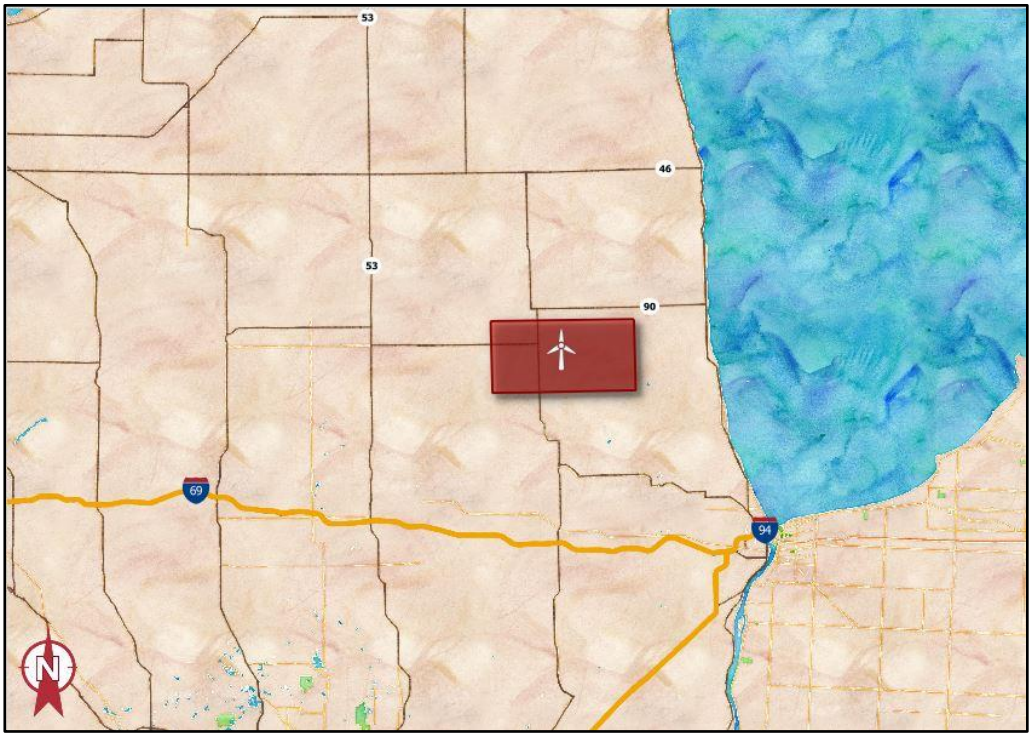
Appendix D: Sound Report

Pre-Construction Wind Turbine Noise Analysis

for the proposed

Riverbend Wind Project
Speaker Township (Sanilac County) Michigan

September 26, 2022



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HANKARD ENVIRONMENTAL
ACOUSTICS AND VIBRATION CONSULTING

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1. Introduction

This report describes the pre-construction noise analysis conducted by Hankard Environmental for the proposed Riverbend Wind project (Project, Facility). The analysis was conducted at the request of the Project proponent, Algonquin Power (Riverbend Wind), LLC, for the purpose of demonstrating that the Project has been designed to meet the Speaker Township (Sanilac County) Ordinance noise limit. The Project is expected to produce up to 300 megawatts (MW) of electrical power using 50 wind turbines, all of which are to be located in Sanilac County, Michigan. This analysis includes noise from each of three potential Project layout scenarios consisting of up to 56 turbines. Only 50 wind turbines will ultimately be constructed. Also included in the analysis is noise from the Facility substation. Figure 1-1 shows the general location of the Project, which is approximately 60 miles northeast of Detroit, Michigan.

Described herein are the applicable noise standards, the Project and its environs, the methods and data used to predict noise levels, and the results of the noise level predictions demonstrating compliance with the Speaker Township Ordinance.

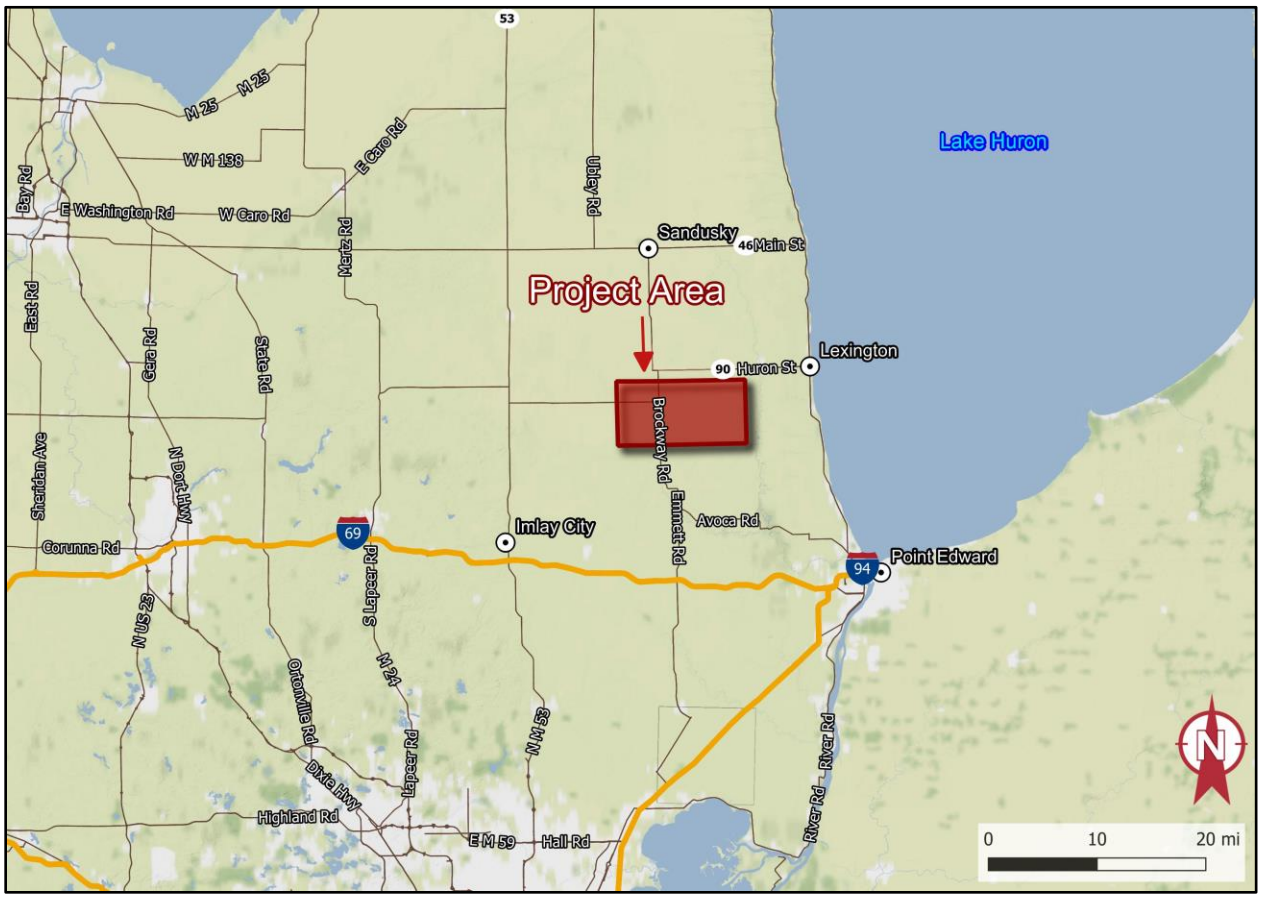

Figure 1-1. General Location of the Proposed Riverbend Wind Energy Center

2. Applicable Noise Standards

There are no federal or state noise laws, rules, or regulations applicable to the Project.

Speaker Township (Sanilac County), Michigan *ARTICLE XIA Section 11A.06.05 Noise*, limits noise from Wind Energy Conversion Systems to the following:

A) *Audible noise or the sound pressure level from the operation of the Wind Energy Facility shall not exceed fifty (50) dBA, or the ambient sound pressure level plus five (5) dBA, whichever is greater for more than ten percent (10%) of any sixty (60) minute interval, measured at any residence, school, hospital, church, or public library existing on the date of approval of any Wind Energy Facility Special Land Use permit. Within one year of facility being operational, the applicant at its expense shall provide sound pressure level measurements from a reasonable number of sampled locations at the perimeter and in the interior of the Wind Energy Facility to demonstrate compliance with this standard. The study shall provide sound pressure level measurements from each location both while the turbines are operational and while they are non-operational. The organization conducting the study must be approved by the township prior to commencement of the study. The Planning Commission may require additional study criteria at that time.*

B) *In the event audible noise from the operation of the Wind Energy Facility contains a steady pure tone, the standards for audible noise set forth in subparagraph A) of this subsection shall be reduced by five (5) dBA.*

   1) A pure tone is defined to exist if the one-third (1/3) octave band sound pressure level in the band, including the tone, exceeds the arithmetic average of the sound pressure levels of the two (2) contiguous one-third (1/3) octave bands by five (5) dBA for center frequencies of five hundred (500) Hz and above, by eight (8) dBA for center frequencies between one hundred and sixty (160) Hz and four hundred (400) Hz, or by fifteen (15) dBA for center frequencies less than or equal to one hundred and twenty-five (125) Hz

C) *Ambient noise levels shall be measured at a building's exterior of potentially affected existing residences, schools, hospitals, churches[,] and public libraries.*

   2) Ambient noise level measurement techniques shall employ all practical means of reducing the effect of wind-generated noise at the microphone.

   3) Ambient noise level measurements may be performed when wind velocities at the proposed project site are sufficient to allow wind turbine operations, provided that the wind velocity does not exceed thirty (30) mph at the ambient noise measurement location.

D) *Any noise level falling between two (2) whole decibels shall be the lower of the two.*

E) *In the event the noise levels resulting from the Wind Energy Facility exceed the criteria listed above, a waiver to said levels may be approved, provided that the following has been accomplished:*

   1) Written consent from the affected property owner(s) has been obtained stating that they are aware of the Wind Energy Facility and the noise limitations imposed by this Article, and that consent is granted to allow noise levels to exceed the maximum limits otherwise allowed; and

   2) If the applicant wishes the waiver to apply to succeeding owners of the property, a permanent noise impact easement must be recorded in the Sanilac County Register of Deeds office that describes the benefited and burdened properties and that advises all subsequent owners of the burdened property that noise levels in excess of those otherwise permitted by the ordinance may exist on or at the burdened property.

Each element of the Speaker Township noise ordinance was addressed as follows in this analysis:

A) The limit of 50 dBA is defined by the Township as the level not to exceed for more than 10% of one hour. In acoustics this is referred to as the one-hour L_{10} ("L-10"). As described in more detail in the following sections, a noise model was created that predicts noise levels from the Project assuming full operations and full acoustic output under normal operating conditions. This model was used to predict noise levels at the exterior of all non-participating principal structures (i.e., residences) in Speaker Township that are located within approximately one mile of any potential Project wind turbine location or the substation. The model predicts noise levels in a metric called the "equivalent level (Leq, dBA). The L10 is generally 1 to 2 dBA louder than the Leq for wind turbine noise. This difference was taken into account in this analysis.

   a. Note, the Speaker Township ordinance allows turbine noise levels to be noise levels to either 50 dBA or 5 dBA above the ambient level. Given the varying nature of ambient noise levels, the Project has elected to demonstrate compliance with the 50 dBA limit.

B) Noise emissions from wind turbines are not generally tonal based on measurements conducted by Hankard Environmental and other researchers.

C) Ambient noise levels were not measured as part of this preconstruction analysis. For the purposes of this analysis, it was assumed that ambient noise levels in the Project area are below 50 dBA.

D) Predicted noise levels were not rounded down to keep results conservative.

E) Noise levels at participating residences were predicted. For the purposes of this analysis, it was assumed that the limit of 50 dBA does not apply to participants.

3. Project Description

The Project plans to construct 50 wind turbines across Speaker and Fremont Townships in Sanilac County, generating up to 300 MW of electric power. This analysis considered three different turbine layouts (Layouts 16, 25, and 16a) which contain up to 56 proposed wind turbine locations. Layouts 16 and 16a include a total of 26 wind turbines in Speaker Township. Layout 25 includes 24 wind turbines in Speaker Township. Associated facilities include gravel access roads, underground cabling, and a substation.

The analyses include a 6.0-MW turbine with a 162-meter rotor diameter (162-6.0) and a 4.5-MW turbine with a 163-meter rotor diameter (163-4.5), such as those manufactured by Vestas. Layouts 16 and 25 utilize 162-6.0 turbines with a hub-height of 119 meters. Layout 16a consists of both 162-6.0 and 163-4.5 turbines with hub-heights of 119 and 118.5 meters, respectively.

All turbines will be fitted with Serrated Trailing Edge (STE) blades. The substation includes two 150 megavolt ampere (MVA) step-up transformers and is located in Fremont Township. As an example, Figure 3-1 shows the locations of the proposed wind turbines and substation for Layout 16a (other layouts shown in subsequent sections). A table of all Project noise source locations for each turbine layout is provided in Appendix A.

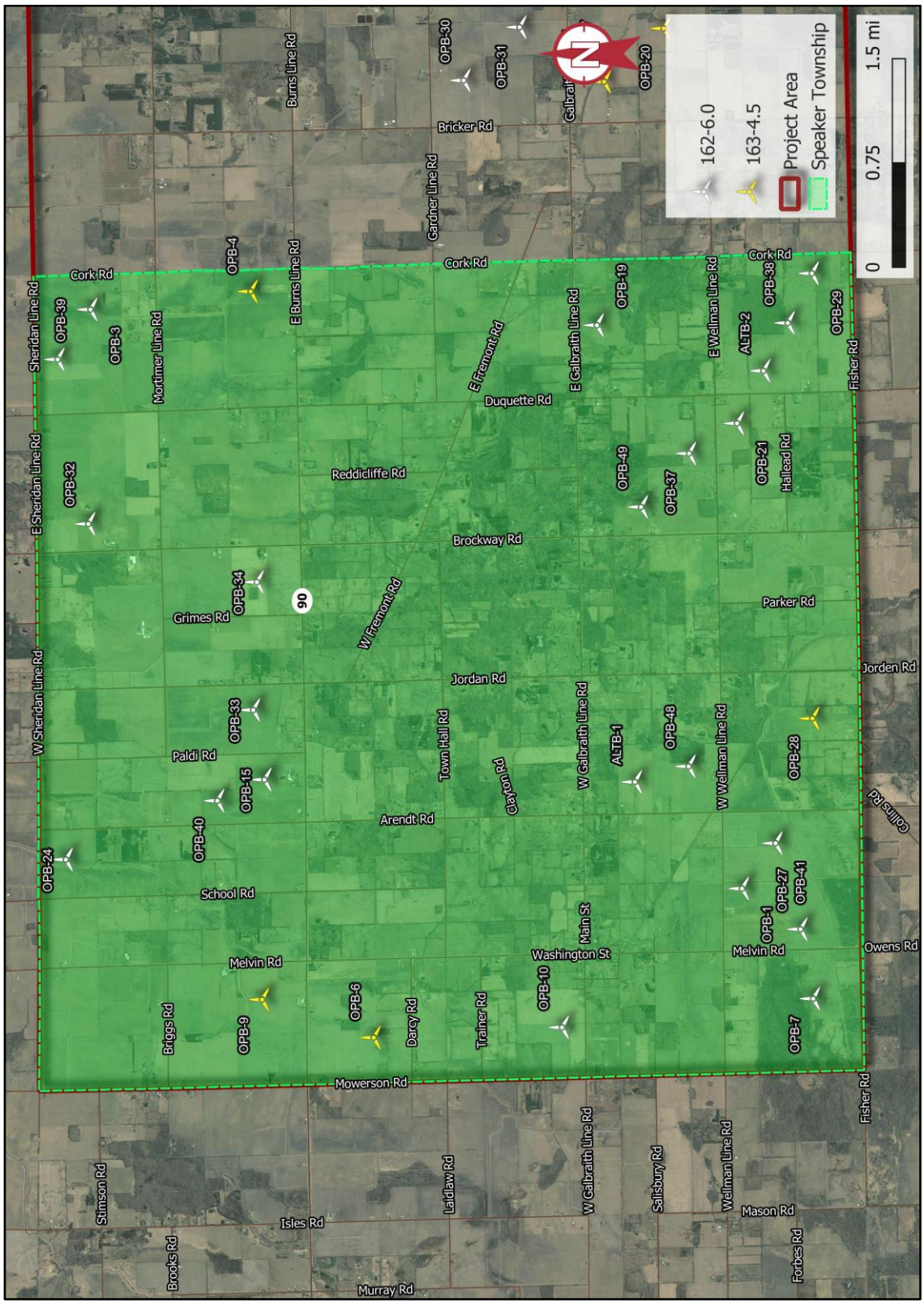

Figure 3-1. Turbine Layout 16a

4. Noise Modeling Method

Noise levels from the proposed Project were predicted using the method set forth in International Organization for Standardization (ISO) Standard 9613-2:1996 - *Attenuation of Sound During Propagation Outdoors*. The method was implemented using the SoundPLAN v8.2 acoustical modeling program. Figure 4-1 shows a representative three-dimensional view of the SoundPLAN model of the Project.

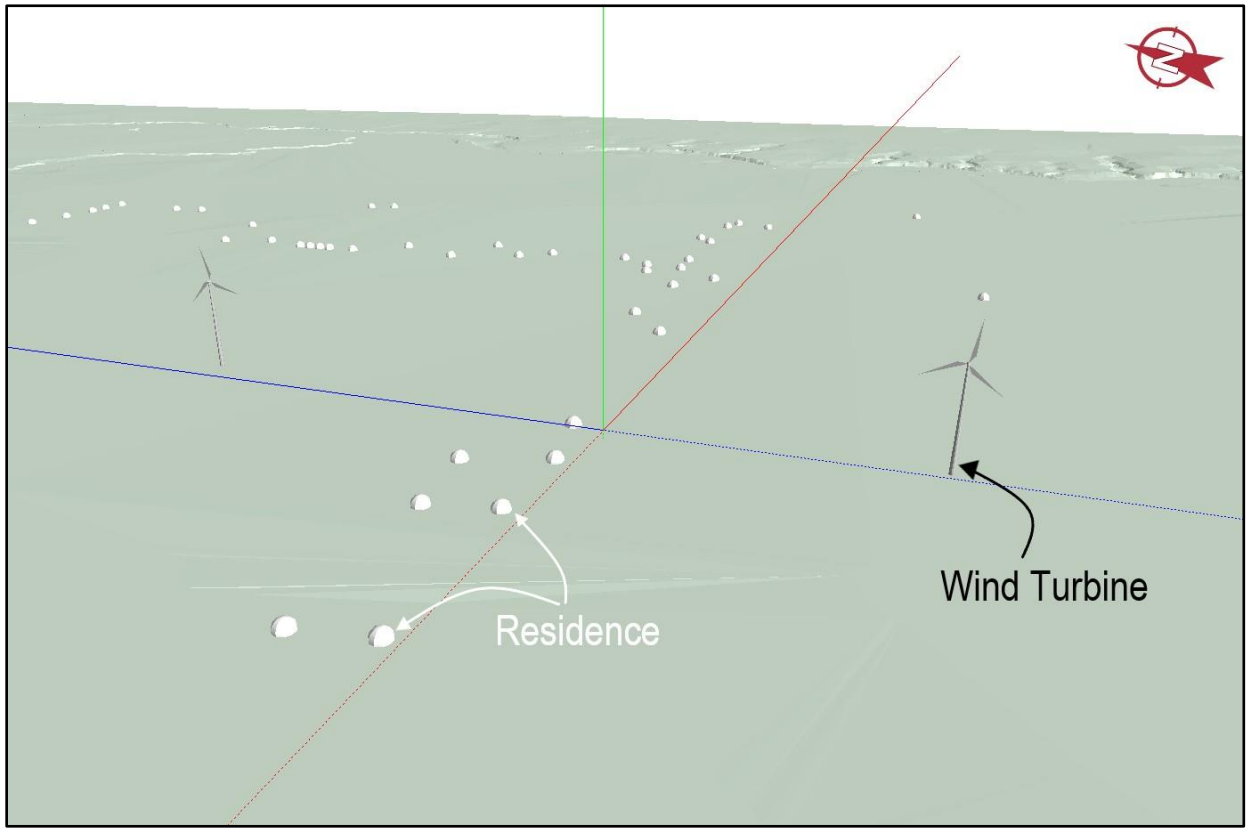

Figure 4-1. Three-Dimensional View of the SoundPLAN Noise Model

The ISO 9613-2:1996 method requires input data and the setting of certain parameters, including the locations of the noise sources and receivers, noise emission factors including frequency characteristics, terrain and ground type, and atmospheric propagation conditions. In general, the ISO 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 specific ISO 9613-2:1996 settings and input data used in this analysis are described below.

Receptors

In the SoundPLAN model receptor points were located at each of the 552 residences (including 57 participants and 495 non-participants) in Speaker Township. The geographic locations of the

receptors were obtained from the Project. All receptors within approximately one mile of any potential Project wind turbine location were included in the analysis. Each receptor's height was set to 4 meters (approximately 13 feet) above the ground. The location of each receptor is provided in Appendix B. Noise level contours were also generated to help graphically illustrate how predicted noise levels vary within the Project area, in accordance with ISO 9613-2:1996, the height above ground for the noise level contours was set to five feet.

Noise Sources

In the SoundPLAN model, each turbine was represented as an acoustical point source located at its hub height that propagates noise assuming no directivity, meaning the maximum acoustical output was assumed in all directions. For each turbine layout, the geographic coordinates, ground elevation, source height, and transformer size are listed in Appendix A. The analysis considered a 6.0-MW turbine with a 162-meter rotor diameter (162-6.0) and a 4.5-MW turbine with a 163-meter rotor diameter (163-4.5), such as those manufactured by Vestas. Layouts 16 and 25 utilize 162-6.0 turbines with a hub-height of 119 meters. Layout 16a consists of both 162-6.0 and 163-4.5 turbines with hub-heights of 119 and 118.5 meters, respectively.

The model indicates that for each of the three layouts analyzed two of the 162-6.0 turbines, which will be located in Fremont Township, will need to be operated in sound optimized (SO) mode to maintain compliance with limits. The operating mode of each turbine used in the noise analysis are listed in Appendix A. For SO modes, the turbine control system reduces the turbine's maximum rotor speed which results in a lower maximum noise emission level.

Table 4-1 lists the octave band sound power levels used in the model for each source. The levels are expressed in terms of A-weighted decibels (dBA) for each of nine standard frequency octave-bands, as defined by the American National Standards Institute (ANSI) Standard S1.11: *Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters*. The noise emission levels of each turbine were provided by the manufacturer and were determined according to International Electrotechnical Commission Standard 61400-11. All wind turbine sound power levels include a 2 dB uncertainty factor added to the sound power level data provided by the manufacturer. Wind turbine noise emissions increase with increasing wind speeds, up to approximately 10 to 11 m/s at hub height. Noise levels cease to increase with increasing hub-height wind speeds once a turbine reaches its maximum rotational speed, and the sound emission of a turbine is directly proportional to its rotational speed. This analysis used the octave band noise levels reported by the manufacturer for a wind speed of 10 m/s at hub height.

The Project includes a substation that will contain two step-up transformers, which are the only significant noise-producing equipment. The noise analysis assumed the simultaneous operation of both step-up transformers at their maximum rating (150 MVA), including the operation of the cooling fans. The sound power levels from the step-up transformers are listed in Table 4-1. The step-up transformers were modeled as point sources located three meters (10 feet) above the ground, with no barriers or directivity reductions. The sound level spectrum of the transformers was estimated using the methodology published in the Edison Electric Institute, "Electric Power Plant Environmental Noise Guide," 2nd Edition, BBN, 1984.

Table 4-1. Source Sound Power Levels

Source	Source or Hub Height (meters)	Octave Band Sound Power Level (dBA)									Overall 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	
162-6MW STE	119	77.2	87.6	95.1	99.7	101.4	100.3	96.2	89.3	79.5	106.3
162-6MW SO2 STE *	119	75.2	85.6	93.1	97.7	99.4	98.3	94.2	87.3	77.5	104.3
163-4.5MW STE Estimate **	118.5	73	87.1	96.6	102.2	104.1	102.5	96.9	88.4	77.4	108.5
Transformer 150 MVA	3	57.7	76.9	89.0	91.5	96.9	94.1	90.3	85.1	76.0	100.5

* SO noise emission levels were estimated based on a similar turbine model and will be confirmed during final design.
** Manufacturers acoustic data only included standard blade noise levels. STE levels were estimated based on suggestions from the manufacturer

Terrain and Ground Effect

The ground elevations in the Project area were modeled by importing DEM data from the USGS National Elevation Dataset into SoundPLAN. The acoustical effect of the ground was modeled using the ISO 9613-2:1996 General Method. All reductions due to terrain acting as a barrier were removed from the analysis resulting in a more conservative model and higher predicted noise levels. The ground absorption factors for the ground near the source, near the receiver, and in between range from 0.0 to 1.0 and represent the proportion of sound that is absorbed or reflected when sound waves interact with the ground. A value of 0.0 represents completely reflective ground material such as pavement, and results in a higher level of sound reaching a receptor. A value of 1.0 represents absorptive material such as thick grass or fresh snow, and results in a lower level of sound reaching a receptor. For this Project we assumed a ground factor of 0.5 (partially reflective) which is representative of the ground cover in the Project area which is mostly cropland with some forested areas and very low percentages of pavement or other reflective surfaces.

Atmospheric Conditions

The air temperature, relative humidity, and atmospheric pressure were set to conditions of 10°C, 70%, and 1 atmosphere, respectively. These values represent the lowest amount of atmospheric absorption of sound available in the ISO 9613-2:1996 method and result in the highest levels of sound reaching the receptors.

Noise Level Metric

The noise levels predicted in this analysis are in the form of the energy equivalent average noise level (L_{eq}), which can be measured over any time period such as one hour. The L_{eq} is the most widely used metric for assessing community noise levels. The following lists how organizations

specify the use of the L_{eq} metric for the purpose of predicting or measuring or assessing noise from wind turbines and other sources:

- The forthcoming American National Standards Institute (ANSI) standard for the prediction of noise levels from wind turbines calls for a 10-minute to one-hour L_{eq}.
- The IEC 61400-11 standard for the measurement of noise from wind turbines calls for 10-second to 10-minute L_{eq}.
- ANSI S12.9 Part 3, the primary standard followed in the U.S. to measure wind turbine noise, calls for the use of the L_{eq}.
- The World Health Organization's standards are in terms of the 8-hour, 24-hour, and annual average L_{eq}.
- Health Canada, the agency that studied wind turbine noise impacts in greater detail than perhaps any other group, did so using the one-hour L_{eq}.
- U.S. government agencies, including highways (FHWA), airports (FAA), and railroads (FTA/FRA), use the one-hour or 24-hour L_{eq}.
- The L_{eq} is used by public service commissions for wind projects (New York DPS: 8-hour L_{eq}, South Dakota PSC: averaged over one hour, and West Virginia PSC: 24-hour L_{eq}).
- The L_{eq} is the metric used by states that regulate noise (Illinois: one-hour L_{eq}, Delaware: 24-hour L_{eq}, and Maryland: 24-hour L_{eq}).

The Speaker Township Ordinance states that noise levels from the Wind Energy Facility should not exceed 50 dBA for more than 10% of any hour. In acoustics this is referred to as the one-hour L_{10} ("L-10"). When wind turbines are operating at full acoustic output (wind speed of approximately 10 m/s at hub-height), the noise they emit is relatively steady with the exception of the small change in level that occurs when each blade passes the tower. This variation in the level causes the one-hour L_{10} to be 1 to 2 dBA higher than the one-hour L_{eq} based on the measurement experience of Hankard Environmental. Therefore, predicted L_{eq} noise levels of 48 dBA or less indicate compliance with the 50 dBA L_{10} limit.

Model Validation

The noise level prediction method used for this analysis has been validated by Hankard Environmental by comparing predicted noise levels to those measured at operating wind farms. An analysis of noise data collected at ten operating wind energy centers consisting of 50 individual measurement locations was conducted. Results of the analysis were presented at NOISECON 2022, the annual conference for the Institute of Noise Control Engineering. The loudest turbine-only noise levels measured at each location, which occur for only a few hours/nights at each site over the course of many weeks of data collection, were compared to the levels predicted at each location using the same methodology employed on this Project (ISO 9613-2:1996 with a 0.5 ground factor). The results show that, on average, the model exactly predicts the measured levels. At a few locations the measured levels were as much as 2 dBA louder than the predicted levels. To account for this, 2 dBA was conservatively added to all wind turbine sound power levels as described above.

5. Predicted Noise Levels

Noise levels were predicted for the full and continuous operation of the proposed Project for each of three potential turbine layouts (Layouts 16, 25, and 16a). Noise levels were predicted at each of the 552 principal structures identified within one mile of any proposed noise source in Speaker Township. For all layouts, predicted noise levels range from 28 to 47 dBA (L_{eq}), which are below Speaker Township's limit of 50 dBA at the exterior of a principal structure. Table 5-1 lists the predicted noise level at the loudest 15 NP receptors (based on Layout 16a).

All predictions, for each layout, include a +2 dBA uncertainty factor applied to the wind turbine sound power levels as previously described. The predicted noise levels at all locations, for each layout, are listed in Appendix B.

Table 5-1. Highest Predicted Non-Participant Noise Levels

Receiver	Predicted Noise Level (dBA)		
	Layout 16a	Layout 16	Layout 25
R-0992	46.8	46.8	46.8
R-2528	46.3	46.3	46.3
R-4536	46.3	46.3	46.3
R-3597	45.9	45.9	45.8
R-0788	45.7	45.6	45.6
R-2797	45.7	45.7	45.6
R-1634	45.6	45.5	45.5
R-0070	45.5	45.4	45.4
R-1015	45.5	45.5	45.5
R-1510	45.5	45.5	45.5
R-3737	45.5	45.5	45.5
R-1245	45.3	45.3	45.3
R-0437	45.1	42.8	42.8
R-2016	45.1	45.0	44.9
R-0985	44.9	44.8	44.8

Figures 5-1 to 5-3 show the results of the predictions in terms of the location of the 50 dBA L_{eq} noise level contours. The area inside the contour has a predicted Project noise level in excess of 50 dBA, and the areas outside the contour have a predicted level less than 50 dBA. More detailed noise level contour figures, which include turbine labels and participating and non-participating receptors, are shown in Appendix C.

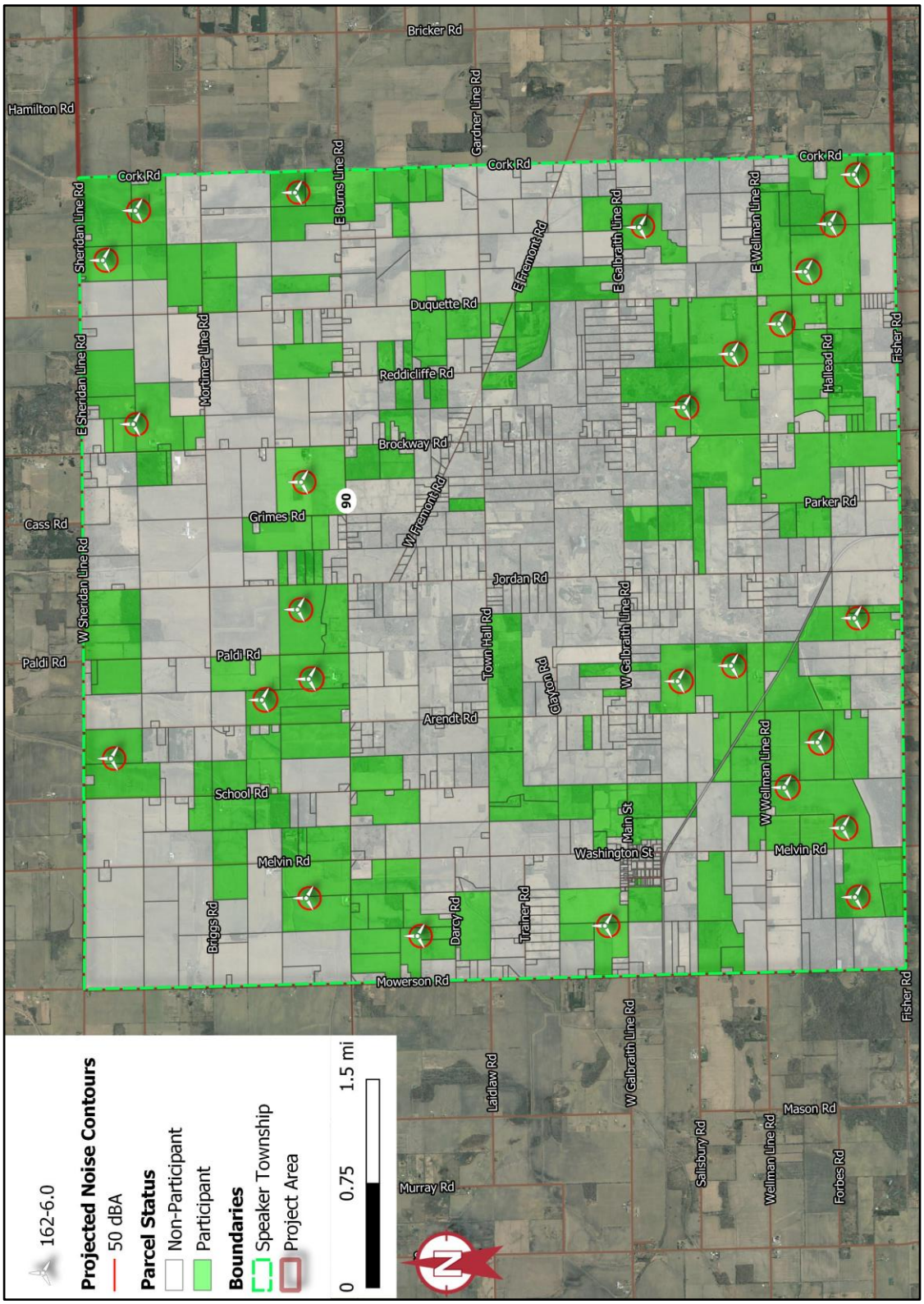

Figure 5-1. Predicted Noise Level Contours – Layout 16

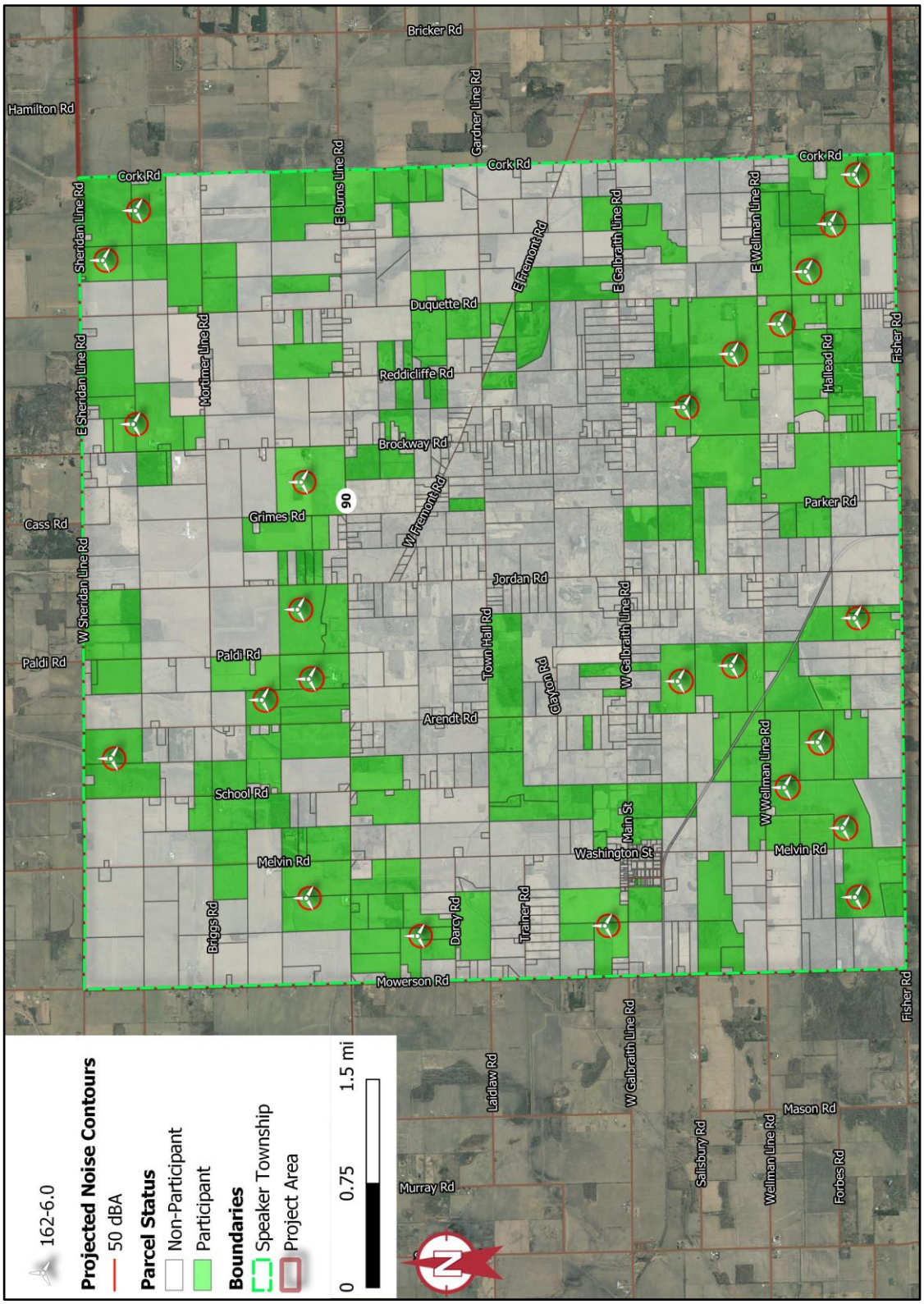

Figure 5-2. Predicted Noise Level Contours – Layout 25

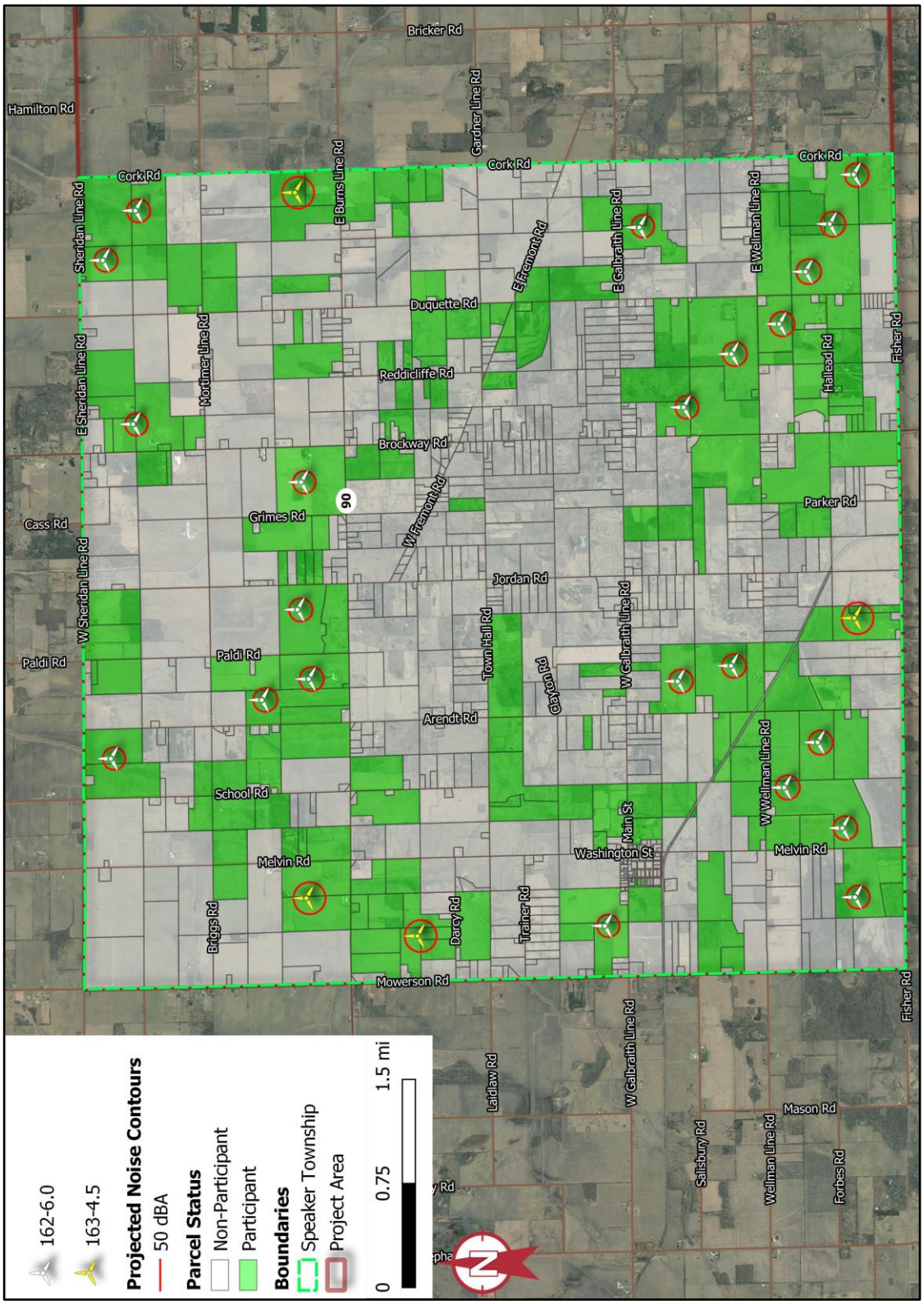

Figure 5-3. Predicted Noise Level Contours – Layout 16a

6. Conclusions

The Speaker Township Ordinance requires noise levels from a Wind Energy Facility to not exceed 50 dBA for more than 10% of any hour. This equates to an hourly L_{10} noise level metric, which is defined as the noise level exceeded 10% of the time. Noise levels from the full and continuous operation of the proposed Project were predicted at each of 552 Speaker Township noise-sensitive receptors (e.g., residences) located within approximately one mile of any potential Project noise source. The noise levels predicted in this analysis are in the form of the energy equivalent average noise level (L_{eq}) over a short duration of time (one hour), which is a widely utilized metric for assessing both industrial and community noise levels. Wind turbines, when operating at full power, emit a slight variation in noise levels that causes the L_{10} to be 1 to 2 dBA greater than the L_{eq} based on the measurement experience of Hankard Environmental.

For all layouts, the maximum predicted L_{eq} noise level at any non-participating receptor is 47 dBA which, when accounting for actual differences between L_{eq} and L_{10} levels, demonstrates compliance with the Speaker Township L_{10} limit of 50 dBA.

The noise modeling (prediction) method used in this analysis has been demonstrated by Hankard Environmental and other acoustical consultants to result in predicted levels that are equal to or greater than actual measured noise levels. That is, measured noise levels will be less than those described herein, which were predicted using the ISO 9613-2:1996 method, utilizing a 0.5 ground factor, a 4-meter receptor height, and adding 2 dBA of uncertainty to the wind turbine sound power levels.

Furthermore, the analysis focused on the very highest turbine noise levels expected. A majority of the time turbine noise levels will be less than those described herein when the turbines are not producing full acoustic output due to low winds, and/or atmospheric conditions not being as conducive to sound propagation as assumed herein (e.g., unstable atmosphere, receptors crosswind to the nearest turbines).

Note that the results described herein are valid for the receptor locations provided, the turbine layouts and substation location analyzed, the wind turbine sound power levels provided by the manufacturer, and the mode of turbine operation modeled. If the Project makes significant changes to any of these parameters, the noise analysis should be updated to demonstrate compliance with the Speaker Township noise limit.

APPENDIX A
Project Noise Source Locations (Layouts 16, 25, and 16a)

Table A-1. Noise Source Locations – Layout 16

Source Name	UTM 17N		Ground Elevation (m asl)	Source / Hub Height (m agl)	Example Source Type	Sound Power Level (dBA)
	Easting (m)	Northing (m)				
ALTA-1	350709	4782594	250	119	162-6MW STE	106.3
ALTA-2	355459	4781111	245	119	162-6MW STE	106.3
ALTA-3	365116	4786230	225	119	162-6MW STE	106.3
ALTA-4	365366	4788768	226	119	162-6MW STE	106.3
ALTA-5	362394	4786145	229	119	162-6MW STE	106.3
ALTA-6	364228	4785565	225	119	162-6MW STE	106.3
OPA-1	349477	4781358	245	119	162-6MW STE	106.3
OPA-2	360615	4785528	230	119	162-6MW STE	106.3
OPA-3	356167	4788880	235	119	162-6MW STE	106.3
OPA-4	356376	4787030	235	119	162-6MW STE	106.3
OPA-5	362476	4787146	230	119	162-6MW STE	106.3
OPA-6	347755	4785610	242	119	162-6MW STE	106.3
OPA-7	348205	4780537	245	119	162-6MW STE	106.3
OPA-8	365628	4781507	225	119	162-6MW STE	106.3
OPA-9	348194	4786899	240	119	162-6MW STE	106.3
OPA-10	347873	4783436	246	119	162-6MW STE	106.3
OPA-11	365725	4781012	225	119	162-6MW STE	106.3
OPA-12	360901	4784538	230	119	162-6MW STE	106.3
OPA-13	360540	4787080	230	119	162-6MW STE	106.3
OPA-14	363977	4786279	228	119	162-6MW STE	106.3
OPA-15	350735	4786871	245	119	162-6MW STE	106.3
OPA-16	365145	4785573	225	119	162-6MW STE	106.3
OPA-17	363562	4787881	230	119	162-6MW STE	106.3
OPA-18	362028	4784081	227	119	162-6MW STE	106.3
OPA-19	355986	4783034	240	119	162-6MW STE	106.3
OPA-20	359415	4782262	230	119	162-6MW STE	106.3
OPA-21	354852	4781415	245	119	162-6MW STE	106.3
OPA-22	365649	4784035	225	119	162-6MW STE	106.3
OPA-23	360931	4787774	230	119	162-6MW STE	106.3
OPA-24	349812	4789164	236	119	162-6MW STE	106.3
OPA-25	365232	4787858	226	119	162-6MW STE	106.3
OPA-26	365614	4783058	229	119	162-6MW STE	106.3
OPA-27	349007	4780683	245	119	162-6MW STE	106.3

Source Name	UTM 17N		Ground Elevation (m asl)	Source / Hub Height (m agl)	Example Source Type	Sound Power Level (dBA)
	Easting (m)	Northing (m)				
OPA-28	351442	4780545	255	119	162-6MW STE	106.3
OPA-29	356585	4780552	237	119	162-6MW STE	106.3
OPA-30	358814	4784572	232	119	162-6MW STE	106.3
OPA-31	359429	4783926	230	119	162-6MW STE	106.3
OPA-32	353690	4788905	240	119	162-6MW STE	106.3
OPA-33	351540	4787001	243	119	162-6MW STE	106.3
OPA-34	353018	4786959	245	119	162-6MW STE	106.3
OPA-35	362338	4785502	229	119	162-6MW STE	106.3
OPA-36	361087	4782993	229	119	162-6MW STE	106.3
OPA-37	354504	4781969	247	119	162-6MW STE	106.3
OPA-38	356012	4780830	240	119	162-6MW STE	106.3
OPA-39	355590	4789259	235	119	162-6MW STE	106.3
OPA-40	350492	4787415	240	119	162-6MW STE	106.3
OPA-41	350001	4780971	245	119	162-6MW STE	106.3
OPA-42	363801	4784679	225	119	162-6MW STE	106.3
OPA-43	365168	4789330	227	119	162-6MW STE	106.3
OPA-44	364114	4789101	230	119	162-6MW STE	106.3
OPA-45	365807	4787294	225	119	162-6MW STE	106.3
OPA-46	363996	4782374	226	119	162-6MW STE SO2	104.3
OPA-47	358800	4782950	230	119	162-6MW STE	106.3
OPA-48	350889	4781974	250	119	162-6MW STE	106.3
OPA-49	353886	4782524	250	119	162-6MW STE	106.3
OPA-50	363595	4782713	227	119	162-6MW STE SO2	104.3
Transformer 1	360046	4786772	232	3	Substation Transformer 150 MVA -5 dB*	95.5
Transformer 2	360087	4786772	232	3	Substation Transformer 150 MVA -5 dB*	95.5

* 5 dB subtracted from sound power level of the transformers to meet Fremont Township ordinance.

Table A-2. Noise Source Locations – Layout 25

Source Name	UTM 17N		Ground Elevation (m asl)	Source / Hub Height (m agl)	Example Source Type	Sound Power Level (dBA)
	Easting (m)	Northing (m)				
1	349477	4781358	245	119	162-6MW STE	106.3
2	360829	4785484	230	119	162-6MW STE	106.3
3	356167	4788880	235	119	162-6MW STE	106.3
4	365366	4788768	226	119	162-6MW STE	106.3
5	362476	4787146	230	119	162-6MW STE	106.3
6	347755	4785610	242	119	162-6MW STE	106.3
7	348205	4780537	245	119	162-6MW STE	106.3
8	365628	4781507	225	119	162-6MW STE	106.3
9	348194	4786899	240	119	162-6MW STE	106.3
10	347873	4783436	246	119	162-6MW STE	106.3
11	365725	4781012	225	119	162-6MW STE	106.3
12	364228	4785565	225	119	162-6MW STE	106.3
13	360540	4787080	230	119	162-6MW STE	106.3
14	363996	4782374	226	119	162-6MW STE SO2	104.3
15	350735	4786871	245	119	162-6MW STE	106.3
16	365145	4785573	225	119	162-6MW STE	106.3
17	363562	4787881	230	119	162-6MW STE	106.3
18	362028	4784081	227	119	162-6MW STE	106.3
19	350709	4782594	250	119	162-6MW STE	106.3
20	359415	4782262	230	119	162-6MW STE	106.3
21	354852	4781415	245	119	162-6MW STE	106.3
22	365649	4784035	225	119	162-6MW STE	106.3
23	360931	4787774	230	119	162-6MW STE	106.3
24	349812	4789164	236	119	162-6MW STE	106.3
25	365232	4787858	226	119	162-6MW STE	106.3
26	365614	4783058	229	119	162-6MW STE	106.3
27	349007	4780683	245	119	162-6MW STE	106.3
28	351442	4780545	255	119	162-6MW STE	106.3
29	356585	4780552	237	119	162-6MW STE	106.3
30	355459	4781111	245	119	162-6MW STE	106.3
31	365116	4786230	225	119	162-6MW STE	106.3
32	353690	4788905	240	119	162-6MW STE	106.3
33	351540	4787001	243	119	162-6MW STE	106.3

Source Name	UTM 17N		Ground Elevation (m asl)	Source / Hub Height (m agl)	Example Source Type	Sound Power Level (dBA)
	Easting (m)	Northing (m)				
34	353018	4786959	245	119	162-6MW STE	106.3
35	362338	4785502	229	119	162-6MW STE	106.3
36	361087	4782993	229	119	162-6MW STE	106.3
37	354504	4781969	247	119	162-6MW STE	106.3
38	356012	4780830	240	119	162-6MW STE	106.3
39	355590	4789259	235	119	162-6MW STE	106.3
40	350492	4787415	240	119	162-6MW STE	106.3
41	350001	4780971	245	119	162-6MW STE	106.3
42	363801	4784679	225	119	162-6MW STE	106.3
43	365168	4789330	227	119	162-6MW STE	106.3
44	364114	4789101	230	119	162-6MW STE	106.3
45	365807	4787294	225	119	162-6MW STE	106.3
46	363977	4786278	228	119	162-6MW STE	106.3
47	362394	4786145	229	119	162-6MW STE	106.3
48	350889	4781974	250	119	162-6MW STE	106.3
49	353886	4782524	250	119	162-6MW STE	106.3
50	363595	4782713	227	119	162-6MW STE SO2	104.3
Transformer 1	360046	4786772	232	3	Substation Transformer 150 MVA -5 dB*	95.5
Transformer 2	360087	4786772	232	3	Substation Transformer 150 MVA -5 dB*	95.5

* 5 dB subtracted from sound power level of transformers to meet Fremont Township ordinance.

Table A-3. Noise Source Locations – Layout 16a

Source Name	UTM 17N		Ground Elevation (m asl)	Source / Hub Height (m agl)	Example Source Type	Sound Power Level (dBA)
	Easting (m)	Northing (m)				
ALTB-1	350709	4782594	250	119	162-6MW STE	106.3
ALTB-2	355459	4781111	245	119	162-6MW STE	106.3
ALTB-3	365116	4786230	225	119	162-6MW STE	106.3
ALTB-4	365366	4788768	226	119	162-6MW STE	106.3
ALTB-5	362394	4786145	229	119	162-6MW STE	106.3
ALTB-6	364228	4785565	225	119	162-6MW STE	106.3
OPB-1	349477	4781358	245	119	162-6MW STE	106.3
OPB-2	360615	4785528	230	119	162-6MW STE	106.3
OPB-3	356167	4788880	235	119	162-6MW STE	106.3
OPB-4	356376	4787030	235	118.5	163-4.5MW STE	108.5
OPB-5	362476	4787146	230	119	162-6MW STE	106.3
OPB-6	347755	4785610	242	118.5	163-4.5MW STE	108.5
OPB-7	348205	4780537	245	119	162-6MW STE	106.3
OPB-8	365628	4781507	225	119	162-6MW STE	106.3
OPB-9	348194	4786899	240	118.5	163-4.5MW STE	108.5
OPB-10	347873	4783436	246	119	162-6MW STE	106.3
OPB-11	365725	4781012	225	119	162-6MW STE	106.3
OPB-12	360901	4784538	230	119	162-6MW STE	106.3
OPB-13	360540	4787080	230	119	162-6MW STE	106.3
OPB-14	363977	4786279	228	119	162-6MW STE	106.3
OPB-15	350735	4786871	245	119	162-6MW STE	106.3
OPB-16	365145	4785573	225	119	162-6MW STE	106.3
OPB-17	363562	4787881	230	119	162-6MW STE	106.3
OPB-18	362028	4784081	227	119	162-6MW STE	106.3
OPB-19	355986	4783034	240	119	162-6MW STE	106.3
OPB-20	359415	4782262	230	118.5	163-4.5MW STE	108.5
OPB-21	354852	4781415	245	119	162-6MW STE	106.3
OPB-22	365649	4784035	225	119	162-6MW STE	106.3
OPB-23	360931	4787774	230	119	162-6MW STE	106.3
OPB-24	349812	4789164	236	119	162-6MW STE	106.3
OPB-25	365232	4787858	226	119	162-6MW STE	106.3
OPB-26	365614	4783058	229	119	162-6MW STE	106.3
OPB-27	349007	4780683	245	119	162-6MW STE	106.3

Source Name	UTM 17N		Ground Elevation (m asl)	Source / Hub Height (m agl)	Example Source Type	Sound Power Level (dBA)
	Easting (m)	Northing (m)				
OPB-28	351442	4780545	255	118.5	163-4.5MW STE	108.5
OPB-29	356585	4780552	237	119	162-6MW STE	106.3
OPB-30	358814	4784572	232	119	162-6MW STE	106.3
OPB-31	359429	4783926	230	119	162-6MW STE	106.3
OPB-32	353690	4788905	240	119	162-6MW STE	106.3
OPB-33	351540	4787001	243	119	162-6MW STE	106.3
OPB-34	353018	4786959	245	119	162-6MW STE	106.3
OPB-35	362338	4785502	229	119	162-6MW STE	106.3
OPB-36	361087	4782993	229	119	162-6MW STE	106.3
OPB-37	354504	4781969	247	119	162-6MW STE	106.3
OPB-38	356012	4780830	240	119	162-6MW STE	106.3
OPB-39	355590	4789259	235	119	162-6MW STE	106.3
OPB-40	350492	4787415	240	119	162-6MW STE	106.3
OPB-41	350001	4780971	245	119	162-6MW STE	106.3
OPB-42	363801	4784679	225	118.5	163-4.5MW STE	108.5
OPB-43	365168	4789330	227	118.5	163-4.5MW STE	108.5
OPB-44	364114	4789101	230	119	162-6MW STE	106.3
OPB-45	365807	4787294	225	119	162-6MW STE	106.3
OPB-46	363996	4782374	226	119	162-6MW STE SO2	104.3
OPB-47	358800	4782950	230	118.5	163-4.5MW STE	108.5
OPB-48	350889	4781974	250	119	162-6MW STE	106.3
OPB-49	353886	4782524	250	119	162-6MW STE	106.3
OPB-50	363595	4782713	227	119	162-6MW STE SO2	104.3
Transformer 1	360046	4786772	232	3	Substation transformer 150 MA -5 dB*	95.5
Transformer 2	360087	4786772	232	3	Substation transformer 150 MA -5 dB*	95.5

* 5 dB subtracted from sound power level of transformers to meet Fremont Township ordinance.

APPENDIX B
Receptor Locations and Predicted Noise Levels

Table B-1. Receptor Locations and Predicted Noise Levels

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-0016	350137	4786266	257	253	39	39	39
R-0017	348691	4785731	245	241	37	39	37
R-0018	348517	4784520	248	244	36	37	36
R-0019	351788	4786212	249	245	39	39	39
R-0035	347471	4783245	250	246	42	42	42
R-0036	351106	4783133	258	254	40	40	40
R-0039	354998	4783345	248	244	38	38	35
R-0040	356668	4783529	239	235	38	38	31
R-0055	353519	4786113	245	241	36	36	36
R-0057	353509	4785815	245	241	34	34	34
R-0070	349201	4781567	249	245	45	46	45
R-0071	351893	4783334	259	255	35	35	35
R-0088	349417	4785936	250	246	35	37	35
R-0089	352214	4786488	249	245	39	39	39
R-0090	353374	4786943	249	245	44	44	44
R-0103	355014	4788288	240	236	37	37	37
R-0105	350113	4783287	259	255	38	38	38
R-0106	348806	4782497	252	248	37	37	37
R-0108	353519	4781946	254	250	41	41	40
R-0111	352855	4780101	247	243	34	35	34
R-0112	352835	4780481	248	244	35	36	35
R-0124	348484	4789316	243	239	33	33	33
R-0130	350205	4786315	254	250	39	39	39
R-0150	348665	4784216	249	245	36	36	36
R-0152	352874	4783218	259	255	35	35	35
R-0208	348686	4786209	249	245	38	40	38
R-0209	347279	4786179	244	240	39	41	39
R-0210	351809	4785439	255	251	34	34	34
R-0222	350062	4783176	259	255	38	38	38
R-0223	350279	4783288	259	255	38	38	38
R-0224	352169	4783135	259	255	35	35	35
R-0237	349326	4787966	244	240	37	37	37
R-0269	351496	4783352	259	255	36	37	36
R-0295	353015	4789415	259	255	37	37	37
R-0308	350304	4782109	250	246	43	43	43
R-0309	353604	4782729	256	252	45	45	45
R-0310	352639	4781599	249	245	36	37	36
R-0312	351572	4780098	255	251	42	44	42

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-0317	356645	4780178	239	235	44	44	44
R-0330	353397	4789449	254	250	39	40	39
R-0331	353266	4789501	259	255	38	38	38
R-0333	350086	4786354	259	255	39	39	39
R-0352	348743	4783136	259	255	37	37	37
R-0354	354874	4783227	249	245	38	38	36
R-0388	349118	4783284	259	255	36	36	36
R-0389	353817	4783193	254	250	40	40	39
R-0391	355263	4780620	249	245	43	43	43
R-0419	348486	4783250	253	249	39	40	39
R-0420	353588	4783723	253	249	35	35	34
R-0422	354468	4783236	250	246	38	38	38
R-0423	356387	4784093	243	239	35	36	30
R-0436	350937	4788063	244	240	40	40	40
R-0437	348118	4786454	244	240	43	45	43
R-0438	354315	4786156	244	240	33	34	32
R-0453	351801	4782725	261	257	37	38	37
R-0454	353514	4783083	259	255	39	40	39
R-0455	352712	4780919	249	245	36	37	36
R-0469	347299	4784740	244	240	36	38	36
R-0470	347308	4784769	244	240	37	38	37
R-0471	351859	4787636	246	242	40	40	40
R-0472	352029	4785815	251	247	36	36	36
R-0485	355615	4786587	240	236	37	38	30
R-0494	348471	4783231	253	249	40	40	40
R-0495	352048	4781681	253	249	37	38	37
R-0515	354368	4788162	244	240	37	37	37
R-0516	348598	4786333	249	245	40	42	40
R-0533	355890	4786580	240	236	39	41	29
R-0534	355358	4786645	240	236	35	37	30
R-0541	348545	4782847	256	252	37	38	37
R-0542	350145	4783657	254	250	36	36	36
R-0543	353595	4783091	259	255	40	40	40
R-0567	353357	4788291	247	243	39	39	39
R-0569	352282	4786353	249	245	39	39	38
R-0581	355886	4786450	241	237	38	40	29
R-0582	354283	4783708	249	245	36	36	35
R-0583	353652	4781021	250	246	37	37	37
R-0584	353654	4781230	251	247	38	38	38
R-0604	352917	4785568	249	245	34	34	34

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-0613	355993	4786470	241	237	39	41	29
R-0614	356614	4785694	242	238	34	35	28
R-0619	353699	4783231	256	252	39	39	39
R-0622	356393	4783243	240	236	42	42	32
R-0644	353300	4789305	251	247	40	40	40
R-0645	350133	4787814	244	240	42	42	42
R-0664	353320	4783350	259	255	36	36	36
R-0665	347415	4780627	249	245	38	38	38
R-0694	351952	4785593	254	250	34	34	34
R-0713	356620	4785766	242	238	34	36	28
R-0718	348649	4782834	258	254	37	37	37
R-0721	355438	4781672	249	245	44	44	44
R-0742	352497	4786393	249	245	39	39	39
R-0754	354824	4787148	244	240	34	35	32
R-0761	348415	4783184	254	250	40	40	40
R-0762	348745	4783232	258	254	37	37	37
R-0787	353721	4789493	249	245	40	40	40
R-0788	350166	4787427	244	240	46	46	46
R-0789	351753	4786189	249	245	39	39	39
R-0804	356177	4788034	239	235	39	40	37
R-0808	347330	4783732	248	244	39	40	39
R-0809	348693	4783142	259	255	37	38	37
R-0810	348790	4783177	258	254	37	37	37
R-0811	348489	4783224	253	249	39	39	39
R-0813	351470	4780102	254	250	43	45	43
R-0844	355381	4789532	239	235	45	45	45
R-0854	353594	4782955	258	254	42	42	41
R-0883	351132	4786506	249	245	43	43	43
R-0884	351822	4785663	254	250	35	35	35
R-0899	348574	4784385	249	245	36	37	36
R-0902	348391	4783181	253	249	40	40	40
R-0903	352827	4780600	249	245	35	36	35
R-0941	348712	4781733	249	245	40	40	40
R-0942	351890	4783188	259	255	36	36	36
R-0943	352457	4781570	253	249	36	37	36
R-0946	354683	4783259	249	245	38	38	37
R-0963	348563	4787320	244	240	41	43	41
R-0964	353479	4786461	246	242	39	39	39
R-0985	348134	4783230	252	248	45	45	45
R-0986	348926	4782375	250	246	37	38	37

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-0987	351996	4782525	266	262	37	37	37
R-0992	355141	4781010	249	245	47	47	47
R-1015	350765	4786537	249	245	46	46	46
R-1016	351690	4786390	249	245	41	41	41
R-1030	348683	4783055	259	255	37	38	37
R-1031	348335	4783229	253	249	41	41	41
R-1048	349507	4788971	240	236	44	44	44
R-1053	352640	4785522	251	247	34	34	34
R-1069	353849	4783228	254	250	39	39	39
R-1070	356692	4783453	239	235	38	38	31
R-1090	352505	4785588	251	247	34	34	34
R-1101	354603	4788070	244	240	36	36	36
R-1108	350253	4782981	255	251	41	41	41
R-1109	350347	4780661	249	245	43	44	43
R-1131	349342	4786382	249	245	36	38	36
R-1133	351851	4787471	244	240	42	42	42
R-1153	350498	4783716	254	250	36	36	36
R-1154	348691	4782611	254	250	37	37	37
R-1157	355307	4783372	244	240	39	39	34
R-1175	352433	4786394	249	245	39	39	39
R-1193	348461	4783165	254	250	39	40	39
R-1194	350467	4783250	259	255	39	40	39
R-1195	347357	4782092	254	250	34	34	34
R-1196	352423	4782513	260	256	36	36	36
R-1217	350013	4786053	259	255	37	37	37
R-1231	348408	4783147	254	250	40	40	40
R-1232	348766	4783233	258	254	37	37	37
R-1233	349574	4783050	259	255	37	37	37
R-1245	351869	4787028	245	241	45	45	45
R-1269	348789	4782891	257	253	37	37	37
R-1270	350955	4783136	258	254	41	41	41
R-1272	355057	4783386	246	242	38	38	35
R-1273	355288	4781779	249	245	44	44	44
R-1315	348477	4783188	254	250	39	39	39
R-1316	351781	4782616	264	260	38	38	38
R-1317	352181	4780895	249	245	38	40	38
R-1338	347270	4784921	245	241	37	39	37
R-1339	348340	4785165	244	240	38	40	38
R-1353	347464	4784377	246	242	36	37	36
R-1358	355076	4783267	248	244	38	38	35

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-1359	355243	4782936	249	245	40	40	37
R-1374	350320	4785425	259	255	35	35	35
R-1384	354379	4786395	244	240	33	34	32
R-1411	353429	4785799	246	242	34	34	34
R-1415	354366	4786056	244	240	33	33	32
R-1418	348708	4782944	259	255	37	37	37
R-1420	353747	4781553	254	250	40	40	40
R-1421	351960	4780075	259	255	39	41	39
R-1450	354397	4788077	244	240	36	37	36
R-1451	349375	4786854	244	240	37	38	37
R-1467	351914	4782515	269	265	37	38	37
R-1490	350360	4786469	249	245	42	42	42
R-1506	355788	4784244	244	240	35	35	30
R-1509	348620	4783179	257	253	38	38	38
R-1510	350413	4782395	252	248	46	46	46
R-1511	351383	4783309	259	255	37	37	37
R-1515	354376	4783345	251	247	38	38	37
R-1517	356745	4781373	244	240	40	40	40
R-1554	354239	4783929	249	245	34	35	33
R-1579	347256	4786218	244	240	38	40	38
R-1580	349930	4786381	252	248	38	38	38
R-1581	348659	4784874	247	243	36	37	36
R-1582	351676	4786392	249	245	41	41	41
R-1599	347347	4783242	250	246	40	40	40
R-1600	348476	4781551	249	245	39	40	39
R-1633	351973	4783203	259	255	35	35	35
R-1634	350720	4781672	254	250	46	46	46
R-1651	350908	4789458	244	240	35	35	35
R-1652	349363	4787074	244	240	38	38	38
R-1654	353386	4786433	246	242	39	39	39
R-1681	352856	4781628	249	245	36	37	36
R-1683	356356	4784033	243	239	36	36	30
R-1703	353438	4788661	247	243	44	44	44
R-1704	352873	4785415	250	246	33	33	33
R-1722	348453	4783080	254	250	39	39	39
R-1723	348371	4783172	253	249	41	41	41
R-1724	348387	4783223	253	249	41	41	41
R-1725	352701	4781726	249	245	36	37	36
R-1727	354408	4783525	249	245	37	37	36
R-1744	350481	4785391	257	253	34	35	34

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-1746	353480	4786425	245	241	39	39	38
R-1761	354889	4786492	242	238	33	34	31
R-1764	348804	4783801	249	245	36	37	36
R-1765	348601	4783226	255	251	38	38	38
R-1784	353767	4789495	248	244	40	40	40
R-1798	348473	4783286	253	249	40	40	40
R-1819	353262	4788590	249	245	41	41	41
R-1820	347287	4785145	249	245	39	41	39
R-1831	355040	4787392	244	240	35	36	33
R-1842	351400	4789488	249	245	33	33	33
R-1844	351930	4785674	258	254	35	35	35
R-1854	355852	4789507	239	235	45	45	45
R-1855	356438	4786593	239	235	42	45	29
R-1857	347433	4783064	251	247	40	40	40
R-1858	350484	4783184	259	255	40	40	40
R-1859	353470	4783656	257	253	35	35	34
R-1860	353320	4783189	259	255	37	38	37
R-1861	351988	4782197	259	255	37	38	37
R-1876	349583	4789478	240	236	43	43	43
R-1879	350907	4788371	244	240	38	38	38
R-1881	354261	4786558	244	240	34	35	33
R-1913	347229	4787832	249	245	33	35	33
R-1919	352126	4785781	251	247	35	36	35
R-1935	354558	4786487	244	240	33	34	32
R-1966	347241	4786755	245	241	37	39	37
R-1967	347451	4785127	249	245	40	42	40
R-1968	351928	4786623	248	244	42	42	42
R-1983	351995	4782418	264	260	37	37	37
R-1999	348600	4789256	243	239	34	34	34
R-2000	350247	4789174	244	240	43	43	43
R-2016	356396	4788635	239	235	45	45	45
R-2018	354997	4786570	241	237	34	35	31
R-2021	348762	4782964	257	253	37	37	37
R-2022	351870	4781838	256	252	38	39	38
R-2023	353283	4781595	251	247	38	38	38
R-2054	347340	4783358	249	245	41	41	41
R-2055	350470	4783617	254	250	36	37	36
R-2056	350300	4782177	251	247	43	43	43
R-2057	352738	4781487	249	245	36	37	36
R-2058	353541	4781559	253	249	39	39	39

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-2073	348734	4785206	245	241	36	38	36
R-2093	348385	4782866	255	251	38	38	38
R-2094	350179	4783166	258	254	39	39	39
R-2095	350437	4783446	254	250	37	38	37
R-2096	348720	4781077	249	245	44	44	44
R-2098	348350	4780200	249	245	45	45	45
R-2102	355112	4782928	249	245	39	40	37
R-2103	354829	4780986	249	245	45	45	45
R-2116	349346	4788650	242	238	39	39	39
R-2133	356381	4788189	239	235	39	40	38
R-2136	349960	4783262	264	260	37	37	37
R-2137	351867	4782892	259	255	37	37	36
R-2161	351878	4786326	249	245	39	39	39
R-2162	353109	4785384	249	245	33	33	33
R-2173	354915	4786915	243	239	34	35	32
R-2180	347687	4783034	252	248	42	42	42
R-2181	348839	4782901	254	250	37	37	37
R-2184	355107	4783199	248	244	39	39	36
R-2208	347310	4784619	244	240	36	37	36
R-2209	352488	4786539	248	244	40	40	40
R-2210	352594	4785693	249	245	35	35	35
R-2221	348803	4783307	254	250	37	37	37
R-2222	350570	4783258	258	254	40	40	40
R-2223	352057	4783203	259	255	35	35	35
R-2224	353593	4783360	260	256	37	37	37
R-2240	350076	4788118	244	240	39	39	39
R-2243	352413	4786490	249	245	39	40	39
R-2246	353510	4785759	245	241	34	34	34
R-2247	353524	4786051	245	241	35	36	35
R-2257	355016	4788165	240	236	37	37	36
R-2266	348460	4783042	254	250	39	39	39
R-2267	348448	4783134	254	250	39	40	39
R-2268	350182	4783471	257	253	37	37	37
R-2269	350743	4783272	259	255	40	40	40
R-2270	354245	4783327	251	247	38	38	38
R-2271	350334	4780435	249	245	41	42	41
R-2291	352373	4785675	250	246	35	35	35
R-2311	356632	4783668	240	236	37	37	30
R-2331	349453	4787508	244	240	38	38	38
R-2332	352558	4787508	245	241	40	40	40

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-2342	356529	4788990	239	235	44	44	44
R-2350	347380	4782968	251	247	39	39	39
R-2351	350906	4783312	259	255	39	39	39
R-2353	355124	4782491	249	245	41	41	40
R-2354	354471	4783359	250	246	37	38	37
R-2355	356621	4781769	244	240	39	39	38
R-2381	354765	4789505	239	235	38	38	38
R-2410	353116	4789490	259	255	37	37	37
R-2411	348103	4786332	244	240	42	44	42
R-2432	353422	4783963	253	249	33	34	33
R-2453	347272	4785511	246	242	41	44	41
R-2454	354233	4786082	244	240	33	34	32
R-2455	353126	4785358	249	245	33	33	33
R-2475	351990	4783117	259	255	36	36	35
R-2525	353573	4783669	254	250	35	35	35
R-2526	352915	4783366	259	255	35	35	35
R-2527	354157	4783333	251	247	38	38	38
R-2528	348656	4780734	249	245	46	46	46
R-2532	355590	4781749	249	245	43	43	42
R-2533	356619	4781679	244	240	39	39	38
R-2571	354399	4786542	244	240	34	34	33
R-2579	351923	4782215	259	255	38	38	38
R-2581	355189	4780192	249	245	39	39	39
R-2596	353043	4785539	249	245	34	34	33
R-2609	349825	4782929	257	253	38	38	38
R-2645	355057	4787209	244	240	35	36	32
R-2650	350362	4782773	254	250	44	44	44
R-2654	355619	4783272	244	240	43	43	34
R-2677	350703	4789467	244	240	36	36	36
R-2682	351865	4787354	244	240	43	43	43
R-2696	350267	4783163	258	254	39	39	39
R-2698	355141	4780759	249	245	44	44	44
R-2722	347237	4786899	245	241	36	38	36
R-2731	347260	4785781	244	240	41	43	41
R-2774	353642	4786455	244	240	37	38	37
R-2783	356509	4788841	239	235	45	45	45
R-2791	348698	4782919	259	255	37	37	37
R-2792	348568	4783221	254	250	38	39	38
R-2794	351939	4781784	254	250	38	38	38
R-2795	354073	4780787	249	245	38	38	38

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-2796	354776	4783251	249	245	38	38	36
R-2797	354331	4781633	252	248	46	46	46
R-2798	356610	4780992	243	239	44	44	44
R-2818	352825	4785394	251	247	33	33	33
R-2833	354080	4783373	250	246	38	38	37
R-2872	351154	4783289	259	255	38	38	38
R-2876	354357	4783756	248	244	35	35	34
R-2896	350702	4786366	249	245	42	42	42
R-2897	347575	4785184	248	244	42	44	42
R-2912	353906	4783238	254	250	39	39	39
R-2913	353653	4780756	249	245	36	37	36
R-2937	352473	4788224	248	244	36	36	36
R-2938	351994	4785625	254	250	35	35	35
R-2940	353027	4785480	249	245	33	34	33
R-2955	348297	4783224	253	249	42	42	42
R-2958	356040	4783365	243	239	45	45	32
R-2974	351890	4786786	247	243	44	44	44
R-2989	348410	4783224	253	249	40	40	40
R-3011	350949	4788501	244	240	37	37	37
R-3028	348827	4781636	249	245	41	41	41
R-3029	352979	4780820	249	245	35	36	35
R-3043	349457	4787400	244	240	38	38	38
R-3044	353386	4787461	245	241	40	40	40
R-3045	354270	4786406	244	240	34	34	33
R-3056	356290	4786578	240	236	42	44	29
R-3065	348634	4784374	249	245	35	36	35
R-3066	348573	4783184	255	251	38	38	38
R-3067	353441	4783344	263	259	37	37	37
R-3068	351502	4782154	259	255	41	41	41
R-3070	356171	4781764	246	242	40	40	40
R-3093	350318	4785307	254	250	34	34	34
R-3107	350398	4783286	259	255	39	39	39
R-3108	347339	4782595	252	248	36	36	36
R-3109	351266	4780062	253	249	41	43	41
R-3131	348172	4788053	245	241	35	36	35
R-3136	348919	4787009	244	240	39	41	39
R-3154	348456	4783108	254	250	39	39	39
R-3170	348623	4788524	244	240	34	35	34
R-3177	351283	4786343	249	245	41	41	41
R-3178	352533	4786608	247	243	41	41	41

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-3192	348757	4783320	254	250	37	37	37
R-3193	350452	4780766	249	245	43	43	43
R-3221	347439	4788286	247	243	32	33	32
R-3225	349470	4786528	248	244	37	38	37
R-3226	348092	4785241	246	242	42	44	42
R-3227	354234	4786065	244	240	33	34	32
R-3249	348471	4783029	254	250	39	39	39
R-3271	350221	4788727	244	240	40	40	40
R-3276	352858	4785575	249	245	34	34	34
R-3293	348759	4783093	258	254	37	37	37
R-3295	348550	4783224	254	250	39	39	39
R-3296	349204	4783248	259	255	36	36	36
R-3297	353568	4783744	252	248	34	35	34
R-3320	349355	4788331	244	240	37	38	37
R-3323	352397	4786421	249	245	39	39	39
R-3345	348531	4783228	254	250	39	39	39
R-3346	348747	4783264	257	253	37	37	37
R-3347	353669	4780902	249	245	37	37	37
R-3348	353636	4781297	252	248	38	38	38
R-3368	349559	4788604	240	236	40	40	40
R-3386	348726	4781190	249	245	43	43	43
R-3387	351442	4783188	259	255	37	38	37
R-3388	353510	4783398	264	260	37	37	37
R-3415	350305	4789164	244	240	42	42	42
R-3419	350229	4785414	259	255	34	35	34
R-3420	350967	4787536	245	241	44	44	44
R-3435	355102	4786407	241	237	34	35	30
R-3441	354519	4780851	249	245	41	41	41
R-3457	349420	4788018	244	240	37	37	37
R-3461	353413	4789386	254	250	40	40	40
R-3479	354458	4786397	244	240	33	34	32
R-3524	348707	4782899	259	255	37	37	37
R-3525	348454	4783183	254	250	40	40	40
R-3526	348807	4783184	257	253	37	37	37
R-3527	348972	4783146	254	250	36	36	36
R-3528	354048	4781717	253	249	43	43	43
R-3545	351902	4786667	247	243	42	42	42
R-3546	351931	4785653	258	254	35	35	35
R-3560	355691	4786508	241	237	37	39	29
R-3564	348412	4783157	254	250	40	40	40

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-3568	356699	4783385	239	235	38	38	31
R-3576	350152	4788583	244	240	40	40	40
R-3578	353343	4788518	248	244	41	41	41
R-3594	348692	4783265	256	252	38	38	38
R-3595	350183	4783533	256	252	36	36	36
R-3596	351712	4781591	257	253	39	40	39
R-3597	355150	4781651	249	245	46	46	46
R-3618	348584	4785317	244	240	37	39	37
R-3619	354305	4786328	244	240	34	34	33
R-3631	355030	4789497	239	235	40	40	40
R-3635	347328	4784072	247	243	37	38	37
R-3638	356438	4783421	239	235	40	40	31
R-3666	347339	4783650	249	245	40	40	40
R-3670	356548	4781549	244	240	40	40	39
R-3687	353440	4788131	245	241	38	38	38
R-3688	352294	4786245	249	245	38	38	38
R-3708	348610	4782829	258	254	37	37	37
R-3709	348444	4783225	253	249	40	40	40
R-3710	350383	4783024	256	252	42	42	42
R-3711	353960	4783341	252	248	38	38	38
R-3736	351147	4789414	247	243	34	34	34
R-3737	350722	4786538	249	245	46	46	46
R-3756	349202	4783177	258	254	36	36	36
R-3757	351697	4783177	259	255	36	36	36
R-3759	354817	4783252	249	245	38	38	36
R-3774	353437	4788616	247	243	44	44	44
R-3775	353837	4788146	244	240	38	38	38
R-3776	349462	4787255	244	240	38	39	38
R-3777	348750	4784493	249	245	35	36	35
R-3778	348912	4784867	248	244	35	36	35
R-3798	353232	4783327	259	255	36	36	36
R-3832	348414	4782959	254	250	39	39	39
R-3833	349682	4783244	259	255	36	37	36
R-3834	351648	4783189	259	255	36	37	36
R-3835	355109	4783080	249	245	39	39	36
R-3837	355807	4781774	249	245	42	42	41
R-3855	350248	4787995	244	240	41	41	41
R-3861	350164	4787881	244	240	41	41	41
R-3862	350680	4786496	249	245	45	45	45
R-3863	352271	4786327	249	245	38	38	38

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-3864	351889	4786875	246	242	45	45	45
R-3877	356432	4788129	239	235	39	40	38
R-3880	350267	4783075	257	253	40	40	40
R-3881	353524	4782493	254	250	45	45	44
R-3884	354750	4780769	249	245	42	42	42
R-3915	350882	4783867	254	250	35	35	35
R-3916	351565	4783288	259	255	36	37	36
R-3932	354477	4788080	244	240	36	36	36
R-3938	348633	4783227	257	253	38	38	38
R-3942	356721	4781619	244	240	39	39	38
R-3958	353443	4787863	244	240	38	38	38
R-3959	348774	4784472	249	245	35	36	35
R-3994	348743	4784522	249	245	35	36	35
R-3995	353523	4785674	245	241	34	34	33
R-4016	350298	4782652	254	250	44	44	44
R-4017	350293	4782880	254	250	42	42	42
R-4018	351990	4782929	259	255	36	36	36
R-4019	353745	4783220	254	250	39	39	39
R-4021	351815	4781588	254	250	38	39	38
R-4044	352203	4785753	251	247	35	35	35
R-4058	348839	4782822	254	250	37	37	37
R-4059	348379	4783013	254	250	39	39	39
R-4060	350260	4783823	254	250	35	35	35
R-4061	353095	4783476	259	255	35	35	35
R-4062	353584	4783575	255	251	36	36	35
R-4080	353831	4789492	246	242	40	40	40
R-4081	352584	4786381	249	245	39	39	39
R-4082	351934	4786502	248	244	41	41	41
R-4100	348702	4782875	259	255	37	37	37
R-4101	350193	4783979	254	250	34	35	34
R-4102	350404	4783168	259	255	40	40	40
R-4103	348692	4782353	251	247	37	37	37
R-4126	350135	4787687	244	240	43	43	43
R-4127	353469	4787176	247	243	42	42	41
R-4141	348697	4783183	259	255	38	38	38
R-4142	353479	4783316	261	257	37	37	37
R-4143	350787	4781575	254	250	44	45	44
R-4144	352028	4781157	253	249	38	40	38
R-4164	349337	4788265	244	240	37	37	37
R-4165	350052	4788400	244	240	39	39	39

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-4168	351886	4787125	244	240	45	45	45
R-4169	352552	4786539	248	244	40	40	40
R-4174	355306	4784434	244	240	34	34	30
R-4181	349650	4783250	259	255	36	36	36
R-4182	352656	4783432	262	258	34	34	34
R-4183	351395	4781607	259	255	41	42	41
R-4184	354066	4780917	250	246	39	39	39
R-4187	354367	4783447	250	246	37	37	36
R-4189	356067	4781780	248	244	41	41	40
R-4229	352186	4782755	263	259	36	36	36
R-4232	355556	4783359	244	240	41	41	34
R-4253	352795	4786431	249	245	41	41	41
R-4271	348458	4782858	254	250	38	38	38
R-4272	348386	4783234	253	249	41	41	41
R-4274	351249	4783168	259	255	39	39	39
R-4275	351926	4781133	250	246	39	41	39
R-4328	348870	4783193	255	251	37	37	37
R-4330	353550	4785812	245	241	34	34	34
R-4331	352721	4781404	249	245	36	36	36
R-4332	353560	4780727	249	245	36	36	36
R-4333	352764	4780664	249	245	35	36	35
R-4334	354928	4786809	243	239	34	35	31
R-4336	356329	4788299	239	235	41	41	40
R-4511	353390	4783909	254	250	34	34	33
R-4515	352640	4783310	259	255	34	35	34
R-4519	351757	4783333	259	255	36	36	35
R-4520	348765	4783386	254	250	37	37	37
R-4521	348310	4785152	244	240	39	41	39
R-4522	350100	4786102	255	251	37	38	37
R-4523	348698	4786281	249	245	39	41	39
R-4524	348634	4788491	244	240	34	35	34
R-4528	355148	4780474	249	245	41	41	41
R-4529	355010	4781976	249	245	44	44	44
R-4530	354585	4783252	249	245	38	38	37
R-4531	354219	4783223	252	248	39	39	39
R-4532	352030	4782552	264	260	36	37	36
R-4533	353038	4781711	249	245	37	37	37
R-4534	351923	4781314	250	246	38	40	38
R-4535	352185	4780962	251	247	38	39	38
R-4536	348671	4780754	249	245	46	46	46

Receiver	UTM17N		Z (m)	GH (m)	Overall Noise Level (dBA)		
	Easting (m)	Northing (m)			Layout 16	Layout 16a	Layout 25
R-4541	351532	4786364	249	245	41	41	41
R-4542	352306	4785781	249	245	35	35	35
R-4543	352961	4785363	249	245	33	33	33
R-4544	351830	4785455	254	250	34	34	34
R-4545	353664	4785934	244	240	34	34	34
R-4546	353375	4785816	247	243	35	35	34
R-4548	354534	4786431	244	240	33	34	32
R-4549	354979	4787255	244	240	35	36	33
R-4550	355466	4788105	239	235	38	38	37
R-4551	354116	4788074	244	240	37	37	37
R-4552	352821	4788105	247	243	37	37	37
R-4553	353421	4789352	252	248	41	41	41
R-4554	352559	4789484	252	248	34	34	34
R-4561	350376	4785522	259	255	35	35	35
R-4562	348832	4782756	254	250	37	37	37
R-4563	348470	4782978	254	250	38	39	38
R-4564	348799	4782927	256	252	37	37	37
R-4584	356630	4785800	241	237	34	36	28
R-4585	353672	4782929	256	252	43	43	43
R-4586	348763	4783185	259	255	37	37	37
R-4587	349723	4783170	259	255	37	37	37
R-4588	351086	4780056	253	249	40	42	40
R-4589	355128	4782691	249	245	40	40	39
R-4590	355566	4783274	244	240	42	42	34
R-4591	356392	4783207	240	236	43	43	32
R-4592	356391	4783188	240	236	43	43	32
R-4593	356707	4783298	240	236	38	39	31
R-4594	356315	4788216	239	235	40	40	39
R-4595	350153	4787536	244	240	45	45	45
R-4596	351868	4787214	244	240	44	44	44
R-4597	350925	4789453	244	240	35	35	35
R-4598	355823	4787962	239	235	38	39	36
R-4599	354994	4786750	242	238	34	35	31
R-4600	348298	4783242	253	249	42	42	42

APPENDIX C
Noise Contour Figures

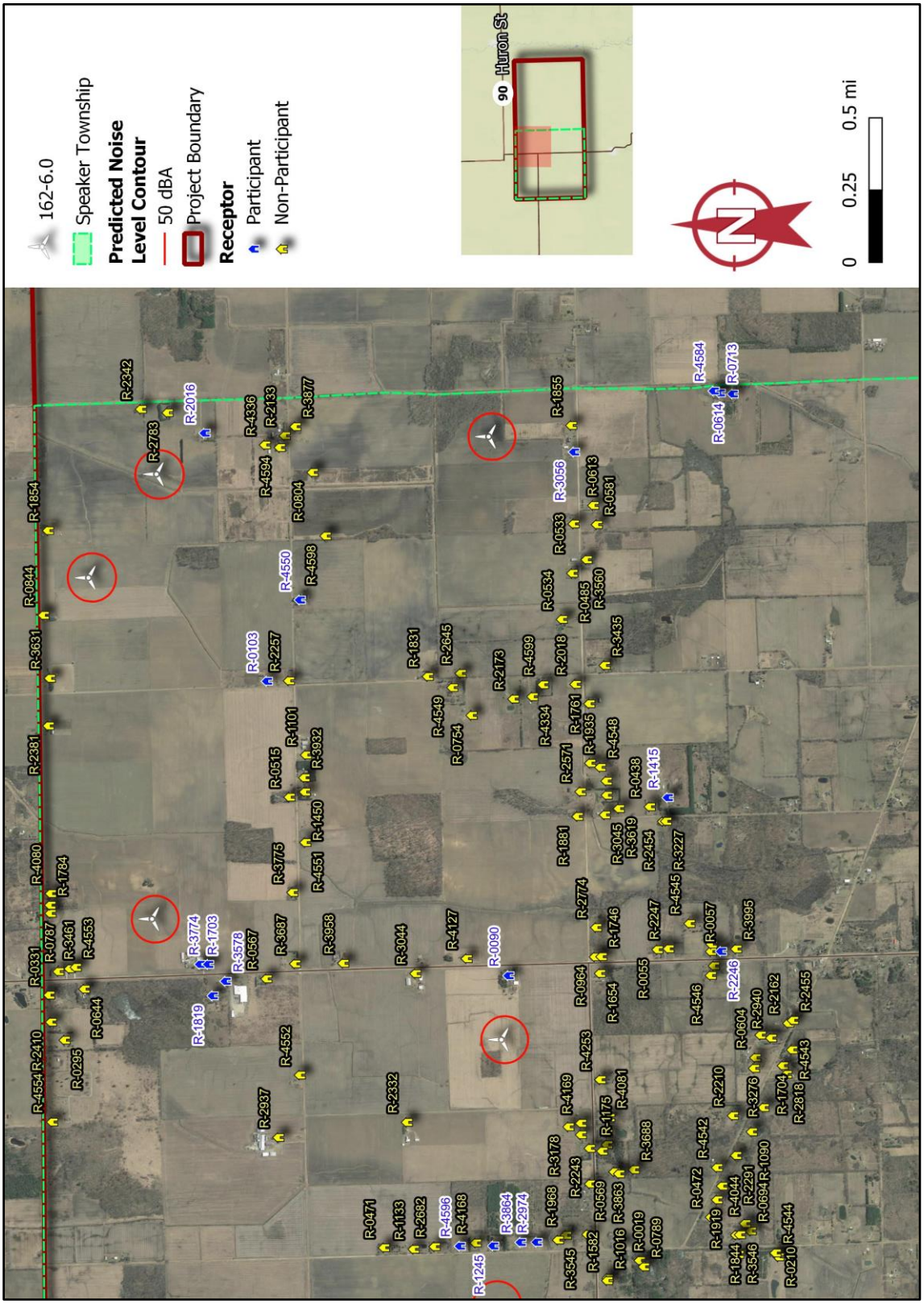

Figure C-1. Predicted Noise Level Contours – L16 Northeast Portion

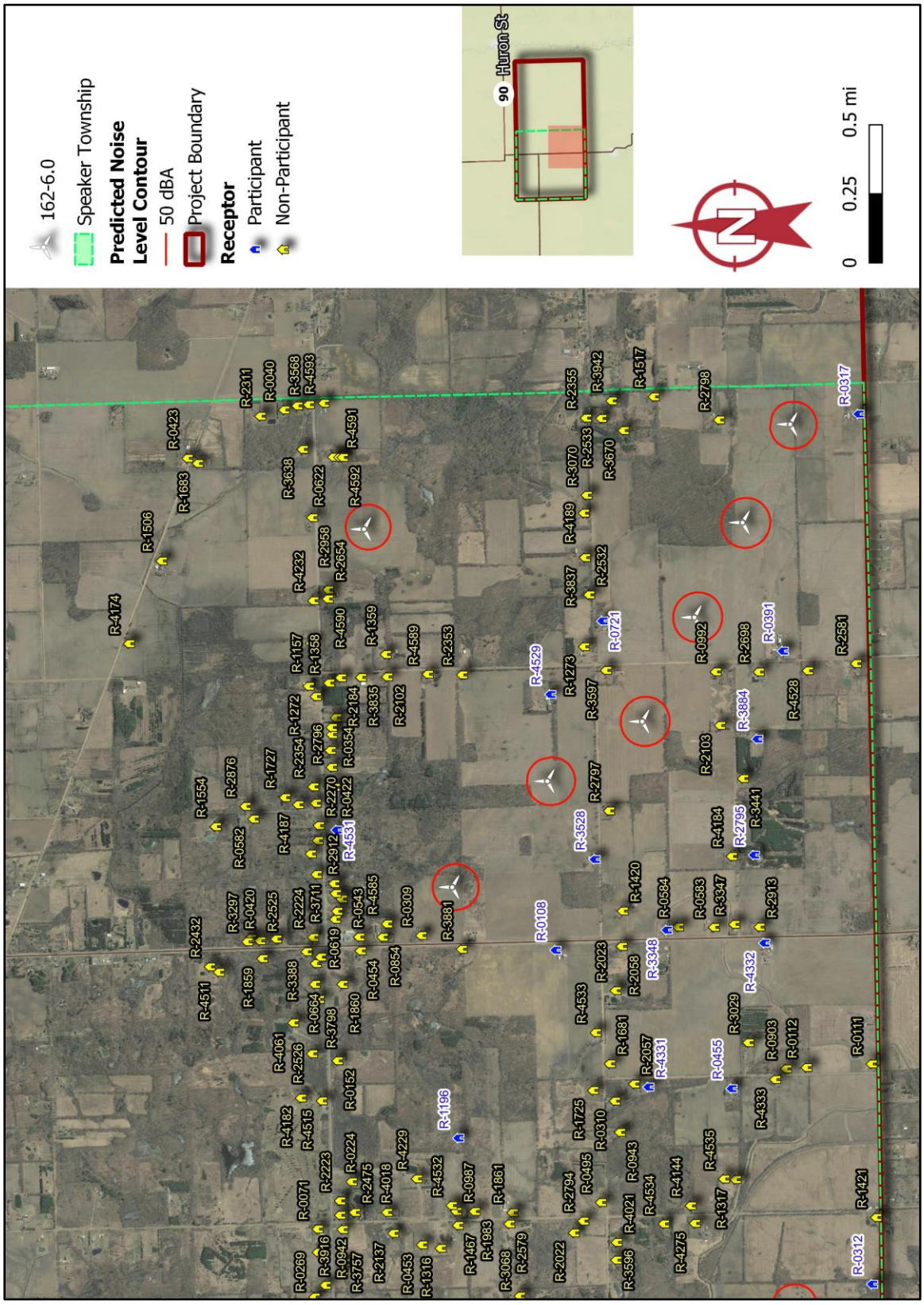

Figure C-2. Predicted Noise Level Contours – L16 Southeast Portion

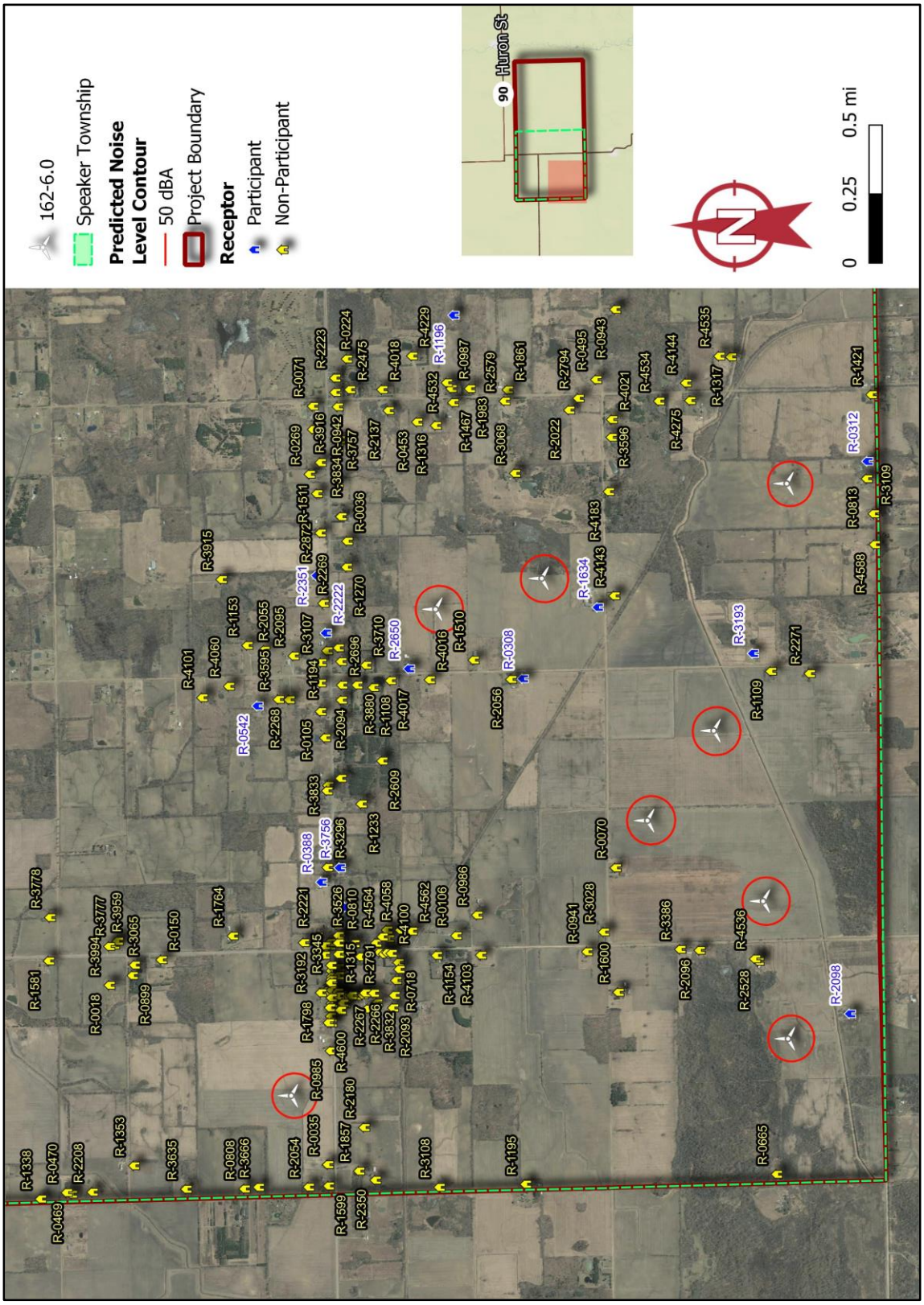

Figure C-3. Predicted Noise Level Contours – L16 Southwest Portion

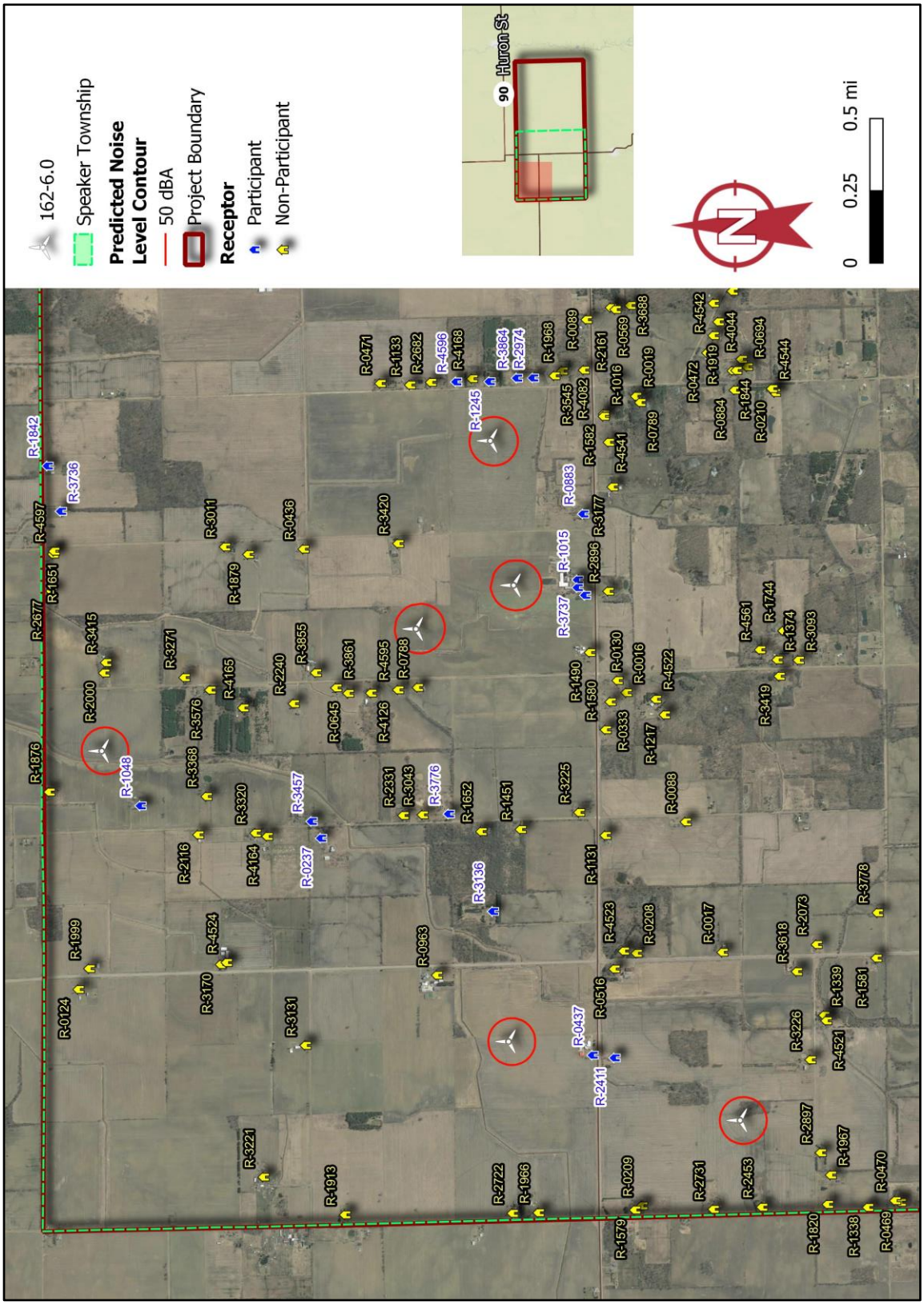

Figure C-4. Predicted Noise Level Contours – L16 Northwest Portion

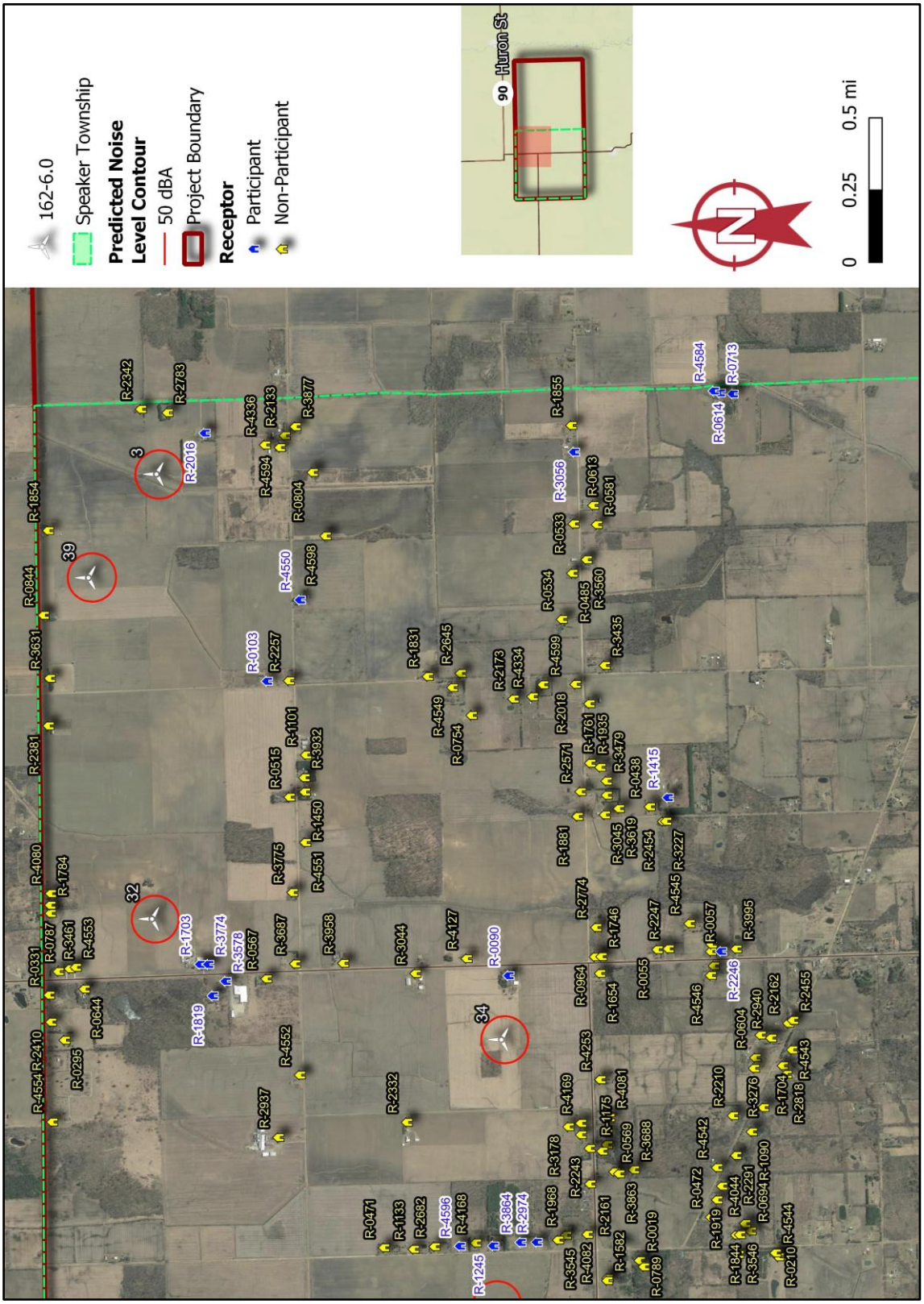

Figure C-5. Predicted Noise Level Contours – L25 Northeast Portion

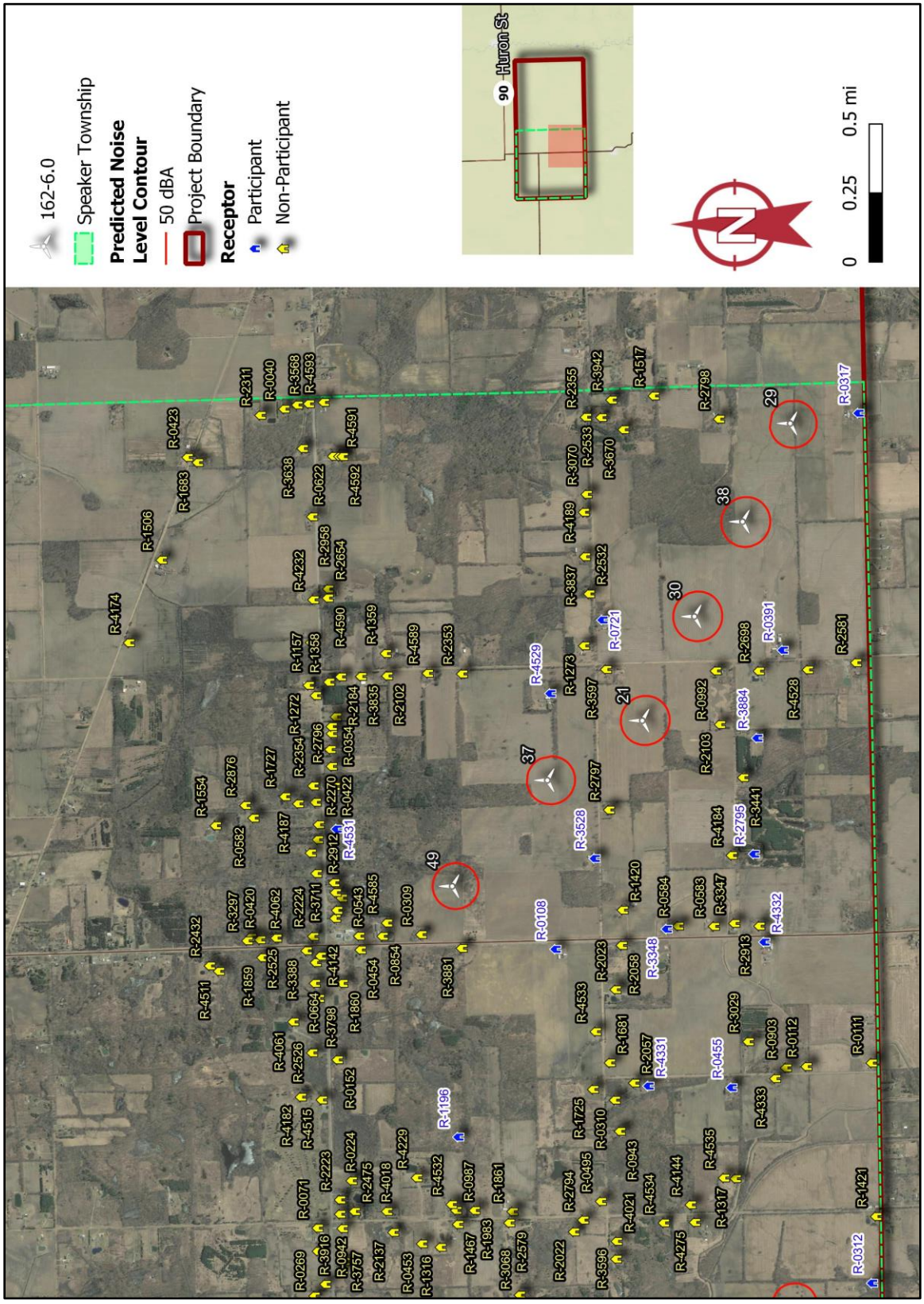

Figure C-6. Predicted Noise Level Contours – L25 Southeast Portion

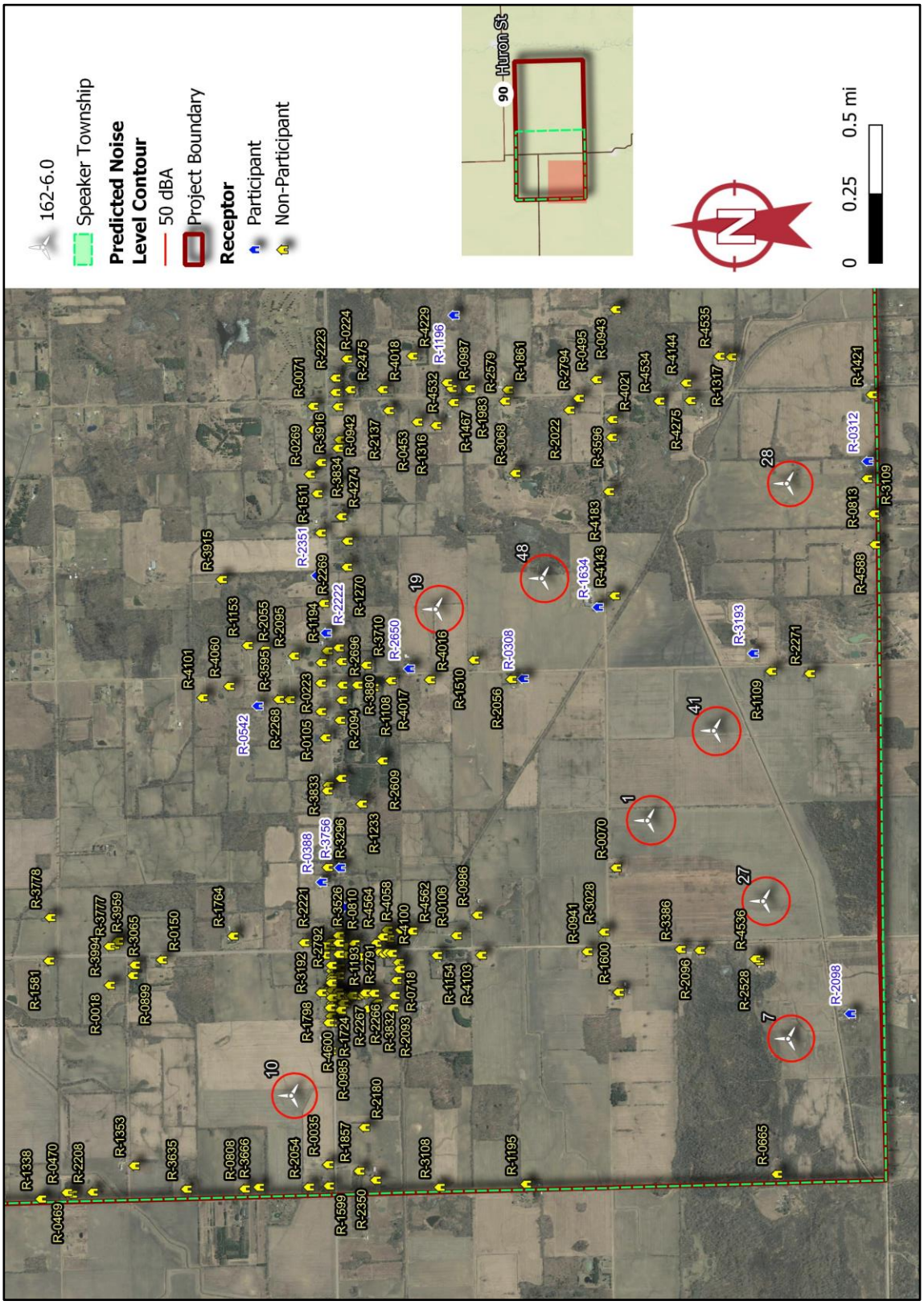

Figure C-7. Predicted Noise Level Contours – L25 Southwest Portion

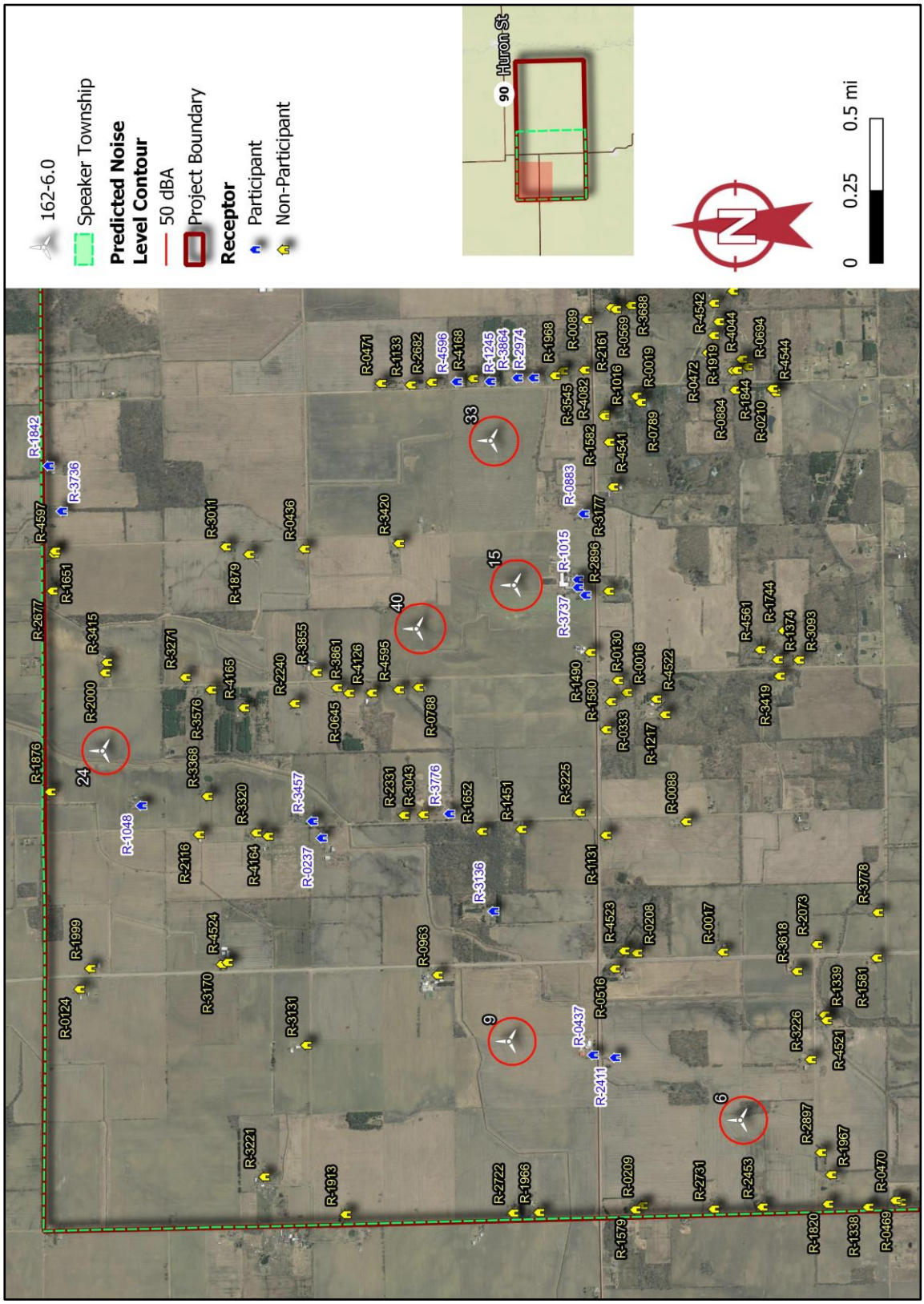

Figure C-8. Predicted Noise Level Contours – L25 Northwest Portion

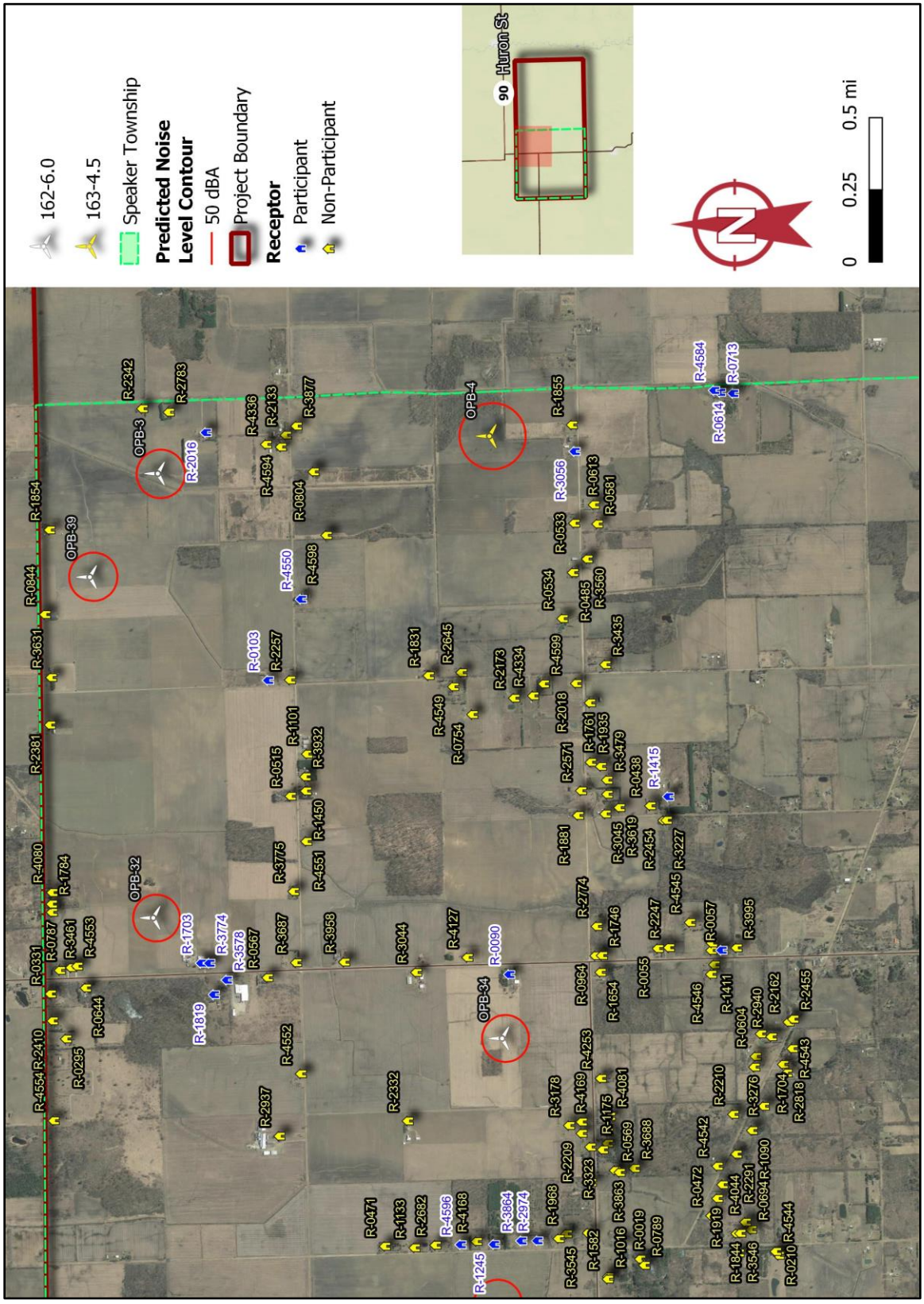

Figure C-9. Predicted Noise Level Contours – L16a Northeast Portion

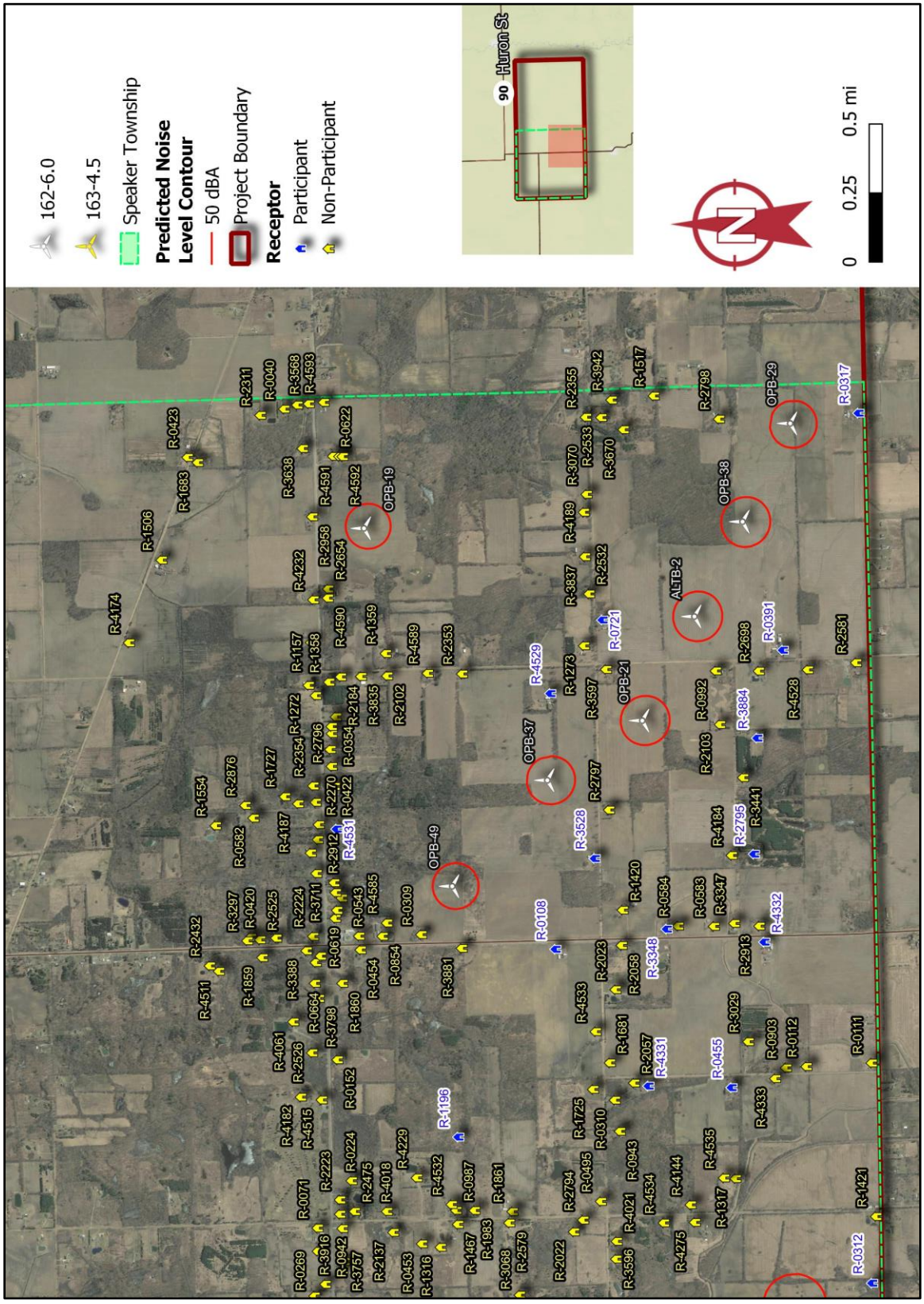

Figure C-10. Predicted Noise Level Contours – L16a Southeast Portion

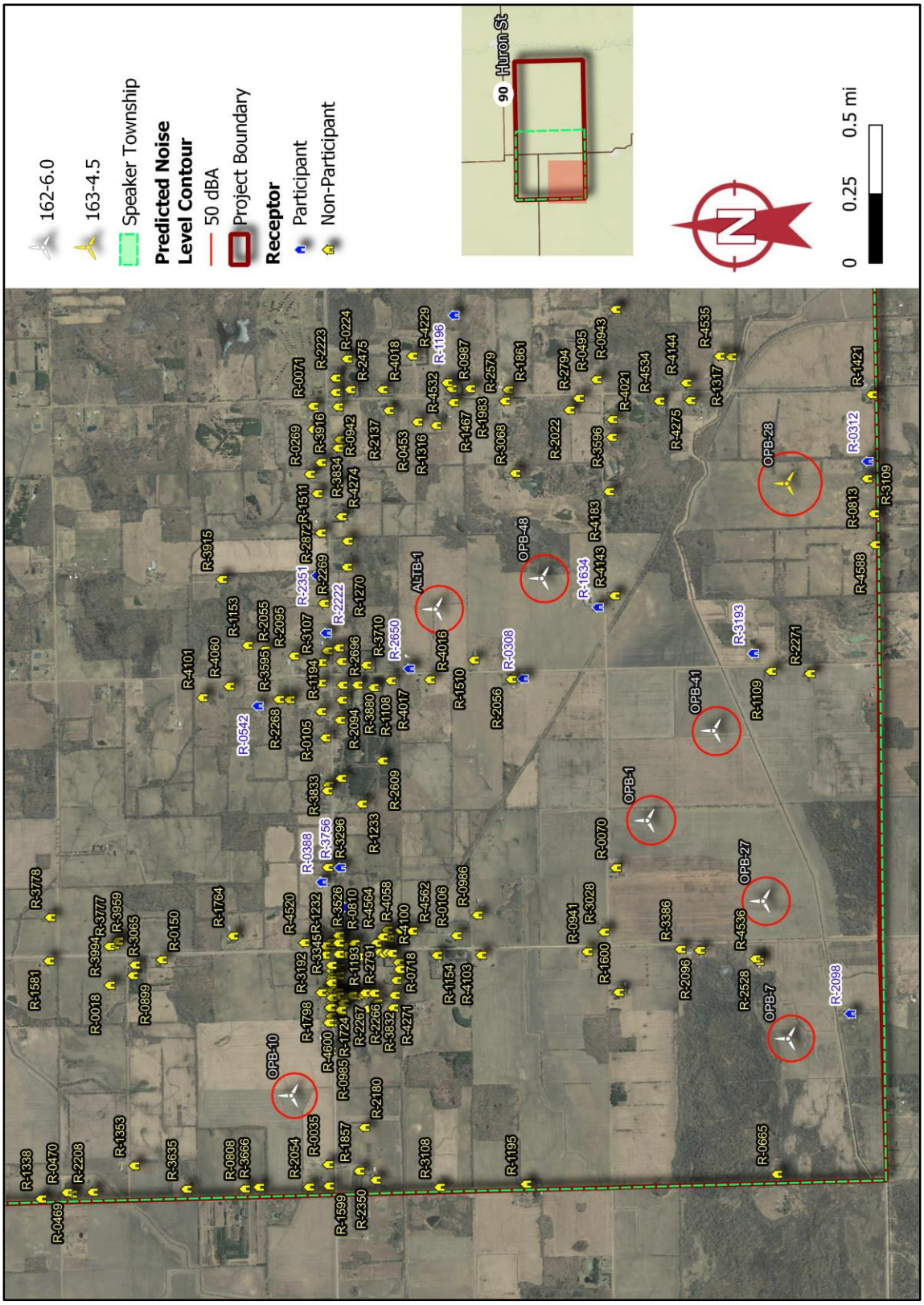

Figure C-11. Predicted Noise Level Contours – L16a Southwest Portion

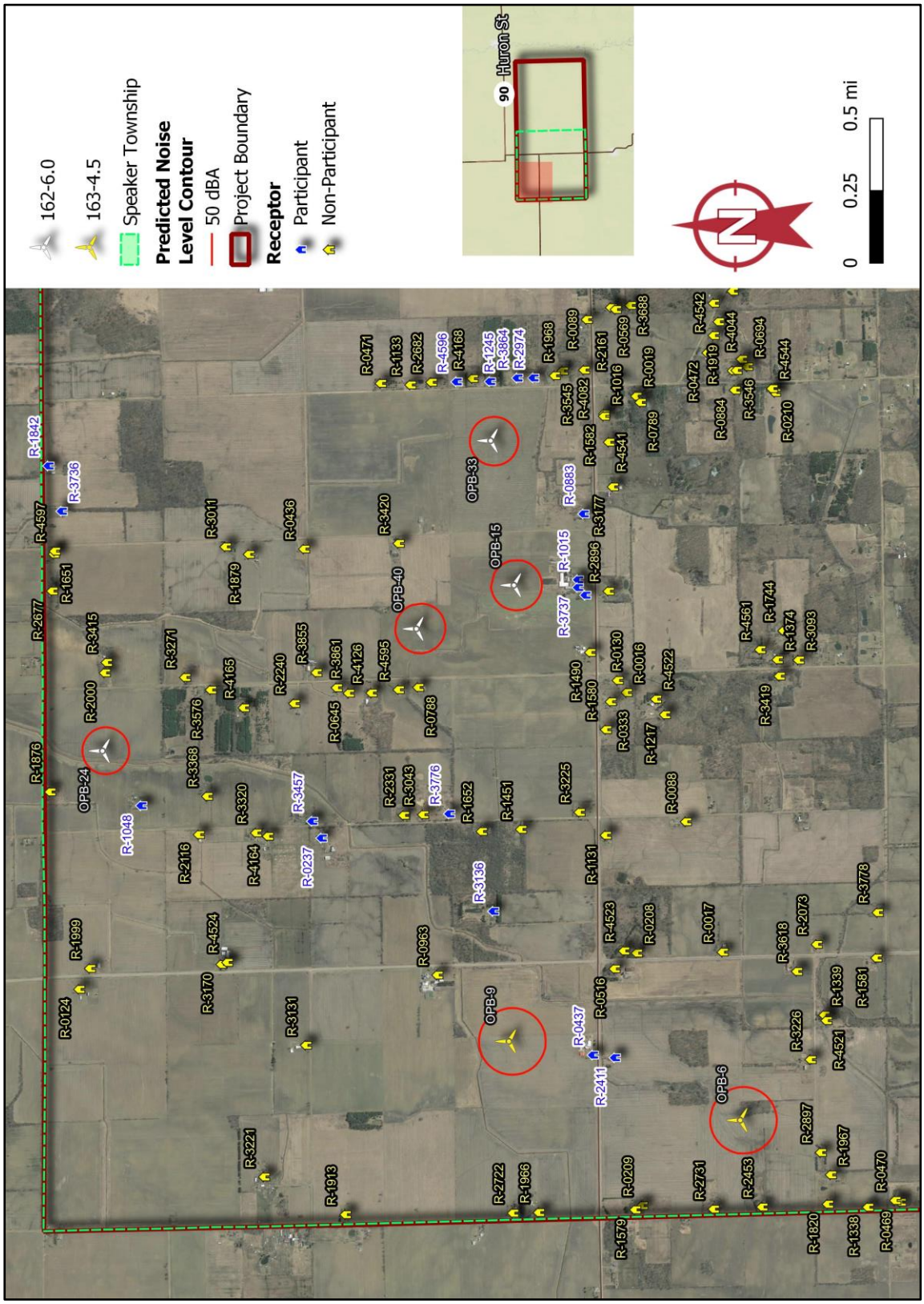

Figure C-12. Predicted Noise Level Contours – L16a Northwest Portion