EXHIBIT 13
Acoustic Screening Level Analysis Report

TETRA TECH

TO:	Geronimo Energy
FROM:	Tetra Tech, Inc.
DATE:	July 3, 2013
PROJECT:	Courtenay Wind Energy Project
RE:	Acoustic Screening Level Analysis

Geronimo Energy is proposing to construct and operate the Courtenay Wind Energy Project (the "Project") in accordance with the North Dakota Energy Conversion Facility Siting Criteria. The Project is located 15 miles north of Jamestown in Stutsman County, North Dakota. Tetra Tech has completed a screening level acoustic assessment to determine the feasibility of the Project to operate within applicable criteria. The results of the acoustic analysis demonstrate the Project has been adequately designed to operate within State of North Dakota regulatory and Stutsman County Zoning Ordinance requirements.

Significance Thresholds

Tetra Tech completed a review of regulations, which identified the following noise requirements applicable to the Project at the county, state, and federal levels.

Recently adopted at the state level, North Dakota Chapter 69-06-08-01(4) specifies noise requirements:

> *"Additional avoidance areas for wind energy conversion facilities. A wind energy conversion facility site must not include a geographic area where, due to operation of the facility, the sound levels within one hundred feet of an inhabited residence or a community building will exceed fifty dBA. The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building."*

At the county level, the Stutsman County Zoning Ordinance was amended on July 7th, 2009, to incorporate a wind turbine section. The nature, scope and purpose of the adopted resolution is:

> *"To provide a framework for siting, construction and operation of wind energy facilities in the county that will preserve the safety and well-being of the residents and facilitate equitable and orderly development."*

The zoning ordinance specific to noise is described in Section 2.10.11(10) and states:

> *"This ordinance adopts EPA guidelines on noise levels. The guidelines are contained in the EPA publication, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Operation of the wind energy facility must not cause any EPA level for activity interference or hearing loss to be exceeded either inside or within 50 feet of an occupied structure."*

The U.S. Environmental Protect Agency (EPA) issued relevant guidance which has been adopted at the county level. The EPA guideline has been accepted as the basis of assessing project acceptability in the permitting of recently proposed wind farms in the state of North Dakota and reaffirmed by the Stutsman County Zoning Ordinance. This guidance includes the EPA published "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" (1974). This report represents the only published study that includes a large database of community reaction to noise to which a proposed project can be readily compared. This publication evaluates the effects of environmental noise with respect to health and safety, and provides information for state and local governments to use in developing their own ambient noise standards. For outdoor residential areas and other locations in which "quiet" is a basis for use, the recommended EPA guideline is an L_{dn} of 55 dBA[1]. Provided that Project operations meet this criterion, EPA concludes that adjacent noise sensitive receptors (NSRs) would regard this noise level as generally acceptable. Assuming the wind turbine generator (WTG) is operating continuously and is the dominant contributor of sound at the receiver location, the L_{dn} is approximately 6.4 dBA above the measured L_{eq}. Consequently, an L_{dn} of 55 dBA corresponds to an average L_{eq} of 48.6 dBA[2].

Facility Sound Levels

Sound power level data are used in acoustic models to predict received sound pressure levels at observer locations. The proposed Project has a nameplate (gross) generating capacity of 200.5 megawatts (MW) and a layout that includes locations for up to 138 WTGs. Tetra Tech conducted the acoustic screening level analyses for the Project layout configuration dated June 24, 2013 implementing the four candidate WTG models at all 138 locations; however, the actual number of WTGs used for the final Project design will be less than 138. Table 1 provides a summary for each candidate WTG type. As shown in this table, the sound power level during full rated power production varies between 104.7 and 105.8 dBA.

Table 1. Courtenay Wind Energy Project – WTG Candidates and Layout Configurations

WTG Model	Quantity	MW per WTG	Hub Height (m)	Rotor Diameter (m)	Sound Power Level (dBA)
Goldwind GW87	138	1.5	85	87	104.7
GE 1.6-87	138	1.6	80	87	105.5
Vestas V100	138	1.8	80	100	105.0
Gamesa G97	138	2.0	78	97	105.8

*A k-factor (or uncertainty factor) of 2 dBA was applied to the overall sound power level.

Predicted L_{eq} noise levels are based on sound power levels determined in accordance with IEC61400-11, Wind Turbine Generator Systems—Part 11: "Wind turbine generator systems – Acoustic Noise Measurement Techniques", where available, for the wind ranging from 3 to 10 m/s. The methodology has been specifically developed to allow for comparison between WTG manufacturers using consistent reporting and measurement techniques. The IEC test is an accepted standard providing a uniform methodology for measuring the noise emissions of a WTG from cut-in through full rotational wind speeds. The IEC testing standard defines deviation values σ_T, σ_R and σ_P for measured apparent sound power levels as described by IEC/TS 61400-14, where σ_T is the total standard deviation, σ_R is the standard deviation for test reproducibility, and σ_P is the standard deviation for product variation. To account for this inherent deviation associated with the IEC testing methodology, a confidence interval of k = 2 dBA was applied. The combination of the modeling parameters used and the inclusion of the 2 dBA term are expected to result in a reasonable and conservative assessment of Project levels.

Sound power specifications and octave band frequency data were obtained by Geronimo from manufacturers for the WTG models under consideration. It is assumed that the WTG models for the Project will have similar sound power profiles as those used in the acoustic modeling analyses; however, it is possible that the final manufacturer warranty values may vary slightly. Table 2 provides a summary of the sound power data correlated by wind speed for each WTG model under consideration at reference rotor hub height assuming a roughness length coefficient of 0.05 meters. The roughness length describes the change in wind speed at increased elevation and may vary based on site specific terrain conditions.

[1] The EPA guideline is presented in terms of day-night level (L_{dn}), this is defined as is the energy average of the A-weighted sound levels occurring during a 24-hour period. The values for the hourly periods from 10 p.m. to 7 a.m. have 10 added to them to represent less tolerance for noise during sleeping hours. They are energy summed and converted to an average noise exposure rating.

[2] The equivalent sound level (L_{eq}) is defined as the level of a constant sound over a specific time period that has the same sound energy as the actual (unsteady) sound over the same period.

As shown in Table 2, when wind speeds are lower than those that correspond to full rated power, the received noise levels will also be less.

Table 2. WTG Broadband Sound Power Levels (dBA) Correlated with Wind Speed

	WTG Sound Power Level at Reference Wind Speed							
Wind Speed (m/s)	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s
Goldwind GW87	--	--	--	103.4	104.3	104.7	104.7	104.2
GE 1.6-87	--	--	101.2	105.1	105.5	105.5	105.5	105.5
Vestas V100	93.8	96.0	100.1	103.9	105.0	105.0	105.0	105.0
Gamesa G97	95.3	95.9	99.6	103.0	105.6	105.8	105.8	105.8

Note: "—" Indicates data unavailable for associated wind speed. Sources: Vestas 2010; WindTest 2009 (Goldwind GW87); GE Energy 2012; and Gamesa 2012.

The Project collector substation was also reviewed as part of the acoustic analysis. The National Electrical Manufacturers Association (NEMA) published NEMA Standards TR1-1993 (R2000) establish the noise level allowed for transformers. Transformer sound source levels for the future transformers were calculated for the Project substation and will house two 120 megavolt ampere (MVA) rating transformers. Transformers are expected to have a NEMA sound rating of less than 80 dBA. The substation transformers will be located in the center of the Project area approximately 650 meters (2,132 feet) northeast of the closest receptor buffered area (ID 8). Due to the separation distance between the substation and the closest NSR, received sound levels at NSRs generated by the substation are expected to be well within regulatory requirements. The transmission line is 115-kilovolt (kV) and audible corona noise is anticipated to be negligible (corona noise is generally a design concern when voltages exceed 345 kV). It is anticipated that sufficient buffer distance will render the occasional corona noise inaudible at NSRs.

Acoustic Modeling Methodology

To assess the noise emission of a wind farm prior to construction and to estimate compliance status with permitting requirements, it is necessary to have prediction models with which a noise emission source level measured at a given reference point can be certified. A generally accepted approach for modeling a WTG as an idealized point source is described in ISO 9613-2, "Attenuation of Sound during Propagation Outdoors". The standard specifies methods to enable noise levels in the community to be predicted from sources of known sound emission and provides a summary of existing knowledge on outdoor sound propagation as published by ISO (the International Organization for Standardization), a worldwide federation of national standards bodies. The calculation methodologies described are relied on by professionals in the field of acoustics.

Standard acoustic engineering methods conforming to ISO 9613-2 were used in this noise analysis using DataKustic GmbH's CadnaA, the computer-aided noise abatement program (v 4.3.143). The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of both sources and receptors, seasonal foliage effects, and meteorological conditions. Operational broadband sound pressure levels were calculated assuming that all WTGs are operating continuously and concurrently at the maximum manufacturer-rated sound level. The sound energy was then summed to determine the equivalent continuous A-weighted downwind sound pressure level at a point of reception.

Topographical information was imported into the acoustic model using the official U.S. Geological Survey (USGS) digital elevation dataset to accurately represent terrain in three dimensions. Terrain conditions, vegetation type, ground cover, and the density and height of foliage can also influence the absorption that takes place when sound waves travel over land. The ISO 9613-2 standard accounts for ground absorption rates by assigning a numerical coefficient of G=0 for acoustically hard, reflective surfaces and G=1 for absorptive surfaces and soft ground. For example, the Project area includes various water bodies, which are considered reflective and therefore the ground absorption factor of G=0.0 was applied. Sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings were ignored under all acoustic modeling scenarios. Sound attenuation by the atmosphere is not strongly dependent on temperature and humidity; however, a temperature of 10°C (50°F) and 70 percent relative humidity parameters were selected as reasonably representative of conditions favorable to sound propagation. Because it is not possible to account for all of the factors that affect noise propagation and attenuation, noise modeling conducted following the methodologies as described in the ISO 9613-2 standard has been accepted as reasonably conservative to serve as regulatory worst case. Inherent to the ISO 9613-2 and IEC61400-11 standards are downwind conditions. That is, the WTG sound power levels and modeling methods are representative of when the wind is blowing from the WTG to the receptor. In fact, the ISO 9613-2 modeling method unrealistically assumes that downwind conditions exist in all directions, between each WTG and each receptor simultaneously even though this is physically impossible, it is a typical assumption. Therefore, lower levels are expected in the upwind direction. Conversely, there may be meteorological conditions from time to time that may aid in the long range propagation of sound. These anomalous meteorological conditions may include wind gradients that bend sound downwards, which principally affect long range sound propagation. Received sound levels during anomalous meteorological conditions were also estimated using a range dependent correction factor.

Acoustic Modeling Results

Acoustic modeling was completed for operation at (1) maximum rotation under moderate downwind propagation conditions and (2) maximum rotation under anomalous meteorological conditions. Acoustic modeling was completed for all 138 WTGs operating concurrently including the 2 dBA confidence interval, although it is statistically unlikely that all of the WTGs would simultaneously operate at levels exceeding the mean. In addition, as mentioned above, the final Project layout design will consist of less than 138 WTGs. No WTGs will be placed within 1,400 feet of an occupied residence. The results of the acoustic modeling show that average noise levels at all modeled NSRs will not exceed 50 dBA.

The acoustic modeling results were compared to numerical limits of the controlling EPA 48.6 dBA guideline and the applicable State criterion of 50 dBA for the purposes of assessing future compliance. In consideration of North Dakota noise requirement, the analysis used a 100 foot buffer around each residential structure. Table 3 summarizes the number of NSRs within selected sound pressure level ranges (in dBA) under each of the identified operational conditions. The tabulated results are independent of the existing acoustic environment, (i.e. are representative of expected Project-generated sound levels only). Note that two of the NSRs (IDs 5 and 6) are not presently occupied and based on statements provided by property owners and are expected to remain so for the foreseeable future. These dwellings are identified in the figures and tabulated results in Attachment 1.

Table A-1 (Attachment 1) presents the received sound levels at each of the 32 individual NSRs for each WTG type by receptor ID, landowner status, and UTM coordinates. Table 3 shows that there are no modeled exceedances of the EPA or State criteria during full rated power production. The assessment procedure included the prediction and plotting of the L_{eq} 50 dBA and EPA 48.6 dBA noise level contours from the Project under reference conditions. NSRs outside these contours are considered to be within acceptable wind farm noise levels. Sound contour maps displaying the corresponding maximum rotation (i.e., at full rated power) Project operational sound levels in color-coded isopleths are presented on Figures 1 to 4 (Attachment 1). Isopleths are projected onto scaled aerial photographs at a height of 1.52 meters (5 feet) above grade i.e., at the approximate height of a person's ears while standing.

In conclusion, the acoustic modeling analysis demonstrates the Project has been adequately designed inclusive of a number of conservative assumptions to generate sound levels below the State of North Dakota noise requirements and Stutsman County Zoning Ordinance limits.

Table 3. Number of NSRs within Sound Level Ranges by WTG Type Analyzed

Sound Level Range (dBA)	Goldwind G87		GE 1.6-87		Vestas V100-1.8		Gamesa G97	
	Maximum Rotational	Anomalous Meteorological	Maximum Rotational	Anomalous Meteorological	Maximum Rotational	Anomalous Meteorological	Maximum Rotational	Anomalous Meteorological
Less than 35	1	1	1	1	1	1	1	1
35 - 40	11	0	8	0	13	11	11	1
40 - 45	9	17	9	17	8	10	8	16
45-50	11	14	14	14	10	10	12	14
50-55+	0	0	0	0	0	0	0	0
>50 (North Dakota Limit)	0	0	0	0	0	0	0	0
> 48.6 (EPA)	0	0	0	0	0	0	0	0

ATTACHMENT 1

Tabulated Results and Sound Contour Figures

Table A-1. Received L_{eq} Sound Levels during Full Rated Power Production

Receptor ID	Receptor Status	UTM Coordinates		Received Sound Level (dBA)							
		Easting (m)	Northing (m)	Goldwind G87		GE 1.6-87		Vestas V100-1.8		Gamesa 2.0-97	
				Maximum Rotational	Anomalous Meteorological	Maximum Rotational	Anomalous Meteorological	Maximum Rotational	Anomalous Meteorological	Maximum Rotational	Anomalous Meteorological
1	Home	525448	5230641	39.6	41.5	40.0	41.9	37.3	39.1	39.1	40.9
2	Home	527529	5229999	44.6	45.8	45.1	46.3	43.0	44.1	44.8	45.9
3	Home Signed	528444	5233508	41.0	42.2	41.5	42.7	39.4	40.5	41.1	42.3
4	Home Signed	529306	5230370	46.8	47.5	47.3	48.1	45.5	46.2	47.2	47.9
5	Home Signed (Unoccupied)	531027	5228025	47.0	47.8	47.5	48.4	45.7	46.4	47.3	48.1
6	Home Signed (Unoccupied)	531067	5228868	44.9	46.2	45.4	46.7	43.2	44.4	45.0	46.2
7	Home	527776	5226085	47.0	47.9	47.5	48.4	45.7	46.5	47.3	48.1
8	Home Signed	530166	5225996	47.0	47.9	47.4	48.4	45.5	46.3	47.2	48.2
9	Home Signed	531953	5226370	46.7	47.6	47.2	48.2	45.4	46.2	47.0	47.9
10	Home Signed	533042	5225222	46.3	47.1	46.9	47.7	45.0	45.7	46.7	47.4
11	Home	529091	5224607	46.4	47.3	46.9	47.9	45.0	45.8	46.7	47.6
12	Home	526858	5220718	38.7	40.5	39.1	41.0	36.5	38.2	38.2	40.0
13	Home	527492	5220490	42.3	43.2	42.8	43.8	40.8	41.7	42.5	43.4
14	Home	530363	5220505	42.5	43.9	42.9	44.4	40.6	42.0	42.4	43.8
15	Home Signed	531101	5220486	46.3	46.8	46.9	47.4	45.2	45.7	46.8	47.3
16	Home Signed	533213	5218579	43.2	43.8	43.7	44.3	42.0	42.5	43.6	44.2
17	Home	527623	5221105	43.4	44.2	44.1	44.9	42.4	42.9	43.9	44.4
18	Home	524390	5220457	26.3	28.8	26.2	28.7	22.5	25.0	24.5	27.0
19	Home	535682	5222347	38.7	40.6	39.1	41.1	36.3	38.2	38.1	40.0
20	Home	535471	5222358	39.7	41.4	40.1	41.9	37.5	39.2	39.3	41.0

Table A-1. Received L_{eq} Sound Levels during Full Rated Power Production

Receptor ID	Receptor Status	UTM Coordinates		Received Sound Level (dBA)							
		Easting (m)	Northing (m)	Goldwind G87		GE 1.6-87		Vestas V100-1.8		Gamesa 2.0-97	
				Maximum Rotational	Anomalous Meteorological	Maximum Rotational	Anomalous Meteorological	Maximum Rotational	Anomalous Meteorological	Maximum Rotational	Anomalous Meteorological
21	Home	526104	5225559	41.3	43.1	41.7	43.6	39.0	40.8	40.8	42.7
22	Home Signed	533083	5225741	46.4	47.2	46.9	47.8	45.2	45.9	46.8	47.5
23	Home	533229	5229296	38.9	41.0	39.3	41.5	36.3	38.4	38.0	40.2
24	Home	532694	5229684	39.4	41.5	39.8	42.0	36.7	38.9	38.5	40.6
25	Home	532635	5229722	39.4	41.5	39.8	42.0	36.8	38.9	38.6	40.7
26	Home	532536	5229776	39.6	41.7	40.0	42.1	37.0	39.1	38.8	40.9
27	Home	532717	5229706	38.6	40.7	38.5	40.6	35.4	37.6	37.7	39.8
28	Home	532440	5230119	39.0	41.1	39.3	41.5	36.4	38.5	38.2	40.3
29	Home	532584	5229841	39.2	41.3	39.6	41.8	36.5	38.7	38.3	40.4
30	Home Signed	534095	5225352	44.6	45.4	45.1	46.0	43.2	44.0	44.8	45.7
31	Home	528014	5231449	45.2	46.1	45.8	46.6	44.0	44.7	45.6	46.4
32	Home Signed	532932	5220358	46.1	46.6	46.7	47.3	45.1	45.6	46.6	47.2

Figure 1. Operational L_{eq} Sound Levels at Full Rated Power Production – Goldwind GW87

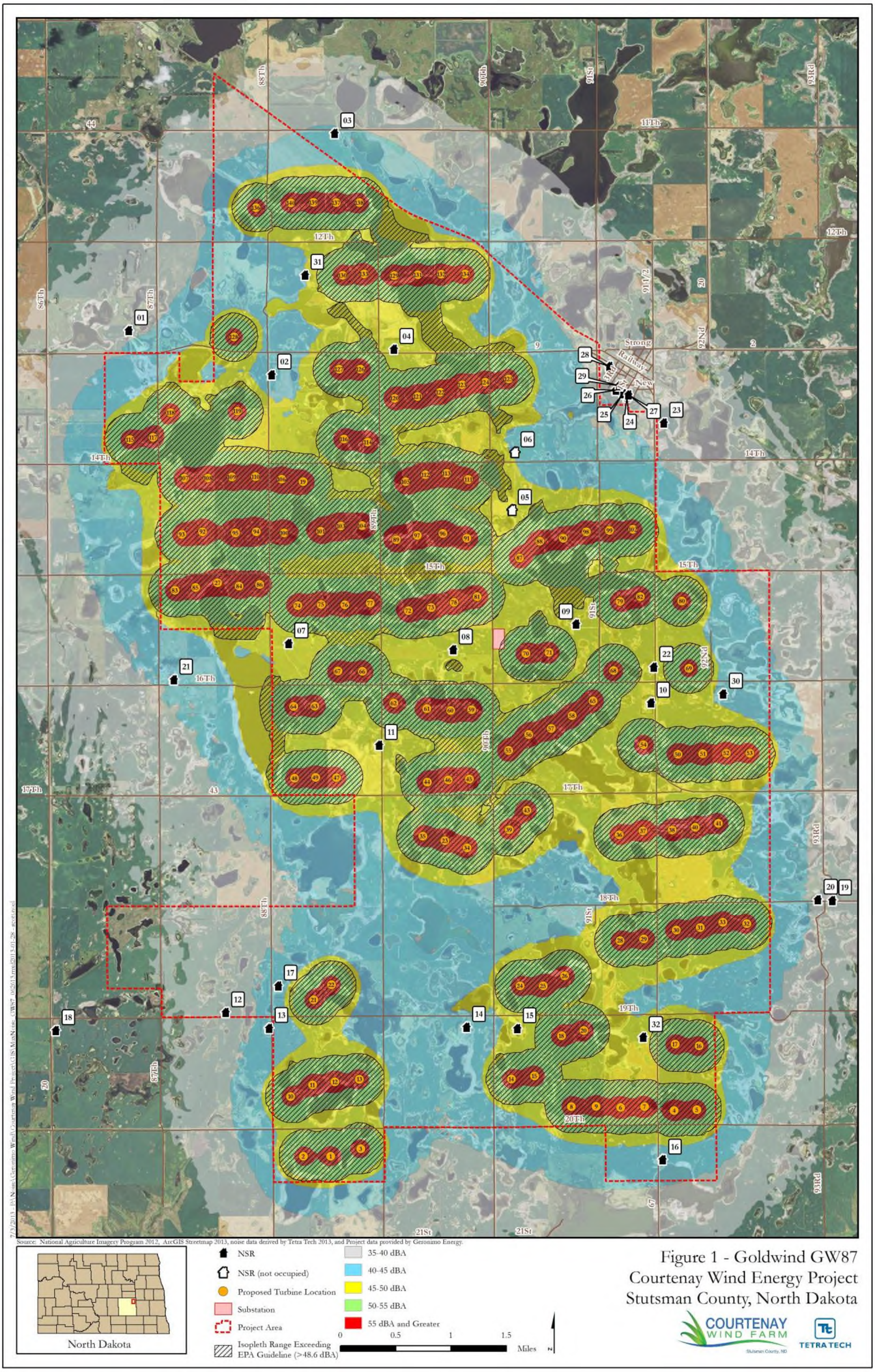

Figure 2. Operational L_{eq} Sound Levels at Full Rated Power Production – GE 1.6-87

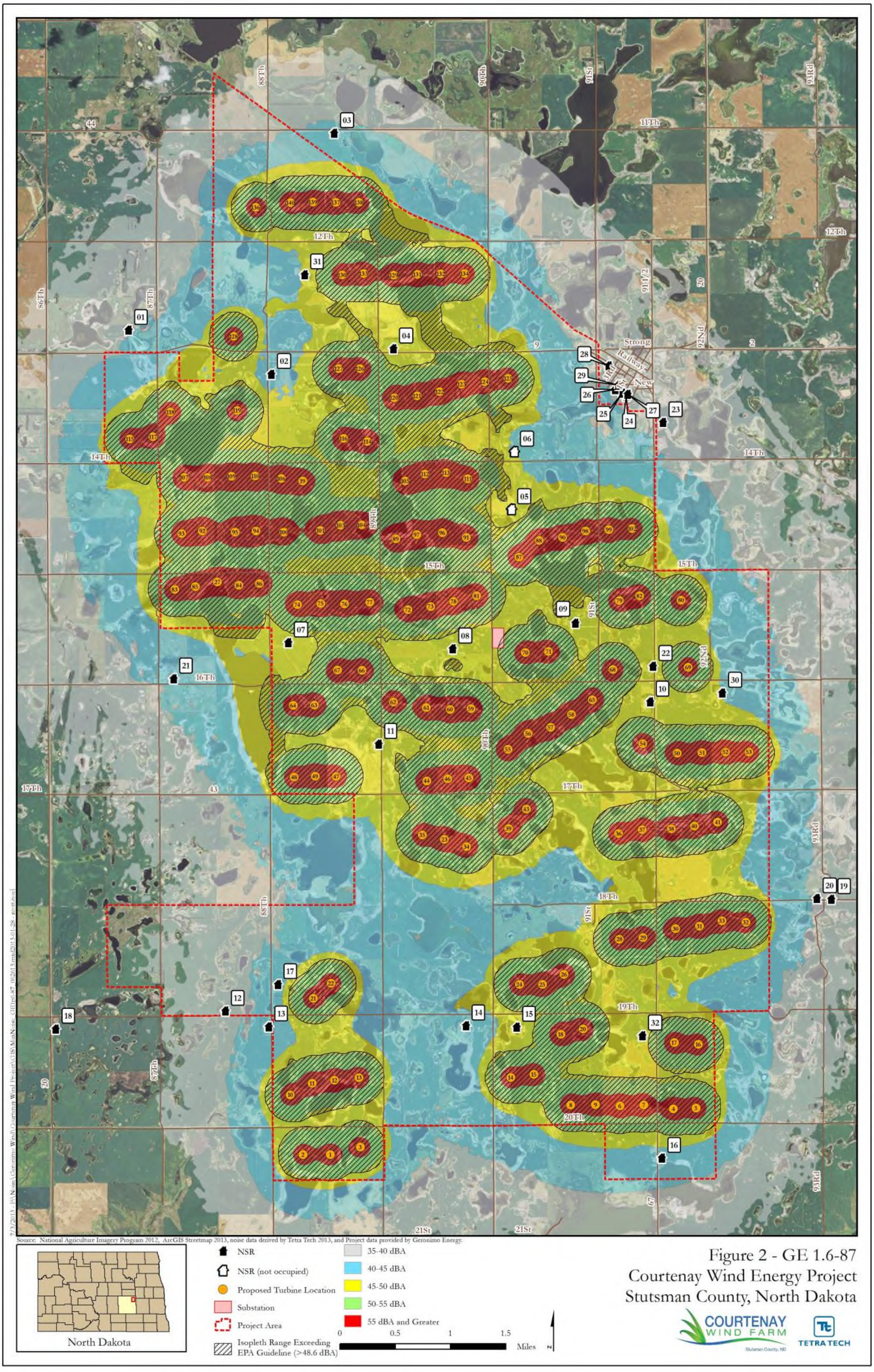

Figure 3. Operational L_{eq} Sound Levels at Full Rated Power Production – Vestas V100-1.8

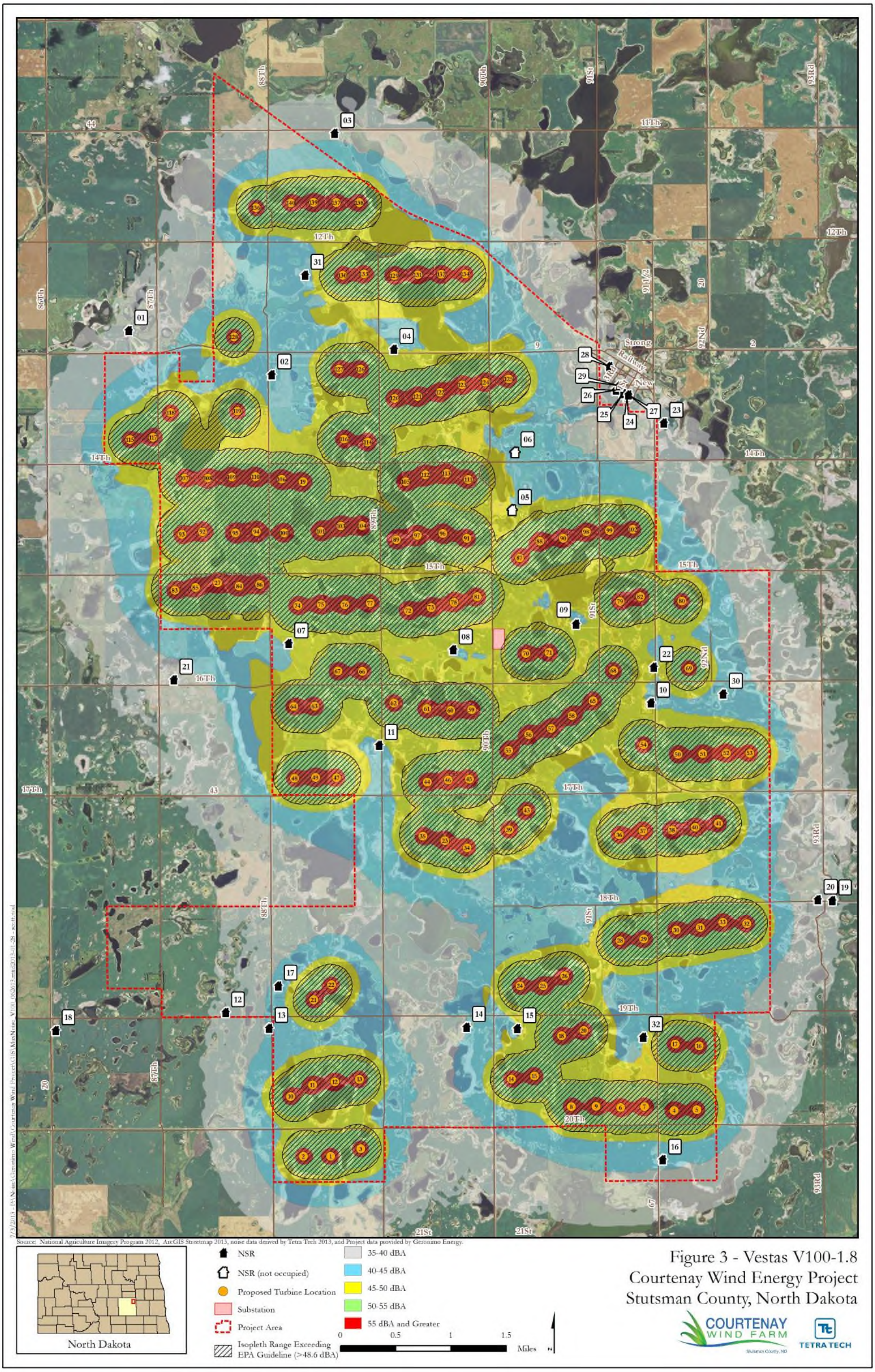

Figure 4. Operational L_{eq} Sound Levels at Full Rated Power Production – Gamesa 2.0-G97