System (BESS). One element of the CPCN application is an analysis of noise from the Project according to the PSC's *Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants (*November 2008). This report describes the results of that analysis which consisted of determining the location of all noise-sensitive receptors located near the Project, measuring existing noise levels within and near the Project (Project Area), predicting both construction and operational noise levels at all identified noise-sensitive receptors, and comparing the resulting levels to acoustical standards.

Noise-producing elements of the operation of the Project include inverters, primary step-up transformers, and battery cooling systems. Solar inverters will be distributed throughout the Project and, depending on the model selected, may have associated transformers and cooling systems co-located. Noise will also be emitted from the Project Substation (Substation) located north of the gravel pit on Koshkonong Road where primary step-up transformers will be located. Noise would also be emitted from inverters, transformers, and cooling systems located at the BESS, which is located north of the Substation. Relative to other forms of electric generation, noise from these systems and facilities is relatively low. Also present in the Project are tracking motors that move solar panels throughout the day, smaller transformers, and other ancillary equipment. Based on measurements conducted by Hankard Environmental at operating solar facilities, these sources are not an audible source of noise off-site and were not included in the analysis.

An ambient noise survey was conducted in the Project Area during March of 2021. Sources of existing noise most commonly observed included natural sounds (birds, wind), distant traffic (Interstate 39/90, Route 73, and Highway 12/18), and local traffic. Less frequently observed noise sources included agricultural equipment, aircraft overhead, and distant dog barks. Based on a series of "hand held" measurements, existing noise levels during the day ranged from 34 to 63 dBA and were strongly correlated with local traffic and wind conditions. The continuous monitors recorded noise levels at night as low as 29 dBA and the highest level measured was approximately 67dBA. For areas removed from traffic, typical noise levels were in the 30's (dBA) under light wind conditions, 40's (dBA) during moderate winds, and 50 dBA or higher when it was windy.

Because Wisconsin has no specific noise limits applicable to solar generation facilities, noise level predictions for Project operation were compared to the Wisconsin regulation for noise produced by wind energy systems (PSC 128.14(3)), which limits noise levels to 50 dBA during the daytime and 45 dBA at night at non-participating noise-sensitive receptors. The Project established its own internal goal of meeting a standard of 45 dBA by a substantial (e.g., 3 dBA) margin.

Based on the current design of the Project, assumptions regarding the design of the BESS, and assumptions regarding noise reduction measures to be included in the design, noise levels from the operation of the Project were predicted at each noise sensitive receptor identified within and around the Project Area (691 receptors, mainly residences). Daytime operation of the Project, which was modeled to consist of all inverters, the Substation, and the BESS operating at maximum capacity, is predicted to generate noise levels ranging from 17 to 42 dBA at the receptors. Nighttime noise levels were predicted assuming that (1) the Substation was energized but producing a noise level 3 dBA less than daytime operation due to the fact that no cooling systems will operate; (2) the BESS was operating fully (potentially discharging energy); and (3) all solar inverters were off. During nighttime operations, predicted noise levels at the receptors located nearest to the Substation/BESS range from approximately 24 to 41 dBA and noise levels at residences located near only solar array inverters drop off to insignificant and inaudible levels. All of the predicted levels are well below the PSC's wind turbine daytime and nighttime noise level standards of 50 dBA and 45 dBA, respectively.

These predicted operational noise levels are based on assumptions regarding the type and location of inverters, the technology chosen for the BESS, the location of the BESS and Substation, and the inclusion of some form of noise reduction measures at the Substation and BESS. Our analysis shows that noise levels from the BESS/Substation should be reduced by approximately 5 dBA through some means of which feasible options exist (e.g., specifying quieter equipment, constructing walls around specific equipment). As the design of the Project is finalized prior to construction, and as equipment noise emission factors and locations become more defined, this noise analysis should be updated to ensure that noise levels at all non-participating noise-sensitive receptors continue to be predicted to be less than the 50 dBA daytime and 45 dBA nighttime standards.

Noise-producing equipment to be employed during construction includes bulldozers, excavators, trucks, vibratory post setters, and cranes. Noise levels were predicted for the site preparation, civil work (grading, etc.), mechanical assembly, and electrical assembly phases of construction. Noise levels from construction will vary greatly at any one receptor and will depend on the type of equipment used and how far away it is being operated. A typical bulldozer has a noise level of 80 to 85 dBA at a distance of 50 feet. If two equally-loud bulldozers were operating simultaneously, noise levels would increase to 83 to 88 dBA. As equipment moves further from a residence, noise levels will decrease. For example, when a single bulldozer moves from 50 feet to 1,000 feet, the noise level drops below 60 dBA.

Noise levels at the nearest residences to the Project facilities could reach as high as 74 dBA during the site clearing and grading phases of construction when equipment is operating directly adjacent to a given residence. Noise levels will be similar during the mechanical installation phase of construction when vibratory pile driving is taking place nearby. Noise levels will be minimal during the electrical finishing stage. It is important to understand that these levels will only occur on those days when construction activities are taking place adjacent to a residence. Noise levels will decrease when construction is more distant, during times when noise-producing equipment is idle, and during times when no construction is taking place near the residence or at the site.

1. Introduction

This report describes the results of a pre-construction noise analysis conducted by Hankard Environmental for the proposed Project, which consists of a photovoltaic solar electrical generation facility in the Towns of Christiana and Deerfield in Dane County, Wisconsin. The general location of the Project is shown in Figure 1-1. The Project is located northeast of Interstate 39/90, and it straddles U.S. Highways 12/18 and State Route 73. The facility will generate electricity using silicon photovoltaic modules fixed to single axis solar trackers. It will be built on approximately 2,350 acres of land within a 6,384-acre Project Area (approximately 10 square miles) and have an installed capacity of 300 MW. On-site facilities are expected to include a Battery Energy Storage System (BESS).

The noise analysis consisted of determining the location of all noise-sensitive receptors located near the Project, measuring existing noise levels within the Project Area, and predicting both construction and operational noise levels at noise-sensitive receptors. The analysis was carried out in accordance with the PSC's November 2008 *Measurement Protocol for Sound and Vibration Assessment of Proposed and Existing Electric Power Plants* (Protocol). The following sections of this report describe the noise regulation applicable to the Project, the Project site and the location of noise sensitive receptors, the results of the pre-construction ambient noise study, the methods and data used to predict construction and operational noise emissions, and predicted construction and operational noise levels including noise-mitigating measures to be employed.

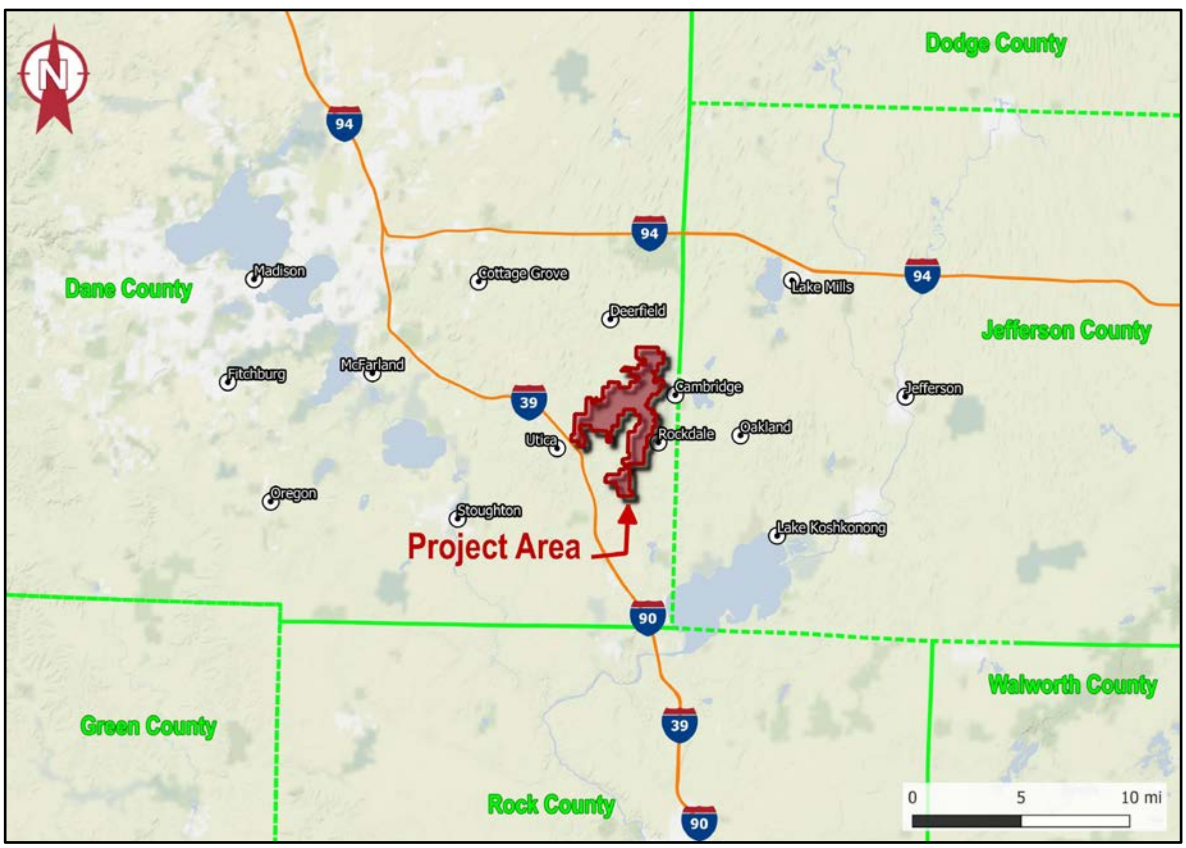


Figure 1-1. General Location of the Project

2. Applicable Regulation

The Project is applying for a CPCN from the PSC. Pursuant to this a noise analysis was conducted according to the PSC's Protocol, which is provided in Appendix A. The PSC has no specific noise limits that apply to solar generation facilities. Absent a specific limit, the Project has elected to compare its predicted noise emissions to the PSC's regulation for noise produced by wind energy systems (PSC 128.14(3)), which limits facility noise levels to 50 dBA during the daytime and 45 dBA at night at non-participating receptors.

The Protocol requires that the following analyses be conducted and information provided. Items 1 through 3 are addressed in this report.

1. Identification of Noise-sensitive Receivers
   a. The location of noise-sensitive receptors, such as residences, schools, day-care centers and hospitals shall be identified and mapped.

2. Measurement of Existing Noise Levels
   a. Existing noise levels shall be measured at representative locations within the Project study area (locations to be selected in consultation with PSC staff),
   b. Noise levels shall be measured during four different time periods on at least one weekday (of a non-holiday week), and long-term unattended monitoring is encouraged (wind projects),
   c. Overall A-weighted and C-weighted levels shall be measured, as well as frequency band levels, and notes should be taken regarding audible sources of noise,
   d. Maps shall be provided showing the relative location of sources, receptors, and measurement locations.

3. Sound Level Estimates for Proposed Generator(s)
   a. Provide manufacturers' sound level estimates for noise-producing equipment, and a description of methods and input data used to make noise level estimates,
   b. Estimate noise levels from facility in dBA and dBC metrics, including noise level contours,
   c. Determine impact of new noise and vibration on the environment by reporting the changes to existing sound levels.

4. Post-construction noise level measurements
   a. Conduct post-construction noise level measurements (not addressed herein).

3. Proposed Project and Environs

The Project is located in the Towns of Christiana and Deerfield in Dane County and it borders the Villages of Cambridge and Rockdale. Figure 3-1 shows the Project, including the locations of the solar panels and inverters, the Substation, the BESS, and the Project Area.

Noise-producing elements of the operation of the Project include inverters, primary step-up transformers, and battery cooling systems. Solar inverters will be distributed throughout the Project and, depending on the model selected, may have associated transformers and cooling systems co-located. Noise will also be emitted from the Project's primary step-up transformers located in the proposed Substation north of the gravel pit on Koshkonong Road. Noise would also be emitted from inverters, transformers, and cooling systems at the BESS, which will be located north of the Substation. Relative to other forms of electric generation, noise from these systems and facilities is relatively low.

One unique feature of solar compared to other forms of electric power generation is that maximum noise levels are produced during daytime periods. At night, when sound impacts to residences are typically of the highest concern, the Project will only emit audible noise in the area of the BESS and Substation. Noise emissions from a solar facility are significantly lower than those for conventional fossil fuel power plants, wind turbine power plants, or even lower than the noise produced by typical activities such as farming. It is expected that noise from the Project will often be inaudible due to the presence of other existing natural and man-made noise, as described in more detail below. Operation of the Project will not emit any measurable vibration off-site.

Land use within the Project Area is overwhelmingly agricultural, including fields, barns and other outbuildings, farmhouses, and other rural residences. For this Project noise impacts were assessed at all noise-sensitive receptors located in an area extending one-half mile beyond any Project element (Project Area). This area encompasses a total of 691 receptor locations including many within the Villages of Cambridge and Rockdale. Of the 691 receptors, 14 are Project participants and 677 are non-participating.

The locations of the receptors are shown generally in Figure 3-1. More detailed figures that include receptor identification numbers are provided in Section 5 below, and all receptor locations are listed in the tables of Appendix C.

Construction of the Project will involve the use of typical construction equipment and will take approximately 18 to 24 months to complete. Equipment to be employed includes heavy trucks for equipment delivery, light duty trucks, scrapers, bulldozers, dump trucks, motor graders, vibratory compactors, backhoes, skid-steer loaders, vibratory pile drivers, cranes, concrete truck and boom truck, and truck-mounted auger or drill rigs. Project construction will begin with initial site preparation including grading, vegetation removal, and any necessary tree removal. The solar arrays and collection and distribution systems will be installed along with access roads. The solar facility will be constructed in sections and multiple sections will be constructed simultaneously.

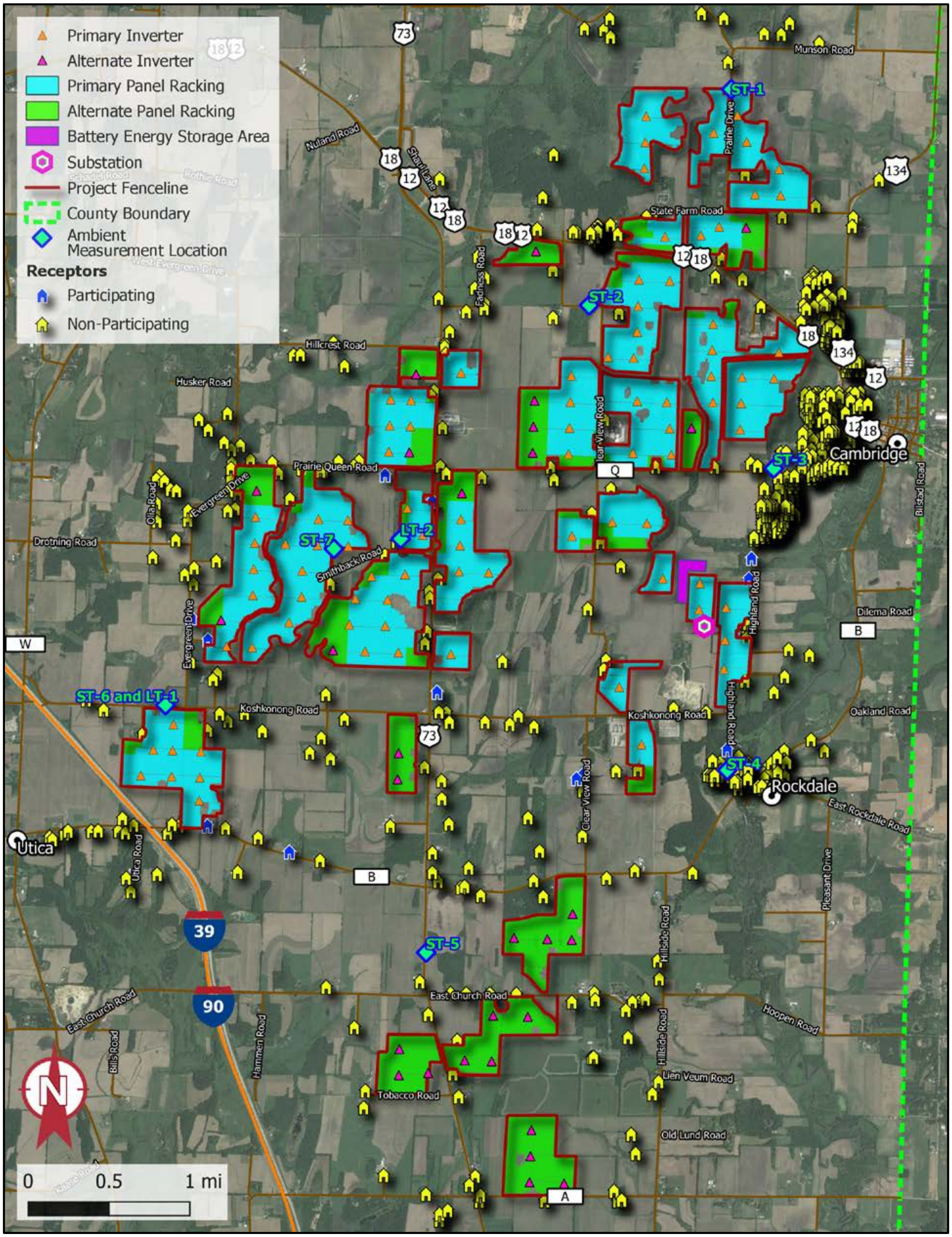


Figure 3-1. Location of Project and Noise-Sensitive Receptors

4. Pre-Construction Background Noise Measurement Survey

A background (ambient) noise level survey was conducted in the Project Area to characterize and document pre-construction noise levels. The survey was conducted between March 16 and March 29, 2021. Noise levels were measured at the locations shown in Figure 3-1, which were selected in consultation with PSC staff to be representative of the noise-sensitive receptors located closest to the Project and also to be distant from roadways and other man-made noise sources to the extent possible.

Attended noise measurements were taken at each of the seven "short-term" locations for approximately ten minutes during each of four different time periods (per PSC protocol) on two different days, for a total 56 individual measurements. These short-term measurement locations are identified as ST-1 through ST-7 in Figure 3-1. In addition, "long-term" noise monitors were placed at two locations, identified as LT-1 and LT-2, to continually measure ambient noise levels over the course of fourteen days. Sources of existing noise commonly observed in the area were natural sounds such as birds calling, wind noise, and rustling vegetation. Other sources of noise included distant traffic at some locations (Interstate 39/90, Highway 12/18, and Route 73), local traffic, and aircraft passing overhead.

The results of both long-term and short-term measurements are discussed here primarily in terms of two metrics: the L_{eq}, which is the average level over the measurement interval (10 minutes for this analysis) and can be influenced by high-level extraneous noises such as wind gusts and local traffic; and the L_{90}, which represents the level exceeded 90% of the time. Thus, the L_{90} filters out sporadic noises to some degree and is representative of the quietest levels within the interval.

Under windy conditions, which are common at the site during the daytime when the Project will be fully operational, the wind rustling vegetation can generate substantial noise. Based on the long-term monitoring results, noise levels (L_{eq}) attributable to the effects of wind at the site ranged from approximately 30 dBA under low wind conditions, to 40 to 50 dBA under moderate wind conditions, to more than 55 dBA under windy conditions. Under calm conditions at night, the noise levels dropped down to 30 dBA (L_{eq}) at locations LT-1 and LT-2. Table 4-1 summarizes the long-term measurement results at LT-1 and LT-2 in terms of the average, minimum, and maximum L_{eq} levels (10-minute, dBA). The long-term continuous monitoring levels from LT-1 and LT-2 are plotted along with local ground wind speed in Figures 4-1 and 4-2. The long-term measured levels are generally consistent with those of the handheld measurements, although a wider range of levels were captured. The wind speeds were acquired from an anemometer connected to the sound level meter at LT-1.

Table 4-1. Summary of Long-Term Measurement Statistics

Long-term site	Average L_{eq} (dBA)	Minimum L_{eq} (dBA)	Maximum L_{eq} (dBA)*
LT1	50	29	63
LT2	47	29	67
Combined	48	29	67

* limited to times when wind speeds are below 5 meters/second

The measured levels for each attended measurement at the seven locations are presented in Table 4-2 in terms of A-weighted L_{eq} and L_{90}. Table 4-2 also lists the identifiable sources of audible sound observed during the specific measurement intervals. The daytime L_{eq} during attended measurements across all seven locations ranged from 34 to 64 dBA and the average was 48 dBA. The daytime L_{90} levels for these same measurements ranged from 27 to 49 dBA with an average of 37 dBA. The results of all 56 attended measurements are provided in Appendix B, including A-weighted (dBA) and C-weighted (dBC) levels for the $L_{eq,}$ $L_{10,}$ $L_{50,}$ and L_{90} metrics.

The following paragraphs provide a description of each measurement location, including the range of noise levels and the existing noise sources observed during each attended measurement.

Measurement Location ST-1: Located on Prairie Dive, approximately 1/4 mile south of the intersection with Munson Road, this location was selected for its general northeastern location and its greater distance from existing sources such as major roadways as compared to other measurement locations. Daytime noise levels range from 34 to 55 dBA (L_{eq}) and 26 to 37 dBA (L_{90}). The primary sources of audible sound include distant traffic on Highway 12/18, birds, and wind induced noise.

Measurement Location ST-2: Located along Clear View Road, approximately 1/3 mile south of Highway 12/18, this location is representative of the rural residences located in the west-central portion of the Project. Daytime noise levels range from 38 to 54 dBA (L_{eq}) and 28 to 49 dBA (L_{90}). The primary sources of audible sound include nearby traffic and traffic on Highway 12/18 and birds.

Measurement Location ST-3: Located near the east-central boundary of the Project near Cambridge Elementary School along Water Street. This location was selected for its general east-central location and its proximity to the Village of Cambridge. Daytime noise levels range from 37 to 52 dBA (L_{eq}) and 28 to 44 dBA (L_{90}). The primary sources of audible sound include local vehicles passing, birds, barking dogs, HVAC unit of the school, and wind.

Measurement Location ST-4: Located near the southeastern boundary of the Project on the grounds of the Rockdale Community Center on Benton Street, this location was selected to be representative of residential areas of Rockdale. Daytime noise levels range from 38 to 52 dBA (L_{eq}) and 29 to 40 dBA (L_{90}). The primary sources of audible sound include birds, local and distant traffic, and furnace vents from nearby homes.

Measurement Location ST-5: Located at the southern boundary of the Project, approximately 100 feet off of Highway 73, between Church Road and County Road B, this location was selected for its general southern location and its proximity to Highway 73. This location is also largely removed from trees. Daytime noise levels range from 48 to 64 dBA (L_{eq}) and 32 to 44 dBA (L_{90}). The primary sources of audible sound include frequent local traffic on Highway 73, birds, and wind.

Measurement Location ST-6: Located in the western portion of the study area near the intersection of Koshkonong Road and Evergreen Drive, approximately ¾ of a mile from Interstate 39/90. This location was selected for its general western location and proximity to Interstate 39/90. Daytime noise levels range from 43 to 51 dBA (L_{eq}) and 35 to 46 dBA (L_{90}). The primary sources of audible sound include distant traffic on Interstate 39/90, airplanes overhead, birds, and wind through trees.

Measurement Location ST-7: Located in the central portion of the study area approximately ½ mile from Route 73 along Smithback Road. This location was selected for its generally central location within the Project and its proximity to Highway 73. Daytime noise levels range from 35 to 48 dBA (L_{eq}) and 22 to 40 dBA (L_{90}). The primary sources of audible sound include distant traffic on Highway 73 and Interstate 39/90, birds, and wind.

Table 4-2. Attended Background Sound Level Measurement Results

Site	Day	Time Period	L_{eq} (dBA)	L_{10} (dBA)	L_{50} (dBA)	L_{90} (dBA)	Wind	Audible Sources
ST1	1	Morning	44.7	43.1	35.9	33.0	light	Distant traffic S and E, Dog bark, Birds/geese, Passing vehicle
ST1	2	Morning	54.4	52.4	38.3	36.7	calm	Distant traffic, Birds/crane, Airplane, Vehicles passing (2)
ST1	1	Afternoon	34.3	37.4	30.2	26.5	moderate	Cranes (birds), Distant traffic (S)
ST1	2	Afternoon	49.1	49.2	34.0	30.7	light	Traffic Hwy-12/18, Airplane, Vehicle passing (1), Birds, ATV approaching
ST1	1	Evening	37.7	36.1	29.9	27.6	calm	Distant traffic, Distant dogs
ST1	2	Evening	36.7	36.7	29.7	26.4	strong	Distant traffic, wind noise
ST1	1	Night	40.8	32.2	27.5	25.6	calm	Distant traffic, otherwise quiet
ST1	2	Night	36.6	38.9	31.7	28.8	strong	Wind noise, trees shaking with gusts
ST2	1	Morning	53.5	56.2	52.5	49.0	light	Steady traffic Hwy-12/18, Low hum (SE, grain mill?), Distant trucks
ST2	2	Morning	52.1	53.9	51.1	47.8	light	Steady traffic Hwy-12/18, Birds, Vehicle passing (1)
ST2	1	Afternoon	45.8	45.9	41.4	37.7	moderate	Traffic Hwy-12/18, Vehicle passing (1)
ST2	2	Afternoon	49.8	44.3	39.2	36.6	light	Traffic Hwy-12/18, Vehicles passing (2)
ST2	1	Evening	38.0	40.5	35.6	30.8	calm	Distant traffic, Distant voices, Some birds
ST2	2	Evening	47.1	48.9	44.1	39.1	strong	Traffic Hwy-12/18, Vehicle passing (1)
ST2	1	Night	40.1	41.0	33.1	28.0	calm	Distant traffic, otherwise quiet
ST2	2	Night	42.0	44.9	40.3	36.8	strong	Wind noise, Sparse traffic on Hwy-12/18
ST3	1	Morning	48.6	51.7	46.0	43.6	light	Birds, Dog, Frequent vehicles passing, Distant traffic NNE especially trucks
ST3	2	Morning	45.7	46.8	41.3	39.8	light	Barking dog, Birds, Occasional vehicles passing, Distant traffic
ST3	1	Afternoon	44.0	48.0	36.7	32.9	moderate	Vehicles passing, Birds, Distant traffic NE, School "bell" (electronic tone)
ST3	2	Afternoon	52.2	48.5	39.3	33.8	calm	Frequent nearby traffic (school), Trucks passing, Birds/woodpecker, Car horn
ST3	1	Evening	43.7	48.1	39.3	33.6	light	Nearby traffic frequent then light, Some birds, Louder geese nearby
ST3	2	Evening	46.6	50.2	40.2	36.4	breezy	Birds, Frequent vehicles passing, Distant traffic, Wind gusts through trees
ST3	1	Night	37.4	38.4	30.8	27.8	calm	HVAC of school, Occasional distant/local traffic, Occasional dog
ST3	2	Night	43.7	46.3	41.5	37.9	strong	Wind noise (trees), Airplane
ST4	1	Morning	43.0	45.8	40.8	38.8	light	Birds/geese, Distant traffic, Numerous cars passing
ST4	2	Morning	45.7	48.5	44.1	39.5	calm	Birds, Local traffic (sparse), Car horn
ST4	1	Afternoon	40.5	44.0	34.0	30.1	moderate	Birds/cranes, Vehicles passing, Distant traffic, Airplane
ST4	2	Afternoon	52.1	50.2	39.2	31.6	calm	Birds, Airplanes, Vehicles nearby (incl. UPS), Furnace vents at nearby homes
ST4	1	Evening	42.8	44.9	35.5	29.3	light	Birds/doves/cranes, Some distant and local traffic
ST4	2	Evening	43.1	46.2	41.0	36.5	light	Birds, Dog, Numerous vehicles passing, Airplane
ST4	1	Night	44.5	44.3	35.6	29.5	calm	Furnace vent at nearby house, Distant traffic, Distant voices
ST4	2	Night	38.3	41.3	37.0	34.5	strong	Wind noise (trees), Dog bark, House furnace vent, Distant traffic

Table 4-2. (continued) Attended Background Sound Level Measurement Results

Site	Day	Time Period	L_{eq} (dBA)	L_{10} (dBA)	L_{50} (dBA)	L_{90} (dBA)	Wind	Audible Sources
ST5	1	Morning	62.5	65.6	51.7	43.9	light	Birds, Frequent local traffic (Hwy-73), Distant traffic
	2	Morning	64.1	66.5	48.2	40.0	light	Frequent local traffic, Birds
	1	Afternoon	58.1	60.9	40.5	32.1	light	Frequent local traffic, Birds/crane
	2	Afternoon	59.2	60.4	41.7	38.1	breezy	Frequent local traffic (Hwy-73), Distant traffic (I-39/90)
	1	Evening	59.3	59.8	43.9	31.9	calm	Birds, Frequent local traffic
	2	Evening	56.9	59.1	42.7	35.5	breezy	Birds, Frequent local traffic, Airplane
	1	Night	53.3	48.1	40.9	37.5	calm	Distant traffic, Occasional vehicles passing nearby
	2	Night	48.4	45.8	42.7	39.1	strong	Wind noise, Passing traffic (few vehicles)
ST6	1	Morning	51.1	47.4	44.0	42.0	light	Birds, Steady traffic I-39/90, Occasional passing vehicles
	2	Morning	49.0	46.1	41.0	38.5	light	Traffic I-39/90, Birds, Airplane, Vehicle passing (1)
	1	Afternoon	46.9	41.2	36.2	34.8	light	Traffic I-39/90 steady/low, Birds, Passing car
	2	Afternoon	43.1	44.6	42.9	40.9	calm	Traffic I-39/90, Birds/crane, Airplane, Barn activity (scraping noise)
	1	Evening	47.8	46.2	44.0	41.9	calm	Steady traffic I-39/90
	2	Evening	44.5	40.0	36.7	34.5	breezy	Traffic I-39/90, Few birds, Airplane, Wind
	1	Night	50.2	52.3	49.5	46.3	calm	Traffic I-39/90
	2	Night	42.9	45.0	42.1	40.1	strong	Wind through trees, Trucks on I-39/90, Airplane
ST7	1	Morning	44.3	47.0	42.9	39.8	light	Cranes (birds), Distant traffic (mostly trucks) Hwy-73 and I-39/90
	2	Morning	40.0	43.2	36.4	34.4	light	Birds (constant), Distant traffic
	1	Afternoon	34.9	38.1	30.5	27.4	light	Birds, Distant trucks NNW and ESE, Airplane
	2	Afternoon	38.3	39.9	31.0	29.0	light	Distant traffic, Airplanes, Few birds, Distant back-up alarm
	1	Evening	40.6	39.7	29.2	22.0	calm	Distant traffic, otherwise quiet
	2	Evening	41.0	41.2	34.0	30.2	moderate	Distant traffic, Few birds, Airplane
	1	Night	47.5	49.2	32.7	24.0	calm	Distant traffic, otherwise quiet
	2	Night	35.3	36.7	33.6	32.1	strong	Distant traffic, wind noise

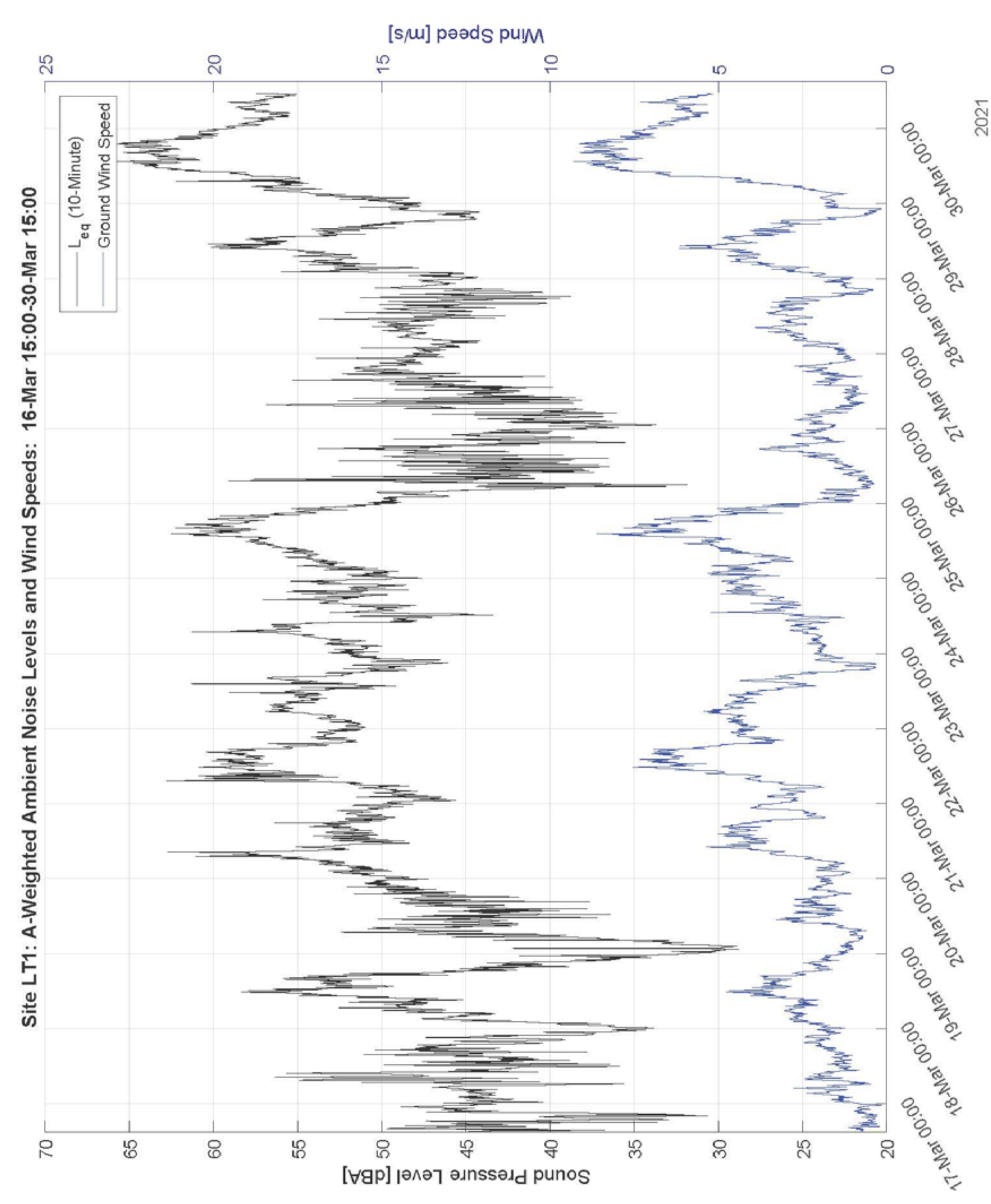


Figure 4-1. Long-Term Background Noise Levels at LT1

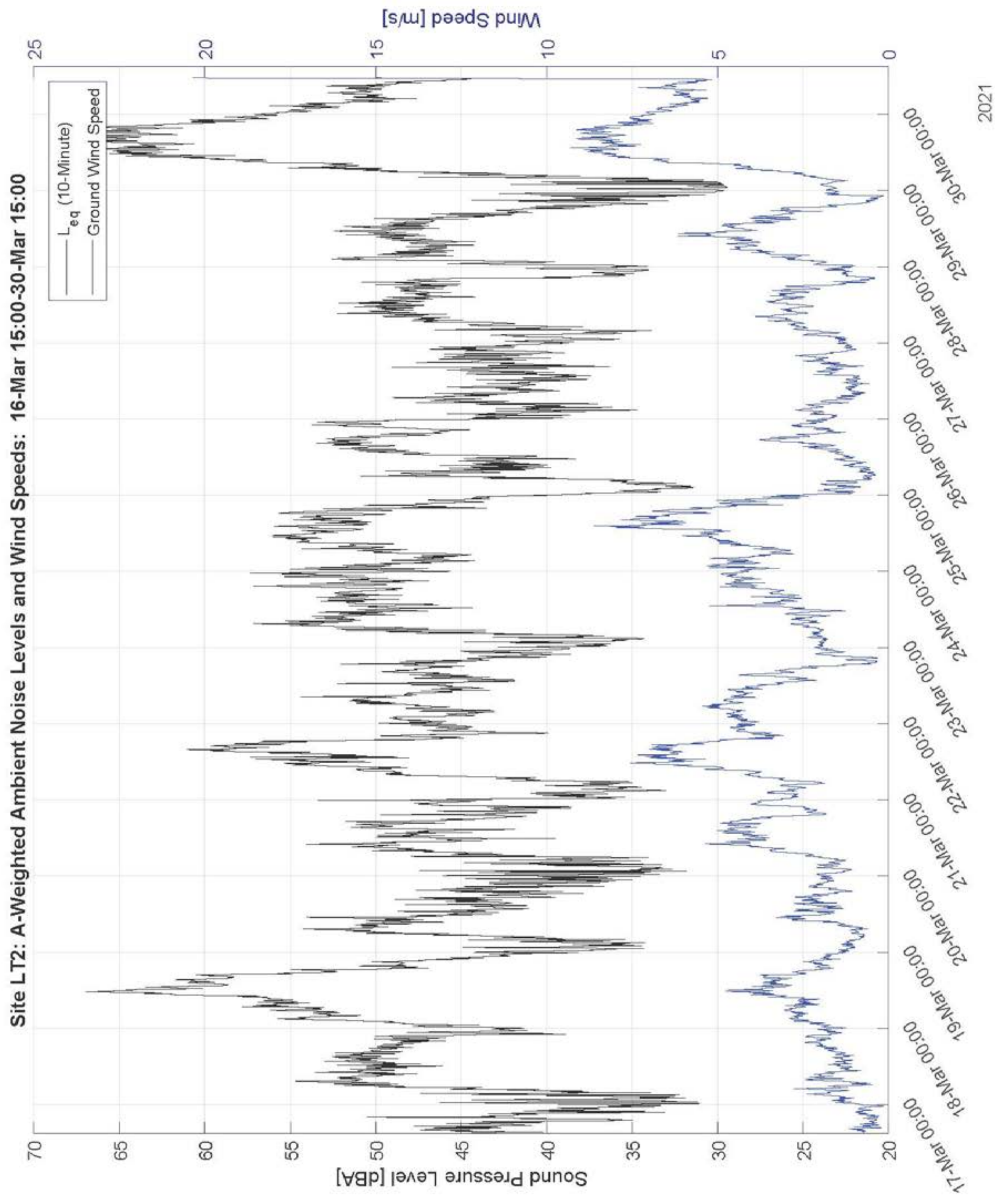


Figure 4-2. Long-Term Background Noise Levels at LT2

5. Noise Modeling Methods

Noise levels from the proposed Project were predicted using the International Organization for Standardization (ISO) Standard 9613-2:1996, *Attenuation of Sound During Propagation Outdoors - Part 2: General method of calculation*. The calculations were made using the SoundPLAN v8.2 software program. There are a number of parameters in the ISO 9613-2:1996 method, including the locations of the noise sources and receivers, noise source spectral characteristics, terrain and ground type, and atmospheric conditions. The ISO 9613-2:1996 method assumes optimal acoustic propagation in all directions, specifically that a "well-developed, moderate ground-based temperature inversion" is present or, equivalently, that all receptors are downwind of all noise sources at all times. The sections below describe the modeling assumptions.

Terrain and Ground Effect

The acoustical effect of the ground was modeled using the ISO 9613-2:1996 General Method. This method requires the selection of ground factors for the ground near the source, near the receiver, and in between. A ground factor of 0.0 represents a completely reflective surface such as pavement, which would result in a higher level of sound reaching a receiver. A ground factor of 1.0 represents absorptive ground such as thick grass or fresh snow, resulting in a lower level of sound reaching the receiver. For this Project a ground factor of 0.5 was used because it is expected that native grasses will be planted during construction, and the terrain between the edges of the Project will mostly be acoustically absorbent. Additionally, the use of a 0.5 ground factor has been validated for use in modeling based on measurements conducted by Hankard Environmental at two operating solar facilities in the U.S.

Atmospheric Conditions

The air temperature, relative humidity, and atmospheric pressure were set to 10°C, 70%, and 1 atmosphere, respectively. Per ISO 9613-2:1996, these values result in the least amount of atmospheric sound absorption and the highest levels of sound reaching the receivers.

Receptors

Noise levels were predicted at each of the 691 receptor locations shown in Figures 5-1 through 5-3, which include all residences and other noise-sensitive uses located within the Project Area. Noise levels at other receptors farther away than those modeled will be lower. In accordance with ISO 9613-2:1996, the height above the ground for each receptor was set to 5 feet.

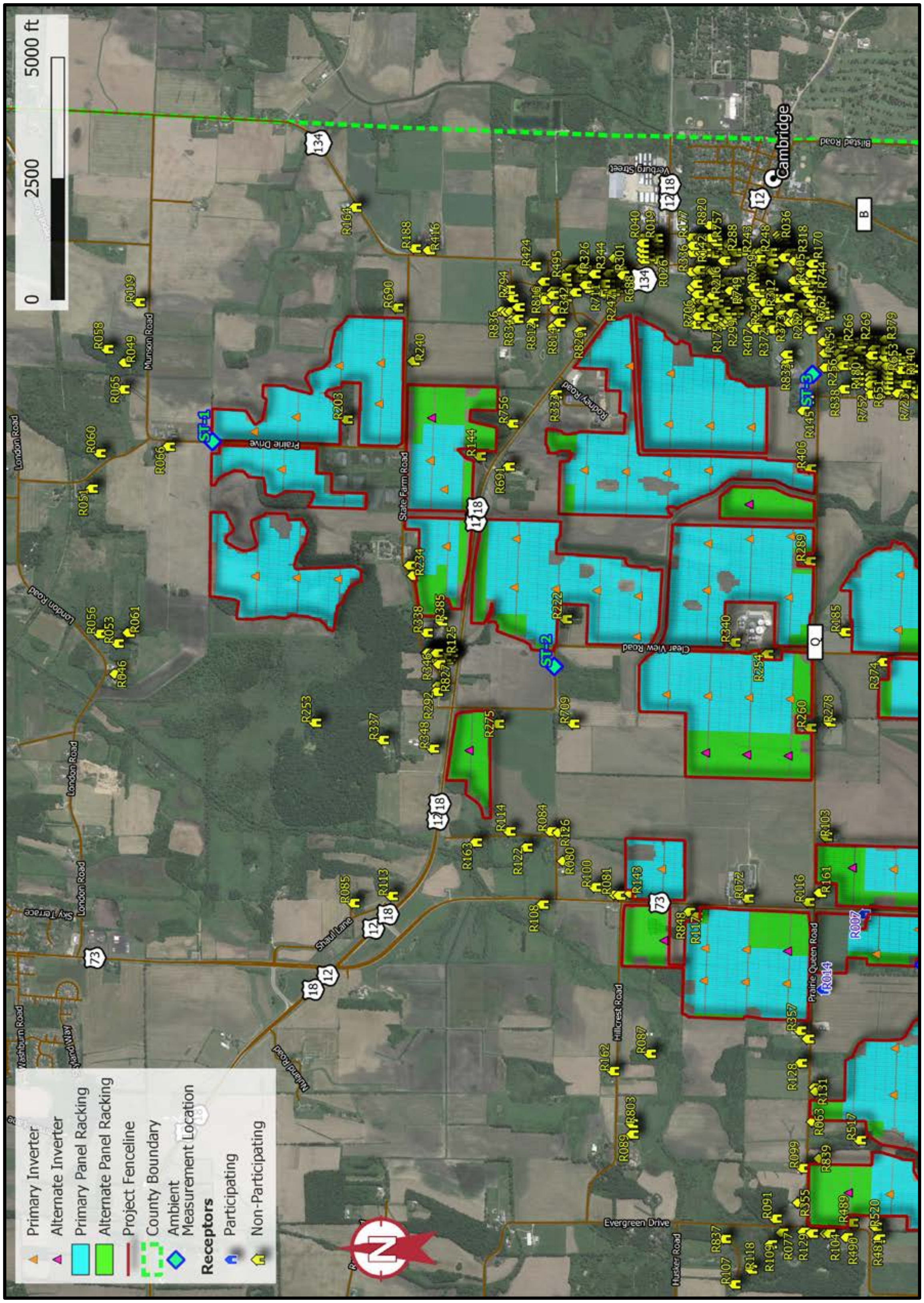


Figure 5-1. Detailed Noise Analysis Layout – North

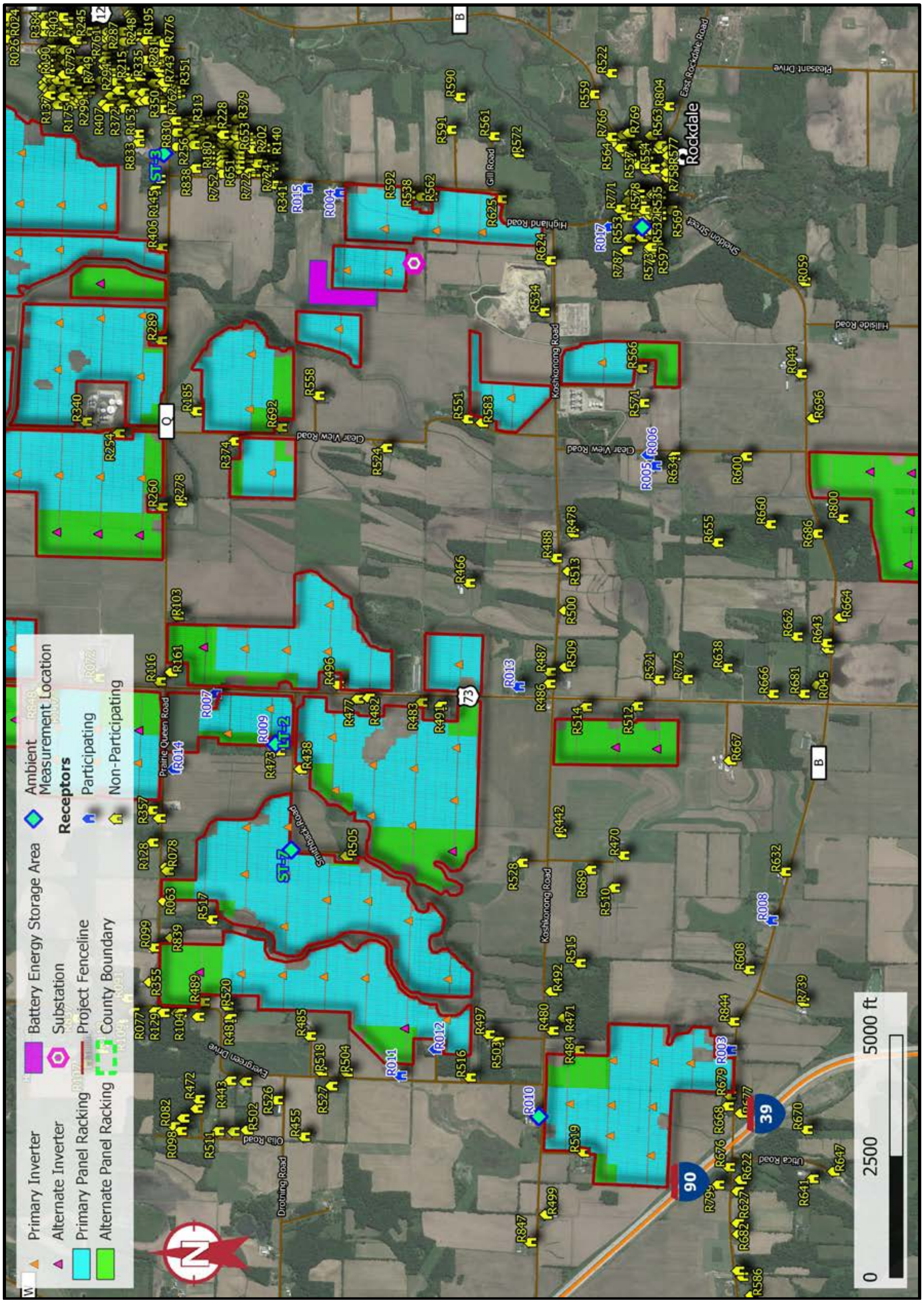


Figure 5-2. Detailed Noise Analysis Layout – Central

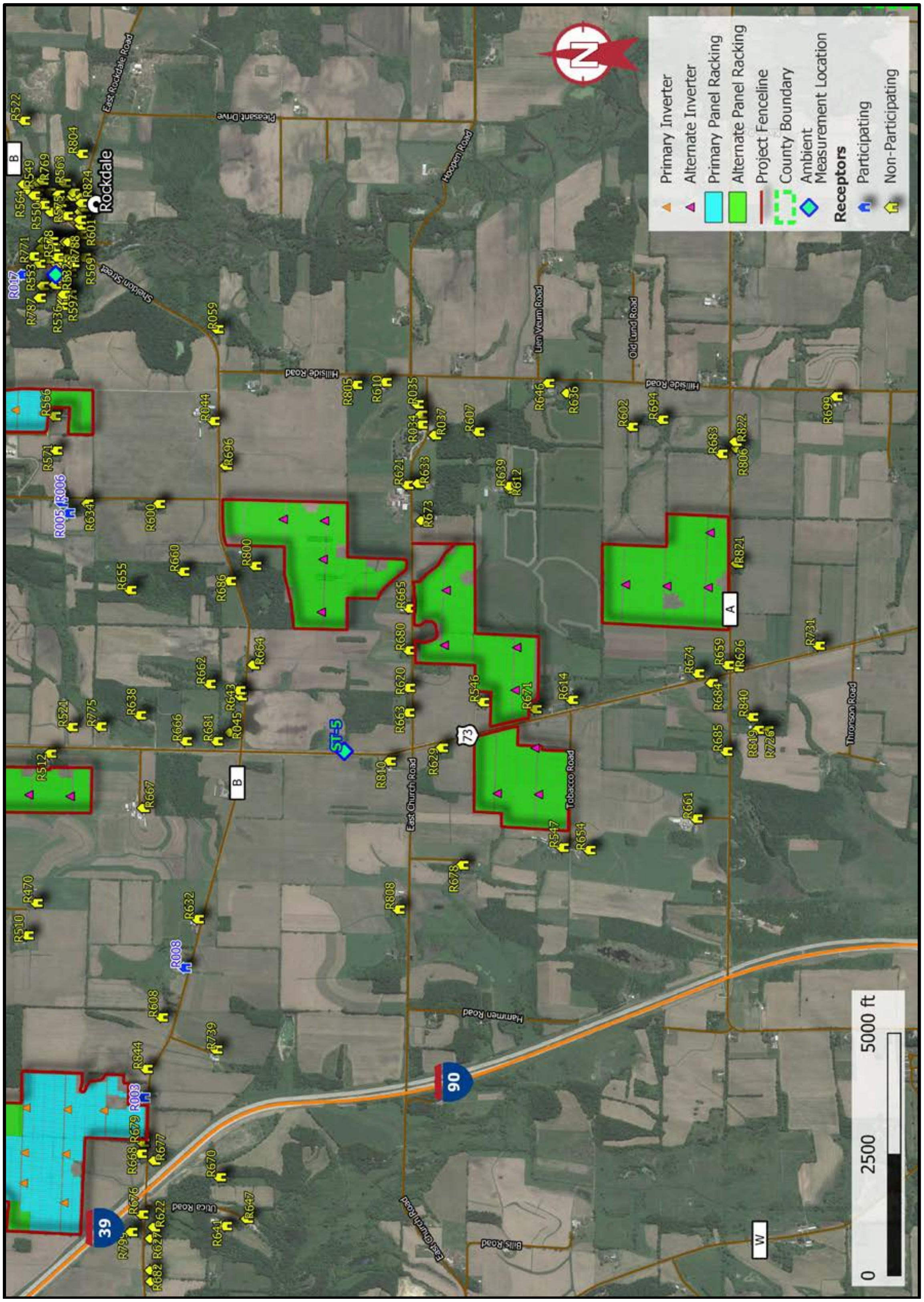


Figure 5-3. Detailed Noise Analysis Layout - South

Construction Noise Sources

Noise levels were predicted for the four phases of construction: site preparation, civil work, mechanical assembly, and electrical work. Table 5-1 lists the equipment associated with each phase, as well as the number of units to be employed, the percentage of time that each piece of equipment is expected to be used at full capacity (the usage factor), and the maximum sound pressure level of each unit at a distance of fifty-feet. This construction noise analysis was conducted using Federal Highway Administration's Roadway Construction Noise Model v1.1. This software program includes the noise source sound pressure levels and usage factors.

Table 5-1. Noise Source Characteristics of Construction Equipment

Construction Phase	Equipment (quantity)	Usage Factor (%)	Sound Pressure Level @ 50 ft (dBA)
1 Site Preparation	Bulldozer (1)	40	81.7
	Excavator (2)	40	80.7
	Moto-grader (2)	40	85.0
	Water Truck (1)	40	74.3
	Dump Truck (1)	40	76.5
2 Civil Work	Roller (1)	40	80.0
	Dump Truck (1)	40	76.5
	Excavator (2)	40	80.7
	Trencher (1)	50	80.4
	Moto-grader (2)	40	85.0
	Water Truck (1)	40	74.3
3 Mechanical Assembly	Pile Driving (1)	20	95.0
	Pickup Truck (2)	40	75.0
	Man Lift (2)	20	74.7
	Crane (1)	16	80.6
	Backhoe/Loader (1)	40	79.1
4 Electrical Work	Pickup Truck (2)	40	75.0
	Flatbed Truck (1)	40	74.3
	Man Lift (1)	20	74.7
	Small Generator (1)	50	77.7
	Compressor (1)	40	80.6

Operational Noise Sources

The operation of the Project includes three main groups of noise sources: the inverters located throughout the solar array, the Substation, and the BESS. This analysis includes a total of 119 solar inverters (includes 29 alternates) located throughout the Project. The sound power levels for the solar array inverters used in the analysis are shown in Table 5-2 and are based on measurements of an existing TMEIC 4,200 kW solar inverter at a solar facility in the Midwest. All solar array inverters were modeled at six-feet above the ground. Solar array inverters were assumed to operate at full capacity during the daytime and not at all at night.

The proposed Substation for this Project is comprised of three 189 MVA step-up transformers. The sound power levels for each transformer shown in Table 5-2 were estimated using the procedures outlined in the "Electric Power Plant Environmental Noise Guide" from the Edison Electric Institute (EEI, 1984), with a reduction of 5 dB in each band (the model indicated that this was necessary in order to achieve lower Project noise levels). The step-up transformers were modeled at a height of three meters above the ground. The Substation was assumed to operate at full capacity 24 hours per day.

The BESS was modeled as consisting of 166 battery storage containers and 83 inverters. The sound power level of each container shown in Table 5-2 is based on a measurement of an existing BESS in the Midwest (Note, on the project where the measurements were made each container included its own inverter, whereas the containers for the Project are expected to have separate inverters. To account for this a 3 dB reduction was applied to the values measured at the existing BESS). The BESS inverter sound power levels shown in Table 5-2 are based on the same TMEIC 4,200 kW solar inverter as that used to model the array inverters, with a reduction of 3 dB in each band in order to achieve the lower noise levels desired by the Project. The noise source representing each container and inverter at the BESS were modeled at six-feet above the ground.

In addition to reducing noise levels by 5 dBA for Substation sources and 3 dBA for inverters at the BESS, the model indicates that additional noise mitigation (reduction) measures are necessary to achieve the goals of the project for those receptors located near the BESS and the Substation. Noise levels can be reduced by relocating equipment further from receptors, specifying the use of quieter equipment than that assumed herein, enclosing equipment in buildings, or constructing a noise barrier/wall. For the purposes of this analysis, noise levels were predicted assuming the construction of a 20-foot-tall noise barrier wall around the entire BESS. This is only an example demonstrating one feasible option. The exact form that noise mitigation should take should be part of the final design of the Project, as the true noise emission levels of equipment is better defined, and the equipment to be used has been selected and the layout finalized.

Table 5-2. Noise Emission Factors

Equipment Type	Octave-Band Sound Power Level (dB)									Overall Sound Power Level (dBA)
	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2,000 Hz	4,000 Hz	8,000 Hz	
Solar Inverter	105.3	98.3	95.3	94.3	95.3	88.3	83.3	78.3	76.3	95.0
Step-up Transformers 189 MVA(1)	97.4	103.4	105.4	100.4	100.4	94.4	89.4	84.4	77.4	100.8
BESS Containers	92.3	89.3	84.3	81.3	83.3	84.3	77.3	72.3	71.3	87.0
BESS Inverters(2)	102.3	95.3	92.3	91.3	92.3	85.3	80.3	75.3	73.3	92.0

6. Predicted Construction Noise Levels

Noise levels from construction of the proposed Project were predicted at distances ranging from 200 to 2,000 feet for each of four primary phases of construction, which include site preparation (clearing), civil work (initial grading, the construction of access roads, final site grading and landscaping), mechanical assembly (installing piers, racks, modules, etc.), and electrical work (connecting all the equipment). Some of this work will be conducted concurrently, although in different areas of the site, resulting in an approximate overall schedule of 18 to 24 months. For more information on construction scheduling refer to the CPCN application.

The noise levels (hourly equivalent, $L_{eq\text{-}1hr}$) for each phase of construction were predicted at multiple distances from construction activities and are listed in Table 6-1. Note that the noise levels are on a worst-case basis in that all of the equipment for a particular construction phase are located at the distances shown in the table. Of the 677 non-participating receptors studied, approximately 70% (474 receptors) are located more than 1,000 feet from any proposed construction site, and worst-case construction noise levels are expected to be 63 dBA or less at that distance. At residences located as close as 200 feet from planned construction activities, noise levels are predicted to be as high as approximately 77 dBA. Table 6-2 provides a distribution of non-participating receptors based on their distance to the nearest construction site.

Mitigation measures for construction noise include, if necessary, the use of ambient controlled broadband backup alarms versus tonal alarms, using well-maintained equipment (particularly with respect to mufflers), communication with affected residents, and the establishment of a telephone complaint hotline and resolution procedure.

Table 6-1. Predicted Construction Noise Levels

Construction Phase	$L_{eq\text{-}1hr}$ (dBA)					
	Distance from Construction (ft)					
	200	300	400	500	1,000	2,000
1 – Site Preparation	74	71	68	66	60	53
2 – Civil Work	75	71	69	67	61	54
3 – Mechanical Assembly (w/o pile driving)	67	64	61	59	53	46
3 – Mechanical Assembly (w/ pile driving)	77	73	71	69	63	56
4 – Electrical Work	69	65	63	61	55	48

Table 6-2. Non-Participating Receptor Distances from Construction

	Distance from Construction (ft)						
	< 200	200 - 299	300 - 399	400 - 499	500 - 999	1,000 - 1999	**≥ 2,000**
Percentage of Non-Participants	8%	2%	2%	2%	17%	39%	31%

7. Predicted Operational Noise Levels

Noise levels were predicted at all non-participating noise-sensitive receptors for two operational scenarios. Daytime operation of the Facility includes all equipment operating at full capacity (maximum noise emissions), while nighttime operation includes only the BESS and the Substation (the solar inverters would be idle). The model of noise emissions is based on the methods, input data, and assumptions described in Section 5.

Table 7-1 lists the loudest noise levels predicted at non-participating receptors, including the overall levels (dBA, L_{eq}) for both daytime and nighttime operation and octave band levels (dB) for daytime operation (worst-case). Table C-2 of Appendix C shows the predicted noise levels at all 677 non-participating noise-sensitive receptors. Overall, the predicted noise levels for daytime operation range from approximately < 15 dBA to 42 dBA (L_{eq}). The maximum predicted Project noise for any receptor during nighttime operations is 41 dBA. These levels are well below the PSC's daytime and nighttime wind turbine noise standards of 50 dBA and 45 dBA, respectively.

The loudest predicted non-participating noise levels at night occur at a group of three residences located to the east of the Substation along Highland Road. These locations have predicted nighttime levels of 40 to 41 dBA. The highest daytime noise levels (42 dBA) are predicted at the same group of receptors. These predicted noise levels include the noise reductions and mitigations listed in Section 5 of this report, but the specific measures may vary moving forward. This could include relocating equipment further from receptors, specifying the use of quieter equipment than that assumed herein, enclosing equipment in buildings, or constructing a noise barrier/wall. The exact form of mitigation can be determined at the time of final design.

Overall, it is expected that noise from the operation of the Project will be barely audible or completely inaudible much of the time at even the nearest receptors given: (1) the relatively low levels of noise predicted to be emitted from the Project, (2) the moderate levels of ambient noise present at the site, particularly during the daytime, (3) the fact that the noise levels described herein will only occur on partly to mostly sunny days when the solar inverters, the Substation and the BESS might all be producing maximum noise emissions, and (4) the fact that the atmosphere is not often as conducive to sound propagation as assumed in this analysis, particularly on sunny days, due to atmospheric mixing.

Table 7-1. Highest Project-Only Noise Levels at Non-Participating Receptors

Receptor	Daytime		Nighttime	
	L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R592	42	56	41	54
R538	42	56	40	54
R505	41	57	< 25	< 45
R562	41	55	40	53
R558	41	56	40	54
R671	41	56	< 25	< 45
R289	41	56	< 25	< 45
R438	41	56	< 25	< 45
R222	41	56	< 25	< 45
R203	41	56	< 25	< 45
R496	41	56	< 25	< 45
R117	40	55	< 25	< 45
R519	40	55	< 25	< 45
R473	40	55	< 25	< 45
R692	40	54	33	48
R477	40	55	< 25	< 45
R848	39	55	< 25	< 45
R489	39	54	< 25	< 45
R821	39	54	< 25	< 45
R254	39	54	< 25	< 45
R341	39	54	39	53
R491	39	54	< 25	< 45

As required by the PSC Measurement Protocol, Tables 7-2 and 7-3 show the expected changes to existing sound levels by combining the observed ambient noise levels with predicted Project noise levels for both daytime (Table 7-2) and nighttime (Table 7-3) periods. A noise level change of three decibels or less is considered barely detectable. The bottom sections of Tables 7-2 and 7-3 show that noise increases in the 10-minute average levels (L_{eq}) due to the Project are 6 dBA or less at all seven sites. This indicates that the worst-case predicted Project noise levels at the majority of residences would be nearly imperceptible above the average background noise measured. The L_{90} values in the tables show larger changes between ambient and total noise levels. The L_{90} represents the quietest moments recorded within each 10-minute measurement period. As such, the increases shown relative to the L_{90} illustrate the worst-case increase between some of the quietest moments of background noise compared to the maximum noise from the Project at a given location.

Maximum predicted operational noise levels are illustrated graphically in Figures 7-1 (daytime) and 7-2 (nighttime), which show the extent to which noise emissions from the Project reach various levels (noise level contours). At more distant locations (outward from the contours shown), noise levels will be lower. Noise levels at participating residences are predicted to range from 21 to 42 dBA during the daytime and up to 41 dBA at night. Table C-1 in Appendix C lists the predicted noise levels at all 14 participating noise-sensitive receptors.

Table 7-2. Estimated Increase in Daytime Noise Level over Existing Ambient Level

Noise Contribution	Site	L_{eq} (dBA)	L_{10} (dBA)	L_{50} (dBA)	L_{90} (dBA)	L_{eq} (dBC)	L_{10} (dBC)	L_{50} (dBC)	L_{90} (dBC)
Daytime Ambient (Average of Afternoon & Evening)	M1	39	40	31	28	56	54	46	42
	M2	45	45	40	36	59	58	51	46
	M3	47	49	39	34	60	59	51	46
	M4	45	46	37	32	58	56	46	41
	M5	58	60	42	34	67	65	52	46
	M6	46	43	40	38	60	59	55	51
	M7	39	40	31	27	56	54	47	42
Project Maximum Operations (Daytime)	M1	37	37	37	37	52	52	52	52
	M2	34	34	34	34	50	50	50	50
	M3	28	28	28	28	44	44	44	44
	M4	18	18	18	18	35	35	35	35
	M5	19	19	19	19	35	35	35	35
	M6	38	38	38	38	53	53	53	53
	M7	44	44	44	44	58	58	58	58
Total Noise (Daytime)	M1	41	42	38	37	57	56	53	52
	M2	45	45	41	38	59	58	53	51
	M3	47	49	39	35	60	59	51	48
	M4	45	46	37	32	58	56	46	42
	M5	58	60	42	35	67	65	52	46
	M6	46	44	42	41	61	60	57	55
	M7	45	45	44	44	60	60	58	58
Increase Over Ambient (Daytime)	M1	2	2	7	9	1	2	6	10
	M2	0	0	1	2	1	1	3	6
	M3	0	0	0	1	0	0	1	2
	M4	0	0	0	0	0	0	0	1
	M5	0	0	0	0	0	0	0	0
	M6	1	1	2	3	1	1	2	4
	M7	6	6	13	17	4	6	12	17

Table 7-3. Estimated Increase in Nighttime Noise Level over Existing Ambient Level

Noise Contribution	Site	L_{eq} (dBA)	L_{10} (dBA)	L_{50} (dBA)	L_{90} (dBA)	L_{eq} (dBC)	L_{10} (dBC)	L_{50} (dBC)	L_{90} (dBC)
Nighttime Ambient (Average of Nighttime)	M1	39	36	30	27	58	52	46	42
	M2	41	43	37	32	64	54	49	45
	M3	41	42	36	33	57	55	50	46
	M4	41	43	36	32	55	53	47	44
	M5	51	47	42	38	61	58	53	49
	M6	47	49	46	43	63	62	57	53
	M7	41	43	33	28	68	56	49	43
Project Maximum Operations (Nighttime)*	M1	< 20	< 20	< 20	< 20	< 40	< 40	< 40	< 40
	M2	< 20	< 20	< 20	< 20	< 40	< 40	< 40	< 40
	M3	33	33	33	33	49	49	49	49
	M4	25	25	25	25	44	44	44	44
	M5	< 20	< 20	< 20	< 20	< 40	< 40	< 40	< 40
	M6	< 20	< 20	< 20	< 20	< 40	< 40	< 40	< 40
	M7	< 20	< 20	< 20	< 20	< 40	< 40	< 40	< 40
Total Noise (Nighttime)	M1	39	36	30	27	58	52	46	42
	M2	41	43	37	32	64	54	49	45
	M3	41	43	38	36	57	56	52	51
	M4	42	43	37	33	55	53	49	47
	M5	51	47	42	38	61	58	53	49
	M6	47	49	46	43	63	62	57	53
	M7	41	43	33	28	68	56	49	43
Increase Over Ambient (Nighttime)	M1	0	0	0	0	0	0	0	0
	M2	0	0	0	0	0	0	0	0
	M3	1	0	2	3	1	1	3	5
	M4	0	0	0	1	0	1	2	3
	M5	0	0	0	0	0	0	0	0
	M6	0	0	0	0	0	0	0	0
	M7	0	0	0	0	0	0	0	0

*Nighttime noise levels from the project are expected to be inaudible at locations M1, M2, M5, M6, and M7

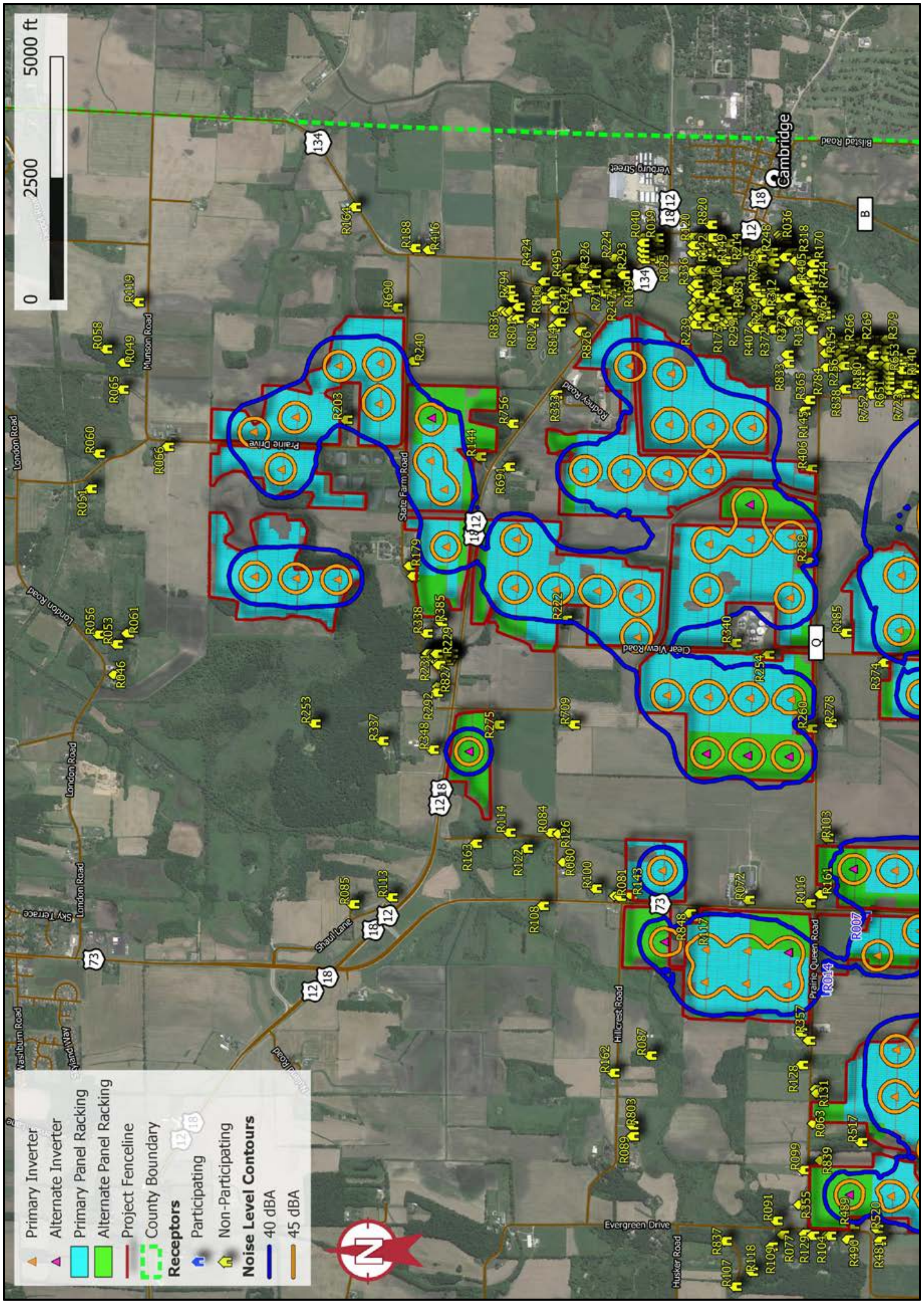


Figure 7-1. Predicted Operational Noise Level Contours – Daytime North

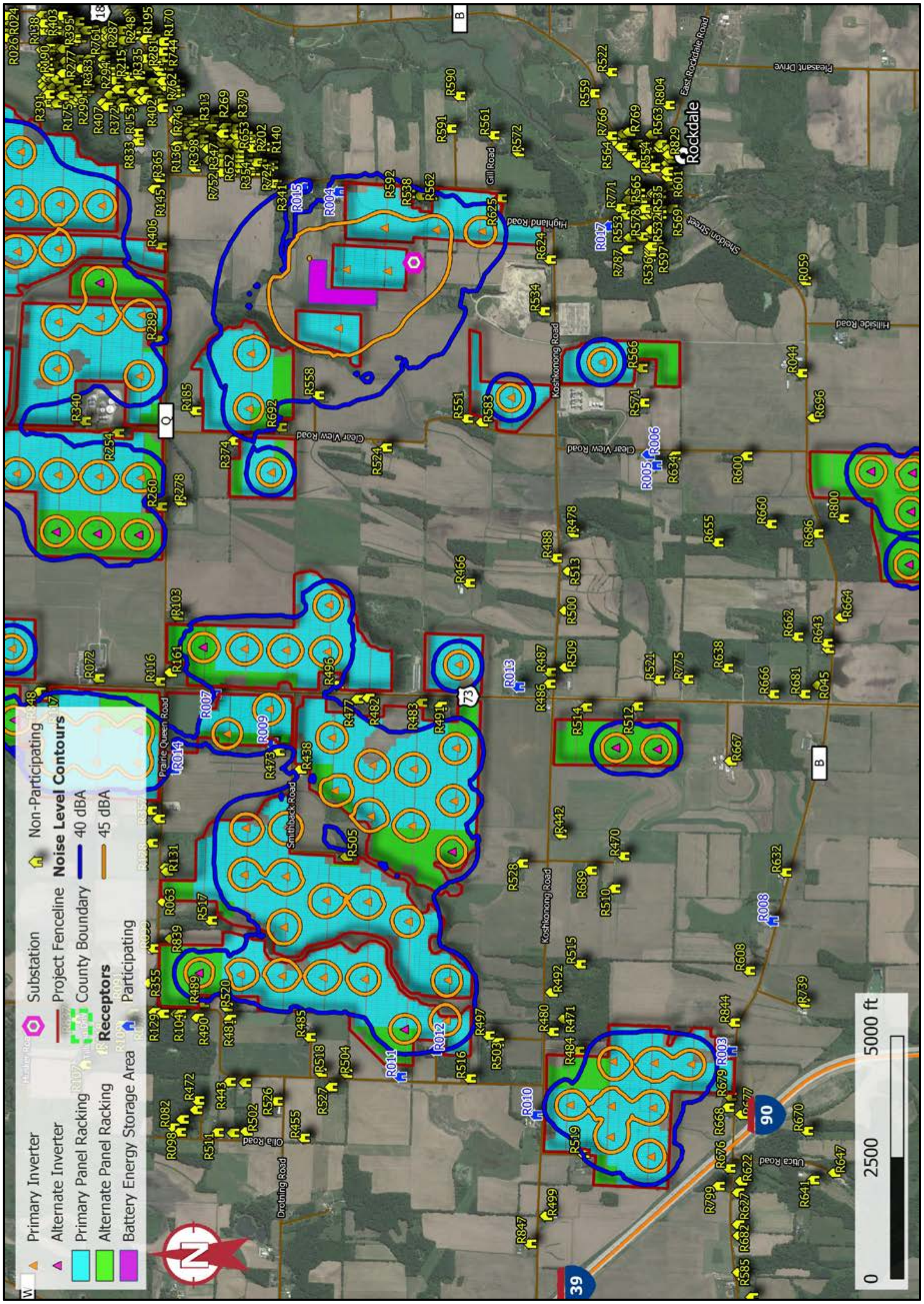


Figure 7-2. Predicted Operational Noise Level Contours – Daytime Central

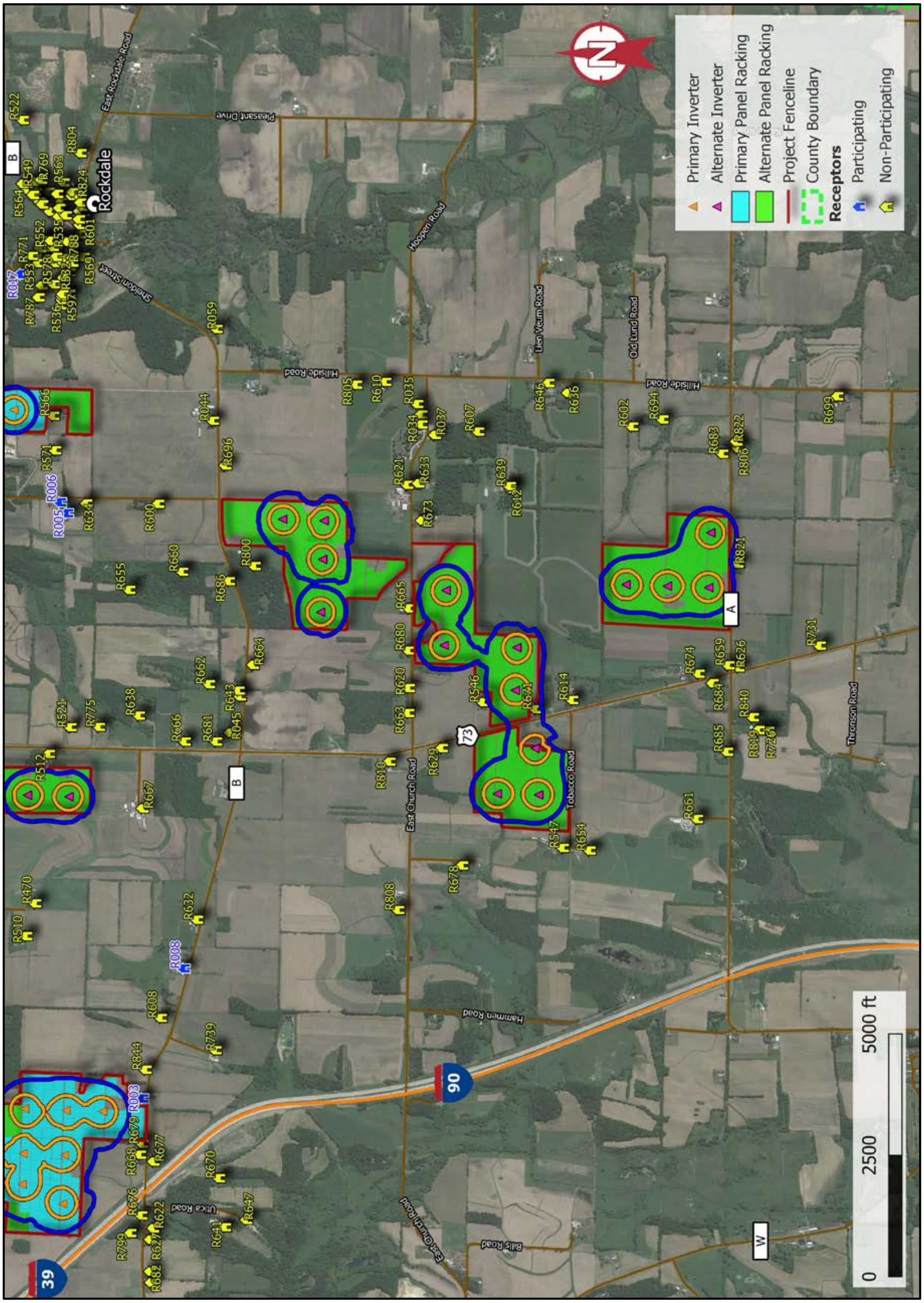


Figure 7-3. Predicted Operational Noise Level Contours – Daytime South

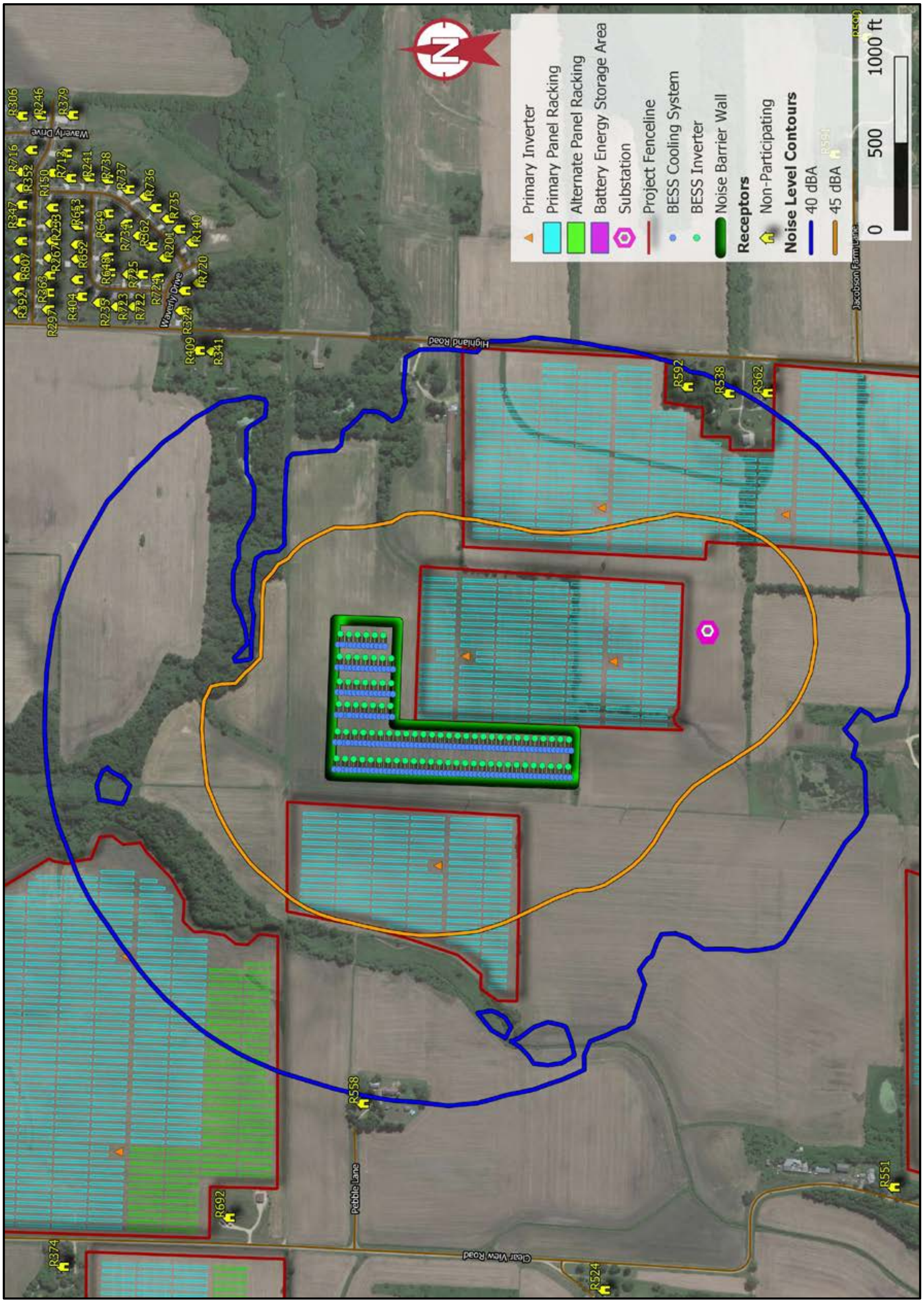


Figure 7-4. Predicted Operational Noise Level Contours – Nighttime

APPENDIX A
Wisconsin Noise and Vibration Protocol

MEASUREMENT PROTOCOL FOR SOUND AND VIBRATION ASSESSMENT OF PROPOSED AND EXISTING ELECTRIC POWER PLANTS

November 2008

Note: Consult with Commission staff prior to conducting any sound and vibration measurements.

I. Introduction

The potential sound and vibration impact associated with the operation of electric generators is often a primary concern for citizens living near proposed power plant sites. This is especially true of projects located near homes, residential neighborhoods, schools, and hospitals. Determining the likely sound and vibration impacts is a highly technical undertaking and requires a serious effort in order to collect reliable and meaningful data for both the public and decision-makers.

This protocol is based, in part, on criteria published in the Standard Guide for Selection of Environmental Noise Measurements and Criteria.[1] The purpose of this protocol is to first establish a consistent and scientifically sound procedure for estimating existing sound and vibration levels in a project area, and second, to determine the likely impact that operation of a new electric power plant will have on the existing sound and vibration environment.

The characteristics of your proposed power plant project and the features of the surrounding environment will influence the design of the sound and vibration study. Site layout, types of generation, and the existence of significant local sound and vibration sources and sensitive receptors should be taken into consideration when designing a sound and vibration study. It may be advisable to hire a qualified consultant to conduct the sound and vibration study.

Note: Consult with Commission staff prior to conducting any sound and vibration measurements.

These guidelines are meant to be general in nature and may need to be modified to accommodate unique site characteristics. Consult with Commission staff assigned to the project for guidance on study design before you begin the sound and vibration study. During consultation, good quality maps or diagrams of the site will be necessary. Maps and diagrams should show the site layout and identify important landscape features as well as significant local sound and vibration sources and sensitive receptors.

II. Measurement of the Existing Sound and Vibration Environment

An estimate of the project area's existing sound and vibration environment is necessary in order to predict the likely impact resulting from a proposed project. The following guidelines must be used in developing a reasonable estimate of an area's existing sound and vibration environment.

A. Sites With Existing Generation (See Figure 1)

1. Two complete sets of sound level measurements must be taken:

   a. One complete set of measurements with the generator(s) off.
   b. One complete set of measurements with existing generator(s) running at full capacity.

If the site includes an existing baseload generator, it is acceptable to take one existing sound level measurement with the baseload unit running and any existing peaking units off and another measurement with all units on.

2. At a minimum, sound level measurements should be taken at three locations or measurement points (MPs). See Figure 1. Because each site is unique, more than three MPs may be necessary. **Consult with Commission staff regarding the quantity and location of the MPs.**

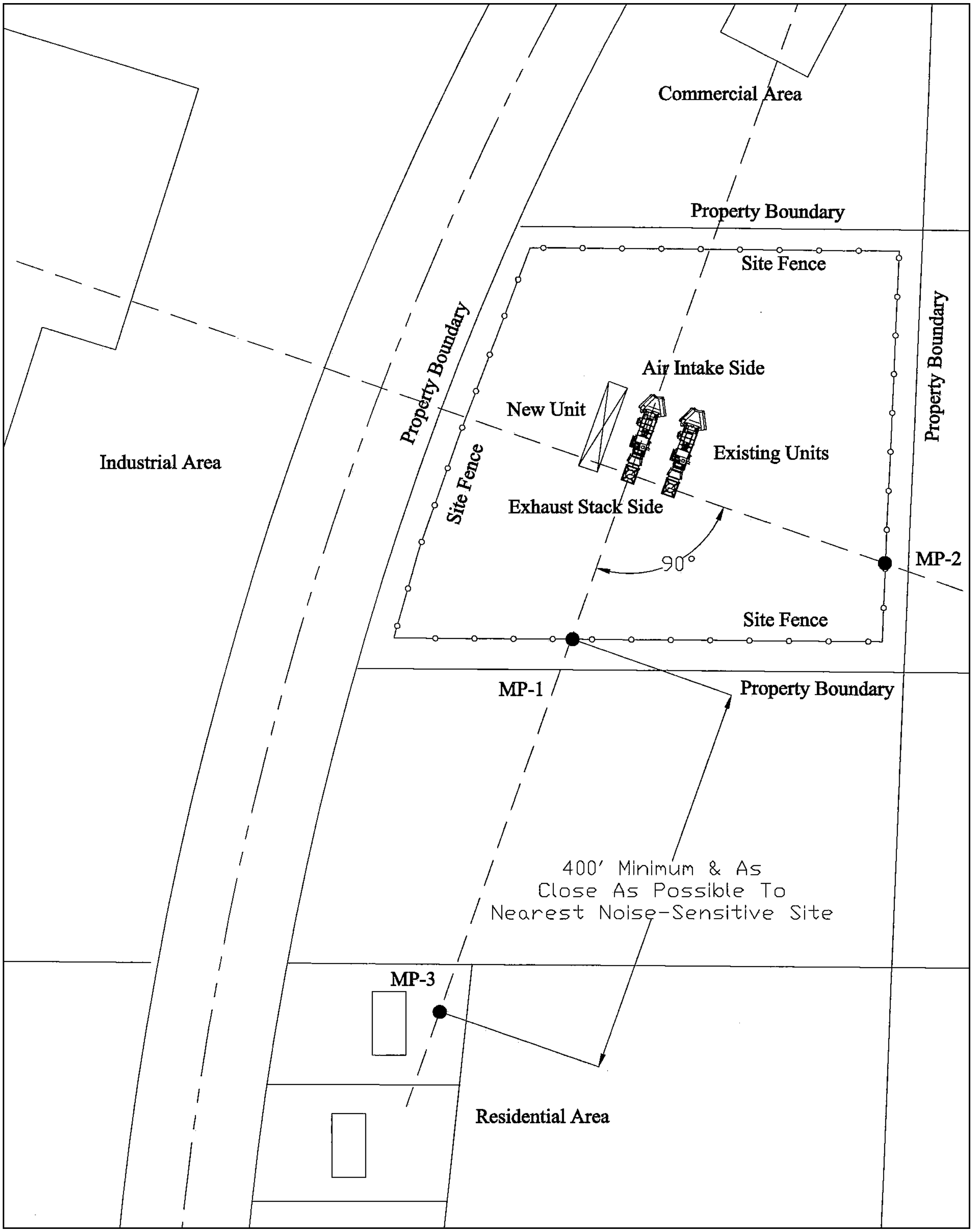
Two sets of measurements should be taken at the site's fence. If the project site is to be expanded in order to accommodate the new generator(s) then the location of the new site fence should be taken into consideration when designing the sound and vibration assessment.

As shown in Figure 1, for sites with gas turbines, MPs should generally be located as follows:

a. MP1 should be established at the site fence, inline with the gas turbine(s). Try to locate MP1 closest to the exhaust stack(s) and closest to the most frequently used generator. If the existing generation is not a combustion turbine then MP1 should be located at the site fence nearest the principal sound and vibration source.
b. MP2 should also be located along the site fence. Locate MP2 at a point 90 degrees, with respect to the existing generators, from MP1. If possible locate MP2 where the ambient sound level is likely to be the least.
c. MP3 should be located 400 feet from MP1 and on a line extending through the existing turbines and MP1. MP3 must be located away from as many ambient sound and vibration sources as possible.
d. Additional MPs should be located as close as possible to the nearest sensitive receptors.

All MPs should be located so that no significant obstruction (building etc.) blocks sound and vibration from the site.

Figure 1 – Recommended Sound Level Measurement Points



3. Duration of measurements should be a minimum of ten continuous minutes for each criterion (See item 4 below) at each location. Measurements should be taken during each of the following four periods:

a. Morning (6 - 8 a.m.)
b. Midday (12 noon – 2 p.m.)
c. Evening (6 - 8 p.m.)
d. Night (10 p.m. – 12 midnight)

Sound level measurements must be made on a weekday of a non-holiday week.

4. For each MP and for each measurement period, provide each of the following measurement criteria:

a. Unweighted octave-band analysis (16,[2] 31.5, 63, 125, 250, 500, 1K, 2K, 4K, & 8K Hz)
b. L_{ave}, L_{10}, L_{50}, and L_{90}, in dBA
c. L_{ave}, L_{10}, L_{50}, and L_{90}, in dBC
d. A narrative description of sounds audible during each measurement

Required sound level measurement criteria is summarized in Table 1.

5. Identify all major sources of sound and vibration (e.g. highways, factories etc.) and where they are located in relation to each MP.

6. Provide a map or diagram clearly showing:

a. the layout of the site
b. the location of MPs
c. the distance between MP1 and MP2 and existing generators
d. the location of significant local sound and vibration sources
e. the distance between all MPs and significant local sound and vibration sources
f. the location of all sensitive receptors (schools, day-care centers, hospitals, and residences or residential neighborhoods) within 400 feet of the site
g. the distance to all major infrastructure (major roads, transmission lines, gas pipelines) within 400 feet of the project site.

B. Sites with No Existing Generation

1. At a minimum, sound level measurements should be taken at three measurement points (MPs). See Figure 1. Because each site is unique, more than three MPs may be necessary. **Consult with Commission staff regarding the quantity and location of the MPs.**

Determine the location of the sites' fenced perimeter. If the approximate location of the proposed generator(s) is known, locate MPs as described for sites with existing generation (See item 2, section titled Sites With Existing Generation). If the location of the new generator(s) is not known, then determine the most likely location. Locate MPs based on the assumed location of the proposed generator(s).

2. Duration of measurements should be a minimum of ten continuous minutes for each criterion (See item 3 below) at each location. Measurements should be taken during each of the following four periods:

a. Morning (6 - 8 a.m.)
b. Midday (12 noon – 2 p.m.)
c. Evening (6 - 8 p.m.)
d. Night (10 p.m. – 12 midnight)

Sound level measurements must be made on a weekday of a non-holiday week.

3. For each MP and for each measurement period, provide each of the following measurement criteria:

a. Unweighted octave-band analysis (16, [2] 31.5, 63, 125, 250, 500, 1K, 2K, 4K, & 8K Hz)
b. L_{ave}, L_{10}, L_{50}, and L_{90}, in dBA
c. L_{ave}, L_{10}, L_{50}, and L_{90}, in dBC
d. A narrative description of sounds audible during each measurement

Required sound level measurement criteria is summarized in Table 1.

4. Identify all major sources of sound and vibration (i.e. highways, factories etc.) and where they are located in relation to MPs.

5. Provide a map or diagram clearly showing:

a. the layout of the site
b. the location of MPs
c. the distance between MP1 and MP2 and existing generators
d. the location of significant local sound and vibration sources
e. the distance between all MPs and significant local sound and vibration sources
f. the location of all sensitive receptors (schools, day-care centers, hospitals, and residences or residential neighborhoods) within 400 feet of the site
g. the distance to all major infrastructure (major roads, transmission lines, gas pipelines) within 400 feet of the project site.

Table 1 – Required Sound Level Measurement Criteria

	Existing Ambient Noise	Existing Noise With Existing Unit(s) Running	Projected Noise Levels With Existing And New Unit(s) Running	Post-Construction Actual Noise Levels
A- Weighted Sound Level (dBA)	Lave, L10, L50, L90 Measured At MP-1, MP-2, & MP-3 Measured during each period, 6-8am Noon-2pm, 6-8pm, and 10pm-Midnight	Lave, L10, L50, L90 Measured At MP-1, MP-2, & MP-3 Measured during each period, 6-8am Noon-2pm, 6-8pm, and 10pm-Midnight	Lavg calculated at Site Fence, 100', 400', and 1000' (CT) and 1500', 2000', and 3000' (CC) of Site Fence	Lave, L10, L50, L90 Measured At MP-1, MP-2, & MP-3 Measured during each period, 6-8am Noon-2pm, 6-8pm, and 10pm-Midnight
C- Weighted Sound Level (dBC)	Lave, L10, L50, L90 Measured At MP-1, MP-2, & MP-3 Measured during each period, 6-8am Noon-2pm, 6-8pm, and 10pm-Midnight	Lave, L10, L50, L90 Measured At MP-1, MP-2, & MP-3 Measured during each period, 6-8am Noon-2pm, 6-8pm, and 10pm-Midnight	Lavg calculated at Site Fence, 100', 400', and 1000' (CT) and 1500', 2000', and 3000' (CC) of Site Fence	Lave, L10, L50, L90 Measured At MP-1, MP-2, & MP-3 Measured during each period, 6-8am Noon-2pm, 6-8pm, and 10pm-Midnight
Octave Bands (dB) **16,[2] 31.5, 63, 125, 250, 500, 1K, 2K, 4K and 8K Hz**	Sound Level, L Measured At MP-1, MP-2, & MP-3 Measured during each period, 6-8am Noon-2pm, 6-8pm, and 10pm-Midnight	Sound Level, L Measured At MP-1, MP-2, & MP-3 Measured during each period, 6-8am Noon-2pm, 6-8pm, and 10pm-Midnight	Sound Level, L, calculated at Site Fence, 100', 400', and 1000' (CT) and 1500', 2000', and 3000' (CC) of Site Fence	Sound Level, L Measured At MP-1, MP-2, & MP-3 Measured during each period, 6-8am Noon-2pm, 6-8pm, and 10pm-Midnight

C. Sound Level Estimate for Proposed Generator(s)

In order to estimate the sound and vibration impact of the proposed project on the existing environment, an estimate of the sound and vibration produced by the proposed generator/s must be provided.

1. Provide the manufacturer's sound level characteristics for the proposed unit(s) operating at full load. Include an **unweighted** octave band (16, [2] 31.5, 63, 125, 250, 500, 1K, 2K, 4K, & 8K Hz) analysis for the unit at full operation. If the plant consists of only combustion turbines, octave band estimates should be for distances of 100 and 400 and 1,000 feet from the generators. If the plant is a combined cycle facility, the estimates should be made for distances of 100, 400, 1000, 1500, 2000, and 3000 feet from the cooling towers, or from whichever source is expected to produce the greatest sound levels.

2. Estimate sound levels from the proposed facility in dBA and dBC at 100 feet and at 400 feet from the unit/s if the plant consists only of combustion turbines. For combined cycle plants, estimate sound levels at 100, 400, 1000, 1500, 2000, and 3000 feet from the cooling towers or whichever source produces the greatest sound levels. For projects with multiple generators the combined sound level impact for all units operating at full load must be estimated.

3. Provide a contour map of the expected sound levels from the new plant, using 5dBA increments, created by the proposed generator/s extending out to a distance of 1,000 feet for a combustion turbine plant and 3,000 feet for a combined cycle plant.

4. Determine the impact of the new sound and vibration source on the existing environment. For each measurement point used in the ambient study:

   a. Report expected changes to existing sound levels for Lave, L10, L50, and L90, in dBA.
   b. Report expected changes to existing sound levels for L_{ave}, L_{10}, L_{50}, and L_{90}, in dBC.

At least two measurement points must be located at the nearest sensitive receptors, as required by sections II.A.2 and II.B.1.

5. Clearly report all assumptions made in arriving at the estimates of impact and any conclusions reached regarding the potential effects on people living near the project area.

6. Include an estimate of the number of hours of operation expected from the proposed generator(s) and under what conditions generators would be expected to run. Indicate whether the plant will be used for peak, intermediate, or base load operation.

III. Post-Construction Measurements

1. Within twelve months of the date when the project is fully operational, and within two weeks of the anniversary date of the pre-construction ambient noise measurements, repeat the existing sound and vibration environment measurements taken before project approval.

For conventional generation projects, post-construction sound level measurements should be taken both with all units running at full capacity and with all units off.

For wind project developments, post-construction sound level measurements should be taken under two wind conditions:

a. Under calm conditions without the wind turbine rotors rotating. These measurements shall be taken with the entire wind generating development off line.
b. Under wind conditions just above the cut-in speed for the wind turbines with as many of the wind turbines in the development operating as practicable.

Notes regarding post-construction sound level measurements for wind project developments:

i. Measurements taken as required under item b may be taken prior to measurements taken under item a.
ii. Because of the variability of wind speeds, post-construction measurements may be taken outside of the measurement periods listed in Section IIA, item 3. However, measurements taken under item a, above, must be taken during the same time of day as the corresponding measurements taken under item b.
iii. For each measurement point at which pre-construction noise measurements were taken, a minimum of three sets of measurements shall be taken under items a and b. The three sets of measurements should correspond to at least two different times of day. Any or all of the measurements may be taken outside of the measurement periods listed in Section IIA, item 3.
iv. Measurements taken to fulfill the requirements of items a and b must be taken within as few consecutive days as practicable.
v. Measurements taken under items a and b must include a measurement of the 16 Hz octave band, as described in Section II, item B3a.

2. Report post construction measurements to the Public Service Commission using the same format as used for the pre-approval sound and vibration studies.

Revision History

Revisions added February 7, 2002.

- Revision History section added.
- In Table 1, typographical error corrected in fourth column, "200'" changed to "2000.'"
- Footnotes converted to endnotes.
- In section II.C.1, added "16" to list of octave bands.
- Added endnote regarding the 16 Hz center frequency octave band measurements in every place where that measurement is mentioned.
- Changed section II.C.4 to require predictions of changes to noise levels at the measurement points from the ambient noise study. The previous language required predictions at points that did not correspond with the ambient measurement points.
- Added language in section III.1, requiring that the post-construction noise measurements take place within twelve months of initial operation, and within two weeks of the anniversary date of the pre-construction ambient noise measurements. The purpose of the change is to minimize fluctuations in seasonal ambient noise between the pre- and post construction measurements.

Revisions added November 17, 2008.

- Added instructions for post-construction noise measurements for wind developments in section III.1.

---

[1] Standard Guide for Selection of Environmental Noise Measurements and Criteria (Designation E 1686-96). July 1996. American Society for Testing and Measurements.

[2] PSC staff acknowledges that few sound level meters are capable of measurement of the 16 Hz center frequency octave band. However, because noise complaints from the public most likely involve low frequency noise associated with proposed plants, we encourage applicants to pursue the collection of this important ambient noise data.

If obtaining the 16 Hz data presents a problem, contact PSC staff prior to collection of any field ambient measurement data.

APPENDIX B

Measured Noise Levels (Attended)

Table B-1.1 Attended Measurements Noise Levels, Day 1

Day	Time	Location	Measure ID	L_{ave} (dBA)	L_{10} (dBA)	L_{50} (dBA)	L_{90} (dBA)	L_{ave} (dBC)	L_{10} (dBC)	L_{50} (dBC)	L_{90} (dBC)
1	Morning	M1	2	44.7	43.1	35.9	33.0	55.1	53.9	50.5	47.4
		M2	1	53.5	56.2	52.5	49.0	61.1	63.4	57.2	53.0
		M3	3	48.6	51.7	46.0	43.6	59.8	60.9	55.5	52.0
		M4	4	43.0	45.8	40.8	38.8	54.7	55.6	51.6	48.6
		M5	5	62.5	65.6	51.7	43.9	70.1	71.2	59.2	53.2
		M6	6	51.1	47.4	44.0	42.0	60.9	62.3	56.8	53.4
		M7	7	44.3	47.0	42.9	39.8	55.6	56.6	52.7	49.4
1	Afternoon	M1	9	34.3	37.4	30.2	26.5	51.0	48.8	44.2	40.7
		M2	8	45.8	45.9	41.4	37.7	57.0	57.4	50.9	46.3
		M3	10	44.0	48.0	36.7	32.9	58.8	57.5	49.8	45.8
		M4	11	40.5	44.0	34.0	30.1	56.6	56.4	46.5	41.9
		M5	12	58.1	60.9	40.5	32.1	67.9	67.1	52.4	45.1
		M6	13	46.9	41.2	36.2	34.8	62.7	57.5	52.5	48.8
		M7	14	34.9	38.1	30.5	27.4	52.6	51.2	44.5	40.4
1	Evening	M1	21	37.7	36.1	29.9	27.6	51.9	48.0	42.0	38.1
		M2	20	38.0	40.5	35.6	30.8	54.7	55.1	46.1	39.8
		M3	15	43.7	48.1	39.3	33.6	55.7	57.4	50.5	43.9
		M4	16	42.8	44.9	35.5	29.3	57.6	55.1	43.3	37.8
		M5	17	59.3	59.8	43.9	31.9	69.3	64.3	50.8	43.6
		M6	18	47.8	46.2	44.0	41.9	60.9	61.5	57.3	53.4
		M7	19	40.6	39.7	29.2	22.0	56.6	53.0	44.1	37.5
1	Night	M1	28	40.8	32.2	27.5	25.6	50.0	46.7	43.1	39.9
		M2	27	40.1	41.0	33.1	28.0	64.5	51.0	45.4	41.6
		M3	22	37.4	38.4	30.8	27.8	49.8	50.8	46.0	42.7
		M4	23	44.5	44.3	35.6	29.5	56.1	52.8	45.5	41.5
		M5	24	53.3	48.1	40.9	37.5	60.5	57.4	51.9	48.3
		M6	25	50.2	52.3	49.5	46.3	63.0	64.2	59.7	56.0
		M7	26	47.5	49.2	32.7	24.0	71.8	54.4	46.4	38.7

Table B-1.2 Attended Measurements Noise Levels, Day 2

Day	Time	Location	Measure ID	L_{ave} (dBA)	L_{10} (dBA)	L_{50} (dBA)	L_{90} (dBA)	L_{ave} (dBC)	L_{10} (dBC)	L_{50} (dBC)	L_{90} (dBC)
2	Morning	M1	49	54.4	52.4	38.3	36.7	67.3	62.0	56.2	53.1
		M2	48	52.1	53.9	51.1	47.8	60.0	61.1	57.9	54.7
		M3	43	45.7	46.8	41.3	39.8	59.0	59.6	56.0	52.8
		M4	44	45.7	48.5	44.1	39.5	55.3	56.4	52.8	49.6
		M5	45	64.1	66.5	48.2	40.0	68.4	68.7	57.5	53.6
		M6	46	49.0	46.1	41.0	38.5	60.8	61.6	56.9	53.5
		M7	47	40.0	43.2	36.4	34.4	56.3	57.3	53.5	50.5
2	Afternoon	M1	56	49.1	49.2	34.0	30.7	59.2	61.9	49.3	45.0
		M2	55	49.8	44.3	39.2	36.6	58.2	58.6	52.4	48.2
		M3	50	52.2	48.5	39.3	33.8	67.0	62.2	51.1	46.4
		M4	51	52.1	50.2	39.2	31.6	62.8	58.4	48.0	42.5
		M5	52	59.2	60.4	41.7	38.1	65.1	65.3	54.4	50.2
		M6	53	43.1	44.6	42.9	40.9	59.9	61.2	57.1	53.7
		M7	54	38.3	39.9	31.0	29.0	53.1	54.3	47.5	43.8
2	Evening	M1	35	36.7	36.7	29.7	26.4	62.3	58.5	49.8	43.7
		M2	34	47.1	48.9	44.1	39.1	64.2	59.7	53.7	47.8
		M3	29	46.6	50.2	40.2	36.4	59.6	57.8	50.9	46.6
		M4	30	43.1	46.2	41.0	36.5	53.5	53.4	46.7	42.4
		M5	31	56.9	59.1	42.7	35.5	65.2	63.6	51.3	45.8
		M6	32	44.5	40.0	36.7	34.5	56.8	55.5	51.2	47.7
		M7	33	41.0	41.2	34.0	30.2	61.7	57.5	50.4	45.3
2	Night	M1	42	36.6	38.9	31.7	28.8	65.3	57.9	49.0	44.7
		M2	41	42.0	44.9	40.3	36.8	63.5	57.4	52.1	48.0
		M3	36	43.7	46.3	41.5	37.9	63.6	58.4	53.6	49.8
		M4	37	38.3	41.3	37.0	34.5	54.0	52.7	48.8	45.7
		M5	38	48.4	45.8	42.7	39.1	61.2	57.9	53.7	50.2
		M6	39	42.9	45.0	42.1	40.1	62.5	60.5	53.8	50.1
		M7	40	35.3	36.7	33.6	32.1	63.9	57.5	51.0	46.6

Table B-2.1 Attended Measured Octave-Band Noise Levels, Day 1

Day	Time	Location	Measure ID	Leq-10min (dB)									
				16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2000 Hz	4000 Hz	8000 Hz
1	Morning	M1	2	55	53	50	46	40	41	42	34	35	28
		M2	1	55	58	58	47	45	52	51	36	25	23
		M3	3	56	55	56	54	47	44	45	39	32	21
		M4	4	56	52	50	47	40	40	39	35	28	21
		M5	5	59	59	67	65	60	58	60	52	44	31
		M6	6	58	57	58	51	47	47	49	40	32	24
		M7	7	56	54	51	46	42	43	42	27	22	19
1	Afternoon	M1	9	55	48	43	36	29	29	31	27	22	19
		M2	8	59	53	53	42	39	40	44	34	27	26
		M3	10	55	53	57	51	45	39	40	34	25	21
		M4	11	55	51	54	49	43	35	35	29	24	21
		M5	12	59	57	66	62	57	55	55	47	35	23
		M6	13	62	56	60	54	49	43	43	32	27	20
		M7	14	53	47	47	48	33	31	25	17	16	15
1	Evening	M1	21	58	54	41	41	39	34	32	30	22	18
		M2	20	56	53	52	41	34	35	35	27	21	16
		M3	15	51	55	51	48	42	39	41	34	24	19
		M4	16	49	48	53	56	44	37	36	30	27	16
		M5	17	58	56	64	65	64	55	53	47	37	21
		M6	18	61	60	56	48	46	46	43	37	28	21
		M7	19	58	54	52	48	41	39	33	31	24	19
1	Night	M1	28	50	48	44	42	37	36	38	33	27	19
		M2	27	69	63	55	48	38	35	36	32	27	19
		M3	22	50	48	44	43	38	34	33	27	17	16
		M4	23	52	50	52	52	47	39	39	36	27	20
		M5	24	59	54	54	54	51	50	50	44	33	20
		M6	25	63	63	57	53	49	49	47	33	24	17
		M7	26	68	63	57	53	47	46	43	35	27	21

Table B-2.2 Attended Measured Octave-Band Noise Levels, Day 2

Day	Time	Location	Measure ID	Leq-10min (dB) 16 Hz	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1,000 Hz	2000 Hz	4000 Hz	8000 Hz
2	Morning	M1	49	58	58	66	60	54	49	51	44	33	26
		M2	48	57	57	57	48	41	45	51	40	28	21
		M3	43	57	57	55	52	43	41	42	37	31	24
		M4	44	55	53	52	46	37	37	34	42	39	25
		M5	45	57	57	60	61	63	58	61	56	46	35
		M6	46	60	58	57	53	45	44	47	38	32	21
		M7	47	56	55	52	46	42	40	32	22	20	19
2	Afternoon	M1	56	53	53	54	56	49	44	46	37	33	20
		M2	55	56	54	54	51	45	45	47	41	30	22
		M3	50	52	53	65	63	55	44	46	41	34	26
		M4	51	64	58	57	55	53	53	45	36	35	25
		M5	52	59	58	59	58	58	57	56	48	39	26
		M6	53	58	58	57	48	40	40	40	29	24	17
		M7	54	51	50	50	43	45	36	28	19	17	17
2	Evening	M1	35	68	58	49	40	31	29	32	31	23	20
		M2	34	69	59	53	50	40	43	45	35	28	24
		M3	29	63	54	52	49	46	40	43	39	32	26
		M4	30	56	48	48	45	39	36	38	37	34	24
		M5	31	60	53	54	63	55	53	54	48	37	23
		M6	32	59	54	50	44	40	39	43	34	23	17
		M7	33	67	57	49	44	40	40	37	25	20	18
2	Night	M1	42	70	59	49	43	35	33	31	29	24	20
		M2	41	69	57	50	44	39	39	39	30	24	22
		M3	36	68	58	53	48	44	42	38	34	29	24
		M4	37	57	50	47	43	37	35	34	29	24	21
		M5	38	65	55	53	49	46	43	45	41	30	21
		M6	39	67	58	55	51	42	40	38	33	27	23
		M7	40	69	58	49	42	36	33	29	23	20	18

APPENDIX C

Predicted Operational Noise Levels

Table C-1. Predicted Operational Noise Levels for Participating Receptors

Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R003	328851	4759315	309	307	37	52	< 20	< 30
R004	334240	4761778	263	261	42	56	41	< 30
R005	332524	4759787	280	279	21	37	< 20	< 30
R006	332593	4759832	279	278	22	38	< 20	< 30
R007	331091	4762552	280	279	40	55	< 20	< 30
R008	329667	4759056	297	295	< 20	< 30	< 20	< 30
R009	330786	4762196	285	283	41	56	< 20	< 30
R010	328449	4760537	305	304	37	52	< 20	< 30
R011	328690	4761389	286	285	35	50	< 20	< 30
R012	328857	4761169	296	294	40	55	< 20	< 30
R013	331136	4760648	287	285	34	50	< 20	< 30
R014	330619	4762812	282	281	40	55	< 20	< 30
R015	334267	4761982	261	259	41	56	40	< 30
R017	334024	4760076	267	266	21	38	< 20	< 30

Table C-2. Predicted Operational Noise Levels for Non-Participating Receptors

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R018	335305	4763908	262	260	23	39	< 20	< 30
R019	335345	4763888	261	259	22	38	< 20	< 30
R020	335273	4763846	262	261	23	39	< 20	< 30
R021	335269	4763907	264	262	26	42	< 20	< 30
R022	335254	4763886	263	262	26	42	< 20	< 30
R024	335311	4763849	261	260	23	39	< 20	< 30
R025	335239	4763851	263	262	26	42	< 20	< 30
R026	335208	4763852	264	263	27	43	< 20	< 30
R027	335224	4763903	265	263	27	43	< 20	< 30
R028	335344	4763856	261	259	22	38	< 20	< 30
R029	335362	4763089	255	253	< 15	< 30	< 20	< 30
R030	335297	4763885	261	260	23	39	< 20	< 30
R031	335326	4763070	255	253	< 15	< 30	< 20	< 30
R032	335313	4763062	255	253	< 15	< 30	< 20	< 30
R033	333081	4757565	276	274	19	35	< 20	< 30
R034	333144	4757566	271	270	19	35	< 20	< 30
R035	333210	4757590	266	265	< 15	< 30	< 20	< 30
R036	335346	4763079	255	254	< 15	< 30	< 20	< 30
R037	333015	4757480	276	275	19	35	< 20	< 30
R038	335209	4763939	265	264	26	43	< 20	< 30
R039	335243	4763944	265	264	26	42	< 20	< 30
R040	335345	4763938	260	259	22	38	< 20	< 30
R041	335276	4763944	263	262	23	39	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R042	335312	4763944	262	260	23	39	< 20	< 30
R044	333104	4758872	284	283	24	41	< 20	< 30
R045	331146	4758765	300	299	< 15	< 30	< 20	< 30
R046	332603	4767259	268	267	< 15	< 30	< 20	< 30
R049	334561	4767202	268	266	< 15	< 30	< 20	< 30
R051	333769	4767410	267	266	< 15	< 30	< 20	< 30
R053	332795	4767247	266	264	< 15	< 30	< 20	< 30
R056	332855	4767360	264	263	< 15	< 30	< 20	< 30
R058	334646	4767313	266	264	< 15	< 30	< 20	< 30
R059	333681	4758849	271	269	< 15	< 30	< 20	< 30
R060	333991	4767361	267	265	< 15	< 30	< 20	< 30
R061	332863	4767178	266	264	23	40	< 20	< 30
R063	329788	4762872	279	277	32	48	< 20	< 30
R065	334392	4767210	267	265	23	40	< 20	< 30
R066	334033	4766926	269	267	30	47	< 20	< 30
R068	335296	4763052	255	253	< 15	< 30	< 20	< 30
R069	329085	4762791	282	281	35	51	< 20	< 30
R072	331191	4763283	281	279	38	53	< 20	< 30
R077	329090	4763066	276	274	26	42	< 20	< 30
R078	330004	4762858	280	278	35	51	< 20	< 30
R080	331427	4764441	271	269	25	41	< 20	< 30
R081	331216	4764117	275	273	33	49	< 20	< 30
R082	328373	4762810	284	282	< 15	< 30	< 20	< 30
R084	331614	4764521	267	266	24	40	< 20	< 30
R085	331163	4765763	274	273	< 15	< 30	< 20	< 30
R087	330216	4763898	267	266	32	48	< 20	< 30
R089	329708	4764008	268	266	< 15	< 30	< 20	< 30
R091	329179	4763107	275	273	26	41	< 20	< 30
R097	329096	4762930	279	278	29	44	< 20	< 30
R098	328343	4762770	283	281	< 15	< 30	< 20	< 30
R099	329496	4762936	280	279	34	50	< 20	< 30
R100	331262	4764242	271	269	29	44	< 20	< 30
R103	331581	4762788	278	277	34	50	< 20	< 30
R104	329085	4762770	282	281	36	51	< 20	< 30
R107	328765	4763366	272	270	< 15	< 30	< 20	< 30
R108	331153	4764574	263	262	23	39	< 20	< 30
R109	329017	4763137	272	271	25	40	< 20	< 30
R110	328424	4762753	277	275	< 15	< 30	< 20	< 30
R113	331208	4765522	272	270	< 15	< 30	< 20	< 30
R114	331613	4764782	267	265	27	43	< 20	< 30
R116	331169	4762901	288	286	37	52	< 20	< 30
R117	331078	4763603	277	275	40	55	< 20	< 30
R118	328859	4763261	272	270	20	36	< 20	< 30
R119	334940	4767113	267	265	< 15	< 30	< 20	< 30
R120	335326	4763625	262	260	22	38	< 20	< 30
R122	331512	4764675	265	263	23	39	< 20	< 30
R123	332727	4765154	271	270	30	46	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R124	335192	4763544	263	262	23	39	< 20	< 30
R125	332734	4765186	272	270	30	45	< 20	< 30
R126	331605	4764470	270	268	26	43	< 20	< 30
R128	330156	4762948	274	273	35	52	< 20	< 30
R129	329086	4762878	279	277	30	45	< 20	< 30
R131	329978	4762850	281	279	35	51	< 20	< 30
R132	334836	4762916	262	261	25	41	< 20	< 30
R133	334791	4763483	266	264	35	50	< 20	< 30
R134	334906	4763455	263	261	30	45	< 20	< 30
R135	334971	4762957	260	259	19	35	< 20	< 30
R136	334533	4762741	265	264	25	40	< 20	< 30
R137	334846	4763562	267	265	34	50	< 20	< 30
R138	335251	4763629	262	261	23	39	< 20	< 30
R139	335130	4764418	275	274	25	41	< 20	< 30
R140	334482	4762204	267	265	34	49	34	48
R141	334933	4763624	264	263	29	45	< 20	< 30
R142	335192	4763514	263	261	23	39	< 20	< 30
R143	331223	4764018	276	274	36	51	< 20	< 30
R144	333971	4764968	282	280	39	54	< 20	< 30
R145	334258	4762932	268	266	36	51	< 20	< 30
R146	335210	4763179	256	255	< 15	< 30	< 20	< 30
R147	335091	4764145	276	274	25	41	< 20	< 30
R148	335255	4763073	255	254	< 15	< 30	< 20	< 30
R149	335196	4763489	263	261	23	39	< 20	< 30
R150	334604	4762449	265	263	< 15	< 30	< 20	< 30
R151	335066	4764218	280	278	29	45	< 20	< 30
R152	334902	4763623	265	264	33	49	< 20	< 30
R153	334774	4763077	262	261	26	42	< 20	< 30
R154	334621	4762712	264	262	21	37	< 20	< 30
R155	334921	4763396	263	261	29	45	< 20	< 30
R156	335001	4763245	260	259	27	43	< 20	< 30
R157	334630	4762632	264	263	24	41	< 20	< 30
R160	332695	4765236	272	270	29	45	< 20	< 30
R161	331227	4762828	285	283	36	52	< 20	< 30
R162	330106	4764129	269	267	26	43	< 20	< 30
R163	331544	4764993	264	262	27	43	< 20	< 30
R164	335536	4765752	265	263	< 15	< 30	< 20	< 30
R165	335014	4763517	265	263	30	46	< 20	< 30
R166	334910	4763117	261	259	26	43	< 20	< 30
R167	334896	4763532	264	262	30	46	< 20	< 30
R168	332712	4765158	272	270	30	46	< 20	< 30
R169	335081	4764073	274	272	30	46	< 20	< 30
R170	335215	4762878	256	255	< 15	< 30	< 20	< 30
R171	334924	4763020	263	261	27	44	< 20	< 30
R172	334791	4763197	263	261	31	47	< 20	< 30
R173	334829	4763143	262	260	28	45	< 20	< 30
R174	335256	4763097	255	254	< 15	< 30	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R175	334795	4763513	266	265	35	51	< 20	< 30
R176	334941	4763418	264	262	30	46	< 20	< 30
R177	335348	4763634	262	260	22	38	< 20	< 30
R178	335308	4763541	262	260	22	38	< 20	< 30
R179	333286	4765407	275	273	37	53	< 20	< 30
R180	334563	4762548	265	263	25	40	< 20	< 30
R181	334517	4762507	266	264	26	40	< 20	< 30
R182	334844	4763537	266	264	34	50	< 20	< 30
R183	334996	4763181	260	258	26	42	< 20	< 30
R184	335008	4763625	264	263	29	45	< 20	< 30
R185	332867	4762674	274	272	37	53	< 20	< 30
R186	335149	4764392	276	274	23	39	< 20	< 30
R188	335279	4765377	268	266	23	39	< 20	< 30
R189	335052	4763576	265	263	30	46	< 20	< 30
R190	334987	4763564	265	263	30	46	< 20	< 30
R191	335123	4762933	258	256	< 15	< 30	< 20	< 30
R192	334791	4763569	267	265	35	51	< 20	< 30
R193	334946	4763274	261	259	28	44	< 20	< 30
R194	334965	4763066	262	260	25	41	< 20	< 30
R195	335233	4763011	256	254	< 15	< 30	< 20	< 30
R196	334542	4762269	267	265	31	45	31	45
R197	332734	4765197	272	270	29	45	< 20	< 30
R198	334800	4763252	263	261	30	45	< 20	< 30
R199	335032	4764368	274	272	28	45	< 20	< 30
R200	335253	4763479	262	260	22	38	< 20	< 30
R201	334454	4762251	269	267	35	49	34	49
R202	334494	4762297	268	266	32	47	32	47
R203	334203	4765806	269	267	41	56	< 20	< 30
R204	335082	4763557	265	263	27	43	< 20	< 30
R205	332736	4765300	274	272	29	45	< 20	< 30
R206	335159	4763187	257	255	19	35	< 20	< 30
R207	335210	4763238	257	256	19	35	< 20	< 30
R208	334947	4763572	264	263	29	45	< 20	< 30
R209	332701	4765215	272	270	29	45	< 20	< 30
R210	334814	4763438	263	261	31	47	< 20	< 30
R211	332737	4765270	273	271	29	45	< 20	< 30
R212	332735	4765282	273	272	29	45	< 20	< 30
R213	335080	4764244	280	279	29	45	< 20	< 30
R214	335204	4763396	260	258	22	38	< 20	< 30
R215	334962	4763132	261	259	26	42	< 20	< 30
R216	335081	4763520	265	264	27	43	< 20	< 30
R217	335183	4763447	261	260	23	39	< 20	< 30
R218	335201	4762930	257	255	< 15	< 30	< 20	< 30
R219	334864	4763104	261	260	27	43	< 20	< 30
R220	334797	4763458	265	263	34	49	< 20	< 30
R222	332948	4764427	273	271	41	56	< 20	< 30
R223	335259	4763319	259	257	19	35	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R224	335217	4764120	269	268	24	39	< 20	< 30
R225	332732	4765220	272	270	29	45	< 20	< 30
R226	335089	4764301	280	279	28	45	< 20	< 30
R227	334974	4762995	261	259	22	38	< 20	< 30
R228	334642	4762545	265	263	24	40	< 20	< 30
R229	332733	4765210	272	270	29	45	< 20	< 30
R230	334814	4763046	262	260	25	41	< 20	< 30
R231	332735	4765259	272	271	29	45	< 20	< 30
R232	335255	4763200	257	255	< 15	< 30	< 20	< 30
R233	334484	4762450	268	266	28	43	27	41
R234	333222	4765386	276	274	37	52	< 20	< 30
R235	334376	4762367	270	269	35	49	34	49
R236	335345	4763578	263	261	19	35	< 20	< 30
R237	334819	4763188	262	261	30	46	< 20	< 30
R238	335035	4763629	264	263	30	46	< 20	< 30
R239	334841	4763622	267	265	35	51	< 20	< 30
R240	334571	4765384	273	271	39	53	< 20	< 30
R241	334596	4762386	264	262	< 15	< 30	< 20	< 30
R242	335255	4763392	260	258	19	35	< 20	< 30
R243	335253	4763232	258	256	< 15	< 30	< 20	< 30
R244	335007	4764426	273	271	28	44	< 20	< 30
R245	335224	4763433	260	259	22	38	< 20	< 30
R246	334706	4762471	264	262	< 15	< 30	< 20	< 30
R247	334993	4764179	275	274	31	47	< 20	< 30
R248	335257	4763117	256	254	< 15	< 30	< 20	< 30
R249	335028	4764104	276	274	31	46	< 20	< 30
R250	334808	4763085	262	260	26	41	< 20	< 30
R251	334989	4763452	265	263	30	47	< 20	< 30
R252	334881	4763597	266	264	34	50	< 20	< 30
R253	332297	4766005	266	264	< 15	< 30	< 20	< 30
R254	332728	4763159	271	270	39	54	< 20	< 30
R255	334929	4762939	261	260	19	35	< 20	< 30
R256	334585	4762695	264	262	21	37	< 20	< 30
R257	335143	4763590	264	262	24	40	< 20	< 30
R258	335027	4763466	265	263	30	47	< 20	< 30
R259	334926	4763001	262	261	25	41	< 20	< 30
R260	332265	4762889	275	273	38	54	< 20	< 30
R261	334527	4762553	265	263	25	41	< 20	< 30
R262	334795	4763544	267	265	35	51	< 20	< 30
R263	334605	4762628	265	263	21	36	< 20	< 30
R264	334799	4763617	267	265	36	51	< 20	< 30
R265	332722	4765176	272	270	30	45	< 20	< 30
R266	334694	4762595	265	263	24	40	< 20	< 30
R267	334454	4762454	268	267	29	45	28	43
R268	332737	4765292	274	272	29	45	< 20	< 30
R269	334706	4762532	264	262	24	39	< 20	< 30
R270	335218	4763130	256	254	< 15	< 30	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R271	334970	4764428	272	270	29	45	< 20	< 30
R272	334820	4762899	263	261	23	39	< 20	< 30
R273	334693	4762622	265	263	23	40	< 20	< 30
R274	334884	4763160	261	259	27	43	< 20	< 30
R275	332289	4764854	273	271	36	50	< 20	< 30
R276	335052	4762985	258	257	< 15	< 30	< 20	< 30
R277	334958	4763492	264	262	30	46	< 20	< 30
R278	332300	4762768	279	277	36	51	< 20	< 30
R279	334964	4763436	264	262	30	46	< 20	< 30
R280	334849	4763392	263	261	30	45	< 20	< 30
R281	335028	4762976	259	257	< 15	< 30	< 20	< 30
R282	334880	4762959	262	260	24	40	< 20	< 30
R283	335092	4763590	265	263	27	43	< 20	< 30
R284	334801	4763136	262	260	29	45	< 20	< 30
R285	334922	4763040	263	261	27	44	< 20	< 30
R286	334595	4762570	266	264	25	40	< 20	< 30
R287	335145	4763138	256	255	18	35	< 20	< 30
R288	335261	4763418	260	259	19	35	< 20	< 30
R289	333312	4762893	274	272	41	56	< 20	< 30
R290	332704	4765265	274	272	30	46	< 20	< 30
R291	332690	4765173	272	270	29	45	< 20	< 30
R292	332492	4765238	278	276	31	47	< 20	< 30
R293	335144	4764115	274	272	25	40	< 20	< 30
R294	334970	4763181	260	258	26	43	< 20	< 30
R295	335304	4763575	263	261	22	38	< 20	< 30
R296	334698	4762564	264	263	24	40	< 20	< 30
R297	334364	4762457	269	267	34	48	33	48
R298	335254	4763362	260	258	19	35	< 20	< 30
R299	334832	4763415	263	261	30	46	< 20	< 30
R300	334849	4763207	262	260	30	46	< 20	< 30
R301	335139	4764081	273	272	27	43	< 20	< 30
R302	334897	4763565	265	263	30	46	< 20	< 30
R303	334940	4763179	260	259	28	44	< 20	< 30
R304	335037	4763545	265	263	30	46	< 20	< 30
R305	334930	4762978	262	260	25	41	< 20	< 30
R306	334704	4762504	264	262	< 15	< 30	< 20	< 30
R307	332528	4765230	279	278	31	47	< 20	< 30
R308	334868	4763367	262	261	29	45	< 20	< 30
R309	335091	4764359	278	276	27	43	< 20	< 30
R310	332706	4765233	272	270	29	45	< 20	< 30
R311	334505	4762226	266	265	34	48	33	48
R312	334915	4763084	262	260	26	42	< 20	< 30
R313	334687	4762654	264	262	20	36	< 20	< 30
R314	335143	4763567	264	263	26	42	< 20	< 30
R315	334888	4763502	264	262	30	46	< 20	< 30
R316	335056	4764093	276	274	30	46	< 20	< 30
R317	332737	4765145	271	270	30	46	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R318	335254	4762974	256	254	< 15	< 30	< 20	< 30
R319	334887	4763346	262	260	29	45	< 20	< 30
R320	335197	4763573	263	262	23	39	< 20	< 30
R321	335122	4764154	276	274	25	40	< 20	< 30
R322	334967	4763045	261	260	22	38	< 20	< 30
R323	335296	4763480	262	260	19	35	< 20	< 30
R324	334362	4762223	267	266	37	52	37	51
R325	334440	4762587	267	265	26	41	< 20	< 30
R326	335148	4764301	279	277	24	39	< 20	< 30
R327	334963	4763093	262	260	27	44	< 20	< 30
R328	334855	4763478	264	263	31	47	< 20	< 30
R329	335007	4764124	277	276	31	47	< 20	< 30
R330	335061	4763487	266	264	29	46	< 20	< 30
R331	335190	4763128	256	254	< 15	< 30	< 20	< 30
R332	334515	4762451	267	265	27	42	25	37
R333	334361	4764490	271	269	33	49	< 20	< 30
R334	335007	4764231	276	274	30	46	< 20	< 30
R335	334970	4763028	261	259	22	38	< 20	< 30
R336	335132	4763634	264	262	25	40	< 20	< 30
R337	332188	4765580	280	278	28	43	< 20	< 30
R338	332862	4765303	276	275	33	49	< 20	< 30
R339	335055	4764155	278	276	30	46	< 20	< 30
R340	332802	4763366	274	272	39	54	< 20	< 30
R341	334290	4762168	266	264	39	54	39	53
R342	335037	4764430	273	272	28	44	< 20	< 30
R343	334639	4762577	265	263	22	36	< 20	< 30
R344	335148	4764245	279	277	24	40	< 20	< 30
R345	332686	4765237	272	270	29	45	< 20	< 30
R346	332734	4765246	272	270	29	45	< 20	< 30
R347	334548	4762504	265	264	26	40	< 20	< 30
R348	332134	4765263	271	269	32	46	< 20	< 30
R349	334543	4762629	264	263	25	41	< 20	< 30
R350	334884	4762925	262	260	20	36	< 20	< 30
R351	334916	4762782	261	259	19	35	< 20	< 30
R352	334577	4762503	265	264	26	40	< 20	< 30
R353	334885	4763428	263	261	30	45	< 20	< 30
R354	334429	4762349	270	268	34	48	34	48
R355	329279	4762961	282	280	34	50	< 20	< 30
R356	331211	4764089	275	274	34	50	< 20	< 30
R357	330360	4762952	276	274	37	53	< 20	< 30
R358	334947	4763543	264	262	30	46	< 20	< 30
R359	335344	4763540	262	260	19	35	< 20	< 30
R360	332734	4765230	272	270	29	45	< 20	< 30
R361	335332	4763490	263	261	19	35	< 20	< 30
R362	334474	4762276	269	267	34	48	33	48
R363	334424	4762455	268	267	32	47	31	46
R364	334543	4762450	267	265	26	40	24	31

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R365	334328	4762903	268	266	34	50	< 20	< 30
R366	334996	4764150	277	275	31	47	< 20	< 30
R367	335251	4763019	255	254	< 15	< 30	< 20	< 30
R368	335138	4763502	264	262	24	39	< 20	< 30
R369	334426	4762316	269	267	34	49	34	49
R370	334933	4763474	264	262	30	46	< 20	< 30
R371	335351	4763473	263	261	18	35	< 20	< 30
R372	334771	4763126	263	261	29	45	< 20	< 30
R373	334863	4763068	262	260	26	43	< 20	< 30
R374	332678	4762431	280	278	39	54	< 20	< 30
R375	334816	4763020	262	260	25	41	< 20	< 30
R376	335003	4763128	261	259	26	43	< 20	< 30
R377	334393	4762457	268	267	33	47	32	47
R378	332691	4765217	272	270	29	45	< 20	< 30
R379	334706	4762415	263	261	< 15	< 30	< 20	< 30
R380	334844	4763505	266	264	34	50	< 20	< 30
R382	335201	4763431	261	259	22	38	< 20	< 30
R383	335074	4763340	262	260	23	39	< 20	< 30
R384	335297	4763627	262	260	22	38	< 20	< 30
R385	332935	4765211	281	279	34	50	< 20	< 30
R387	335254	4763137	256	254	< 15	< 30	< 20	< 30
R388	335002	4764368	274	272	29	45	< 20	< 30
R389	334872	4763003	262	260	26	42	< 20	< 30
R390	334541	4762688	265	263	25	39	< 20	< 30
R391	334852	4763595	267	265	34	50	< 20	< 30
R392	334395	4762510	269	267	31	46	31	45
R393	332707	4765186	272	270	29	45	< 20	< 30
R394	335250	4763576	263	261	23	39	< 20	< 30
R395	335246	4763501	262	260	22	38	< 20	< 30
R396	335310	4763409	262	260	19	35	< 20	< 30
R397	335068	4764426	274	272	27	44	< 20	< 30
R398	334571	4762628	264	263	25	41	< 20	< 30
R399	335222	4763053	256	254	< 15	< 30	< 20	< 30
R400	335212	4763210	257	255	18	35	< 20	< 30
R401	335252	4763552	262	261	23	39	< 20	< 30
R402	334821	4762984	262	261	25	41	< 20	< 30
R403	335303	4763514	262	260	19	35	< 20	< 30
R404	334386	4762399	270	268	34	49	34	48
R405	335077	4762989	258	256	< 15	< 30	< 20	< 30
R406	333895	4762890	268	266	37	53	< 20	< 30
R407	334775	4763228	264	262	31	47	< 20	< 30
R408	335143	4763530	264	262	24	40	< 20	< 30
R409	334291	4762192	266	264	39	54	38	53
R410	335072	4763413	263	261	24	39	< 20	< 30
R411	334866	4762843	262	260	20	36	< 20	< 30
R412	335149	4764331	278	276	23	39	< 20	< 30
R416	335267	4765288	267	266	20	36	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R419	335055	4763607	265	263	30	46	< 20	< 30
R420	332734	4765238	272	270	29	45	< 20	< 30
R421	334991	4763598	265	263	30	46	< 20	< 30
R423	334800	4762893	263	261	23	39	< 20	< 30
R424	335167	4764622	274	273	23	40	< 20	< 30
R438	330618	4762013	283	282	41	56	< 20	< 30
R442	330215	4760382	305	304	31	47	< 20	< 30
R443	328659	4762458	278	276	28	44	< 20	< 30
R454	328340	4762437	283	282	< 15	< 30	< 20	< 30
R455	328307	4761993	287	285	< 15	< 30	< 20	< 30
R456	328483	4762668	276	275	22	38	< 20	< 30
R466	331787	4760957	281	279	25	41	< 20	< 30
R470	330074	4759987	303	301	24	40	< 20	< 30
R471	329054	4760360	303	301	33	48	< 20	< 30
R472	328543	4762657	277	275	23	39	< 20	< 30
R473	330730	4762151	285	283	40	55	< 20	< 30
R477	331058	4761656	284	283	40	55	< 20	< 30
R478	332102	4760304	282	280	< 15	< 30	< 20	< 30
R479	328655	4762362	279	277	28	44	< 20	< 30
R480	328973	4760432	303	302	33	49	< 20	< 30
R481	329053	4762456	279	278	35	50	< 20	< 30
R482	331066	4761587	283	281	39	54	< 20	< 30
R483	331037	4761255	285	283	38	53	< 20	< 30
R484	328853	4760270	309	307	38	53	< 20	< 30
R485	328940	4761957	284	282	37	53	< 20	< 30
R486	331154	4760451	300	298	31	47	< 20	< 30
R487	331229	4760449	297	296	31	47	< 20	< 30
R488	331944	4760411	286	284	19	35	< 20	< 30
R489	329153	4762625	279	277	39	54	< 20	< 30
R490	329061	4762659	281	280	36	52	< 20	< 30
R491	331016	4761134	287	285	39	54	< 20	< 30
R492	329221	4760437	300	299	32	48	< 20	< 30
R494	335118	4764246	280	278	26	42	< 20	< 30
R495	335097	4764431	273	272	26	42	< 20	< 30
R496	331147	4761780	286	284	41	56	< 20	< 30
R497	328950	4760833	301	300	37	52	< 20	< 30
R499	327818	4760472	300	298	26	43	< 20	< 30
R500	331615	4760351	298	296	25	41	< 20	< 30
R502	328348	4762352	284	282	< 15	< 30	< 20	< 30
R503	328907	4760775	303	302	36	51	< 20	< 30
R504	328711	4761727	291	289	34	51	< 20	< 30
R505	330071	4761726	284	283	41	57	< 20	< 30
R506	334036	4759774	256	254	< 15	< 30	< 20	< 30
R507	334151	4759956	263	261	< 15	< 30	< 20	< 30
R508	334094	4759859	257	255	< 15	< 30	< 20	< 30
R509	331258	4760350	295	293	27	43	< 20	< 30
R510	329870	4760045	307	305	19	35	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R511	328342	4762534	282	281	< 15	< 30	< 20	< 30
R512	331013	4759902	291	289	35	50	< 20	< 30
R513	331862	4760329	285	283	19	35	< 20	< 30
R514	331007	4760223	298	297	35	50	< 20	< 30
R515	329398	4760261	304	302	30	46	< 20	< 30
R516	328680	4760951	293	291	31	46	< 20	< 30
R517	329672	4762576	279	277	37	52	< 20	< 30
R518	328718	4761887	290	288	33	50	< 20	< 30
R519	328210	4760238	311	309	40	55	< 20	< 30
R520	329127	4762476	280	278	37	52	< 20	< 30
R521	331180	4759767	287	285	32	48	< 20	< 30
R522	334992	4760065	267	265	< 15	< 30	< 20	< 30
R524	332637	4761479	280	278	31	45	28	34
R525	334541	4759905	271	270	< 15	< 30	< 20	< 30
R526	328536	4762165	286	284	24	40	< 20	< 30
R527	328626	4761821	291	289	32	48	< 20	< 30
R528	330029	4760625	298	296	34	50	< 20	< 30
R531	334175	4759771	254	252	< 15	< 30	< 20	< 30
R532	334098	4759811	255	254	< 15	< 30	< 20	< 30
R533	334440	4759837	257	255	< 15	< 30	< 20	< 30
R534	333491	4760488	289	288	32	47	25	36
R535	334196	4759811	255	253	< 15	< 30	< 20	< 30
R536	333830	4759824	264	262	21	37	< 20	< 30
R537	334418	4759894	255	254	< 15	< 30	< 20	< 30
R538	334216	4761260	278	276	42	56	40	54
R539	334509	4759989	255	254	< 15	< 30	< 20	< 30
R540	334124	4759911	258	257	< 15	< 30	< 20	< 30
R542	334238	4759866	256	254	< 15	< 30	< 20	< 30
R543	334478	4759821	262	261	< 15	< 30	< 20	< 30
R544	334126	4759808	255	253	< 15	< 30	< 20	< 30
R546	331337	4757178	297	296	39	54	< 20	< 30
R547	330423	4756677	295	293	34	50	< 20	< 30
R548	334275	4759707	256	254	< 15	< 30	< 20	< 30
R549	334575	4759980	259	258	< 15	< 30	< 20	< 30
R550	334478	4759958	255	254	< 15	< 30	< 20	< 30
R551	332818	4760969	281	280	33	48	< 20	< 30
R552	334194	4759905	259	258	< 15	< 30	< 20	< 30
R553	334093	4759969	260	259	17	35	< 20	< 30
R554	334386	4759840	255	254	< 15	< 30	< 20	< 30
R556	334463	4759943	256	254	< 15	< 30	< 20	< 30
R557	333953	4759948	266	265	20	36	< 20	< 30
R558	332965	4761904	274	273	41	56	40	54
R559	334859	4760175	257	255	< 15	< 30	< 20	< 30
R560	334196	4759877	257	256	< 15	< 30	< 20	< 30
R561	334596	4760803	277	276	25	40	< 20	< 30
R562	334216	4761192	278	276	41	55	40	53
R563	334599	4759810	272	271	< 15	< 30	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R564	334556	4760037	255	253	< 15	< 30	< 20	< 30
R565	334175	4759855	256	255	< 15	< 30	< 20	< 30
R566	333135	4759874	288	286	36	50	< 20	< 30
R568	333885	4759819	264	262	20	36	< 20	< 30
R569	334133	4759685	252	250	< 15	< 30	< 20	< 30
R570	334003	4759810	259	257	18	35	< 20	< 30
R571	332919	4759863	293	291	32	48	< 20	< 30
R572	334490	4760649	278	277	25	40	< 20	< 30
R573	333862	4759820	264	262	20	36	< 20	< 30
R575	334394	4759795	257	255	< 15	< 30	< 20	< 30
R577	334420	4759709	257	255	< 15	< 30	< 20	< 30
R578	334134	4759857	257	255	< 15	< 30	< 20	< 30
R579	333973	4759819	262	260	19	35	< 20	< 30
R580	333961	4759870	266	264	19	35	< 20	< 30
R582	334237	4759914	260	259	< 15	< 30	< 20	< 30
R583	332795	4760875	283	281	36	50	< 20	< 30
R585	327464	4759265	294	293	22	39	< 20	< 30
R586	327308	4759181	297	295	< 15	< 30	< 20	< 30
R587	334516	4759759	266	265	< 15	< 30	< 20	< 30
R588	334235	4759943	263	262	< 15	< 30	< 20	< 30
R590	334843	4761018	267	266	21	37	< 20	< 30
R591	334637	4761074	276	274	30	44	26	36
R592	334227	4761333	277	275	42	56	41	54
R593	334605	4759990	259	258	< 15	< 30	< 20	< 30
R596	334539	4759753	266	264	< 15	< 30	< 20	< 30
R597	333901	4759774	261	259	20	36	< 20	< 30
R600	332583	4759216	285	284	24	40	< 20	< 30
R601	334376	4759683	256	254	< 15	< 30	< 20	< 30
R602	333068	4756242	269	268	19	35	< 20	< 30
R604	327428	4759239	295	294	< 15	< 30	< 20	< 30
R606	327280	4759204	297	295	< 15	< 30	< 20	< 30
R607	333037	4757209	269	267	< 15	< 30	< 20	< 30
R608	329356	4759199	303	301	23	39	< 20	< 30
R610	333349	4757792	268	266	< 15	< 30	< 20	< 30
R612	332676	4757004	278	277	24	41	< 20	< 30
R614	331352	4756619	284	283	33	48	< 20	< 30
R615	327695	4759262	299	297	25	41	< 20	< 30
R620	331427	4757644	292	291	33	48	< 20	< 30
R621	332702	4757653	281	279	30	46	< 20	< 30
R622	328036	4759248	301	299	29	45	< 20	< 30
R624	333815	4760449	291	289	32	47	25	36
R625	334200	4760757	290	288	37	51	27	38
R626	331557	4755576	284	282	27	43	< 20	< 30
R627	327965	4759266	300	299	28	44	< 20	< 30
R629	331050	4757437	300	298	33	49	< 20	< 30
R632	329972	4758972	292	290	< 15	< 30	< 20	< 30
R633	332711	4757584	281	279	30	46	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R634	332585	4759667	285	283	21	36	< 20	< 30
R636	333280	4756646	271	269	< 15	< 30	< 20	< 30
R638	331254	4759337	288	286	28	44	< 20	< 30
R639	332694	4757011	279	277	24	41	< 20	< 30
R641	328043	4758796	303	301	< 15	< 30	< 20	< 30
R642	331374	4758702	295	293	21	36	< 20	< 30
R643	331411	4758712	295	293	21	37	< 20	< 30
R646	333341	4756768	265	263	< 15	< 30	< 20	< 30
R647	328089	4758664	289	288	< 15	< 30	< 20	< 30
R648	334456	4762353	269	267	33	47	33	47
R649	334489	4762353	268	266	31	46	31	46
R650	334416	4762406	271	269	33	48	33	47
R651	334452	4762406	270	269	32	47	32	46
R652	334478	4762406	269	268	31	46	31	44
R653	334511	4762406	268	266	27	41	27	41
R654	330407	4756509	292	290	32	48	< 20	< 30
R655	332042	4759397	279	278	< 15	< 30	< 20	< 30
R659	331569	4755638	284	283	28	43	< 20	< 30
R660	332157	4759065	297	295	27	44	< 20	< 30
R661	330604	4755835	282	280	< 15	< 30	< 20	< 30
R662	331451	4758898	302	300	19	35	< 20	< 30
R663	331271	4757647	295	293	31	47	< 20	< 30
R664	331572	4758621	295	293	25	41	< 20	< 30
R665	331927	4757641	290	288	38	54	< 20	< 30
R666	331091	4759049	290	288	24	40	< 20	< 30
R667	330671	4759315	290	288	31	47	< 20	< 30
R668	328498	4759331	303	302	33	49	< 20	< 30
R670	328351	4758834	296	294	19	35	< 20	< 30
R671	331293	4756847	295	293	41	56	< 20	< 30
R673	332478	4757562	278	276	32	47	< 20	< 30
R674	331517	4755825	283	281	28	44	< 20	< 30
R676	328116	4759323	300	298	32	48	< 20	< 30
R677	328455	4759246	301	299	32	47	< 20	< 30
R678	330313	4757308	280	278	27	42	< 20	< 30
R679	328567	4759316	305	303	35	50	< 20	< 30
R680	331662	4757644	290	288	38	53	< 20	< 30
R681	331091	4758853	296	295	< 15	< 30	< 20	< 30
R682	327764	4759267	301	299	23	39	< 20	< 30
R683	332898	4755677	272	270	30	47	< 20	< 30
R684	331457	4755738	286	285	26	42	< 20	< 30
R685	331027	4755647	277	276	< 15	< 30	< 20	< 30
R686	332098	4758771	289	287	29	44	< 20	< 30
R687	335026	4764288	278	276	29	45	< 20	< 30
R688	335111	4764065	272	271	27	43	< 20	< 30
R689	329985	4760194	312	310	26	42	< 20	< 30
R690	334905	4765490	274	272	34	49	< 20	< 30
R691	333907	4764787	278	276	36	51	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R692	332764	4762139	284	282	40	54	33	48
R694	333113	4756051	264	262	20	36	< 20	< 30
R696	332824	4758795	285	283	31	46	< 20	< 30
R699	333258	4754955	272	270	< 15	< 30	< 20	< 30
R700	332702	4765165	272	270	30	45	< 20	< 30
R701	335149	4764361	277	275	23	39	< 20	< 30
R702	335157	4763225	257	256	19	35	< 20	< 30
R703	335257	4763178	257	255	< 15	< 30	< 20	< 30
R704	334858	4763152	262	260	27	43	< 20	< 30
R705	332682	4765219	272	270	29	45	< 20	< 30
R706	334955	4763603	265	263	31	47	< 20	< 30
R709	332291	4764380	276	274	32	49	< 20	< 30
R710	335002	4764204	277	275	30	46	< 20	< 30
R711	335057	4764187	279	277	30	46	< 20	< 30
R712	335012	4764260	275	274	30	46	< 20	< 30
R713	334595	4762419	264	262	< 15	< 30	< 20	< 30
R714	334639	4762426	265	263	< 15	< 30	< 20	< 30
R715	334644	4762487	264	263	25	39	< 20	< 30
R716	334606	4762504	265	263	25	40	< 20	< 30
R717	334484	4762504	267	266	28	42	26	37
R718	334452	4762509	268	266	29	44	28	41
R719	334540	4762405	267	265	25	38	25	38
R720	334410	4762192	266	265	36	51	36	51
R721	334396	4762217	267	266	36	51	36	51
R722	334369	4762306	268	267	36	51	36	50
R723	334369	4762336	269	267	35	50	35	50
R724	334419	4762264	269	267	35	50	35	49
R725	334425	4762292	269	267	35	50	34	49
R726	331159	4755388	285	283	< 15	< 30	< 20	< 30
R731	331692	4755065	286	284	24	41	< 20	< 30
R732	334510	4762592	264	263	26	41	< 20	< 30
R733	334532	4762353	267	265	30	43	30	43
R734	334515	4762319	268	266	31	45	31	45
R735	334523	4762246	266	264	32	46	32	46
R736	334563	4762285	266	265	30	43	30	43
R737	334575	4762316	266	264	27	41	27	41
R738	334593	4762353	264	263	25	34	25	34
R739	329153	4758856	304	303	20	36	< 20	< 30
R740	334920	4762809	260	259	19	35	< 20	< 30
R741	334955	4762825	259	258	18	35	< 20	< 30
R742	335047	4763181	259	257	22	38	< 20	< 30
R743	334935	4762876	260	259	19	35	< 20	< 30
R744	335027	4762850	259	257	< 15	< 30	< 20	< 30
R745	334860	4762804	262	260	19	35	< 20	< 30
R746	334697	4762728	264	262	20	36	< 20	< 30
R747	334767	4762884	263	261	23	39	< 20	< 30
R748	334679	4762692	264	262	20	36	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R749	335013	4763389	264	262	28	45	< 20	< 30
R750	334681	4762764	264	262	25	41	< 20	< 30
R751	334620	4762796	264	263	26	42	< 20	< 30
R752	334361	4762508	268	267	33	47	32	46
R753	334369	4759713	256	254	< 15	< 30	< 20	< 30
R755	334528	4759849	272	271	< 15	< 30	< 20	< 30
R756	334177	4764765	276	274	33	49	< 20	< 30
R757	335345	4763514	262	260	19	35	< 20	< 30
R758	334333	4759708	256	254	< 15	< 30	< 20	< 30
R759	335072	4763247	260	258	20	36	< 20	< 30
R760	334997	4763215	259	257	24	40	< 20	< 30
R761	335100	4763245	259	257	20	36	< 20	< 30
R762	334900	4762860	261	259	19	35	< 20	< 30
R763	335035	4763246	260	259	26	42	< 20	< 30
R764	334867	4762777	262	260	23	40	< 20	< 30
R765	335021	4763203	259	257	24	40	< 20	< 30
R766	334592	4760066	252	251	< 15	< 30	< 20	< 30
R767	334234	4759890	258	256	< 15	< 30	< 20	< 30
R768	334227	4759757	251	250	< 15	< 30	< 20	< 30
R769	334616	4759951	264	263	< 15	< 30	< 20	< 30
R770	334447	4759691	257	255	< 15	< 30	< 20	< 30
R771	334139	4760009	267	266	19	35	< 20	< 30
R772	335121	4762886	257	256	< 15	< 30	< 20	< 30
R773	335080	4762873	258	256	< 15	< 30	< 20	< 30
R774	335073	4762927	258	257	< 15	< 30	< 20	< 30
R775	331183	4759587	283	281	31	47	< 20	< 30
R776	335183	4762878	257	255	< 15	< 30	< 20	< 30
R777	335049	4764302	279	278	29	45	< 20	< 30
R778	335025	4762910	259	257	< 15	< 30	< 20	< 30
R779	334984	4763502	265	263	30	46	< 20	< 30
R780	334968	4763352	263	261	29	46	< 20	< 30
R781	334994	4762895	259	257	< 15	< 30	< 20	< 30
R782	335319	4763483	262	261	19	35	< 20	< 30
R783	335111	4763207	258	256	19	35	< 20	< 30
R784	334530	4762793	265	264	28	44	< 20	< 30
R785	333899	4759816	263	262	20	36	< 20	< 30
R786	334098	4759755	254	252	< 15	< 30	< 20	< 30
R787	333879	4759967	268	266	23	39	< 20	< 30
R788	334229	4759784	253	251	< 15	< 30	< 20	< 30
R789	334232	4759804	254	252	< 15	< 30	< 20	< 30
R790	334188	4759956	264	262	< 15	< 30	< 20	< 30
R791	334126	4759756	253	251	< 15	< 30	< 20	< 30
R792	334986	4764509	271	269	27	44	< 20	< 30
R793	334892	4764490	270	268	29	45	< 20	< 30
R794	334967	4764764	270	268	22	38	< 20	< 30
R795	334813	4764468	271	269	26	41	< 20	< 30
R797	335012	4764506	271	269	27	44	< 20	< 30

Non-Participating Receptor	X (m)	Y (m)	Z (m)	Ground (m)	Daytime		Nighttime	
					L_{eq} (dBA)	L_{eq} (dBC)	L_{eq} (dBA)	L_{eq} (dBC)
R799	328005	4759390	303	301	29	45	< 20	< 30
R800	332193	4758611	290	288	32	47	< 20	< 30
R801	334831	4764761	271	269	24	40	< 20	< 30
R803	329776	4764012	267	266	< 15	< 30	< 20	< 30
R804	334784	4759704	262	260	< 15	< 30	< 20	< 30
R805	333331	4757975	271	269	23	40	< 20	< 30
R806	332932	4755580	266	265	29	45	< 20	< 30
R807	334421	4762508	268	267	31	45	30	43
R808	330033	4757710	282	280	< 15	< 30	< 20	< 30
R810	330965	4757765	299	297	26	42	< 20	< 30
R811	335070	4764566	272	270	24	41	< 20	< 30
R812	334813	4764637	271	269	23	39	< 20	< 30
R813	335016	4764610	270	269	24	41	< 20	< 30
R814	334784	4764503	271	269	25	41	< 20	< 30
R815	334975	4764560	271	269	25	42	< 20	< 30
R816	334955	4764560	271	269	25	42	< 20	< 30
R817	335019	4764785	270	268	19	35	< 20	< 30
R819	331163	4755449	284	282	< 15	< 30	< 20	< 30
R820	335425	4763518	258	256	< 15	< 30	< 20	< 30
R821	332208	4755581	285	283	39	54	< 20	< 30
R822	332974	4755589	264	262	23	38	< 20	< 30
R823	334522	4760002	256	254	< 15	< 30	< 20	< 30
R824	334510	4759705	261	259	< 15	< 30	< 20	< 30
R825	334612	4763039	267	265	32	48	< 20	< 30
R826	334757	4764337	270	268	33	49	< 20	< 30
R827	332664	4765223	272	270	29	45	< 20	< 30
R829	334474	4759702	259	257	< 15	< 30	< 20	< 30
R830	334693	4762804	264	262	25	41	< 20	< 30
R831	334878	4764799	271	269	24	40	< 20	< 30
R832	334883	4764772	271	269	24	40	< 20	< 30
R833	334557	4763035	267	265	33	49	< 20	< 30
R834	334836	4764731	271	270	24	40	< 20	< 30
R835	334910	4764725	271	269	22	38	< 20	< 30
R836	334886	4764826	271	269	26	42	< 20	< 30
R837	329051	4763427	269	267	19	35	< 20	< 30
R838	334394	4762679	266	265	29	44	< 20	< 30
R839	329557	4762828	280	278	34	49	< 20	< 30
R840	331244	4755485	288	286	19	35	< 20	< 30
R843	335199	4762986	257	255	< 15	< 30	< 20	< 30
R844	329031	4759295	308	306	34	49	< 20	< 30
R845	330309	4762903	277	275	37	53	< 20	< 30
R847	327644	4760573	295	293	22	38	< 20	< 30
R848	331107	4763650	277	275	39	55	< 20	< 30

APPENDIX D

Photographs of Measurement Locations

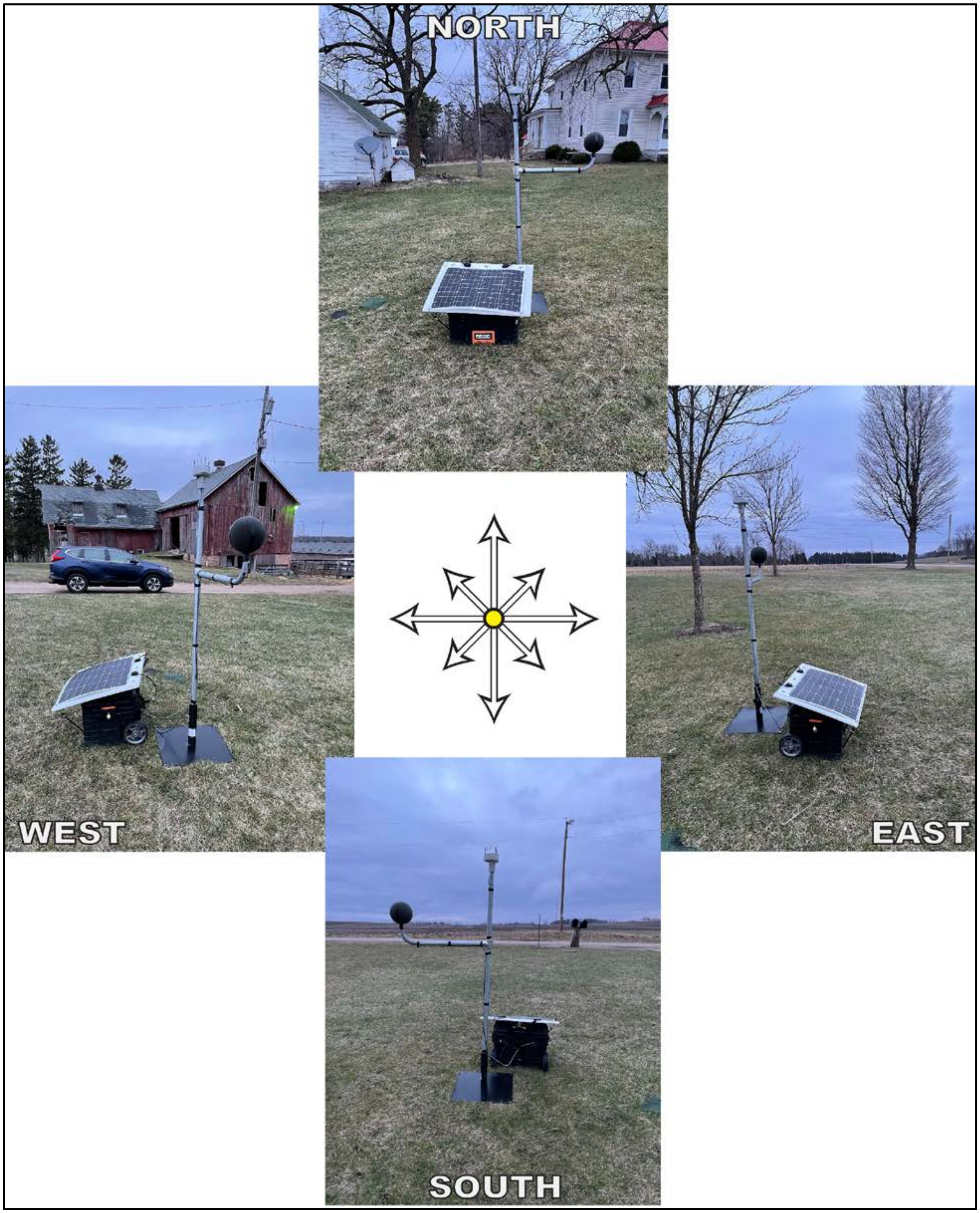


Figure D-1. Photographs of Location LT1

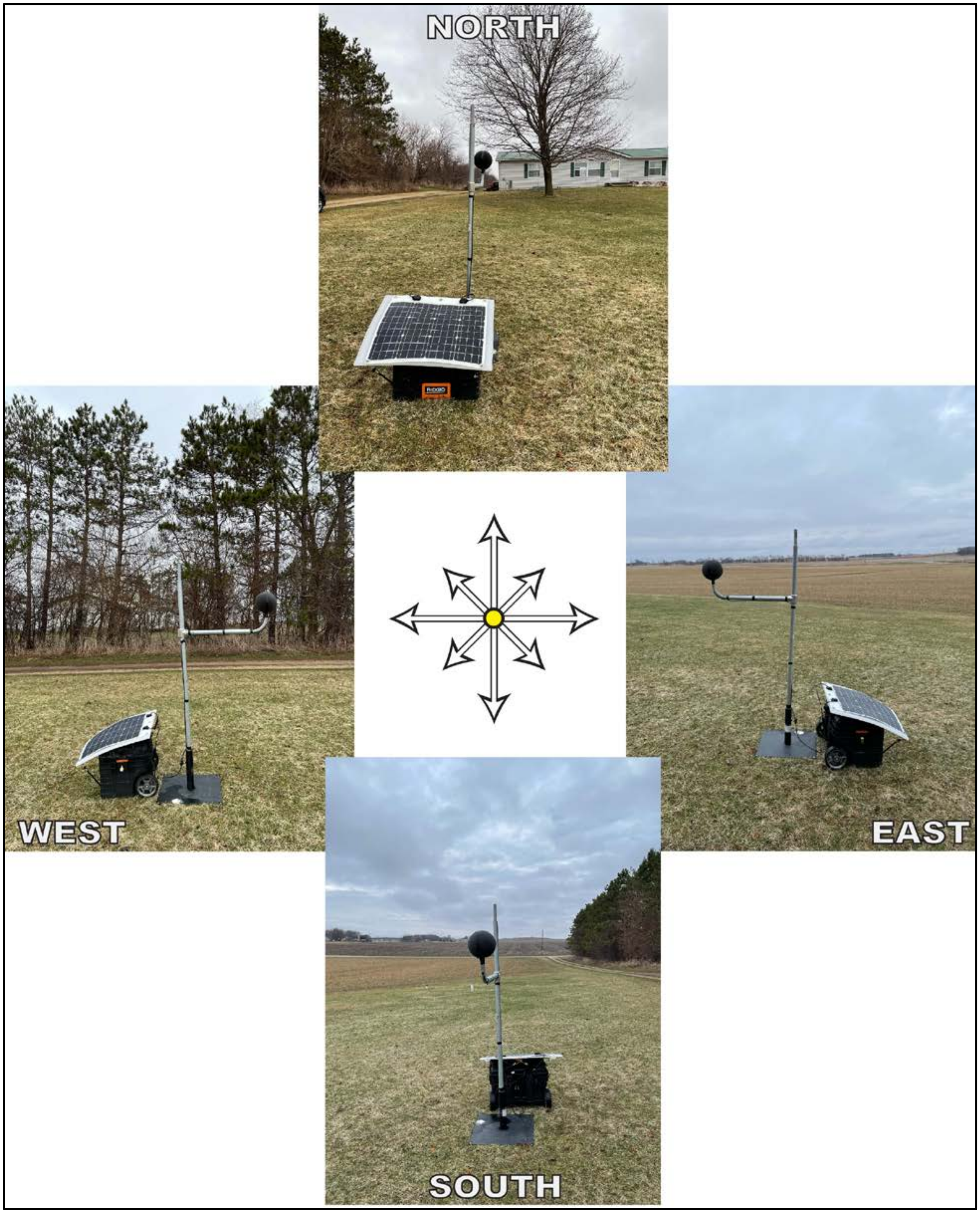


Figure D-2. Photographs of Location LT2

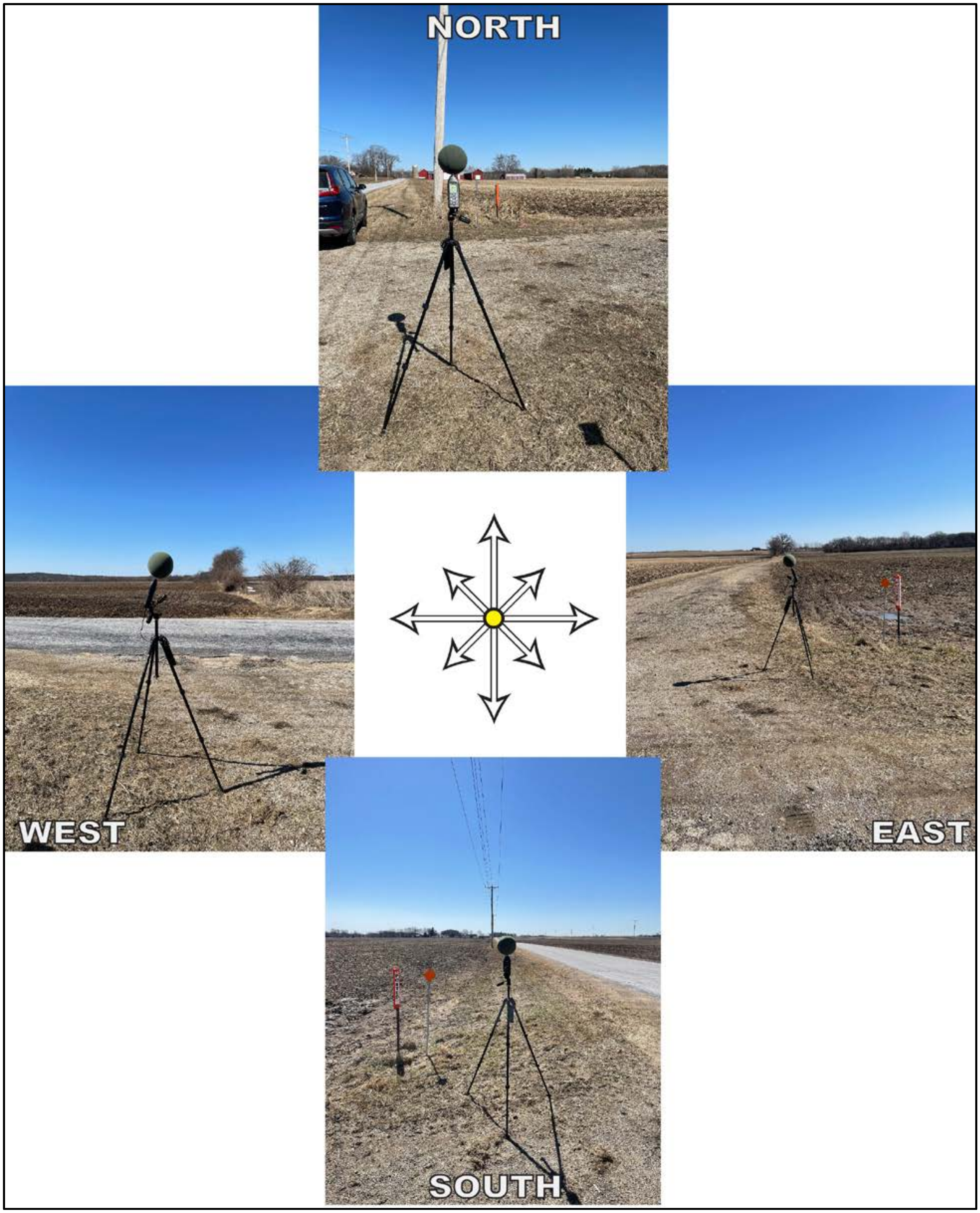


Figure D-3. Photographs of Location ST1

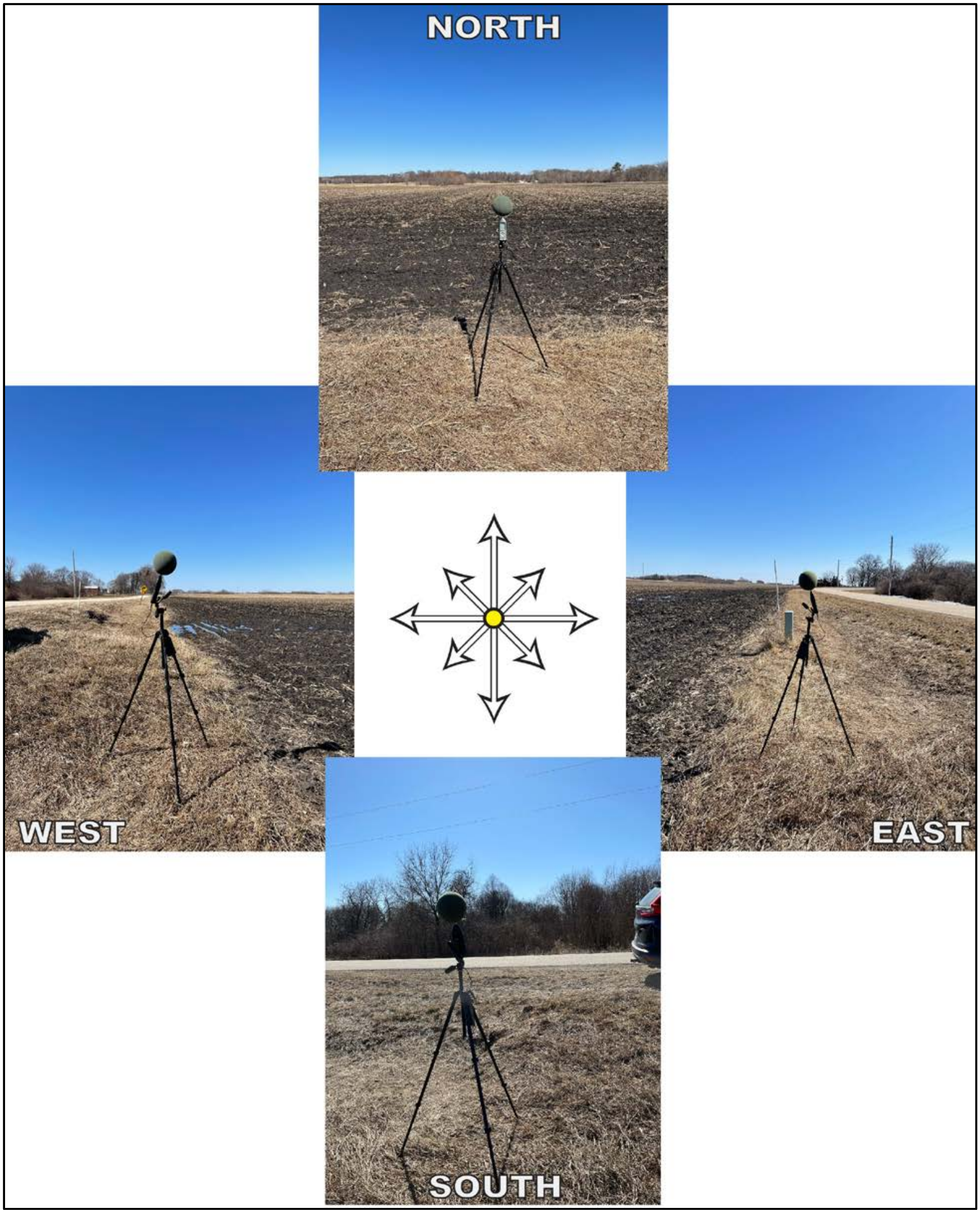


Figure D-4. Photographs of Location ST2

Figure D-5. Photographs of Location ST3

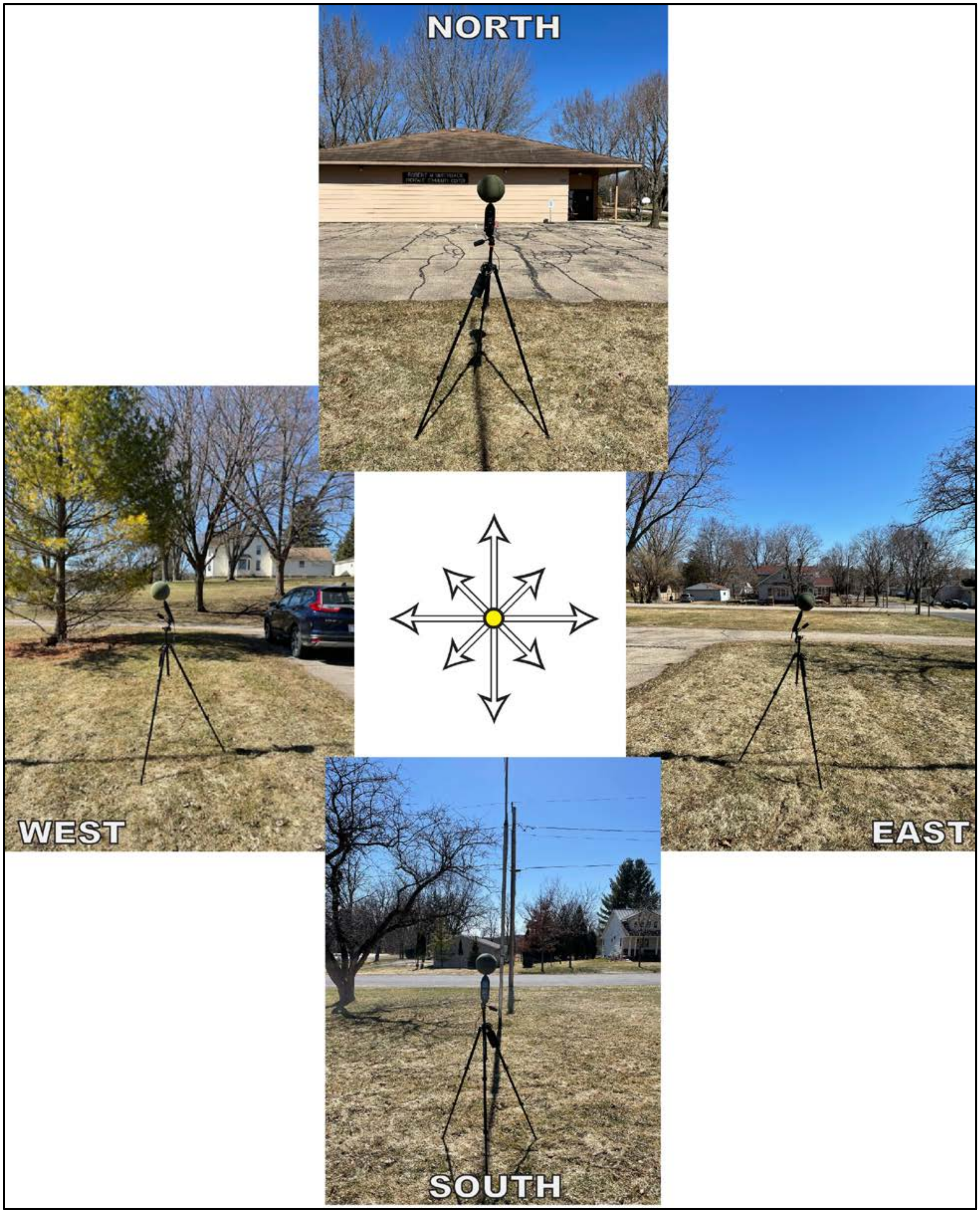


Figure D-6. Photographs of Location ST4

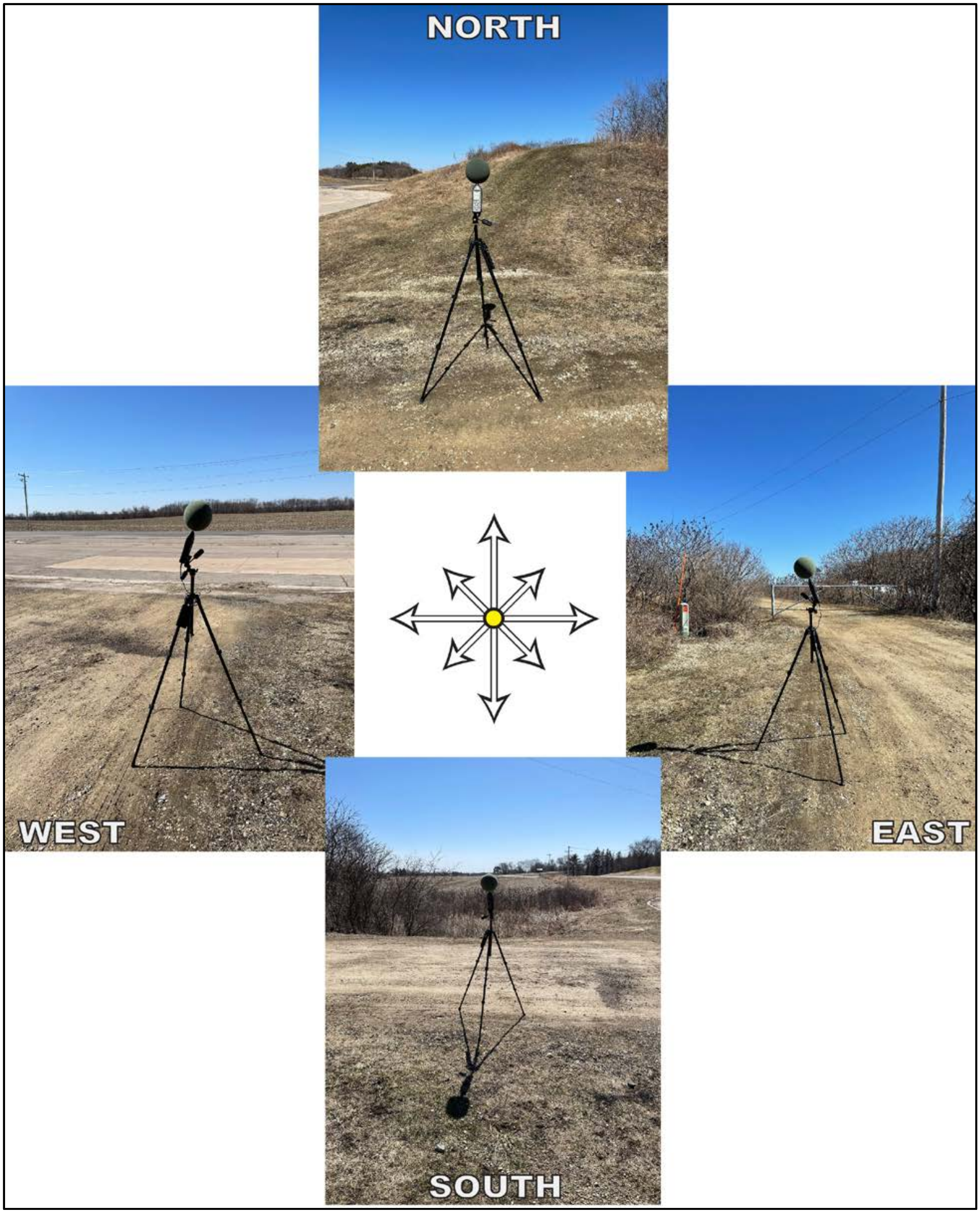


Figure D-7. Photographs of Location ST5

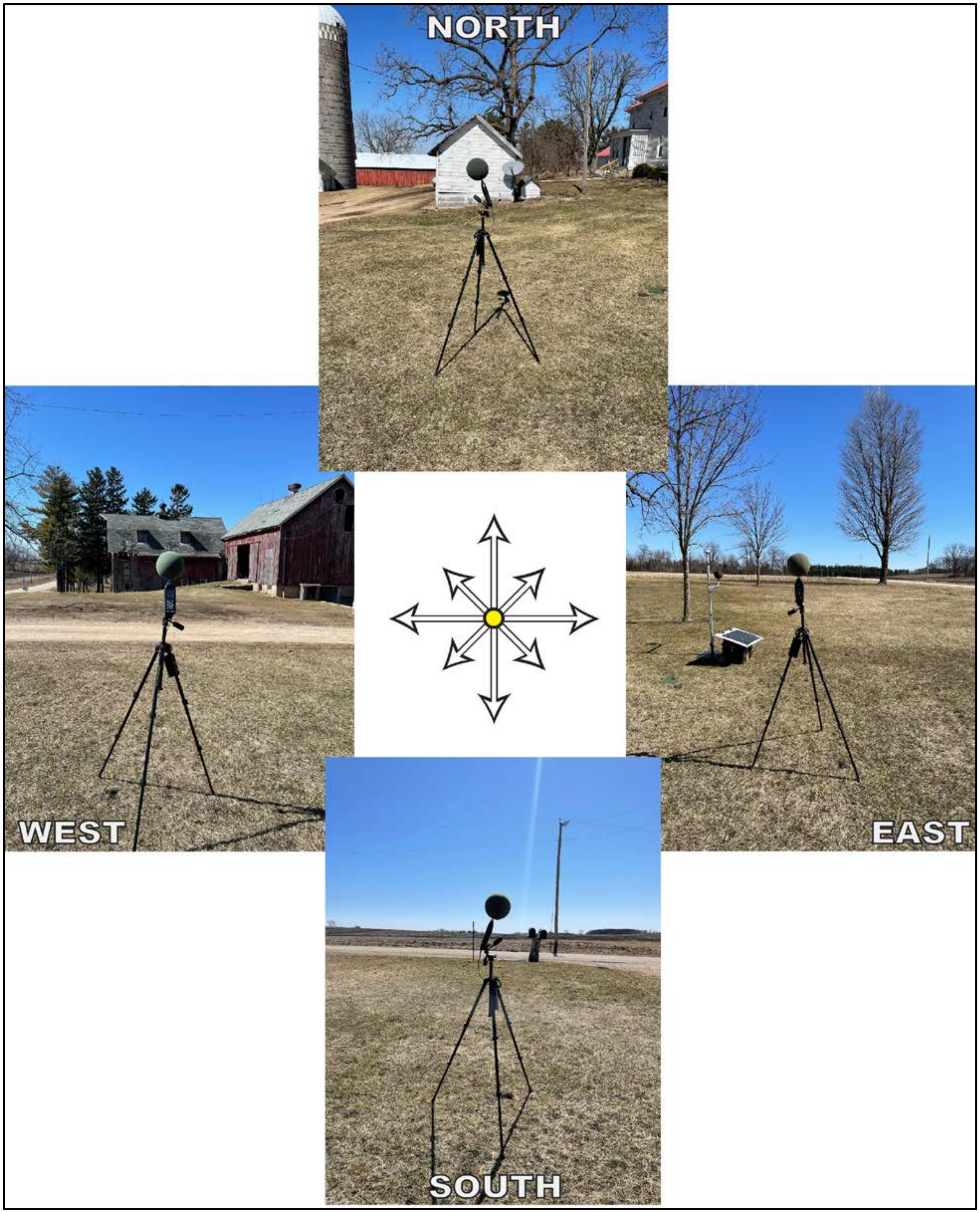


Figure D-8. Photographs of Location ST6

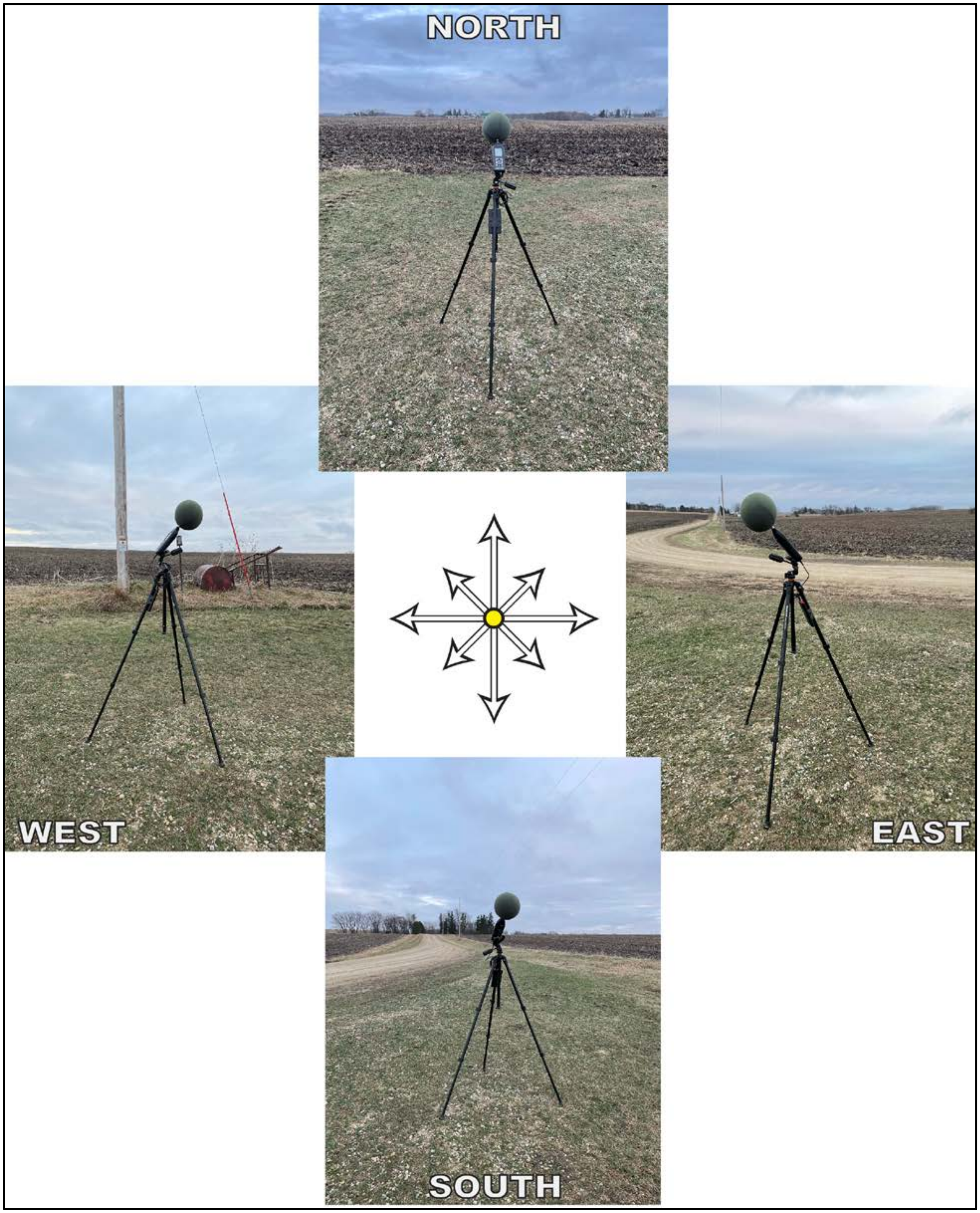


Figure D-9. Photographs of Location ST7