



PROPOSED ST. LAWRENCE WIND ENERGY PROJECT
SOUND LEVEL REPORT
JANUARY 2007

INTRODUCTION

Tetra Tech EC, Inc. (TtEC) performed computer modeling in order to calculate sound levels that would be generated by operation of the proposed St. Lawrence Wind Energy project (Project) located in the Town of Cape Vincent, Jefferson County, New York. The commercially available CadnaA model, developed by Datakustik GmbH, was used for this analysis. The software takes into account spreading losses, ground and atmospheric effects, shielding from terrain, barriers and buildings, and reflections from surfaces. The software is standards-based and the International Organization for Standardization (ISO) 9613-2 standard was used for air absorption and other noise propagation calculations (ISO, 1989).

SLW proposes to install and operate approximately ninety-six (96) Gamesa G87 2.0 megawatt (MW) wind turbines, or equivalent, at the Project. For the purposes of this model, all of the turbines were assumed to be operating at their maximum sound level, which occurs at wind speeds of 8 meters/second (m/s) and above, as measured at 10 meters above the ground. The wind turbine hub is located 83.8 meters above the ground.

The model results are presented in two ways. First, TtEC depicted noise contours that show the distribution of noise levels from 45 decibels (dBA) up to 55 dBA over the entire Project area. Secondly, TtEC depicted the calculated sound level at specific receptor points, which are the nearest residences. Both the noise contours and the receptors are overlaid on the same topographic map of the area. Predicted levels at the specific receptor points are presented in tabular format.

APPLICABLE NOISE STANDARDS AND ORDINANCES

The New York State Department of Environmental Conservation (NYSDEC) document entitled *Assessing and Mitigating Noise Impacts* (NYSDEC; February 2, 2001) provides the following guidance for assessing noise impacts:

Table 1
Effect of Increases in Noise Levels on Receptors

Increase in Existing Ambient Sound Levels (dBA)	Expected Effect on Receptors
0 – 3	No appreciable effect.
3 – 6	Potential for adverse noise impact only in cases where the most sensitive receptors are present.
> 6	Potential noise impact. Requires a closer analysis of impact potential depending on existing sound pressure levels (SPLs) and the character of surrounding land use and receptors.
10	Perceived as a doubling of the sound level.

Based on the above guidance, TtEC used an increase in the ambient level of 6 dBA as an indication of potential noise impacts. Sound levels less than a 6 dBA increase were an indication of no potential noise impacts. In addition, the NYSDEC policy indicates that the typical ambient level in rural environments is 45 dBA, where ambient noise is defined as the all encompassing noise from sources near and far and is determined by the Leq measure. Leq is the equivalent sound level that combines the time-varying sound levels over the measurement period into a single number. It can be thought of as the average noise level, but it is computed using logarithmic equations rather than the usual arithmetic method used to determine an average of a group of values. The Leq is always a little higher than the arithmetic average because of the greater levels of energy contained in the higher sound levels.

Table 2 provides examples of sound levels of common sources of noise.

Table 2
Typical A-Weighted* Sound Levels

Sound Level (dBA)	Source/Location	Subjective Impression
180	Rocket Engine at 3 feet	Severe Pain
160	Sonic Boom	
140	Threshold of Pain	Slight Pain
130	Hydraulic Press at 3 feet	
120	Pneumatic Riveter at 3 feet	Extremely Loud
110	Unmuffled Motorcycle at 3 feet	
100	Chain Saw at 3 feet	Very Loud
90	Train at 100 feet	
80	Truck Traffic at 50 feet	Moderately Loud
70	Auto Traffic at 50 feet	
60	Normal Conversation	Typical
50	Typical Office	
40	Bedroom at Night	Quiet
30	Soft Whisper	
20	Sound Test Booth	Very Quiet
10	Breathing	
0	Threshold of Hearing	No Sound

Source: Compiled by T. Adams (TtEC) from various sources.

*A-weighted sound levels are levels that have been adjusted to match the frequency response of the human auditory system.

NOISE MODEL INPUT DATA

The specific wind turbine for the Project has not been determined at this time. As a result, the sound power level of the wind turbine with the current highest sound rating of a typical 2.0 MW wind turbine was used in this model. This turbine is the Gamesa G87 turbine with an A-weighted sound power rating of 105.3 dBA. The selected turbine will likely have a slightly lower sound rating. The data are provided as octave band sound power levels (PWL) in decibels (referenced to 10-12 watts). Sound power is a measure of the total acoustic power generated by a sound source and is independent of distance from the source. The un-weighted octave band sound power levels are presented in Table 3.

Atmospheric absorption of sound from the turbines was calculated using a temperature of 10 degrees Celsius (50 degrees Fahrenheit) and a relative humidity level of 70 percent; typical for this area of New York. The ground absorption coefficient was selected as 0.5; where 0.0 is indicative of a highly reflective ground surface such as pavement or calm water, and 1.0 is highly absorptive ground surface such as agricultural land and forest. Since the Project consists of primarily agriculture with some forested areas, 1.0 would be the most realistic coefficient, but use of 0.5 would produce a more conservative modeled result for the purposes of the Draft Environmental Impact Statement (DEIS).

Table 3
Sound Power Levels Of Gamesa G87 Wind Turbine

	Octave Band Center Frequency (Hertz)										
	31.5	63	125	250	500	1k	2k	4k	8k	Total (dBA)	Total (dB)
PWL (dB re: 10 ⁻¹² watts)	118.8	111.8	107.7	105.2	103.0	100.8	95.8	88.6	78.3	105.3	120.2

RESULTS

The modeled Project noise contour map is presented as Figure 1. The predicted level at 150 meters (500 feet) from each turbine is about 50 dBA and the area for potential impacts is small around the turbines ranging from about 250 meters (800 feet) for a single turbine where the ambient level is 40 dBA and up to 400 meters (1,300 feet) for multiple turbines in close proximity to each other at the same low ambient level. Higher ambient levels would cause the size of the potential impact area to shrink.

Potential noise impacts were compared to an ambient sound level of 45 dBA. Measurements recently obtained at other proposed wind farm sites in New York confirm that the 45 dBA level presented in the NYSDEC noise policy is fairly accurate.

Predicted sound levels at the 246 nearest residences and one (1) school identified in the area (Figure 1) vary from 22.9 to 48.3 dBA (Table 4). Houses not indicated by a symbol in Figure 1 are outside the Project boundaries and further from the turbines where the predicted levels would be below 22.9 dBA. The last column of the table shows the calculated increase in the assumed existing ambient level of 45 dBA. These increases range from zero to 5.0 dBA. These predicted increases in sound levels over the existing ambient are all below the 6 dBA increase identified by the NYSDEC as having the potential to produce a noise impact.

The highest predicted level of 48.3 dBA is only 3.3 dBA above the existing ambient of 45 dBA. This level is below the 5 dBA increase allowed per the draft Town of Cape Vincent amended zoning regulations. This indicates that the project will also be in compliance with the draft amended zoning regulations if they are promulgated.

As a result, noise levels from the proposed St. Lawrence Wind Energy Project are in compliance with State guidelines, local draft zoning ordinance criteria for noise associated with commercial wind turbine operation, and will not produce noise impacts above New York policy. The predicted turbine sound level at the 1,000 Islands High School at the northeastern tip of the Project is only 41.1 dBA, which is below the existing ambient level and does not appear to pose noise concerns.

Table 4

Predicted Sound Levels at Nearest Receptors to Turbines

Predicted Sound Level Range (dBA)	Number of Residences within Range	Predicted Increase in 45 dBA Ambient (dBA)
22.9 – 24.9	7	0
25 – 29.9	3	0 – 0.1
30 – 34.9	38	0.1 – 0.4
35 – 39.9	67	0.4 – 1.2
40 – 44.9	84	1.2 – 3.0
45 – 48.3	48	3.0 – 5.0

Table 5 presents the predicted sound level results in 100-foot increments from the base of a turbine extending from 100 feet to 2,000 feet. These results were obtained using the same conservative assumptions described above for the noise modeling. This table should be used as a general guide only since the values do not include the additive effect of multiple turbines located in close proximity to each other.

Table 5

**Predicted Sound Levels in
100-Foot Increments From a Single Isolated Turbine**

Distance from Base of Turbine (feet)	Predicted Sound Level (dBA)
100	56
200	54.4
300	52.5
400	50.8
500	49.2
600	47.8
700	46.6
800	45.4
900	44.4
1,000	43.4
1,100	42.5
1,200	41.7
1,300	40.9
1,400	40.2
1,500	39.5
1,600	38.9
1,700	38.2
1,800	37.7
1,900	37.1
2,000	36.6

CONCLUSION

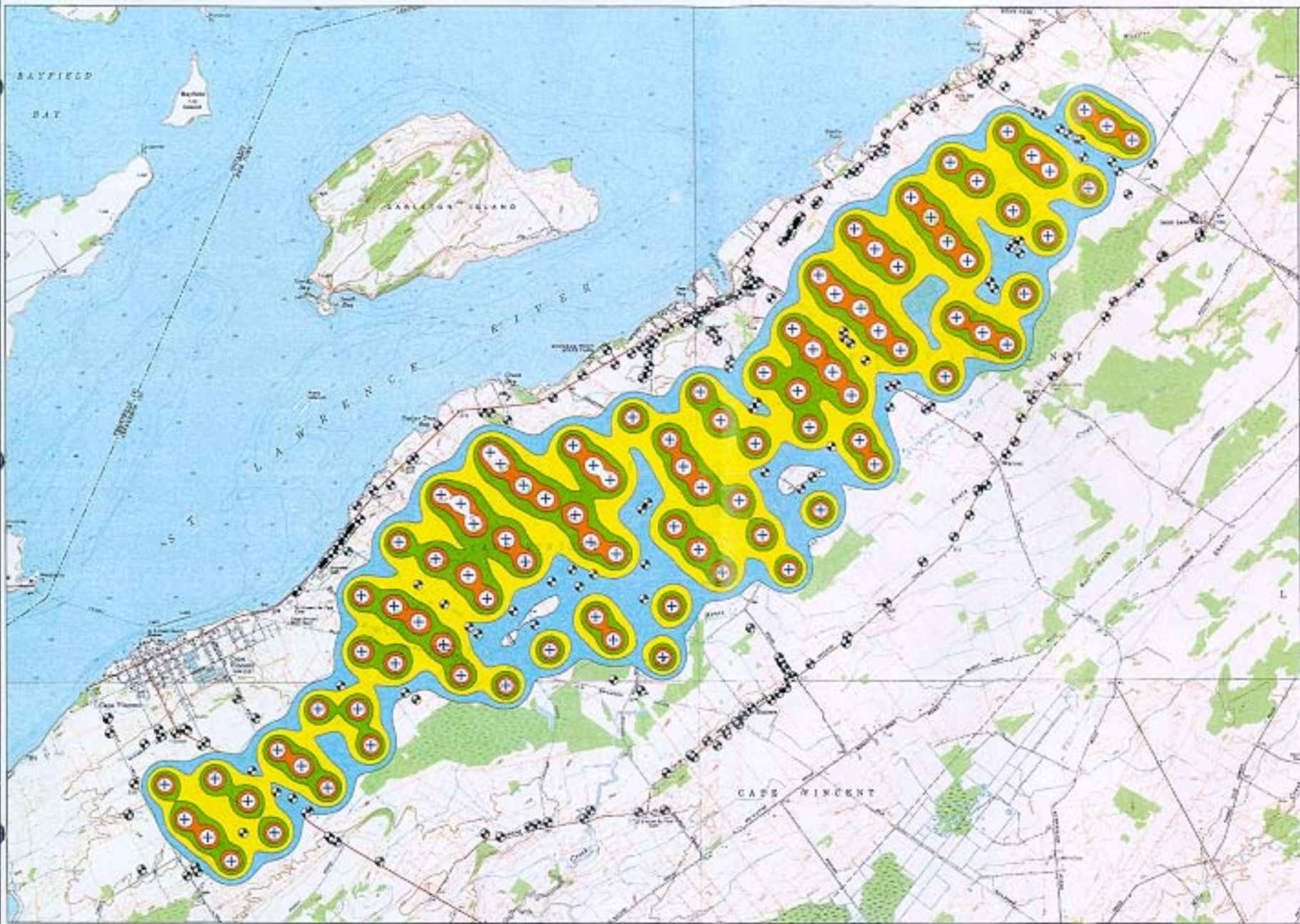
Predicted sound levels from the Project turbines operating at maximum sound level producing conditions are quite low at the surrounding residences (i.e. < 48.3 dBA) and would not add significantly to existing ambient sound levels, nor create a significant noise impact. In general, the Project turbines would be inaudible at most residences outside the noise contours shown in Figure 1. Predicted levels are in compliance with the NYSDEC noise policy guidelines and the local Town of Cape Vincent draft ordinance regarding potential noise impacts associated with commercial wind turbine operation.

REFERENCES

DataKustik GmbH, 2005. *Computer Aided Noise Abatement Model CadnaA*, Version 3.5. Munich, Germany.

ISO, 1989. International Organization for Standardization. *Standard ISO 9613-2 Acoustics – Attenuation of Sound During Propagation Outdoors*. Geneva, Switzerland.

New York State Department of Environmental Conservation (NYSDEC). February 2, 2001. *Assessing and Mitigating Noise Impacts*, Program Policy. Albany, New York.



St. Lawrence
Windpower, LLC

Figure 1
Proposed St. Lawrence
Wind Energy Project
Sound Contour Map



- + Wind Turbine Locations
 - 🏠 Residence
- Sound Level (dBA)
- + > 45.0
 - + > 47.0
 - + > 49.0
 - + > 51.0

TETRA TECH, LLC

N

0 0.25 0.5
Miles

Source:
USGS 7.5 Minute
Topographic Map
Cape Vincent N and S
St. Lawrence and
Chaumont, 1988

Project Name and Location:
S060400010, Figure 01/01
Issue: 01/01/07