Appendix D

Preliminary Noise Compliance Assessment Report

THREE WATERS WIND FARM, LLC

THREE WATERS WIND PROJECT

Preliminary Noise Compliance Assessment | October 3, 2019

PREPARED FOR:
THREE WATERS WIND FARM, LLC

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6.0 SOUND PROPAGATION MODELING

6.1 MODELING PROCEDURE

Modeling for the Project was in accordance with the standard ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The ISO standard states,

> This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level … under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation … or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.

The model takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. The acoustical modeling software used here was CadnaA, from Datakustik GmbH. CadnaA is a widely accepted acoustical propagation modeling tool, used by many noise control professionals in the United States and internationally.

ISO 9613-2 also assumes downwind sound propagation between every source and every receiver, consequently, all wind directions, including the prevailing wind directions, are taken into account.

Model input parameters are listed in Appendix B including the modeled sound power spectra for each turbine model.

For this analysis, we utilized a ground absorption factor of G=0.7, which is appropriate for comparing modeled results to the L_{50} metric used in the state standard, particularly when summing model results with the monitored L_{50} levels[12]. A 2-dB uncertainty factor was added to the turbine sound power per typical manufacturer warranty confidence interval specifications.

Two distinct receiver heights are included in the analysis; different receiver heights result in different sound levels as a result of source proximity and relative exposure. Residences are modeled as discrete receivers at 4 meters (13 feet) above ground level. The 4-meter (13-foot) receiver height mimics the height of a second story window. A total of 343 Minnesota residences were modeled, at locations within 3.2 kilometers (2 miles) of the Project. In addition, a total of 37 Iowa residences were modeled, at locations within 3.2 kilometers (2 miles) of the

[12] Generally accepted wind turbine modeling procedure calls for a ground absorption factor of G = 0.5, with a 2 dB uncertainty factor added to the manufacturer's guaranteed levels, to predict a maximum $L_{EQ(1-hr)}$. In this case, the Minnesota state limit utilizes an L_{50} metric instead of maximum $L_{EQ(1-hr)}$, which means a ground factor of G=0.7 can be used.

Minnesota-Iowa border. The grid, represented in the results map by sound pressure level contours, is calculated at a height of 1.5 meters (5 feet), to represent one's average listening height when standing outside.

A search distance up to 10,000 meters (6.2 miles) allows for the contributions of distant turbines to be considered at receivers. The contribution of distant turbines will depend on the geometry and geography of the Project.

The model included the all of the primary and alternate Project turbine locations in Minnesota and Iowa with select turbines utilizing low-noise trailing edge blades (LNTE) and one turbine using noise reduced operations (NRO). The turbines using LNTE and NRO are noted in Appendix B. The model also included the sound emissions from 26 turbines at NextEra's Endeavor Wind Farm in Osceola County, Iowa southwest of the proposed Project.

6.2 MODELING RESULTS

Overall A-weighted Model Results

Modeling results are shown in Figure 31. Results are presented as contour lines representing 5-dB increments of calculated A-weighted sound pressure levels. Appendix C provides a list of the calculated sound pressure levels at each receiver in tabular format and a map showing all receiver identification numbers for reference in the appendix table.

A summary of the sound propagation model results is presented in Table 7. All modeled residences are projected to have sound levels at or below 50 dBA. The highest modeled sound level (L_{50}) at a residence is 50 dBA, and the average sound level (L_{50}) across all residences is 40 dBA.

TABLE 7: MODEL RESULTS SUMMARY

Statistical Metric	Modeled Turbine-Only Sound Level (dBA) by Residence Classification		
	All Residences	Participating Residences	Non-Participating Residences
Average L50	40	46	38
Maximum L50	50	50	50
Minimum L50	25	32	25

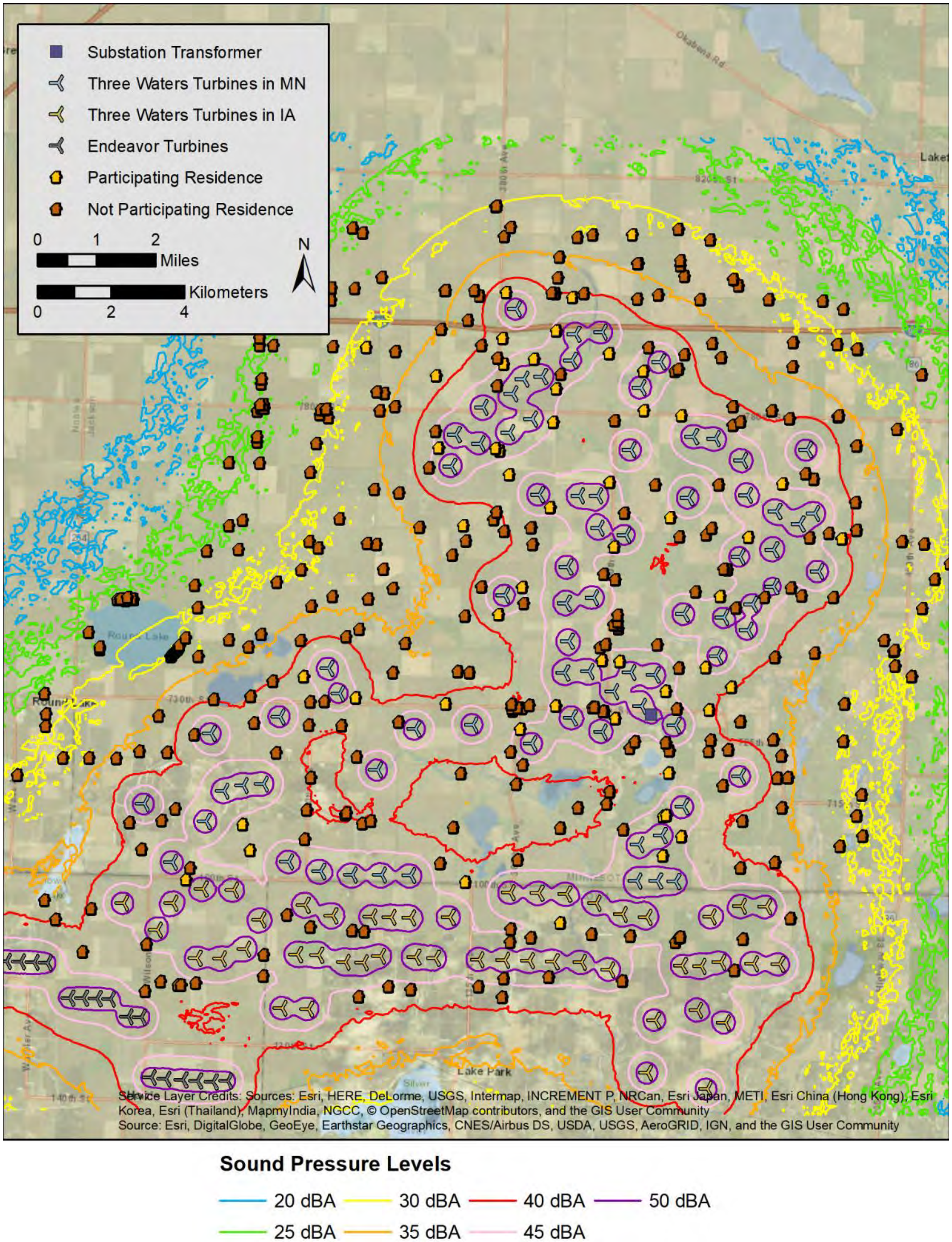

FIGURE 31: SOUND PROPAGATION MODEL RESULTS

Model Results Added to Background L_{50}

To assess compliance with state noise regulations, the model results must be summed (logarithmically)[13] with the monitored overall nighttime L_{50} results to determine the projected cumulative sound level (L_{50}) that could occur when the Project is operating. This analysis is presented in Table 8 for each monitor location. As shown in the Table, the model results summed with the overall nighttime L_{50} for each background monitor location are less than 50 dBA.

TABLE 8: MODEL RESULTS (dBA) SUMMED WITH MONITORED BACKGROUND SOUND LEVELS (L_{50}, dBA)

Scenario/Metric	Monitor Location				
	Monitor A	Monitor B	Monitor C	Monitor D	Monitor I
Monitored Overall Nighttime L_{50} Background Sound Level	31	29	35	34	33
Modeled Turbine-Only Sound Level	45	45	49	45	49
Total Sound (L_{50}) of Background & Modeled Turbine Sound Levels	45	45	49	45	49

The background L_{50} does and will vary from hour to hour, as shown in the monitor results in Section 5.0. The average overall nighttime L_{50} across all the monitor sites was 33 dBA, but there were some nighttime hours during the monitoring period when the L_{50} was above 40 dBA and as high as 48 dBA for a few hours. Thus, in Appendix C, the model results are summed with a range of potential background L_{50} values ranging from 30 dBA to 45 dBA in 5 dB increments.

13 $L_{p1,2} = 10 \times \log_{10}\left(10^{L_{p1}/10} + 10^{L_{p2}/10}\right)$

7.0 CONCLUSIONS

The Three Waters Wind Project is a proposed wind power generation facility in Jackson County, Minnesota. The facility will include up to 71 wind turbines in Minnesota for a rating of up to 201 MW in Minnesota. The facility will also include additional wind turbines in Iowa. For the CN and SPA, RSG performed a preliminary noise compliance assessment of the Project based on the preliminary turbine layout including both the primary and alternate turbine locations.

Conclusions of the assessment are as follows:

1. Background sound levels vary around the Project site during the day but are generally consistent across the area at night. The overall nighttime L_{50} across the Project area ranged from 29 dBA at Monitor B to 35 dBA at Monitor C. The average overall nighttime L_{50} across the site was 33 dBA. During the day, the overall L50 across the Project area ranged from 34 at Monitor B to 41 at Monitor D with an average overall daytime L_{50} of 38 dBA.
2. Minimum 1-hour nighttime L_{50}s were between 19 and 28 dBA across the Project area, while maximum 1-hour nighttime L_{50}s were between 42 and 48 dBA.
3. State noise regulations require that wind power generation facilities show compliance with a nighttime limit of 50 dBA (L_{50}) and a daytime limit of 60 dBA (L_{50}) at residences.
4. Sound propagation modeling was performed in accordance with ISO 9613-2 at a total of 380 discrete receivers (343 in Minnesota within 2 miles of the Project, 37 in Iowa within 2 miles of the state border) with spectral ground attenuation and a ground factor of G=0.7. These modeling parameters are meant to represent the L_{50} of the proposed facility.
5. Modeling was completed for the anticipated turbine model, the GE 2.82-127 with a hub height of 89 meters.
6. Projected sound levels from the Project, including all primary and alternate turbine locations in Minnesota and Iowa, in combination with modeled sound levels from the Endeavor Wind Farm in Osceola, Iowa are 50 dBA or less at all residences with the highest projected sound level (L_{50}) at a residence of 50 dBA. The average sound level (L_{50}) across all modeled residences is 40 dBA.
7. When added to the overall nighttime L_{50} from monitored locations, sound levels remain below 50 dBA, but the background L_{50} does and will vary from hour to hour, as shown in the monitor results.

APPENDIX B. MODEL INPUT DATA

TABLE 9: SOUND PROPAGATION MODELING PARAMETERS

PARAMETER	SETTING
Ground Absorption	Spectral for all sources, Mixed Ground (G=0.7)
Atmospheric Attenuation	Based on 10 Degrees Celsius, 70% Relative Humidity
Reflections	None
Receiver Height	4 meters for residences, 1.5 meters for grid
Search Distance	10,000 meters

TABLE 10: TURBINE HUB HEIGHT AND 1/1 OCTAVE BAND MODELED TURBINE SPECTRA (dBZ UNLESS OTHERWISE INDICATED)

SOUND SOURCE	HUB HEIGHT	1/1 OCTAVE BAND CENTER FREQUENCY (HZ)									SUM (dBA)	SUM (dBZ)
		31.5	*63*	*125*	*250*	*500*	*1000*	*2000*	*4000*	*8000*		
GE 2.82-127	89 m	122	119	114	109	107	106	101	93	77	110.0	123.9
GE 2.82-127 LNTE[16]	89 m	122	119	113	101	104	104	102	94	78	108.5	123.7
GE 2.82-127 LNTE w/NRO[17] 107	89 m	121	117	111	104	100	102	101	94	80	107.0	122.8
Clipper C96	80 m											

TABLE 11: MODELED TURBINE SOUND POWER LEVELS & LOCATIONS[18]

TURBINE ID	STATE	TURBINE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD83 Z15N)	
					X (m)	Y (m)
2	MN	GE 2.82-127	112	89	313703	4834648
4	MN	GE 2.82-127	112	89	311924	4830366
5	MN	GE 2.82-127	112	89	312052	4831232
6	MN	GE 2.82-127 LNTE	110.5	89	312708	4830978
7	MN	GE 2.82-127	112	89	313609	4832347
8	MN	GE 2.82-127	112	89	313911	4832743
9	MN	GE 2.82-127	112	89	314397	4832807
A10	MN	GE 2.82-127 LNTE	110.5	89	315208	4833245
11	MN	GE 2.82-127	112	89	316038	4834018
13	MN	GE 2.82-127	112	89	317094	4832503

[16] LNTE: Low Noise Trailing Edges
[17] NRO: Noise Reduced Operations
[18] A map showing the location of the turbines by Turbine ID is provided in Figure 34 after this Table.

TURBINE ID	STATE	TURBINE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD83 Z15N)	
					X (m)	Y (m)
14	MN	GE 2.82-127	112	89	314314	4829597
A15	MN	GE 2.82-127 LNTE	110.5	89	320126	4826609
16	MN	GE 2.82-127	112	89	315416	4829572
17	MN	GE 2.82-127	112	89	315915	4829569
19	MN	GE 2.82-127	112	89	318515	4831182
20	MN	GE 2.82-127	112	89	319118	4831115
21	MN	GE 2.82-127	112	89	319853	4830528
24	MN	GE 2.82-127 LNTE	110.5	89	316685	4828498
27	MN	GE 2.82-127 LNTE & NRO 107	109	89	320691	4827095
28	MN	GE 2.82-127	112	89	320773	4829144
29	MN	GE 2.82-127	112	89	321408	4828797
30	MN	GE 2.82-127	112	89	321825	4829087
31	MN	GE 2.82-127	112	89	318267	4826346
32	MN	GE 2.82-127 LNTE	110.5	89	319347	4826249
33	MN	GE 2.82-127	112	89	307268	4823554
A36	MN	GE 2.82-127 LNTE	110.5	89	308884	4824177
38	MN	GE 2.82-127	112	89	310947	4823211
42	MN	GE 2.82-127	112	89	312515	4823334
44	MN	GE 2.82-127	112	89	315129	4825611
45	MN	GE 2.82-127	112	89	314130	4822819
47	MN	GE 2.82-127	112	89	316352	4824237
48	MN	GE 2.82-127 LNTE	110.5	89	316824	4824754
49	MN	GE 2.82-127	112	89	317470	4824691
51	MN	GE 2.82-127	112	89	317113	4823842
53	MN	GE 2.82-127	112	89	318026	4823314
56	MN	GE 2.82-127	112	89	318243	4821099
58	MN	GE 2.82-127	112	89	319804	4821926
59	MN	GE 2.82-127	112	89	303574	4821177
60	MN	GE 2.82-127	112	89	305251	4820697
63	MN	GE 2.82-127	112	89	306813	4821722
64	MN	GE 2.82-127	112	89	310034	4819247
65	MN	GE 2.82-127	112	89	310832	4819228
66	MN	GE 2.82-127	112	89	321612	4830813

TURBINE ID	STATE	TURBINE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD83 Z15N)	
					X (m)	Y (m)
68	MN	GE 2.82-127	112	89	315010	4824743
69	MN	GE 2.82-127	112	89	309230	4819238
70	MN	GE 2.82-127	112	89	308360	4819346
72	MN	GE 2.82-127	112	89	317537	4819076
73	MN	GE 2.82-127	112	89	318035	4819062
74	MN	GE 2.82-127	112	89	317657	4820313
75	MN	GE 2.82-127	112	89	315086	4827632
76	MN	GE 2.82-127	112	89	315043	4826643
A77	MN	GE 2.82-127	112	89	315808	4826797
78	MN	GE 2.82-127	112	89	319996	4829584
79	MN	GE 2.82-127	112	89	316985	4819074
80	MN	GE 2.82-127	112	89	312793	4831978
81	MN	GE 2.82-127	112	89	317035	4820064
82	MN	GE 2.82-127	112	89	321927	4827502
A83	MN	GE 2.82-127	112	89	316033	4823137
86	MN	GE 2.82-127	112	89	320691	4828100
87	MN	GE 2.82-127	112	89	313527	4831285
88	MN	GE 2.82-127	112	89	304343	4819594
89	MN	GE 2.82-127	112	89	306260	4821682
90	MN	GE 2.82-127	112	89	307503	4819605
91	MN	GE 2.82-127 LNTE	110.5	89	320008	4825910
92	MN	GE 2.82-127	112	89	315675	4824786
93	MN	GE 2.82-127	112	89	315948	4828687
94	MN	GE 2.82-127	112	89	316824	4830816
95	MN	GE 2.82-127	112	89	305739	4821530
96	MN	GE 2.82-127	112	89	314138	4831664
97	MN	GE 2.82-127	112	89	308586	4824871
98	MN	GE 2.82-127	112	89	318388	4829506
A2	MN	GE 2.82-127	112	89	305390	4823091
A9	MN	GE 2.82-127	112	89	315303	4833970
95M	MN	GE 2.82-127	112	89	317622	4833211
97M	MN	GE 2.82-127	112	89	313389	4826857
99M	MN	GE 2.82-127	112	89	309925	4822098
96M	MN	GE 2.82-127 LNTE	110.5	89	319782	4827905
98M	MN	GE 2.82-127	112	89	315208	4823518
A53	MN	GE 2.82-127 LNTE	110.5	89	319187	4825195

TURBINE ID	STATE	TURBINE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD83 Z15N)	
					X (m)	Y (m)
1	IA	GE 2.82-127	112.0	89	303000	4818475
3	IA	GE 2.82-127	112.0	89	304352	4818472
4	IA	GE 2.82-127	112.0	89	305167	4818859
5	IA	GE 2.82-127	112.0	89	306000	4818834
6	IA	GE 2.82-127	112.0	89	306740	4818019
7	IA	GE 2.82-127	112.0	89	307940	4818421
9	IA	GE 2.82-127 LNTE	110.5	89	310292	4818090
10	IA	GE 2.82-127	112.0	89	310820	4818075
11	IA	GE 2.82-127	112.0	89	311881	4818093
12	IA	GE 2.82-127	112.0	89	313529	4818766
13	IA	GE 2.82-127	112.0	89	314301	4818745
14	IA	GE 2.82-127	112.0	89	315066	4818724
18	IA	GE 2.82-127	112.0	89	319008	4818104
19	IA	GE 2.82-127	112.0	89	319825	4818394
20	IA	GE 2.82-127	112.0	89	320513	4818376
21	IA	GE 2.82-127	112.0	89	303926	4817752
22	IA	GE 2.82-127	112.0	89	305004	4816976
23	IA	GE 2.82-127	112.0	89	305676	4816957
24	IA	GE 2.82-127	112.0	89	307737	4817079
25	IA	GE 2.82-127	112.0	89	309540	4816847
26	IA	GE 2.82-127 LNTE	110.5	89	310001	4817025
27	IA	GE 2.82-127	112.0	89	310953	4816998
28	IA	GE 2.82-127	112.0	89	315475	4816865
29	IA	GE 2.82-127	112.0	89	316245	4816665
31	IA	GE 2.82-127	112.0	89	318732	4816757
32	IA	GE 2.82-127	112.0	89	306332	4817221
33	IA	GE 2.82-127	112.0	89	308305	4817063
34	IA	GE 2.82-127	112.0	89	311485	4816970
35	IA	GE 2.82-127	112.0	89	313384	4816922
36	IA	GE 2.82-127	112.0	89	314056	4816904
37	IA	GE 2.82-127	112.0	89	314710	4816886
A5	IA	GE 2.82-127	112.0	89	312682	4816942
A9	IA	GE 2.82-127 LNTE	110.5	89	318204	4816771
A10	IA	GE 2.82-127 LNTE	110.5	89	319263	4816864
A11	IA	GE 2.82-127	112.0	89	307323	4815615

TURBINE ID	STATE	TURBINE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD83 Z15N)	
					X (m)	Y (m)
A12	IA	GE 2.82-127	112.0	89	308043	4815594
A13	IA	GE 2.82-127	112.0	89	317476	4815290
A14	IA	GE 2.82-127	112.0	89	317277	4813852
A15	IA	GE 2.82-127	112.0	89	318888	4813412
A16	IA	GE 2.82-127	112.0	89	318630	4815565
A17	IA	GE 2.82-127	112.0	89	319384	4815222
A18	IA	GE 2.82-127	112.0	89	320156	4816830
A19	IA	GE 2.82-127	112.0	89	320860	4816808
A20	IA	GE 2.82-127	112.0	89	308698	4818135
A21	IA	GE 2.82-127	112.0	89	309039	4816861
A23	IA	GE 2.82-127 LNTE	110.5	89	309762	4818105
A24	IA	GE 2.82-127	112.0	89	315873	4818480
A25	IA	GE 2.82-127	112.0	89	316591	4818175
A26	IA	GE 2.82-127	112.0	89	317261	4818088
Endeavor Wind Farm in IA						
2-1 B	IA	Clipper C96		80	296066	4817468
2-2 B	IA	Clipper C96		80	296440	4817459
2-3 B	IA	Clipper C96		80	296829	4817447
2-4 B	IA	Clipper C96		80	297192	4817436
2-5 B	IA	Clipper C96		80	297587	4817416
2-6 B	IA	Clipper C96		80	297877	4817418
2-7 B	IA	Clipper C96		80	298201	4817438
2-8 B	IA	Clipper C96		80	298616	4817558
2-9 ALT. B	IA	Clipper C96		80	299002	4816916
2-10 B	IA	Clipper C96		80	299354	4816905
2-11 B	IA	Clipper C96		80	299819	4816889
2-12 B	IA	Clipper C96		80	300203	4816875
2-13 B	IA	Clipper C96		80	300568	4816862
2-14 B	IA	Clipper C96		80	300928	4816848
2-16 B	IA	Clipper C96		80	301531	4815896
2-17 B	IA	Clipper C96		80	301902	4815887
2-18 B	IA	Clipper C96		80	302281	4815875
2-19 B	IA	Clipper C96		80	302653	4815864
2-20 B	IA	Clipper C96		80	303126	4815380
2-21 B	IA	Clipper C96		80	303493	4815371
1-A5 B	IA	Clipper C96		80	303758	4813732
1-A6 B	IA	Clipper C96		80	304156	4813698

TURBINE ID	STATE	TURBINE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD83 Z15N)	
					X (m)	Y (m)
1-1 B	IA	Clipper C96		80	304620	4813664
1-2 B	IA	Clipper C96		80	305012	4813638
1-3 B	IA	Clipper C96		80	305439	4813610
1-4 B	IA	Clipper C96		80	305832	4813631

TABLE 12: MODELED RECEIVER RESULTS, WITH AND WITHOUT BACKGROUND SOUND LEVELS (L_{50})

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J39	44	44	45	45	48	312341	4819054	461
J40	49	49	49	49	50	304846	4819436	473
J41	43	44	44	45	47	319831	4819438	454
J42	44	44	45	46	48	311652	4819556	457
J43	44	44	45	46	48	313768	4819658	455
J44	41	41	42	43	46	320771	4819582	447
J45	50	50	50	50	51	317718	4819771	457
J46	44	44	45	45	48	303525	4819945	475
J47	45	45	45	46	48	306479	4819923	473
J48	34	36	38	41	45	322540	4820027	437
J49	46	46	46	47	48	307963	4820227	469
J50	48	48	48	49	50	318224	4820294	452
J51	32	34	37	41	45	323158	4820303	440
J52	41	41	42	43	46	312006	4820535	464
J53	47	47	47	48	49	316647	4820486	456
J54	45	46	46	47	48	306284	4820616	472
J55	41	41	42	44	46	314928	4820522	453
J56	45	45	45	46	48	303193	4820674	474
J57	43	43	43	45	47	309536	4820642	469
J58	46	46	46	47	48	304083	4820723	470
J59	43	43	43	44	47	309770	4820720	467
J60	41	42	42	44	47	319886	4820710	447
J61	42	42	43	44	47	309068	4820891	467
J62	42	42	43	44	47	309106	4820933	468
J63	49	49	49	49	50	317731	4820844	448
J64	49	49	49	50	51	317807	4820864	449
J65	45	45	46	46	48	304449	4821052	469
J66	43	43	43	44	47	308021	4821014	464
J67	32	34	37	41	45	322997	4820848	443
J68	41	41	42	44	46	315405	4821079	455
J69	38	39	40	42	46	320955	4821066	441

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J70	42	42	43	44	47	316192	4821188	448
J71	42	42	43	44	47	316267	4821515	452
J72	33	35	37	41	45	323133	4821435	436
J73	41	41	42	43	46	313725	4821714	449
J74	47	47	47	47	49	319346	4821678	451
N380	32	34	37	41	45	300147	4821969	476
J75	42	42	42	44	47	308133	4821899	470
J76	40	41	42	43	46	320829	4821884	440
J77	38	39	40	42	46	321122	4821901	440
J78	41	41	42	43	46	312217	4822007	450
J79	44	44	44	45	47	317881	4822028	450
J80	45	45	46	46	48	313908	4822235	454
N379	33	35	37	41	45	301378	4822432	475
J81	38	39	40	42	46	302838	4822419	470
J82	36	37	38	41	45	302105	4822438	478
J84	45	45	45	46	48	309387	4822455	462
J85	41	41	42	43	46	304224	4822588	471
J86	39	39	40	42	46	303467	4822619	473
J87	44	45	45	46	48	307194	4822577	473
J88	39	40	40	43	46	320947	4822493	437
J89	46	46	46	47	48	313581	4822599	456
J90	43	43	43	45	47	318959	4822609	449
J91	45	45	46	46	48	317885	4822626	450
J92	43	44	44	45	47	319493	4822649	446
J93	45	45	45	46	48	316822	4822694	447
J94	47	47	48	48	49	317792	4822840	450
J95	45	45	46	46	48	316962	4822868	448
J96	48	48	48	48	50	304957	4823068	475
J97	43	43	43	45	47	319025	4822914	449
J98	31	34	36	41	45	322633	4822882	438
J99	38	39	40	42	46	320725	4822934	439
J100	47	47	47	48	49	313834	4823222	453
J101	42	43	43	44	47	308967	4823316	466
J102	43	43	44	45	47	308082	4823328	463

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J103	45	45	45	46	48	306595	4823386	468
J104	47	47	47	48	49	310520	4823405	459
J105	38	38	40	42	46	303989	4823577	470
J106	40	41	41	43	46	319823	4823428	441
J107	49	49	49	50	51	316426	4823508	452
J108	43	43	44	45	47	313629	4823711	454
J109	50	50	50	50	51	316120	4823694	453
J110	50	50	50	50	51	316092	4823697	452
J111	43	43	44	45	47	313604	4823778	454
J112	44	44	44	45	47	313895	4823776	455
J114	43	43	44	45	47	313775	4823796	452
J115	43	43	43	45	47	318983	4823741	442
J116	49	49	49	49	50	318104	4823766	448
J117	49	49	49	50	50	315804	4823802	453
J119	49	49	49	50	51	315852	4823809	453
J120	48	48	48	49	50	314800	4823853	456
J121	44	44	45	46	48	314079	4823866	460
J122	43	43	44	45	47	313605	4823885	457
J123	43	43	44	45	47	311808	4823909	460
J124	44	45	45	46	48	308112	4823966	466
J125	47	47	47	48	49	308507	4823968	467
J126	41	42	42	44	47	305494	4824033	465
J127	34	36	38	41	45	322667	4823905	435
J128	42	42	43	44	47	306494	4824105	463
J129	46	46	46	47	48	309353	4824076	461
J130	48	48	49	49	50	317793	4824244	447
J131	42	42	43	44	47	319582	4824352	438
J132	42	42	42	44	47	307100	4824520	469
J133	45	45	45	46	48	307944	4824640	469
J134	40	40	41	43	46	310376	4824760	465
J135	40	40	41	43	46	312453	4824763	463
J136	40	40	41	43	46	312132	4824783	462
J137	31	34	37	41	45	324485	4824652	437
J138	46	46	46	47	48	318150	4824875	445

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J139	47	47	48	48	49	318884	4824900	443
J140	31	34	36	41	45	324041	4824940	443
J141	49	49	49	50	51	316551	4825057	450
J142	34	35	37	41	45	304329	4825202	470
J143	35	36	38	41	45	305070	4825199	471
J144	33	35	37	41	45	304354	4825225	471
J145	49	49	49	50	51	316065	4825090	450
J146	33	35	37	41	45	304366	4825250	471
J147	32	34	37	41	45	304410	4825302	472
J148	32	34	37	41	45	304427	4825322	472
J149	32	34	37	41	45	304437	4825327	472
J150	33	35	37	41	45	304466	4825357	471
J151	31	33	36	40	45	302387	4825387	471
J152	41	41	42	44	46	320765	4825175	439
J153	34	35	37	41	45	304470	4825376	471
J155	34	35	37	41	45	304487	4825386	472
J156	32	34	37	41	45	304520	4825430	471
J157	30	33	36	40	45	302388	4825455	471
J158	33	34	37	41	45	304531	4825456	471
J159	32	34	37	41	45	304538	4825465	470
J160	36	37	39	41	46	306444	4825452	468
J161	32	34	37	41	45	304545	4825478	469
J162	37	38	39	42	46	321846	4825287	434
J163	33	35	37	41	45	304552	4825493	469
J164	33	35	37	41	45	323994	4825329	446
J165	47	47	47	48	49	316003	4825448	452
J166	33	35	37	41	45	324019	4825362	446
J167	33	35	37	41	45	324019	4825362	446
J168	37	38	39	42	46	310705	4825557	458
J169	46	46	47	47	49	316153	4825520	452
J170	35	36	38	41	45	305905	4825652	472
J171	45	46	46	47	48	317561	4825517	439
J172	40	41	41	43	46	307859	4825639	467
J381	33	35	37	41	45	304724	4825701	471

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J173	41	41	42	43	46	309090	4825738	464
J174	35	36	38	41	45	306787	4825804	465
J175	29	33	36	40	45	302088	4825863	476
J176	34	36	38	41	45	323750	4825643	444
J177	38	39	40	42	46	309451	4825939	464
J178	45	45	45	46	48	316504	4825953	447
J179	45	45	45	46	48	316471	4826037	449
J180	45	45	45	46	48	316378	4826066	448
J181	45	45	45	46	48	316487	4826138	447
J182	40	40	41	43	46	312329	4826290	458
J183	46	46	47	47	49	313245	4826338	456
J184	45	45	45	46	48	316487	4826323	447
J185	32	34	37	41	45	305057	4826524	473
J186	36	37	38	41	45	308146	4826569	467
J187	50	50	50	50	51	319710	4826519	443
J188	29	32	36	40	45	303093	4826727	469
J384	28	32	36	40	45	302870	4826749	472
J189	29	32	36	40	45	303313	4826755	474
J383	28	32	36	40	45	302936	4826761	472
J382	28	32	36	40	45	302963	4826764	472
J190	46	46	47	47	49	313930	4826636	454
J191	32	34	37	41	45	324784	4826508	448
J192	28	32	36	40	45	303269	4826769	473
J193	28	32	36	40	45	303148	4826800	470
J194	35	37	38	41	45	309700	4826763	458
J195	35	36	38	41	45	308726	4826831	464
J196	50	50	50	50	51	320494	4826806	440
J197	42	43	43	44	47	322361	4826798	435
J198	46	46	47	47	49	319285	4826836	442
J199	45	45	45	46	48	321498	4826844	438
J200	36	37	38	41	45	310374	4827047	456
J201	45	46	46	47	48	318601	4826950	443
J202	30	33	36	40	45	304977	4827135	469
J203	44	44	45	46	48	312773	4827095	456

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J204	47	47	47	47	49	313898	4827085	454
J205	33	35	37	41	45	307208	4827219	470
J206	46	46	47	47	49	321206	4827063	438
J207	45	45	46	46	48	316420	4827288	446
J208	32	34	37	41	45	325115	4827302	452
J209	46	46	47	47	49	316107	4827442	447
J210	33	35	37	41	45	307875	4827561	462
J211	35	36	38	41	45	310117	4827570	456
J212	47	47	47	48	49	319474	4827566	443
J213	46	46	47	47	49	319373	4827570	443
J214	31	34	36	41	45	325541	4827722	452
J215	38	39	40	42	46	311983	4827964	453
J216	28	32	36	40	45	305299	4828075	472
J217	30	33	36	40	45	306173	4828109	468
J218	33	35	37	41	45	308339	4828148	465
J219	35	36	38	41	45	309915	4828246	457
J220	49	49	49	49	50	316388	4828178	446
J221	34	36	38	41	45	309678	4828281	459
J222	43	44	44	45	47	314163	4828243	453
J223	32	34	37	41	45	308096	4828334	464
J224	39	39	40	42	46	312353	4828346	455
J225	33	35	37	41	45	324828	4828264	457
J226	35	36	38	41	45	324222	4828329	443
J227	43	43	44	45	47	322596	4828401	436
J228	43	43	43	45	47	318167	4828459	441
J229	48	48	48	48	50	320044	4828440	440
J230	49	49	49	50	51	321717	4828426	438
J231	44	44	44	45	47	318898	4828515	445
J232	41	42	42	44	47	313397	4828603	453
J233	46	46	47	47	49	322238	4828551	439
J234	28	32	36	40	45	305902	4828758	461
J235	37	38	39	42	46	311089	4828714	454
J236	44	44	44	45	47	314145	4828704	451
J237	44	44	44	45	47	314125	4828707	451

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J238	39	40	41	43	46	312288	4828756	452
J239	41	41	42	43	46	322992	4828631	437
J240	44	44	45	46	48	319047	4828691	445
J241	29	33	36	40	45	306274	4828907	463
J242	33	35	37	41	45	308918	4828944	461
J243	41	41	42	44	46	313102	4828925	453
J244	45	45	45	46	48	317913	4828977	439
J245	42	42	43	44	47	313188	4829125	454
J246	47	47	47	48	49	316668	4829101	443
J247	48	48	49	49	50	314651	4829254	457
J248	41	41	42	43	46	322958	4829389	440
J249	38	38	40	42	46	310533	4829647	456
J250	35	37	38	41	45	309869	4829744	460
J251	44	45	45	46	48	317504	4829873	441
J252	47	47	47	47	49	319241	4829867	443
J253	48	48	48	49	50	316264	4829942	452
J254	47	47	47	47	49	320975	4829904	444
J255	45	45	46	46	48	321816	4830017	438
J256	45	45	45	46	48	313536	4830150	459
J257	31	34	37	41	45	308123	4830214	463
J258	46	46	46	47	49	321605	4830172	439
J259	46	46	46	47	48	311355	4830342	455
J260	26	32	36	40	45	305908	4830474	465
J261	29	32	36	40	45	306739	4830465	462
J262	49	49	49	49	50	313271	4830793	454
J263	48	48	48	49	50	311613	4830867	455
J264	49	49	49	50	51	313159	4830866	452
J265	31	34	37	41	45	308286	4830992	460
J266	27	32	36	40	45	306671	4831034	463
J267	38	39	40	42	46	322997	4830922	440
J268	28	32	36	40	45	306681	4831171	462
J269	47	47	47	48	49	311523	4831331	454
J270	33	35	37	41	45	324096	4831388	449
J271	46	46	47	47	49	319617	4831495	443

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J272	47	47	47	48	49	314729	4831576	447
J273	32	34	37	41	45	308611	4831698	458
J274	44	44	45	46	48	316406	4831613	449
J275	44	44	45	46	48	319827	4831583	443
J276	30	33	36	40	45	308386	4831779	455
J277	42	42	42	44	47	321158	4831673	440
J278	28	32	36	40	45	306677	4831874	460
J279	46	46	46	47	49	318217	4831748	445
J280	39	39	40	42	46	322480	4831726	447
J281	36	37	38	41	46	310013	4831886	458
J282	30	33	36	40	45	308402	4831915	456
J283	31	34	37	41	45	308534	4831916	456
J284	38	39	40	42	46	322503	4831755	447
J285	31	34	37	41	45	308556	4831936	456
J286	25	31	35	40	45	306775	4831962	459
J287	28	32	36	40	45	306814	4831962	460
J288	28	32	36	40	45	306875	4831965	459
J289	46	46	47	47	49	317203	4831893	443
J290	37	38	39	42	46	310422	4832003	457
J291	41	41	42	43	46	320676	4831889	442
J292	27	32	36	40	45	306814	4832055	459
J293	28	32	36	40	45	306853	4832058	458
J294	27	32	36	40	45	306764	4832061	459
J295	42	43	43	44	47	319626	4831998	446
J296	36	37	38	41	45	310137	4832354	451
J297	35	36	38	41	45	309933	4832394	452
J298	49	49	49	49	50	314809	4832481	449
J299	27	32	36	40	45	306784	4832622	458
J300	50	50	50	50	51	313199	4832559	453
J302	27	32	36	40	45	306806	4832763	457
J303	27	32	36	40	45	306806	4832763	457
J304	40	40	41	43	46	311543	4832836	453
J305	49	49	50	50	51	314938	4832879	447
J306	50	50	50	50	51	317194	4832961	444

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J307	29	33	36	40	45	324761	4832872	448
J308	47	47	48	48	49	318041	4832961	442
J309	46	46	47	47	49	318137	4833013	444
J310	47	47	47	48	49	313379	4833149	451
J311	35	36	38	41	45	321245	4833083	441
J312	49	49	49	50	51	314202	4833289	450
J313	45	45	46	46	48	313223	4833320	451
J314	38	39	40	42	46	319311	4833336	439
J315	35	36	38	41	45	310441	4833492	452
J316	44	44	44	45	47	318299	4833418	440
J317	47	47	47	47	49	316261	4833447	446
J318	32	34	37	41	45	309645	4833608	453
J319	26	32	36	40	45	306749	4833660	454
J320	27	32	36	40	45	307114	4833659	457
J321	31	33	36	40	45	308733	4833642	452
J322	42	42	43	44	47	312775	4833661	449
J323	47	47	47	48	49	317326	4833614	443
J324	30	33	36	40	45	323020	4833550	446
J325	31	34	37	41	45	323008	4833567	447
J326	38	39	40	42	46	319062	4833719	439
J327	31	33	36	41	45	322470	4833686	446
J328	26	31	35	40	45	306748	4833875	458
J329	34	35	38	41	45	321260	4833740	441
J330	44	44	45	46	48	313357	4833858	448
J331	48	48	48	49	50	314806	4834061	440
J332	36	37	39	41	46	311682	4834110	449
J333	39	40	41	43	46	312402	4834357	445
J334	28	32	36	40	45	308126	4834554	452
J336	25	31	35	40	45	306846	4834908	452
J337	27	32	36	40	45	308676	4834899	450
J338	31	33	36	41	45	322075	4834869	443
J339	36	37	38	41	46	318730	4834910	440
J340	40	40	41	43	46	317030	4834932	445
J341	43	43	43	45	47	315255	4834964	443

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J342	33	35	37	41	45	320593	4834911	443
J343	40	41	41	43	46	312729	4835005	448
J344	38	38	40	42	46	317585	4835036	444
J345	42	42	43	44	47	314779	4835079	445
J346	42	42	43	44	47	315574	4835073	444
J348	42	42	43	44	47	314692	4835088	445
J349	46	46	46	47	48	313447	4835110	445
J350	34	36	38	41	45	311773	4835158	449
J351	35	36	38	41	45	311809	4835167	449
J352	39	39	40	42	46	312588	4835161	448
J353	29	32	36	40	45	308691	4835228	448
J354	30	33	36	40	45	309327	4835224	448
J355	26	31	35	40	45	307337	4835322	452
J356	27	32	36	40	45	307904	4835370	451
J357	33	35	37	41	45	319778	4835290	442
J358	31	33	36	40	45	310072	4835521	451
J359	40	40	41	43	46	314851	4835504	442
J360	33	35	37	41	45	319630	4835463	442
J361	35	36	38	41	45	318307	4835551	442
J362	34	36	38	41	45	318195	4835835	442
J363	36	37	38	41	45	317056	4835889	445
J364	36	37	38	41	45	317023	4835894	445
J365	33	35	37	41	45	318199	4835969	442
J366	37	38	39	42	46	314891	4836067	441
J367	32	34	37	41	45	319006	4836530	441
J368	34	36	38	41	45	315383	4836605	441
J369	35	36	38	41	45	313404	4836630	445
J370	26	31	35	40	45	308191	4836698	450
J371	28	32	36	40	45	309547	4836728	450
J372	33	35	37	41	45	315807	4836673	441
J373	34	35	37	41	45	316885	4836669	439
J374	27	32	36	40	45	309276	4836860	450
J375	34	35	37	41	45	313573	4836874	444
J376	32	34	37	41	45	318132	4836825	442

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
J377	32	34	37	41	45	313158	4837446	444
J378	32	34	37	41	45	313193	4837452	444
N385	32	34	37	41	45	300916	4823298	476
N386	31	33	36	40	45	300927	4823625	475
N387	30	33	36	40	45	300891	4824176	480
J388	31	33	36	40	45	322637	4834650	447
D1	45	45	46	46	48	309434	4815927	468
D2	43	43	44	45	47	313337	4815925	448
O3	45	46	46	47	48	303618	4816088	478
D4	45	45	45	46	48	310848	4816129	464
O5	44	44	45	46	48	304513	4816243	479
O6	44	44	45	46	48	304597	4816244	474
D7	46	46	46	47	48	310251	4816201	462
D8	46	46	46	47	48	312690	4816212	461
O9	46	46	46	47	49	304996	4816305	478
O11	44	44	45	45	48	304049	4816348	483
D12	48	48	48	49	50	316613	4816356	451
O13	46	46	47	47	49	306834	4816494	471
D14	49	49	49	49	50	313378	4816421	455
D15	50	50	50	50	51	314610	4816467	461
D16	50	50	50	50	51	319666	4816652	448
O17	49	49	49	49	50	306849	4817068	468
O18	44	44	44	45	47	301926	4817150	482
O19	48	48	48	49	50	303665	4817358	481
D20	49	49	49	49	50	313561	4817415	456
D21	47	47	47	48	49	318060	4817414	457
D22	48	48	48	49	50	314129	4817544	458
D23	48	48	48	48	50	319904	4817494	449
D24	47	47	47	48	49	318152	4817534	458
D25	47	47	47	48	49	318200	4817552	458
D26	48	48	49	49	50	316834	4817580	454
D27	50	50	50	50	51	309593	4817705	468
D28	48	48	48	48	49	315773	4817635	450
D29	49	49	49	50	51	309262	4817730	468

RECEIVER ID	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL (dBA)	COMBINED BACKGROUND AND MODELED SOUND PRESSURE LEVEL (L_{50}, dBA)				COORDINATES (UTM NAD83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
		30 dBA Background	*35 dBA Background*	*40 dBA Background*	*45 dBA Background*	X (m)	Y (m)	
D30	50	50	50	50	51	308116	4817831	473
D31	47	47	47	48	49	313576	4817777	459
O32	42	42	42	44	47	301194	4818039	476
D33	47	47	47	48	49	314926	4817940	455
D34	49	49	49	50	51	307486	4818163	475
D35	44	45	45	46	48	321195	4818063	434
O36	43	43	44	45	47	302151	4818329	475
O37	38	39	40	42	46	300892	4818556	466
O38	50	50	50	50	51	304738	4819118	478

Appendix B

Noise Analysis for the Proposed Plum Creek Wind Farm

GERONIMO ENERGY

PLUM CREEK WIND FARM

Preliminary Noise Compliance Assessment | November 5, 2019

PREPARED FOR:
GERONIMO ENERGY, A National Grid Company

SUBMITTED BY:
RSG

IN COOPERATION WITH:
MERJENT

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NONPUBLIC DATA IN APPENDIX B HAS BEEN EXCISED

6.0 SOUND PROPAGATION MODELING

6.1 MODELING PROCEDURE

Modeling for the Project was in accordance with the standard ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The ISO standard states,

> This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level … under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation … or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night.

The model takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. The acoustical modeling software used here was CadnaA, from Datakustik GmbH. CadnaA is a widely accepted acoustical propagation modeling tool, used by many noise control professionals in the United States and internationally.

ISO 9613-2 also assumes downwind sound propagation between every source and every receiver, consequently, all wind directions, including the prevailing wind directions, are taken into account.

Model input parameters are listed in Appendix B including the modeled sound power spectra for each turbine model. Each turbine model under consideration has sound mitigation built into the turbine in the form of serrated trailing edges on the Vestas turbines (STE) or low-noise trailing edges (LNTE) on the GE turbines. The sound powers used in the model and detailed in Appendix B include this mitigation technology. In addition some of the turbines in each layout use noise reduced operations which is detailed in Appendix B.

For this analysis, we utilized a ground absorption factor of G=0.7, which is appropriate for comparing modeled results to the L_{50} metric used in the state standard, particularly when summing model results with the monitored L_{50} levels[18]. A 2-dB uncertainty factor was added to the turbine sound power per typical manufacturer warranty confidence interval specifications.

[18] Generally accepted wind turbine modeling procedure calls for a ground absorption factor of G = 0.5, with a 2 dB uncertainty factor added to the manufacturer's guaranteed levels, to predict a maximum $L_{EQ(1\text{-}hr)}$. In this case, the state limit utilizes an L_{50} metric instead of maximum $L_{EQ(1\text{-}hr)}$, which means a ground factor of G=0.7 can be used.

Two distinct receiver heights are included in the analysis; different receiver heights result in different sound levels as a result of source proximity and relative exposure. Residences are modeled as discrete receivers at 4 meters (13 feet) above ground level. A total of 461 residences were modeled throughout and around the Project area. The grid, represented in the results maps by sound pressure level contours, is calculated at a height of 1.5 meters (5 feet), to represent one's average listening height when standing outside. The sound pressure level contours represent turbine-only sound levels.

A search distance up to 10,000 meters (6.2 miles) allows for the contributions of distant turbines to be considered at receivers. The contribution of distant turbines will depend on the geometry and geography of the Project.

6.2 MODELING RESULTS

Overall A-weighted Model Results

A summary of the sound propagation model results is presented in Table 9. For each turbine model, results are presented as turbine-only sound levels from the sound propagation model, and total sound levels, which is a calculation summing (logarithmically)[19] the modeled turbine-only sound levels to the average monitored nighttime background L_{50} across all monitor locations. The highest modeled turbine-only sound level (L_{50}) at a non-participating residence is 44 dBA for the GE-127, and the average sound level (L_{50}) across all non-participating residences is 28 to 33 dBA depending on which turbine model is selected. The highest modeled turbine-only sound level at a participating residence is 46 dBA for the GE-127 and the V150, and the average sound level (L_{50}) across all participating residences is 35 to 40 dBA depending on which turbine model is selected. For all turbine models, when added with the average monitored nighttime background L_{50} across all monitor locations, 42 dBA in Table 6, the total sound level is less than 50 dBA.

Maps of model results for each turbine model are shown in Figure 33 through 35. Results are presented as contour lines representing 5-dB increments of calculated A-weighted sound pressure levels. Appendix C provides a list of the calculated sound pressure levels at each receiver in tabular format and a map showing all receiver identification numbers for reference in the appendix table.

[19] $L_{p1,2} = 10 \times \log_{10}\left(10^{L_{p1}/10} + 10^{L_{p2}/10}\right)$

TABLE 9: MODEL RESULTS SUMMARY (dBA)

TURBINE MODEL	NOISE SOURCE	STATISTICAL L_{50} METRIC	RESIDENCE CLASSIFICATION		
			All Residences	Participating Residences	Non-Participating Residences
GE-127	Turbine-Only Noise	Avg	35	40	33
		Max	46	46	44
		Min	19	23	19
	Total Sound (Background + Turbine)	Avg	43	44	43
		Max	47	47	46
		Min	42	42	42
V150	Turbine-Only Noise	Avg	31	36	29
		Max	46	46	41
		Min	13	20	13
	Total Sound (Background + Turbine)	Avg	42	43	42
		Max	48	48	44
		Min	42	42	42
V162	Turbine-Only Noise	Avg	30	35	28
		Max	45	45	40
		Min	12	19	12
	Total Sound (Background + Turbine)	Avg	42	43	42
		Max	47	47	44
		Min	42	42	42

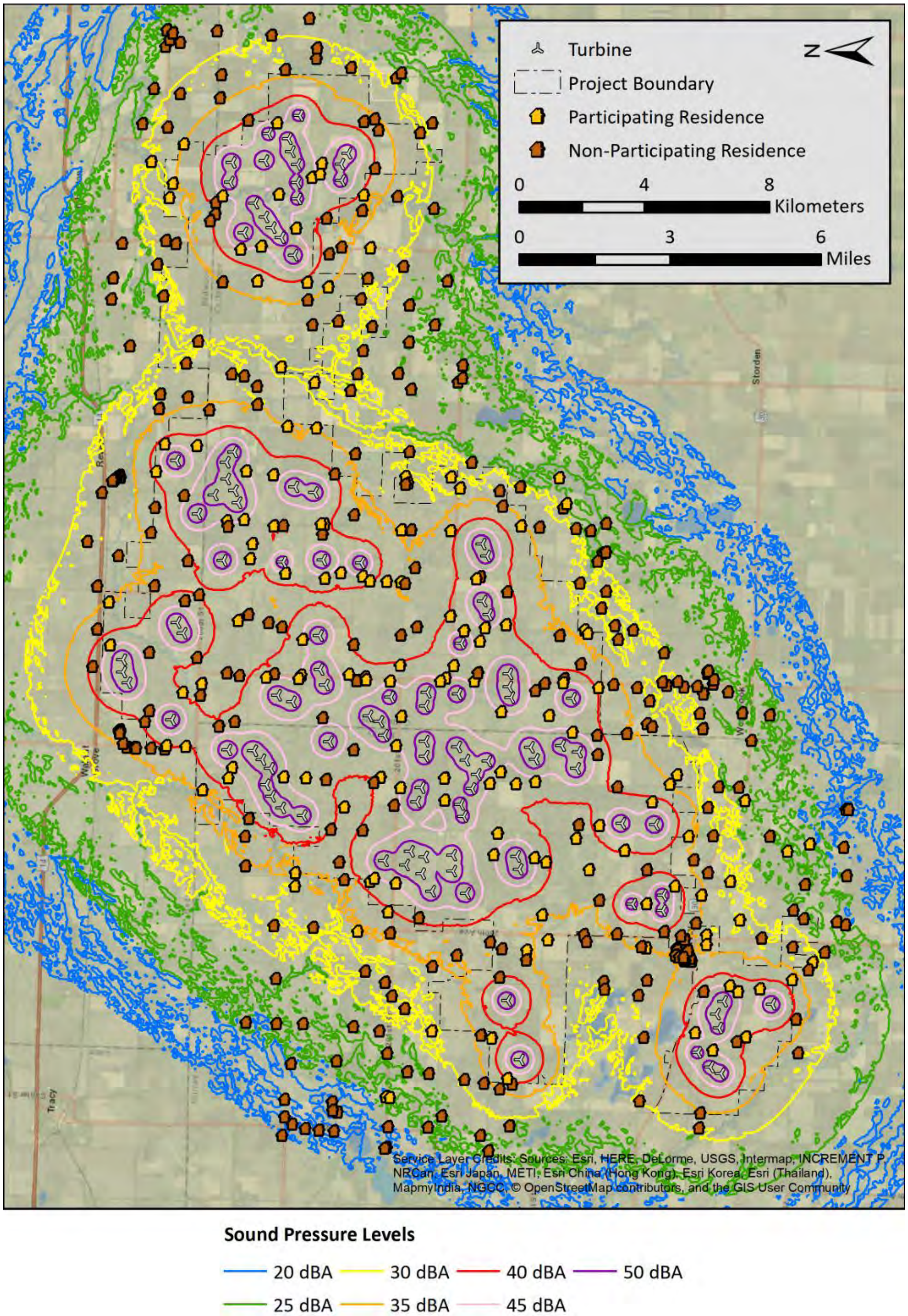


FIGURE 33: SOUND PROPAGATION MODEL RESULTS (TURBINE-ONLY SOUND LEVEL) - GE 2.8-127

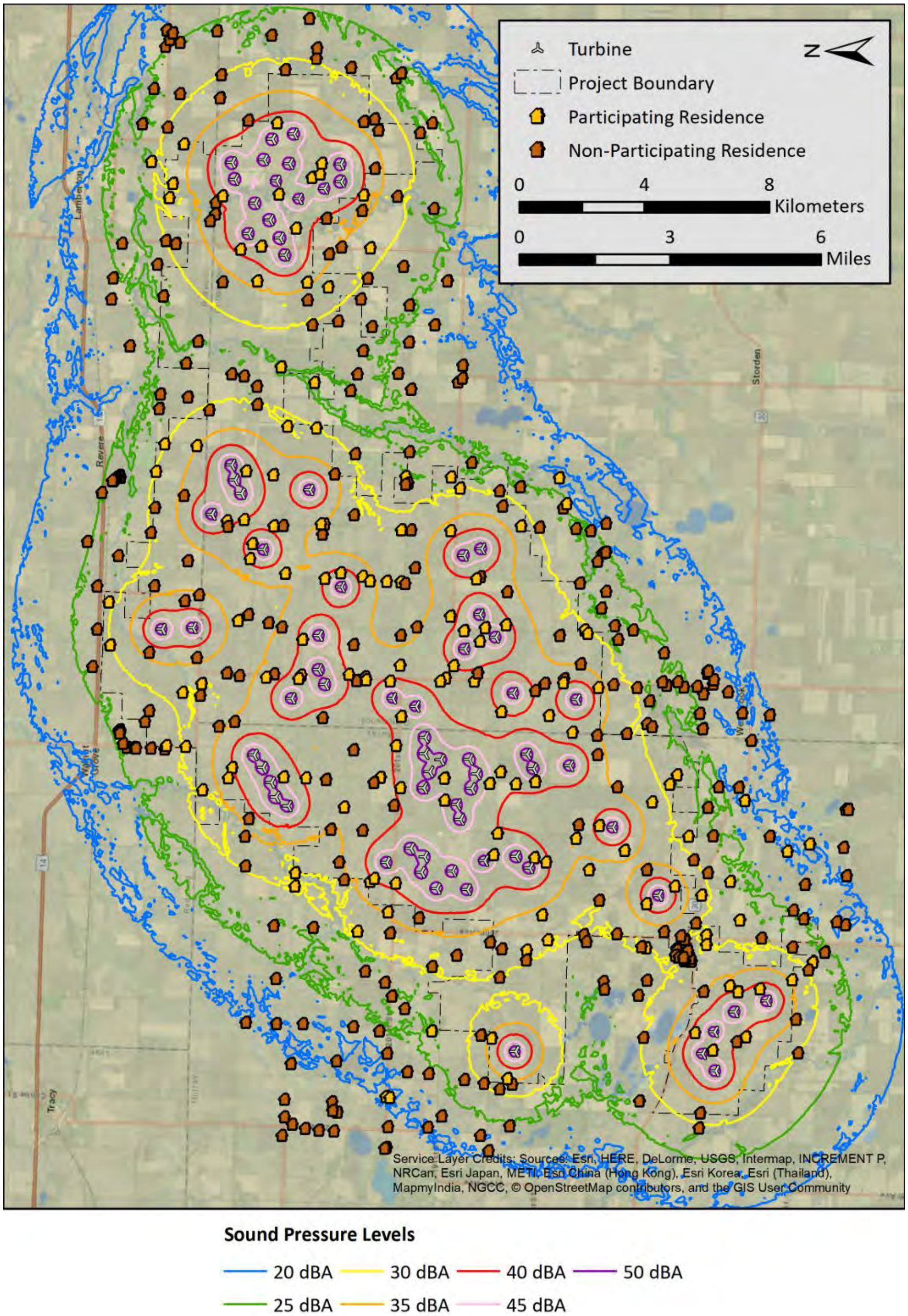
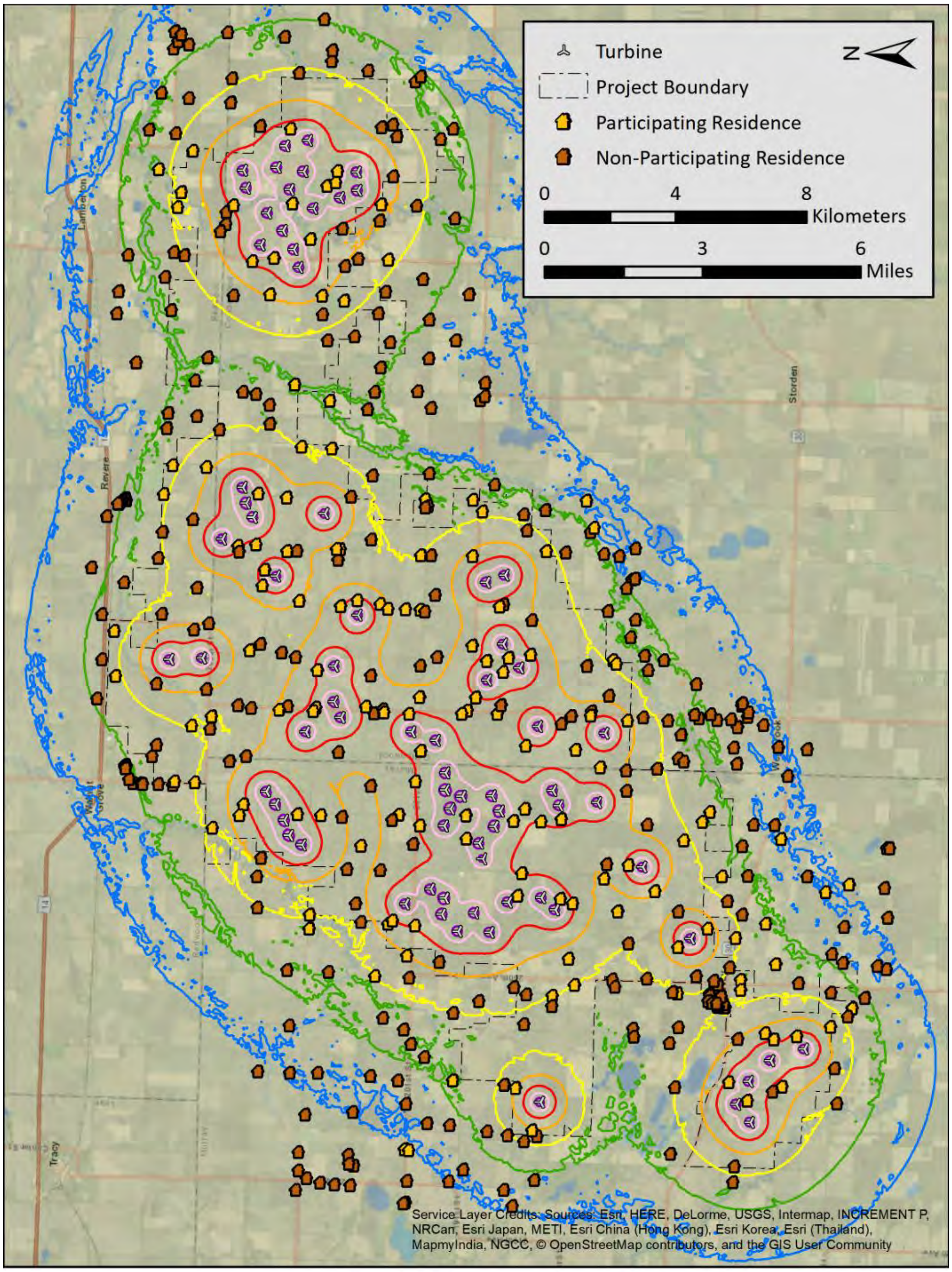


FIGURE 34: SOUND PROPAGATION MODEL RESULTS (TURBINE-ONLY SOUND LEVEL) - VESTAS V150



Sound Pressure Levels

20 dBA 30 dBA 40 dBA 50 dBA
25 dBA 35 dBA 45 dBA

FIGURE 35: SOUND PROPAGATION MODEL RESULTS (TURBINE-ONLY SOUND LEVEL) - VESTAS V162

Model Results Added to Background

To assess compliance with state noise regulations, the model results must be summed with the monitored nighttime results to determine the projected cumulative sound level that could occur when the Project is operating. An analysis of this is presented in Table 10 for each monitor location. As shown in the table, the model results summed with the overall nighttime for each background monitor location are less than 50 dBA.

TABLE 10: MODEL RESULTS (dBA) SUMMED WITH MONITORED BACKGROUND SOUND LEVELS (L_{50}, dBA)

SCENARIO	METRIC	MONITOR LOCATION				
		Monitor 1	Monitor 2	Monitor 3	Monitor 4	Monitor 5
Background Monitor Results	Overall Nighttime	39	46	39	43	43
	Maximum 1-hr Nighttime	46	51	50	61[20]	50
	Minimum 1-hr Nighttime	31	37	31	30	30
GE-127	Modeled Sound Level	41	44	42	44	44
	Summed with Overall Nighttime	43	48	44	47	47
V150	Modeled Sound Level	28	40	38	43	43
	Summed with Overall Nighttime	39	47	41	46	46
V162	Modeled Sound Level	27	39	37	43	43
	Summed with Overall Nighttime	39	47	41	46	46

The background does and will vary from hour to hour, as shown in the monitor results in Section 5.3. The average overall nighttime L_{50} across all monitor sites was 42 dBA (see Table 6), but there were some nighttime hours during the monitoring period when the L_{50} was above 45 dBA and as high as 61 dBA[20]. Thus, in Appendix C, the model results are summed with a range of potential background values ranging from 35 dBA to 50 dBA in 5 dB increments.

[20] The 61 dBA nighttime L50 was due to a social event/celebration occurring at the property where the monitoring was taking place.

7.0 CONCLUSIONS

Plum Creek Wind Farm is a proposed wind power generation facility in Cottonwood, Murray, and Redwood Counties. The Project will include up to 110 turbines for a project rating of up to 414 MW. For the SPA, RSG performed a preliminary noise compliance assessment of the Project based on the preliminary turbine layout.

Conclusions of the assessment are as follows:

1. Background sound levels vary around the Project site during the day and night. The overall nighttime L_{50} across the Project area ranged from 39 dBA at Monitors 1 and 3 to 46 dBA at Monitor 2. The average overall nighttime L_{50} across the site was 42 dBA. During the day, the overall L50 across the Project area ranged from 37 at Monitor 3 to 45 at Monitor 2 with an average overall daytime L_{50} of 41 dBA.
2. Minimum 1-hour nighttime L_{50}s were between 30 and 37 dBA across the Project area, while maximum 1-hour nighttime L_{50}s were between 46 and 61 dBA.
3. Elevated background sound levels at night were due primarily to biogenic sources such as insect sounds. When weighted to exclude insect sounds as discussed in Section 5.3, nighttime sound levels (L_{50}) are generally at least 10 dB lower.
4. State noise regulations require that wind power generation facilities show compliance with a nighttime limit of 50 dBA (L_{50}) and a daytime limit of 60 dBA (L_{50}) at residences.
5. Sound propagation modeling was performed in accordance with ISO 9613-2 at a total of 461 discrete receivers with spectral ground attenuation and a ground factor of G=0.7. These modeling parameters are meant to represent the L_{50} of the proposed facility.
6. Modeling was completed for three turbine models and two potential layouts. The GE 2.8-127 with a hub height of 89 meters was modeled with a layout of 110 turbines. The Vestas V150 and V162, with hub heights of 105 and 125 meters respectively, were each modeled with an 74 turbine layout.
7. Projected turbine-only sound levels from the Project are less than 50 dBA at all residences with the highest projected sound level (L_{50}) at a non-participating residence of 44 dBA. The average turbine-only sound level (L_{50}) across all modeled residences is 30 to 35 dBA depending on which turbine model is selected.
8. When added to the average overall nighttime L_{50} across the monitored sites, sound levels remain below 50 dBA, but the background L_{50} does and will vary from hour to hour, as shown in the monitor results.

APPENDIX B. MODEL INPUT DATA

TABLE 11: SOUND PROPAGATION MODELING PARAMETERS

PARAMETER	SETTING
Ground Absorption	Spectral for all sources, Mixed Ground (G=0.7)
Atmospheric Attenuation	Based on 10 Degrees Celsius, 70% Relative Humidity
Reflections	None
Receiver Height	4 meters for residences, 1.5 meters for grid
Search Distance	10,000 meters

[NONPUBLIC DATA HAS BEEN EXCISED...

TABLE 12: TURBINE HUB HEIGHT AND 1/1 OCTAVE BAND MODELED TURBINE SPECTRA (dBZ UNLESS OTHERWISE INDICATED)

Table 12 EXCISED due to proprietary information. The sound power level of the turbines are considered trade secret information and may be provided only under a proper protective agreement. The modeled sound power levels in Table 13 below are also excised in this document version.

TABLE 13: MODELED TURBINE SOUND POWER LEVELS & LOCATIONS[23]

TURBINE ID	TURBINE	NRO MODE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD 83 Z15N) X (m)	Y (m)
1	GE 2.8-127 LNTE			89	294206	4878187
2	GE 2.8-127 LNTE			89	294309	4879744
3	GE 2.8-127 LNTE			89	291992	4879824
4	GE 2.8-127 LNTE			89	293452	4879902
5	GE 2.8-127 LNTE			89	293899	4879983
6	GE 2.8-127 LNTE			89	292197	4880172
7	GE 2.8-127 LNTE			89	292670	4880565
8	GE 2.8-127 LNTE			89	297710	4881687
9	GE 2.8-127 LNTE			89	297205	4881698
10	GE 2.8-127 LNTE			89	299967	4881931
11	GE 2.8-127 LNTE			89	297421	4882665

[23] Maps showing the locations of the turbines by Turbine ID are provided after this Table.

TURBINE ID	TURBINE	NRO MODE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD 83 Z15N)	
					X (m)	Y (m)
12	GE 2.8-127 LNTE			89	300001	4883012
13	GE 2.8-127 LNTE			89	301760	4884454
14	GE 2.8-127 LNTE			89	302286	4884402
15	GE 2.8-127 LNTE			89	304008	4884591
16	GE 2.8-127 LNTE			89	302490	4884929
17	GE 2.8-127 LNTE			89	302442	4885940
18	GE 2.8-127 LNTE			89	302059	4885779
19	GE 2.8-127 LNTE			89	292438	4886250
20	GE 2.8-127 LNTE			89	298527	4886302
21	GE 2.8-127 LNTE			89	298942	4886381
22	GE 2.8-127 LNTE			89	304030	4886559
23	GE 2.8-127 LNTE			89	304380	4886623
24	GE 2.8-127 LNTE			89	304796	4886629
25	GE 2.8-127 LNTE			89	306691	4887275
26	GE 2.8-127 LNTE			89	302001	4887296
27	GE 2.8-127 LNTE			89	308564	4887333
28	GE 2.8-127 LNTE			89	301579	4887648
29	GE 2.8-127 LNTE			89	308950	4887482
30	GE 2.8-127 LNTE			89	297758	4887988
31	GE 2.8-127 LNTE			89	301118	4887810
32	GE 2.8-127 LNTE			89	302023	4887997
33	GE 2.8-127 LNTE			89	305764	4888158
34	GE 2.8-127 LNTE			89	300613	4888169
35	GE 2.8-127 LNTE			89	304144	4888256
36	GE 2.8-127 LNTE			89	302448	4888267
37	GE 2.8-127 LNTE			89	298481	4888418
38	GE 2.8-127 LNTE			89	298989	4888424
39	GE 2.8-127 LNTE			89	297825	4889102
40	GE 2.8-127 LNTE			89	304206	4889239
41	GE 2.8-127 LNTE			89	303755	4889291
42	GE 2.8-127 LNTE			89	302638	4889301
43	GE 2.8-127 LNTE			89	302148	4889310
44	GE 2.8-127 LNTE			89	298929	4889330
45	GE 2.8-127 LNTE			89	298400	4889419
46	GE 2.8-127 LNTE			89	301144	4889431

TURBINE ID	TURBINE	NRO MODE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD 83 Z15N)	
					X (m)	Y (m)
47	GE 2.8-127 LNTE			89	300696	4889571
48	GE 2.8-127 LNTE			89	299109	4889782
49	GE 2.8-127 LNTE			89	298671	4889933
50	GE 2.8-127 LNTE			89	304053	4890414
51	GE 2.8-127 LNTE			89	302829	4890615
52	GE 2.8-127 LNTE			89	298812	4890618
53	GE 2.8-127 LNTE			89	303263	4890753
54	GE 2.8-127 LNTE			89	303446	4891096
55	GE 2.8-127 LNTE			89	308345	4891366
56	GE 2.8-127 LNTE			89	321452	4891781
57	GE 2.8-127 LNTE			89	320590	4891989
58	GE 2.8-127 LNTE			89	321118	4892011
59	GE 2.8-127 LNTE			89	304932	4892686
60	GE 2.8-127 LNTE			89	302622	4892384
61	GE 2.8-127 LNTE			89	306024	4892697
62	GE 2.8-127 LNTE			89	304438	4892499
63	GE 2.8-127 LNTE			89	308440	4892591
64	GE 2.8-127 LNTE			89	310601	4892843
65	GE 2.8-127 LNTE			89	300254	4893222
66	GE 2.8-127 LNTE			89	320004	4893378
67	GE 2.8-127 LNTE			89	322674	4893334
68	GE 2.8-127 LNTE			89	321101	4893392
69	GE 2.8-127 LNTE			89	320522	4893406
70	GE 2.8-127 LNTE			89	310772	4893485
71	GE 2.8-127 LNTE			89	318194	4893502
72	GE 2.8-127 LNTE			89	303903	4893565
73	GE 2.8-127 LNTE			89	321514	4893593
74	GE 2.8-127 LNTE			89	321922	4893686
75	GE 2.8-127 LNTE			89	308374	4893866
76	GE 2.8-127 LNTE			89	300499	4893901
77	GE 2.8-127 LNTE			89	318754	4893924
78	GE 2.8-127 LNTE			89	304103	4894030
79	GE 2.8-127 LNTE			89	319075	4894215
80	GE 2.8-127 LNTE			89	300871	4894226
81	GE 2.8-127 LNTE			89	301771	4894258

TURBINE ID	TURBINE	NRO MODE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD 83 Z15N)	
					X (m)	Y (m)
82	GE 2.8-127 LNTE			89	322090	4894312
83	GE 2.8-127 LNTE			89	301243	4894398
84	GE 2.8-127 LNTE			89	319415	4894442
85	GE 2.8-127 LNTE			89	321229	4894445
86	GE 2.8-127 LNTE			89	302036	4894538
87	GE 2.8-127 LNTE			89	319856	4894754
88	GE 2.8-127 LNTE			89	302324	4894795
89	GE 2.8-127 LNTE			89	318913	4895121
90	GE 2.8-127 LNTE			89	310650	4895425
91	GE 2.8-127 LNTE			89	311898	4895427
92	GE 2.8-127 LNTE			89	321164	4895492
93	GE 2.8-127 LNTE			89	320541	4895555
94	GE 2.8-127 LNTE			89	302359	4895629
95	GE 2.8-127 LNTE			89	311023	4895665
96	GE 2.8-127 LNTE			89	311568	4895675
97	GE 2.8-127 LNTE			89	310519	4896063
98	GE 2.8-127 LNTE			89	306084	4897062
99	GE 2.8-127 LNTE			89	311617	4897273
100	GE 2.8-127 LNTE			89	304504	4898826
101	GE 2.8-127 LNTE			89	305249	4898991
102	GE 2.8-127 LNTE			89	304847	4899003
103	GE 2.8-127 LNTE			89	310266	4895304
104	GE 2.8-127 LNTE			89	309912	4896596
105	GE 2.8-127 LNTE			89	308426	4895781
106	GE 2.8-127 LNTE			89	306435	4897256
107	GE 2.8-127 LNTE			89	307114	4887446
108	GE 2.8-127 LNTE			89	303323	4897429
109	GE 2.8-127 LNTE			89	294330	4886670
110	GE 2.8-127 LNTE			89	300224	4888077
1	V162 STE			125	294318	4878345
2	V162 STE			125	293968	4879379
3	V162 STE			125	292079	4879996
4	V162 STE			125	293336	4880040
5	V162 STE			125	292634	4880420
6	V162 STE			125	297697	4881809

TURBINE ID	TURBINE	NRO MODE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD 83 Z15N)	
					X (m)	Y (m)
7	V162 STE			125	299875	4883282
8	V162 STE			125	303967	4884442
10	V162 STE			125	301855	4884664
11	V162 STE			125	302221	4886032
12	V162 STE			125	301756	4885826
13	V162 STE			125	298571	4885956
14	V162 STE			125	298942	4886381
15	V162 STE			125	292699	4886411
16	V162 STE			125	304173	4886468
18	V162 STE			125	305963	4887034
19	V162 STE			125	298812	4887402
20	V162 STE			125	308797	4887495
21	V162 STE			125	306687	4887547
22	V162 STE			125	301587	4887647
23	V162 STE			125	301118	4887810
24	V162 STE			125	302061	4887879
25	V162 STE			125	297882	4887951
26	V162 STE			125	305588	4888029
27	V162 STE			125	308584	4888064
28	V162 STE			125	300604	4888284
29	V162 STE			125	298478	4888421
30	V162 STE			125	302045	4888801
31	V162 STE			125	297918	4888929
32	V162 STE			125	301658	4889155
33	V162 STE			125	302762	4889305
34	V162 STE			125	302229	4889315
35	V162 STE			125	298929	4889330
36	V162 STE			125	301137	4889348
37	V162 STE			125	298430	4889416
38	V162 STE			125	303753	4889605
40	V162 STE			125	299202	4889759
41	V162 STE			125	304015	4890343
42	V162 STE			125	298751	4890532
44	V162 STE			125	307570	4891973
45	V162 STE			125	320544	4891990

TURBINE ID	TURBINE	NRO MODE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD 83 Z15N)	
					X (m)	Y (m)
46	V162 STE			125	321118	4892011
47	V162 STE			125	306024	4892697
48	V162 STE			125	304443	4892500
49	V162 STE			125	320324	4892526
50	V162 STE			125	304932	4892707
52	V162 STE			125	310680	4892993
54	V162 STE			125	320003	4893338
55	V162 STE			125	322082	4893495
56	V162 STE			125	304008	4893576
57	V162 STE			125	321134	4893642
59	V162 STE			125	300549	4893692
60	V162 STE			125	318189	4893775
61	V162 STE			125	318746	4893941
63	V162 STE			125	300843	4894091
64	V162 STE			125	320571	4894059
65	V162 STE			125	321911	4894192
66	V162 STE			125	301310	4894232
67	V162 STE			125	319321	4894272
68	V162 STE			125	321252	4894462
69	V162 STE			125	308765	4894469
70	V162 STE			125	301789	4894495
71	V162 STE			125	319860	4894745
72	V162 STE			125	302188	4894781
73	V162 STE			125	318882	4894958
74	V162 STE			125	320619	4895388
75	V162 STE			125	310556	4895181
77	V162 STE			125	310995	4895399
78	V162 STE			125	321164	4895492
79	V162 STE			125	311479	4895505
80	V162 STE			125	309903	4896130
81	V162 STE			125	306266	4896745
82	V162 STE			125	306220	4897736
83	V162 STE			125	300133	4888168
1	V150 STE			105	294318	4878345
2	V150 STE			105	293968	4879379

TURBINE ID	TURBINE	NRO MODE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD 83 Z15N)	
					X (m)	Y (m)
3	V150 STE			105	292079	4879996
4	V150 STE			105	293336	4880040
5	V150 STE			105	292634	4880420
6	V150 STE			105	297697	4881809
7	V150 STE			105	299875	4883282
8	V150 STE			105	303967	4884442
10	V150 STE			105	301855	4884664
11	V150 STE			105	302221	4886032
12	V150 STE			105	301756	4885826
13	V150 STE			105	298571	4885956
14	V150 STE			105	298942	4886381
15	V150 STE			105	292699	4886411
16	V150 STE			105	304173	4886468
18	V150 STE			105	305963	4887034
19	V150 STE			105	298812	4887402
20	V150 STE			105	308797	4887495
21	V150 STE			105	306687	4887547
22	V150 STE			105	301587	4887647
23	V150 STE			105	301118	4887810
24	V150 STE			105	302061	4887879
25	V150 STE			105	297882	4887951
26	V150 STE			105	305588	4888029
27	V150 STE			105	308584	4888064
28	V150 STE			105	300604	4888284
29	V150 STE			105	298478	4888421
30	V150 STE			105	302045	4888801
31	V150 STE			105	297918	4888929
32	V150 STE			105	301658	4889155
33	V150 STE			105	302762	4889305
34	V150 STE			105	302229	4889315
35	V150 STE			105	298929	4889330
36	V150 STE			105	301137	4889348
37	V150 STE			105	298430	4889416
38	V150 STE			105	303753	4889605
40	V150 STE			105	299202	4889759

TURBINE ID	TURBINE	NRO MODE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD 83 Z15N)	
					X (m)	Y (m)
41	V150 STE			105	304015	4890343
42	V150 STE			105	298751	4890532
44	V150 STE			105	307570	4891973
45	V150 STE			105	320544	4891990
46	V150 STE			105	321118	4892011
47	V150 STE			105	306024	4892697
48	V150 STE			105	304443	4892500
49	V150 STE			105	320324	4892526
50	V150 STE			105	304932	4892707
52	V150 STE			105	310680	4892993
54	V150 STE			105	320003	4893338
55	V150 STE			105	322082	4893495
56	V150 STE			105	304008	4893576
57	V150 STE			105	321134	4893642
59	V150 STE			105	300549	4893692
60	V150 STE			105	318189	4893775
61	V150 STE			105	318746	4893941
63	V150 STE			105	300843	4894091
64	V150 STE			105	320571	4894059
65	V150 STE			105	321911	4894192
66	V150 STE			105	301310	4894232
67	V150 STE			105	319321	4894272
68	V150 STE			105	321252	4894462
69	V150 STE			105	308765	4894469
70	V150 STE			105	301789	4894495
71	V150 STE			105	319860	4894745
72	V150 STE			105	302188	4894781
73	V150 STE			105	318882	4894958
74	V150 STE			105	320619	4895388
75	V150 STE			105	310556	4895181
77	V150 STE			105	310995	4895399
78	V150 STE			105	321164	4895492
79	V150 STE			105	311479	4895505
80	V150 STE			105	309903	4896130
81	V150 STE			105	306266	4896745

TURBINE ID	TURBINE	NRO MODE	MODELED SOUND POWER LEVEL (dBA)	HUB HEIGHT (m)	COORDINATES (UTM NAD 83 Z15N)	
					X (m)	Y (m)
82	V150 STE			105	306220	4897736
83	V150 STE			105	300133	4888168

...NONPUBLIC DATA HAS BEEN EXCISED]

TABLE 14: MODELED RECEIVER COORDINATES

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N) X(m)	Y (m)	ELEVATION + RECEIVER HEIGHT (m)
1	302440	4898831	381
2	302434	4898600	382
3	302410	4898539	383
4	302410	4898068	387
5	303263	4898256	382
6	302569	4898952	379
7	302991	4899049	376
8	302935	4899048	376
9	302993	4899080	376
10	302938	4899080	376
11	302889	4899071	376
12	303607	4898119	383
13	305486	4898110	370
14	305709	4899371	362
15	305029	4899934	363
16	306229	4899784	360
17	307085	4899404	359
18	307602	4899778	359
19	308573	4899106	355
20	309321	4898056	362
21	310114	4897936	365
22	310503	4896999	367
23	311268	4897890	364
24	312160	4897614	362
25	312103	4896593	365
26	313241	4896184	365
27	313653	4896880	360
28	313286	4897805	359
29	313755	4897756	355
30	315290	4898733	355
31	316889	4897657	352
32	316794	4899329	352
33	317467	4899274	356
34	318580	4898982	350
35	317909	4897852	352
36	320044	4897476	348
37	320488	4897361	350
38	321192	4898051	347
39	321755	4897005	352
40	322294	4897529	350
41	323375	4897131	351
42	323532	4897971	347
43	322408	4898331	342
44	324880	4897592	348
45	325401	4897546	347
46	325107	4897456	346
47	325309	4897354	348
48	325381	4895945	351
49	323979	4895800	353
50	323227	4895846	354
51	319512	4895997	350
52	319882	4895985	352
53	318665	4897583	354
54	318571	4897256	354
55	318392	4895181	358
56	317339	4895765	355
57	314740	4896929	357
58	315441	4896547	355
59	314397	4895470	364
60	311292	4895001	375
61	309727	4895074	375
62	309691	4895631	375
63	309516	4895594	374
64	308968	4894821	380
65	308479	4894880	379
66	308415	4896879	371
67	307332	4896515	375

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N) X(m)	Y (m)	ELEVATION + RECEIVER HEIGHT (m)
68	307616	4897952	366
69	307129	4896978	371
70	305314	4896593	380
71	304105	4896480	385
72	304473	4896440	383
73	304206	4897040	382
74	302391	4897623	390
75	302489	4897566	390
76	302467	4896951	391
77	301787	4895466	406
78	301465	4895588	408
79	301488	4893806	418
80	301469	4893094	423
81	301409	4892442	424
82	300524	4891872	430
83	299816	4892289	429
84	300155	4894922	407
85	299782	4891280	439
86	300578	4890267	437
87	301479	4890717	435
88	301316	4890916	433
89	302494	4890211	431
90	301148	4890065	438
91	303429	4890039	428
92	304563	4890401	424
93	304577	4891475	419
94	304698	4891201	419
95	304602	4891163	419
96	304777	4891721	417
97	302364	4891566	426
98	303389	4892554	417
99	304750	4893244	407
100	304645	4893333	407
101	304787	4894112	400
102	304688	4894375	398

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N) X(m)	Y (m)	ELEVATION + RECEIVER HEIGHT (m)
103	304824	4895632	390
104	304736	4895223	393
105	303116	4895888	391
106	303259	4895373	394
107	305729	4891565	413
108	305898	4893203	398
109	306437	4894291	393
110	306286	4893869	394
111	306691	4894942	386
112	306493	4895268	382
113	308018	4893754	388
114	307842	4892489	395
115	308030	4891978	400
116	307920	4891279	405
117	307763	4891048	408
118	307749	4890507	411
119	307740	4890046	415
120	307680	4889909	417
121	308195	4889597	417
122	309261	4892567	392
123	309578	4892507	388
124	309591	4892613	388
125	309534	4893820	382
126	309523	4894130	380
127	309883	4891551	397
128	311188	4892176	381
129	311835	4891505	387
130	312659	4892764	376
131	311165	4894146	376
132	312724	4893680	374
133	313418	4894654	370
134	314000	4894665	371
135	314335	4895070	366
136	317374	4894651	357
137	318490	4894518	358

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
	X(m)	Y (m)	
138	319300	4896162	353
139	319057	4893415	360
140	320098	4895767	352
141	322522	4894937	355
142	322432	4894021	355
143	325012	4897124	348
144	314615	4893885	368
145	314125	4892813	374
146	315963	4892890	368
147	316091	4892068	374
148	316760	4893037	368
149	317329	4893046	367
150	317173	4892383	372
151	318240	4892349	369
152	318463	4891955	370
153	318428	4891036	372
154	317450	4891118	374
155	317839	4889972	379
156	316601	4889775	388
157	315906	4890969	378
158	316792	4891336	376
159	315139	4891258	380
160	314401	4891442	380
161	313855	4891664	382
162	315970	4888971	391
163	315422	4889795	383
164	314406	4890141	390
165	314138	4888222	397
166	314253	4888085	396
167	314675	4888072	396
168	313897	4889718	390
169	311913	4889779	392
170	311105	4889903	397
171	310907	4889813	401
172	310867	4889907	401

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
	X(m)	Y (m)	
173	311094	4888449	405
174	310737	4888155	409
175	311557	4887777	400
176	310774	4886232	417
177	310659	4886894	413
178	310154	4886791	415
179	311074	4884972	408
180	310109	4884845	425
181	310239	4884745	424
182	309440	4884436	425
183	309489	4885610	427
184	309523	4886206	423
185	309603	4883480	425
186	309375	4883975	412
187	308656	4883585	428
188	308396	4883744	428
189	308687	4883487	428
190	307699	4884311	427
191	307441	4883475	429
192	306902	4883620	428
193	306336	4883196	435
194	305898	4883087	433
195	306192	4882604	431
196	305466	4881612	441
197	309373	4888459	414
198	309397	4889720	408
199	309397	4890037	406
200	307908	4887500	427
201	307839	4887630	427
202	307426	4886633	432
203	306366	4886685	432
204	306265	4887354	432
205	305837	4887518	433
206	306171	4888030	432
207	305053	4888360	434

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
	X(m)	Y (m)	
208	304662	4888619	433
209	304563	4888793	432
210	304555	4887703	433
211	304822	4887585	432
212	303588	4886835	435
213	301649	4886866	439
214	301288	4887203	438
215	301276	4886371	440
216	301342	4885743	444
217	299523	4884438	447
218	299957	4884360	447
219	299682	4886958	444
220	300754	4888643	438
221	301445	4888665	435
222	304492	4885437	429
223	304253	4885748	433
224	304623	4884826	433
225	304499	4884845	434
226	305112	4884283	434
227	304353	4883725	441
228	304444	4883240	433
229	304356	4882484	437
230	302829	4883767	442
231	302882	4882812	438
232	303201	4882162	438
233	303103	4882008	441
234	303920	4882082	435
235	304422	4881532	437
236	304528	4881679	435
237	301564	4881199	441
238	301254	4881443	446
239	299607	4880051	444
240	299598	4880835	438
241	300686	4882004	447
242	301168	4883123	449

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
	X(m)	Y (m)	
243	302208	4883746	443
244	302916	4884561	439
245	303460	4885312	438
246	306021	4884959	429
247	306197	4884156	429
248	306090	4884064	430
249	306631	4888472	428
250	306288	4889543	423
251	306037	4890049	423
252	305062	4890086	424
253	298424	4893434	407
254	298512	4884026	449
255	299933	4883698	449
256	299134	4882883	445
257	297541	4883702	448
258	296436	4884193	448
259	296213	4884106	452
260	297075	4885531	452
261	296279	4885349	451
262	295949	4886025	453
263	295991	4886821	449
264	296212	4887189	444
265	296971	4889470	451
266	296499	4890396	448
267	297162	4890469	442
268	296552	4891448	438
269	296672	4892865	443
270	298000	4893446	423
271	298199	4891867	438
272	298148	4891041	438
273	298237	4890899	437
274	298761	4892031	439
275	298085	4890223	439
276	296466	4883131	459
277	296541	4881622	462

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N) X(m)	COORDINATES (UTM NAD 83 Z15N) Y (m)	ELEVATION + RECEIVER HEIGHT (m)
278	296290	4880956	465
279	296398	4881086	466
280	295886	4881211	466
281	296003	4881212	465
282	296810	4880595	468
283	296427	4880265	475
284	296130	4880273	471
285	297701	4880422	456
286	297993	4881280	453
287	297432	4882178	453
288	298520	4882167	443
289	298829	4880667	451
290	298426	4880214	452
291	298767	4885402	447
292	298902	4885776	451
293	299001	4887076	448
294	299590	4895047	413
295	298643	4895038	424
296	295420	4889048	448
297	295783	4888265	447
298	295629	4886034	461
299	296019	4882191	459
300	296054	4882340	459
301	300511	4880208	442
302	301172	4879873	448
303	301158	4879218	439
304	302662	4878821	444
305	303544	4879111	437
306	303028	4880384	440
307	303524	4880479	441
308	304152	4880363	441
309	304392	4880555	442
310	304365	4880978	440
311	304540	4881184	442
312	304801	4880223	442

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N) X(m)	COORDINATES (UTM NAD 83 Z15N) Y (m)	ELEVATION + RECEIVER HEIGHT (m)
313	304893	4880211	442
314	304875	4880203	442
315	304458	4880046	442
316	304595	4880027	442
317	304215	4879572	440
318	303476	4878235	442
319	320154	4893962	356
320	320681	4892907	360
321	320794	4892643	360
322	321147	4892580	358
323	319375	4892433	364
324	319627	4891295	366
325	320122	4891247	374
326	320971	4890880	374
327	320080	4890163	373
328	319697	4888987	383
329	317368	4888570	386
330	301074	4896416	395
331	296734	4894119	431
332	295033	4894051	441
333	293638	4895016	440
334	293591	4894038	446
335	292315	4893575	445
336	291174	4893786	450
337	290378	4893537	456
338	290231	4893127	456
339	290602	4893783	457
340	290017	4893869	461
341	290179	4892686	456
342	290153	4892196	461
343	290761	4892086	458
344	291091	4892258	450
345	290810	4892239	455
346	292400	4892119	457
347	293591	4893187	442

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N) X(m)	Y (m)	ELEVATION + RECEIVER HEIGHT (m)
348	295273	4891191	444
349	293490	4891579	455
350	294914	4890560	448
351	294475	4890336	454
352	293355	4890737	460
353	292641	4890487	460
354	291246	4890532	455
355	291230	4890414	456
356	290290	4890466	469
357	289627	4890515	466
358	289608	4890582	467
359	290271	4889187	468
360	290011	4887500	474
361	289512	4887252	471
362	290315	4886569	469
363	291648	4886488	479
364	291825	4886638	478
365	291503	4886894	473
366	291675	4887391	467
367	291799	4888012	469
368	291990	4889164	467
369	290632	4888748	466
370	292052	4889840	465
371	293353	4889057	460
372	294068	4889931	450
373	293219	4887500	478
374	293120	4887152	477
375	295080	4886893	454
376	294943	4883554	468
377	294689	4883523	470
378	294494	4882448	467
379	294981	4882162	468
380	295596	4880736	473
381	293146	4882280	464
382	291118	4882412	482

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N) X(m)	Y (m)	ELEVATION + RECEIVER HEIGHT (m)
383	290244	4880506	462
384	290735	4880458	465
385	293170	4879002	482
386	293020	4879293	482
387	292743	4880064	482
388	293301	4880632	474
389	294624	4880352	462
390	294798	4879518	468
391	294604	4879244	473
392	294704	4878550	474
393	294996	4877510	471
394	296046	4877497	476
395	296328	4878491	468
396	296903	4879190	468
397	293731	4877392	459
398	292652	4877320	455
399	295559	4876854	472
400	295312	4876988	468
401	295879	4876470	472
402	296755	4875816	462
403	296860	4876092	475
404	298324	4875771	479
405	299227	4875871	468
406	300456	4875798	452
407	300441	4875720	453
408	298142	4879496	456
409	300728	4879025	442
410	299591	4878225	450
411	299116	4877671	459
412	299340	4876952	461
413	298047	4877108	470
414	297228	4877478	471
415	296951	4877144	477
416	295720	4881173	465
417	295777	4881187	466

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
	X(m)	Y (m)	
418	295845	4881210	467
419	295844	4881182	467
420	295840	4881163	467
421	295946	4881204	465
422	295778	4881256	465
423	295722	4881136	465
424	295600	4880808	473
425	295598	4880827	473
426	295600	4880855	471
427	295601	4880885	470
428	295647	4880889	470
429	295651	4880930	470
430	295647	4880773	471
431	295590	4880771	474
432	295685	4880774	470
433	295880	4880943	465
434	295918	4880862	463
435	295608	4880969	467
436	295607	4880944	467
437	295649	4880980	469
438	295707	4880992	469
439	311154	4899063	353

RECEIVER ID	COORDINATES (UTM NAD 83 Z15N)		ELEVATION + RECEIVER HEIGHT (m)
	X(m)	Y (m)	
440	311084	4899038	353
441	311085	4899067	353
442	311094	4899148	353
443	311086	4899178	353
444	311028	4899235	353
445	310969	4899266	353
446	310982	4899306	353
447	310603	4899627	354
448	309031	4900100	354
449	322551	4890896	372
450	322478	4891236	367
451	322205	4890762	374
452	324146	4893748	354
453	325243	4894199	352
454	324499	4892766	354
455	324832	4892729	355
456	325775	4892983	354
457	324215	4891646	360
458	322116	4889430	375
459	323874	4890208	371
460	324031	4890035	367
461	322437	4889055	377

TABLE 15: MODEL RESULTS FOR EACH RECEIVER, WITH AND WITHOUT BACKGROUND SOUND LEVELS (L_{50}, dBA)

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
1	36	38	41	45	50	26	35	40	45	50	25	35	40	45	50
2	36	39	41	46	50	26	36	40	45	50	25	35	40	45	50
3	36	39	42	46	50	26	36	40	45	50	25	35	40	45	50
4	38	40	42	46	50	27	36	40	45	50	26	36	40	45	50
5	41	42	43	46	50	27	36	40	45	50	27	36	40	45	50
6	36	38	41	45	50	26	35	40	45	50	25	35	40	45	50
7	37	39	42	46	50	26	35	40	45	50	25	35	40	45	50
8	37	39	42	46	50	26	35	40	45	50	25	35	40	45	50
9	37	39	42	46	50	26	35	40	45	50	25	35	40	45	50
10	37	39	42	46	50	26	35	40	45	50	25	35	40	45	50
11	37	39	42	46	50	26	35	40	45	50	25	35	40	45	50
12	42	43	44	47	51	28	36	40	45	50	27	36	40	45	50
13	43	43	45	47	51	37	39	42	46	50	36	39	41	46	50
14	44	45	46	48	51	30	36	40	45	50	29	36	40	45	50
15	41	42	44	47	51	27	36	40	45	50	26	35	40	45	50
16	38	39	42	46	50	28	36	40	45	50	27	36	40	45	50
17	35	38	41	45	50	29	36	40	45	50	28	36	40	45	50
18	33	37	41	45	50	27	36	40	45	50	26	36	40	45	50
19	32	37	41	45	50	27	36	40	45	50	26	36	40	45	50
20	36	39	41	46	50	30	36	40	45	50	29	36	40	45	50
21	38	40	42	46	50	31	36	41	45	50	30	36	40	45	50
22	44	44	45	47	51	36	39	42	46	50	35	38	41	45	50
23	42	42	44	47	51	30	36	40	45	50	29	36	40	45	50
24	42	43	44	47	51	30	36	40	45	50	29	36	40	45	50
25	42	43	44	47	51	35	38	41	45	50	34	37	41	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
26	36	39	41	46	50	31	36	40	45	50	30	36	40	45	50
27	34	37	41	45	50	28	36	40	45	50	27	36	40	45	50
28	33	37	41	45	50	27	36	40	45	50	26	36	40	45	50
29	32	37	41	45	50	26	36	40	45	50	25	35	40	45	50
30	29	36	40	45	50	24	35	40	45	50	23	35	40	45	50
31	29	36	40	45	50	27	36	40	45	50	26	35	40	45	50
32	27	36	40	45	50	24	35	40	45	50	23	35	40	45	50
33	28	36	40	45	50	25	35	40	45	50	24	35	40	45	50
34	29	36	40	45	50	26	36	40	45	50	25	35	40	45	50
35	30	36	40	45	50	28	36	40	45	50	27	36	40	45	50
36	34	37	41	45	50	32	37	41	45	50	31	36	41	45	50
37	34	38	41	45	50	33	37	41	45	50	32	37	41	45	50
38	32	37	41	45	50	30	36	40	45	50	29	36	40	45	50
39	35	38	41	45	50	33	37	41	45	50	32	37	41	45	50
40	32	37	41	45	50	30	36	40	45	50	29	36	40	45	50
41	31	36	40	45	50	29	36	40	45	50	28	36	40	45	50
42	27	36	40	45	50	26	35	40	45	50	25	35	40	45	50
43	29	36	40	45	50	27	36	40	45	50	27	36	40	45	50
44	27	36	40	45	50	25	35	40	45	50	24	35	40	45	50
45	27	36	40	45	50	24	35	40	45	50	23	35	40	45	50
46	27	36	40	45	50	25	35	40	45	50	24	35	40	45	50
47	27	36	40	45	50	24	35	40	45	50	23	35	40	45	50
48	28	36	40	45	50	26	36	40	45	50	25	35	40	45	50
49	32	37	41	45	50	30	36	40	45	50	29	36	40	45	50
50	34	38	41	45	50	33	37	41	45	50	32	37	41	45	50
51	41	42	43	46	50	38	40	42	46	50	38	39	42	46	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
52	42	42	44	47	51	39	41	43	46	50	38	40	42	46	50
53	32	37	41	45	50	30	36	40	45	50	29	36	40	45	50
54	33	37	41	45	50	31	36	41	45	50	30	36	40	45	50
55	45	45	46	48	51	42	43	44	47	51	41	42	44	46	51
56	35	38	41	45	50	33	37	41	45	50	32	37	41	45	50
57	30	36	40	45	50	26	36	40	45	50	25	35	40	45	50
58	31	36	41	45	50	27	36	40	45	50	26	36	40	45	50
59	33	37	41	45	50	28	36	40	45	50	27	36	40	45	50
60	46	46	47	48	51	45	45	46	48	51	44	44	45	47	51
61	45	45	46	48	51	40	41	43	46	50	39	40	43	46	50
62	45	46	46	48	51	42	43	44	47	51	41	42	44	46	51
63	44	44	45	47	51	41	42	43	46	50	40	41	43	46	50
64	41	42	43	46	50	43	44	45	47	51	42	43	44	47	51
65	41	42	44	46	51	41	42	44	47	51	40	42	43	46	50
66	39	41	43	46	50	33	37	41	45	50	32	37	41	45	50
67	40	41	43	46	50	36	38	41	45	50	35	38	41	45	50
68	38	39	42	46	50	33	37	41	45	50	32	37	41	45	50
69	42	43	44	47	51	37	39	42	46	50	36	39	42	46	50
70	41	42	43	46	50	36	39	42	46	50	35	38	41	45	50
71	39	40	42	46	50	31	37	41	45	50	31	36	40	45	50
72	38	40	42	46	50	32	37	41	45	50	31	37	41	45	50
73	40	41	43	46	50	31	37	41	45	50	30	36	40	45	50
74	39	41	43	46	50	29	36	40	45	50	28	36	40	45	50
75	40	41	43	46	50	29	36	40	45	50	28	36	40	45	50
76	40	41	43	46	50	31	36	40	45	50	30	36	40	45	50
77	45	46	46	48	51	40	41	43	46	50	39	40	42	46	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
78	42	43	44	47	51	38	40	42	46	50	37	39	42	46	50
79	46	46	47	48	51	45	45	46	48	51	44	44	45	47	51
80	42	43	44	47	51	39	40	43	46	50	38	40	42	46	50
81	41	42	43	46	50	36	39	42	46	50	35	38	41	45	50
82	40	41	43	46	50	35	38	41	45	50	34	38	41	45	50
83	40	41	43	46	50	35	38	41	45	50	34	38	41	45	50
84	41	42	43	46	50	38	40	42	46	50	37	39	42	46	50
85	41	42	43	46	50	37	39	42	46	50	36	38	41	46	50
86	43	44	45	47	51	39	41	43	46	50	38	40	42	46	50
87	41	42	43	46	51	38	40	42	46	50	37	39	42	46	50
88	40	41	43	46	50	37	39	42	46	50	36	39	41	46	50
89	45	46	47	48	51	41	42	43	46	50	40	41	43	46	50
90	45	45	46	48	51	41	42	44	47	51	40	42	43	46	50
91	46	46	47	48	51	43	44	45	47	51	43	43	45	47	51
92	44	45	45	48	51	41	42	43	46	51	41	42	43	46	50
93	42	43	44	47	51	38	40	42	46	50	38	40	42	46	50
94	42	42	44	47	51	38	40	42	46	50	37	39	42	46	50
95	42	43	44	47	51	38	40	42	46	50	37	39	42	46	50
96	43	43	45	47	51	40	41	43	46	50	39	40	42	46	50
97	43	44	45	47	51	36	38	41	45	50	35	38	41	45	50
98	44	44	45	47	51	38	40	42	46	50	37	39	42	46	50
99	45	46	47	48	51	43	44	45	47	51	42	43	44	47	51
100	45	46	46	48	51	42	43	44	47	51	42	42	44	47	51
101	43	44	45	47	51	38	40	42	46	50	37	39	42	46	50
102	43	44	45	47	51	37	39	42	46	50	36	38	41	45	50
103	38	40	42	46	50	33	37	41	45	50	32	37	41	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
104	39	40	42	46	50	34	37	41	45	50	33	37	41	45	50
105	42	43	44	47	51	34	38	41	45	50	33	37	41	45	50
106	42	43	44	47	51	36	38	41	45	50	35	38	41	45	50
107	40	41	43	46	50	37	39	42	46	50	36	39	42	46	50
108	45	45	46	48	51	42	43	44	47	51	41	42	43	46	51
109	38	40	42	46	50	34	38	41	45	50	33	37	41	45	50
110	39	40	42	46	50	36	38	41	45	50	35	38	41	45	50
111	37	39	42	46	50	33	37	41	45	50	33	37	41	45	50
112	37	39	42	46	50	34	37	41	45	50	33	37	41	45	50
113	44	45	46	48	51	36	39	41	46	50	35	38	41	45	50
114	43	44	45	47	51	40	41	43	46	50	39	41	43	46	50
115	43	44	45	47	51	42	43	44	47	51	41	42	44	46	51
116	44	45	46	48	51	38	40	42	46	50	37	39	42	46	50
117	41	42	43	46	50	36	39	41	46	50	35	38	41	45	50
118	37	39	42	46	50	33	37	41	45	50	32	37	41	45	50
119	36	39	41	46	50	33	37	41	45	50	32	37	41	45	50
120	36	39	42	46	50	33	37	41	45	50	32	37	41	45	50
121	36	39	41	46	50	34	37	41	45	50	33	37	41	45	50
122	41	42	44	47	51	34	38	41	45	50	33	37	41	45	50
123	40	42	43	46	50	35	38	41	45	50	34	37	41	45	50
124	41	42	43	46	50	35	38	41	45	50	34	38	41	45	50
125	40	41	43	46	50	37	39	42	46	50	36	39	42	46	50
126	40	42	43	46	50	38	40	42	46	50	37	39	42	46	50
127	37	39	42	46	50	32	37	41	45	50	31	36	41	45	50
128	40	41	43	46	50	35	38	41	45	50	34	38	41	45	50
129	34	38	41	45	50	30	36	40	45	50	29	36	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
130	34	38	41	45	50	30	36	40	45	50	29	36	40	45	50
131	43	43	45	47	51	38	40	42	46	50	37	39	42	46	50
132	35	38	41	45	50	31	37	41	45	50	30	36	40	45	50
133	34	38	41	45	50	30	36	40	45	50	29	36	40	45	50
134	33	37	41	45	50	29	36	40	45	50	28	36	40	45	50
135	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
136	38	40	42	46	50	36	39	42	46	50	36	38	41	45	50
137	46	46	47	48	51	44	45	46	48	51	43	44	45	47	51
138	40	41	43	46	50	37	39	42	46	50	36	39	42	46	50
139	45	45	46	48	51	43	44	45	47	51	42	43	44	47	51
140	45	45	46	48	51	42	43	44	47	51	41	42	43	46	50
141	41	42	43	46	50	39	40	42	46	50	38	40	42	46	50
142	45	46	46	48	51	43	44	45	47	51	42	43	44	47	51
143	28	36	40	45	50	25	35	40	45	50	24	35	40	45	50
144	31	37	41	45	50	28	36	40	45	50	27	36	40	45	50
145	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
146	32	37	41	45	50	30	36	40	45	50	29	36	40	45	50
147	32	37	41	45	50	29	36	40	45	50	28	36	40	45	50
148	35	38	41	45	50	33	37	41	45	50	32	37	41	45	50
149	39	40	42	46	50	36	38	41	45	50	35	38	41	45	50
150	35	38	41	45	50	33	37	41	45	50	32	37	41	45	50
151	38	40	42	46	50	36	38	41	45	50	35	38	41	45	50
152	36	39	42	46	50	35	38	41	45	50	34	38	41	45	50
153	33	37	41	45	50	32	37	41	45	50	31	36	41	45	50
154	32	37	41	45	50	30	36	40	45	50	29	36	40	45	50
155	29	36	40	45	50	27	36	40	45	50	27	36	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
156	29	36	40	45	50	26	35	40	45	50	25	35	40	45	50
157	30	36	40	45	50	27	36	40	45	50	26	36	40	45	50
158	31	37	41	45	50	29	36	40	45	50	28	36	40	45	50
159	30	36	40	45	50	26	36	40	45	50	25	35	40	45	50
160	30	36	40	45	50	26	36	40	45	50	25	35	40	45	50
161	31	36	41	45	50	27	36	40	45	50	26	35	40	45	50
162	28	36	40	45	50	24	35	40	45	50	23	35	40	45	50
163	26	36	40	45	50	24	35	40	45	50	23	35	40	45	50
164	28	36	40	45	50	24	35	40	45	50	23	35	40	45	50
165	26	36	40	45	50	23	35	40	45	50	22	35	40	45	50
166	27	36	40	45	50	23	35	40	45	50	22	35	40	45	50
167	27	36	40	45	50	23	35	40	45	50	22	35	40	45	50
168	27	36	40	45	50	24	35	40	45	50	23	35	40	45	50
169	31	36	40	45	50	27	36	40	45	50	26	35	40	45	50
170	31	37	41	45	50	28	36	40	45	50	27	36	40	45	50
171	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
172	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
173	31	37	41	45	50	28	36	40	45	50	27	36	40	45	50
174	33	37	41	45	50	30	36	40	45	50	29	36	40	45	50
175	29	36	40	45	50	27	36	40	45	50	26	35	40	45	50
176	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
177	33	37	41	45	50	30	36	40	45	50	29	36	40	45	50
178	35	38	41	45	50	32	37	41	45	50	31	36	41	45	50
179	23	35	40	45	50	20	35	40	45	50	19	35	40	45	50
180	30	36	40	45	50	26	36	40	45	50	25	35	40	45	50
181	28	36	40	45	50	25	35	40	45	50	24	35	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
182	30	36	40	45	50	26	36	40	45	50	25	35	40	45	50
183	33	37	41	45	50	30	36	40	45	50	29	36	40	45	50
184	36	38	41	46	50	32	37	41	45	50	31	37	41	45	50
185	28	36	40	45	50	24	35	40	45	50	23	35	40	45	50
186	24	35	40	45	50	22	35	40	45	50	21	35	40	45	50
187	30	36	40	45	50	26	35	40	45	50	25	35	40	45	50
188	30	36	40	45	50	26	36	40	45	50	25	35	40	45	50
189	29	36	40	45	50	25	35	40	45	50	24	35	40	45	50
190	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
191	29	36	40	45	50	26	36	40	45	50	25	35	40	45	50
192	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
193	31	37	41	45	50	28	36	40	45	50	27	36	40	45	50
194	33	37	41	45	50	29	36	40	45	50	28	36	40	45	50
195	31	36	40	45	50	27	36	40	45	50	26	36	40	45	50
196	30	36	40	45	50	26	35	40	45	50	25	35	40	45	50
197	38	40	42	46	50	38	39	42	46	50	37	39	42	46	50
198	35	38	41	45	50	32	37	41	45	50	31	36	40	45	50
199	35	38	41	45	50	31	36	41	45	50	30	36	40	45	50
200	44	44	45	47	51	40	41	43	46	50	39	40	42	46	50
201	43	44	45	47	51	40	41	43	46	50	39	40	42	46	50
202	41	42	44	46	51	36	39	42	46	50	36	38	41	45	50
203	42	43	44	47	51	42	43	44	47	51	41	42	44	46	51
204	45	46	46	48	51	45	46	46	48	51	44	45	46	48	51
205	43	44	45	47	51	44	45	46	48	51	43	44	45	47	51
206	45	45	46	48	51	43	43	44	47	51	42	42	44	47	51
207	43	43	45	47	51	40	42	43	46	50	40	41	43	46	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
208	45	45	46	48	51	38	40	42	46	50	37	39	42	46	50
209	45	46	47	48	51	38	40	42	46	50	37	39	42	46	50
210	44	44	45	47	51	38	40	42	46	50	37	39	42	46	50
211	43	44	45	47	51	39	41	43	46	50	38	40	42	46	50
212	45	46	47	48	51	40	41	43	46	50	39	41	43	46	50
213	45	46	46	48	51	42	43	44	47	51	41	42	44	47	51
214	46	46	47	48	51	44	45	46	48	51	43	44	45	47	51
215	43	43	44	47	51	41	42	44	47	51	40	42	43	46	50
216	44	44	45	47	51	44	45	45	48	51	43	44	45	47	51
217	38	40	42	46	50	36	38	41	45	50	35	38	41	45	50
218	38	40	42	46	50	36	39	42	46	50	36	38	41	45	50
219	42	43	44	47	51	41	42	43	46	50	40	41	43	46	50
220	46	46	47	48	51	46	46	47	48	51	45	45	46	48	51
221	45	46	46	48	51	46	46	47	48	51	45	45	46	48	51
222	42	43	44	47	51	38	39	42	46	50	37	39	42	46	50
223	44	44	45	47	51	39	41	43	46	50	38	40	42	46	50
224	43	43	45	47	51	38	40	42	46	50	37	39	42	46	50
225	44	45	45	48	51	39	41	43	46	50	38	40	42	46	50
226	38	40	42	46	50	35	38	41	45	50	34	37	41	45	50
227	39	41	43	46	50	37	39	42	46	50	36	39	41	46	50
228	36	38	41	45	50	33	37	41	45	50	32	37	41	45	50
229	32	37	41	45	50	29	36	40	45	50	28	36	40	45	50
230	42	42	44	47	51	36	38	41	45	50	35	38	41	45	50
231	36	39	41	46	50	32	37	41	45	50	31	36	40	45	50
232	34	37	41	45	50	29	36	40	45	50	28	36	40	45	50
233	34	37	41	45	50	29	36	40	45	50	28	36	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
234	31	36	40	45	50	28	36	40	45	50	27	36	40	45	50
235	30	36	40	45	50	26	36	40	45	50	25	35	40	45	50
236	31	37	41	45	50	27	36	40	45	50	26	36	40	45	50
237	34	37	41	45	50	28	36	40	45	50	27	36	40	45	50
238	36	39	41	46	50	29	36	40	45	50	28	36	40	45	50
239	33	37	41	45	50	27	36	40	45	50	26	36	40	45	50
240	37	39	42	46	50	29	36	40	45	50	28	36	40	45	50
241	42	43	44	47	51	32	37	41	45	50	31	36	41	45	50
242	39	41	43	46	50	35	38	41	45	50	34	37	41	45	50
243	44	44	45	47	51	37	39	42	46	50	36	38	41	45	50
244	45	46	47	48	51	38	40	42	46	50	37	39	42	46	50
245	43	44	45	47	51	38	40	42	46	50	37	39	42	46	50
246	36	39	41	46	50	33	37	41	45	50	32	37	41	45	50
247	34	38	41	45	50	30	36	40	45	50	29	36	40	45	50
248	34	38	41	45	50	30	36	40	45	50	30	36	40	45	50
249	41	42	43	46	50	38	40	42	46	50	38	39	42	46	50
250	37	39	42	46	50	35	38	41	45	50	34	37	41	45	50
251	38	40	42	46	50	34	38	41	45	50	34	37	41	45	50
252	40	42	43	46	50	37	39	42	46	50	37	39	42	46	50
253	30	36	40	45	50	27	36	40	45	50	26	35	40	45	50
254	37	39	42	46	50	34	38	41	45	50	33	37	41	45	50
255	42	43	44	47	51	43	43	45	47	51	42	43	44	47	51
256	40	42	43	46	50	37	39	42	46	50	36	38	41	46	50
257	36	39	42	46	50	32	37	41	45	50	31	36	41	45	50
258	34	38	41	45	50	30	36	40	45	50	29	36	40	45	50
259	34	37	41	45	50	30	36	40	45	50	29	36	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
260	37	39	42	46	50	34	37	41	45	50	33	37	41	45	50
261	35	38	41	45	50	31	36	41	45	50	30	36	40	45	50
262	35	38	41	45	50	31	36	41	45	50	30	36	40	45	50
263	36	39	42	46	50	32	37	41	45	50	31	37	41	45	50
264	37	39	42	46	50	33	37	41	45	50	32	37	41	45	50
265	41	42	44	47	51	38	40	42	46	50	37	39	42	46	50
266	36	38	41	45	50	33	37	41	45	50	32	37	41	45	50
267	39	41	43	46	50	36	38	41	45	50	35	38	41	45	50
268	35	38	41	45	50	31	36	41	45	50	30	36	40	45	50
269	33	37	41	45	50	29	36	40	45	50	28	36	40	45	50
270	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
271	38	40	42	46	50	34	38	41	45	50	33	37	41	45	50
272	42	43	44	47	51	39	40	42	46	50	38	40	42	46	50
273	44	45	46	48	51	41	42	43	46	50	40	41	43	46	50
274	38	40	42	46	50	34	38	41	45	50	33	37	41	45	50
275	46	46	47	49	51	42	42	44	47	51	41	42	43	46	50
276	36	39	41	46	50	31	36	40	45	50	30	36	40	45	50
277	40	41	43	46	50	33	37	41	45	50	33	37	41	45	50
278	36	38	41	45	50	31	36	41	45	50	30	36	40	45	50
279	37	39	42	46	50	32	37	41	45	50	31	36	40	45	50
280	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
281	36	38	41	45	50	31	36	40	45	50	30	36	40	45	50
282	36	38	41	45	50	31	37	41	45	50	30	36	40	45	50
283	34	38	41	45	50	30	36	40	45	50	29	36	40	45	50
284	35	38	41	45	50	30	36	40	45	50	30	36	40	45	50
285	35	38	41	45	50	32	37	41	45	50	31	36	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
286	43	43	44	47	51	39	41	43	46	50	38	40	42	46	50
287	45	45	46	48	51	42	43	44	47	51	41	42	43	46	51
288	39	41	43	46	50	36	39	42	46	50	35	38	41	45	50
289	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
290	34	37	41	45	50	30	36	40	45	50	29	36	40	45	50
291	41	42	44	47	51	41	42	44	46	51	40	41	43	46	50
292	45	46	46	48	51	45	46	46	48	51	44	45	46	48	51
293	44	45	46	48	51	45	45	46	48	51	44	45	46	48	51
294	38	40	42	46	50	34	38	41	45	50	33	37	41	45	50
295	34	38	41	45	50	31	36	40	45	50	30	36	40	45	50
296	35	38	41	45	50	31	36	41	45	50	30	36	40	45	50
297	36	38	41	46	50	32	37	41	45	50	32	37	41	45	50
298	36	38	41	45	50	30	36	40	45	50	29	36	40	45	50
299	36	38	41	45	50	31	36	40	45	50	30	36	40	45	50
300	36	38	41	45	50	31	36	40	45	50	30	36	40	45	50
301	33	37	41	45	50	26	36	40	45	50	26	35	40	45	50
302	31	36	40	45	50	25	35	40	45	50	24	35	40	45	50
303	28	36	40	45	50	22	35	40	45	50	21	35	40	45	50
304	28	36	40	45	50	22	35	40	45	50	21	35	40	45	50
305	27	36	40	45	50	21	35	40	45	50	21	35	40	45	50
306	29	36	40	45	50	25	35	40	45	50	24	35	40	45	50
307	30	36	40	45	50	25	35	40	45	50	24	35	40	45	50
308	29	36	40	45	50	24	35	40	45	50	23	35	40	45	50
309	29	36	40	45	50	25	35	40	45	50	24	35	40	45	50
310	30	36	40	45	50	25	35	40	45	50	25	35	40	45	50
311	29	36	40	45	50	25	35	40	45	50	24	35	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
312	28	36	40	45	50	23	35	40	45	50	22	35	40	45	50
313	28	36	40	45	50	23	35	40	45	50	22	35	40	45	50
314	28	36	40	45	50	23	35	40	45	50	22	35	40	45	50
315	28	36	40	45	50	23	35	40	45	50	22	35	40	45	50
316	28	36	40	45	50	23	35	40	45	50	22	35	40	45	50
317	28	36	40	45	50	23	35	40	45	50	22	35	40	45	50
318	23	35	40	45	50	19	35	40	45	50	18	35	40	45	50
319	45	46	47	48	51	46	46	47	48	51	45	46	46	48	51
320	45	46	46	48	51	44	45	46	48	51	44	44	45	47	51
321	45	45	46	48	51	45	45	46	48	51	44	45	46	48	51
322	45	45	46	48	51	44	44	45	47	51	43	43	45	47	51
323	40	41	43	46	50	40	41	43	46	50	39	41	43	46	50
324	36	39	42	46	50	36	39	42	46	50	36	38	41	46	50
325	39	41	43	46	50	39	40	42	46	50	38	40	42	46	50
326	39	41	43	46	50	37	39	42	46	50	36	39	41	46	50
327	33	37	41	45	50	32	37	41	45	50	31	37	41	45	50
328	29	36	40	45	50	27	36	40	45	50	26	36	40	45	50
329	27	36	40	45	50	24	35	40	45	50	23	35	40	45	50
330	37	39	42	46	50	32	37	41	45	50	32	37	41	45	50
331	31	36	41	45	50	27	36	40	45	50	26	36	40	45	50
332	29	36	40	45	50	24	35	40	45	50	23	35	40	45	50
333	26	35	40	45	50	20	35	40	45	50	19	35	40	45	50
334	26	36	40	45	50	22	35	40	45	50	21	35	40	45	50
335	23	35	40	45	50	19	35	40	45	50	18	35	40	45	50
336	22	35	40	45	50	17	35	40	45	50	16	35	40	45	50
337	21	35	40	45	50	15	35	40	45	50	14	35	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
338	22	35	40	45	50	16	35	40	45	50	15	35	40	45	50
339	19	35	40	45	50	14	35	40	45	50	13	35	40	45	50
340	20	35	40	45	50	13	35	40	45	50	12	35	40	45	50
341	21	35	40	45	50	16	35	40	45	50	15	35	40	45	50
342	22	35	40	45	50	17	35	40	45	50	16	35	40	45	50
343	24	35	40	45	50	18	35	40	45	50	17	35	40	45	50
344	24	35	40	45	50	19	35	40	45	50	18	35	40	45	50
345	24	35	40	45	50	18	35	40	45	50	17	35	40	45	50
346	25	35	40	45	50	21	35	40	45	50	20	35	40	45	50
347	28	36	40	45	50	23	35	40	45	50	22	35	40	45	50
348	33	37	41	45	50	28	36	40	45	50	27	36	40	45	50
349	29	36	40	45	50	24	35	40	45	50	23	35	40	45	50
350	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
351	30	36	40	45	50	27	36	40	45	50	26	35	40	45	50
352	29	36	40	45	50	25	35	40	45	50	24	35	40	45	50
353	27	36	40	45	50	23	35	40	45	50	23	35	40	45	50
354	24	35	40	45	50	20	35	40	45	50	20	35	40	45	50
355	25	35	40	45	50	20	35	40	45	50	20	35	40	45	50
356	22	35	40	45	50	18	35	40	45	50	17	35	40	45	50
357	23	35	40	45	50	18	35	40	45	50	17	35	40	45	50
358	22	35	40	45	50	17	35	40	45	50	17	35	40	45	50
359	26	36	40	45	50	21	35	40	45	50	20	35	40	45	50
360	27	36	40	45	50	23	35	40	45	50	22	35	40	45	50
361	26	36	40	45	50	22	35	40	45	50	21	35	40	45	50
362	29	36	40	45	50	24	35	40	45	50	24	35	40	45	50
363	39	40	43	46	50	34	37	41	45	50	33	37	41	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
364	40	42	43	46	50	35	38	41	45	50	34	38	41	45	50
365	36	38	41	45	50	31	37	41	45	50	31	36	40	45	50
366	34	37	41	45	50	30	36	40	45	50	30	36	40	45	50
367	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
368	28	36	40	45	50	24	35	40	45	50	23	35	40	45	50
369	26	36	40	45	50	22	35	40	45	50	21	35	40	45	50
370	26	36	40	45	50	23	35	40	45	50	22	35	40	45	50
371	29	36	40	45	50	25	35	40	45	50	25	35	40	45	50
372	31	37	41	45	50	27	36	40	45	50	26	36	40	45	50
373	36	39	41	46	50	33	37	41	45	50	32	37	41	45	50
374	38	40	42	46	50	36	38	41	45	50	35	38	41	45	50
375	40	41	43	46	50	30	36	40	45	50	29	36	40	45	50
376	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
377	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
378	33	37	41	45	50	29	36	40	45	50	29	36	40	45	50
379	32	37	41	45	50	27	36	40	45	50	27	36	40	45	50
380	36	38	41	45	50	31	36	40	45	50	30	36	40	45	50
381	33	37	41	45	50	30	36	40	45	50	30	36	40	45	50
382	31	36	40	45	50	28	36	40	45	50	27	36	40	45	50
383	31	36	41	45	50	29	36	40	45	50	29	36	40	45	50
384	35	38	41	45	50	32	37	41	45	50	32	37	41	45	50
385	41	42	43	46	50	39	40	42	46	50	38	40	42	46	50
386	42	43	44	47	51	40	41	43	46	50	39	41	43	46	50
387	45	46	46	48	51	45	46	46	48	51	45	45	46	48	51
388	43	44	45	47	51	41	42	44	47	51	41	42	44	46	51
389	43	44	45	47	51	36	38	41	45	50	35	38	41	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
390	45	45	46	48	51	38	40	42	46	50	37	39	42	46	50
391	44	45	46	48	51	40	41	43	46	50	39	41	43	46	50
392	43	44	45	47	51	43	43	45	47	51	42	43	44	47	51
393	37	39	42	46	50	34	37	41	45	50	33	37	41	45	50
394	31	36	40	45	50	29	36	40	45	50	28	36	40	45	50
395	32	37	41	45	50	29	36	40	45	50	29	36	40	45	50
396	32	37	41	45	50	28	36	40	45	50	27	36	40	45	50
397	38	40	42	46	50	34	38	41	45	50	33	37	41	45	50
398	33	37	41	45	50	30	36	40	45	50	29	36	40	45	50
399	31	37	41	45	50	28	36	40	45	50	28	36	40	45	50
400	33	37	41	45	50	30	36	40	45	50	29	36	40	45	50
401	29	36	40	45	50	26	36	40	45	50	25	35	40	45	50
402	21	35	40	45	50	20	35	40	45	50	20	35	40	45	50
403	27	36	40	45	50	23	35	40	45	50	22	35	40	45	50
404	23	35	40	45	50	19	35	40	45	50	19	35	40	45	50
405	24	35	40	45	50	19	35	40	45	50	18	35	40	45	50
406	21	35	40	45	50	16	35	40	45	50	15	35	40	45	50
407	23	35	40	45	50	17	35	40	45	50	16	35	40	45	50
408	32	37	41	45	50	27	36	40	45	50	27	36	40	45	50
409	26	36	40	45	50	21	35	40	45	50	21	35	40	45	50
410	28	36	40	45	50	23	35	40	45	50	22	35	40	45	50
411	25	35	40	45	50	22	35	40	45	50	21	35	40	45	50
412	26	36	40	45	50	21	35	40	45	50	20	35	40	45	50
413	27	36	40	45	50	23	35	40	45	50	22	35	40	45	50
414	29	36	40	45	50	25	35	40	45	50	24	35	40	45	50
415	29	36	40	45	50	25	35	40	45	50	24	35	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
416	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
417	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
418	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
419	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
420	35	38	41	45	50	30	36	40	45	50	30	36	40	45	50
421	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
422	35	38	41	45	50	30	36	40	45	50	30	36	40	45	50
423	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
424	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
425	36	38	41	45	50	31	36	40	45	50	30	36	40	45	50
426	36	38	41	45	50	31	36	40	45	50	30	36	40	45	50
427	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
428	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
429	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
430	35	38	41	45	50	30	36	40	45	50	30	36	40	45	50
431	36	38	41	45	50	31	36	40	45	50	30	36	40	45	50
432	35	38	41	45	50	30	36	40	45	50	30	36	40	45	50
433	34	38	41	45	50	29	36	40	45	50	29	36	40	45	50
434	35	38	41	45	50	30	36	40	45	50	30	36	40	45	50
435	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
436	35	38	41	45	50	30	36	40	45	50	30	36	40	45	50
437	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
438	35	38	41	45	50	31	36	40	45	50	30	36	40	45	50
439	34	37	41	45	50	26	36	40	45	50	25	35	40	45	50
440	34	37	41	45	50	26	36	40	45	50	26	35	40	45	50
441	34	37	41	45	50	26	36	40	45	50	25	35	40	45	50

RECEIVER ID	GE 2.8-127 LNTE					VESTAS V150 STE					VESTAS V162 STE				
	MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL				MODELED TURBINE-ONLY SOUND PRESSURE LEVEL	COMBINED BACKGROUND + MODELED SOUND PRESSURE LEVEL			
		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND		35 dBA BACKGROUND	40 dBA BACKGROUND	45 dBA BACKGROUND	50 dBA BACKGROUND
442	33	37	41	45	50	26	36	40	45	50	25	35	40	45	50
443	33	37	41	45	50	26	36	40	45	50	25	35	40	45	50
444	33	37	41	45	50	26	36	40	45	50	25	35	40	45	50
445	33	37	41	45	50	26	36	40	45	50	25	35	40	45	50
446	33	37	41	45	50	26	35	40	45	50	25	35	40	45	50
447	32	37	41	45	50	25	35	40	45	50	24	35	40	45	50
448	31	36	41	45	50	25	35	40	45	50	24	35	40	45	50
449	36	38	41	45	50	32	37	41	45	50	31	37	41	45	50
450	37	39	42	46	50	34	37	41	45	50	33	37	41	45	50
451	37	39	42	46	50	33	37	41	45	50	32	37	41	45	50
452	34	37	41	45	50	32	37	41	45	50	31	36	40	45	50
453	30	36	40	45	50	27	36	40	45	50	27	36	40	45	50
454	32	37	41	45	50	30	36	40	45	50	29	36	40	45	50
455	31	36	40	45	50	28	36	40	45	50	27	36	40	45	50
456	28	36	40	45	50	26	35	40	45	50	25	35	40	45	50
457	31	37	41	45	50	29	36	40	45	50	28	36	40	45	50
458	29	36	40	45	50	27	36	40	45	50	27	36	40	45	50
459	30	36	40	45	50	27	36	40	45	50	26	36	40	45	50
460	27	36	40	45	50	25	35	40	45	50	24	35	40	45	50
461	29	36	40	45	50	26	36	40	45	50	26	35	40	45	50

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ReGenerate Consulting Technical Memorandum for Fenton Wind **(Update)**

Date: January 9th, 2019

Subject: Calculation of Sound at the Proposed Fenton Wind Farm Retrofit

Summary of Changes:

At the request of Fenton Wind Farm and based on comments from State of Minnesota officials, ReGenerate Consulting has changed the wind farm design and some modelling assumptions, plus included additional information in this report. The major changes include:

- The existing wind farm has been modeled which results in a turbine-only sound level at the highest receptor of 47.98 dB(A).
- The new design will now have 100% low-noise trailing edge (LNTE) blades on all repowered machines. This will include 136 turbines repowered to GE 1.6-91 machines with (LNTE) blades plus one machine that will not be repowered and will remain a GE 1.5-77. This represents an increase from two to 136 machines installed with the LNTE blades. This configuration results in a turbine-only sound of 48.90 at the highest receptor, which is approximately 1 dB(A) lower than our previous repower design and is less than 1 dB(A) higher than the existing configuration. This change should be imperceptible to the human ear. [12]
- In addition, Fenton Wind Farm has requested that we model the project to include a 35 dB(A) ambient sound.

Results for the exiting, previous repower and the proposed revised configuration are presented below.

	Maximum Receptor Sound [dB(A)]		
	Existing Configuration (137x GW1.5-77)	Previous Re-power Configuration (135x GE1.6-91 & 2x GE1.6-91 LNTE)	Updated Re-power Configuration (136x GE1.6-91 LNTE & 1x GE1.5-77)
WTG Only Modeling	47.98	49.82	48.90
With 35 dB(A) Ambient	48.20	49.96	49.07

Table 1: Sound results summary

Executive Summary:

The Fenton Wind Farm (Project) in southwestern Minnesota has been studied for the impact of sound on surrounding residences. Modeling and topographic reviews were completed to determine potential maximum results at receptor locations in and around the project.

The Project consists of 136 GE1.6-91 re-power turbines with LNTE blades at 80 m hub-height which are to be retrofitted from the current GE1.5-77 sl/sle turbines at 80 m hub-height, with 1 turbine remaining with the current GE1.5-77 sl/sle because this turbine was repaired with new components only within the last few years. The re-power turbines can cause additional sound throughout the Project area and this effect was studied at sensitive locations (receptors) to quantify the impact before the proposed Project is constructed. The impact was calculated for 320 receptors.

These re-power turbines utilize the optional low noise trailing edge (LNTE) offered by GE. This configuration was specified by EDF in an effort to reduce sound at project receptors while not reducing energy production.

ReGenerate used openWind to model sound, modeling assumptions for this analysis include:

Sound Model:

- Sound modeled in accordance with International Standard ISO 9613-2;
- Turbine is operating 100% of the time;
- Turbine sound emission used A-weighted octave band spreading provided by GE, with a total sound power level of 105.0 dB(A) for the GE1.6-91 re-power with LNTE and 104.0 dB(A) for the GE1.5-77 sl/sle;
- Sound emission was assumed at rated power;
- Ground porosity was set to 0.5;
- Miscellaneous attenuation was set to zero;
- Vegetative dampening effects were ignored.
- Sound is modeled up to 10 km from the nearest turbine;
- Default observer eye level is 1.75 m;
- An ambient noise of 35 dB(A) is assumed for the entire project area, this is added to the turbine only noise results based on logarithmic addition.

These models are still likely to produce estimates higher than those which will actually be experienced. Factors that will lower the impact, but not modeled include:

- Availability of the turbines;
- Turbines operating at lower wind speeds, therefore lower sound emission;
- Impact of vegetation in dampening of sound.

This model is realistic enough to be recommended for turbine siting and permitting by ReGenerate Consulting. The effect on 320 receptors has been quantified with summary of the results shown below in Table 2.

Total Sound [dB(A)]	Total Receptors	% of Total Receptors
0 to 35	0	0.00%
35.1 to 40	248	77.50%
40.1 to 45	40	12.50%
45.1 to 49.1	32	10.00%
49.2 or more	0	0.00%

Table 2: Sound results summary

The maximum value of total sound at any receptor location was found to be 49.1 dB(A). Appendix I shows the turbine coordinates provided for the Project. Appendix II shows the results at each receptor analyzed for this study. Appendix III shows the results of the spatial mapping for sound results.

Introduction:

The Fenton Wind Plant (Project) is being developed by EDF Renewable Energy in south-western Minnesota and has retained ReGenerate Consulting (ReGenerate) to carry out an independent analysis of the sound effects caused by the proposed Project.

The Project consists of 136 GE1.6-91 re-power turbines with LNTE blades at 80 m hub-height which are to be retrofitted from the current GE1.5-77 sl/sle turbines at 80 m hub-height, with 1 turbine remaining with the current GE1.5-77 sl/sle because this turbine was repaired with new components only within the last few years. The re-power turbines can introduce additional sound throughout the Project area and this effect was studied at sensitive locations (receptors) to quantify the impact before the proposed Project is constructed.

These re-power turbines utilize the optional low noise trailing edge (LNTE) offered by GE. This configuration was specified by EDF in an effort to reduce sound at project receptors while not decreasing energy production.

This report describes the Project site, sound methodology and results of the analysis.

Proposed Project:

The Project is located near Chandler, Minnesota in relatively flat, agricultural land. There are scattered dwellings, farm buildings and trees.

The Client provided ReGenerate with the coordinates of turbines and receptors for the Project. The layout features 136 GE1.6-91 re-power turbines with LNTE blades at 80 m hub-height which are to be retrofitted from the current GE1.5-77 sl/sle turbines at 80 m hub-height, with 1 turbine remaining with the current GE1.5-77 sl/sle. The coordinates provided for the Project are shown in Appendix I. The impact of sound was calculated for 320 receptors; coordinates for receptors can be found in Appendix II.

Methodology:

The cumulative effects of turbine generated noise propagation throughout the Project area were studied to limit the impact on sensitive receptors. ReGenerate used the openWind software [1] to model turbine sound for this project. This model complies with ISO 9613-2, the international standard for propagation and attenuation of industrial noise.

Modeling assumptions for the sound analysis include:

- Sound modeled in accordance with International Standard ISO 9613-2;
- Turbine is operating 100% of the time;
- Turbine sound emission used A-weighted octave band spreading provided by GE, with a total sound power level of 105.0 dB(A) for the GE1.6-91 re-power with LNTE and 104.0 dB(A) for the GE1.5-77 sl/sle;
- Sound emission was assumed at rated power;
- Ground porosity was set to 0.5;
- Miscellaneous attenuation was set to zero;
- Vegetative dampening effects were ignored.
- Sound is modeled up to 10 km from the nearest turbine;
- Default observer eye level is 1.75 m;
- An ambient noise of 35 dB(A) is assumed for the entire project area, this is added to the turbine only noise results based on logarithmic addition.

This base-case run for both models is still likely to produce estimates higher than those which will actually be experienced. Factors that will lower the impact, but not modeled include:

- Availability of the turbines;
- Turbines operating at lower wind speeds, therefore lower sound emission;
- Impact of vegetation in dampening of sound.

The methodology implemented as part of these models is realistic enough to be recommended for turbine siting purposes by ReGenerate Consulting.

Project Specifics:

Background (ambient) sound at similar rural locations is expected to be approximately 25 – 30 dB(A). [2,3,4,5,6] In an attempt to determine the ambient sound level at a more local level, a literature review of the ambient measurements at wind projects previously reviewed by the Minnesota Energy Environmental Review & Analysis (EERA) was conducted with resulting ambient sound shown in Table 3 below. [7,8,9,10]

Ambient Noise [dB(A)]	Project
28	Red Pine
35*	Blazing Star 2
32*	Nobles 2
34.5*	Odell
*Includes impact of neighboring wind farms	

Table 3: Ambient Sound Measurements of Neighboring Projects

It should be noted that the ambient measurements of all but the Red Pine project include some impact of nearby operational projects. In an effort to be slightly conservative, the maximum value found (35 dB(A)) was used as the assumed ambient background value for the Fenton project. This 35 dB(A) ambient value is added to the turbine only sound model results, therefore the ambient sound is included in both the individual receptor results and the sound map in Appendix IV.

There are no known local regulations for noise, the Minnesota Pollution Control Agency (MPCA) has released guidelines for sound limits at Classification 1 (including households units and farm houses). These guidelines limit daytime sound to 60 dB(A) and nighttime sound to 50 dB(A). [11]

Results:

The effect on 320 receptors has been quantified using the methodology described above and the maximum value of total sound at any receptor location was found to be 49.1 dB(A). A summary of the results can be seen below in Table 3; detailed results can be found in Appendix II. Also included in Appendix II are the modeled results based on the original turbine configuration using the same methodology.

Total Sound [dB(A)]	Total Receptors	% of Total Receptors
0 to 35	0	0.00%
35.1 to 40	248	77.50%
40.1 to 45	40	12.50%
45.1 to 49.1	32	10.00%
49.2 or more	0	0.00%

Table 4: Sound results summary

A map of results for total sound, plus locations of turbines and receptors can be found in Appendix 4, on page 90 of this report.

Conclusion:

Sound has been studied for receptors in the vicinity of the Project. No receptor is predicted to experience turbine-only sound above 48.9 dB(A) nor total sound higher than 49.1 dB(A). This sound level is within the guideline set forth by the MPCA for all receptors during the nighttime hours.

The previous GE1.5-77 sl/sle configuration was found to have a maximum total sound level of 48.2 dB(A) at the highest receptor. After utilizing the LNTE blades for all repower turbines, this results in a maximum increase of 0.9 dB(A). An increase of 1 dB is generally considered to be imperceptible to the human ear. [12]

References:

[1] AWS Truepower. (Feb 2017). OpenWind User Manual v1.8. Retrieved from http://ww2.awstruepower.com/openwind_user_manual.

[2] ESS Group, Inc. (Aug 2010). Sound Survey and Analysis Report. Retrieved from https://www.rd.usda.gov/files/UWP_MA01-CVEC_Brewster_EA-App4.pdf

[3] AMEC Environment & Infrastructure. (Jun 2013). Noise 2011-2012 Baseline Report. Retrieved from http://s1.q4cdn.com/240714812/files/documents_properties/blackwater/NewGold_BL_Noise_130628_Final1%20(2).pdf

[4] Engineering ToolBox. (2003). Outdoor Ambient Sound Levels. Retrieved from https://www.engineeringtoolbox.com/outdoor-noise-d_62.html

[5] Caltrans. (Sep 2013). Technical Noise Supplement to the Traffic Noise Analysis Protocol. Retrieved from http://www.dot.ca.gov/hq/env/noise/pub/TeNS_Sept_2013B.pdf.

[6] Minnesota Pollution Control Agency. (Retrieved Jan 2019). Noise pollution. Retrieved from https://www.pca.state.mn.us/air/noise-pollution.

[7] David Braslau Associates, Inc. (5 Apr 2016). Red Pine Wind Farm: Pre-Construction Noise Monitoring Study.

[8] RSG. (31 Oct 2017). Preliminary Noise Compliance Report: Blazing Star Wind Farm 2.

[9] David Braslau Associates, Inc. (14 Apr 2016). Nobles 2 Wind Farm: Pre-Construction Noise Monitoring Study.

[10] WSB & Associates, Inc. (25 Sep 2013). Noise Analysis for the Proposed Odell Wind Farm.

[11] Minnesota Department of Health Environmental Health Division. (22 May, 2009). Public Health Impacts of Wind Turbines. Retrieved from http://www.health.state.mn.us/divs/eh/hazardous/topics/windturbines.pdf.

[12] "A Guide to Noise Control in Minnesota; Acoustical Properties, Measurement, Analysis and Regulation," MPCA (November 2015) available at: www.pca.state.mn.us (accessed January 7, 2019) at 9.

Appendix I – Project Turbine Coordinates (UTM WGS84 Zone 15)

Turbine ID	X [m]	Y [m]	Turbine Model
1	257412	4859961	GE1.6-91 re-power with LNTE
2	257865	4859949	GE1.6-91 re-power with LNTE
3	258355	4859970	GE1.6-91 re-power with LNTE
4	258787	4860071	GE1.6-91 re-power with LNTE
5	259093	4859849	GE1.6-91 re-power with LNTE
6	259732	4859870	GE1.6-91 re-power with LNTE
7	257641	4860564	GE1.6-91 re-power with LNTE
8	257970	4860636	GE1.6-91 re-power with LNTE
9	258357	4860662	GE1.6-91 re-power with LNTE
10	258672	4860741	GE1.6-91 re-power with LNTE
11	259104	4860463	GE1.6-91 re-power with LNTE
12	259514	4860259	GE1.6-91 re-power with LNTE
13	258170	4861201	GE1.6-91 re-power with LNTE
14	258475	4861197	GE1.6-91 re-power with LNTE
15	259316	4861187	GE1.6-91 re-power with LNTE
16	259745	4861410	GE1.6-91 re-power with LNTE
17	257464	4861724	GE1.6-91 re-power with LNTE
18	257675	4862217	GE1.6-91 re-power with LNTE
19	258383	4861652	GE1.6-91 re-power with LNTE
20	258516	4862021	GE1.6-91 re-power with LNTE
21	258817	4862188	GE1.6-91 re-power with LNTE
22	259246	4862243	GE1.6-91 re-power with LNTE
23	259192	4861850	GE1.6-91 re-power with LNTE
24	259847	4862065	GE1.6-91 re-power with LNTE
25	256221	4862410	GE1.6-91 re-power with LNTE
26	256549	4862430	GE1.6-91 re-power with LNTE
27	256862	4862494	GE1.6-91 re-power with LNTE
28	257184	4862488	GE1.6-91 re-power with LNTE
29	256828	4863155	GE1.6-91 re-power with LNTE
30	257511	4863074	GE1.6-91 re-power with LNTE
31	257829	4863069	GE1.6-91 re-power with LNTE
32	258266	4863293	GE1.6-91 re-power with LNTE
33	261032	4863394	GE1.6-91 re-power with LNTE
34	261716	4863358	GE1.6-91 re-power with LNTE
35	257758	4863880	GE1.6-91 re-power with LNTE
36	258238	4863772	GE1.6-91 re-power with LNTE
37	258531	4863885	GE1.6-91 re-power with LNTE
38	259264	4863917	GE1.6-91 re-power with LNTE
39	261196	4863878	GE1.6-91 re-power with LNTE
40	261520	4863875	GE1.6-91 re-power with LNTE

Turbine ID	X [m]	Y [m]	Turbine Model
41	257659	4864705	GE1.6-91 re-power with LNTE
42	257950	4864574	GE1.6-91 re-power with LNTE
43	258826	4864702	GE1.6-91 re-power with LNTE
44	259340	4864973	GE1.6-91 re-power with LNTE
45	261008	4864610	GE1.6-91 re-power with LNTE
46	261722	4864693	GE1.6-91 re-power with LNTE
47	262187	4864805	GE1.6-91 re-power with LNTE
48	259676	4865508	GE1.6-91 re-power with LNTE
49	260751	4865505	GE1.6-91 re-power with LNTE
50	261181	4865579	GE1.6-91 re-power with LNTE
51	261153	4865186	GE1.6-91 re-power with LNTE
52	261851	4865311	GE1.6-91 re-power with LNTE
53	260001	4865750	GE1.6-91 re-power with LNTE
54	261047	4865965	GE1.6-91 re-power with LNTE
55	261703	4865990	GE1.6-91 re-power with LNTE
56	260489	4866507	GE1.6-91 re-power with LNTE
57	260898	4866492	GE1.6-91 re-power with LNTE
58	261434	4866218	GE1.6-91 re-power with LNTE
59	261904	4866194	GE1.6-91 re-power with LNTE
60	262421	4866346	GE1.6-91 re-power with LNTE
61	263988	4865805	GE1.6-91 re-power with LNTE
62	264393	4866046	GE1.6-91 re-power with LNTE
63	264753	4866068	GE1.6-91 re-power with LNTE
64	264336	4865280	GE1.6-91 re-power with LNTE
65	264772	4865462	GE1.6-91 re-power with LNTE
66	264324	4864784	GE1.6-91 re-power with LNTE
67	264703	4864808	GE1.6-91 re-power with LNTE
68	265036	4864817	GE1.6-91 re-power with LNTE
69	265448	4864568	GE1.6-91 re-power with LNTE
70	265920	4864434	GE1.6-91 re-power with LNTE
71	265875	4865021	GE1.6-91 re-power with LNTE
72	266231	4864624	GE1.6-91 re-power with LNTE
73	264118	4864234	GE1.6-91 re-power with LNTE
74	264517	4863931	GE1.6-91 re-power with LNTE
75	265007	4863882	GE1.6-91 re-power with LNTE
76	266538	4863653	GE1.6-91 re-power with LNTE
77	263977	4863579	GE1.6-91 re-power with LNTE
78	264408	4863323	GE1.6-91 re-power with LNTE
79	264934	4863111	GE1.6-91 re-power with LNTE
80	265873	4863276	GE1.6-91 re-power with LNTE
81	267075	4863387	GE1.6-91 re-power with LNTE
82	267545	4863233	GE1.6-91 re-power with LNTE

Turbine ID	X [m]	Y [m]	Turbine Model
83	267926	4863228	GE1.6-91 re-power with LNTE
84	264586	4862957	GE1.6-91 re-power with LNTE
85	266422	4862915	GE1.6-91 re-power with LNTE
86	264358	4862596	GE1.6-91 re-power with LNTE
87	265976	4862624	GE1.6-91 re-power with LNTE
88	266775	4862630	GE1.6-91 re-power with LNTE
89	267472	4862446	GE1.6-91 re-power with LNTE
90	263149	4863558	GE1.6-91 re-power with LNTE
91	264248	4862063	GE1.6-91 re-power with LNTE
92	265330	4862175	GE1.6-91 re-power with LNTE
93	266815	4862298	GE1.6-91 re-power with LNTE
94	268692	4862138	GE1.6-91 re-power with LNTE
95	265154	4861529	GE1.6-91 re-power with LNTE
96	265363	4865065	GE1.6-91 re-power with LNTE
97	266098	4861554	GE1.6-91 re-power with LNTE
98	266417	4861562	GE1.6-91 re-power with LNTE
99	266838	4861803	GE1.6-91 re-power with LNTE
100	267112	4861538	GE1.6-91 re-power with LNTE
101	267411	4861783	GE1.6-91 re-power with LNTE
102	268673	4861507	GE1.6-91 re-power with LNTE
103	265114	4861006	GE1.6-91 re-power with LNTE
104	265735	4861230	GE1.6-91 re-power with LNTE
105	266482	4861032	GE1.6-91 re-power with LNTE
106	266261	4860487	GE1.6-91 re-power with LNTE
107	267857	4860502	GE1.5-77 sl/sle
108	265813	4860365	GE1.6-91 re-power with LNTE
109	267433	4860182	GE1.6-91 re-power with LNTE
110	265397	4859850	GE1.6-91 re-power with LNTE
111	265807	4860017	GE1.6-91 re-power with LNTE
112	266859	4859909	GE1.6-91 re-power with LNTE
113	266465	4859662	GE1.6-91 re-power with LNTE
114	267346	4859593	GE1.6-91 re-power with LNTE
115	267791	4859494	GE1.6-91 re-power with LNTE
116	265786	4859340	GE1.6-91 re-power with LNTE
117	267155	4859291	GE1.6-91 re-power with LNTE
118	265579	4859081	GE1.6-91 re-power with LNTE
119	266584	4858967	GE1.6-91 re-power with LNTE
120	266961	4858899	GE1.6-91 re-power with LNTE
121	266010	4858398	GE1.6-91 re-power with LNTE
122	267127	4858405	GE1.6-91 re-power with LNTE
123	264735	4857894	GE1.6-91 re-power with LNTE
124	265161	4857872	GE1.6-91 re-power with LNTE

Turbine ID	X [m]	Y [m]	Turbine Model
125	265526	4857867	GE1.6-91 re-power with LNTE
126	266212	4857982	GE1.6-91 re-power with LNTE
127	266524	4858124	GE1.6-91 re-power with LNTE
128	266026	4857678	GE1.6-91 re-power with LNTE
129	264685	4857193	GE1.6-91 re-power with LNTE
130	265164	4857222	GE1.6-91 re-power with LNTE
131	265552	4857385	GE1.6-91 re-power with LNTE
132	266038	4857367	GE1.6-91 re-power with LNTE
133	264610	4856151	GE1.6-91 re-power with LNTE
134	264940	4856193	GE1.6-91 re-power with LNTE
135	265271	4856154	GE1.6-91 re-power with LNTE
136	265656	4856150	GE1.6-91 re-power with LNTE
137	266091	4855821	GE1.6-91 re-power with LNTE

Appendix II – Individual Receptor Results (UTM WGS84 Zone 15)

Receptor ID	X [m]	Y [m]	Original (GE1.5-77)	Retrofit (GE1.6-91)
			Sound [dB(A)]	
1	261728	4868551	37.1	37.3
2	261810	4868616	37.0	37.2
3	261872	4868740	36.9	37.1
4	262517	4868936	36.7	36.8
5	262930	4868412	37.1	37.3
6	262933	4868366	37.2	37.4
7	262987	4868366	37.1	37.4
8	263059	4868360	37.1	37.3
9	263086	4868360	37.1	37.3
10	263125	4868402	37.1	37.3
11	263125	4868345	37.1	37.3
12	263061	4868294	37.2	37.4
13	263092	4868288	37.2	37.4
14	262864	4868214	37.3	37.6
15	262856	4868164	37.4	37.6
16	262866	4868105	37.5	37.7
17	263010	4868191	37.3	37.6
18	262979	4868236	37.3	37.5
19	263035	4868235	37.3	37.5
20	263066	4868234	37.3	37.5
21	263089	4868235	37.3	37.5
22	263123	4868236	37.3	37.5
23	263162	4868367	37.1	37.3
24	263179	4868300	37.2	37.4
25	263180	4868240	37.2	37.5
26	263246	4868227	37.2	37.5
27	263229	4868290	37.2	37.4
28	263294	4868338	37.1	37.3
29	263284	4868443	37.0	37.2
30	263361	4868379	37.1	37.3
31	263334	4868333	37.1	37.3
32	263358	4868331	37.1	37.3
33	263329	4868281	37.2	37.4
34	263361	4868279	37.2	37.4
35	263359	4868240	37.2	37.4
36	263408	4868290	37.1	37.4
37	263466	4868275	37.2	37.4
38	263400	4868327	37.1	37.3
39	263424	4868327	37.1	37.3
40	263457	4868330	37.1	37.3

Receptor ID	X [m]	Y [m]	Original (GE1.5-77)	Retrofit (GE1.6-91)
			Sound [dB(A)]	
41	263469	4868369	37.1	37.3
42	263473	4868394	37.0	37.2
43	263408	4868356	37.1	37.3
44	263416	4868382	37.0	37.3
45	263411	4868402	37.0	37.2
46	263432	4868433	37.0	37.2
47	263538	4868437	37.0	37.2
48	263580	4868432	37.0	37.2
49	263589	4868462	36.9	37.1
50	263639	4868443	37.0	37.1
51	263625	4868384	37.0	37.2
52	263682	4868382	37.0	37.2
53	263752	4868331	37.0	37.2
54	263694	4868278	37.1	37.3
55	263672	4868276	37.1	37.3
56	263625	4868274	37.1	37.3
57	263625	4868250	37.2	37.4
58	263685	4868189	37.2	37.4
59	263612	4868154	37.3	37.5
60	263581	4868160	37.3	37.5
61	263536	4868163	37.3	37.5
62	263569	4868211	37.2	37.4
63	263543	4868208	37.2	37.4
64	263528	4868208	37.2	37.4
65	263506	4868218	37.2	37.4
66	263530	4868274	37.1	37.4
67	263559	4868284	37.1	37.3
68	263583	4868283	37.1	37.3
69	263584	4868318	37.1	37.3
70	263629	4868317	37.1	37.3
71	263635	4868342	37.1	37.3
72	263580	4868393	37.0	37.2
73	263524	4868381	37.0	37.2
74	263520	4868346	37.1	37.3
75	263520	4868321	37.1	37.3
76	263855	4868841	36.6	36.8
77	263386	4868859	36.6	36.8
78	263230	4868097	37.4	37.6
79	264179	4868181	37.1	37.4
80	264287	4868190	37.1	37.3
81	264529	4868321	36.9	37.1
82	265259	4868362	36.7	36.9

Receptor ID	X [m]	Y [m]	Original (GE1.5-77)	Retrofit (GE1.6-91)
			Sound [dB(A)]	
83	265359	4868144	36.9	37.1
84	266422	4868075	36.6	36.7
85	266113	4867822	36.8	37.0
86	265297	4867579	37.6	37.9
87	265678	4867189	38.0	38.3
88	264736	4868057	37.2	37.4
89	263889	4867745	37.8	38.0
90	263747	4867678	37.9	38.2
91	263655	4867691	37.9	38.2
92	263793	4867523	38.2	38.5
93	262434	4868003	37.8	38.0
94	262341	4867987	37.8	38.1
95	262166	4867950	38.0	38.2
96	262125	4867965	38.0	38.2
97	261941	4868111	37.7	38.0
98	261344	4868014	38.0	38.3
99	260426	4867962	37.9	38.2
100	258796	4868013	36.8	37.0
101	257091	4867220	36.6	36.8
102	258038	4867062	37.2	37.4
103	259283	4867286	38.1	38.4
104	259689	4867404	38.5	38.8
105	260721	4866774	45.8	46.7
106	263496	4866875	39.7	40.0
107	263598	4867003	39.3	39.7
108	263596	4867164	38.9	39.3
109	266888	4866300	38.1	38.4
110	264508	4865736	47.5	48.4
111	263549	4865931	43.0	43.7
112	263875	4866491	41.7	42.3
113	262951	4865705	41.7	42.2
114	262729	4865726	42.3	42.8
115	261957	4865829	47.2	48.1
116	261952	4865706	46.5	47.3
117	260320	4865741	46.1	46.9
118	260689	4865919	46.7	47.5
119	259432	4865952	42.8	43.5
120	255879	4866365	36.5	36.7
121	257069	4865277	39.5	39.9
122	258711	4865266	42.5	43.1
123	263766	4865161	43.8	44.4
124	263614	4864793	43.0	43.6

Receptor ID	X [m]	Y [m]	Original (GE1.5-77)	Retrofit (GE1.6-91)
			Sound [dB(A)]	
125	266841	4865297	40.3	40.7
126	268353	4865399	37.4	37.6
127	269163	4865234	36.9	37.1
128	270095	4863734	36.9	37.1
129	268457	4864368	38.6	38.9
130	266127	4863851	45.0	45.7
131	265367	4864104	45.9	46.7
132	263506	4864393	43.0	43.6
133	263857	4864002	46.0	46.8
134	262429	4864076	42.4	43.0
135	261886	4864022	44.8	45.6
136	261442	4864302	45.9	46.7
137	260465	4864288	42.8	43.4
138	260469	4864152	42.6	43.2
139	259868	4864211	42.3	42.8
140	258997	4864332	45.1	45.8
141	256976	4864425	41.1	41.6
142	255167	4863448	37.8	38.1
143	255563	4863719	38.3	38.6
144	257012	4864111	41.7	42.2
145	263465	4863670	45.3	46.0
146	266672	4863122	46.9	47.8
147	269357	4862369	39.8	40.2
148	268264	4862764	42.7	43.3
149	268365	4862181	44.5	45.3
150	266878	4862973	46.8	47.6
151	265626	4862510	46.0	46.7
152	264041	4862384	45.4	46.2
153	263531	4863016	42.9	43.4
154	262931	4862399	40.2	40.5
155	261505	4862621	41.0	41.5
156	258149	4862766	45.5	46.2
157	257795	4862681	46.4	47.2
158	257210	4862839	47.2	48.1
159	256982	4862810	47.5	48.3
160	255547	4862913	39.6	40.0
161	254089	4862120	36.5	36.7
162	254056	4862005	36.5	36.7
163	254832	4862141	37.5	37.8
164	255671	4862113	40.7	41.2
165	258583	4862462	46.2	47.0
166	261923	4862320	39.8	40.2

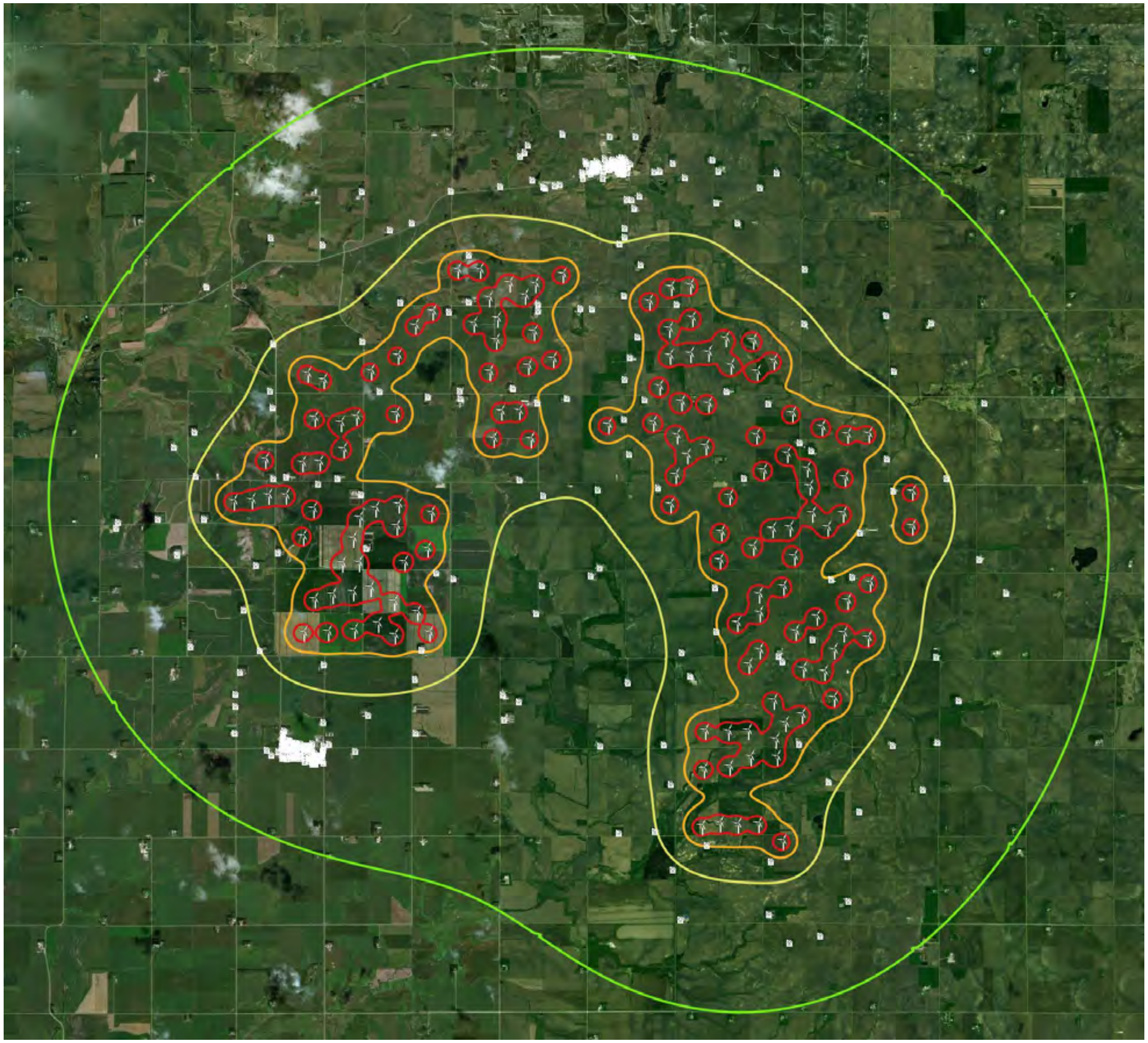
Receptor ID	X [m]	Y [m]	Original (GE1.5-77)	Retrofit (GE1.6-91)
			Sound [dB(A)]	
167	267724	4861437	44.2	44.8
168	269898	4860870	37.8	38.0
169	267562	4860628	45.8	46.2
170	267165	4860601	44.7	45.3
171	262913	4860958	38.7	39.0
172	262751	4860823	38.5	38.8
173	259909	4860969	44.0	44.6
174	260222	4860850	41.9	42.4
175	258636	4861469	48.2	49.1
176	257012	4861437	43.0	43.6
177	256594	4861232	40.9	41.3
178	255156	4861480	37.8	38.0
179	256344	4860426	39.3	39.6
180	261726	4860166	38.1	38.4
181	261847	4860672	38.3	38.6
182	265025	4860521	43.8	44.4
183	270375	4860243	36.9	37.1
184	269051	4859112	38.5	38.7
185	266785	4859501	47.5	48.3
186	266150	4859223	46.5	47.3
187	266214	4859120	46.4	47.1
188	265022	4859718	44.1	44.8
189	264375	4859356	40.3	40.7
190	259590	4859571	44.9	45.7
191	257785	4859367	42.3	42.9
192	256617	4859674	39.5	39.9
193	256236	4859282	37.8	38.1
194	255338	4859788	37.0	37.2
195	256142	4858889	37.2	37.4
196	256130	4858659	37.0	37.2
197	258564	4858407	38.4	38.7
198	259447	4859036	40.4	40.9
199	261056	4858697	37.6	37.8
200	261339	4858552	37.4	37.6
201	261061	4858233	37.2	37.4
202	263365	4858838	38.4	38.7
203	264504	4858911	40.9	41.3
204	269440	4858298	37.3	37.5
205	269023	4857546	37.3	37.5
206	268188	4857518	38.5	38.8
207	266472	4857599	45.8	46.6
208	263982	4857677	40.8	41.3

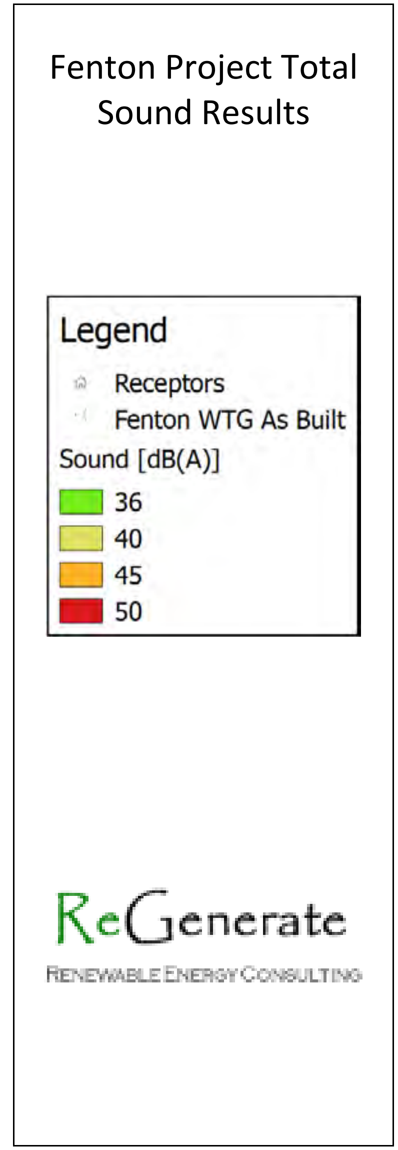
Receptor ID	X [m]	Y [m]	Original (GE1.5-77)	Retrofit (GE1.6-91)
			Sound [dB(A)]	
209	262808	4857696	37.7	37.9
210	259420	4858050	37.5	37.8
211	258300	4857764	37.1	37.3
212	257824	4857911	37.2	37.4
213	257718	4857877	37.1	37.3
214	257713	4857822	37.0	37.3
215	257703	4857783	37.0	37.2
216	257702	4857733	36.9	37.1
217	257681	4857700	36.9	37.1
218	257660	4857701	36.9	37.1
219	257622	4857707	36.9	37.1
220	257606	4857704	36.9	37.1
221	257580	4857708	36.9	37.1
222	257550	4857709	36.9	37.1
223	257736	4858309	37.8	38.1
224	257524	4857931	37.1	37.3
225	257476	4857882	37.0	37.2
226	257457	4857879	37.0	37.2
227	257419	4857885	37.0	37.2
228	257395	4857882	37.0	37.2
229	257300	4857884	37.0	37.2
230	257278	4857885	37.0	37.2
231	257243	4857890	36.9	37.1
232	257219	4857890	36.9	37.1
233	257305	4857942	37.0	37.2
234	257224	4857948	37.0	37.2
235	257200	4857949	37.0	37.2
236	257162	4857946	37.0	37.2
237	257120	4857995	37.0	37.2
238	257092	4858002	37.0	37.2
239	257061	4858003	37.0	37.2
240	257014	4858004	37.0	37.2
241	256971	4858016	36.9	37.1
242	256974	4858047	37.0	37.2
243	256977	4858073	37.0	37.2
244	256977	4858121	37.1	37.3
245	256674	4857841	36.6	36.8
246	256752	4857751	36.6	36.8
247	256894	4857804	36.7	36.9
248	256989	4857967	36.9	37.1
249	257023	4857957	36.9	37.1
250	257028	4857903	36.9	37.0

Receptor ID	X [m]	Y [m]	Original (GE1.5-77)	Retrofit (GE1.6-91)
			Sound [dB(A)]	
251	256996	4857898	36.8	37.0
252	256955	4857897	36.8	37.0
253	256960	4857847	36.8	37.0
254	256999	4857846	36.8	37.0
255	257040	4857847	36.8	37.0
256	257076	4857846	36.8	37.0
257	257102	4857845	36.8	37.0
258	257126	4857838	36.8	37.0
259	257132	4857895	36.9	37.1
260	257188	4857839	36.9	37.1
261	257225	4857829	36.9	37.1
262	256959	4857729	36.7	36.8
263	256958	4857679	36.6	36.8
264	256995	4857681	36.6	36.8
265	257041	4857664	36.6	36.8
266	257105	4857674	36.7	36.8
267	257165	4857674	36.7	36.9
268	257221	4857668	36.7	36.9
269	257308	4857667	36.7	36.9
270	257284	4857717	36.8	37.0
271	257213	4857718	36.7	36.9
272	257219	4857744	36.8	37.0
273	257152	4857723	36.7	36.9
274	257095	4857725	36.7	36.9
275	257045	4857726	36.7	36.9
276	257313	4857716	36.8	37.0
277	257345	4857789	36.9	37.1
278	257298	4857794	36.9	37.1
279	257384	4857835	36.9	37.1
280	257402	4857832	36.9	37.1
281	257426	4857832	37.0	37.2
282	257454	4857813	36.9	37.1
283	257426	4857715	36.8	37.0
284	257501	4857707	36.8	37.0
285	257442	4857665	36.8	37.0
286	257364	4857611	36.7	36.9
287	257448	4857616	36.7	36.9
288	257492	4857606	36.7	36.9
289	257523	4857609	36.8	36.9
290	257552	4857609	36.8	37.0
291	257565	4857657	36.8	37.0
292	257540	4857659	36.8	37.0

Receptor ID	X [m]	Y [m]	Original (GE1.5-77)	Retrofit (GE1.6-91)
			Sound [dB(A)]	
293	257516	4857661	36.8	37.0
294	257589	4857660	36.8	37.0
295	257612	4857616	36.8	37.0
296	257499	4857560	36.7	36.9
297	257525	4857559	36.7	36.9
298	257561	4857558	36.7	36.9
299	257553	4857752	36.9	37.1
300	257510	4857824	37.0	37.2
301	256095	4858167	36.6	36.7
302	257003	4858187	37.2	37.4
303	257652	4857617	36.8	37.0
304	257693	4857622	36.8	37.0
305	257706	4857574	36.8	37.0
306	264085	4856945	41.3	41.9
307	266990	4856890	40.2	40.6
308	268722	4856678	37.0	37.2
309	267539	4856322	38.1	38.4
310	264701	4855798	44.6	45.4
311	263757	4856096	39.3	39.7
312	263103	4856076	37.5	37.8
313	264068	4855373	38.7	39.1
314	265873	4855467	42.7	43.4
315	267280	4855508	37.8	38.0
316	267280	4854691	36.8	37.0
317	266737	4854074	36.5	36.7
318	265808	4854489	37.5	37.7
319	264171	4854459	36.9	37.2
320	266169	4853958	36.5	36.7

Appendix III – Map





APPENDIX C

SOUND LEVEL ASSESSMENT REPORT
GE 2.5 PROJECT

Dodge County Wind Project
Dodge and Steele Counties, Minnesota

Prepared for:

Dodge County Wind, LLC
700 Universe Boulevard
Juno Beach, Florida 33408

Prepared by:

Epsilon Associates, Inc.
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Maynard, MA 01754

October 11, 2019

6.0 MODELED SOUND LEVELS

6.1 Sound Sources

6.1.1 Project Wind Turbines

The sound level analysis for the Project conservatively includes 72 wind turbines, of which four (4) are considered alternate locations. All of these 72 wind turbines are GE 2.5-116 LNTE units with a hub height of 90 meters and a rotor diameter of 116 meters. A technical report from GE[8] was provided by DCW through Atwell which documented the expected sound power levels associated with the GE 2.5-116 LNTE wind turbine. The sound power levels are defined as "calculated apparent" by the turbine manufacturer and therefore do not include any uncertainty factor.

6.1.2 Substation Transformer

In addition to the wind turbines, there will be a collector substation associated with the Project in Dodge County. The substation is proposed to be located north of wind turbine #58 as shown in Figure 6-1. One 225 megavolt-ampere (MVA) transformer is proposed for the substation. According to the specification sheet provided by the DCW, the sound pressure level for this unit will be 75 dBA. Epsilon has estimated octave-band sound power levels using the broadband sound pressure level provided and techniques in the Electric Power Plant Environmental Noise Guide (Edison Electric Institute), Table 4.5 Sound Power Levels of Transformers. Table 6-1 below summarizes the sound power level data used in the modeling.

Table 6-1 Modeled Substation Transformer Sound Power Levels

		Sound Power Levels per Octave-Band Center Frequency [Hz]								
Maximum	Broadband	31.5	63	125	250	500	1k	2k	4k	8k
Rating	dBA	dB	dB	dB	dB	dB	dB	dB	dB	dB
225 MVA	95	92	98	100	95	95	89	84	79	72

6.2 Modeling Methodology

The sound impacts associated with the proposed wind turbines were predicted using the Cadna/A sound level calculation software developed by DataKustik GmbH. This software uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation). The benefits of this software are a more refined set of computations due to the inclusion of

[8] General Electric Company, Technical Documentation Wind Turbine Generator Systems 2.5-116 with LNTE – 60 Hz Product Acoustic Specifications, 2016.

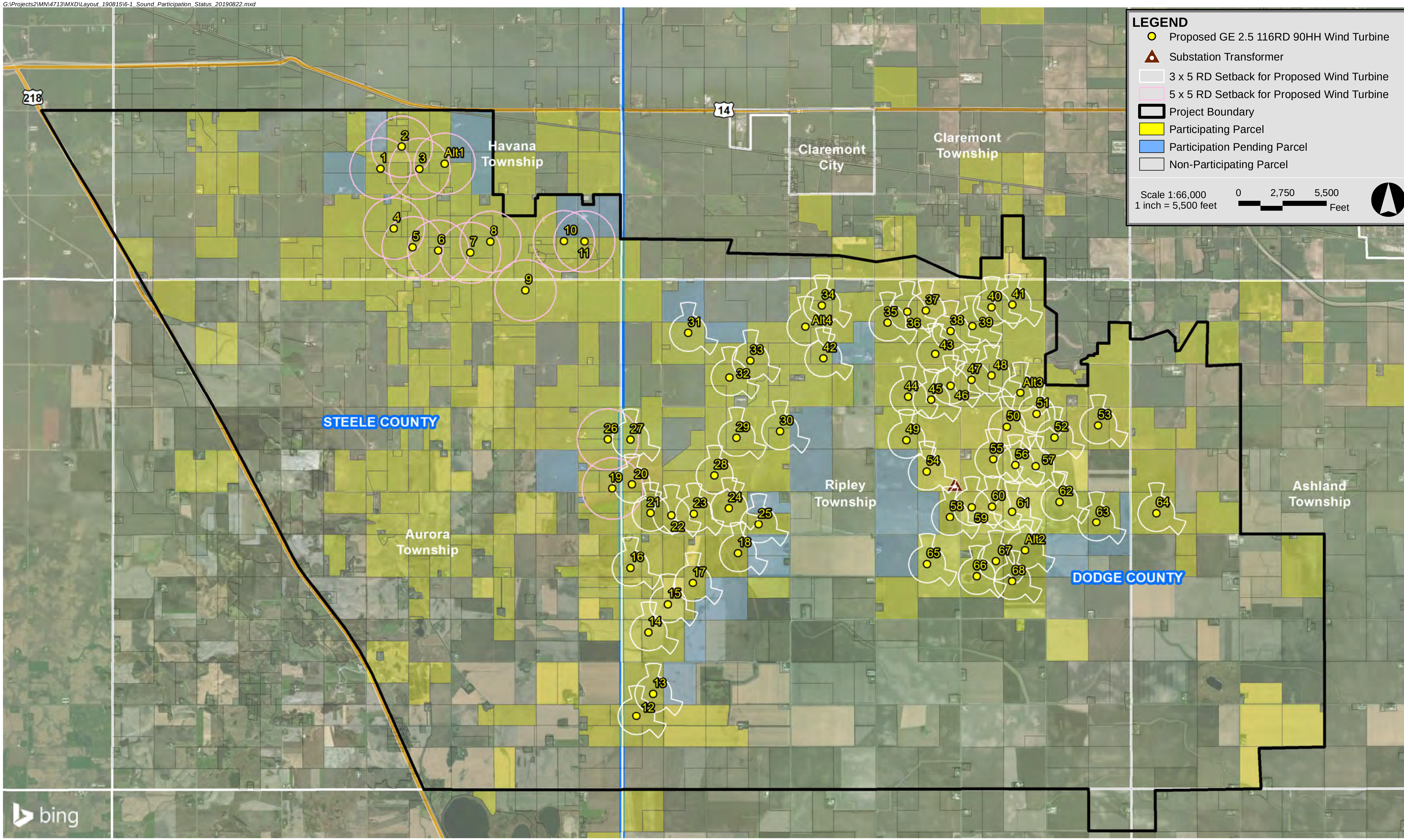
topography, ground attenuation, multiple building reflections (if applicable), drop-off with distance, and atmospheric absorption. The Cadna/A software allows for octave band calculation of sound from multiple sources as well as computation of diffraction.

Inputs and significant parameters employed in the model are described below:

- *Project Layout:* A Project layout dated August 15, 2019 was provided by DCW. The 68 proposed wind turbines and 4 proposed alternates were conservatively input into the model. The Project will also have one 225 MVA transformer at a collector substation. The location of the substation transformer in the model was estimated based on plans received from DCW on July 14 and 18, 2017. The proposed wind turbines and substation are identified in Figure 6-1. Wind turbine location coordinates for the current layout are provided in Appendix D.

- *Parcel Participation:* A dataset containing participation status information for property parcels in the proximity of the Project was provided by Atwell on December 10, 2018. This information was supplemented by Atwell/DCW regarding a recent change to participation status for the parcel with Receptor #358 whole owner recently signed a participation agreement. Parcels identified as "LSE" within the dataset and the receptor #358 parcel are participating and are indicated as such on Figure 6-1. Consistent with the LWECS requirement, properties in Dodge County not participating in the Project will have turbines set back at least 3 rotor diameters (RD) from their property in non-prevailing wind directions and at least 5 RD from their property in prevailing wind directions from each wind turbine (5 by 3 setback). Therefore, any parcel located in Dodge County that is closer than these setbacks must be a participating parcel for the Project. Accordingly, any non-"LSE" parcel in Dodge County closer than these setbacks has been assigned a "participation pending" status. Properties located in Steele County not participating in the Project will have turbines set back at least 5 rotor diameters from their property in any direction from a wind turbine (5 by 5 setback). Therefore, any parcel located in Steele County closer than this setback must be a participating parcel for the Project. Accordingly, any non-"LSE" parcel in Steele County closer than the 5 by 5 setback has been assigned a "participation pending" status. A setback data layer was provided by Atwell and is shown on Figure 6-1. Participation status used throughout this analysis is shown in Figure 6-1.

G:\Projects2\MN\4713\MXD\Layout_190815\6-1_Sound_Participation_Status_20190822.mxd



Dodge County Wind Dodge & Steele Counties, MN

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Figure 6-1

Participation Status, 190815 Layout

- *Modeling Receptor Locations:* A modeling receptor dataset dated June 15, 2017 was provided by Atwell. Receptors within 2 miles of the Project Area categorized as residential, mobile home, town, church, or municipal (694) were input into the Cadna/A model. These modeling receptors were modeled as discrete points at a height of 1.5 meters above ground level to mimic the ears of a typical standing person. Participation status for each modeling receptor was assigned as previously described. All modeling receptors are identified in Figure 6-2 and are distinguished as either participating, participation pending, or non-participating.

  A modeling grid with 20-meter spacing was calculated for the entire Project Area. The grid was modeled at a height of 1.5 meters above ground level (AGL) for consistency with the discrete modeling points. This modeling grid allowed for the creation of sound level isolines.

- *Terrain Elevation:* Elevation contours for the modeling domain were directly imported into Cadna/A which allowed for consideration of terrain shielding where appropriate. The terrain height contour elevations for the modeling domain were generated from elevation information derived from the National Elevation Dataset (NED) developed by the U.S. Geological Survey.

- *Source Sound Levels:* Maximum broadband sound power levels for the GE 2.5-116 LNTE wind turbines provided in the technical report were input to the model. These sound levels represent "worst-case" operational sound level emissions. The substation transformer sound power levels as presented in Table 6-1 were input into the model.

- *Uncertainty factor:* No uncertainty factor was provided by the wind turbine manufacturer for the GE 2.5-116; however, based on experience with other wind turbine models and wind turbine sound level modeling, an uncertainty factor of 2.0 dBA was assumed and conservatively added to the sound power level for each modeled wind turbine.

- *Meteorological Conditions:* A temperature of 10ºC (50ºF) and a relative humidity of 70% was assumed in the model.

- *Ground Attenuation:* Spectral ground absorption was calculated using a G-factor of 0.5 which corresponds to "mixed ground" consisting of both hard and porous ground cover. This method yields more conservative results (i.e., higher sound levels) as the vast majority of the area is actually agricultural.

G:\Projects2\MN\4713\MXD\Layout_190815\6-2_Sound_Level_Modeling_Locations_20190822.mxd

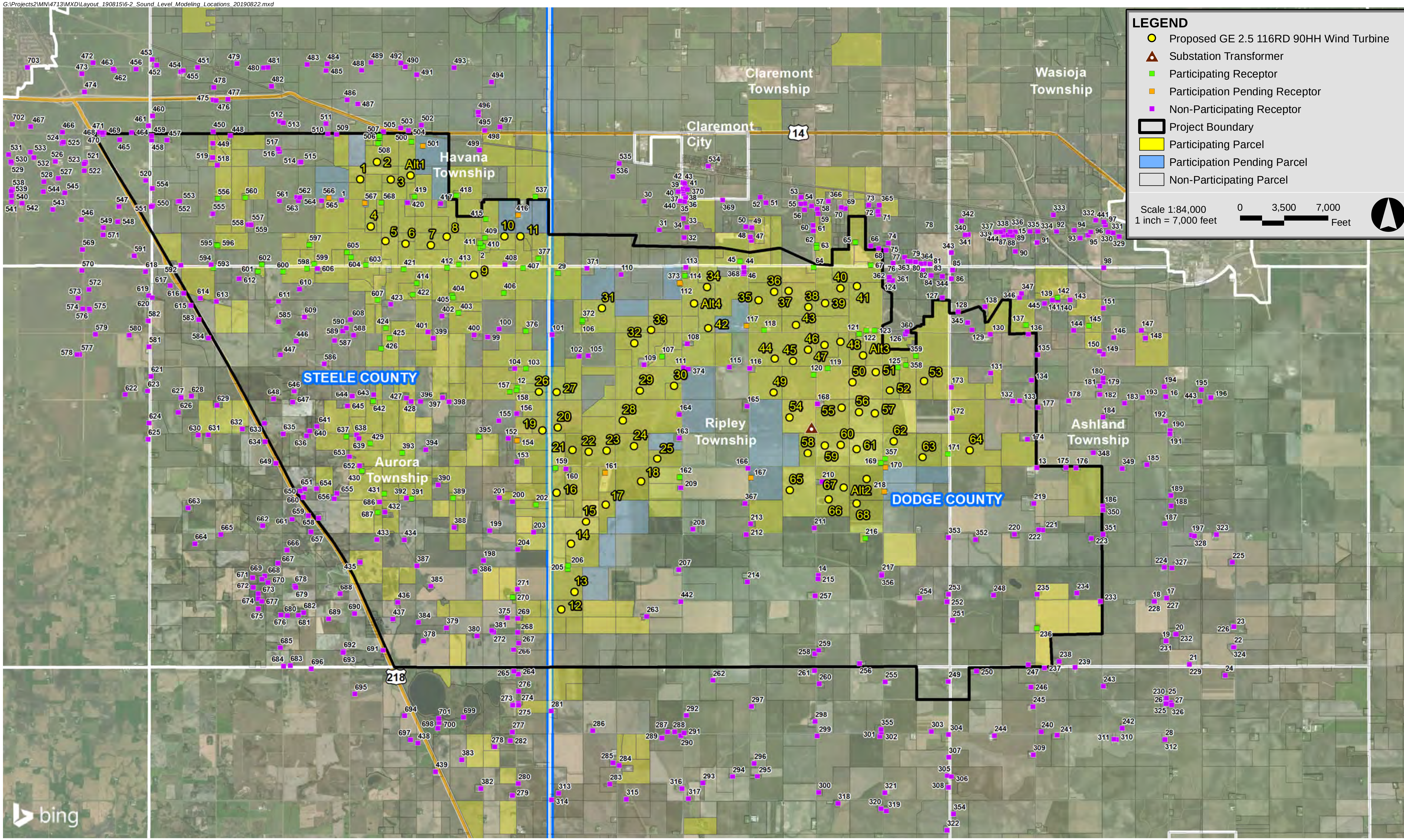

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Figure 6-2

Sound Level Modeling Locations, 190815 Layout

Octave-band sound power levels corresponding to the highest available broadband sound power level for the proposed wind turbine type including uncertainty and estimated octave-band sound power levels from the proposed substation transformer were input into Cadna/A to model L_{eq} sound pressure levels during conditions when worst-case sound power levels are expected. Sound pressure levels were modeled at 694 receptors within 2 miles of the Project Area. In addition to modeling at discrete points, sound levels were also modeled throughout a large grid of points, each spaced 20 meters apart to allow for the generation of sound level isolines in each modeling scenario.

Several modeling assumptions inherent in the ISO 9613-2 calculation methodology, or selected as conditional inputs by Epsilon, were implemented in the Cadna/A model to ensure conservative results (i.e., higher sound levels), and are described below:

- All modeled sources were assumed to be operating simultaneously and at the design wind speed corresponding to the greatest sound level impacts.
- As per ISO 9613-2, the model assumed favorable conditions for sound propagation, corresponding to a moderate, well-developed ground-based temperature inversion, as might occur on a calm, clear night or equivalently downwind propagation.
- Meteorological conditions assumed in the model (T = 10°C/RH = 70%) were selected to minimize atmospheric attenuation in the 500 Hz and 1 kHz octave bands where the human ear is most sensitive.
- No additional attenuation due to tree shielding, air turbulence, or wind shadow effects was considered in the model.

6.3 Sound Level Modeling Results

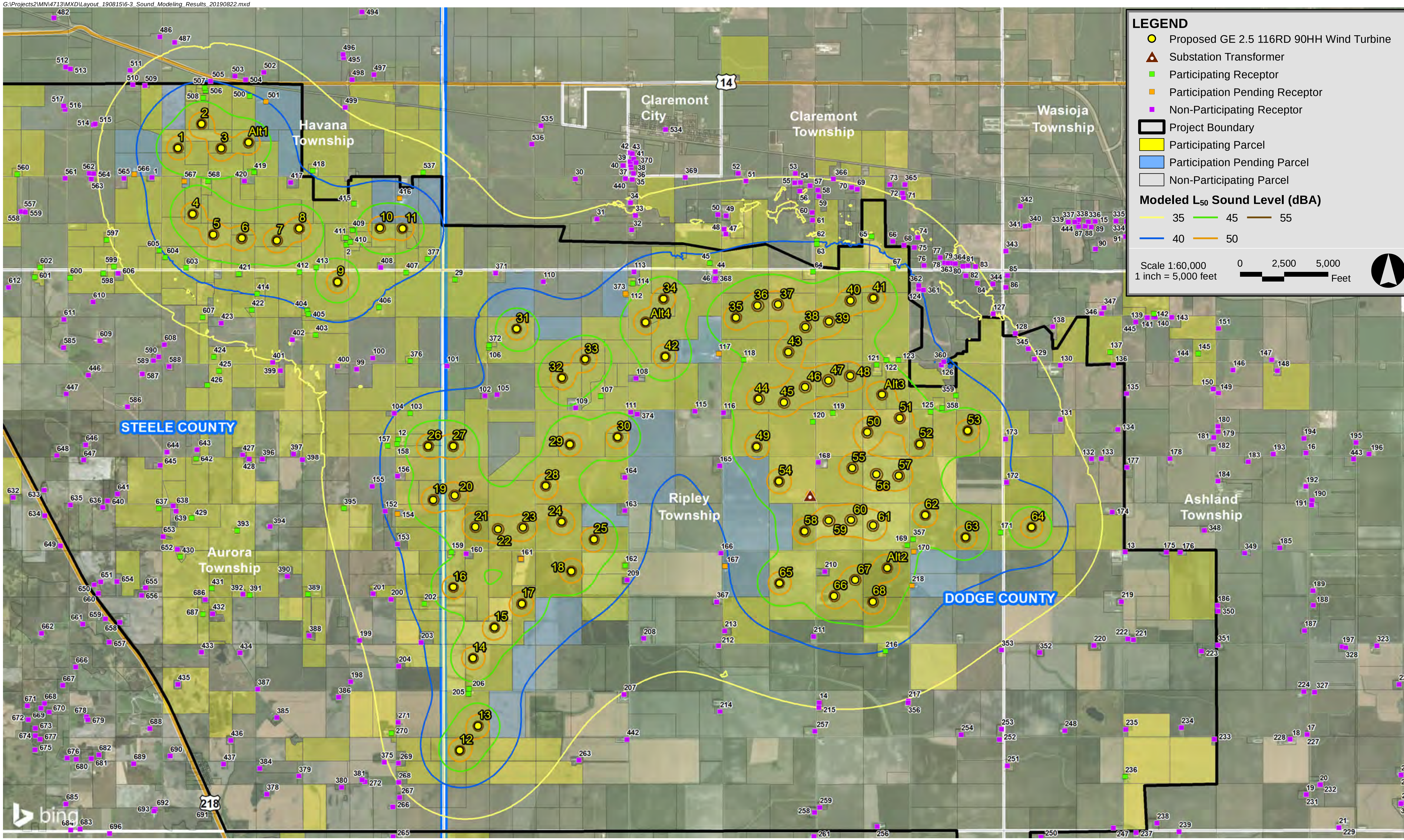
All modeled sound levels, as output from Cadna/A are A-weighted equivalent sound levels (L_{eq}, dBA). Based on Epsilon's experience in conducting post-construction sound level measurement programs for wind energy facilities, the equivalent sound level has been comparable to the median (L_{50}, dBA) sound level when the wind turbine sound was prevalent and steady under ideal wind and operational conditions.[9] Therefore, the modeled sound levels for this Project may be considered as L_{50} sound levels and directly compared to the Minnesota L_{50} limit.

Table E-1 in Appendix E shows the predicted Project Only broadband (dBA) sound levels at the 694 Noise Area Classification 1 receptors modeled within 2 miles of the Project Area. These broadband L_{50} sound levels range from 17 to 47 dBA and represent the worst-case future L_{50} sound levels produced solely by wind turbines and substation associated with the

9 Within 0.4 decibels

Project. Four locations (#119, #120, #121, and #210) are modeled to have a sound level of 47 dBA. Location #210 is a non-participating receptor, while locations #119, #120, and #121 are participating. In addition to these discrete modeling points, sound level isolines generated from the modeling grid are presented in Figure 6-3.

G:\Projects2\MN\4713\MXD\Layout_190815\6-3_Sound_Modeling_Results_20190822.mxd



Dodge County Wind   Dodge & Steele Counties, MN

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Figure 6-3

Modeled L_{50} Sound Level Results, 190815 Layout

7.0 EVALUATION OF SOUND LEVELS

The proposed Dodge County Wind Project within Dodge and Steele Counties, MN is required to comply with the sound level requirements in Minn. R. Ch. 7030 for Noise Pollution Control. NAC 1 (primarily residential) receptors are protected by the lowest sound level limits of the MPCA. Since wind turbines can operate under conditions resulting in maximum sound power, during both the day and at night, the Project would need to comply during the period with more stringent limits, nighttime. Furthermore, because wind turbine sound is generally steady, the L_{50} (median) sound level is more likely to be affected by wind turbine sound than the L_{10} which is controlled more by unsteady sound. The L_{50} limit is also more restrictive than the L_{10} limit. Therefore, NAC 1 receptors have been evaluated against the L_{50} sound level limit of 50 dBA in this analysis.

The highest predicted worst-case Project Only L_{50} sound level at a modeling receptor is 47 dBA, and, therefore, is below the most restrictive MPCA sound limit of 50 dBA. This sound level is modeled at non-participating receptor #210 and participating receptors #119, #120, and #121. Nighttime measurements showed non-wind-turbine ambient L_{50} broadband sound levels range from 25 to 56 dBA when ground-level wind speeds were at or below 11 mph and winds at hub height corresponded to conditions in the modeling. These measured sound levels exceeded 50 dBA at five (5) of the six (6) locations during the measurement program. Ambient sound levels in the Project Area fluctuate due to sound sources such as ground-level winds and vegetation rustle, both of which can cause ambient sound levels to exceed the MPCA L_{50} nighttime limit of 50 dBA. Project Only modeled sound levels sorted from high to low are presented in Table F-2 of Appendix F.

8.0 LOW FREQUENCY AND INFRASOUND

An evaluation of low frequency (LF) and infrasound levels from a wind energy center at receptors is not required by the State of Minnesota. However, a discussion of LF and infrasound, as it pertains to wind turbines, is provided below for informational purposes.

Low frequency (LF) and infrasound are present in the environment due to other sources besides wind turbines. For example, refrigerators, air conditioners, and televisions generate infrasound and low frequency sound. The frequency range of low frequency sound is generally from 20 Hz to 200 Hz, and the range below 20 Hz is often described as "*infrasound*". However, audibility can extend to frequencies below 20 Hz if the energy is high enough. Since there is no sharp change in hearing at 20 Hz, the division between "low-frequency sound" and "infrasound" should only be considered "practical and conventional." The threshold of hearing is standardized for frequencies down to 20 Hz.[10] Based on extensive research and data, Watanabe and Moeller have proposed normal hearing thresholds for frequencies below 20 Hz.[11] These sound levels are so high that infrasound is generally considered inaudible. For example, the sound level at 8 Hz would need to be 100 dB to be audible.

A detailed infrasound and low frequency noise measurement program of wind turbines was conducted from 2013-2015 by the Ministry for the Environment, Climate and Energy of the Federal State of Baden-Wuerttemberg, Germany.[12] The conclusions of the German study were:

> *"Infrasound and low-frequency noise are an everyday part of our technical and natural environment. Compared with other technical and natural sources, the level of infrasound caused by wind turbines is low. Already at a distance of 150 m (~500 ft), it is well below the human limits of perception. Accordingly, it is even lower at the usual distances from residential areas. Effects on health caused by infrasound below the perception thresholds have not been scientifically proven. Together with the health authorities, we in Baden-Württemberg have come to the conclusion that adverse effects relating to infrasound from wind turbines cannot be expected on the basis of the evidence at hand."*

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10 Acoustics - Normal equal-loudness-level contours, International Standard ISO 226:2003, International Organization for Standardization, Geneva, Switzerland, (2003).

11 T. Watanabe, and H. Moeller, "Low Frequency Hearing Thresholds in Pressure Field and in Free Field", J. Low Frequency Noise and Vibration, 9(3), 106-115, (1990).

12 *Low frequency noise incl. infrasound from wind turbines and other sources*, LUBW, Baden-Wuerttemberg, Germany, September 2016.

The Massachusetts Department of Environmental Protection (MA DEP) and the Massachusetts Department of Public Health commissioned an expert panel who found that: "Claims infrasound from wind turbines directly impacts the vestibular system have not been demonstrated scientifically. Available evidence shows that the infrasound levels near wind turbines cannot impact the vestibular system."[13]

Health Canada, in collaboration with Statistics Canada, conducted one of the most extensive studies to understand the impacts of wind turbine noise to-date.[14] A cross-section epidemiological study was carried out in 2013 in the provinces of Ontario and Prince Edward Island on randomly selected participants living near and far from operating wind turbines. Many peer-reviewed publications have been written based on the Health Canada research, including an analysis of low frequency and infrasound data. For example, Keith et al concluded that there was no advantage of using C-weighting to measure low frequency sound since the relationship between A-weighting and C-weighting are so highly correlated.[15] In other words, acceptable A-weighted limits also eliminate low frequency and infrasound impacts.

Low frequency and infrasound has also been studied extensively in Japan. Tachibana et al conducted extensive measurements of 34 wind farms nationwide and concluded that infrasound from wind turbines is not audible/sensible, and that wind turbine noise is not a problem in the infrasound region.[16]

As noted in the 2011 NARUC report, "the widespread belief that wind turbines produce elevated or even harmful levels of low frequency and infrasonic sound is utterly untrue as proven repeatedly and independently by numerous investigators."[17]

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13 *Wind Turbine Health Impact Study: Review of Independent Expert Panel,* Massachusetts Department of Environmental Protection and Massachusetts Department of Public Health, January 2012.

14 Health Canada website: http://www.hc-sc.gc.ca/ewh-semt/noise-bruit/turbine-eoliennes/summary-resume-eng.php

15 *Wind turbine sound pressure level calculations at dwellings,* S. E. Keith et al, J. Acoustical Society of America, 139(3), March 2016.

16 *Nationwide field measurements of wind turbine noise in Japan,* H. Tachibana et al, Noise Control Engineering Journal, 62(2), March-April 2014.

17 Assessing Sound Emissions from Proposed Wind Farms & Measuring the Performance of Completed Projects, NARUC, prepared by Hessler Associates, Inc., October 2011.

9.0 CONCLUSIONS

A comprehensive sound level modeling assessment was conducted for the Dodge County Wind Project. In addition, ambient sound levels were measured to characterize the existing background sound levels within the area.

Nighttime measurements showed non-wind-turbine ambient L_{50} broadband sound levels range from 25 to 56 dBA when ground-level wind speeds were at or below 11 mph and winds at hub height corresponded to conditions in the modeling. These measured sound levels exceeded 50 dBA at five (5) of the six (6) locations during the measurement program. Ambient sound levels in the Project Area fluctuate due to sound sources such as ground-level winds and vegetation rustle, both of which can cause ambient sound levels to exceed the MPCA L_{50} nighttime limit of 50 dBA. The highest predicted worst-case Project Only L_{50} sound level at a modeling receptor is 47 dBA, and, therefore, is below the most restrictive MPCA sound limit of 50 dBA.

Appendix A

DCW Sound Level Measurement Protocol

Dodge County Wind Project
Dodge and Steele Counties, MN

Sound Level Measurement Protocol

March 9, 2018

Introduction

This protocol describes the methodology involved in measuring the ambient sound levels for the Dodge County Wind ("DCW") Project. This Project is currently being developed by NextEra Energy Resources, LLC (NEER). DCW will be a wind power generation facility consisting of approximately 70 wind turbines located within Dodge and Steele Counties, Minnesota. Based on a preliminary 170MW layout dated December 12, 2017, the proposed wind turbines will be a combination of GE 1.7 and GE 2.5 megawatt (MW) wind turbines. The GE 1.7 MW wind turbines have a hub height of 80 meters and a rotor diameter of 103 meters. The GE 2.5 MW wind turbines have a hub height of 89 meters and a rotor diameter of 127 meters. Locations of the proposed wind turbines in the 170MW layout dated December 12, 2017 are presented in Figure 1.

As part of this effort, Epsilon will conduct a sound level measurement program to document existing ambient sound levels in the vicinity of the DCW Project. The purpose of this protocol is to describe the measurement methodology, identify acoustical and meteorological equipment proposed, and provide a schedule. Procedures identified in the Guidance for Large Wind Energy Conversion System, Noise Study Protocol and Report ("LWECS Guidance") published by the Minnesota Department of Commerce ("DOC"), Energy Facility Permitting, dated October 8, 2012 were used in the development of this measurement protocol.

Sound Level Measurement Methodology

The Guidance advises measurement at a minimum of three (3) locations within the Project area where wind turbines are either not constructed or not operating to represent ambient sound level conditions. Broadband A-weighted (dBA) and one-third octave-band (dB) sound levels will be measured at a total of 8 locations in Dodge and Steele Counties to collect pre-construction sound level data. Six (6) of these locations will be long-term measurement locations within the Project Boundary. The long-term sound level measurement locations were selected based on LWECS Guidance, modeled sound levels, proximity of residential locations to the wind turbines, wind turbine types, and proximity to other measurement locations in the measurement program. Per the LWECS Guidance document, one (1) location has been selected to represent the receptor with the worst-case modeled sound level based on a preliminary modeling analysis.

The six (6) preferred long-term locations[1] and eight (8) alternate locations[2] in Dodge and Steele Counties are shown in Figure 1 and briefly described below. All long-term locations are proposed to be at a residence (exterior) with some on participating parcels and others on non-participating parcels. Non-participating homeowners may be unwilling to grant permission at a particular location; if permission is not granted, measurements will be conducted at an alternate location when practical. In addition, the alternate location may be selected if site conditions realized during setup warrant relocation. At the time of this Protocol, permission has not been obtained at the measurement locations. Additional alternative locations may be selected and/or the number of measurement locations reduced if permission cannot be obtained prior to the commencement of the measurement program.

Preferred Locations:

- Location L1P: Steele Co – One of three non-participating residences highlighted on the figure
- Location L2P: Steele Co – Participating Residence
- Location L3P: Dodge Co – Participating Residence
    - Highest modeled sound level at a participating residence
- Location L4P: Dodge Co – Non-participating Residence
    - Highest modeled sound level
- Location L5P: Dodge Co – Participating Residence
- Location L6P: Dodge Co – One of two non-participating residences highlighted on the figure

Alternate Locations:

- Location L1A1: Steele Co – Participating Residence
- Location L1A2: Steele Co – Participating Residence
- Location L2A: Steele Co – Participating Residence
- Location L3A: Steele Co – Participating Residence
- Location L4A: Dodge Co – Participating Residence
- Location L5A: Dodge Co – Participating Residence
- Location L6A1: Dodge Co – Participating Residence
- Location L6A2: Dodge Co – Participating Residence

Long-term measurements will be supplemented with short-term measurements at two (2) locations west of the Project Boundary. One daytime and one nighttime measurement will be taken for 20-minutes during environmental conditions with no precipitation and with ground-level wind speeds less than 11 mph (5 m/s). Sound observations will be made during both periods at each location by Epsilon staff. Publically accessible locations will be utilized and are briefly described below and shown on Figure 1.

- Location S1: Steele Co

[1] Preferred long-term measurement locations are identified with a "P" in their ID.
[2] Alternate long-term measurement locations are identified with an "A" in their ID.

  - Intersection of US Highway 218 and ST 73rd St
- **Location S2:** Steele Co
  - Intersection of SE 34th St and SE 58th St

Measurement Equipment

The sound level measurements will be made using Larson Davis (LD) model 831 sound level meters (or equivalent). The model meets "Type 1 Precision" requirements set forth in American National Standards Institute (ANSI) S1.4-1983 standard for sound level meters. The meters will log values of various broadband A-weighted (dBA) sound level measurement parameters including the L_{eq}, L_{max}, L_{10}, L_{50}, and L_{90}. Long-term meters will be programmed to log this statistical data on an hourly basis and short-term meters will log the complete 20-minute measurements. The LWECS Guidance also requires C-weighted data collection. This will be calculated through post-processing analysis since simultaneous A-weighted and C-weighted collection is not possible with commonly available commercial instrumentation. One-minute time history data will be collected by the long-term meters and 1-second time history data will be collected by the short-term meter. The microphones will be tripod-mounted at a height of 1.5 meters (5 feet) above ground. A 7-inch windscreen will be placed on all microphones.

The measurement equipment will be calibrated in the field before and after the survey with the manufacturer's acoustical calibrator which meets the standards of IEC 942 Class 1L and ANSI S1.40-1984. All calibrations will be within $\pm$1.0 dB from the most recent calibration otherwise the data collected during that period will be discarded. The meters are calibrated and certified as accurate to standards set by the National Institute of Standards and Technology by an independent laboratory within the past 12 months.

Since this is a wind turbine project, the wind speed during the noise study is significant in importance. The ground-level wind speed has a direct influence on the ambient sound levels. Ground-level wind speed data will be continuously measured at all long-term sound level measurement locations for the duration of the study per the LWECS Guidance. A HOBO H21-002 micro-weather station (or similar) will be used at the monitoring locations. The wind sensors will be mounted at microphone height (1.5 meters) per the LWECS Guidance and log data every hour. This wind instrument has a measurement range of 0 to 45 m/s (100 mph) and an accuracy of $\pm$1.1 m/s (2.4 mph). The starting threshold is ≤1 m/s (2.2 mph). For the short-term measurements where micro-weather station utilization is not practical, wind speeds will be measured for a subset of the measurement period with a hand-held Davis Instruments TurboMeter electronic wind speed indicator.

Additional meteorological parameters, e.g. temperature, precipitation, etc., will be collected through additional instrumentation deployed by Epsilon and/or will be downloaded from the closest National Weather Service station for the entire program.

In order to allow for the characterization of background sound levels during different wind regimes, which may be useful once the wind energy facility is operational, it would be necessary to know the wind speeds at higher heights (hub height, if possible) during the background sound level measurement program. If these data are available during the program, they will be incorporated into the report.

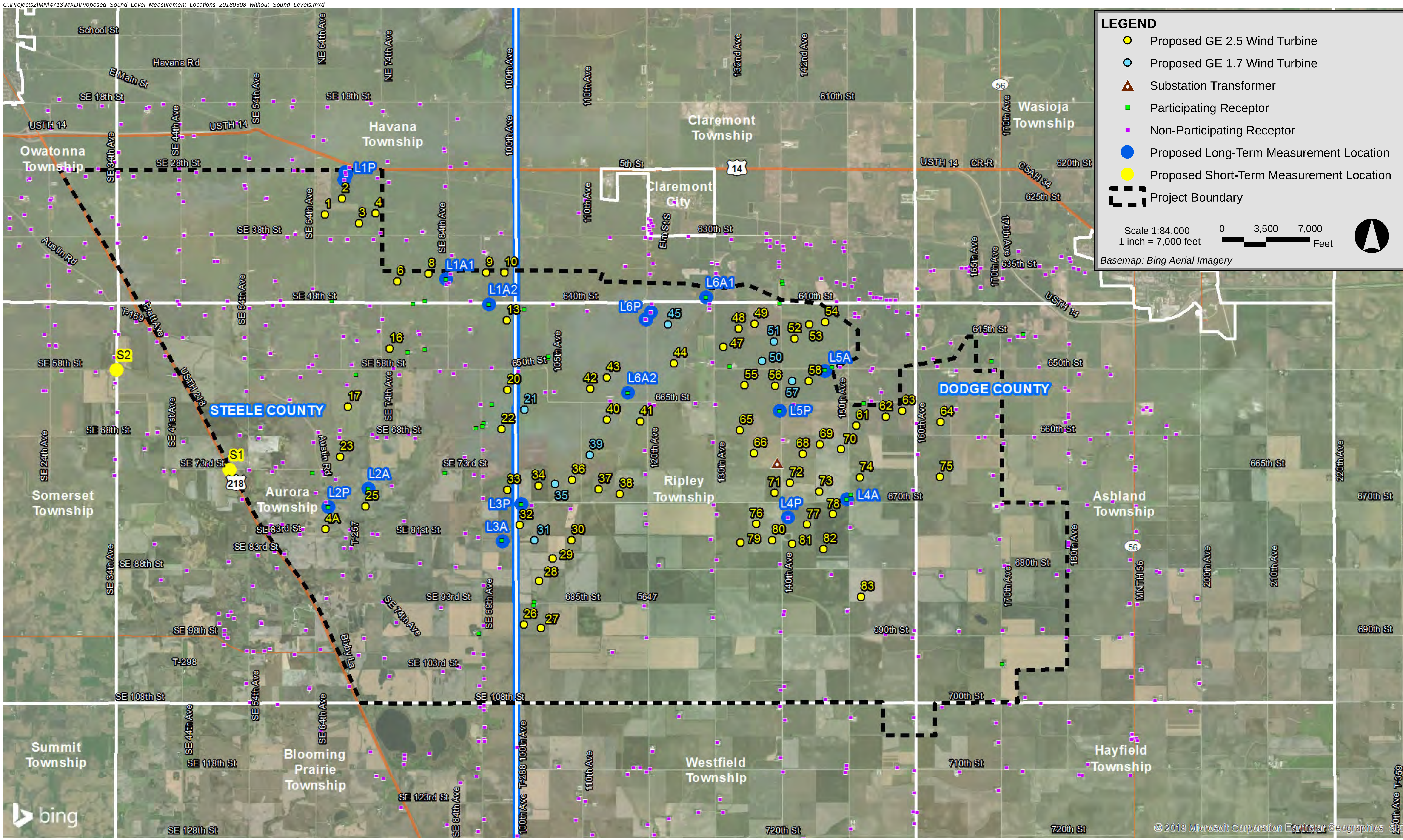
Schedule

The sound level measurement program is planned to commence on Monday, March, 19, 2018. All equipment is expected to be operating by no later than Wednesday, March 21. Following the approach outlined in the Guidance document, the long-term measurements will last for at least 1 week. The equipment will not be staffed continuously; however, observations at the long-term locations will be made four times during the program (see below). The field technician will leave the site on March 21 or March 22 and return on March 28 or March 29. Continuous A-weighted measurements (24 hours/day) will be made concurrently at all long-term measurement locations over the approximately 7-day period. The observation periods will be as follows:

- Upon deployment (daytime),
- During the 1st night when all monitors are running (nighttime),
- During the day after the setup and/or night observations, and
- During the pick-up (daytime).

Results/Report

The LWECS document will be used as a guide for sound level data processing, result summaries, and the report structure. No extraneous noise events will be excluded from the data. Hourly periods of recorded precipitation and periods with high wind speeds will be removed from the datasets. The percentage of the excluded data will be presented. Sound levels will be presented in graphical format as they were measured in relation to wind speed over the measurement duration. The report will include various figures and tables to effectively summarize the results of the measurement program.



Dodge County Wind **Dodge & Steele Counties, MN**

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Figure 1

Proposed Sound Level Measurement Locations, 170 MW Layout (171212)

Appendix B

NCEI Meteorological Data: NWS Station – Dodge Center Airport, Dodge Center, MN

Table B-1

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 0:15	FM-15	OVC:08 80	10		34	1	31	-0.8	25	-4	70	6	20		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 0:35	FM-15	OVC:08 80	10		32	0	29	-1.4	25	-4	75	5	20		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 0:55	FM-15	OVC:08 80	10		34	1	31	-0.8	25	-4	70	6	30		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 1:15	FM-15	OVC:08 80	10		34	1	31	-0.8	25	-4	70	6	40		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 1:35	FM-15	OVC:08 80	10		34	1	31	-0.8	25	-4	70	6	30		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 1:55	FM-15	SCT:04 70 OVC:08 80	10		32	0	29	-1.4	25	-4	75	3	360		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 2:15	FM-15	BKN:07 70 OVC:08 80	10		32	0	29	-1.4	25	-4	75	6	20		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 2:35	FM-15	BKN:07 70 OVC:08 80	10		32	0	29	-1.4	25	-4	75	7	30		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 2:55	FM-15	SCT:04 70 OVC:08 80	10		32	0	29	-1.4	25	-4	75	5	40		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 3:15	FM-15	OVC:08 80	10		32	0	30	-1	27	-3	80	6	60		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 3:35	FM-15	SCT:04 90	10		32	0	28	-2.2	21	-6	64	8	80		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 3:55	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	10	80		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 4:15	FM-15	CLR:00	10		30	-1	26	-3.2	19	-7	64	9	80		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 4:35	FM-15	CLR:00	10		30	-1	26	-3.2	19	-7	64	8	70		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 4:55	FM-15	CLR:00	10		30	-1	26	-3.2	19	-7	64	9	80		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 5:15	FM-15	CLR:00	10		30	-1	26	-3.2	19	-7	64	9	80		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 5:35	FM-15	CLR:00	10		30	-1	26	-3.2	19	-7	64	10	80		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 5:55	FM-15	SCT:04 50	10		30	-1	26	-3.2	19	-7	64	8	80		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 6:15	FM-15	SCT:04 50	10		28	-2	24	-4.4	16	-9	59	10	70		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 6:35	FM-15	CLR:00	10		28	-2	24	-4.4	16	-9	59	9	90		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 6:55	FM-15	CLR:00	10		28	-2	24	-4.4	16	-9	59	8	90		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 7:15	FM-15	CLR:00	10		28	-2	24	-4.4	16	-9	59	7	80		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 7:35	FM-15	CLR:00	10		28	-2	24	-4.4	16	-9	59	9	60		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 7:55	FM-15	SCT:04 46 BKN:07 50	10		28	-2	24	-4.4	16	-9	59	8	70		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 8:15	FM-15	BKN:07 35 OVC:08 43	10		28	-2	24	-4.4	16	-9	59	8	80		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 8:35	FM-15	OVC:08 35	10		28	-2	24	-4.4	16	-9	59	7	70		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 8:55	FM-15	SCT:04 22 BKN:07 28 OVC:08 35	5	-SN:03 |SN:71 |	28	-2	25	-4	18	-8	64	7	40		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 9:15	FM-15	OVC:08 26	10	-SN:03 |SN:71 |	27	-3	24	-4.4	18	-8	69	7	50		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 9:35	FM-15	BKN:07 26	7		28	-2	24	-4.4	16	-9	59	9	60		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 9:55	FM-15	SCT:04 24	7		28	-2	25	-4	18	-8	64	7	110		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 10:15	FM-15	SCT:04 20	7	-SN:03 |SN:71 |	28	-2	25	-4	18	-8	64	3	90		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 10:35	FM-15	SCT:04 20	7		28	-2	25	-4	18	-8	64	7	80		28.64					30.03
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 10:55	FM-15	SCT:04 14	7		28	-2	25	-4	18	-8	64	7	60		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 11:15	FM-15	SCT:04 14	10		28	-2	25	-3.9	19	-7	69	8	60		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 11:35	FM-15	CLR:00	7	UP:09 ||	28	-2	25	-3.9	19	-7	69	5	20		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 11:55	FM-15	SCT:04 10	4	-SN:03 |SN:71 |	28	-2	25	-3.9	19	-7	69	6	50		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 12:15	FM-15	SCT:04 8 SCT:04 13	4	-SN:03 |SN:71 |	28	-2	26	-3.5	21	-6	74	6	60		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 12:35	FM-15	SCT:04 15	5	-SN:03 |SN:71 |	28	-2	26	-3.5	21	-6	74	5	10		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 12:55	FM-15	SCT:04 15	7	-SN:03 |SN:71 |	28	-2	26	-3.2	23	-5	80	5	20		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 13:15	FM-15	SCT:04 15	10		28	-2	26	-3.5	21	-6	74	6	30		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 13:35	FM-15	SCT:04 17	5	-SN:03 |SN:71 |	28	-2	26	-3.2	23	-5	80	7	30		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 13:55	FM-15	SCT:04 15	4	-SN:03 |SN:71 |	28	-2	26	-3.2	23	-5	80	7	10		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 14:15	FM-15	BKN:07 15	3	UP:09 ||	28	-2	27	-2.8	25	-4	86	7	20		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 14:35	FM-15	BKN:07 15	3	UP:09 ||	28	-2	27	-2.8	25	-4	86	7	10		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 14:55	FM-15	SCT:04 11 BKN:07 17	4	UP:09 ||	28	-2	27	-2.8	25	-4	86	7	30		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 15:15	FM-15	SCT:04 15 BKN:07 19	4	UP:09 ||	28	-2	27	-2.8	25	-4	86	9	20		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 15:35	FM-15	BKN:07 15	4	UP:09 ||	28	-2	27	-2.8	25	-4	86	8	40		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 15:55	FM-15	SCT:04 15 SCT:04 20	4	UP:09 ||	28	-2	27	-2.8	25	-4	86	10	30		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 16:15	FM-15	SCT:04 15 SCT:04 20	7	UP:09 ||	28	-2	27	-2.8	25	-4	86	10	20		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 16:35	FM-15	SCT:04 21	7	UP:09 ||	28	-2	27	-2.8	25	-4	86	8	30		28.59					29.98

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 16:55	FM-15	SCT:04 19	10	UP:09 ||	28	-2	26	-3.2	23	-5	80	8	20		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 17:15	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	9	10		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 17:35	FM-15	CLR:00	10	UP:09 ||	28	-2	25	-3.9	19	-7	69	9	30		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 17:55	FM-15	CLR:00	10	UP:09 ||	28	-2	25	-3.9	19	-7	69	9	20		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 18:15	FM-15	CLR:00	10	UP:09 ||	28	-2	25	-3.9	19	-7	69	8	30		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 18:35	FM-15	CLR:00	10	UP:09 ||	28	-2	25	-3.9	19	-7	69	8	30		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 18:55	FM-15	CLR:00	10	UP:09 ||	28	-2	26	-3.5	21	-6	74	9	20		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 19:15	FM-15	SCT:04 36 SCT:04 42	10	UP:09 ||	28	-2	26	-3.5	21	-6	74	7	40		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 19:35	FM-15	SCT:04 27 BKN:07 34 OVC:08 42	7	-SN:03 |SN:71 |	27	-3	25	-3.9	21	-6	80	6	30		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 19:55	FM-15	BKN:07 23 BKN:07 29 OVC:08 40	7	UP:09 ||	27	-3	25	-3.9	21	-6	80	6	20		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 20:15	FM-15	SCT:04 23 SCT:04 30 BKN:07 40	10	UP:09 ||	27	-3	25	-3.9	21	-6	80	6	20		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 20:36	FM-15	SCT:04 35	10		27	-3	25	-3.9	21	-6	80	6	10		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 20:55	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	0	0		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 21:15	FM-15	CLR:00	10		27	-3	25	-3.9	21	-6	80	0	0		28.64					30.03
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 21:35	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	3	330		28.64					30.03
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 21:55	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	3	330		28.64					30.03
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 22:15	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	5	330		28.64					30.03
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 22:35	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	3	330		28.64					30.03
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 22:55	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	3	340		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 23:15	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	5	350		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 23:35	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	5	350		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 23:55	FM-15	CLR:00	10		27	-3	25	-3.9	21	-6	80	5	340		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/20/2018 23:59	SOD																			
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 0:15	FM-15	SCT:04 65	10		25	-4	23	-5	19	-7	80	5	340		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 0:35	FM-15	OVC:08 65	10		27	-3	25	-3.9	21	-6	80	5	350		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 0:55	FM-15	BKN:07 65	10		25	-4	23	-5	19	-7	80	5	340		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 1:15	FM-15	CLR:00	10		25	-4	24	-4.6	21	-6	86	5	340		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 1:35	FM-15	CLR:00	10		25	-4	23	-5	19	-7	80	5	340		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 1:55	FM-15	CLR:00	10		25	-4	23	-5	19	-7	80	3	360		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 2:15	FM-15	CLR:00	10		25	-4	24	-4.6	21	-6	86	5	340		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 2:35	FM-15	CLR:00	10		23	-5	22	-5.7	19	-7	86	5	330		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 2:55	FM-15	CLR:00	10		23	-5	22	-5.7	19	-7	86	6	340		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 3:15	FM-15	CLR:00	10		23	-5	22	-5.7	19	-7	86	3	350		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 3:35	FM-15	CLR:00	10		23	-5	22	-5.7	19	-7	86	5	340		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 3:55	FM-15	CLR:00	10		23	-5	22	-5.7	19	-7	86	5	340		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 4:15	FM-15	CLR:00	10		23	-5	22	-5.7	19	-7	86	3	360		28.68					30.07
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 4:35	FM-15	CLR:00	10		21	-6	20	-6.5	19	-7	93	5	330		28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 4:55	FM-15	CLR:00	10		21	-6	20	-6.5	19	-7	93	5	330		28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 5:15	FM-15	CLR:00	10		21	-6	20	-6.5	19	-7	93	5	330		28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 5:35	FM-15	CLR:00	10		21	-6	20	-6.5	19	-7	93	5	340		28.71					30.1
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 5:55	FM-15	CLR:00	10		21	-6	20	-6.5	19	-7	93	3	350		28.71					30.1
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 6:15	FM-15	CLR:00	10		21	-6	20	-6.5	19	-7	93	3	330		28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 6:35	FM-15	CLR:00	10		23	-5	22	-5.7	19	-7	86	0	0		28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 6:55	FM-15	CLR:00	10		25	-4	23	-5	19	-7	80	0	0		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 7:15	FM-15	BKN:07 50	10		25	-4	24	-4.6	21	-6	86	3	340		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 7:35	FM-15	OVC:08 50	10		25	-4	23	-5	19	-7	80	0	0		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 7:55	FM-15	OVC:08 50	10		25	-4	24	-4.6	21	-6	86	0	0		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 8:15	FM-15	OVC:08 50	10		27	-3	25	-3.9	21	-6	80	0	0		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 8:35	FM-15	OVC:08 50	10		27	-3	25	-3.9	21	-6	80	0	0		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 8:55	FM-15	OVC:08 50	10		28	-2	26	-3.5	21	-6	74	0	0		28.74					30.13

Table B-1

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 9:15	FM-15	OVC:08 50	10		28	-2	25	-3.9	19	-7	69	0	0		28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 9:35	FM-15	OVC:08 50	10		30	-1	26	-3.3	18	-8	59	0	0		28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 9:55	FM-15	OVC:08 50	10		30	-1	26	-3.3	18	-8	59	0	0		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 10:15	FM-15	OVC:08 50	10		30	-1	26	-3.3	18	-8	59	0	0		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 10:35	FM-15	OVC:08 50	10		30	-1	25	-3.6	16	-9	55	3	280		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 10:55	FM-15	OVC:08 60	10		30	-1	26	-3.3	18	-8	59	7	280		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 11:15	FM-15	OVC:08 60	10		30	-1	26	-3.2	19	-7	64	6	270		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 11:35	FM-15	OVC:08 60	10		30	-1	26	-3.3	18	-8	59	8	250		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 11:55	FM-15	BKN:07 60	10		30	-1	26	-3.2	19	-7	64	8	240		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 12:15	FM-15	BKN:07 60	10		30	-1	26	-3.2	19	-7	64	6	240		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 12:35	FM-15	SCT:04 60	10		32	0	28	-2.5	19	-7	60	6	260		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 12:55	FM-15	BKN:07 60	10		34	1	29	-1.5	21	-6	60	6	280		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 13:15	FM-15	BKN:07 60	10		34	1	30	-1.1	23	-5	65	7	300		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 13:35	FM-15	SCT:04 41 BKN:07 60	10		34	1	30	-1.1	23	-5	65	10	290		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 13:55	FM-15	BKN:07 41	10		34	1	31	-0.8	25	-4	70	8	310		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 14:15	FM-15	SCT:04 25 SCT:04 43	10		34	1	31	-0.8	25	-4	70	6	260		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 14:35	FM-15	BKN:07 25	10		36	2	32	-0.1	25	-4	65	3	310		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 14:55	FM-15	SCT:04 25	10		36	2	33	0.3	27	-3	70	7	310		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 15:15	FM-15	CLR:00	10		36	2	33	0.3	27	-3	70	8	320		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 15:35	FM-15	SCT:04 25	10		36	2	33	0.3	27	-3	70	7	320		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 15:55	FM-15	SCT:04 23	10		36	2	33	0.3	27	-3	70	8	350		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 16:15	FM-15	SCT:04 23	10		34	1	31	-0.4	27	-3	75	7	330		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 16:35	FM-15	SCT:04 23	10		34	1	31	-0.4	27	-3	75	6	340		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 16:55	FM-15	SCT:04 23	10		34	1	31	-0.4	27	-3	75	8	340		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 17:15	FM-15	CLR:00	10		34	1	31	-0.4	27	-3	75	7	350		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 17:35	FM-15	CLR:00	10		34	1	31	-0.4	27	-3	75	5	330		28.81					30.2
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 17:55	FM-15	CLR:00	10		34	1	31	-0.4	27	-3	75	5	350		28.82					30.21
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 18:15	FM-15	CLR:00	10		32	0	30	-1	27	-3	80	5	340		28.82					30.21
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 18:35	FM-15	SCT:04 95	10		32	0	29	-1.4	25	-4	75	0	0		28.82					30.21
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 18:55	FM-15	SCT:04 27	10		30	-1	29	-1.7	27	-3	86	0	0		28.82					30.21
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 19:15	FM-15	SCT:04 27	10		32	0	29	-1.4	25	-4	75	0	0		28.82					30.21
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 19:35	FM-15	BKN:07 27	10		30	-1	28	-2.1	25	-4	80	0	0		28.82					30.22
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 19:55	FM-15	BKN:07 29	10		30	-1	28	-2.1	25	-4	80	0	0		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 20:15	FM-15	OVC:08 29	10		32	0	30	-1	27	-3	80	0	0		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 20:35	FM-15	OVC:08 29	10		32	0	30	-1	27	-3	80	3	80		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 20:55	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 21:15	FM-15	BKN:07 29	10		30	-1	29	-1.7	27	-3	86	3	70		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 21:35	FM-15	BKN:07 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 21:55	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 22:15	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 22:35	FM-15	OVC:08 29	10		30	-1	29	-1.5	28	-2	93	0	0		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 22:55	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	3	110		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 23:15	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	3	110		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 23:35	FM-15	OVC:08 31	10		30	-1	29	-1.7	27	-3	86	5	90		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/21/2018 23:55	FM-15	OVC:08 31	10		30	-1	29	-1.7	27	-3	86	0	0		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 0:15	FM-15	OVC:08 31	10		30	-1	29	-1.7	27	-3	86	0	0		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 0:35	FM-15	OVC:08 31	10		30	-1	29	-1.7	27	-3	86	5	70		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 0:55	FM-15	OVC:08 31	10		30	-1	29	-1.7	27	-3	86	0	0		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 1:15	FM-15	BKN:07 31	10		30	-1	29	-1.7	27	-3	86	3	50		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 1:35	FM-15	SCT:04 31	10		30	-1	28	-2.1	25	-4	80	3	80		28.87					30.27

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 1:55	FM-15	SCT:04 31 SCT:04 100	10		28	-2	28	-2.4	27	-3	93	3	140		28.87					30.27
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 2:15	FM-15	BKN:07 31	10		28	-2	28	-2.4	27	-3	93	0	0		28.87					30.27
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 2:35	FM-15	OVC:08 31	10		30	-1	29	-1.7	27	-3	86	0	0		28.87					30.27
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 2:55	FM-15	OVC:08 31	10		30	-1	29	-1.7	27	-3	86	0	0		28.87					30.27
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 3:15	FM-15	OVC:08 31	10		30	-1	29	-1.7	27	-3	86	0	0		28.88					30.28
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 3:35	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.88					30.28
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 3:55	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.88					30.28
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 4:15	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	5	80		28.88					30.28
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 4:35	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.89					30.29
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 4:55	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	3	110		28.89					30.29
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 5:15	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 5:35	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 5:55	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 6:15	FM-15	OVC:08 29	10		30	-1	29	-1.7	27	-3	86	0	0		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 6:35	FM-15	OVC:08 29	7		30	-1	29	-1.5	28	-2	93	0	0		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 6:55	FM-15	OVC:08 29	7		30	-1	29	-1.5	28	-2	93	0	0		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 7:15	FM-15	OVC:08 27	7		30	-1	29	-1.5	28	-2	93	0	0		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 7:35	FM-15	BKN:07 27	7		32	0	30	-0.8	28	-2	87	0	0		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 7:55	FM-15	CLR:00	10		34	1	31	-0.4	27	-3	75	0	0		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 8:15	FM-15	SCT:04 29	10		34	1	31	-0.7	25	-4	70	3	110		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 8:35	FM-15	SCT:04 29	7		34	1	31	-0.4	27	-3	75	6	100		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 8:55	FM-15	CLR:00	7		34	1	31	-0.4	27	-3	75	5	120		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 9:15	FM-15	CLR:00	10		34	1	31	-0.4	27	-3	75	6	110		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 9:35	FM-15	CLR:00	7		36	2	33	0.3	27	-3	70	6	90		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 9:55	FM-15	CLR:00	10		36	2	33	0.3	27	-3	70	6	80		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 10:15	FM-15	CLR:00	10		36	2	33	0.3	27	-3	70	5	60		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 10:35	FM-15	CLR:00	10		37	3	33	0.8	28	-2	70	7	70		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 10:55	FM-15	CLR:00	10		37	3	33	0.6	27	-3	65	6	20		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 11:15	FM-15	CLR:00	10		37	3	33	0.6	27	-3	65	5	40		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 11:35	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	6	60		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 11:55	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	6	40		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 12:15	FM-15	SCT:04 25	10		39	4	35	1.5	28	-2	65	6	10		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 12:35	FM-15	SCT:04 25	10		39	4	35	1.5	28	-2	65	5	40		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 12:55	FM-15	SCT:04 25	10		39	4	35	1.5	28	-2	65	8	360		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 13:15	FM-15	SCT:04 25	10		39	4	35	1.5	28	-2	65	5	350		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 13:35	FM-15	SCT:04 25	10		39	4	35	1.5	28	-2	65	6	10		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 13:55	FM-15	SCT:04 25	10		39	4	35	1.5	28	-2	65	3	340		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 14:15	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	8	350		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 14:35	FM-15	CLR:00	10		39	4	35	1.9	30	-1	70	9	350		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 14:55	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	7	350		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 15:15	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	9	20		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 15:35	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	9	360		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 15:55	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	8	50		28.89					30.29
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 16:15	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	8	30		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 16:35	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	7	20		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 16:55	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	8	10		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 17:15	FM-15	CLR:00	10		39	4	35	1.5	28	-2	65	3	10		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 17:35	FM-15	SCT:04 55	10		39	4	35	1.5	28	-2	65	5	20		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 17:55	FM-15	BKN:07 50	10		37	3	33	0.8	28	-2	70	3	20		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 18:15	FM-15	BKN:07 50	10		37	3	33	0.8	28	-2	70	0	0		28.92					30.32

Table B-1

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 18:35	FM-15	SCT:04 50	10		36	2	33	0.5	28	-2	75	3	350		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 18:55	FM-15	SCT:04 100	10		36	2	33	0.5	28	-2	75	0	0		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 19:15	FM-15	CLR:00	10		36	2	33	0.5	28	-2	75	3	350		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 19:35	FM-15	CLR:00	10		34	1	32	-0.2	28	-2	81	3	350		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 19:55	FM-15	CLR:00	10		34	1	31	-0.4	27	-3	75	3	340		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 20:15	FM-15	CLR:00	10		34	1	31	-0.4	27	-3	75	3	350		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 20:35	FM-15	CLR:00	10		34	1	31	-0.4	27	-3	75	5	360		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 20:55	FM-15	CLR:00	10		32	0	30	-1	27	-3	80	5	360		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 21:15	FM-15	CLR:00	10		32	0	30	-1	27	-3	80	5	10		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 21:35	FM-15	CLR:00	10		30	-1	29	-1.7	27	-3	86	3	10		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 21:55	FM-15	CLR:00	10		32	0	30	-1	27	-3	80	3	10		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 22:15	FM-15	CLR:00	10		32	0	29	-1.4	25	-4	75	0	0		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 22:35	FM-15	CLR:00	10		30	-1	28	-2.1	25	-4	80	6	20		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 22:55	FM-15	CLR:00	10		30	-1	28	-2.1	25	-4	80	3	10		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 23:15	FM-15	CLR:00	10		30	-1	28	-2.1	25	-4	80	3	10		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 23:35	FM-15	SCT:04 100	10		30	-1	28	-2.1	25	-4	80	5	20		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/22/2018 23:55	FM-15	SCT:04 100	10		30	-1	28	-2.1	25	-4	80	5	20		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 0:15	FM-15	CLR:00	10		30	-1	28	-2.1	25	-4	80	5	30		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 0:35	FM-15	CLR:00	10		28	-2	27	-2.8	25	-4	86	3	20		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 0:55	FM-15	CLR:00	10		30	-1	28	-2.5	23	-5	75	5	10		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 1:15	FM-15	CLR:00	10		28	-2	26	-3.2	23	-5	80	5	10		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 1:35	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	6	30		28.95					30.35
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 1:55	FM-15	SCT:04 110	10		30	-1	27	-2.8	21	-6	69	3	30		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 2:15	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	5	50		28.94					30.34
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 2:35	FM-15	CLR:00	10		30	-1	28	-2.5	23	-5	75	5	40		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 2:55	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	5	50		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 3:15	FM-15	CLR:00	10		28	-2	26	-3.2	23	-5	80	5	70		28.93					30.33
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 3:35	FM-15	CLR:00	10		28	-2	26	-3.2	23	-5	80	6	70		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 3:55	FM-15	CLR:00	10		28	-2	26	-3.2	23	-5	80	7	60		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 4:15	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	6	60		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 4:35	FM-15	CLR:00	10		28	-2	26	-3.2	23	-5	80	5	80		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 4:55	FM-15	SCT:04 90	10		28	-2	26	-3.5	21	-6	74	3	80		28.92					30.32
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 5:15	FM-15	SCT:04 90	10		28	-2	26	-3.5	21	-6	74	7	80		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 5:35	FM-15	SCT:04 90	10		28	-2	26	-3.5	21	-6	74	7	80		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 5:55	FM-15	SCT:04 90	10		28	-2	26	-3.5	21	-6	74	7	70		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 6:15	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	8	70		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 6:35	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	8	80		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 6:55	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	9	80		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 7:15	FM-15	CLR:00	10		28	-2	25	-3.9	19	-7	69	9	90		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 7:35	FM-15	CLR:00	10		30	-1	26	-3.2	19	-7	64	8	100		28.91					30.31
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 7:55	FM-15	CLR:00	10		30	-1	26	-3.2	19	-7	64	10	90		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 8:15	FM-15	CLR:00	10		32	0	28	-2.5	19	-7	60	14	90		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 8:35	FM-15	CLR:00	10		32	0	28	-2.1	21	-6	64	13	100		28.89					30.29
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 8:55	FM-15	CLR:00	10		32	0	28	-2.1	21	-6	64	14	90		28.89					30.29
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 9:15	FM-15	CLR:00	10		34	1	29	-1.8	19	-7	56	15	80		28.89					30.29
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 9:35	FM-15	CLR:00	10		34	1	29	-1.8	19	-7	56	13	90		28.89					30.29
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 9:55	FM-15	CLR:00	10		34	1	29	-1.8	19	-7	56	10	80		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 10:15	FM-15	CLR:00	10		36	2	31	-0.8	21	-6	56	9	90		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 10:35	FM-15	CLR:00	10		36	2	31	-0.8	21	-6	56	11	100		28.9					30.3
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 10:55	FM-15	CLR:00	10		36	2	30	-1.1	19	-7	52	13	80		28.89					30.29

Table B-1

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 11:15	FM-15	CLR:00	10		37	3	32	-0.1	23	-5	56	13	80		28.88					30.28
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 11:35	FM-15	CLR:00	10		37	3	31	-0.5	21	-6	52	15	90		28.88					30.28
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 11:55	FM-15	CLR:00	10		37	3	32	-0.1	23	-5	56	13	90		28.87					30.27
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 12:15	FM-15	CLR:00	10		39	4	34	0.9	25	-4	56	13	90		28.87					30.27
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 12:35	FM-15	CLR:00	10		39	4	34	0.9	25	-4	56	16	90		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 12:55	FM-15	CLR:00	10		39	4	34	0.9	25	-4	56	14	100		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 13:15	FM-15	CLR:00	10		39	4	34	0.9	25	-4	56	14	90		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 13:35	FM-15	CLR:00	10		39	4	34	0.9	25	-4	56	15	80		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 13:55	FM-15	CLR:00	10		39	4	33	0.5	23	-5	52	14	80		28.82					30.22
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 14:15	FM-15	CLR:00	10		41	5	35	1.5	25	-4	53	15	80		28.82					30.21
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 14:35	FM-15	CLR:00	10		39	4	34	0.9	25	-4	56	18	70		28.81					30.2
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 14:55	FM-15	CLR:00	10		39	4	33	0.5	23	-5	52	17	90		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 15:15	FM-15	CLR:00	10		39	4	33	0.5	23	-5	52	18	80		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 15:35	FM-15	CLR:00	10		39	4	34	0.9	25	-4	56	18	80	22	28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 15:55	FM-15	CLR:00	10		39	4	34	0.9	25	-4	56	18	80	24	28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 16:15	FM-15	SCT:04 120	10		39	4	34	0.9	25	-4	56	20	90	23	28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 16:35	FM-15	SCT:04 110	10		39	4	34	0.9	25	-4	56	15	80		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 16:55	FM-15	BKN:07 110	10		39	4	34	0.9	25	-4	56	16	90	22	28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 17:15	FM-15	OVC:08 110	10		37	3	32	0.2	25	-4	60	17	80		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 17:35	FM-15	OVC:08 100	10		37	3	32	0.2	25	-4	60	18	80	24	28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 17:55	FM-15	BKN:07 100	10		37	3	32	-0.1	23	-5	56	20	80		28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 18:15	FM-15	SCT:04s 100s	10		37	3	32	-0.1	23	-5	56	18	80		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 18:35	FM-15	SCT:04 100	10		37	3	31	-0.5	21	-6	52	20	90	23	28.71					30.1
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 18:55	FM-15	SCT:04 100	10		37	3	31	-0.5	21	-6	52	14	90		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 19:15	FM-15	SCT:04 100	10		37	3	31	-0.5	21	-6	52	15	90		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 19:35	FM-15	SCT:04 100	10		36	2	31	-0.8	21	-6	56	15	90		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 19:56	FM-15	SCT:04 90	10		36	2	31	-0.8	21	-6	56	15	80		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 20:15	FM-15	SCT:04 90	10		36	2	31	-0.8	21	-6	56	17	90		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 20:35	FM-15	SCT:04 80	10		36	2	31	-0.8	21	-6	56	17	90		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 20:56	FM-15	SCT:04s 95s	10		36	2	31	-0.8	21	-6	56	16	100		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 21:15	FM-15	SCT:04 95	10		36	2	31	-0.8	21	-6	56	18	100		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 21:35	FM-15	SCT:04 80 BKN:07 95	10		36	2	31	-0.8	21	-6	56	13	100		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 21:56	FM-15	SCT:04 95	10		36	2	31	-0.8	21	-6	56	11	90		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 22:15	FM-15	SCT:04 80 BKN:07 95	10		36	2	31	-0.8	21	-6	56	11	90		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 22:35	FM-15	SCT:04 80	10		36	2	31	-0.8	21	-6	56	13	90	18	28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 22:55	FM-15	SCT:04 90	10		34	1	29	-1.5	21	-6	60	14	100		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 23:15	FM-15	SCT:04 90	10		36	2	30	-1.1	19	-7	52	17	100		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 23:35	FM-15	SCT:04 90	10		34	1	29	-1.5	21	-6	60	17	100		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/23/2018 23:55	FM-15	SCT:04 80 SCT:04 90	10		34	1	29	-1.5	21	-6	60	17	100	23	28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 0:15	FM-15	SCT:04 90	10		34	1	29	-1.5	21	-6	60	17	100		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 0:35	FM-15	SCT:04 90	10		34	1	29	-1.5	21	-6	60	16	100	23	28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 0:55	FM-15	SCT:04 90	10		34	1	29	-1.5	21	-6	60	20	100	25	28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 1:15	FM-15	SCT:04 90	10		34	1	29	-1.5	21	-6	60	20	100	26	28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 1:35	FM-15	SCT:04 90	10		34	1	30	-1.1	23	-5	65	22	90	25	28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 1:55	FM-15	SCT:04 80 SCT:04 90	10		32	0	28	-2.1	21	-6	64	17	90	28	28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 2:15	FM-15	SCT:04 80	10		32	0	28	-2.5	19	-7	60	22	90		28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 2:35	FM-15	SCT:04 80	10		32	0	27	-2.6	18	-8	55	23	90	30	28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 2:55	FM-15	OVC:08 80	10		32	0	27	-2.6	18	-8	55	22	90	28	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 3:15	FM-15	OVC:08 80	10		30	-1	26	-3.3	18	-8	59	23	80	28	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 3:35	FM-15	OVC:08 80	10		30	-1	25	-3.6	16	-9	55	21	90	30	28.67					30.06

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 3:55	FM-15	OVC:08 70	10		30	-1	26	-3.3	18	-8	59	22	80	26	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 4:15	FM-15	BKN:07 70 BKN:07 85	10		30	-1	25	-3.6	16	-9	55	18	80		28.68					30.07
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 4:35	FM-15	SCT:04 60 SCT:04 85	10		28	-2	25	-4	18	-8	64	16	80	24	28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 4:55	FM-15	BKN:07 60	10		28	-2	25	-4	18	-8	64	20	80	26	28.71					30.1
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 5:15	FM-15	BKN:07 60	10		28	-2	25	-3.9	19	-7	69	21	80		28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 5:35	FM-15	SCT:04 70	10		28	-2	25	-3.9	19	-7	69	18	80	26	28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 5:55	FM-15	SCT:04 70	10		28	-2	25	-3.9	19	-7	69	20	80	26	28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 6:15	FM-15	SCT:04 80 SCT:04 95	10		28	-2	25	-3.9	19	-7	69	22	70		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 6:35	FM-15	SCT:04 90	10		28	-2	25	-3.9	19	-7	69	21	70	25	28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 6:55	FM-15	SCT:04 90	10		28	-2	25	-3.9	19	-7	69	17	60	21	28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 7:15	FM-15	SCT:04 90	10		28	-2	25	-3.9	19	-7	69	17	60	24	28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 7:35	FM-15	SCT:04 80	10		28	-2	25	-3.9	19	-7	69	22	70	25	28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 7:55	FM-15	SCT:04 80	10		28	-2	26	-3.5	21	-6	74	13	70	23	28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 8:15	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	14	60		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 8:35	FM-15	SCT:04 80	10		28	-2	26	-3.5	21	-6	74	16	60	20	28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 8:55	FM-15	SCT:04 80	10		28	-2	26	-3.5	21	-6	74	16	70		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 9:15	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	16	60		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 9:35	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	17	70	22	28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 9:55	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	18	70		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 10:15	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	17	80		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 10:35	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	17	70		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 10:55	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	15	80		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 11:15	FM-15	CLR:00	10		32	0	28	-2.1	21	-6	64	16	70		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 11:35	FM-15	CLR:00	10		34	1	29	-1.5	21	-6	60	15	80		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 11:55	FM-15	CLR:00	10		34	1	29	-1.5	21	-6	60	18	90	24	28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 12:15	FM-15	CLR:00	10		34	1	29	-1.5	21	-6	60	18	90	26	28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 12:35	FM-15	SCT:04 80	10		36	2	31	-0.8	21	-6	56	23	90	26	28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 12:55	FM-15	CLR:00	10		36	2	31	-0.8	21	-6	56	18	80	25	28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 13:15	FM-15	CLR:00	10		36	2	31	-0.4	23	-5	60	20	90		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 13:35	FM-15	CLR:00	10		37	3	32	-0.1	23	-5	56	15	80	24	28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 13:55	FM-15	CLR:00	10		37	3	32	-0.1	23	-5	56	22	80	25	28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 14:15	FM-15	CLR:00	10		37	3	31	-0.5	21	-6	52	18	90	24	28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 14:35	FM-15	CLR:00	10		37	3	31	-0.5	21	-6	52	21	80	25	28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 14:55	FM-15	CLR:00	10		37	3	31	-0.5	21	-6	52	18	80		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 15:15	FM-15	CLR:00	10		37	3	32	-0.1	23	-5	56	15	80		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 15:35	FM-15	CLR:00	10		37	3	32	-0.1	23	-5	56	17	80	22	28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 15:55	FM-15	CLR:00	10		37	3	31	-0.5	21	-6	52	21	80	26	28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 16:15	FM-15	CLR:00	10		39	4	34	0.9	25	-4	56	17	80	23	28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 16:35	FM-15	CLR:00	10		39	4	33	0.5	23	-5	52	21	80		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 16:55	FM-15	SCT:04 90	10		39	4	33	0.5	23	-5	52	17	80		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 17:15	FM-15	BKN:07 90	10		37	3	32	-0.1	23	-5	56	16	80		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 17:35	FM-15	BKN:07 90	10		37	3	32	0.2	25	-4	60	9	90		28.81					30.2
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 17:55	FM-15	OVC:08 90	10		37	3	31	-0.5	21	-6	52	11	90		28.81					30.2
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 18:15	FM-15	OVC:08 90	10		36	2	31	-0.8	21	-6	56	9	90		28.82					30.21
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 18:35	FM-15	OVC:08 90	10		36	2	32	-0.1	25	-4	65	7	80		28.82					30.22
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 18:55	FM-15	OVC:08 90	10		34	1	31	-0.8	25	-4	70	7	80		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 19:16	FM-15	BKN:07 90	10		34	1	30	-1.1	23	-5	65	5	40		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 19:35	FM-15	SCT:04 90	10		34	1	29	-1.5	21	-6	60	6	40		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 19:55	FM-15	SCT:04 90	10		34	1	31	-0.8	25	-4	70	9	60		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 20:15	FM-15	SCT:04 90	10		34	1	31	-0.8	25	-4	70	10	70		28.84					30.23

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 20:35	FM-15	BKN:07 80	10		34	1	31	-0.8	25	-4	70	9	70		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 20:55	FM-15	SCT:04 80	10		32	0	29	-1.4	25	-4	75	8	80		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 21:15	FM-15	SCT:04 90	10		32	0	29	-1.4	25	-4	75	9	90		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 21:35	FM-15	SCT:04 90	10		32	0	29	-1.8	23	-5	69	11	100		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 21:55	FM-15	BKN:07 90	10		32	0	28	-2.1	21	-6	64	13	100		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 22:15	FM-15	OVC:08 90	10		32	0	28	-2.1	21	-6	64	13	100		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 22:35	FM-15	OVC:08 90	10		32	0	28	-2.1	21	-6	64	13	100		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 22:55	FM-15	SCT:04 90	10		30	-1	27	-2.8	21	-6	69	11	100	17	28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 23:15	FM-15	BKN:07 80 BKN:07 90	10		30	-1	27	-2.8	21	-6	69	11	100		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 23:35	FM-15	OVC:08 80	10		30	-1	27	-2.8	21	-6	69	11	100		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/24/2018 23:56	FM-15	OVC:08 80	10		30	-1	28	-2.5	23	-5	75	13	90		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 0:15	FM-15	OVC:08 80	10		30	-1	27	-2.8	21	-6	69	14	100		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 0:35	FM-15	OVC:08 80	10		30	-1	27	-2.8	21	-6	69	14	100		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 0:55	FM-15	OVC:08 80	10		30	-1	27	-2.8	21	-6	69	10	100		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 1:15	FM-15	OVC:08 80	10		30	-1	27	-2.8	21	-6	69	13	100		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 1:35	FM-15	OVC:08 80	10		30	-1	27	-2.8	21	-6	69	13	100	17	28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 1:55	FM-15	OVC:08 80	10		30	-1	27	-2.8	21	-6	69	13	110	20	28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 2:15	FM-15	OVC:08 80	10		30	-1	26	-3.2	19	-7	64	17	110	22	28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 2:35	FM-15	OVC:08 80	10		30	-1	26	-3.2	19	-7	64	15	110	22	28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 2:55	FM-15	OVC:08 80	10		30	-1	26	-3.2	19	-7	64	16	110	22	28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 3:15	FM-15	BKN:07 70 OVC:08 80	10		28	-2	25	-3.9	19	-7	69	14	110		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 3:35	FM-15	OVC:08 70	10		28	-2	25	-3.9	19	-7	69	14	110	20	28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 3:55	FM-15	OVC:08 70	10		28	-2	25	-3.9	19	-7	69	14	110	18	28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 4:15	FM-15	OVC:08 70	10		28	-2	25	-3.9	19	-7	69	16	110		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 4:35	FM-15	SCT:04 70	10		28	-2	25	-3.9	19	-7	69	15	120		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 4:55	FM-15	BKN:07 80	10		28	-2	25	-4	18	-8	64	18	120		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 5:15	FM-15	SCT:04 80	10		28	-2	25	-4	18	-8	64	15	110		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 5:35	FM-15	CLR:00	10		27	-3	24	-4.4	18	-8	69	17	110		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 5:55	FM-15	CLR:00	10		27	-3	24	-4.4	18	-8	69	16	110		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 6:15	FM-15	CLR:00	10		27	-3	24	-4.4	18	-8	69	21	120	25	28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 6:35	FM-15	SCT:04 80	10		27	-3	24	-4.7	16	-9	64	20	110	23	28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 6:55	FM-15	SCT:04 80	10		27	-3	24	-4.7	16	-9	64	18	110		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 7:15	FM-15	CLR:00	10		27	-3	24	-4.4	18	-8	69	15	110		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 7:35	FM-15	CLR:00	10		27	-3	24	-4.7	16	-9	64	15	110		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 7:55	FM-15	CLR:00	10		28	-2	24	-4.4	16	-9	59	17	110		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 8:15	FM-15	CLR:00	10		28	-2	24	-4.4	16	-9	59	20	120	24	28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 8:35	FM-15	CLR:00	10		28	-2	25	-4	18	-8	64	16	110		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 8:55	FM-15	CLR:00	10		30	-1	26	-3.3	18	-8	59	15	120		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 9:15	FM-15	CLR:00	10		30	-1	26	-3.3	18	-8	59	15	140		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 9:35	FM-15	SCT:04 90	10		32	0	27	-2.6	18	-8	55	16	130	20	28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 9:55	FM-15	CLR:00	10		34	1	29	-1.9	18	-8	51	16	140	20	28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 10:15	FM-15	SCT:04 100	10		34	1	29	-1.9	18	-8	51	17	130		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 10:35	FM-15	SCT:04 100	10		34	1	29	-1.9	18	-8	51	14	120		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 10:55	FM-15	SCT:04 100	10		36	2	30	-1.3	18	-8	48	11	120		28.87					30.26
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 11:15	FM-15	SCT:04 100	10		36	2	30	-1.3	18	-8	48	15	140		28.85					30.25
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 11:35	FM-15	CLR:00	10		37	3	31	-0.8	19	-7	48	14	110		28.85					30.24
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 11:55	FM-15	CLR:00	10		37	3	31	-0.5	21	-6	52	15	120		28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 12:15	FM-15	SCT:04 90	10		39	4	32	-0.1	19	-7	45	17	130	23	28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 12:35	FM-15	SCT:04 90	10		39	4	32	-0.3	18	-8	42	16	140	22	28.84					30.23
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 12:55	FM-15	SCT:04 90	10		39	4	32	-0.1	19	-7	45	16	130		28.82					30.22

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 13:15	FM-15	SCT:04 90	10		39	4	32	0.2	21	-6	48	15	130		28.82					30.21
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 13:35	FM-15	SCT:04 90	10		39	4	32	-0.1	19	-7	45	17	130	21	28.81					30.2
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 13:55	FM-15	SCT:04 90	10		39	4	32	-0.3	18	-8	42	18	140	24	28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 14:15	FM-15	BKN:07 80	10		39	4	32	-0.3	18	-8	42	17	140		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 14:35	FM-15	BKN:07 80	10		39	4	32	0.2	21	-6	48	17	140		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 14:55	FM-15	BKN:07 80	10		39	4	32	-0.1	19	-7	45	16	140		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 15:15	FM-15	OVC:08 80	10		39	4	33	0.5	23	-5	52	14	140		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 15:35	FM-15	OVC:08 80	10		39	4	33	0.5	23	-5	52	15	150		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 15:55	FM-15	BKN:07 80	10		41	5	35	1.5	25	-4	53	14	140	20	28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 16:15	FM-15	OVC:08 80	10		41	5	35	1.5	25	-4	53	13	140		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 16:35	FM-15	OVC:08 80	10		41	5	35	1.5	25	-4	53	9	140		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 16:55	FM-15	OVC:08 80	10		41	5	35	1.5	25	-4	53	10	140		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 17:15	FM-15	OVC:08 80	10		41	5	35	1.5	25	-4	53	8	150		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 17:35	FM-15	OVC:08 80	10		39	4	34	0.9	25	-4	56	8	150		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 17:55	FM-15	OVC:08 70	10		39	4	34	1.3	27	-3	61	6	160		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 18:15	FM-15	OVC:08 70	10		39	4	34	1.3	27	-3	61	6	150		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 18:35	FM-15	OVC:08 70	10		37	3	33	0.8	28	-2	70	5	150		28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 18:55	FM-15	OVC:08 70	10		37	3	33	0.8	28	-2	70	5	140		28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 19:15	FM-15	OVC:08 70	10		37	3	33	0.8	28	-2	70	6	140		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 19:35	FM-15	OVC:08 70	10		37	3	33	0.8	28	-2	70	6	130		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 19:55	FM-15	OVC:08 70	10		37	3	33	0.8	28	-2	70	7	130		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 20:15	FM-15	BKN:07 70 OVC:08 75	10		37	3	33	0.6	27	-3	65	7	130		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 20:35	FM-15	SCT:04 60 OVC:08 70	10		36	2	33	0.3	27	-3	70	8	120		28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 20:55	FM-15	SCT:04 60 SCT:04 70	10		36	2	33	0.3	27	-3	70	8	120		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 21:15	FM-15	CLR:00	10		36	2	31	-0.4	23	-5	60	9	120		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 21:35	FM-15	CLR:00	10		36	2	32	-0.1	25	-4	65	9	120		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 21:55	FM-15	CLR:00	10		36	2	31	-0.8	21	-6	56	11	130		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 22:15	FM-15	CLR:00	10		36	2	31	-0.8	21	-6	56	11	140		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 22:35	FM-15	SCT:04 60	10		36	2	31	-0.8	21	-6	56	9	140		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 22:55	FM-15	CLR:00	10		34	1	31	-0.8	25	-4	70	6	150		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 23:15	FM-15	SCT:04 100	10		34	1	31	-0.8	25	-4	70	9	140		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 23:35	FM-15	SCT:04 90	10		34	1	29	-1.5	21	-6	60	18	140		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/25/2018 23:55	FM-15	SCT:04 43 SCT:04 50 BKN:07 65	10		34	1	29	-1.5	21	-6	60	15	140		28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 0:15	FM-15	SCT:04 47 SCT:04 60 OVC:08 80	10		34	1	29	-1.5	21	-6	60	16	140	22	28.8					30.19
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 0:35	FM-15	OVC:08 80	10		34	1	29	-1.5	21	-6	60	11	130		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 0:55	FM-15	OVC:08 80	10		34	1	29	-1.5	21	-6	60	17	130	21	28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 1:15	FM-15	OVC:08 80	10		34	1	29	-1.5	21	-6	60	16	130		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 2:35	FM-15	SCT:04 90	10		32	0	28	-2.1	21	-6	64	13	120		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 2:55	FM-15	SCT:04 110	10		32	0	28	-2.1	21	-6	64	10	120		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 3:15	FM-15	CLR:00	10		32	0	28	-2.1	21	-6	64	9	120		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 3:35	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	10	120		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 3:55	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	9	110		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 4:15	FM-15	BKN:07 100	10		30	-1	27	-2.8	21	-6	69	9	110		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 4:35	FM-15	OVC:08 100	10		30	-1	26	-3.2	19	-7	64	10	120		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 4:55	FM-15	OVC:08 100	10		30	-1	26	-3.2	19	-7	64	11	110		28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 5:15	FM-15	OVC:08 100	10		30	-1	26	-3.2	19	-7	64	11	120		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 5:35	FM-15	BKN:07 100	10		30	-1	27	-2.8	21	-6	69	13	120		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 5:55	FM-15	BKN:07 100	10		30	-1	27	-2.8	21	-6	69	13	110		28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 6:15	FM-15	BKN:07 100	10		30	-1	27	-2.8	21	-6	69	11	100		28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 6:35	FM-15	BKN:07 100	10		30	-1	27	-2.8	21	-6	69	10	100		28.72					30.11

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 6:55	FM-15	BKN:07 90	10		30	-1	27	-2.8	21	-6	69	13	110		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 7:15	FM-15	SCT:04 30 BKN:07 36 BKN:07 90	10		32	0	28	-2.1	21	-6	64	13	120		28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 7:35	FM-15	SCT:04 30 OVC:08 36	10		32	0	28	-2.1	21	-6	64	13	120		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 7:55	FM-15	BKN:07 36	10		32	0	28	-2.1	21	-6	64	13	120		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 8:15	FM-15	BKN:07 32	10		32	0	28	-2.1	21	-6	64	13	120		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 8:35	FM-15	OVC:08 39	10		34	1	30	-1.1	23	-5	65	13	120		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 8:55	FM-15	SCT:04 39 SCT:04 100	10		34	1	29	-1.5	21	-6	60	14	110		28.71					30.1
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 9:15	FM-15	SCT:04 100	10		34	1	30	-1.1	23	-5	65	11	120		28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 9:35	FM-15	SCT:04 38	10		34	1	29	-1.5	21	-6	60	15	140		28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 9:55	FM-15	BKN:07 36	10		34	1	31	-0.8	25	-4	70	16	130		28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 10:15	FM-15	BKN:07 36	10		34	1	30	-1.1	23	-5	65	16	130	20	28.68					30.07
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 10:35	FM-15	SCT:04 36	10		36	2	32	-0.1	25	-4	65	17	130	22	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 10:55	FM-15	CLR:00	10		36	2	31	-0.5	23	-5	60	17	120		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 11:15	FM-15	SCT:04 70	10		36	2	32	-0.1	25	-4	65	16	130		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 11:35	FM-15	SCT:04 29 BKN:07 70	10		37	3	32	0.2	25	-4	60	15	130		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 11:55	FM-15	BKN:07 29 OVC:08 70	10		36	2	32	-0.1	25	-4	65	11	140		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 12:15	FM-15	OVC:08 31	10		37	3	32	0.2	25	-4	60	10	120		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 12:35	FM-15	OVC:08 31	10		37	3	32	0.2	25	-4	60	6	100		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 12:55	FM-15	OVC:08 29	10		37	3	32	0.2	25	-4	60	8	100		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 13:15	FM-15	OVC:08 29	7	-RA:02 |RA:61 |	37	3	33	0.6	27	-3	65	8	130		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 13:35	FM-15	OVC:08 33	3	-RA:02 |RA:61 |	36	2	33	0.5	28	-2	75	7	100		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 13:55	FM-15	OVC:08 33	10		37	3	34	1.2	30	-1	75	8	90		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 14:15	FM-15	OVC:08 33	10		37	3	33	0.8	28	-2	70	11	100		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 14:35	FM-15	OVC:08 33	10		37	3	33	0.8	28	-2	70	11	110		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 14:55	FM-15	OVC:08 29	10	-RA:02 |RA:61 |	37	3	34	1.2	30	-1	75	8	110		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 15:15	FM-15	OVC:08 29	10	-RA:02 |RA:61 |	37	3	33	0.8	28	-2	70	11	110		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 15:36	FM-15	BKN:07 27 OVC:08 44	3	RA:02 |RA:62 |	36	2	34	0.9	30	-1	81	15	100		28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 15:55	FM-15	BKN:07 27 OVC:08 35	4	-RA:02 |RA:61 |	36	2	34	0.9	30	-1	81	14	100		28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 16:15	FM-15	OVC:08 25	2.50V	-SN:03 |SN:71 |	36	2	34	0.9	30	-1	81	10	110		28.59					29.97
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 16:35	FM-15	OVC:08 23	10	UP:09 ||	36	2	34	0.9	30	-1	81	10	100		28.59					29.97
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 16:55	FM-15	BKN:07 16 OVC:08 21	7	-DZ:01 |DZ:51 |	36	2	34	0.9	30	-1	81	13	110	16	28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 17:15	FM-15	OVC:08 14	2.5	UP:09 ||	34	1	33	0.7	32	0	93	13	110	16	28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 17:35	FM-15	OVC:08 12	2	UP:09 ||	34	1	33	0.7	32	0	93	9	110		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 17:55	FM-15	OVC:08 7	1.25	UP:09 ||	34	1	34	1.1	34	1	100	6	110		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 18:15	FM-15	OVC:08 7	2	UP:09 ||	34	1	34	1.1	34	1	100	7	100		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 18:35	FM-15	OVC:08 7	2.5	UP:09 ||	34	1	34	1.1	34	1	100	6	180		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 18:55	FM-15	OVC:08 7	2	UP:09 ||	34	1	34	1.1	34	1	100	3	150		28.59					29.97
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 19:15	FM-15	SCT:04 7 OVC:08 15	2	UP:09 ||	34	1	34	1.1	34	1	100	5	110		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 19:35	FM-15	BKN:07 3 BKN:07 7 OVC:08 14	2	UP:09 ||	34	1	34	1.1	34	1	100	3	110		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 19:55	FM-15	OVC:08 3	1.75	BR:1 ||	34	1	34	1.1	34	1	100	0	0		28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 20:15	FM-15	OVC:08 3	1.5	BR:1 ||	34	1	34	1.1	34	1	100	0	0		28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 20:35	FM-15	OVC:08 3	1.5	UP:09 ||	34	1	34	1.1	34	1	100	3	120		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 20:55	FM-15	OVC:08 5	2.5	BR:1 ||	34	1	34	1.1	34	1	100	3	140		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 21:15	FM-15	OVC:08 7	3	BR:1 ||	34	1	34	1.1	34	1	100	6	180		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 21:35	FM-15	OVC:08 7	5	UP:09 ||	34	1	34	1.1	34	1	100	5	190		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 21:55	FM-15	OVC:08 7	5	BR:1 ||	34	1	34	1.1	34	1	100	8	200		28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 22:15	FM-15	OVC:08 7	2.5	BR:1 ||	34	1	34	1.1	34	1	100	7	230		28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 22:35	FM-15	OVC:08 5	2	BR:1 ||	34	1	33	0.7	32	0	93	7	220		28.55					29.93
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 22:55	FM-15	OVC:08 5	1.75	BR:1 ||	34	1	33	0.7	32	0	93	6	240		28.55					29.93
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 23:15	FM-15	OVC:08 3	2	BR:1 ||	32	0	32	0	32	0	100	7	250		28.55					29.93

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 23:35	FM-15	OVC:08 5	2	BR:1 ||	32	0	32	0	32	0	100	7	250		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 23:55	FM-15	OVC:08 3	2.5	BR:1 ||	32	0	32	0	32	0	100	7	260		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/26/2018 23:59	SOD																			
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 0:15	FM-15	OVC:08 3	2.5	BR:1 ||	32	0	32	0	32	0	100	7	250		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 0:35	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	7	260		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 0:55	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	7	280		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 1:15	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	8	280		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 1:35	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	9	290		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 1:55	FM-15	OVC:08 3	2.5	BR:1 ||	32	0	31	-0.4	30	-1	93	8	290		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 2:15	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	10	290		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 2:35	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	11	280		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 2:55	FM-15	OVC:08 3	2	BR:1 ||	32	0	31	-0.4	30	-1	93	11	280		28.55					29.93
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 3:15	FM-15	OVC:08 3	2	BR:1 ||	32	0	31	-0.4	30	-1	93	13	280	16	28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 3:35	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	10	290		28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 3:55	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	14	300		28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 4:15	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	15	300		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 4:35	FM-15	OVC:08 3	3	BR:1 ||	32	0	31	-0.4	30	-1	93	13	310	18	28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 4:55	FM-15	OVC:08 5	3	BR:1 ||	32	0	31	-0.4	30	-1	93	9	310		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 5:15	FM-15	OVC:08 5	4	BR:1 ||	32	0	31	-0.4	30	-1	93	10	300		28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 5:35	FM-15	OVC:08 7	4	BR:1 ||	32	0	31	-0.4	30	-1	93	8	320		28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 5:55	FM-15	OVC:08 7	5	BR:1 ||	32	0	31	-0.4	30	-1	93	15	310		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 6:15	FM-15	OVC:08 7	5	BR:1 ||	32	0	31	-0.4	30	-1	93	11	300		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 6:35	FM-15	OVC:08 9	5	BR:1 ||	32	0	31	-0.4	30	-1	93	11	300	16	28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 6:55	FM-15	BKN:07 9 OVC:08 13	4	BR:1 ||	32	0	31	-0.4	30	-1	93	10	300		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 7:15	FM-15	BKN:07 7 OVC:08 11	3	BR:1 ||	32	0	31	-0.4	30	-1	93	8	290		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 7:35	FM-15	OVC:08 7	3	BR:1 ||	32	0	31	-0.4	30	-1	93	13	310		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 7:55	FM-15	OVC:08 7	4	BR:1 ||	32	0	31	-0.4	30	-1	93	13	300		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 8:15	FM-15	OVC:08 9	5	BR:1 ||	32	0	31	-0.4	30	-1	93	13	320	17	28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 8:35	FM-15	OVC:08 9	4	BR:1 ||	32	0	31	-0.4	30	-1	93	13	310		28.64					30.03
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 8:55	FM-15	OVC:08 7	4	BR:1 ||	32	0	31	-0.4	30	-1	93	11	300		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 9:15	FM-15	OVC:08 7	5	BR:1 ||	32	0	31	-0.4	30	-1	93	15	310		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 9:35	FM-15	OVC:08 7	5	BR:1 ||	32	0	31	-0.4	30	-1	93	11	290	17	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 9:55	FM-15	OVC:08 7	5	BR:1 ||	32	0	31	-0.4	30	-1	93	10	280		28.68					30.07
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 10:15	FM-15	OVC:08 7	5	BR:1 ||	32	0	31	-0.4	30	-1	93	11	290		28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 10:35	FM-15	OVC:08 7	5	BR:1 ||	34	1	32	0.2	30	-1	87	13	300		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 10:55	FM-15	OVC:08 7	4	BR:1 ||	34	1	32	0.2	30	-1	87	10	300		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 11:15	FM-15	OVC:08 7	5	BR:1 ||	34	1	32	0.2	30	-1	87	8	310		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 11:35	FM-15	OVC:08 7	7		34	1	32	0.2	30	-1	87	11	300		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 11:55	FM-15	OVC:08 7	7		34	1	32	0.2	30	-1	87	13	280	16	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 12:15	FM-15	OVC:08 9	10		34	1	32	0.2	30	-1	87	11	270		28.68					30.07
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 12:35	FM-15	OVC:08 11	10		36	2	34	0.9	30	-1	81	9	290		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 12:55	FM-15	OVC:08 11	10		36	2	34	0.9	30	-1	81	9	290		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 13:15	FM-15	OVC:08 13	10		37	3	35	1.6	32	0	81	11	310		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 13:35	FM-15	OVC:08 13	10		37	3	35	1.6	32	0	81	10	310		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 13:55	FM-15	OVC:08 13	10		37	3	35	1.6	32	0	81	9	270		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 14:15	FM-15	BKN:07 13	10		37	3	35	1.6	32	0	81	7	280		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 14:35	FM-15	SCT:04 15	10		39	4	36	2.3	32	0	75	8	260		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 14:55	FM-15	CLR:00	10		41	5	38	3.3	34	1	76	7	240		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 15:15	FM-15	CLR:00	10		41	5	37	2.9	32	0	70	6	260		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 15:35	FM-15	CLR:00	10		43	6	38	3.5	32	0	66	8	260		28.65					30.04

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 15:55	FM-15	CLR:00	10		43	6	39	3.9	34	1	71	6	270		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 16:15	FM-15	CLR:00	10		43	6	39	3.9	34	1	71	9	240		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 16:35	FM-15	CLR:00	10		43	6	39	3.9	34	1	71	6	260		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 16:55	FM-15	CLR:00	10		43	6	39	3.9	34	1	71	6	270		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 17:15	FM-15	CLR:00	10		43	6	39	3.9	34	1	71	8	250		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 17:35	FM-15	CLR:00	10		43	6	40	4.4	36	2	76	9	220		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 17:55	FM-15	CLR:00	10		41	5	39	3.8	36	2	81	10	230		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 18:15	FM-15	CLR:00	10		39	4	37	2.7	34	1	81	8	240		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 18:35	FM-15	CLR:00	10		37	3	36	2.1	34	1	87	7	230		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 18:55	FM-15	CLR:00	10		36	2	34	1.3	32	0	87	9	220		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 19:15	FM-15	CLR:00	7		34	1	33	0.7	32	0	93	9	220		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 19:35	FM-15	CLR:00	10		34	1	32	0.2	30	-1	87	10	220		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 19:55	FM-15	SCT:04 85	7		34	1	32	0.2	30	-1	87	10	220		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 20:15	FM-15	SCT:04 85	7		34	1	32	0.2	30	-1	87	9	220		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 20:35	FM-15	CLR:00	7		32	0	30	-0.8	28	-2	87	9	230		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 20:55	FM-15	CLR:00	7		32	0	31	-0.4	30	-1	93	8	220		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 21:15	FM-15	CLR:00	7		32	0	31	-0.4	30	-1	93	7	210		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 21:35	FM-15	CLR:00	7		32	0	31	-0.4	30	-1	93	9	220		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 21:55	FM-15	CLR:00	7		32	0	31	-0.4	30	-1	93	8	210		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 22:35	FM-15	CLR:00	7		32	0	30	-0.8	28	-2	87	7	220		28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 22:55	FM-15	SCT:04 85	7		30	-1	30	-1.1	30	-1	100	7	220		28.64					30.03
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 23:15	FM-15	CLR:00	7		30	-1	30	-1.1	30	-1	100	7	210		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 23:35	FM-15	CLR:00	7		30	-1	29	-1.5	28	-2	93	6	210		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 23:55	FM-15	CLR:00	5	BR:1 ||	30	-1	30	-1.1	30	-1	100	7	200		28.62					30.01
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/27/2018 23:59	SOD																			
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 0:15	FM-15	CLR:00	7		30	-1	30	-1.1	30	-1	100	10	200		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 0:35	FM-15	CLR:00	5	BR:1 ||	30	-1	29	-1.5	28	-2	93	7	200		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 0:55	FM-15	CLR:00	5	BR:1 ||	30	-1	29	-1.5	28	-2	93	6	200		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 1:15	FM-15	CLR:00	7		30	-1	29	-1.5	28	-2	93	7	220		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 1:35	FM-15	CLR:00	7		30	-1	30	-1.1	30	-1	100	7	210		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 1:55	FM-15	CLR:00	7		30	-1	29	-1.5	28	-2	93	7	210		28.59					29.97
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 2:15	FM-15	SCT:04 90	7		30	-1	29	-1.5	28	-2	93	7	200		28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 2:35	FM-15	SCT:04 90	7		30	-1	29	-1.5	28	-2	93	6	200		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 2:55	FM-15	CLR:00	7		30	-1	29	-1.5	28	-2	93	9	180		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 3:15	FM-15	CLR:00	10		30	-1	29	-1.5	28	-2	93	7	180		28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 3:35	FM-15	CLR:00	10		30	-1	29	-1.5	28	-2	93	8	180		28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 3:55	FM-15	CLR:00	10		30	-1	29	-1.5	28	-2	93	9	180		28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 4:15	FM-15	CLR:00	7		30	-1	29	-1.5	28	-2	93	9	170		28.55					29.93
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 4:35	FM-15	CLR:00	7		30	-1	29	-1.5	28	-2	93	9	180		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 4:55	FM-15	SCT:04 90	7		30	-1	29	-1.7	27	-3	86	8	180		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 5:15	FM-15	SCT:04 90	7		30	-1	29	-1.7	27	-3	86	6	190		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 5:35	FM-15	CLR:00	7		30	-1	29	-1.7	27	-3	86	9	180		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 5:55	FM-15	CLR:00	10		30	-1	29	-1.7	27	-3	86	8	180		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 6:15	FM-15	CLR:00	7		28	-2	28	-2.4	27	-3	93	9	170		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 6:35	FM-15	CLR:00	7		30	-1	29	-1.7	27	-3	86	8	180		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 6:55	FM-15	SCT:04 100	7		30	-1	29	-1.5	28	-2	93	8	180		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 7:15	FM-15	CLR:00	10		32	0	30	-0.8	28	-2	87	10	190		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 7:35	FM-15	CLR:00	10		34	1	32	-0.2	28	-2	81	13	180		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 7:55	FM-15	CLR:00	10		36	2	33	0.5	28	-2	75	11	180		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 8:15	FM-15	CLR:00	10		34	1	32	-0.2	28	-2	81	16	170		28.53					29.91

Table B-1

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 8:35	FM-15	CLR:00	10		36	2	33	0.5	28	-2	75	15	180		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 8:55	FM-15	CLR:00	10		36	2	34	0.9	30	-1	81	17	170		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 9:15	FM-15	CLR:00	10		36	2	34	0.9	30	-1	81	15	180		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 9:35	FM-15	CLR:00	10		36	2	34	0.9	30	-1	81	18	180		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 9:55	FM-15	CLR:00	10		36	2	34	0.9	30	-1	81	13	200		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 10:15	FM-15	CLR:00	10		36	2	34	0.9	30	-1	81	21	190		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 10:35	FM-15	SCT:04 100	10		37	3	36	2.1	34	1	87	16	180		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 10:55	FM-15	CLR:00	10		37	3	36	2.1	34	1	87	14	190		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 11:15	FM-15	CLR:00	10		39	4	37	2.7	34	1	81	11	190	20	28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 11:35	FM-15	CLR:00	10		43	6	39	3.9	34	1	71	16	210	22	28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 11:55	FM-15	CLR:00	10		43	6	39	3.9	34	1	71	17	210		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 12:15	FM-15	CLR:00	10		43	6	38	3.1	30	-1	61	16	200		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 12:35	FM-15	CLR:00	10		43	6	39	3.9	34	1	71	20	190	23	28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 12:55	FM-15	CLR:00	10		43	6	40	4.4	36	2	76	18	190	23	28.51					29.89
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 13:15	FM-15	CLR:00	10		45	7	41	5	36	2	71	18	190		28.51					29.89
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 13:35	FM-15	CLR:00	10		45	7	41	5	36	2	71	18	200	23	28.49					29.87
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 13:55	FM-15	CLR:00	10		45	7	41	5	36	2	71	16	210	20	28.48					29.86
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 14:15	FM-15	CLR:00	10		45	7	41	5	36	2	71	13	210	20	28.48					29.86
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 14:35	FM-15	CLR:00	10		46	8	41	5.3	36	2	66	14	220		28.48					29.86
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 14:42	FM-15				46	8			36	2	66	11	230							29.85
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 14:49	FM-15				46	8			37	3	71	10	210							29.85
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 14:55	FM-15	CLR:00	10		46	8	41	5.3	36	2	66	13	220	17	28.47					29.85
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 15:15	FM-15	CLR:00	10		46	8	42	5.5	37	3	71	14	230		28.46					29.84
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 15:35	FM-15	CLR:00	10		48	9	43	5.8	36	2	62	13	240		28.46					29.84
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 15:55	FM-15	CLR:00	10		48	9	43	6.1	37	3	66	16	250	20	28.46					29.84
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 16:15	FM-15	SCT:04 24	10		46	8	42	5.5	37	3	71	13	260		28.47					29.85
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 16:35	FM-15	SCT:04 24	10		46	8	42	5.5	37	3	71	13	280		28.47					29.85
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 16:55	FM-15	CLR:00	10		46	8	42	5.5	37	3	71	9	270		28.47					29.85
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 17:15	FM-15	CLR:00	10		46	8	41	5.3	36	2	66	8	270		28.47					29.85
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 17:35	FM-15	CLR:00	10		45	7	41	5	36	2	71	8	270		28.48					29.86
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 17:55	FM-15	CLR:00	10		45	7	41	5	36	2	71	7	280		28.48					29.86
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 18:15	FM-15	BKN:07 27	10		45	7	41	5	36	2	71	6	260		28.49					29.87
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 18:35	FM-15	OVC:08 25	10		43	6	40	4.6	37	3	81	5	250		28.49					29.87
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 18:55	FM-15	OVC:08 23	10		43	6	40	4.6	37	3	81	7	260		28.5					29.88
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 19:15	FM-15	OVC:08 23	10		43	6	40	4.6	37	3	81	5	290		28.5					29.88
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 19:35	FM-15	SCT:04 17 OVC:08 24	10		43	6	40	4.6	37	3	81	11	310		28.51					29.89
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 19:55	FM-15	BKN:07 27 BKN:07 85	10		43	6	40	4.6	37	3	81	9	300		28.51					29.89
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 20:15	FM-15	SCT:04 24 SCT:04 29 BKN:07 85	10		41	5	39	4	37	3	87	8	300		28.52					29.9
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 20:35	FM-15	OVC:08 22	10		41	5	39	4	37	3	87	9	310		28.53					29.91
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 20:55	FM-15	OVC:08 22	10		39	4	38	3.2	36	2	87	11	320		28.54					29.92
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 21:15	FM-15	OVC:08 24	10		39	4	38	3.2	36	2	87	10	320		28.55					29.93
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 21:35	FM-15	OVC:08 24	10		39	4	38	3.2	36	2	87	9	320		28.55					29.93
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 21:55	FM-15	OVC:08 26	10		39	4	37	2.7	34	1	81	8	320		28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 22:15	FM-15	OVC:08 26	10		39	4	37	2.7	34	1	81	8	320		28.56					29.94
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 22:35	FM-15	OVC:08 24	10		37	3	36	2.1	34	1	87	8	330		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 22:55	FM-15	OVC:08 24	10		37	3	35	1.6	32	0	81	9	320		28.56					29.95
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 23:15	FM-15	OVC:08 24	10		37	3	34	1.2	30	-1	75	11	330		28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 23:35	FM-15	BKN:07 24	10		36	2	33	0.5	28	-2	75	15	330		28.58					29.96
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 23:55	FM-15	CLR:00	10		34	1	32	-0.2	28	-2	81	13	320		28.59					29.97
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/28/2018 23:59	SOD																			

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 0:15	FM-15	CLR:00	10		32	0	30	-0.8	28	-2	87	9	320		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 0:35	FM-15	CLR:00	10		30	-1	29	-1.7	27	-3	86	10	320		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 0:55	FM-15	SCT:04 95	10		30	-1	29	-1.7	27	-3	86	13	320		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 1:15	FM-15	SCT:04 95	10		30	-1	28	-2.1	25	-4	80	10	330	16	28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 1:35	FM-15	CLR:00	10		28	-2	27	-2.8	25	-4	86	10	330		28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 1:55	FM-15	CLR:00	10		28	-2	27	-2.8	25	-4	86	14	330	22	28.59					29.98
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 2:15	FM-15	CLR:00	10		28	-2	27	-2.8	25	-4	86	11	330	17	28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 2:35	FM-15	CLR:00	10		28	-2	26	-3.2	23	-5	80	14	330		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 2:55	FM-15	CLR:00	10		27	-3	26	-3.5	23	-5	86	15	340	21	28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 3:15	FM-15	SCT:04 95	10		27	-3	25	-3.9	21	-6	80	14	340	18	28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 3:35	FM-15	SCT:04 85	10		27	-3	25	-3.9	21	-6	80	11	340		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 3:55	FM-15	CLR:00	10		27	-3	25	-3.9	21	-6	80	14	340		28.61					29.99
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 4:15	FM-15	CLR:00	10		27	-3	25	-3.9	21	-6	80	15	340	24	28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 4:35	FM-15	SCT:04 85	10		27	-3	25	-3.9	21	-6	80	15	340		28.61					30
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 4:55	FM-15	CLR:00	10		25	-4	23	-5	19	-7	80	15	330		28.63					30.02
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 5:15	FM-15	CLR:00	10		25	-4	23	-5	19	-7	80	11	340		28.64					30.03
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 5:35	FM-15	SCT:04 85	10		25	-4	23	-5	19	-7	80	13	340	18	28.65					30.04
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 5:55	FM-15	SCT:04 85	10		25	-4	23	-5	19	-7	80	11	340	17	28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 6:15	FM-15	SCT:04 85	10		25	-4	23	-5	19	-7	80	13	340		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 6:35	FM-15	CLR:00	10		25	-4	23	-5	19	-7	80	14	340		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 6:55	FM-15	CLR:00	10		25	-4	23	-5	19	-7	80	14	340		28.68					30.07
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 7:35	FM-15	CLR:00	10		25	-4	23	-5	19	-7	80	16	340		28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 7:55	FM-15	CLR:00	10		25	-4	23	-5	19	-7	80	14	350		28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 8:15	FM-15	CLR:00	10		27	-3	25	-3.9	21	-6	80	13	340		28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 8:35	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	13	340		28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 8:55	FM-15	CLR:00	10		27	-3	25	-3.9	21	-6	80	13	350		28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 9:15	FM-15	CLR:00	10		27	-3	24	-4.2	19	-7	74	13	350		28.71					30.1
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 9:35	FM-15	CLR:00	10		28	-2	25	-3.9	19	-7	69	13	360		28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 9:55	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	13	340		28.71					30.1
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 10:15	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	14	330	18	28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 10:35	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	13	330	18	28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 10:55	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	15	340		28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 11:15	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	14	340		28.68					30.07
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 12:15	FM-15	CLR:00	10		34	1	30	-1.1	23	-5	65	15	340	18	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 12:35	FM-15	CLR:00	10		34	1	30	-1.1	23	-5	65	15	350		28.66					30.05
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 12:55	FM-15	CLR:00	10		36	2	31	-0.5	23	-5	60	15	330	21	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 13:15	FM-15	CLR:00	10		36	2	31	-0.5	23	-5	60	18	360	23	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 13:35	FM-15	CLR:00	10		36	2	31	-0.8	21	-6	56	17	330	24	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 13:55	FM-15	CLR:00	10		36	2	31	-0.5	23	-5	60	17	350	22	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 14:15	FM-15	CLR:00	10		36	2	31	-0.8	21	-6	56	17	350	24	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 14:35	FM-15	CLR:00	10		37	3	31	-0.5	21	-6	52	16	340		28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 14:55	FM-15	CLR:00	10		37	3	31	-0.8	19	-7	48	16	340	23	28.67					30.06
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 15:15	FM-15	CLR:00	10		37	3	31	-0.8	19	-7	48	15	330	22	28.68					30.07
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 15:35	FM-15	CLR:00	10		37	3	31	-0.8	19	-7	48	15	340		28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 15:55	FM-15	CLR:00	10		37	3	31	-0.8	19	-7	48	16	340	21	28.69					30.08
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 16:15	FM-15	CLR:00	10		37	3	31	-0.8	19	-7	48	16	VRB	22	28.7					30.09
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 16:35	FM-15	CLR:00	10		37	3	30	-0.9	18	-8	45	14	330		28.71					30.1
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 16:55	FM-15	CLR:00	10		37	3	31	-0.8	19	-7	48	15	340	20	28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 17:15	FM-15	CLR:00	10		37	3	31	-0.8	19	-7	48	14	330		28.72					30.11
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 17:35	FM-15	CLR:00	10		37	3	31	-0.8	19	-7	48	11	330	16	28.72					30.11

Table B-1

STATION	STATION_NAME	ELEVATION	LATITUDE	LONGITUDE	DATE	REPORTTPYE	HOURLYSKYCONDITIONS	HOURLYVISIBILITY	HOURLYPRSENTWEATHERTYPE	HOURLYDRYBULBTEMPF	HOURLYDRYBULBTEMPC	HOURLYWETBULBTEMPF	HOURLYWETBULBTEMPC	HOURLYDewPointTempF	HOURLYDewPointTempC	HOURLYRelativeHumidity	HOURLYWindSpeed	HOURLYWindDirection	HOURLYWindGustSpeed	HOURLYStationPressure	HOURLYPressureTendency	HOURLYPressureChange	HOURLYSeaLevelPressure	HOURLYPrecip	HOURLYAltimeterSetting
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 17:55	FM-15	CLR:00	10		36	2	30	-1.1	19	-7	52	9	340		28.73					30.12
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 18:15	FM-15	CLR:00	10		36	2	30	-1.1	19	-7	52	8	330		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 18:35	FM-15	CLR:00	10		34	1	29	-1.5	21	-6	60	7	330		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 18:55	FM-15	SCT:04 90	10		32	0	28	-2.1	21	-6	64	7	320		28.74					30.13
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 19:15	FM-15	CLR:00	10		32	0	28	-2.1	21	-6	64	5	310		28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 19:35	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	6	300		28.75					30.14
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 19:55	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	6	290		28.76					30.15
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 20:15	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	7	310		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 20:35	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	7	310		28.77					30.16
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 20:55	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	7	310		28.78					30.17
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 21:15	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	8	310		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 21:35	FM-15	CLR:00	10		30	-1	27	-2.8	21	-6	69	7	310		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 21:55	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	6	310		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 22:15	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	5	290		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 22:35	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	3	300		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 22:55	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	3	300		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 23:15	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	3	300		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 23:35	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	5	300		28.79					30.18
WBAN:04978	DODGE CENTER AIRPORT MN US	397.8	44.01778	-92.83139	3/29/2018 23:55	FM-15	CLR:00	10		28	-2	26	-3.5	21	-6	74	6	300		28.8					30.19

Appendix C

Short-term Sound Level Measurement Data

Table C-1: Short-term Sound Level Measurement Results

S1	Sound Pressure Level							
	Leq	L10	L50	L90	Leq	L10	L50	L90
	dBA	dBA	dBA	dBA	dBC	dBC	dBC	dBC
Daytime	52	53	41	31	63	64	55	50
Nighttime	50	53	28	23	58	59	47	44
S2	**Sound Pressure Level**							
	Leq	L10	L50	L90	Leq	L10	L50	L90
	dBA	dBA	dBA	dBA	dBC	dBC	dBC	dBC
Daytime	30	33	28	24	48	49	47	46
Nighttime	30	33	29	26	47	49	47	46

Notes:

1. Daytime and nighttime measurements were on March 20, 2018 and March 21, 2018, respectively

Appendix D

DCW Wind Turbine Coordinates

Table D-1: DCW Wind Turbine Coordinates

Wind Turbine ID	Coordinates NAD83 UTM Zone 15N (meters)	
	X (Easting)	Y (Northing)
1	491773.49	4876513.69
2	492177.40	4876929.74
3	492515.95	4876507.29
4	492027.69	4875376.03
5	492382.70	4875021.02
6	492872.33	4874956.90
7	493480.60	4874916.73
8	493862.85	4875124.65
9	494524.33	4874201.90
10	495256.04	4875133.97
11	495645.46	4875128.40
12	496632.97	4866120.24
13	496950.55	4866540.12
14	496863.02	4867708.41
15	497232.19	4868242.38
16	496520.92	4868936.19
17	497702.64	4868650.42
18	498559.17	4869213.08
19	496175.92	4870443.22
20	496546.68	4870518.48
21	496901.03	4869976.79
22	497294.89	4869935.28
23	497723.95	4869962.98
24	498388.48	4870067.35
25	498952.27	4869760.73
26	496087.93	4871373.26
27	496519.91	4871371.21
28	498114.74	4870686.08
29	498532.91	4871403.19
30	499356.88	4871529.00
31	497612.89	4873395.25
32	498398.28	4872549.54
33	498796.96	4872868.03
34	500149.90	4873911.23
35	501398.06	4873589.09
36	501770.29	4873795.69
37	502124.90	4873815.21
38	502595.92	4873426.22
39	503005.34	4873519.47
40	503372.12	4873881.51
41	503770.23	4873926.96
42	500177.97	4872914.07
43	502301.86	4872993.95
44	501790.90	4872182.22
45	502227.91	4872122.24
46	502591.63	4872391.24
47	502991.91	4872505.27
48	503371.39	4872585.69
49	501755.51	4871361.61
50	503662.93	4871608.22

Table D-1: DCW Wind Turbine Coordinates

Wind Turbine ID	Coordinates NAD83 UTM Zone 15N (meters)	
	X (Easting)	Y (Northing)
51	504224.94	4871855.24
52	504569.48	4871409.27
53	505395.56	4871637.86
54	502140.74	4870760.46
55	503404.54	4870993.37
56	503820.93	4870883.24
57	504206.39	4870859.18
58	502581.34	4869899.76
59	502997.22	4870084.96
60	503382.55	4870096.20
61	503764.41	4869999.27
62	504662.35	4870183.97
63	505359.94	4869797.24
64	506497.95	4869971.23
65	502147.93	4869004.19
66	503091.92	4868779.21
67	503453.82	4869064.27
68	503763.25	4868682.38
Alt1	492991.91	4876607.27
Alt2	504008.92	4869270.22
Alt3	503919.66	4872259.61
Alt4	499837.87	4873507.53

Appendix E

Sound Level Modeling Results – Tabular – Sorted by Receptor ID

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
1	491323.97	4876003.31	Non-Participating	1	41
2	494675.74	4874843.64	Participating	1	44
12	495571.71	4871482.46	Participating	1	43
13	508114.34	4869543.75	Non-Participating	1	33
14	502838.46	4866942.77	Non-Participating	1	35
15	507596.16	4875246.28	Non-Participating	1	30
16	511230.91	4871253.21	Non-Participating	1	26
17	511252.81	4866394.34	Non-Participating	1	25
18	510963.01	4866310.55	Non-Participating	1	25
19	511236.15	4865354.84	Non-Participating	1	24
20	511469.59	4865525.69	Non-Participating	1	24
21	511803.28	4864790.87	Non-Participating	1	23
22	512882.51	4865215.73	Non-Participating	1	22
23	512873.66	4865696.43	Non-Participating	1	23
24	512672.12	4864525.97	Non-Participating	1	22
25	511249.27	4863981.03	Non-Participating	1	23
26	511259.59	4863882.99	Non-Participating	1	23
27	511344.96	4863873.64	Non-Participating	1	23
28	511215.66	4862975.26	Non-Participating	1	22
29	496552.23	4874244.46	Participating	1	38
30	498628.08	4875979.63	Non-Participating	1	34
31	499002.42	4875287.65	Non-Participating	1	36
32	499599.12	4875101.12	Non-Participating	1	37
33	499667.39	4875349.30	Non-Participating	1	36
34	499579.55	4875568.90	Non-Participating	1	35
35	499611.30	4875969.22	Non-Participating	1	34
36	499630.61	4876074.26	Non-Participating	1	34
37	499592.84	4876172.35	Non-Participating	1	33
38	499584.90	4876221.63	Non-Participating	1	34
39	499575.64	4876277.53	Non-Participating	1	33
40	499452.74	4876213.03	Non-Participating	1	34
41	499633.37	4876323.52	Non-Participating	1	33
42	499577.34	4876430.68	Non-Participating	1	33
43	499610.04	4876414.33	Non-Participating	1	33
44	501043.37	4874380.00	Non-Participating	1	42
45	500947.46	4874527.17	Participating	1	41
46	501031.13	4874231.83	Non-Participating	1	43
47	501227.06	4875030.65	Non-Participating	1	39
48	501197.62	4875115.32	Non-Participating	1	38
49	501230.36	4875345.51	Non-Participating	1	37
50	501090.13	4875362.70	Non-Participating	1	37
51	501571.15	4875944.50	Non-Participating	1	35
52	501438.59	4876074.41	Non-Participating	1	35
53	502423.50	4876077.06	Non-Participating	1	35
54	502510.29	4875920.42	Non-Participating	1	35
55	502413.98	4875915.66	Non-Participating	1	35
56	502502.88	4875773.32	Non-Participating	1	36
57	502679.62	4875863.27	Non-Participating	1	36

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
58	502810.85	4875788.66	Non-Participating	1	36
59	502831.49	4875681.24	Non-Participating	1	36
60	502714.55	4875399.19	Non-Participating	1	37
61	502721.16	4875266.90	Non-Participating	1	38
62	502793.92	4874915.01	Participating	1	40
63	502795.77	4874857.59	Participating	1	40
64	502728.04	4874380.81	Participating	1	44
65	503738.09	4874989.75	Participating	1	39
66	504105.86	4874905.08	Non-Participating	1	39
67	504104.11	4874434.02	Participating	1	42
68	504298.15	4874837.83	Non-Participating	1	38
69	503489.38	4875803.62	Non-Participating	1	35
70	503392.81	4875830.08	Non-Participating	1	35
71	504290.41	4875654.93	Non-Participating	1	35
72	504273.87	4875735.63	Non-Participating	1	35
73	504056.70	4875882.71	Non-Participating	1	34
74	504535.62	4874968.38	Non-Participating	1	37
75	504475.43	4874793.75	Non-Participating	1	38
76	504646.75	4874484.85	Non-Participating	1	38
77	504921.92	4874625.08	Non-Participating	1	37
78	505001.62	4874532.14	Non-Participating	1	37
79	505124.98	4874525.20	Non-Participating	1	36
80	505184.52	4874515.28	Non-Participating	1	36
81	505399.82	4874479.23	Non-Participating	1	35
82	505367.74	4874307.25	Non-Participating	1	36
83	505532.77	4874466.33	Non-Participating	1	35
84	505566.18	4874182.83	Non-Participating	1	36
85	506083.22	4874314.89	Non-Participating	1	34
86	506058.09	4874109.83	Non-Participating	1	34
87	507311.95	4875159.44	Non-Participating	1	30
88	507422.02	4875164.20	Non-Participating	1	30
89	507528.65	4875149.91	Non-Participating	1	30
90	507599.42	4874772.15	Non-Participating	1	30
91	508121.97	4874981.77	Non-Participating	1	29
92	508591.19	4875255.26	Non-Participating	1	28
93	509166.13	4875086.85	Non-Participating	1	28
94	509022.59	4875282.64	Non-Participating	1	27
95	509351.34	4875158.02	Non-Participating	1	27
96	509416.42	4875235.41	Non-Participating	1	22
97	509776.66	4875411.96	Non-Participating	1	27
98	509731.74	4874372.94	Non-Participating	1	27
99	494854.60	4872697.99	Non-Participating	1	36
100	495132.34	4872890.10	Non-Participating	1	37
101	496413.53	4872753.51	Non-Participating	1	39
102	497067.91	4872235.01	Non-Participating	1	41
103	495778.39	4871934.81	Participating	1	42
104	495507.06	4871937.58	Non-Participating	1	40
105	497277.52	4872254.03	Non-Participating	1	41

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
106	497138.35	4873069.61	Participating	1	42
107	499065.71	4872231.14	Participating	1	44
108	499677.17	4872538.85	Non-Participating	1	43
109	498632.85	4872029.26	Non-Participating	1	45
110	498077.69	4874206.61	Non-Participating	1	39
111	499582.38	4871957.52	Non-Participating	1	44
112	499505.52	4873983.70	Participation Pending	1	44
113	499640.46	4874375.81	Non-Participating	1	42
114	499618.58	4874177.48	Participating	1	43
115	500691.28	4871972.52	Non-Participating	1	42
116	501183.27	4871944.87	Non-Participating	1	44
117	501103.10	4872967.75	Participation Pending	1	44
118	501528.69	4872860.66	Participating	1	45
119	503071.21	4871942.22	Participating	1	47
120	502725.93	4871787.44	Participating	1	47
121	503827.13	4872773.68	Participating	1	47
122	503996.46	4872856.76	Participating	1	45
123	504201.25	4872856.23	Participating	1	44
124	504551.09	4874079.47	Non-Participating	1	40
125	504758.52	4871963.59	Participating	1	46
126	504942.08	4872768.12	Non-Participating	1	41
127	505837.17	4873650.51	Non-Participating	1	36
128	506220.82	4873313.16	Non-Participating	1	35
129	506549.56	4872868.13	Non-Participating	1	35
130	506996.44	4872762.57	Non-Participating	1	34
131	506998.03	4871828.06	Non-Participating	1	35
132	507534.25	4871148.65	Non-Participating	1	35
133	507702.53	4871154.60	Non-Participating	1	34
134	507988.15	4871657.51	Non-Participating	1	33
135	508141.14	4872275.11	Non-Participating	1	32
136	507912.94	4872763.80	Non-Participating	1	32
137	507852.51	4872992.61	Participating	1	32
138	506865.15	4873428.54	Non-Participating	1	34
139	508493.79	4873588.15	Non-Participating	1	30
140	508608.89	4873590.53	Non-Participating	1	30
141	508631.91	4873590.93	Non-Participating	1	30
142	508613.65	4873652.84	Participating	1	30
143	508917.66	4873593.31	Non-Participating	1	29
144	509004.04	4872856.29	Non-Participating	1	29
145	509375.92	4872966.88	Participating	1	29
146	509975.20	4872682.45	Non-Participating	1	28
147	510643.93	4872858.40	Non-Participating	1	27
148	510742.82	4872673.86	Non-Participating	1	27
149	509722.39	4872284.72	Non-Participating	1	29
150	509630.84	4872355.63	Non-Participating	1	29
151	509722.69	4873399.56	Non-Participating	1	28
152	495349.84	4870249.67	Non-Participating	1	40
153	495559.21	4869681.85	Non-Participating	1	40

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
154	495562.38	4870204.93	Participation Pending	1	42
155	495124.76	4870677.40	Non-Participating	1	39
156	495559.28	4870851.63	Non-Participating	1	42
157	495387.82	4871379.34	Participating	1	41
158	495550.87	4871409.04	Participating	1	43
159	496488.82	4869537.11	Participating	1	45
160	496747.46	4869514.95	Non-Participating	1	46
161	497688.18	4869422.48	Participation Pending	1	46
162	499490.33	4869311.02	Participating	1	42
163	499484.18	4870256.98	Non-Participating	1	42
164	499480.74	4870826.96	Non-Participating	1	42
165	501120.03	4871028.07	Non-Participating	1	42
166	501137.73	4869524.71	Non-Participating	1	40
167	501212.34	4869298.23	Participation Pending	1	40
168	502822.20	4871087.25	Non-Participating	1	46
169	504355.79	4869657.97	Participating	1	46
170	504464.66	4869547.53	Participation Pending	1	46
171	505966.47	4869876.74	Participating	1	44
172	506068.12	4870744.95	Non-Participating	1	41
173	506052.46	4871492.14	Non-Participating	1	41
174	507891.98	4870234.05	Non-Participating	1	34
175	508823.64	4869539.44	Non-Participating	1	31
176	509063.51	4869535.71	Non-Participating	1	30
177	508143.94	4871002.25	Non-Participating	1	33
178	508887.77	4871155.48	Non-Participating	1	31
179	509716.92	4871621.42	Non-Participating	1	29
180	509716.39	4871712.56	Non-Participating	1	29
181	509642.37	4871517.50	Non-Participating	1	29
182	509638.57	4871313.88	Non-Participating	1	29
183	510238.58	4871099.40	Non-Participating	1	28
184	509715.57	4870766.88	Non-Participating	1	29
185	510779.47	4869615.18	Non-Participating	1	27
186	509710.09	4868616.84	Non-Participating	1	28
187	511208.69	4868187.15	Non-Participating	1	26
188	511358.45	4868626.10	Non-Participating	1	26
189	511354.81	4868870.63	Non-Participating	1	26
190	511340.26	4870437.24	Non-Participating	1	26
191	511328.61	4870357.34	Non-Participating	1	26
192	511231.78	4870673.51	Non-Participating	1	26
193	510669.32	4871235.95	Non-Participating	1	27
194	511198.71	4871506.32	Non-Participating	1	26
195	512094.54	4871434.48	Non-Participating	1	25
196	512320.76	4871236.81	Non-Participating	1	25
197	511855.79	4867910.86	Non-Participating	1	25
198	494754.88	4867302.15	Non-Participating	1	34
199	494905.17	4868021.02	Non-Participating	1	35
200	495449.94	4868724.88	Non-Participating	1	38
201	495138.07	4868819.47	Non-Participating	1	37

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
202	496022.17	4868650.40	Participating	1	42
203	495966.21	4867985.63	Non-Participating	1	40
204	495581.29	4867570.63	Non-Participating	1	37
205	496788.12	4867093.39	Participating	1	44
206	496798.37	4867179.05	Participating	1	44
207	499466.54	4867083.00	Non-Participating	1	35
208	499809.28	4868052.25	Non-Participating	1	37
209	499522.27	4869059.69	Non-Participating	1	40
210	502932.76	4869206.67	Non-Participating	1	47
211	502739.87	4868086.02	Non-Participating	1	41
212	501100.51	4867929.92	Non-Participating	1	36
213	501205.69	4868183.52	Non-Participating	1	37
214	501126.31	4866789.30	Non-Participating	1	34
215	502829.57	4866859.28	Non-Participating	1	35
216	503980.77	4867832.68	Participating	1	40
217	504375.89	4866974.59	Non-Participating	1	35
218	504434.89	4868964.79	Participation Pending	1	45
219	508048.06	4868683.08	Non-Participating	1	32
220	507577.42	4867933.06	Non-Participating	1	32
221	508256.18	4868031.55	Non-Participating	1	30
222	508160.93	4868043.79	Non-Participating	1	31
223	509431.73	4867831.46	Non-Participating	1	28
224	511197.03	4867137.19	Non-Participating	1	25
225	512836.13	4867255.07	Non-Participating	1	23
226	512876.54	4865698.06	Non-Participating	1	23
227	511254.51	4866393.12	Non-Participating	1	25
228	510956.59	4866312.68	Non-Participating	1	25
229	511803.46	4864790.40	Non-Participating	1	23
230	511248.62	4863982.43	Non-Participating	1	23
231	511238.56	4865356.24	Non-Participating	1	24
232	511480.24	4865525.57	Non-Participating	1	24
233	509654.54	4866311.78	Non-Participating	1	26
234	509084.69	4866510.99	Non-Participating	1	27
235	508125.47	4866480.14	Non-Participating	1	29
236	508115.22	4865668.00	Participating	1	28
237	508300.10	4864702.93	Non-Participating	1	26
238	508661.25	4864863.00	Non-Participating	1	26
239	509043.52	4864717.00	Non-Participating	1	26
240	508220.95	4863160.03	Non-Participating	1	25
241	508608.56	4863085.28	Non-Participating	1	24
242	510181.05	4863250.58	Non-Participating	1	23
243	509723.76	4864264.38	Non-Participating	1	25
244	507091.02	4863071.04	Non-Participating	1	25
245	508023.68	4863776.16	Non-Participating	1	26
246	507972.08	4864241.82	Non-Participating	1	26
247	507911.18	4864780.64	Non-Participating	1	27
248	507075.09	4866460.06	Non-Participating	1	30
249	505979.98	4864375.54	Non-Participating	1	28

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
250	506660.75	4864623.72	Non-Participating	1	28
251	506083.96	4865856.15	Non-Participating	1	30
252	505944.82	4866307.39	Non-Participating	1	31
253	505982.60	4866485.83	Non-Participating	1	31
254	505286.95	4866388.36	Non-Participating	1	32
255	504453.20	4864368.89	Non-Participating	1	29
256	503837.48	4864808.63	Non-Participating	1	30
257	502759.65	4866448.52	Non-Participating	1	34
258	502756.62	4865044.88	Non-Participating	1	30
259	502847.64	4865132.72	Non-Participating	1	31
260	502861.92	4864320.45	Non-Participating	1	29
261	502744.45	4864637.95	Non-Participating	1	30
262	500293.87	4864408.55	Non-Participating	1	30
263	498693.14	4865949.36	Non-Participating	1	34
264	495594.27	4864552.69	Non-Participating	1	31
265	495484.80	4864629.42	Non-Participating	1	31
266	495481.67	4865143.24	Non-Participating	1	33
267	495597.95	4865308.34	Non-Participating	1	34
268	495580.09	4865567.90	Non-Participating	1	35
269	495577.97	4865900.74	Non-Participating	1	36
270	495457.06	4866413.77	Participating	1	36
271	495573.74	4866601.10	Non-Participating	1	37
272	494999.07	4865576.36	Non-Participating	1	33
273	495460.45	4863808.79	Non-Participating	1	29
274	495591.47	4863853.66	Non-Participating	1	29
275	495598.45	4863807.52	Non-Participating	1	29
276	495602.69	4864144.71	Non-Participating	1	30
277	495449.26	4863156.32	Non-Participating	1	28
278	495021.10	4862798.98	Non-Participating	1	27
279	495447.60	4861627.16	Non-Participating	1	25
280	495589.39	4861913.81	Non-Participating	1	26
281	496387.78	4863669.96	Non-Participating	1	30
282	495401.41	4862947.65	Non-Participating	1	27
283	497806.48	4861897.78	Non-Participating	1	26
284	498032.83	4862353.66	Non-Participating	1	27
285	497883.34	4862416.63	Non-Participating	1	27
286	497390.91	4863188.77	Non-Participating	1	29
287	499200.13	4863160.86	Non-Participating	1	28
288	499366.82	4863159.80	Non-Participating	1	28
289	499062.33	4863011.63	Non-Participating	1	28
290	499521.73	4863071.93	Non-Participating	1	28
291	499600.44	4863131.46	Non-Participating	1	28
292	499653.41	4863563.84	Non-Participating	1	29
293	500052.87	4861924.15	Non-Participating	1	26
294	500766.98	4862078.00	Non-Participating	1	26
295	501364.94	4862089.11	Non-Participating	1	26
296	501290.46	4862403.31	Non-Participating	1	27
297	501228.41	4863777.42	Non-Participating	1	29

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
298	502760.35	4863408.22	Non-Participating	1	28
299	502811.16	4863065.78	Non-Participating	1	27
300	502845.02	4861700.00	Non-Participating	1	26
301	504324.44	4863058.11	Non-Participating	1	27
302	504359.50	4863154.55	Non-Participating	1	27
303	505569.77	4863166.39	Non-Participating	1	26
304	505982.13	4863095.12	Non-Participating	1	26
305	505957.47	4862103.78	Non-Participating	1	25
306	506058.01	4862083.94	Non-Participating	1	25
307	505988.95	4862547.09	Non-Participating	1	25
308	505982.34	4861816.52	Non-Participating	1	25
309	508028.80	4862608.01	Non-Participating	1	24
310	510037.65	4862973.60	Non-Participating	1	23
311	509978.52	4862987.49	Non-Participating	1	23
312	511214.04	4862974.57	Non-Participating	1	22
313	496566.43	4861678.65	Non-Participating	1	26
314	496394.58	4861521.88	Non-Participating	1	26
315	498202.69	4861536.49	Non-Participating	1	26
316	499547.11	4861789.56	Non-Participating	1	26
317	499706.65	4861546.15	Non-Participating	1	26
318	503314.07	4861437.35	Non-Participating	1	25
319	504482.21	4861250.15	Non-Participating	1	25
320	504352.19	4861303.49	Non-Participating	1	25
321	504448.61	4861690.45	Non-Participating	1	25
322	505946.34	4860787.53	Non-Participating	1	24
323	512456.10	4867927.90	Non-Participating	1	24
324	512869.46	4865200.07	Non-Participating	1	22
325	511241.06	4863845.52	Non-Participating	1	23
326	511377.68	4863817.25	Non-Participating	1	23
327	511380.49	4867122.86	Non-Participating	1	19
328	511919.63	4867891.62	Non-Participating	1	25
329	510106.92	4875126.21	Non-Participating	1	26
330	509957.99	4875215.57	Non-Participating	1	27
331	509838.84	4875240.39	Non-Participating	1	26
332	509540.98	4875523.36	Non-Participating	1	27
333	508513.01	4875649.50	Non-Participating	1	24
334	508137.19	4875249.86	Non-Participating	1	29
335	507954.57	4875255.16	Non-Participating	1	29
336	507476.85	4875245.18	Non-Participating	1	30
337	507291.26	4875238.55	Non-Participating	1	30
338	507308.94	4875273.90	Non-Participating	1	30
339	507133.29	4875236.34	Non-Participating	1	31
340	506456.95	4875177.45	Non-Participating	1	32
341	506392.06	4875165.44	Non-Participating	1	32
342	506303.13	4875506.73	Non-Participating	1	32
343	506056.14	4874737.23	Non-Participating	1	33
344	505835.16	4874164.35	Non-Participating	1	35
345	506443.65	4873048.96	Non-Participating	1	35

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N X (m)	Coordinates UTM NAD83 Zone 15N Y (m)	Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
346	507707.14	4873655.54	Non-Participating	1	29
347	507746.57	4873752.32	Non-Participating	1	29
348	509482.74	4869911.96	Non-Participating	1	29
349	510177.21	4869522.86	Non-Participating	1	28
350	509715.75	4868523.34	Non-Participating	1	28
351	509715.75	4867936.59	Non-Participating	1	28
352	506639.54	4867805.93	Non-Participating	1	33
353	505981.69	4867853.87	Non-Participating	1	35
354	506107.06	4861179.97	Non-Participating	1	24
355	504354.46	4863221.55	Non-Participating	1	27
356	504370.17	4866942.89	Non-Participating	1	35
357	504454.04	4869760.35	Participating	1	46
358	504953.18	4872026.30	Participating	1	45
359	505194.11	4872241.77	Participating	1	43
360	504982.82	4872823.99	Non-Participating	1	40
361	504632.53	4874064.72	Non-Participating	1	40
362	504550.66	4874140.13	Non-Participating	1	40
363	505058.05	4874529.02	Non-Participating	1	36
364	505317.29	4874471.44	Non-Participating	1	36
365	504311.78	4875881.90	Non-Participating	1	34
366	503080.23	4875981.03	Non-Participating	1	35
367	501067.74	4868680.68	Non-Participating	1	38
368	501045.42	4874262.69	Non-Participating	1	43
369	500526.98	4876004.95	Non-Participating	1	35
370	499677.17	4876262.10	Non-Participating	1	34
371	497251.94	4874354.41	Non-Participating	1	38
372	497140.70	4873107.83	Participating	1	42
373	499493.80	4874005.78	Participation Pending	1	43
374	499695.62	4871921.37	Non-Participating	1	44
375	495332.11	4865917.77	Non-Participating	1	35
376	495778.75	4872841.02	Participating	1	37
377	496079.55	4874600.17	Participating	1	41
378	493303.66	4865363.05	Non-Participating	1	28
379	493858.51	4865675.06	Non-Participating	1	30
380	494597.57	4865481.24	Non-Participating	1	31
381	494950.93	4865608.48	Non-Participating	1	33
382	494693.22	4861787.99	Non-Participating	1	25
383	494229.69	4862485.36	Non-Participating	1	25
384	493181.97	4865807.99	Non-Participating	1	29
385	493478.15	4866684.14	Non-Participating	1	30
386	494547.73	4867036.45	Non-Participating	1	33
387	493147.39	4867174.99	Non-Participating	1	30
388	494039.10	4868100.58	Non-Participating	1	33
389	494018.51	4868810.50	Participating	1	33
390	493659.28	4869128.74	Non-Participating	1	32
391	493009.42	4868795.04	Participating	1	31
392	492892.87	4868809.26	Non-Participating	1	30
393	492790.68	4869907.25	Participating	1	31

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
394	493362.95	4869980.97	Non-Participating	1	32
395	494639.05	4870297.72	Participating	1	36
396	493230.51	4871142.26	Non-Participating	1	33
397	493766.48	4871236.38	Non-Participating	1	34
398	493921.25	4871132.90	Non-Participating	1	34
399	493540.46	4872673.61	Non-Participating	1	34
400	494524.93	4872747.21	Non-Participating	1	36
401	493407.56	4872816.88	Non-Participating	1	35
402	493747.84	4873206.91	Non-Participating	1	37
403	494151.04	4873285.23	Participating	1	38
404	494002.17	4873709.27	Participating	1	40
405	494024.46	4873648.96	Participating	1	40
406	495243.19	4873764.68	Participating	1	39
407	495706.37	4874363.08	Participating	1	41
408	495270.39	4874448.85	Non-Participating	1	43
409	494786.51	4875095.87	Participating	1	44
410	494742.68	4874890.93	Participating	1	44
411	494673.38	4874964.89	Participating	1	43
412	493870.54	4874371.18	Participating	1	44
413	494159.74	4874451.58	Participating	1	45
414	493136.16	4874000.60	Participating	1	40
415	494807.37	4875552.26	Participating	1	42
416	495595.18	4875646.56	Participation Pending	1	43
417	493717.24	4875917.78	Non-Participating	1	42
418	494099.39	4876121.20	Participating	1	40
419	493086.55	4876093.83	Participating	1	44
420	492917.55	4875943.58	Non-Participating	1	44
421	492824.93	4874336.74	Participating	1	43
422	493045.90	4873720.17	Participating	1	38
423	492516.61	4873491.63	Non-Participating	1	36
424	492393.91	4872911.32	Participating	1	34
425	492485.00	4872667.59	Participating	1	34
426	492280.30	4872422.45	Participating	1	33
427	492886.93	4871221.63	Non-Participating	1	32
428	493003.05	4871142.66	Non-Participating	1	32
429	492012.71	4870131.27	Participating	1	30
430	491814.62	4869462.51	Participating	1	29
431	492354.77	4868912.11	Participating	1	30
432	492373.27	4868475.96	Non-Participating	1	30
433	492178.63	4867809.55	Non-Participating	1	28
434	492842.51	4867801.89	Non-Participating	1	30
435	491772.81	4867258.11	Non-Participating	1	27
436	492683.89	4866290.27	Non-Participating	1	28
437	492560.24	4865883.35	Non-Participating	1	28
438	493165.10	4862890.93	Non-Participating	1	26
439	493590.90	4862204.60	Non-Participating	1	25
440	499494.35	4875986.15	Non-Participating	1	34
441	509739.94	4875483.39	Non-Participating	1	27

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
442	499516.46	4866307.27	Non-Participating	1	33
443	512055.62	4871144.22	Non-Participating	1	25
444	507243.76	4875236.34	Non-Participating	1	30
445	508298.59	4873512.15	Non-Participating	1	30
446	490229.89	4872596.92	Non-Participating	1	30
447	489847.36	4872269.25	Non-Participating	1	28
448	488635.42	4877561.29	Non-Participating	1	28
449	488219.84	4877375.84	Non-Participating	1	27
450	488227.59	4877664.18	Non-Participating	1	27
451	487845.93	4879211.82	Non-Participating	1	25
452	486858.06	4879271.46	Non-Participating	1	24
453	486750.57	4879405.48	Non-Participating	1	24
454	487445.96	4879108.89	Non-Participating	1	25
455	487500.71	4879138.87	Non-Participating	1	25
456	486363.48	4879172.96	Non-Participating	1	23
457	487110.32	4877460.18	Non-Participating	1	25
458	486739.40	4877456.16	Non-Participating	1	25
459	486738.89	4877554.33	Non-Participating	1	25
460	486756.68	4878037.63	Non-Participating	1	24
461	486660.03	4877806.42	Non-Participating	1	24
462	485834.32	4879132.42	Non-Participating	1	23
463	485809.66	4879170.03	Non-Participating	1	23
464	486256.72	4877643.56	Non-Participating	1	24
465	485959.87	4877465.90	Non-Participating	1	24
466	484581.56	4877648.78	Non-Participating	1	22
467	483815.76	4877785.78	Non-Participating	1	21
468	485477.21	4877647.07	Non-Participating	1	23
469	485584.47	4877637.05	Non-Participating	1	23
470	485555.94	4877595.45	Non-Participating	1	23
471	485553.87	4877635.12	Non-Participating	1	23
472	485326.16	4879324.31	Non-Participating	1	22
473	485052.32	4879054.82	Non-Participating	1	22
474	485117.12	4878621.98	Non-Participating	1	21
475	488227.48	4878434.34	Non-Participating	1	26
476	488294.10	4878419.31	Non-Participating	1	27
477	488578.50	4878448.47	Non-Participating	1	27
478	488238.28	4878729.90	Non-Participating	1	26
479	488802.63	4879306.04	Non-Participating	1	26
480	489444.23	4879207.74	Non-Participating	1	28
481	489545.45	4879212.95	Non-Participating	1	28
482	489635.56	4878759.90	Non-Participating	1	29
483	490495.82	4879286.80	Non-Participating	1	29
484	490977.06	4879298.11	Non-Participating	1	30
485	490949.78	4879137.82	Non-Participating	1	30
486	491460.25	4878431.59	Non-Participating	1	33
487	491713.80	4878334.91	Non-Participating	1	34
488	491806.50	4879142.21	Non-Participating	1	31
489	492039.41	4879331.55	Non-Participating	1	30

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
490	492860.00	4879226.20	Non-Participating	1	31
491	493142.48	4879036.43	Non-Participating	1	32
492	492758.53	4879319.56	Non-Participating	1	31
493	494040.55	4879209.90	Non-Participating	1	30
494	494946.88	4878858.40	Non-Participating	1	31
495	494631.87	4878070.88	Non-Participating	1	33
496	494622.23	4878130.23	Non-Participating	1	33
497	495153.30	4877779.20	Non-Participating	1	33
498	494779.88	4877690.16	Non-Participating	1	33
499	494656.56	4877212.33	Non-Participating	1	35
500	493010.05	4877412.07	Participating	1	41
501	493292.00	4877317.09	Participation Pending	1	40
502	493253.70	4877817.21	Non-Participating	1	37
503	492754.95	4877751.84	Non-Participating	1	39
504	492937.93	4877693.98	Non-Participating	1	39
505	492333.63	4877666.52	Non-Participating	1	40
506	492251.72	4877503.81	Participating	1	42
507	492234.18	4877555.41	Participating	1	41
508	492209.17	4877379.83	Participating	1	44
509	491204.57	4877592.32	Non-Participating	1	37
510	490993.10	4877604.29	Non-Participating	1	36
511	490950.33	4877852.19	Non-Participating	1	35
512	489835.40	4877912.18	Non-Participating	1	31
513	489914.98	4877880.09	Non-Participating	1	31
514	490320.50	4876915.99	Non-Participating	1	34
515	490345.19	4876928.97	Non-Participating	1	34
516	489824.65	4877177.26	Non-Participating	1	32
517	489798.47	4877241.24	Non-Participating	1	32
518	488326.68	4876849.62	Non-Participating	1	28
519	488211.66	4877034.73	Non-Participating	1	27
520	486597.05	4876484.54	Non-Participating	1	25
521	485139.90	4876925.87	Non-Participating	1	23
522	485112.68	4876718.66	Non-Participating	1	23
523	485111.73	4876886.12	Non-Participating	1	23
524	484576.48	4877381.31	Non-Participating	1	22
525	484604.14	4877406.38	Non-Participating	1	22
526	484415.46	4876945.29	Non-Participating	1	22
527	484482.97	4876529.89	Non-Participating	1	22
528	484133.35	4876454.25	Non-Participating	1	22
529	483354.68	4876911.14	Non-Participating	1	21
530	483340.51	4876941.40	Non-Participating	1	21
531	483284.50	4877111.89	Non-Participating	1	21
532	483894.45	4877038.60	Non-Participating	1	21
533	483805.65	4877165.29	Non-Participating	1	21
534	500183.35	4876832.93	Non-Participating	1	32
535	498032.98	4876897.85	Non-Participating	1	32
536	497876.00	4876576.62	Non-Participating	1	33
537	496003.73	4876090.86	Participating	1	38

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
538	483371.66	4876260.99	Non-Participating	1	21
539	483342.50	4876216.88	Non-Participating	1	21
540	483353.94	4876115.55	Non-Participating	1	21
541	483356.50	4875964.09	Non-Participating	1	21
542	483610.07	4875926.75	Non-Participating	1	21
543	484347.49	4875779.83	Non-Participating	1	22
544	484122.70	4876211.77	Non-Participating	1	22
545	484639.57	4876183.37	Non-Participating	1	22
546	485040.33	4875536.46	Non-Participating	1	23
547	485950.14	4875850.27	Non-Participating	1	24
548	485922.83	4875490.30	Non-Participating	1	24
549	485570.32	4875343.66	Non-Participating	1	24
550	486758.93	4875870.36	Non-Participating	1	25
551	486732.47	4875847.61	Non-Participating	1	25
552	487379.99	4875967.61	Non-Participating	1	26
553	487414.85	4875979.00	Non-Participating	1	26
554	486752.22	4876287.93	Non-Participating	1	25
555	488220.58	4875677.44	Non-Participating	1	28
556	488332.16	4876043.35	Participating	1	28
557	489116.44	4875427.96	Non-Participating	1	30
558	489070.22	4875417.85	Non-Participating	1	30
559	489141.82	4875405.73	Non-Participating	1	30
560	488998.60	4876062.19	Participating	1	30
561	489826.70	4875987.32	Non-Participating	1	32
562	490243.39	4876075.04	Non-Participating	1	34
563	490277.50	4875981.51	Non-Participating	1	34
564	490318.56	4876072.58	Non-Participating	1	35
565	490841.49	4875989.47	Non-Participating	1	38
566	491021.44	4876062.81	Participation Pending	1	39
567	491885.42	4875936.91	Participation Pending	1	45
568	492288.14	4875939.17	Participating	1	45
569	485068.52	4874814.15	Non-Participating	1	17
570	485049.92	4874303.42	Non-Participating	1	23
571	485562.84	4875163.93	Non-Participating	1	24
572	485226.22	4873854.62	Non-Participating	1	23
573	484962.06	4873636.11	Non-Participating	1	22
574	485076.63	4873384.34	Non-Participating	1	23
575	485248.40	4873345.47	Non-Participating	1	23
576	485233.04	4873372.20	Non-Participating	1	23
577	484992.60	4872278.33	Non-Participating	1	23
578	484936.10	4872282.95	Non-Participating	1	23
579	485379.31	4872761.19	Non-Participating	1	23
580	486198.35	4872740.10	Non-Participating	1	24
581	486676.17	4872464.77	Non-Participating	1	25
582	486655.64	4873090.69	Non-Participating	1	25
583	487877.11	4873120.91	Non-Participating	1	26
584	488112.71	4872671.02	Non-Participating	1	26
585	489802.42	4873070.99	Non-Participating	1	29

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N X (m)	Coordinates UTM NAD83 Zone 15N Y (m)	Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
586	490903.77	4872050.05	Non-Participating	1	30
587	491158.49	4872615.01	Non-Participating	1	31
588	491617.71	4872744.89	Non-Participating	1	32
589	491351.60	4872844.56	Non-Participating	1	31
590	491439.59	4872911.18	Non-Participating	1	33
591	486316.80	4874665.05	Non-Participating	1	25
592	487443.29	4874431.59	Non-Participating	1	25
593	488227.77	4874362.55	Participating	1	27
594	488176.73	4874445.52	Non-Participating	1	27
595	488313.23	4874925.37	Participating	1	28
596	488330.19	4874908.78	Participating	1	28
597	490542.51	4874927.42	Participating	1	35
598	490484.06	4874350.37	Participating	1	33
599	490667.31	4874464.80	Participating	1	34
600	489910.19	4874274.68	Participating	1	31
601	489305.30	4874280.67	Participating	1	30
602	489395.90	4874448.33	Participating	1	30
603	491911.47	4874443.00	Participating	1	41
604	491551.67	4874626.99	Participating	1	40
605	491452.04	4874745.89	Participating	1	40
606	490742.07	4874350.00	Non-Participating	1	34
607	492196.54	4873592.10	Participating	1	36
608	491538.28	4873118.40	Non-Participating	1	33
609	490427.30	4873185.69	Non-Participating	1	31
610	490308.00	4873855.52	Non-Participating	1	32
611	489807.12	4873557.35	Non-Participating	1	30
612	488849.73	4874109.24	Non-Participating	1	29
613	488302.06	4873557.83	Non-Participating	1	27
614	487911.15	4873636.20	Non-Participating	1	27
615	487684.01	4873459.47	Non-Participating	1	26
616	487514.01	4873755.84	Non-Participating	1	26
617	487184.42	4873945.73	Non-Participating	1	26
618	486591.04	4874277.89	Non-Participating	1	25
619	486670.36	4873699.15	Non-Participating	1	25
620	486755.87	4873650.47	Non-Participating	1	25
621	486727.45	4871753.50	Non-Participating	1	20
622	486094.94	4871309.02	Non-Participating	1	23
623	486638.09	4871400.01	Non-Participating	1	24
624	486672.02	4870622.68	Non-Participating	1	24
625	486655.48	4870232.51	Non-Participating	1	24
626	487378.63	4870881.50	Non-Participating	1	23
627	487448.24	4871236.67	Non-Participating	1	25
628	487697.00	4871268.04	Non-Participating	1	25
629	488319.13	4871047.52	Non-Participating	1	26
630	487859.22	4870334.28	Non-Participating	1	25
631	488100.93	4870340.68	Non-Participating	1	25
632	488931.40	4870482.89	Non-Participating	1	26
633	489465.02	4870612.47	Non-Participating	1	25

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
634	489473.93	4870174.17	Non-Participating	1	24
635	489918.83	4870357.95	Non-Participating	1	26
636	490477.39	4870317.69	Non-Participating	1	26
637	491440.93	4870296.94	Participating	1	29
638	491691.36	4870338.51	Non-Participating	1	30
639	491742.59	4870251.31	Non-Participating	1	30
640	490556.45	4870428.90	Non-Participating	1	28
641	490729.74	4870543.54	Non-Participating	1	28
642	492088.16	4871151.03	Participating	1	30
643	492101.16	4871308.61	Non-Participating	1	31
644	491583.87	4871268.58	Non-Participating	1	30
645	491466.08	4871036.24	Non-Participating	1	30
646	490182.63	4871392.80	Non-Participating	1	28
647	490146.04	4871128.30	Non-Participating	1	28
648	489684.58	4871207.32	Non-Participating	1	28
649	489742.38	4869647.95	Non-Participating	1	26
650	490330.39	4868981.77	Non-Participating	1	27
651	490439.21	4869028.96	Non-Participating	1	27
652	491759.63	4869590.01	Non-Participating	1	29
653	491515.95	4869809.52	Non-Participating	1	27
654	490718.55	4869035.68	Non-Participating	1	28
655	491214.49	4868921.13	Non-Participating	1	28
656	491144.65	4868793.54	Non-Participating	1	28
657	490586.54	4867989.99	Non-Participating	1	25
658	490772.60	4868329.90	Non-Participating	1	26
659	490521.01	4868392.32	Non-Participating	1	26
660	490399.71	4868828.19	Non-Participating	1	27
661	490132.35	4868300.15	Non-Participating	1	20
662	489421.01	4868140.33	Non-Participating	1	24
663	487623.14	4868576.03	Non-Participating	1	24
664	487782.58	4867705.95	Non-Participating	1	24
665	488410.14	4867926.75	Non-Participating	1	24
666	490006.54	4867558.26	Non-Participating	1	24
667	489786.08	4867239.58	Non-Participating	1	23
668	489471.01	4866930.92	Non-Participating	1	19
669	489407.69	4866850.23	Non-Participating	1	24
670	489550.29	4866777.40	Non-Participating	1	23
671	489177.54	4866889.51	Non-Participating	1	24
672	489191.30	4866647.84	Non-Participating	1	24
673	489312.09	4866497.79	Non-Participating	1	25
674	489313.39	4866375.23	Non-Participating	1	25
675	489310.25	4866131.82	Non-Participating	1	24
676	489861.71	4865984.83	Non-Participating	1	25
677	489395.33	4866310.51	Non-Participating	1	25
678	490197.73	4866693.01	Non-Participating	1	24
679	490217.54	4866649.68	Non-Participating	1	24
680	490017.33	4865967.73	Non-Participating	1	25
681	490278.87	4865979.10	Non-Participating	1	25

Table E-1: Project Only Results

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
682	490410.02	4866045.09	Non-Participating	1	25
683	490085.49	4864761.25	Non-Participating	1	23
684	489923.58	4864746.23	Non-Participating	1	23
685	489842.93	4865195.32	Non-Participating	1	24
686	492242.97	4868718.98	Non-Participating	1	30
687	492201.39	4868471.14	Participating	1	29
688	491286.85	4866494.23	Non-Participating	1	27
689	491009.28	4865891.24	Non-Participating	1	26
690	491637.21	4866020.30	Non-Participating	1	27
691	492326.88	4865129.44	Non-Participating	1	27
692	491378.79	4865103.88	Non-Participating	1	26
693	491360.33	4865074.29	Non-Participating	1	26
694	492846.71	4863545.15	Non-Participating	1	26
695	491647.96	4864076.25	Non-Participating	1	25
696	490594.15	4864686.77	Non-Participating	1	24
697	492988.35	4862968.51	Non-Participating	1	25
698	493649.83	4863248.87	Non-Participating	1	26
699	494269.33	4863513.13	Non-Participating	1	27
700	493677.47	4863383.00	Non-Participating	1	27
701	493669.38	4863482.76	Non-Participating	1	27
702	483374.01	4877839.13	Non-Participating	1	21
703	483734.01	4879213.02	Non-Participating	1	21

Appendix F

Sound Level Modeling Results – Tabular - Sorted by Sound Level

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N X (m)	Y (m)	Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
119	503071.21	4871942.22	Participating	1	47
210	502932.76	4869206.67	Non-Participating	1	47
121	503827.13	4872773.68	Participating	1	47
120	502725.93	4871787.44	Participating	1	47
357	504454.04	4869760.35	Participating	1	46
169	504355.79	4869657.97	Participating	1	46
160	496747.46	4869514.95	Non-Participating	1	46
161	497688.18	4869422.48	Participation Pending	1	46
168	502822.20	4871087.25	Non-Participating	1	46
125	504758.52	4871963.59	Participating	1	46
170	504464.66	4869547.53	Participation Pending	1	46
118	501528.69	4872860.66	Participating	1	45
122	503996.46	4872856.76	Participating	1	45
159	496488.82	4869537.11	Participating	1	45
568	492288.14	4875939.17	Participating	1	45
413	494159.74	4874451.58	Participating	1	45
109	498632.85	4872029.26	Non-Participating	1	45
358	504953.18	4872026.30	Participating	1	45
218	504434.89	4868964.79	Participation Pending	1	45
567	491885.42	4875936.91	Participation Pending	1	45
419	493086.55	4876093.83	Participating	1	44
409	494786.51	4875095.87	Participating	1	44
111	499582.38	4871957.52	Non-Participating	1	44
107	499065.71	4872231.14	Participating	1	44
117	501103.10	4872967.75	Participation Pending	1	44
123	504201.25	4872856.23	Participating	1	44
420	492917.55	4875943.58	Non-Participating	1	44
508	492209.17	4877379.83	Participating	1	44
410	494742.68	4874890.93	Participating	1	44
116	501183.27	4871944.87	Non-Participating	1	44
171	505966.47	4869876.74	Participating	1	44
206	496798.37	4867179.05	Participating	1	44
2	494675.74	4874843.64	Participating	1	44
112	499505.52	4873983.70	Participation Pending	1	44
205	496788.12	4867093.39	Participating	1	44
374	499695.62	4871921.37	Non-Participating	1	44
64	502728.04	4874380.81	Participating	1	44
108	499677.17	4872538.85	Non-Participating	1	43
412	493870.54	4874371.18	Participating	1	44
411	494673.38	4874964.89	Participating	1	43
416	495595.18	4875646.56	Participation Pending	1	43
373	499493.80	4874005.78	Participation Pending	1	43
114	499618.58	4874177.48	Participating	1	43
12	495571.71	4871482.46	Participating	1	43
46	501031.13	4874231.83	Non-Participating	1	43
421	492824.93	4874336.74	Participating	1	43
158	495550.87	4871409.04	Participating	1	43
359	505194.11	4872241.77	Participating	1	43

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N X (m)	Coordinates UTM NAD83 Zone 15N Y (m)	Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
368	501045.42	4874262.69	Non-Participating	1	43
408	495270.39	4874448.85	Non-Participating	1	43
156	495559.28	4870851.63	Non-Participating	1	42
202	496022.17	4868650.40	Participating	1	42
165	501120.03	4871028.07	Non-Participating	1	42
164	499480.74	4870826.96	Non-Participating	1	42
415	494807.37	4875552.26	Participating	1	42
67	504104.11	4874434.02	Participating	1	42
44	501043.37	4874380.00	Non-Participating	1	42
163	499484.18	4870256.98	Non-Participating	1	42
372	497140.70	4873107.83	Participating	1	42
506	492251.72	4877503.81	Participating	1	42
154	495562.38	4870204.93	Participation Pending	1	42
106	497138.35	4873069.61	Participating	1	42
115	500691.28	4871972.52	Non-Participating	1	42
162	499490.33	4869311.02	Participating	1	42
103	495778.39	4871934.81	Participating	1	42
113	499640.46	4874375.81	Non-Participating	1	42
417	493717.24	4875917.78	Non-Participating	1	42
1	491323.97	4876003.31	Non-Participating	1	41
211	502739.87	4868086.02	Non-Participating	1	41
507	492234.18	4877555.41	Participating	1	41
45	500947.46	4874527.17	Participating	1	41
157	495387.82	4871379.34	Participating	1	41
173	506052.46	4871492.14	Non-Participating	1	41
126	504942.08	4872768.12	Non-Participating	1	41
407	495706.37	4874363.08	Participating	1	41
603	491911.47	4874443.00	Participating	1	41
377	496079.55	4874600.17	Participating	1	41
105	497277.52	4872254.03	Non-Participating	1	41
172	506068.12	4870744.95	Non-Participating	1	41
102	497067.91	4872235.01	Non-Participating	1	41
209	499522.27	4869059.69	Non-Participating	1	40
500	493010.05	4877412.07	Participating	1	41
124	504551.09	4874079.47	Non-Participating	1	40
360	504982.82	4872823.99	Non-Participating	1	40
63	502795.77	4874857.59	Participating	1	40
404	494002.17	4873709.27	Participating	1	40
152	495349.84	4870249.67	Non-Participating	1	40
362	504550.66	4874140.13	Non-Participating	1	40
414	493136.16	4874000.60	Participating	1	40
153	495559.21	4869681.85	Non-Participating	1	40
501	493292.00	4877317.09	Participation Pending	1	40
505	492333.63	4877666.52	Non-Participating	1	40
62	502793.92	4874915.01	Participating	1	40
104	495507.06	4871937.58	Non-Participating	1	40
216	503980.77	4867832.68	Participating	1	40
405	494024.46	4873648.96	Participating	1	40

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N X (m)	Coordinates UTM NAD83 Zone 15N Y (m)	Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
167	501212.34	4869298.23	Participation Pending	1	40
203	495966.21	4867985.63	Non-Participating	1	40
361	504632.53	4874064.72	Non-Participating	1	40
418	494099.39	4876121.20	Participating	1	40
605	491452.04	4874745.89	Participating	1	40
166	501137.73	4869524.71	Non-Participating	1	40
604	491551.67	4874626.99	Participating	1	40
406	495243.19	4873764.68	Participating	1	39
155	495124.76	4870677.40	Non-Participating	1	39
566	491021.44	4876062.81	Participation Pending	1	39
65	503738.09	4874989.75	Participating	1	39
110	498077.69	4874206.61	Non-Participating	1	39
47	501227.06	4875030.65	Non-Participating	1	39
66	504105.86	4874905.08	Non-Participating	1	39
101	496413.53	4872753.51	Non-Participating	1	39
503	492754.95	4877751.84	Non-Participating	1	39
504	492937.93	4877693.98	Non-Participating	1	39
68	504298.15	4874837.83	Non-Participating	1	38
367	501067.74	4868680.68	Non-Participating	1	38
48	501197.62	4875115.32	Non-Participating	1	38
200	495449.94	4868724.88	Non-Participating	1	38
422	493045.90	4873720.17	Participating	1	38
61	502721.16	4875266.90	Non-Participating	1	38
76	504646.75	4874484.85	Non-Participating	1	38
75	504475.43	4874793.75	Non-Participating	1	38
371	497251.94	4874354.41	Non-Participating	1	38
403	494151.04	4873285.23	Participating	1	38
29	496552.23	4874244.46	Participating	1	38
565	490841.49	4875989.47	Non-Participating	1	38
60	502714.55	4875399.19	Non-Participating	1	37
376	495778.75	4872841.02	Participating	1	37
537	496003.73	4876090.86	Participating	1	38
213	501205.69	4868183.52	Non-Participating	1	37
49	501230.36	4875345.51	Non-Participating	1	37
204	495581.29	4867570.63	Non-Participating	1	37
32	499599.12	4875101.12	Non-Participating	1	37
50	501090.13	4875362.70	Non-Participating	1	37
74	504535.62	4874968.38	Non-Participating	1	37
100	495132.34	4872890.10	Non-Participating	1	37
77	504921.92	4874625.08	Non-Participating	1	37
201	495138.07	4868819.47	Non-Participating	1	37
271	495573.74	4866601.10	Non-Participating	1	37
402	493747.84	4873206.91	Non-Participating	1	37
502	493253.70	4877817.21	Non-Participating	1	37
509	491204.57	4877592.32	Non-Participating	1	37
78	505001.62	4874532.14	Non-Participating	1	37
208	499809.28	4868052.25	Non-Participating	1	37
99	494854.60	4872697.99	Non-Participating	1	36

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N X (m)	Coordinates UTM NAD83 Zone 15N Y (m)	Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
212	501100.51	4867929.92	Non-Participating	1	36
363	505058.05	4874529.02	Non-Participating	1	36
423	492516.61	4873491.63	Non-Participating	1	36
395	494639.05	4870297.72	Participating	1	36
607	492196.54	4873592.10	Participating	1	36
33	499667.39	4875349.30	Non-Participating	1	36
59	502831.49	4875681.24	Non-Participating	1	36
79	505124.98	4874525.20	Non-Participating	1	36
400	494524.93	4872747.21	Non-Participating	1	36
80	505184.52	4874515.28	Non-Participating	1	36
269	495577.97	4865900.74	Non-Participating	1	36
270	495457.06	4866413.77	Participating	1	36
82	505367.74	4874307.25	Non-Participating	1	36
56	502502.88	4875773.32	Non-Participating	1	36
58	502810.85	4875788.66	Non-Participating	1	36
127	505837.17	4873650.51	Non-Participating	1	36
364	505317.29	4874471.44	Non-Participating	1	36
31	499002.42	4875287.65	Non-Participating	1	36
510	490993.10	4877604.29	Non-Participating	1	36
57	502679.62	4875863.27	Non-Participating	1	36
84	505566.18	4874182.83	Non-Participating	1	36
81	505399.82	4874479.23	Non-Participating	1	35
131	506998.03	4871828.06	Non-Participating	1	35
54	502510.29	4875920.42	Non-Participating	1	35
55	502413.98	4875915.66	Non-Participating	1	35
69	503489.38	4875803.62	Non-Participating	1	35
70	503392.81	4875830.08	Non-Participating	1	35
128	506220.82	4873313.16	Non-Participating	1	35
14	502838.46	4866942.77	Non-Participating	1	35
129	506549.56	4872868.13	Non-Participating	1	35
345	506443.65	4873048.96	Non-Participating	1	35
51	501571.15	4875944.50	Non-Participating	1	35
83	505532.77	4874466.33	Non-Participating	1	35
34	499579.55	4875568.90	Non-Participating	1	35
268	495580.09	4865567.90	Non-Participating	1	35
71	504290.41	4875654.93	Non-Participating	1	35
199	494905.17	4868021.02	Non-Participating	1	35
215	502829.57	4866859.28	Non-Participating	1	35
366	503080.23	4875981.03	Non-Participating	1	35
53	502423.50	4876077.06	Non-Participating	1	35
207	499466.54	4867083.00	Non-Participating	1	35
217	504375.89	4866974.59	Non-Participating	1	35
344	505835.16	4874164.35	Non-Participating	1	35
401	493407.56	4872816.88	Non-Participating	1	35
499	494656.56	4877212.33	Non-Participating	1	35
52	501438.59	4876074.41	Non-Participating	1	35
356	504370.17	4866942.89	Non-Participating	1	35
72	504273.87	4875735.63	Non-Participating	1	35

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
353	505981.69	4867853.87	Non-Participating	1	35
375	495332.11	4865917.77	Non-Participating	1	35
597	490542.51	4874927.42	Participating	1	35
132	507534.25	4871148.65	Non-Participating	1	35
369	500526.98	4876004.95	Non-Participating	1	35
564	490318.56	4876072.58	Non-Participating	1	35
73	504056.70	4875882.71	Non-Participating	1	34
511	490950.33	4877852.19	Non-Participating	1	35
86	506058.09	4874109.83	Non-Participating	1	34
399	493540.46	4872673.61	Non-Participating	1	34
487	491713.80	4878334.91	Non-Participating	1	34
563	490277.50	4875981.51	Non-Participating	1	34
606	490742.07	4874350.00	Non-Participating	1	34
515	490345.19	4876928.97	Non-Participating	1	34
562	490243.39	4876075.04	Non-Participating	1	34
130	506996.44	4872762.57	Non-Participating	1	34
267	495597.95	4865308.34	Non-Participating	1	34
365	504311.78	4875881.90	Non-Participating	1	34
514	490320.50	4876915.99	Non-Participating	1	34
174	507891.98	4870234.05	Non-Participating	1	34
263	498693.14	4865949.36	Non-Participating	1	34
398	493921.25	4871132.90	Non-Participating	1	34
424	492393.91	4872911.32	Participating	1	34
440	499494.35	4875986.15	Non-Participating	1	34
85	506083.22	4874314.89	Non-Participating	1	34
133	507702.53	4871154.60	Non-Participating	1	34
198	494754.88	4867302.15	Non-Participating	1	34
214	501126.31	4866789.30	Non-Participating	1	34
397	493766.48	4871236.38	Non-Participating	1	34
30	498628.08	4875979.63	Non-Participating	1	34
35	499611.30	4875969.22	Non-Participating	1	34
257	502759.65	4866448.52	Non-Participating	1	34
599	490667.31	4874464.80	Participating	1	34
38	499584.90	4876221.63	Non-Participating	1	34
40	499452.74	4876213.03	Non-Participating	1	34
138	506865.15	4873428.54	Non-Participating	1	34
370	499677.17	4876262.10	Non-Participating	1	34
425	492485.00	4872667.59	Participating	1	34
36	499630.61	4876074.26	Non-Participating	1	34
41	499633.37	4876323.52	Non-Participating	1	33
343	506056.14	4874737.23	Non-Participating	1	33
442	499516.46	4866307.27	Non-Participating	1	33
486	491460.25	4878431.59	Non-Participating	1	33
498	494779.88	4877690.16	Non-Participating	1	33
598	490484.06	4874350.37	Participating	1	33
352	506639.54	4867805.93	Non-Participating	1	33
608	491538.28	4873118.40	Non-Participating	1	33
39	499575.64	4876277.53	Non-Participating	1	33

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
42	499577.34	4876430.68	Non-Participating	1	33
43	499610.04	4876414.33	Non-Participating	1	33
266	495481.67	4865143.24	Non-Participating	1	33
389	494018.51	4868810.50	Participating	1	33
37	499592.84	4876172.35	Non-Participating	1	33
13	508114.34	4869543.75	Non-Participating	1	33
386	494547.73	4867036.45	Non-Participating	1	33
426	492280.30	4872422.45	Participating	1	33
134	507988.15	4871657.51	Non-Participating	1	33
177	508143.94	4871002.25	Non-Participating	1	33
396	493230.51	4871142.26	Non-Participating	1	33
495	494631.87	4878070.88	Non-Participating	1	33
536	497876.00	4876576.62	Non-Participating	1	33
272	494999.07	4865576.36	Non-Participating	1	33
388	494039.10	4868100.58	Non-Participating	1	33
497	495153.30	4877779.20	Non-Participating	1	33
381	494950.93	4865608.48	Non-Participating	1	33
390	493659.28	4869128.74	Non-Participating	1	32
496	494622.23	4878130.23	Non-Participating	1	33
534	500183.35	4876832.93	Non-Participating	1	32
590	491439.59	4872911.18	Non-Participating	1	33
561	489826.70	4875987.32	Non-Participating	1	32
394	493362.95	4869980.97	Non-Participating	1	32
428	493003.05	4871142.66	Non-Participating	1	32
588	491617.71	4872744.89	Non-Participating	1	32
254	505286.95	4866388.36	Non-Participating	1	32
427	492886.93	4871221.63	Non-Participating	1	32
535	498032.98	4876897.85	Non-Participating	1	32
341	506392.06	4875165.44	Non-Participating	1	32
136	507912.94	4872763.80	Non-Participating	1	32
219	508048.06	4868683.08	Non-Participating	1	32
340	506456.95	4875177.45	Non-Participating	1	32
610	490308.00	4873855.52	Non-Participating	1	32
135	508141.14	4872275.11	Non-Participating	1	32
220	507577.42	4867933.06	Non-Participating	1	32
342	506303.13	4875506.73	Non-Participating	1	32
516	489824.65	4877177.26	Non-Participating	1	32
491	493142.48	4879036.43	Non-Participating	1	32
137	507852.51	4872992.61	Participating	1	32
253	505982.60	4866485.83	Non-Participating	1	31
265	495484.80	4864629.42	Non-Participating	1	31
517	489798.47	4877241.24	Non-Participating	1	32
264	495594.27	4864552.69	Non-Participating	1	31
600	489910.19	4874274.68	Participating	1	31
252	505944.82	4866307.39	Non-Participating	1	31
380	494597.57	4865481.24	Non-Participating	1	31
393	492790.68	4869907.25	Participating	1	31
490	492860.00	4879226.20	Non-Participating	1	31

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
391	493009.42	4868795.04	Participating	1	31
492	492758.53	4879319.56	Non-Participating	1	31
513	489914.98	4877880.09	Non-Participating	1	31
587	491158.49	4872615.01	Non-Participating	1	31
589	491351.60	4872844.56	Non-Participating	1	31
609	490427.30	4873185.69	Non-Participating	1	31
175	508823.64	4869539.44	Non-Participating	1	31
178	508887.77	4871155.48	Non-Participating	1	31
222	508160.93	4868043.79	Non-Participating	1	31
259	502847.64	4865132.72	Non-Participating	1	31
339	507133.29	4875236.34	Non-Participating	1	31
488	491806.50	4879142.21	Non-Participating	1	31
643	492101.16	4871308.61	Non-Participating	1	31
87	507311.95	4875159.44	Non-Participating	1	30
90	507599.42	4874772.15	Non-Participating	1	30
221	508256.18	4868031.55	Non-Participating	1	30
258	502756.62	4865044.88	Non-Participating	1	30
444	507243.76	4875236.34	Non-Participating	1	30
493	494040.55	4879209.90	Non-Participating	1	30
494	494946.88	4878858.40	Non-Participating	1	31
512	489835.40	4877912.18	Non-Participating	1	31
337	507291.26	4875238.55	Non-Participating	1	30
88	507422.02	4875164.20	Non-Participating	1	30
338	507308.94	4875273.90	Non-Participating	1	30
489	492039.41	4879331.55	Non-Participating	1	30
251	506083.96	4865856.15	Non-Participating	1	30
385	493478.15	4866684.14	Non-Participating	1	30
602	489395.90	4874448.33	Participating	1	30
89	507528.65	4875149.91	Non-Participating	1	30
176	509063.51	4869535.71	Non-Participating	1	30
336	507476.85	4875245.18	Non-Participating	1	30
445	508298.59	4873512.15	Non-Participating	1	30
139	508493.79	4873588.15	Non-Participating	1	30
248	507075.09	4866460.06	Non-Participating	1	30
276	495602.69	4864144.71	Non-Participating	1	30
387	493147.39	4867174.99	Non-Participating	1	30
429	492012.71	4870131.27	Participating	1	30
434	492842.51	4867801.89	Non-Participating	1	30
485	490949.78	4879137.82	Non-Participating	1	30
557	489116.44	4875427.96	Non-Participating	1	30
559	489141.82	4875405.73	Non-Participating	1	30
644	491583.87	4871268.58	Non-Participating	1	30
15	507596.16	4875246.28	Non-Participating	1	30
379	493858.51	4865675.06	Non-Participating	1	30
431	492354.77	4868912.11	Participating	1	30
586	490903.77	4872050.05	Non-Participating	1	30
611	489807.12	4873557.35	Non-Participating	1	30
140	508608.89	4873590.53	Non-Participating	1	30

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
141	508631.91	4873590.93	Non-Participating	1	30
142	508613.65	4873652.84	Participating	1	30
256	503837.48	4864808.63	Non-Participating	1	30
261	502744.45	4864637.95	Non-Participating	1	30
262	500293.87	4864408.55	Non-Participating	1	30
558	489070.22	4875417.85	Non-Participating	1	30
601	489305.30	4874280.67	Participating	1	30
642	492088.16	4871151.03	Participating	1	30
392	492892.87	4868809.26	Non-Participating	1	30
560	488998.60	4876062.19	Participating	1	30
639	491742.59	4870251.31	Non-Participating	1	30
645	491466.08	4871036.24	Non-Participating	1	30
281	496387.78	4863669.96	Non-Participating	1	30
432	492373.27	4868475.96	Non-Participating	1	30
484	490977.06	4879298.11	Non-Participating	1	30
638	491691.36	4870338.51	Non-Participating	1	30
686	492242.97	4868718.98	Non-Participating	1	30
446	490229.89	4872596.92	Non-Participating	1	30
144	509004.04	4872856.29	Non-Participating	1	29
274	495591.47	4863853.66	Non-Participating	1	29
335	507954.57	4875255.16	Non-Participating	1	29
91	508121.97	4874981.77	Non-Participating	1	29
143	508917.66	4873593.31	Non-Participating	1	29
347	507746.57	4873752.32	Non-Participating	1	29
348	509482.74	4869911.96	Non-Participating	1	29
430	491814.62	4869462.51	Participating	1	29
585	489802.42	4873070.99	Non-Participating	1	29
637	491440.93	4870296.94	Participating	1	29
652	491759.63	4869590.01	Non-Participating	1	29
687	492201.39	4868471.14	Participating	1	29
260	502861.92	4864320.45	Non-Participating	1	29
275	495598.45	4863807.52	Non-Participating	1	29
346	507707.14	4873655.54	Non-Participating	1	29
273	495460.45	4863808.79	Non-Participating	1	29
334	508137.19	4875249.86	Non-Participating	1	29
181	509642.37	4871517.50	Non-Participating	1	29
182	509638.57	4871313.88	Non-Participating	1	29
184	509715.57	4870766.88	Non-Participating	1	29
145	509375.92	4872966.88	Participating	1	29
483	490495.82	4879286.80	Non-Participating	1	29
179	509716.92	4871621.42	Non-Participating	1	29
180	509716.39	4871712.56	Non-Participating	1	29
255	504453.20	4864368.89	Non-Participating	1	29
384	493181.97	4865807.99	Non-Participating	1	29
150	509630.84	4872355.63	Non-Participating	1	29
235	508125.47	4866480.14	Non-Participating	1	29
286	497390.91	4863188.77	Non-Participating	1	29
292	499653.41	4863563.84	Non-Participating	1	29

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
297	501228.41	4863777.42	Non-Participating	1	29
149	509722.39	4872284.72	Non-Participating	1	29
482	489635.56	4878759.90	Non-Participating	1	29
612	488849.73	4874109.24	Non-Participating	1	29
92	508591.19	4875255.26	Non-Participating	1	28
436	492683.89	4866290.27	Non-Participating	1	28
641	490729.74	4870543.54	Non-Participating	1	28
646	490182.63	4871392.80	Non-Participating	1	28
186	509710.09	4868616.84	Non-Participating	1	28
223	509431.73	4867831.46	Non-Participating	1	28
287	499200.13	4863160.86	Non-Participating	1	28
288	499366.82	4863159.80	Non-Participating	1	28
350	509715.75	4868523.34	Non-Participating	1	28
447	489847.36	4872269.25	Non-Participating	1	28
640	490556.45	4870428.90	Non-Participating	1	28
655	491214.49	4868921.13	Non-Participating	1	28
151	509722.69	4873399.56	Non-Participating	1	28
291	499600.44	4863131.46	Non-Participating	1	28
378	493303.66	4865363.05	Non-Participating	1	28
647	490146.04	4871128.30	Non-Participating	1	28
146	509975.20	4872682.45	Non-Participating	1	28
183	510238.58	4871099.40	Non-Participating	1	28
289	499062.33	4863011.63	Non-Participating	1	28
290	499521.73	4863071.93	Non-Participating	1	28
448	488635.42	4877561.29	Non-Participating	1	28
656	491144.65	4868793.54	Non-Participating	1	28
249	505979.98	4864375.54	Non-Participating	1	28
277	495449.26	4863156.32	Non-Participating	1	28
349	510177.21	4869522.86	Non-Participating	1	28
555	488220.58	4875677.44	Non-Participating	1	28
93	509166.13	4875086.85	Non-Participating	1	28
298	502760.35	4863408.22	Non-Participating	1	28
351	509715.75	4867936.59	Non-Participating	1	28
437	492560.24	4865883.35	Non-Participating	1	28
518	488326.68	4876849.62	Non-Participating	1	28
236	508115.22	4865668.00	Participating	1	28
250	506660.75	4864623.72	Non-Participating	1	28
481	489545.45	4879212.95	Non-Participating	1	28
556	488332.16	4876043.35	Participating	1	28
648	489684.58	4871207.32	Non-Participating	1	28
654	490718.55	4869035.68	Non-Participating	1	28
95	509351.34	4875158.02	Non-Participating	1	27
98	509731.74	4874372.94	Non-Participating	1	27
282	495401.41	4862947.65	Non-Participating	1	27
433	492178.63	4867809.55	Non-Participating	1	28
480	489444.23	4879207.74	Non-Participating	1	28
519	488211.66	4877034.73	Non-Participating	1	27
595	488313.23	4874925.37	Participating	1	28

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
596	488330.19	4874908.78	Participating	1	28
94	509022.59	4875282.64	Non-Participating	1	27
234	509084.69	4866510.99	Non-Participating	1	27
299	502811.16	4863065.78	Non-Participating	1	27
699	494269.33	4863513.13	Non-Participating	1	27
285	497883.34	4862416.63	Non-Participating	1	27
449	488219.84	4877375.84	Non-Participating	1	27
613	488302.06	4873557.83	Non-Participating	1	27
193	510669.32	4871235.95	Non-Participating	1	27
284	498032.83	4862353.66	Non-Participating	1	27
651	490439.21	4869028.96	Non-Participating	1	27
355	504354.46	4863221.55	Non-Participating	1	27
450	488227.59	4877664.18	Non-Participating	1	27
593	488227.77	4874362.55	Participating	1	27
594	488176.73	4874445.52	Non-Participating	1	27
650	490330.39	4868981.77	Non-Participating	1	27
653	491515.95	4869809.52	Non-Participating	1	27
302	504359.50	4863154.55	Non-Participating	1	27
477	488578.50	4878448.47	Non-Participating	1	27
691	492326.88	4865129.44	Non-Participating	1	27
147	510643.93	4872858.40	Non-Participating	1	27
185	510779.47	4869615.18	Non-Participating	1	27
278	495021.10	4862798.98	Non-Participating	1	27
301	504324.44	4863058.11	Non-Participating	1	27
332	509540.98	4875523.36	Non-Participating	1	27
148	510742.82	4872673.86	Non-Participating	1	27
247	507911.18	4864780.64	Non-Participating	1	27
296	501290.46	4862403.31	Non-Participating	1	27
688	491286.85	4866494.23	Non-Participating	1	27
690	491637.21	4866020.30	Non-Participating	1	27
97	509776.66	4875411.96	Non-Participating	1	27
441	509739.94	4875483.39	Non-Participating	1	27
614	487911.15	4873636.20	Non-Participating	1	27
701	493669.38	4863482.76	Non-Participating	1	27
330	509957.99	4875215.57	Non-Participating	1	27
476	488294.10	4878419.31	Non-Participating	1	27
700	493677.47	4863383.00	Non-Participating	1	27
233	509654.54	4866311.78	Non-Participating	1	26
283	497806.48	4861897.78	Non-Participating	1	26
303	505569.77	4863166.39	Non-Participating	1	26
329	510106.92	4875126.21	Non-Participating	1	26
435	491772.81	4867258.11	Non-Participating	1	27
660	490399.71	4868828.19	Non-Participating	1	27
16	511230.91	4871253.21	Non-Participating	1	26
192	511231.78	4870673.51	Non-Participating	1	26
194	511198.71	4871506.32	Non-Participating	1	26
237	508300.10	4864702.93	Non-Participating	1	26
294	500766.98	4862078.00	Non-Participating	1	26

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
295	501364.94	4862089.11	Non-Participating	1	26
475	488227.48	4878434.34	Non-Participating	1	26
583	487877.11	4873120.91	Non-Participating	1	26
698	493649.83	4863248.87	Non-Participating	1	26
293	500052.87	4861924.15	Non-Participating	1	26
553	487414.85	4875979.00	Non-Participating	1	26
190	511340.26	4870437.24	Non-Participating	1	26
191	511328.61	4870357.34	Non-Participating	1	26
238	508661.25	4864863.00	Non-Participating	1	26
304	505982.13	4863095.12	Non-Participating	1	26
316	499547.11	4861789.56	Non-Participating	1	26
478	488238.28	4878729.90	Non-Participating	1	26
552	487379.99	4875967.61	Non-Participating	1	26
584	488112.71	4872671.02	Non-Participating	1	26
246	507972.08	4864241.82	Non-Participating	1	26
616	487514.01	4873755.84	Non-Participating	1	26
658	490772.60	4868329.90	Non-Participating	1	26
313	496566.43	4861678.65	Non-Participating	1	26
315	498202.69	4861536.49	Non-Participating	1	26
689	491009.28	4865891.24	Non-Participating	1	26
694	492846.71	4863545.15	Non-Participating	1	26
280	495589.39	4861913.81	Non-Participating	1	26
317	499706.65	4861546.15	Non-Participating	1	26
615	487684.01	4873459.47	Non-Participating	1	26
629	488319.13	4871047.52	Non-Participating	1	26
187	511208.69	4868187.15	Non-Participating	1	26
189	511354.81	4868870.63	Non-Participating	1	26
479	488802.63	4879306.04	Non-Participating	1	26
692	491378.79	4865103.88	Non-Participating	1	26
693	491360.33	4865074.29	Non-Participating	1	26
188	511358.45	4868626.10	Non-Participating	1	26
239	509043.52	4864717.00	Non-Participating	1	26
635	489918.83	4870357.95	Non-Participating	1	26
659	490521.01	4868392.32	Non-Participating	1	26
245	508023.68	4863776.16	Non-Participating	1	26
300	502845.02	4861700.00	Non-Participating	1	26
314	496394.58	4861521.88	Non-Participating	1	26
331	509838.84	4875240.39	Non-Participating	1	26
636	490477.39	4870317.69	Non-Participating	1	26
649	489742.38	4869647.95	Non-Participating	1	26
244	507091.02	4863071.04	Non-Participating	1	25
279	495447.60	4861627.16	Non-Participating	1	25
307	505988.95	4862547.09	Non-Participating	1	25
438	493165.10	4862890.93	Non-Participating	1	26
617	487184.42	4873945.73	Non-Participating	1	26
632	488931.40	4870482.89	Non-Participating	1	26
697	492988.35	4862968.51	Non-Participating	1	25
383	494229.69	4862485.36	Non-Participating	1	25

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N X (m)	Y (m)	Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
592	487443.29	4874431.59	Non-Participating	1	25
633	489465.02	4870612.47	Non-Participating	1	25
457	487110.32	4877460.18	Non-Participating	1	25
631	488100.93	4870340.68	Non-Participating	1	25
682	490410.02	4866045.09	Non-Participating	1	25
695	491647.96	4864076.25	Non-Participating	1	25
195	512094.54	4871434.48	Non-Participating	1	25
224	511197.03	4867137.19	Non-Participating	1	25
318	503314.07	4861437.35	Non-Participating	1	25
321	504448.61	4861690.45	Non-Participating	1	25
443	512055.62	4871144.22	Non-Participating	1	25
550	486758.93	4875870.36	Non-Participating	1	25
628	487697.00	4871268.04	Non-Participating	1	25
382	494693.22	4861787.99	Non-Participating	1	25
551	486732.47	4875847.61	Non-Participating	1	25
554	486752.22	4876287.93	Non-Participating	1	25
18	510963.01	4866310.55	Non-Participating	1	25
228	510956.59	4866312.68	Non-Participating	1	25
305	505957.47	4862103.78	Non-Participating	1	25
306	506058.01	4862083.94	Non-Participating	1	25
451	487845.93	4879211.82	Non-Participating	1	25
630	487859.22	4870334.28	Non-Participating	1	25
680	490017.33	4865967.73	Non-Participating	1	25
196	512320.76	4871236.81	Non-Participating	1	25
676	489861.71	4865984.83	Non-Participating	1	25
197	511855.79	4867910.86	Non-Participating	1	25
240	508220.95	4863160.03	Non-Participating	1	25
320	504352.19	4861303.49	Non-Participating	1	25
439	493590.90	4862204.60	Non-Participating	1	25
520	486597.05	4876484.54	Non-Participating	1	25
681	490278.87	4865979.10	Non-Participating	1	25
17	511252.81	4866394.34	Non-Participating	1	25
227	511254.51	4866393.12	Non-Participating	1	25
319	504482.21	4861250.15	Non-Participating	1	25
328	511919.63	4867891.62	Non-Participating	1	25
454	487445.96	4879108.89	Non-Participating	1	25
455	487500.71	4879138.87	Non-Participating	1	25
458	486739.40	4877456.16	Non-Participating	1	25
459	486738.89	4877554.33	Non-Participating	1	25
619	486670.36	4873699.15	Non-Participating	1	25
620	486755.87	4873650.47	Non-Participating	1	25
243	509723.76	4864264.38	Non-Participating	1	25
582	486655.64	4873090.69	Non-Participating	1	25
657	490586.54	4867989.99	Non-Participating	1	25
673	489312.09	4866497.79	Non-Participating	1	25
677	489395.33	4866310.51	Non-Participating	1	25
241	508608.56	4863085.28	Non-Participating	1	24
308	505982.34	4861816.52	Non-Participating	1	25

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N X (m)	Coordinates UTM NAD83 Zone 15N Y (m)	Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
581	486676.17	4872464.77	Non-Participating	1	25
591	486316.80	4874665.05	Non-Participating	1	25
618	486591.04	4874277.89	Non-Participating	1	25
627	487448.24	4871236.67	Non-Participating	1	25
662	489421.01	4868140.33	Non-Participating	1	24
674	489313.39	4866375.23	Non-Participating	1	25
309	508028.80	4862608.01	Non-Participating	1	24
460	486756.68	4878037.63	Non-Participating	1	24
461	486660.03	4877806.42	Non-Participating	1	24
671	489177.54	4866889.51	Non-Participating	1	24
675	489310.25	4866131.82	Non-Participating	1	24
634	489473.93	4870174.17	Non-Participating	1	24
665	488410.14	4867926.75	Non-Participating	1	24
19	511236.15	4865354.84	Non-Participating	1	24
231	511238.56	4865356.24	Non-Participating	1	24
323	512456.10	4867927.90	Non-Participating	1	24
623	486638.09	4871400.01	Non-Participating	1	24
672	489191.30	4866647.84	Non-Participating	1	24
685	489842.93	4865195.32	Non-Participating	1	24
354	506107.06	4861179.97	Non-Participating	1	24
547	485950.14	4875850.27	Non-Participating	1	24
548	485922.83	4875490.30	Non-Participating	1	24
580	486198.35	4872740.10	Non-Participating	1	24
20	511469.59	4865525.69	Non-Participating	1	24
232	511480.24	4865525.57	Non-Participating	1	24
333	508513.01	4875649.50	Non-Participating	1	24
464	486256.72	4877643.56	Non-Participating	1	24
624	486672.02	4870622.68	Non-Participating	1	24
663	487623.14	4868576.03	Non-Participating	1	24
669	489407.69	4866850.23	Non-Participating	1	24
452	486858.06	4879271.46	Non-Participating	1	24
678	490197.73	4866693.01	Non-Participating	1	24
679	490217.54	4866649.68	Non-Participating	1	24
696	490594.15	4864686.77	Non-Participating	1	24
322	505946.34	4860787.53	Non-Participating	1	24
625	486655.48	4870232.51	Non-Participating	1	24
666	490006.54	4867558.26	Non-Participating	1	24
453	486750.57	4879405.48	Non-Participating	1	24
465	485959.87	4877465.90	Non-Participating	1	24
549	485570.32	4875343.66	Non-Participating	1	24
571	485562.84	4875163.93	Non-Participating	1	24
622	486094.94	4871309.02	Non-Participating	1	23
664	487782.58	4867705.95	Non-Participating	1	24
225	512836.13	4867255.07	Non-Participating	1	23
242	510181.05	4863250.58	Non-Participating	1	23
311	509978.52	4862987.49	Non-Participating	1	23
310	510037.65	4862973.60	Non-Participating	1	23
456	486363.48	4879172.96	Non-Participating	1	23

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
667	489786.08	4867239.58	Non-Participating	1	23
21	511803.28	4864790.87	Non-Participating	1	23
229	511803.46	4864790.40	Non-Participating	1	23
670	489550.29	4866777.40	Non-Participating	1	23
25	511249.27	4863981.03	Non-Participating	1	23
26	511259.59	4863882.99	Non-Participating	1	23
230	511248.62	4863982.43	Non-Participating	1	23
469	485584.47	4877637.05	Non-Participating	1	23
470	485555.94	4877595.45	Non-Participating	1	23
471	485553.87	4877635.12	Non-Participating	1	23
579	485379.31	4872761.19	Non-Participating	1	23
27	511344.96	4863873.64	Non-Participating	1	23
325	511241.06	4863845.52	Non-Participating	1	23
468	485477.21	4877647.07	Non-Participating	1	23
575	485248.40	4873345.47	Non-Participating	1	23
576	485233.04	4873372.20	Non-Participating	1	23
326	511377.68	4863817.25	Non-Participating	1	23
546	485040.33	4875536.46	Non-Participating	1	23
570	485049.92	4874303.42	Non-Participating	1	23
574	485076.63	4873384.34	Non-Participating	1	23
683	490085.49	4864761.25	Non-Participating	1	23
521	485139.90	4876925.87	Non-Participating	1	23
522	485112.68	4876718.66	Non-Participating	1	23
523	485111.73	4876886.12	Non-Participating	1	23
684	489923.58	4864746.23	Non-Participating	1	23
23	512873.66	4865696.43	Non-Participating	1	23
226	512876.54	4865698.06	Non-Participating	1	23
462	485834.32	4879132.42	Non-Participating	1	23
463	485809.66	4879170.03	Non-Participating	1	23
572	485226.22	4873854.62	Non-Participating	1	23
577	484992.60	4872278.33	Non-Participating	1	23
626	487378.63	4870881.50	Non-Participating	1	23
22	512882.51	4865215.73	Non-Participating	1	22
28	511215.66	4862975.26	Non-Participating	1	22
312	511214.04	4862974.57	Non-Participating	1	22
324	512869.46	4865200.07	Non-Participating	1	22
578	484936.10	4872282.95	Non-Participating	1	23
24	512672.12	4864525.97	Non-Participating	1	22
545	484639.57	4876183.37	Non-Participating	1	22
573	484962.06	4873636.11	Non-Participating	1	22
472	485326.16	4879324.31	Non-Participating	1	22
527	484482.97	4876529.89	Non-Participating	1	22
543	484347.49	4875779.83	Non-Participating	1	22
466	484581.56	4877648.78	Non-Participating	1	22
524	484576.48	4877381.31	Non-Participating	1	22
525	484604.14	4877406.38	Non-Participating	1	22
473	485052.32	4879054.82	Non-Participating	1	22
528	484133.35	4876454.25	Non-Participating	1	22

Table F-1: Project Only Results Sorted By Sound Level

Receptor ID	Coordinates UTM NAD83 Zone 15N		Participation Status	Noise Area Classification	Project Only Broadband L_{50} Sound Level (dBA)
	X (m)	Y (m)			
544	484122.70	4876211.77	Non-Participating	1	22
526	484415.46	4876945.29	Non-Participating	1	22
96	509416.42	4875235.41	Non-Participating	1	22
532	483894.45	4877038.60	Non-Participating	1	21
474	485117.12	4878621.98	Non-Participating	1	21
533	483805.65	4877165.29	Non-Participating	1	21
542	483610.07	4875926.75	Non-Participating	1	21
467	483815.76	4877785.78	Non-Participating	1	21
538	483371.66	4876260.99	Non-Participating	1	21
539	483342.50	4876216.88	Non-Participating	1	21
540	483353.94	4876115.55	Non-Participating	1	21
541	483356.50	4875964.09	Non-Participating	1	21
529	483354.68	4876911.14	Non-Participating	1	21
530	483340.51	4876941.40	Non-Participating	1	21
531	483284.50	4877111.89	Non-Participating	1	21
702	483374.01	4877839.13	Non-Participating	1	21
703	483734.01	4879213.02	Non-Participating	1	21
661	490132.35	4868300.15	Non-Participating	1	20
621	486727.45	4871753.50	Non-Participating	1	20
327	511380.49	4867122.86	Non-Participating	1	19
668	489471.01	4866930.92	Non-Participating	1	19
569	485068.52	4874814.15	Non-Participating	1	17

BEFORE THE

MINNESOTA PUBLIC UTILITIES COMMISSION

Katie Sieben	**Chair**
Dan Lipschultz	**Commissioner**
Valerie Means	**Commissioner**
Matt Schuerger	**Commissioner**
John A. Tuma	**Commissioner**

In the Matter of the Application of Freeborn Wind Energy, LLC for a Large Wind Energy Conversion System Site Permit for the 84 MW Freeborn Wind Farm in Freeborn County

PUC Docket No. IP6946/WS-17-410

ASSOCIATION OF FREEBORN COUNTY LANDOWNERS COMMENT ON AMENDMENT OF FREEBORN WIND SITE PERMIT AND REQUEST FOR CONTESTED CASE

Northern States Power Minnesota (NSPM) d/b/a Xcel Energy as owner of Freeborn Wind, LLC (hereinafter "Freeborn Wind") has requested that the Freeborn Wind, LLC site permit be amended. Applicants have both the burden of production and the burden of proof. The Commission accepted the request for amendment of the permit and on October 23, 2019, the Commission issued "Notice of Comment Period," requesting comments on the following questions:

- Should the Minnesota Public Utilities Commission amend the Freeborn Wind Farm Site Permit to change the number, type and layout of the turbines to be used, as well as additional participating land?
- Should the Commission accept the supplemental environmental impact analysis?
- Should any permit conditions be modified or added if the requested amendments are approved?

- Are there other issues or concerns related to this matter?

Association of Freeborn County Landowners (hereinafter "AFCL"), an intervenor with full party status, offers these initial comments. Because Xcel Energy filed over 20 line item filings, hundreds of pages, in this docket on Friday, November 8, 2019, AFCL has requested an extension of time for comment. Xcel objected, stating "AFCL's request is premised solely on the Company making pre-construction filings today for project substation and O&M building site preparation (grading in a row crop agricultural field on land owned by Xcel Energy) and pouring of an associated concrete pad." Xcel's Friday 26 line item filings go far beyond what Xcel in its Objection states are substation and O&M plans. AFCL again requests a two week extension for filing comments to address these filings, with a 2 week extension for reply comments.

Addressing the Commissions question of whether the Minnesota Public Utilities Commission amend the Freeborn Wind Farm Site Permit to change the number, type and layout of the turbines to be used, as well as additional participating land, that cannot be determined without a contested. The need for a contested case and public hearings is clear, from the Commission's adoption of the ALJ's Findings 243 and 244, and the allowance of time to demonstrate that it could comply with requirements, and in response to the many filings of Xcel Energy with its permit amendment request, and the need for public, party, and agency review. To date, the record does not support, and Freeborn Wind has not demonstrated, that it can comply with permit requirements.

In the original contested case for this project, the Administrative Law Judge found that Freeborn Wind had not demonstrated that it could comply with the MPCA's noise standard.

> Based upon these Conclusions of Law, the Administrative Law Judge respectfully recommends that the Commission deny the site permit to Freeborn Wind Energy, LLC to construct and operate the up to 84 MW portion of the Freeborn Wind Farm in Freeborn

County, Minnesota. In the alternative, the Administrative Law Judge respectfully recommends that the Commission provide Freeborn Energy, LLC with a period of time to submit a plan demonstrating how it will comply with Minnesota's Noise Standards at all times throughout the footprint of the Freeborn Wind Project.

ALJ's Recommendation of Denial, p. 118-119, #5 Conclusions of Law[1]; see also Minn. R. 7030.0400.

The Findings of Fact amended and adopted by the Commission include FoF 243 and 244:

Finding 243

Should the Commission choose to do so, it could provide Freeborn Wind with an opportunity to submit a plan demonstrating how it will comply with Minnesota's noise standards at all times throughout the footprint of the Freeborn Wind Project. ~~The plan should include low frequency noise measurements for evaluation in consultation with MDH.~~

Finding 244

The Administrative Law Judge further recommends that the plan be made available for public and agency comment and a hearing held with a summary report. The Commission should then review and approve a pre-construction noise mitigation plan that best assures that turbine noise will not cause noise levels that exceed Minnesota's noise standards.

Order, December 19, 2018. Those Findings as amended above have not been amended or deleted in subsequent orders.

Regarding the Commission's second question, as to whether the Commission accept the supplemental environmental impact analysis, again, the Commission should "accept" it for filing, but a contested case is required to review the information presented by parties, the public, and agencies.

The Xcel Energy Request for Amendment is extensive[2], over 500 pages, and it requires thorough analysis by parties, the public, and agencies. AFCL hereby requests referral to the Office of Administrative Hearings for a contested case and public hearings to address the many

[1] Initial Filing 5/14/2018 (PUC Unique ID (**20185-143018-01**), refiled separating Recommendation from a denial of an AFCL Motion (PUC Unique ID **20185-143479-02).**

issues of material fact, including, but not limited to, those presented below.

Based upon this Application for Permit Amendment, the material issues of fact and AFCL's comment and supported by the Affidavit of Overland and documents attached thereto, comments from the public, AFCL requests a Contested Case addressing the material issues of fact, including, but not limited to:

- Whether the project can and will comply with the noise standard. Minn. R. 7030.0400.
- Whether 3 dB(A), a doubling of sound pressure, is a "non-significant increase."
- Whether the 3 dB(A) modeling margin of error should be accounted for in determination of likely compliance.
- Whether use of a 0.5 ground factor is supported by the science of wind noise modeling.
- Whether use of 0.0 ground factor is the standard ground factor for wind noise modeling due to height of turbine and direct line to receptors on ground.
- Whether use of a 0.5 ground factor lowers modeled noise by 3 dB(A) from modeling results using 0.0 ground factor.
- Whether failure to include 3 dB(A) margin of error and 3 B(A) impact of use of 0.5 ground factors skews modeling results by predicting lower noise levels.
- Whether addition of 3 dB(A) margin of error and/or 3 dB(A) 0.5 ground factor decrease to the values of Table 5.1 demonstrates likelihood of noise levels above standard.
- Whether ISO 3613-2 and Minn. R. 7030.0400 were designed for wind noise modeling.
- Whether ISO 3613-2 and Minn. R. 7030.0400 were designed for modeling noise where noise source is high above ground level.
- Whether ISO 3613-2 and Minn. R. 7030.0400 were designed for modeling ground noise generation and ground receptors.
- Whether ambient sound measurements are to be included in modeling under 2015 Commerce and MPCA Comments and/or 2012 MPCA Guidelines.
- Whether cumulative impacts of outstate portion of this project and/or other nearby projects are to be included in modeling.
- Whether the increase in size of blades increases noise emitted, and if so, how much.
- Whether use of feathered blades decreases noise emitted, and if so, how much.

2

20198-155331-01	PUBLIC	17-410	WS	XCEL ENERGY	OTHER--SITE PERMIT AMENDMENT APPLICATION-PART 1 OF 4 – Narrative →Attachment C	08/20/2019
20198-155331-02	PUBLIC	17-410	WS	XCEL ENERGY	OTHER--SITE PERMIT AMENDMENT APPLICATION-PART 2 OF 4 – Attachment D (p. 1-10)	08/20/2019
20198-155331-03	PUBLIC	17-410	WS	XCEL ENERGY	OTHER--SITE PERMIT AMENDMENT APPLICATION-PART 3 OF 4 – Attachment D (p. 11-20)	08/20/2019
20198-155331-04	PUBLIC	17-410	WS	XCEL ENERGY	OTHER--SITE PERMIT AMENDMENT APPLICATION-PART 4 OF 4 – Attachment E → J	08/20/2019

- Whether ISO 3613-2 and Minn. R. 7030.0400 address the expected sound power levels at lower bandwidths (i.e., 125, 63, 31.5, and lower.
- Whether participants and non-participants are afforded different treatment under the noise rule.
- Whether permit language and amended permit language and removal of Section 7.4.1 is consistent with requirements of Minn. R. 7030.0400.
- Whether setbacks proposed are sufficient to meet the noise standard.
- Whether small wind standards for noise and noise setbacks, are appropriate to use for LWECS.
- Whether the Commission's/EERA's draft site permit and site permit template sections regarding noise has a basis in law or rule.
- Whether shadow flicker modeling accurately depicts potential for impacts.
- Whether 30 hours annually is reasonable limit for shadow flicker.
- Whether project as proposed will limit shadow flicker to 30 hours annually, the ceiling for shadow flicker under both the permit and the Freeborn County ordinance.
- Whether project proposes different shadow flicker limits for participants and non-participants, and if so, whether that is a legitimate distinction.
- Whether reliance on complaints of the affected public to trigger investigation and mitigation of shadow flicker is reasonable.
- Whether applicant has provided all the required decommissioning information for Minn. R. 7854.0500, Subp. 13.
- Whether shifting timing of production of Decommissioning information out beyond granting of permit removes it from public participation and scrutiny, a limitation of due process.
- Whether lease clause allowing shift of decommissioning and cost to landowners, "allowing" landowners to then collect from owner is permissible.
- Whether financial assurance is adequate.
- Whether decommissioning costs are accurate given Xcel and other cost estimates.
- Whether Invenergy's Dan Litchfield should be the pre-construction contact person.
- Whether the Complaint Procedures filed by Xcel Energy are adequate.

A contested case is necessary to address these issues of material fact.

I. <u>WHETHER THE PROJECT IS LIKELY TO COMPLY WITH THE MPCA'S NOISE STANDARD IS AN ISSUE OF MATERIAL FACT</u>.

In the original contested case for this project, as above, the Administrative Law Judge found that Freeborn Wind had not demonstrated that it could comply with the MPCA's noise standard. ALJ's Recommendation of Denial, p. 118-119, #5 Conclusions of Law[3]; see also

[3] Initial Filing 5/14/2018 (PUC Unique ID (**20185-143018-01**), refiled separating Recommendation from a denial of an AFCL Motion (PUC Unique ID **20185-143479-02).**

Minn. R. 7030.0400. To date, there has been no demonstration that the project can or will comply with the state's noise rule, and there is much in the record to suggest that it will not.

The following are material noise-related issues that are not settled and must be addressed in a contested case, including but not limited to:

- Whether the project can and will comply with the noise standard. Minn. R. 7030.0400.
- Whether 3 dB(A), a doubling of sound pressure, is a "non-significant increase."
- Whether the 3 dB(A) modeling margin of error should be accounted for in determination of likely compliance.
- Whether use of a 0.5 ground factor is supported by the science of wind noise modeling.
- Whether use of 0.0 ground factor is the standard ground factor for wind noise modeling due to height of turbine and direct line to receptors on ground.
- Whether use of a 0.5 ground factor lowers modeled noise by 3 dB(A) from modeling results using 0.0 ground factor.
- Whether failure to include 3 dB(A) margin of error and 3 B(A) impact of use of 0.5 ground factors skews modeling results by predicting lower noise levels.
- Whether addition of 3 dB(A) margin of error and/or 3 dB(A) 0.5 ground factor decrease to the values of Table 5.1 demonstrates likelihood of noise levels above standard.
- Whether ISO 3613-2 and Minn. R. 7030.0400 were designed for wind noise modeling.
- Whether ISO 3613-2 and Minn. R. 7030.0400 were designed for modeling noise where noise source is high above ground level.
- Whether ISO 3613-2 and Minn. R. 7030.0400 were designed for modeling ground noise generation and ground receptors.
- Whether ambient sound measurements are to be included in modeling under 2015 Commerce and MPCA Comments and/or 2012 MPCA Guidelines.
- Whether cumulative impacts of outstate portion of this project and/or other nearby projects are to be included in modeling.
- Whether the increase in size of blades increases noise emitted, and if so, how much.
- Whether use of feathered blades decreases noise emitted, and if so, how much.
- Whether ISO 3613-2 and Minn. R. 7030.0400 address the expected sound power levels at lower bandwidths (i.e., 125, 63, 31.5, and lower.
- Whether participants and non-participants are afforded different treatment under the noise rule.
- Whether permit language and amended permit language and removal of Section 7.4.1 is consistent with requirements of Minn. R. 7030.0400.
- Whether setbacks proposed are sufficient to meet the noise standard.
- Whether small wind standards for noise and noise setbacks, are appropriate to use for LWECS.
- Whether the Commission's/EERA's draft site permit and site permit template sections regarding noise has a basis in law or rule.

Since the ALJ's Recommendation of Denial, no follow up noise studies were submitted for the record until NSP d/b/a Xcel Energy as owner of Freeborn Wind filed its amendment request on August 20, 2019, which contained, among other things, Attachment E, "2019 Updated Pre-Construction Noise Analysis."

Noise monitoring is a material issue, particularly in light of Freeborn Wind's initial failure to demonstrate it could comply with the MPCA noise standard, and Freeborn Wind's failure to provide such demonstration prior to issuance of the site permit. The Bent Tree noise studies showing exceedences shows how important this is when those studies showed noise exceedences of smaller wind turbines at 1,150 and 1,525 feet.

A fundamental issue of material fact is the applicants use of 0.5 ground factor in noise modeling after use of the 0.0 ground factor failed to demonstrate compliance. Use of a 0.5 ground factor following failure of a demonstration of compliance is "moving the goalposts" and needs to be carefully scrutinized and whether use of that ground factor is appropriate for wind noise modeling must be addressed. Hankard's testimony in the Badger Hollow docket was that wind was an exception to use of a 0.5 ground factor due to the elevation of the noise source:

> The model that we use has been shown to predict conservatively with 0.5. I mean, 0.5 ground factor is used in probably -- well, with the exception perhaps of wind turbine projects which are different because the source is elevated. But for projects like a typical power plant, a solar plant where the sources are relatively close to the ground, I would say 90 to 99 percent of the studies use 0.5.

Exhibit A, Hankard, Tr. p. 122, WI PSC Badger Hollow Docket 9697-CE-100.

Wind developers have been found to utilize a 0.5 ground factor when 0. 0 produces results predicting noise exceedences, in this docket, and in at least one docket in Wisconsin. 0.0 is the appropriate ground factor for a turbine hundreds of feet in the air with direct access to the receptors, and 0.5 is intended for modeling ground source noise, not wind noise, a greatly elevated source.[4] AFCL Exhibit B, Testimony of Schomer, Wisconsin PSC Docket 2535-CE-100; see Exhibit A, Testimony of Hankard (selected), Wisconsin PSC Docket 9697-CE-100[5]. Wind, because it is elevated with a direct path to "receptors," and not impaired by terrain, vegetation, and/or buildings. The International Standard ISO 9316-2, the noise modeling standard was not developed for wind turbine noise emanating 300+ feet in the air. See Schomer, id. ISO 9316-2 and the 1996 revision, ISO 9316-2 (1996) were developed for noise modeling of a facility that is located on the ground and to measure noise impact on "receptors," also on the ground, and the impact of ground absorption. Id. It was not designed for modeling of noise impacts of sources 300+ feet in the air. Id. Use of the 0.5 ground factor rather than the 0.0 ground factor as a modeling assumption underpredicts noise by 3dB(A), a doubling of noise, and when added to the modeling 3 dB(A) margin of error, there is a resulting increase by a factor of 2-4 – the amount of the increase in noise depends on the frequency. See Exhibit B, Schomer, 577-578); see Id., Hessler 519-520, 524-525 re: 10 dB(A) margin to allow for compliance.

Wind developers have also failed to include ambient noise studies in conjunction with their project noise modeling, failing to comply with the Minnesota Department of Commerce Wind Noise Guidance and MPCA's interpretation of noise rules.[6] For this reason, the Freeborn Invenergy applicant, utilizing Hankard, was ordered to provide that modeling within one week after the close of the hearing to correct that omission, and filed that exhibit on March 1, 2018 (FR-18, Affidavit of Hankard and Noise Tables, 20183-140712-03). This requirement, found in the 2015 Commerce Guideline is reinforced by MPCA's comment, as above, and further when MPCA's Frank Kohlasch filed a latter in the Freeborn Wind docket. See Freeborn Wind Hearing

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[4] Exhibit B, Testimony of Schomer, Affidavit of Overland (Wisconsin PSC Docket 2535-CE-100).
[5] Exhibit A, Testimony of Hankard, Affidavit of Overland (WPSC Docket 9697-CE-100).
[6] Online at https://mn.gov/eera/web/project-file?legacyPath=/opt/documents/FINAL%20LWECS%20Guidance%20Noise%20Study%20Protocol%20JULY%209%202013.pdf See MPCA's Comment, Appendix A (p. 12 of 13).

Exhibit EERA-9, Guidance for Large Wind Energy Conversion System Noise Study Protocol and Report (20183-140949-02); see also MPCA Comments (20189-146351-01). The MPCA Kolasch letter stated expressly that ambient noise was to be included – that "the MPCA has historically, and consistently, interpreted and applied said noise standards for *total* sound[7].

There is a 3 dB(A) margin of error incorporated into modeling. In the original contested case, when asked about the margin of error, whether it is ± 2 dB(A), Hankard stated:

> NO, it's 3.

Tr., Vol 1 B p. 64 l. 2-24 – p. 65 l 1-8; see also Tr., p. 112 l. 15 – p. 113 l. 12; referenced in Permit Order Finding 241 fn 1.

The modeling for the new turbines and disclosure of locations has now been produced by NSP/Xcel, and there must be an opportunity for vetting of this information, in particular because the previous modeling in the record, all modeled using a 0.0 ground factor, was not sufficient to demonstrate compliance. The reliability and credibility of the new noise modeling is a material issue to be established in a contested case hearing.

Xcel Energy/NSPM/Freeborn Wind LLC has yet to demonstrate that it can and will comply, and while it may be possible for Xcel to comply, as of this date, compliance is not supported by fact or the record. Compliance has not yet been demonstrated. The project has changed, and potential for compliance must be demonstrated in a contested case.

II. WHETHER SETBACK DISTANCES PROPOSED ARE ADEQUATE IS A MATERIAL ISSUE OF FACT

Whether the setbacks proposed by the applicants are adequate is a material issue of fact. The movement of turbines proposed in Xcel's plan, and the noise and shadow flicker impacts based on the increased turbine size and placement, must be reviewed in a contested case.

[7] MPCA's Frank Kolasch letter, September 11, 2018, Freeborn Wind docket IP-6946/WS-17-410. https://legalectric.org/f/2019/02/Exhibit-M_Kohlasch_Letter_20189-146351-01.pdf

Whether the setbacks for noise, shadow flicker, or other purposes that are proposed by the applicants are sufficient is an issue of material fact. Whether setbacks for these larger turbines that are less than 1,150 and 1,525, the setbacks in the Bent Tree Noise Studies that showed exceedences, are adequate for this project is a material issue of fact. As above, noise monitoring is a material issue, particularly in light of Freeborn Wind's initial failure to demonstrate it could comply with the MPCA noise standard, and Freeborn Wind's failure to provide such demonstration prior to issuance of the site permit.

For example, Applicants state that turbine #47 was removed due to noise. Turbines 16, 23, and 37 (participants) and 20, 30 and 40 (non-participants) appear to be the same distance and direction of #47, which was removed. See Amendment Application, part 4 of 4. Why are these other similarly situated turbines not removed? Using google earth and the coordinates of turbines and homes found in Attachment G, turbine #29 appears to be 1370' from a home. Turbine # 47 appears to be 1,342 feet from a home. It is difficult to tell, but there is a question regarding the distance from turbines to homes, and the information provided is not specific. Mindful that a turbine at 1,342 feet was, by applicant's admission, removed for "noise," and that in Bent Tree, one of the homes bought out was 1,525 from the nearest turbine, and with demonstrated exceedences at 1,525 feet, it is an issue of material fact whether the project can comply with the noise standard at less than 1,525 feet.

Table 3-1 Final Measurement Point Locations

Final Measurement Point	Easting	Northing	Distance to nearest turbine, ft
Langrud (BT-M01)	462985	4841921	1150 – Turbine 362
Hagen (BT-M02)	462949	4847019	1525 – Turbine 132

Table 3-1, p. 11, AFCL-11 (201712-138411-07), Bent Tree Noise Monitoring and Noise Study Phase I, Appendix A; see also Bent Tree Noise Report, Phase II, p. 10 of Comment of Stephanie Richter, 3/15/2019 (20183-141042-01).

The Bent Tree noise studies showing exceedences of the noise standard at 1,150 and 1,525 feet shows how important this is when those studies demonstrated noise exceedences of turbines smaller than those proposed for this project at 1,150 and 1,525 feet.[8] Larger, noisier turbines, such as the V120s proposed to replace V116s in this project, would likely require greater setback distances for compliance.

III. SHADOW FLICKER MODELING SHOWS POTENTIAL FOR IMPACTS

There are multiple material issues of fact regarding shadow flicker, including but not limited to:

- Whether shadow flicker modeling accurately depicts potential for impacts.
- Whether 30 hours annually is reasonable limit for shadow flicker.
- Whether project as proposed will limit shadow flicker to 30 hours annually, the ceiling for shadow flicker under both the permit and the Freeborn County ordinance.
- Whether project proposes different shadow flicker limits for participants and non-participants, and if so, whether that is a legitimate distinction.
- Whether reliance on complaints of the affected public to trigger investigation and mitigation of shadow flicker is reasonable.

Shadow flicker is at issue, and the above points are material issues of fact that must be settled. The applicant has provided over 300 pages of shadow flicker data and predictions After a review of these pages, Dorenne Hansen of AFCL stated in her comment:

> The highest shadow flicker occurs for a participant at 6,412 minutes or more than 106 hours. The highest shadow flicker for a non-participant is 7,416 minutes or more than 123.6 hours.
>
> There are 19 participants and 18 non-participants showing over 30 hours of shadow flicker to their receptor.

Hansen Comment, November 11, 2019 (201911-157410).

IV. DECOMMISSIONING PLAN MUST BE REVIEWED AND VETTED.

There are several aspects of decommissioning that constitute material issues of fact,

[8] See Bent Tree Noise Monitoring Study, p. /, PUC Unique ID #/.

factors not addressed in the contested case proceeding, including but not limited to:

- Whether applicant has provided all the required decommissioning information for Minn. R. 7854.0500, Subp. 13.
- Whether shifting timing of production of Decommissioning information out beyond granting of permit removes it from public participation and scrutiny, a limitation of due process.
- Whether lease clause allowing shift of decommissioning and cost to landowners, "allowing" landowners to then collect from owner is permissible.
- Whether financial assurance is adequate.
- Whether decommissioning costs are accurate given Xcel and other cost estimates.

First is whether the decommissioning plan filed in February, 2019, after granting of the site permit and with no review or vetting in the contested case, is adequate. Under the rules, a plan and decommissioning information including cost and financial assurance plan must be provided in the Application, and it was not. The Commission, Commerce, and the Administrative Law Judge all failed to require that the application comply with the rules. A decommissioning plan was provided after the permit was issued by the Commission, but it has had no review by the public, parties, or agencies.

The decommission plan and financial assurance must be reviewed and vetted in a contested case hearing to establish whether the plan is adequate and whether the applicant has provided all the information required by rule; whether cost estimates are accurate and consistent with other cost estimates; whether the applicant sufficiently takes responsibility for decommissioning; and whether the process for review of the decommissioning plan provides sufficient due process to parties and the public.

The rule regarding application content is specific, and without question, this information was not included in the original application, nor was it included in response to discovery or in testimony in the contested case:

7030.0500, Subp. 13. Decommissioning and restoration.

> The applicant shall include the following information regarding decommissioning of the project and restoring the site:
>
> A. the anticipated life of the project;
> B. the estimated decommissioning costs in current dollars;
> C. the method and schedule for updating the costs of decommissioning and restoration;
> D. the method of ensuring that funds will be available for decommissioning and restoration; and
> E. the anticipated manner in which the project will be decommissioned and the site restored.

Minn. R. 7854.0500, Subp. 13.

No permit should have been granted before this information has been provided, opened for comment, and reviewed by Commerce, the public, parties, and the Commission, as contemplated by the requirement that decommissioning information be included in the application. This is the Commission's responsibility to assure an application, and as agent for the Commission, it is also the Department's responsibility.

Decommissioning is particularly important, because in the project leases, there is a clause which would transfer responsibility for decommissioning to the landowner, who would then need to attempt to collect costs from the project owner:

> If Grantee fails to remove such Windpower Facilities within twelve (12) months of termination of the Easement, or such longer period as Owner may provide by extension, Owner may do so, in which case grantee shall reimburse Owner for reasonable and documented costs of removal and restoration incurred by Owner.

Exhibit C, AFCL-35, Wayne Brandt Public Comment from Public Hearing, p. "15" 20183-140948-08

see also Brandt, Public Hearing, p. 133-139. Xcel's response to AFCL's Information Request 9 was that it would not remove this clause allowing a shift of decommissioning responsibility to the landowner, stating it was a standard clause in a wind lease. Exhibit D, AFCL IR 9. Xcel also stated in an Information Request response that it would not add a statement that "*As owner and operator of Project facilities, Xcel Energy will bear the financial responsibility for* *decommissioning activities and Project area restoration."* as it deemed that was "unnecessary." Exhibit E, AFCL IR 10.

The Lake Benton II project demonstrates financial assurance through a performance bond:

> **4.0 DECOMMISSIONING SECURITY**
>
> LBII will establish performance bonds with Pipestone County for the total amount of infrastructure located within those communities.

Exhibit H, Lake Benton II (IP-6903/WS-18-179). Freeborn Wind has not established performance bonds with Freeborn County for decommissioning.

The lease clause above, described as a discussed at the hearing, and Xcel's responses to Information Requests reiterated in Permit Amendment discovery, should be sufficient to trigger scrutiny, production of decommissioning information, and demonstration of financial assurance.

The Commission did not "acknowledge its error in finding the application substantially complete without a decommissioning plan." Order Amending, p. 11. "[t]he Commission noted that parties had the authority to request the relevant information via discovery." Id. AFCL did request this information, attempting to assure that decommissioning information was in the record, and the response to AFCL IR 16 requesting specifics to sections 10.10 2 and 10.10.3 was:

> Freeborn Wind will comply with the terms of the Site Permit as it relates to the preparation, content and distribution of a decommissioning plan. See Section 11.0 of the Draft Site Permit.

Exhibit J, Freeborn Wind Hearing Exhibit AFCL 21, IR 16, Dan Litchfield (January 12, 2018). That pushes compliance to "after-the-fact" production, and there is no opportunity for public and party review.

Commerce and the Commission have thus far disregarded the application filing requirements of Minn. R. 7845.0500, and did not correct this error prior to issuing a permit. The

Commission claims that it has taken "remedial measures," but "after-the-fact" production is not sufficient. Now is the time to correct these errors.

The Commission's Order did not require provision of decommission information prior to granting of the permit, a production which is required under the rules for LWECS applications. Minn. R. 7845.0500, Subp. 13. Whether the decommissioning plan proposed is adequate is an issue of material fact, as the plan has not been reviewed and vetted by parties, the public, or agencies. Another issue of material fact is whether the company is sufficiently locked in to do the decommissioning in light of the "out" in the lease contracts whereby if the owner does not decommission, the landowner would decommission the equipment on that parcel and seek compensation from the project owner. Also an issue of material fact is whether the cost estimate is adequate, particularly where it is roughly one-half of the cost estimate of other Xcel Energy decommissioning estimates. How specifically will decommissioning be funded, and the financial assurance for decommissioning is another issue of material fact.

The Commission's rules have, for over 20 years, required that decommissioning information be included in any application for a wind site permit. Minn. R. 7854.0500, Subp. 13. In practice, however, the Commission and the Environmental Quality Board before it, and the Department of Commerce, have for over 20 years abjectly ignored this rule! The Commission has declared applications complete without the information required. Commerce has written into its draft Permit provisions allowing this information to be provided after issuance of a permit, contrary to the rule. For the Freeborn Wind siting docket, in both the contested case and the PUC's consideration, both the ALJ and PUC staff tried to shift this burden of production to AFCL, and allowed the project to be permitted without it. At this point, the decommissioning plan should be carefully reviewed by the parties, public, and agencies.

The cost of decommissioning is an issue of material fact. The Freeborn Wind decommission estimate stated in the February 2019 "Decommission Plan" is not consistent with other wind project decommissioning estimates:

Freeborn Decommissioning Plan
Cost Estimate Breakdown (February 2019)

Turbine sites (100 sites)		
Dismantle turbines		$ 7,251,413
Trucking/Haul Off		$13,514,800
Foundation removal (4' depth)		$ 1,074,267
Site Civil Work Removal		$ 3,480,635
Cement Stabilized Material Haul Off (replace with black dirt)		$ 2,494,706
	Total	$27,815,821
Collection System		
Remove MV cable (≥ 4 ft below grade)		$ 1,016,100
Other Misc.		
Repairs to drain tile & ditches from crossings		$ 270,000
O&M Building removal		$ 89,700
Mobilization		$ 797,339
General conditions		$ 1,626,408
	Total	$ 2,783,447
Alternates		
Scrap Value of Components		-$5,507,080
Final estimate:		**$26,108,288**
		$261,083 per turbine

Xcel Application, Appendix J, p. 7 of 8.

For Palmers Creek, the Commission accepted a cost estimate that was not itemized, with a cost estimate for decommissioning:

> Based on the current estimate, the cost of decommissioning is $7,385,822 with a potential scrap return value of $445,500. These anticipated costs shall be reviewed and updated every five years by the Applicant.

Exhibit F, p. 2 of 3, Palmers Creek Decommissioning Plan, 18 turbines (IP-6979/WS-17-265).

For the Nobles wind project, now owned by Xcel, the decommissioning estimate is:

> In the 2010 Remaining Lives Filing, E002-D-10-173, the Commission approved a net salvage rate of -8.7% to be used for the project. This means that an additional 8.7% of the value of all the project's assets will be recovered as part of the ratepayers' service rate. These funds collected for removal and restoration are included in the accumulated reserve for the project, but tracked separately from the reserve for the asset itself. A conservative estimate for a decommissioning expense is approximately four-hundred forty-five thousand dollars ($445,000) per turbine (2009 dollars).[1]

Exhibit G, Nobles decommissioning cost. (IP-6646/WS-09-584).

For Next Era's Lake Benton decommissioning, the cost estimate is:

3.0 COST ESTIMATE

1.0 Turbines and Towers		**Cost Estimate**
	1.1 Dismantle Turbine & Towers	$ 5,000,000
	1.2 Removal of Transformers	$ 200,000
2.0 Tower Foundations		
	2.1 Foundation Removal, Disposal and Grading	$ 1,200,000
	2.2 Transformer Pad Removal and Disposal	$ 125,000
3.0 Other Structures		
	3.1 MET Towers, O&M Building Salvage, Fence Removal	$ 50,000
	3.2 Grading	$ 100,000
4.0 Tower Access and Site Roads		
	4.1 Remove Access Roads	$ 1,000,000
5.0 Collection System		
	5.1 Remove Collection System Terminations	$ 200,000
6.0 Substation		
	6.1 Substation Foundations, Fence, Steel and Grading	$ 300,000
	6.2 Substation Equipment	$ 200,000
7.0 Mobilization/Demobilization		
	7.1 Mobilization/Demobilize	$ 300,000
8.0 Project Salvage Value		
	8.1 Project Steel Salvage Value	($ 2,200,000)
	TOTAL:	**$ 6,475,000**

Exhibit H, p 4 of 8, Lake Benton Decommissioning Plan (IP-6903/WS-18-179).

For Pleasant Valley, another Xcel owned project"

> A conservative estimate for a decommissioning expense is approximately two-hundred ninety thousand dollars ($290,000) per turbine (2015 dollars).

Exhibit I, p. 2 of 3, Pleasant Valley decommission cost estimate (IP-6828/WS-09-1197).

The Freeborn Wind decommissioning cost estimate is quite different than other decommissioning cost estimates. Financial assurance also must be carefully vetted.

All aspects of the decommissioning plan should be fully reviewed in a contested case proceeding. The adequacy of decommissioning plans is a material issue of fact, the manner in which it will be done, whether the land will be restored to its previous condition, how much it will cost, and financial assurance, particularly because leases include potential shifting of responsibility to lessors, all are material issues of fact. The Commission now has some experience with decommissioning of wind project, and should review this plan in light of that experience.

V. COMPLAINT PROCESS PROPOSED IS INADEQUATE

The Commission's complaint process is broken. The Commission has long been aware that there have been problems with the standard complaint process and has dealt with the Bent Tree, Big Blue, and other projects for years, including the MinnCan pipeline which had numerous complaints filed. Complaints are often not addressed, and it has taken too many years for complaints that are not resolved to work their way to a meeting before the Commission. See Testimony of Bernie and Cheryl Hagen, Public Hearing Tr. p. 108-111; p. 112-115.

The complaint process proposed in the draft permit for this project is the same boilerplate language used in every wind project, and there have only been nominal revisions over time. Davis, Tr. Vol. 2, p. 180, l. 14-17. The Draft Site Permit includes the complaint process, located at the very end of the document. Freeborn Wind Hearing Exhibit EERA-8, Draft Site Permit – p. 72 of 77. This complaint process is found at the end of each permit issued and if a permit is issued in this docket, a copy of the permit is mailed to "everyone that is notice of the issuance of the permit." Freeborn Hearing Transcript, Davis, Vol. 2, p. 179-180.

The complaint process is complex and ostensibly is subject to revision:

> Q: What would it take to initiate a review of the complaint process?
> A: This is when you would provide a comment on it. It's part of the draft site permit, so—
> Q: So right now?
> A: So this is when comments should be submitted, yeah.

Davis, Freeborn Wind Tr. Vol 2, p.180. Comments were submitted, but apparently ignored.

A complaint system reliant on a person's knowledge of how to make a complaint is inadequate. Commerce did not engage the public and produce a workable complaint process, and in this Freeborn case, Freeborn proposes the process, with no changes.

Complaints regarding interference with over-the-air signal are even more problematic, hence KAAL's intervention in the initial hearing, because unless someone identifies the wind project as the source of the interference and knows how to and does in fact make a complaint under the permit's complaint process, there may be no record of the problem. Commerce is not the recipient of complaints from the television signal, and people experiencing over-the-air interference may not know why they have interference. Freeborn Evidentiary Hearing, Davis, Tr. Vol. 2, p. 181, l. 13- p. 183, l. 8. Although Davis does not know of any complaints, Cheryl Hagen testified regarding their trouble with over-the-air TV reception due to Bent Tree at the Public Hearing. Testimony of Cheryl Hagen, Freeborn Public Hearing Tr. p. 108-109.

Xcel filed its "Complaint Handling Procedures" late Friday, November 8, 2019, claiming that it is in response to permit "Section 9.0 Complaint Procedures" but it is nothing more than a cut and paste of Attachment A to the Permit, and lists Dan Litchfield (of Invenergy) as the party to be contacted prior to construction! See COMPLIANCE FILING--SECTION 9.0-PRE-CONSTRUCTION-COMPLAINT PROCEDURES , November 8, 2019 (201911-157375-01). Xcel Energy is now the owner – how is this reference to Invenergy personnel as a contact person correct?

No permit amendment should be issued without thorough review and revision of the complaint process by the public, parties, and agencies.

VI. AFCL REQUESTS A CONTESTED CASE PROCEEDING

Amendment of the Freeborn Wind permit should not be approved until the permit amendment request has been reviewed and vetted, with newly provided noise studies, shadow flicker, site plan, and decommissioning plans, and other Xcel Energy filings are made public and subject to a contested case proceeding. Freeborn Wind, has provided new information regarding noise and shadow flicker modeling, new layout/site plan, 2019 project setbacks, "updated SPA Figures 1-17," and the new application, together with "Compliance Filings" filed since, must be vetted as the initial application was – this can only be done in a contested case proceeding.

Freeborn Wind thus far has not demonstrated that it could comply with the permit. As the permit amendment applicant, Xcel Energy has the burden of production and the burden of proof. Freeborn via Xcel has now provided additional information that was not available at the time of the initial application and the initial contested case. Freeborn is proposing to increase the size of the turbines and move many turbines. No decommissioning information was provided in the initial application, and some decommissioning information was provided in February 2019, subsequent to the initial granting of the site permit, long after the public hearing had ended. Cost estimates vary considerably from that of other decommissioning cost estimates that Xcel and other developers have produced. While it has provided information and made assertions of compliance, the assertions have not been vetted. Freeborn Wind has not demonstrated that it can build the project when considering the many terminated leases, the project as originally proposed, and the planned permit amendment changes.

AFCL requests an extension of two weeks to address the many filings of Xcel Energy on Friday, November 8, 2019 which do address substantive issues regarding this permit.

AFCL asks that the Commission refer this permit amendment request to the Office of Administrative Hearings for a continuation of the contested case to review the many issues of material fact. The Commission should not amend the permits until this new information has been vetted and reviewed, discovery propounded, necessary land rights shown to be acquired, and the dockets opened for comment to be reviewed by parties, Commerce, and the public, in a contested case hearing. Freeborn Wind has the burden of proof and production and must make its demonstration that it can comply with the permit. This must be done in a public process, a hearing held, and then deliberated the Commission, all as contemplated by the Commission's adoption of ALJ Recommendation Findings 243 and 244.

November 12, 2019

Carol A Overland

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BEFORE THE

MINNESOTA PUBLIC UTILITIES COMMISSION

Katie Sieben	**Chair**
Dan Lipschultz	**Commissioner**
Valerie Means	**Commissioner**
Matt Schuerger	**Commissioner**
John A. Tuma	**Commissioner**

In the Matter of the Application of Freeborn Wind Energy, LLC for a Large Wind Energy Conversion System Site Permit for the 84 MW Freeborn Wind Farm in Freeborn County	**PUC Docket No. IP6946/WS-17-410**

AFFIDAVIT OF CAROL A. OVERLAND
IN SUPPORT OF
ASSOCIATION OF FREEBORN COUNTY LANDOWNERS'
COMMENT AND REQUEST FOR
REFERRAL TO OFFICE OF ADMINISTRATIVE HEARINGS
FOR A
CONTESTED CASE AND PUBLIC HEARING

STATE OF MINNESOTA)
) ss.
COUNTY OF GOODHUE)

I, Carol A. Overland, after affirming, state and depose as follows:

1. I am an attorney licensed in good standing in the State of Minnesota, License No. 654217.

2. I am representing Association of Freeborn County Landowners in the above-captioned matter.

3. Attached as Exhibit A is a true and correct copy of Testimony of Hessler and Schomer, Wisconsin PSC Docket 2535-CE-100 regarding 10 dB(A) margin to assure no noise exceedences (Hessler); development of ISO 9316-2 (Schomer) and use of 0.0 ground

factor and 0.5 ground factor (Schomer). Wisconsin PSC Docket 2535-CE-100, Transcript, Vol. 4, October 12, 2012 (PSC REF #175015).

4. Attached as Exhibit B is a true and correct copy of Testimony of Hankard (selected), Tr. p. 122, regarding use of ground factor of 0.5 for most projects with the exception of wind, where he stated:

   > The model that we use has been shown to predict conservatively with 0.5. I mean, 0.5 ground factor is used in probably -- well, with the exception perhaps of wind turbine projects which are different because the source is elevated. But for projects like a typical power plant, a solar plant where the sources are relatively close to the ground, I would say 90 to 99 percent of the studies use 0.5.

   Testimony of Hankard, p. 122, Wisconsin PSC Docket 9697-CE-100, January 16, 2019, (PSC REF #358548).

5. Attached as Exhibit C is a true and correct copy of AFCL 35 (20183-140948-08), p. "15" of Wayne Brandt lease with Invenergy.

6. Attached as Exhibit D is a true and correct copy of AFCL IR-9 to Xcel Energy, Xcel's response regarding language that Xcel Energy assume responsibility for decommission be added to permit.

7. Attached as Exhibit E is a true and correct copy of AFCL IR-10 to Xcel Energy, Xcel's response, where Xcel states that it would not change language in leases regarding landowner responsibility regarding decommissioning.

8. Attached as Exhibit F is a true and correct copy of the decommissioning cost estimate for the Palmers Creek wind project, $7,355,822 for 18 turbines (IP-6979/WS-17-265).

9. Attached as Exhibit G is a true and correct copy of the decommissioning cost estimate for Nobles Wind Project decommissioning cost. (IP-6646/WS-09-584).

10. Attached as Exhibit H is a true and correct copy of the Exhibit H, p 4 of 8, Lake Benton Decommissioning Plan (IP-6903/WS-18-179).

11. Attached as Exhibit I is a true and correct copy of the Pleasant Valley decommission cost estimate, see p. 2 of 3 (IP-6828/WS-09-1197).

12. Attached as Exhibit J is a true and correct copy of the Freeborn Wind Hearing Exhibit AFCL 21, IR 16, Dan Litchfield (January 12, 2018).

Based on the Application for Permit Amendment, and the above Exhibits, AFCL has identified issues of material fact that should be addressed in a contested case, including but not limited to:

- Whether the project can and will comply with the noise standard. Minn. R. 7030.0400.
- Whether 3 dB(A), a doubling of sound pressure, is a "non-significant increase."
- Whether the 3 dB(A) modeling margin of error should be accounted for in determination of likely compliance.
- Whether use of a 0.5 ground factor is supported by the science of wind noise modeling.
- Whether use of 0.0 ground factor is the standard ground factor for wind noise modeling due to height of turbine and direct line to receptors on ground.
- Whether use of a 0.5 ground factor lowers modeled noise by 3 dB(A) from modeling results using 0.0 ground factor.
- Whether failure to include 3 dB(A) margin of error and 3 B(A) impact of use of 0.5 ground factors skews modeling results by predicting lower noise levels.
- Whether addition of 3 dB(A) margin of error and/or 3 dB(A) 0.5 ground factor decrease to the values of Table 5.1 demonstrates likelihood of noise levels above standard.
- Whether ISO 3613-2 and Minn. R. 7030.0400 were designed for wind noise modeling.
- Whether ISO 3613-2 and Minn. R. 7030.0400 were designed for modeling noise where noise source is high above ground level.
- Whether ISO 3613-2 and Minn. R. 7030.0400 were designed for modeling ground noise generation and ground receptors.
- Whether ambient sound measurements are to be included in modeling under 2015 Commerce and MPCA Comments and/or 2012 MPCA Guidelines.
- Whether cumulative impacts of outstate portion of this project and/or other nearby projects are to be included in modeling.
- Whether the increase in size of blades increases noise emitted, and if so, how much.
- Whether use of feathered blades decreases noise emitted, and if so, how much.
- Whether ISO 3613-2 and Minn. R. 7030.0400 address the expected sound power levels at lower bandwidths (i.e., 125, 63, 31.5, and lower.
- Whether participants and non-participants are afforded different treatment under the noise rule.
- Whether permit language and amended permit language and removal of Section 7.4.1 is consistent with requirements of Minn. R. 7030.0400.
- Whether setbacks proposed are sufficient to meet the noise standard.
- Whether small wind standards for noise and noise setbacks, are appropriate to use for LWECS.
- Whether the Commission's/EERA's draft site permit and site permit template sections regarding noise has a basis in law or rule.
- Whether shadow flicker modeling accurately depicts potential for impacts.
- Whether 30 hours annually is reasonable limit for shadow flicker.
- Whether project as proposed will limit shadow flicker to 30 hours annually, the ceiling for shadow flicker under both the permit and the Freeborn County ordinance.
- Whether project proposes different shadow flicker limits for participants and non-participants, and if so, whether that is a legitimate distinction.
- Whether reliance on complaints of the affected public to trigger investigation and mitigation of shadow flicker is reasonable.

- Whether applicant has provided all the required decommissioning information for Minn. R. 7854.0500, Subp. 13.
- Whether shifting timing of production of Decommissioning information out beyond granting of permit removes it from public participation and scrutiny, a limitation of due process.
- Whether lease clause allowing shift of decommissioning and cost to landowners, "allowing" landowners to then collect from owner is permissible.
- Whether financial assurance is adequate.
- Whether decommissioning costs are accurate given Xcel and other cost estimates.
- Whether Invenergy's Dan Litchfield should be the pre-construction contact person.
- Whether the Complaint Procedures filed by Xcel Energy are adequate.

Further your affiant sayeth naught.

November 12, 2019

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LORI A. ANDERSON
NOTARY PUBLIC - MINNESOTA
My Commission Expires Jan. 31, 2020

Signed and affirmed before me this
12th day of November, 2019.

Lori A. Anderson
Notary Public

Exhibit A

Testimony of Hankard (selected)

Wisconsin PSC Docket 9697-CE-100

January 16, 2019

PSC REF# 358548

A I do recall that.
Q Do you believe that it would have been appropriate to apply a ground factor of 0.2 or 0.3 to your analysis of the Badger Hollow project?
A No.
Q Why not?
A The model that we use has been shown to predict conservatively with 0.5. I mean, 0.5 ground factor is used in probably -- well, with the exception perhaps of wind turbine projects which are different because the source is elevated. But for projects like a typical power plant, a solar plant where the sources are relatively close to the ground, I would say 90 to 99 percent of the studies use 0.5. And when consultants like myself go out and measure these plants after they're constructed to verify our modeling assumptions, that assumption checks out as being, if anything, overpredicting the levels. So there's no need to -- there would be no justification to use something like a .2 or .3 which would predict yet higher levels because we're already demonstrating that the model is probably overpredicting. So that would not be justified for those reasons.
MR. NOWICKI: Thank you. No further questions.

Exhibit B

Testimony of Hessler and Schomer

Wisconsin PSC Docket 2535-CE-100

October 10, 2012 - Volume 4 (PSC REF # 175015) wondering if he's looked at these.

EXAMINER NEWMARK: Follow-up on what?

MR. REYNOLDS: Follow-up on the question of recent science. He's reviewed the literature. I want to know if he's reviewed these two articles.

MR. WILSON: You already released him.

EXAMINER NEWMARK: He's answered the question. You've had your chance to cross him.

MR. REYNOLDS: Well, this is in response to the redirect. Just two articles.

EXAMINER NEWMARK: You had your chance to cross him. You're excused. Thanks.

(Witness excused.)

EXAMINER NEWMARK: Is that the balance of the applicant's witnesses?

MR. WILSON: They're all done.

EXAMINER NEWMARK: Okay. Believe it or not, hm? All right. I think we have time for Mr. Hessler.

MS. NEKOLA: Clean Wisconsin would like to call Mr. Hessler.

DAVID HESSLER, CLEAN WISCONSIN WITNESS, DULY SWORN

EXAMINER NEWMARK: Thanks for your patience.

DIRECT EXAMINATION

BY MS. NEKOLA:
Q Good morning, Mr. Hessler.
A Good morning.
Q Please state your name and business address for the record.
A My name is David Hessler. My business is located at 3862 Clifton Manor Place in Haymarket, Virginia.
Q Did you prepare 12 pages of direct testimony, nine pages of rebuttal testimony, five pages of surrebuttal testimony, and three exhibits in this proceeding?
A Yes, I did.
Q And is the information in your testimony and exhibits true and correct to the best of your knowledge?
A Yes, it is.
Q Mr. Hessler, have you had the opportunity to review Mr. Schomer's surrebuttal testimony?
A Yes, I have.
Q Mr. Schomer states that low frequency pulse will be audible to many residents of Forest. Do you agree with that?
A No, I don't think that's an inevitable or foregone conclusion. The --
MR. McKEEVER: Excuse me, Mr. Hessler. Could you speak up.

THE WITNESS: I'm as close as I can get to this thing without eating it.

MR. McKEEVER: Thank you.

A No, I don't think that conclusion is inevitable. That research that his testimony is based on is 30 years of experience evaluating health effects from low frequency noise associated with military sources like artillery and tanks. And he has just taken that result and just applied it wholesale to wind turbines without considering the dramatic difference in the magnitude of the two sources.

An artillery shot is, I think everyone realizes, much, much louder than any wind turbine could be. There are many studies that show that wind turbines -- the low frequency content of wind turbine noise is very, very low and is around the -- at or under the threshold of hearing. So tanks and artillery are not -- I wouldn't describe them as being near the threshold of (inaudible).

THE REPORTER: Near the threshold of what?

THE WITNESS: Hearing. (Laughter.) How about that?

BY MS. NEKOLA:

Q Mr. Hessler, is there a particular recent study that you can point to that assesses the magnitude of low

frequency wind turbine noise?
A Yeah. There's many, many studies that have been done, I've taken my own measurements. But there is one that I think kind of epitomizes the research on this topic, and it's a study that was undertaken specifically to try to address this issue of what is going on with low frequency noise in wind turbines. It's a study that was published in the Noise Control Engineering Journal April of last year by O'Neal. And just to very briefly summarize it, they kind of went through the literature and found all of the existing -- all the ones they could, all the existing thresholds for the perception of low frequency noise worldwide.

They did a literature review of all the papers that have -- that they could find that were ever written on the subject and they summarized the results of all of those. All of those results essentially say that it's so low in magnitude that it's pretty much inconsequential.

And then the last part of this study is that they went out and did their own field measurements on two different types of turbines; and then they compared those findings to all of the thresholds that they had found, and found that the levels were under the threshold of hearing in every instance, every ANSI standard, every threshold they could find.

(Hessler Exhibit No. 4 was marked.)

Q I'd like to hand you this. Is this a true and correct copy of the study that you were just talking about?

A Yes, it is.

MS. NEKOLA: Your Honor, we'd like to move this study into the record as Hessler Exhibit 4.

MS. BENSKY: We object, Your Honor.

EXAMINER NEWMARK: Okay. Go ahead.

MS. BENSKY: Well, I haven't seen it. I haven't had a chance to look through it. I'm paging through his testimony now to see if he did talk extensively about low frequency noise. I don't recall that he did. I don't believe this was cited in his testimony. So our witness can't see it and I don't have the ability to read it now and ask questions. So that's why I object.

EXAMINER NEWMARK: Response?

MS. NEKOLA: Your Honor, this is in response to surrebuttal testimony that referenced low frequency noise, and Mr. Hessler contemplated addressing low frequency noise all along in this case. I think it's highly appropriate to add this to the record. It's a more recent study than anything else that we have so far in the record. And if we -- we could give parties a chance to read it and perhaps decide later. We think it's --

EXAMINER NEWMARK: And just -- I didn't catch who he was responding to.

MS. NEKOLA: Mr. Schomer.

EXAMINER NEWMARK: Schomer's surrebuttal?

MS. NEKOLA: Surrebuttal, um-hmm.

MS. BENSKY: I guess there is no reason this couldn't have been part of Mr. Hessler's direct testimony. His work for Clean Wisconsin, as I understand it, is quite extensive on this case. And if this was going to be an issue that he wanted to address all along, then -- this is a 2011 study, there is no reason this couldn't have come in earlier. It'll take me more than ten minutes to read this and understand it.

We don't have any ability to put any information in the record to rebut it. So that's where the prejudice is.

MS. NEKOLA: Your Honor, this is a 2011 study that reviewed over 100 scientific papers worldwide on this topic, and also included a field study to measure wind turbine noise outside and within nearby residences. I think it would add to the record.

EXAMINER NEWMARK: Yeah, it looks like, from what I can see on direct, Schomer does reference studies about low frequency noise. And so I don't see why this couldn't have come in earlier. I'm going to have to leave it out as prejudicial. It's just too late to go through all of this and to have another witness come in.

MS. NEKOLA: One more thing that is relevant here, I think, is that we anticipated that Mr. Hessler would be able to do his own study of low frequency noise in another wind farm in Wisconsin. And he was -- he has so far been unable to do that because we haven't been able to get access to any wind farms. And so I think this is also his attempt to put in the best recent information on low frequency noise that he has available to him.

EXAMINER NEWMARK: I understand. Does staff have any opinion on this?

MR. LORENCE: I was just paging through his testimony. I see a reference to low frequency in his surrebuttal. But can you tell me where it is in his direct?

EXAMINER NEWMARK: Yeah, Schomer page 3, that first top of the page, there's been a multitude of literature published over the last 40 to 50 years that indicates that low frequency, and it continues on from there.

MR. LORENCE: Page 2 or 3?

EXAMINER NEWMARK: 3.

MR. LORENCE: I guess the only thought I have is if this is the only reference, I don't think he was really asserting anything other than the statement saying that there is publications. I thought his testimony was more direct in the sursurrebuttal with respect to low frequency. And I guess I thought -- and that was at least on page 16 of his sur-sur where he draws his last conclusion. Maybe it's the same thing. And so that's why I noticed that the -- the most as opposed to in his direct.

EXAMINER NEWMARK: And what pages on his surrebuttal? He just has surrebuttal, right? Does he have a third round?

MR. LORENCE: I saw it on surrebuttal page 16. And there may be other places. But I was looking at his last conclusion which is lines 12 through 22.

EXAMINER NEWMARK: I don't see that much difference in those two passages. But let's back up a little bit because I am aware that there is an attempt to do a study, is that the Glacier Hills farm? Is that the case?
MS. NEKOLA: Or the Shirley site.
EXAMINER NEWMARK: Or Shirley.
MS. BENSKY: He was denied access several months ago; isn't that correct?
MS. NEKOLA: No. They have not made a decision, final decision. But it has the same effect of being denied, actually.
MS. BENSKY: But in his direct testimony, doesn't he say he was denied?
MS. NEKOLA: Well, I'm not sure, but the -- the truth is that he has not been able to get access.
MR. REYNOLDS: Has there been any reason given for that?
MS. NEKOLA: No. Right, his direct testimony just says that we have not been granted access to the site. So thus far, we haven't been able to -- he hasn't been able to do the study.
EXAMINER NEWMARK: Okay. Well, the problem with this is I don't think this is enough of

a substitute for a study at the other wind farms, and I know that the access question has not been fully determined.

MS. NEKOLA: That's right.

EXAMINER NEWMARK: And I would be prepared to reopen the hearing if we could have a study developed on that specific -- on those locations, one of those locations, if access is granted. But that would mean scheduling that and having a process for it.

But at this time in the game and at this hearing, I don't think we can admit this -- this study because the parties have not had a chance to review it and their witnesses aren't available. You know, if there is a point in time when we know access cannot be given, I can consider reopening the hearing to take a look at these late exhibits as a substitute. But I would like to, you know, try to -- I don't want to do that now and I don't want to thwart any attempts to get the studies done. I think that's much better evidence. So -- or it would be evidence rather than, you know, literature review.

So are there any other exhibits that relate to this? I saw you had a number of items there.

MS. NEKOLA: Not on low frequency noise. We have one other that we want to offer on another matter.

EXAMINER NEWMARK: Okay. All right. So are we okay with that?

MS. NEKOLA: We just want to point out that the study that we're -- tried to move in was not just a literature review, but that there were also actual sound measurements at wind farms.

EXAMINER NEWMARK: Okay. Thanks for clarifying that. So for now we will hold off on that.

MR. WILSON: Your Honor, for what it's worth, I had a discussion with Cindy Smith yesterday morning where this topic came up about the inability to do the low frequency testing --

EXAMINER NEWMARK: Let's go off the record.

(Discussion off the record.)

EXAMINER NEWMARK: Let's get back on.

BY MS. NEKOLA:

Q Okay. So do you think that low frequency noise problems can be ruled out?

A No. Despite the findings in that study, no, I don't think we can just assume that there won't be any problems. And I say that with respect to the testimony we heard yesterday from those three homeowners that had to leave their house -- houses at Shirley. That was very compelling and I think irrefutable evidence that there is a problem at that site. The question is why is that? And that's what we were hoping to explore with that field survey.

So I think what's happening is that there is a low frequency noise that is associated with very specific turbine models or types of blades or blade control mechanisms that results in, according to the studies that I've seen recently, results in inaudible low frequency sounds that can produce adverse symptoms and problems in certain people in rare cases. But it needs to be investigated. And that's really the state of knowledge on that.

Q You say that these instances are rare. Can you give an example of a more typical situation?

A Yeah. Yesterday we also heard from Jeff Bump who lives at the Glacier Hills site. And I'm familiar with Glacier Hills. And I know -- I met Jeff Bump. My brother and I set up instruments at his house last winter, and we measured day and night at his house for about 18 days I think at his house, and ten other houses around that site. All the ones with the closest possible exposure to turbines. We measured off of the site to get the background conditions on a -- kind of a running time history of background throughout the survey.

And, you know, he said he was bothered by this horn sound and that's -- I heard that, that's associated with the hydraulic system in the Vestas V90 turbine that's at that site. He said he was kept awake by a swishing noise. That's mid-frequency oscillation, around 500 hertz, due to the blades. But what he didn't complain about is low frequency issues and any of these adverse health effects. He said, well, he might have got a headache once, but really it was all about the fact that he was bothered at night.

But the point is that this project, Glacier Hills, has over -- I think it's over 120 turbines that are distributed over an area that's about, very roughly, 40 square miles. There are hundreds and hundreds of people that live in close proximity to turbines at that project. Yet the only people that are complaining are Mr. Bump and another fellow that lives next -- or nearby him. Those two people are the only ones that have any problem with noise out of many, many hundreds. And that is the typical situation based on all of the post-operational surveys that I've done. The number of people that are actually complaining or bothered by it is very, very low compared to the total population.

Q Thank you. Mr. Schomer also mentioned that the data contained in your Exhibit 1 is artificially elevated by pseudo-noise or instrument error. Do you have a response to that?

A Yeah. What we did in our analysis of the applicant's sound study was to look at the data, the sound data, as a function of wind speed. And that's been criticized as, well, the sound levels are elevated because the wind was blowing over the microphone. But the fact of the matter is that the winds were very light during that survey; and the peak wind, the highest wind, at the microphone during that entire two-week period was only seven miles per hour.

We have -- some years ago, I think it was about 2008, we did study, a wind tunnel study, to evaluate that phenomenon of wind blowing over the microphone to quantify what that error is. And in that study, what we found was for a seven-mile-per-hour wind, the self-generated noise or pseudo-noise would be only around 20 dB, whereas in the field survey at Highland, the levels being measured under those conditions was in the neighborhood of about 45 dBA. So there wouldn't be any effect at all from a pseudo-noise. I believe the data is perfectly valid.

(Hessler Exhibit No. 5 was marked.)

Q You've been handed a copy of a study that you just referred to and described. Is that a true and correct copy of that study?

A Yes, it is.

MS. NEKOLA: We'd like to enter this into the record as Exhibit 5.

EXAMINER NEWMARK: Any objections?

MS. BENSKY: No objection.

EXAMINER NEWMARK: All right.

(Hessler Exhibit No. 5 received.)

BY MS. NEKOLA:

Q Turning to the surrebuttal testimony of Mr. Horonjeff, have you had an opportunity to review that testimony?

A Yes, I have.

Q Mr. Horonjeff points out that your comparison of the Highland sound data with the met mast wind speed shows considerable scatter at any given wind speed,

and he suggests that the mean value should not be used. Do you have a response to that?
A Yeah. It's not really a matter of where you draw the line, the mean trend line, in that data. What it shows is that the vast majority of the sound levels that were measured during the survey were measured under very low wind conditions that -- below the point, generally speaking, where the turbines would begin to operate. And the principal point is that during the windier conditions when the project would be operating, there are very, very few measurements of low sound levels during those wind conditions, only about six to a dozen ten-minute samples out of roughly 2,000 measurements that were taken.
Mr. Horonjeff is saying that, well, sometimes it's quiet when it's windy, but that is a rarity and that's what that figure shows.
Q You were present yesterday when Mr. Reynolds questioned Ms. Blank about the sound modeling for the project, correct?
A Yes.
Q And do you recall that Mr. Reynolds quoted your direct testimony at page 11 as saying that sound models should have an ideal target level of 40 decibels? Do you recall him saying that?

A Well, I think what he said was that the project should be designed to 40. 40 is the recommended level. My view on that is -- and what we've asserted in papers and things that we've published based on our field studies of completed projects -- is that if possible, projects should use 40 dBA as an ideal design goal if at all feasible because what we find is that below 40 there's very few, if any, complaints. But as a regulatory limit, we've put forward a level of 45 because the regulatory limit is different from an ideal design goal. A regulatory limit has to balance everybody's best interest. So the 40 we weren't saying was a suggested regulatory limit but rather an ideal design goal.
Q So just to be clear, is it your position that the Highland wind project should meet the 40 decibel noise standard?
A Should it meet the 40?
Q Right, is that your position?
A No. I think it -- I would be satisfied or I would recommend that it meet the 45 limit as currently it's obligated to do.
MS. NEKOLA: Mr. Hessler is available for cross-examination.
EXAMINER NEWMARK: All right. Do you have

questions?

CROSS-EXAMINATION

BY MS. BENSKY:

Q Good afternoon, Mr. Hessler.

A Good afternoon.

Q In your papers, you have a very distinct talent in taking complicated information and making it understandable for everyone, so I commend you on that and I ask that you do your best to keep it at that level here.

A We'll see how it goes.

Q Let's start with page 2, I'm just going to go through your testimony. So direct testimony page 2. At line 2, you say, "Typical projects involve field surveys to establish baseline background sound level conditions..." Is that the same way of saying ambient sound?

A Yeah. It's essentially the same thing.

Q And why is it important to establish that baseline?

A Well, the way most projects -- not just wind projects, but any fossil plant or any project -- would be evaluated is to see how its noise is going to compare to the sound level that already exists at that location. If the facility noise is going to greatly exceed the existing level, then there's

likely to be an adverse impact. If it's below the background, you might not even hear it. So it gives you a baseline to make a judgment on what the impact's going to be.
Q And in your view, is establishing that baseline an important thing to do?
A Yeah. We typically do do that for wind projects or any power plant.
Q Turning to page 3. You have your testimony up there with you?
A Yes, I do.
Q Now, page 3, and correct me if I'm wrong, it looks like you are first reviewing the initial predictions that were listed in the application using the zero coefficient assuming a total reflective ground?
A Where is it that you're at there?
Q On page 3, question number 7 -- or line 7. Your overall impression of the studies. I just want to clarify that what you're talking about right there is the modeling results where a zero coefficient was used; is that correct?
A Yeah, yeah. That's correct.
Q And looking at those results, if the average background noise was between 29 and 34 decibels and the project level was 45 decibels, your opinion is

that the project would be quite audible; is that correct?
A Yes, that's right.
Q If those were the actual numbers. And is the reason why the project would be quite audible is because you have that 11 to 16 above ambient level?
A That's right.
Q And do you have an opinion as to whether an ambient level of between 12 and 16 decibels -- or an actual level above -- let me start over.
Do you have an opinion as to whether that relative noise level would result in adverse community reaction?
A Yeah. If those were the actual levels, then we would conclude in any assessment that the project was likely to have a pretty significant adverse impact.
Q So it's not necessarily that 45-decibel level you're concerned about, you're more concerned about the relative difference, that 11 to 16 decibel difference; is that correct?
A Yeah. That's what I'm talking about in that particular paragraph.
Q Now, on page 4, going down to line number 12, you're talking about your review of the met tower data, and you had requested a site plan that you did not

receive?
A That's right.
Q And I understand later in your testimony that you kind of reverse engineered a site plan based on the available information?
A Yeah. It was possible to import into our modeling software the -- I guess the sound contour map from the application. It wasn't absolutely necessary to get the site plan in the first place. It was just -- it would have helped things. That's all.
Q So what information would you have expected the site plan to contain that would have been helpful to you?
A Just a particular kind of computer file that is easily imported into the modeling program. Just more to save time. What we had to do was just take the PDF and work with it.
Q So you feel that you obtained all of the information that you needed?
A Yeah. We made do.
Q The information that you used in your gathering of that data, do you know if that's the exact data that would have been contained in the site plan?
A We used the actual site plan from the application.
Q But you said you didn't receive the site plan.
A We used the site plan that was published in the

environmental assessment. It was just a matter of convenience to get the computer file. It wasn't germane to anything really.
Q So the actual data would have been the same? What I'm --
A That's right.
Q What I'm getting at is do you think that you input the right numbers based on the information that you had?
A Yes.
Q Now, let's talk about the met tower. The met tower was 49.5 meters, 162 feet. And is it your understanding that the hub height of the proposed turbines is between 299 to 328 feet?
A Right. Yeah. This met tower anemometer puts it within the rotor plane, not exactly at the hub height. It's very rare to have a met tower high enough that it goes all the way up to 80 or so meters.
Q So it's at the bottom of the rotor plane, 162 feet would be at the very bottom assuming the blade lengths are between 160 and 180 feet?
A Right.
Q Is there some sort of formula that you applied to that 49 meters to estimate the wind speed at the hub

height?
A The hub height wind speed wasn't needed for anything. What we did do was take the met tower wind speed at 49 and a half meters and then normalize that to 10 meters because you have to put the wind speed data on an even footing with the turbine sound power level data which is also -- which is always expressed as a function of the wind speed of 10 meters.
Q But that's something different than estimating what the wind speed would be at the hub height?
A Yes. The hub height, whether it's near the bottom of the rotor plane or at the hub height, it doesn't make any difference here, to what we were shooting for here.
Q But wouldn't it be -- if you want to know how fast the blades are going to turn, wouldn't you want to know the wind speed at the hub height? Wouldn't that be ideal?
A No. It's really -- it's all about the wind speed at this normalized height of 10 meters that's relevant to this whole thing. Even if we had a met tower that was -- met mast that was 80 meters, we would have just taken that value and normalized it to 10 meters. It would have been the same.
Q But if you had a met tower at 100 meters, you would

not have had to apply that formula?
A No. We would have had to apply it to any elevation anemometer. We want to bring it down to 10 meters from whatever height, the highest possible height.
Q So based on the met tower data, you don't know the actual speed of the wind at the hub height; is that correct?
A We could easily infer it from this 49 and a half meter data if we wanted to know it.
Q So you didn't -- is your answer you did not have the actual wind speed at the hub height?
A Met mast wasn't high enough.
Q And you did not have the actual speed at the rotor tip of 500 feet?
A We could have inferred that if we needed to know. The ideal thing would have been to have anemometers over the whole diameter of the blade, but you never have that.
Q So you have to make some approximations?
A Oh, yeah.
Q Is there generally a difference -- or can there be a difference in wind speed at 500 feet as opposed to 162 feet?
A Yeah. It is typically higher with elevation.
Q What happens when there's a very -- there's a higher

wind at the rotor tip than at the bottom of the rotor?

EXAMINER NEWMARK: In what sense? What do you mean what happens? In terms of what?

A Yeah, in terms of what?

BY MS. BENSKY:

Q When there is a higher -- when there's a higher wind at the top than there is at the bottom of the rotor, does that have any effect on the sound produced?

A Yeah. Yeah. The wind speed is typically always higher at the top than it is at the bottom. It's very rarely perfectly flat, although that does happen. The degree to which the wind speed varies from the top to the bottom or from -- between any two heights is the wind sheer, and the higher the sheer the more slanted that -- the greater the difference between the wind speeds at different heights, the greater the noise generation generally is.

Q Is there a particular season where the wind sheer is greater?

A Yeah, at most sites it's typically in the summertime.

Q The wind sheer is greater in the summertime?

A Yeah.

Q Are there any other weather conditions where the wind sheer would be greater?

A It's typically higher at night than it is during the day.
Q Now, looking at the bottom of page 4, is it your testimony that when the near ground level wind speed is very low, that does not necessarily mean that the hub height wind speed is the same; is that correct?
A Right. You -- it's hard to tell anything from the wind speed measured at a meter above the ground. That generally remains pretty low even when it gets really windy out. That's why we wanted to use the met mast that -- at the highest possible anemometer to get a sense of what's going on up at the elevation that the turbines would see that wind.
Q Just so we're all on the same page, what's an anemometer?
A A device for measuring wind speed.
Q And that's the thing that sits on top of that met tower?
A Yeah.
Q Let's turn to page 5. Looks like I already covered that. Let's go to page 10. Starting on line 6 and just follow along. Is it correct that you state, "A common design theory for new industrial projects of all kinds is to design the project so that its sound level does not exceed the background level by more

than 5 decibels..." Did I read that correctly?
A That's right.
Q Then you state, "...the logic being that such an increase is not particularly noticeable, at least when the character of the noise is rather bland and free of any prominent tones or other identifiable characteristics. Because wind turbine noise often has a variable, churning, sometimes periodic character to it, this approach is somewhat tenuous for wind projects, but nevertheless it is commonly used..."
Is it your testimony that wind turbines create a sound of such a characteristic that the 5 decibel above ambient is too much?
A Yeah. Yeah. The 5 increase would -- makes the most sense when you have a, for example, a very constant source that has a bland character to it like a conventional power plant. That sound 5 above the background is usually -- or usually results in a negligible impact, people don't really notice it. Now, wind turbines don't have a particularly steady sound so that they are more audible than other sources relative to the background. So even a 5 increase is generally pretty noticeable.
Q Thank you. Now, at the bottom of the page, you state

that assuming a background noise of 34 to 36 decibels, your recommendation in an ideal world is that the project noise be limited to between 39 to 41 decibels; is that correct?
A Yeah. That would be a 5 increase over this background level that I'm coming up with.
Q Okay. Now, on the next page, and I'm going to hand out an article that you reference and footnote on page 11.
EXAMINER NEWMARK: That's Hessler 5, right?
MS. NEKOLA: 6.
MS. BRANT: No, Your Honor. It's the same scientific journal, I believe, or a very similar format.
MS. BENSKY: No, it's a different article.
MS. NEKOLA: It's a different article, right.
BY MS. BENSKY:
Q And the first question is looking at the publication that I just gave you, is this indeed the publication that you reference in footnote 3 on page 11 of your direct testimony?
A Yeah, yeah. I'm glad you handed it out to everybody.
Q Now, let's turn to page 96, it's just this third page

in. And you're talking about the World Health Organization target noise level to protect the public. And that is listed at 40 decibels day or night; is that correct?
A I think they specifically call that the nighttime target.
Q Okay. Oh, you're right, nighttime sound levels.
And has that changed since this paper was published?
A Not to my knowledge, no.
Q And turning to page 98, first full paragraph beginning with Considering the EPA guidelines. And there's some discussion of day and night levels; and then you state -- first of all, did you author this paper?
A Yeah. I was a co-author on it.
Q Co-author with George Hessler?
A Yeah.
Q So you state, "A 45 decibel composite noise equivalent level with a 5 decibel evening weighing would be even more ideal at 45, 40 and 35 decibels for day, evening and nighttime levels, respectively."
EXAMINER NEWMARK: Can you point to that for the record.
MS. BENSKY: It is on -- it is a

publication which is footnote 3 of Hessler Direct 11. It's called, "Recommended noise level design goals and limits at residential receptors for wind turbine developments in the United States," and it's on page 98 of that publication.

EXAMINER NEWMARK: And where on page 98?

MS. BENSKY: It's in the middle of the page. There's a first -- full paragraph begins with Considering the EPA.

EXAMINER NEWMARK: Okay. Thanks.

MS. BENSKY: And I'm looking at the last sentence.

EXAMINER NEWMARK: Um-hmm. Okay.

BY MS. BENSKY:

Q So my question is, is it correct that in this paper, you recommend an ideal design target of 45, 40 and 30 decibels respectively during the day, evening and nighttime?

A No. What we're doing in that part of the paper is going through all of the regulations that pertain or could possibly pertain to wind projects and just summarizing each one. At the end of the section, then draw a conclusion on what we recommend based on all these various standards.

Q And your conclusion is that a composite noise

equivalent level would be even more ideal at 45, 40
and 35; is that your conclusion in this paper?
A It's not a conclusion. It's just a comment on this
particular measure.
Q But it's correct that -- I'm reading it correctly,
right, that, "A 45 dBA composite noise equivalent
level with the 5 dBA evening weighing would be even
more ideal at 45, 40 and 35 decibels for day, evening
and nighttime levels, respectively." Am I reading
that correctly?
A Yeah, yeah. The lower the level the better. But we
end up concluding later that as a practical matter 40
is -- seems to make sense.
Q But taking out -- you're not a state regulator,
correct?
A That's right.
Q So -- you're a noise engineer, correct?
A Right.
Q And based on your very extensive expertise as a noise
engineer, your opinion is that it would be ideal to
have a 45, 40 and 35 dBA level for day, evening and
nighttime?
A I'll always say it's more ideal.
Q Let's move on. Tell me, did you make any differen --
what hours are we talking about? What's daytime?

What are daytime hours as you're talking about here?
A It's usually 7 in the morning to 10:00 (sic) at night.
Q And what's evening?
A Then that goes to -- I'd say it's 7 to 10 p.m. or something.
Q So daytime would be 7 to 7, evening would be 7 to 10?
A Yeah.
Q And then nighttime would be 10 to 7 in the morning?
A Right.
Q Now, please turn to the next page, page 99, first full paragraph on that page says -- starts The States of New York, Massachusetts and California. Are you there?
A Okay. Yeah.
Q The first -- or the second sentence reads, "An ambient-based method is based on the perception of the new sound in a specific residential community. A perception-based method is clearly a better approach than a single absolute limit, and, in fact, many years of experience have shown this approach is working well in all these three states."
Did I read that correctly?
A Yes, that's right.
Q And you're talking about three states that have an

ambient-based guideline; is that correct?
A Right.
Q And the words that I just read, are those your recommendations in this article? You're not quoting anyone else. I want to know if that is your work right there?
A Yeah, yeah. We're talking about how they do things in New York, Massachusetts and California. And how that is, how that works, is that you measure the background, you add some factor to it, in Massachusetts it's 10, and essentially what you come up with is an absolute limit that is derived from the background. But the final answer is an absolute number.
Q But your opinion, is it correct that your opinion here is a perception-based method, which is this ambient relative standard, is clearly a better approach than a single absolute limit; is that your opinion?
A It's what's -- that's what it's saying here. But the end result of the paper is that it's better to go with absolute numbers.
Q So you contradict yourself in this publication?
A I suppose so. I think my father wrote that part, but -- in fact, I'm sure he did.

Q I'm going to tell him you said that.
A I'm always -- I'm used to that.
Q Now, on page 11 of your testimony, you're still discussing this article and you're discussing the results of it looks like a survey that you conducted? Is that correct?
A Okay. We're back in the direct testimony again?
Q Yeah. The direct testimony on line 12 --
A Yeah, okay.
Q -- you're referring to a study, and the study that you're referring to is still in this article?
A Yeah. It's just later on in the same article, yeah.
Q And you state at least 95 percent of residents were apparently satisfied with or unfazed by the sound emissions of the new wind project, even when sound levels were around or above 45 decibels. Was that your conclusion based on this study?
A Yes, it was. And what that study is all about is we're --
Q I'm sorry. Let me ask you the questions, keep this moving along.
A Okay. Go ahead.
Q Please look at Table 4 of your paper, it's on page 101, and it looks like those are the results of this study that you're talking about in your direct

testimony?
A Yes, that's right.
Q So looking at site A, there are approximately 107 households that are within this kind of target area near wind turbines; is that correct?
A Um-hmm. Yes.
Q And you found that when noise decibel levels were below 40, there were no complaints --
A That's correct.
Q -- correct? No sound complaints or no complaints at all?
A No complaints related to noise.
Q Okay. So the survey didn't ask about did people have problems with nausea or sleeplessness, it just said are you bothered by the sound?
A Well, there was no official survey. These houses that are in the table or are counted in the table, what those are are all of the houses where the project operations ever received a call with any kind of concern about the noise from the project. Some were definite complaints, others were just kind of mild concern. But they're all included here. When we do these surveys, we'll ask, you know, who has ever called about a problem; and then we will put instrumentation at that house and include them in the

compliance study. So we know how many complain and we know what the level was there.
Q Okay. So you had 107 homes where there were noise complaints --
A No.
Q -- correct?
A No, that's incorrect. The 107 is the total number of households that are within 2,000 feet of a turbine at that project.
Q I'm sorry, I didn't hear you. My colleague was talking to me.
A Yeah, the -- all the numbers in that column, the 107 is how many houses there were within 2,000 feet of a turbine in that project. In other words, it's the total population essentially.
Q Okay. And this -- to obtain the complaint data, you went to the company to get their records, correct?
A Well, it was just a matter of talking with the operations people. No records per se.
Q So you didn't receive anything saying here's our stack of written complaints?
A We asked who has ever called with any kind of concern about noise. And they -- then they told us. There may be more. That's possible.
Q So it's -- you called up Bob who runs this project

and said who's complained and he said, well, I think this guy, this guy and this guy; that's what it was?
A Well, it's whoever called up at any time. And I think this is -- it seemed to be pretty accurate.
Q But you didn't go to every -- you didn't send out a survey to 107 residences --
A No, no, not at all. This -- the purpose of these surveys was never to -- was not primarily to evaluate the impact. It was to carry out a compliance survey to see whether the project was meeting its requirements. And we just were able to draw out of that this information.
Q And that obviously is a very important distinction.
A Yeah. Yeah. None of these surveys were undertaken with the primary purpose of counting how many people complained.
EXAMINER NEWMARK: Let me just note, on your direct, you label this study, not a survey. So I don't know if that makes a difference as to what we're really getting at. You weren't intending to do a survey here, you were doing a study?
THE WITNESS: Well, all of the examples in this table, they're all field surveys of actual projects.
EXAMINER NEWMARK: Okay. So it did make a

difference. All right.
BY MS. BENSKY:
Q So I just want to make a very important clarification. You did not go -- for site A, you did not go to 107 residences, personally ask somebody do you have a problem with the noise, yes or no, and then get a result, correct?
A Yeah, that's correct.
Q So if somebody didn't complain to the company -- even if they did complain to the company, they might not be included in this?
A Oh, yeah. There could be more. We're not claiming that it is the definitive number, but this was what we were able to find out.
Q Right. So you're not saying that 95 percent of 107 households are -- don't have any noise complaints related to this project? That's not what this is saying?
A Well, what it's saying is that we know how many definitely did complain and there may be some more, but in general it shows that the vast majority did not complain.
Q All right. Now, you were here and -- you had the great pleasure of sitting here all day yesterday, correct?

A Yes, I did.
Q And you heard some people come up and testify that they had various complaints about noise, correct?
A Um-hmm. Yes.
Q Did you hear anybody say that they didn't go off and complain to the company?
A It seemed like when asked, most of them said they did call the company and made various progress.
Q Did you -- do you remember hearing anybody say they did not complain to the company?
A I don't specifically remember any examples.
Q Okay. That's fine. Going back to the actual text of your testimony, at line 11, the text reads, "In fact, an interesting finding of the study was that at least 95 percent of residents were apparently satisfied with or unfazed by the sound emissions of the new wind project, even though sound levels around and above 45 dBA were observed..." That's what it says, correct?
A Yes, that's right.
Q But that's really not a conclusion that we can draw because you're assuming that at no -- that if a person did not complain to the company, that they are satisfied or unfazed by the noise, correct?
A That's why I used the word "apparently."

Q But that's an assumption that you're making in that statement?
A Yes. But this is -- as you can see from the table, this is repeatable over five sites in this study and several more after it.
Q I'm not concerned about the decibels right now. I'm just talking about the data, the number of complaints. So one big assumption of this study is that if a person was upset about the noise to any degree, that they complained to the company. Would you agree that that's an assumption that you're making in that statement?
A Yes.
Q Now, the second assumption that we're making is that the company gave you all of the complaints that they received?
A Yes.
Q And we don't know -- those are big assumptions. We just don't know if -- we don't know the answers, you never went back and double-checked that?
A They're assumptions, but I think they're fairly accurate.
Q But you really don't have a basis for thinking that they're accurate?
A I can't imagine that -- you know, in this first site

there was three complaints. I can't imagine there was 50 complaints there. I don't think that's the case.
Q But --
A And part of the reason for believing that is that we measure -- when we do these surveys, we measure in this example these three houses; but then at -- many, many, many others throughout the project area all have the houses that are closest to turbines. And not only do we measure, but I personally have talked to all these people, the ones that have complained and then the other ones elsewhere. And it's -- it's surprising to me, it was surprising to me how many people just don't -- it's not the noise, even though the levels are fairly high.
Q But that information that you just gave us is not reflected in this survey? You said you went out and you talked to people.
A Yeah.
Q But we don't know, based on this survey here, how many people you talked to, what they said, there's no written survey; is that correct?
A No. This is what I've gathered in the course of doing this work.
Q Okay. Just a couple follow-up questions, one having

to do with this. So let's turn to page 97. And
there's two columns on the right-hand column, first
full paragraph, that begins with, "In addition, the
report clearly indicates."
A Yeah. Okay. I'm there.
Q Okay. About -- looking at the very last sentence of
that paragraph beginning with Schomer. Do you see
that?
A Yes, um-hmm.
Q And you state, "Schomer suggests that an adjustment
of 10 decibels should be subtracted for quiet rural
environments and perhaps another 5 decibels if the
project is newly introduced into such a long-standing
quiet setting." Is that what this says?
A Um-hmm.
Q And getting into this issue of day and night levels.
Is there anywhere in this paper that you criticize
Mr. Schomer's suggestion?
A No. This is just saying that we're taking onboard
what he has to say about it and figured it into this
overall analysis.
Q But you agree that you're not critical of that
particular suggestion in this paper?
A No. That's why it's in there.
Q Now, you spent the day here yesterday and you heard

Mr. Hankard say that if you measure at very close to a wall, you're going to get a result that's three decibels higher and that's not a good thing to do to measure sound in a wall. Do you agree with that?
A Yes, yes. You don't want to put the microphone right on a vertical surface, no.
Q My question is, what's the decibel level on the other side of the wall? Does sound -- can sound waves go through the wall?
A Yes. To some extent. Depends on the wall construction and so on, frequency content of the noise.
Q I hear some laughing behind me from Mr. Schomer, so I don't know if that was a question showing a lot of naivety.
But what I'm getting at is when there's a 45-decibel level outside a home, what's going on inside the home? Does the sound travel through the wall such that the walls can create some sort of reverberation and make it even louder indoors than it is outdoors?
A No. What typically happens is the level inside is substantially lower than what you're measuring outside.
Q With any frequency of sound?

A Yeah, as a general rule.
Q Are there any frequencies that travel better through walls than other frequencies?
A Sure, sure. The lower frequencies pass through a given construction much more easily than high frequencies.
Q And when you say low frequency, what is the kind of baseline low frequency that's going to make it through the wall?
A Any frequency down to 1 hertz.
Q But up to what hertz level?
A Well, let's say from 20 hertz down.
Q Okay. I'm almost done. Can you please turn to your rebuttal testimony, and pull out Exhibit 3 from that testimony, please.

Now, Exhibit 3 looks like it's a comparison between the model predictions and the actual noise levels measured; is that correct?
A Is it this figure, you mean?
Q Yeah.
A Okay. Yeah. What that's showing is the black figures in the middle of the chart are the sound level at 1,000 feet from an isolated wind turbine in three different directions measured over 14 days.
Q So there are actually three black lines in here?

A Yeah. They all kind of are similar.
Q And the -- I guess it would be the Y axis at the bottom, that represents a total of 14 days?
A That's right.
Q So my first question is we see some peaks, correct?
A Yes.
Q What length of time is one of those peaks? Is it an hour, a minute, a second?
A This data was measured in ten-minute increments, and there's a couple of -- well, there is a very prominent spike right in the middle of the survey, that was probably 20 to 30 minutes in duration.
Q That spike?
A Yeah.
Q Is every spike -- is every little point a ten-minute average or 30-minute average?
A Well, the sound level data appears as a continuous line; but it's actually made up of many, many thousands of ten-minute samples all strung together.
Q What I'm trying to figure out is for how long was it that loud when we see a peak? Does this graph give us that information?
A Well, from having looked at graphs like this a lot, I can tell there's -- this peak in the middle is, like I said, probably 20 to 30 minutes long.

Q And where was this measurement taken? What state?
A This is at a site in Minnesota that was in an extremely rural area, not near any roads or towns or anything. And it was just in a wide open field.
Q And near what wind farm?
A Prairie Star, I believe it's called.
Q And do you know the make and model of the turbine?
A I think it was a Vestas V90.
Q And do you know what the power output was?
A The electrical power output? It was 2 megawatt, I think.
Q And do you know how tall the turbine was?
A I think it was on a typical 80 meter mast. This is just taken as an example just to compare modeling versus what you measure.
Q So with an 80 meter mast it would be probably around 400 -- 360, 370 feet?
A Right, right.
Q And this 14-day period was in August?
A That's correct.
Q Is there a certain month of the year where the winds are stronger?
A Well, it varies at every site. I don't know what the wind rose was at this particular site, I don't recall.

Q As a general matter in Minnesota, is it windier in the winter or in the summer?
A I think it's the wintertime there.
Q And you agree that in August there are generally more leaves on the trees, more grass on the ground, more birds?
A Yes.
Q Now, looking at this, we do see several points where there are exceedances over 40 decibels; is that correct?
A Yes. Remember, this is only a thousand feet away.
Q Right. But there are exceedances over 40 decibels?
A That's right.
Q Now, this bold red line looks like it is -- the first bold line at the top is using that 0.0 coefficient --
A Yes, that's right. Um-hmm.
Q -- modeling? And the second line down is using the .5 coefficient?
A Right.
Q And then there's a very, very faint red line down below and that's the 1.0 coefficient?
A Right.
Q Now, if the standard was you may not exceed 40 decibels at night, looking at this graph, would you think that there are exceedances?

A Yeah. It does go over 40 for this particular measurement setup, these distances and so on.
Q On average it doesn't, but it does go up there, it goes above it?
A Right. Well, that's typical.
Q So it is typ -- are you saying that it's typical that there are -- that the actual sound does exceed the modeling at certain times? Would that be a correct assumption?
A Oh, most definitely, yes.
MS. BENSKY: That's all I have.
MR. REYNOLDS: Could we take a break?
EXAMINER NEWMARK: It will be short if we do it now. It will be longer if we wait 'til after he's done.
MR. REYNOLDS: I'd rather take a short break. It's going to be at least a half hour.
EXAMINER NEWMARK: All right. Let's take 20 minutes.
(Recess taken from 12:15 to 12:43 p.m.)
(Change of reporters.)
EXAMINER NEWMARK: Okay. There's a motion to move Mr. Hessler's study that he footnoted in his testimony, and that would be --
MS. BENSKY: Footnote 3, page 11 of

direct.

EXAMINER NEWMARK: Okay. And his -- Exhibit 5 it would be, we would mark it as 5.

Any objections to that?

MS. BRANT: I'm sorry, Your Honor, would it be 5 or 6? We have a pending with 4 that was denied, but potentially to be admitted later.

MS. NEKOLA: And then we have 5.

MS. BRANT: Exhibit 5, which is his pseudo notice.

MS. BENSKY: So 6. 4 was marked.

EXAMINER NEWMARK: So 5 is still pending.

Let's go off the record.

(Discussion off the record.)

EXAMINER NEWMARK: So Hessler 6, any objections? No. Okay. It's in the record.

(Hessler Exhibit No. 6 marked and received.)

EXAMINER NEWMARK: All right. I think, Mr. Hessler, remember you're under oath, and you're available for cross.

CROSS-EXAMINATION

BY MR. REYNOLDS:

Q Mr. Hessler, I have a couple of questions for you.
You testified that you were struck by the testimony of the Shirley Wind people.

A Yes. That's correct.
Q Why is that?
A Because of the -- because it's completely credible, and I don't doubt it at all.
Q And do you doubt -- is it significant to you that the residents testified that they had no problems before, and when they left the site, their symptoms disappeared?
A Yeah. That's very simple. It appears to be due to the project there.
Q And what -- was that one of the reasons you wanted to do some testing of Glacier Hills? Sorry, at Shirley.
A Yes. And I think what's needed is to get to the bottom of why that is.
Q And what -- is it fair to say that the symptoms that they complained of, such as headache, nausea, ear problems, are consistent with exposure to low frequency sound?
A Yeah, I think that's true. Of course it depends on the magnitude of the sound, whether you're affected or not, but because specifically one fellow said he lived one mile away, that means that it's the only possible sound that could travel that far would be low frequency noise.
Q And so what -- what has -- what's been the result of

your effort to test up there? What would you have to do and what request did you make, and what were the results?
A Well, we came up with a preliminary test plan where we had identified one or two units that were kind of isolated so we could kind of more or less scientifically measure them, and I think we submitted that to the project up there so they would know they were abound. But at first we didn't hear anything, and I think they finally said, well, they don't want to -- we're welcome to participate, but they don't want to do it.
Q And what were you planning to actually test for?
A Well, low frequency specifically. And what we had in mind was to test using a procedure that's outlined in IEC standard 61400, which is a procedure for measuring the sound power of wind turbines. It's what all manufacturers use. But the point is that that methodology uses a reflecting board that you put on the ground and then you lay the microphone right on the board, and the reason for that is that the wind speed is theoretically zero at the surface. So you're largely eliminating self-contamination from pseudo-noise that we talked about a bit earlier because it's very, very difficult to measure low

frequency noise because it's covered up by cell noise of wind. It's a real technical challenge.
Q And let me ask you this. You've noted that there are significant differences. There's -- there's a significant difference between, say, Mr. Bump's testimony and the three individuals who abandoned their homes at Shirley?
A Right.
Q Now, there are different machines at the farms, right?
A That's right.
Q What's at Glacier Hills?
A Those are Vestas V90.
Q And what's the output?
A I think they're 2 megawatt.
Q All right. And what are the ones at Shirley?
A They're the Nordex N100, and that's two and a half -- I don't remember.
Q And the -- that's one of the machines that's proposed at this Highland project; is that right?
A One of the three that are being considered. It's prominent in these analyses I think just because it has a slightly higher sound power level, but that's the only reason it's really being looked at carefully.

Q All right. Are you aware of recent low frequency noise from large turbine literature that describes findings of higher low frequency noise from larger turbines, those in the 2.3 to 3.6 megawatt category?
A Yeah. I have heard that, but my sense is that -- well, what strikes me is how remarkably similar the sound power level is of all the turbines that are in current use all the way from one-and-a-half-megawatt units up to 3-megawatt units. They're all remarkably similar in my view.
Q Well, are you familiar with a 2010 low frequency noise from large turbines work by Henrik Moller and Christian Pedersen on the subject?
A Yeah. Yeah, I've read that, but some time ago. And I think they do some sort of analysis, and it appears that it maybe is a little bit louder in the lower frequencies for larger turbines, but that may be true slightly.
Q So you would point to the potential cause of the Shirley complaints to the machine itself?
A Yeah. I think -- I think this sort of problem is related to the specific turbine. Now, before yesterday when I heard that testimony, my view is that those kinds of problems were principally associated with the Vestas V82 in its early form that

had stall-regulated blades instead of pitch-regulated blades. But this is the first I've heard of a problem with a N100 site. I've worked with project that put in N90s and N100s and there aren't any problems at that site, so it's puzzling.
Q Let me ask you this. You have -- you heard testimony about your recommended noise level design goals, right? That's a paper that you and your dad and -- you and your dad put together?
A Yeah.
Q All right. And would you -- your findings indicate that a 40-decibel level in the A range, that's the audible range, is ideal?
A Yeah. And the reason for that is that we found that there are few, if any, complaints at houses where the outside level was 40 or less.
Q And so in an ideal world, if it would be possible to have a project where the maximum level is 40 --
A Uh-huh.
Q -- is it fair to say that we probably wouldn't see the citizens come in here and talk about the need to abandon their homes?
A I think what you would see is a lack of complaints about audible noise and amplitude modulation, things like that, but that 40 dBA level really is not

connected in any way to this infrasonic situation.
Q The dBA level would be connected with sleep disturbance?
A Yeah. It's the audible noise, the swishing sound that you can hear, you know, as Mr. Bump said yesterday.
Q Well, let me ask you this. There have been some references to the sound of these turbines being at 40 dBA being like the sound of a refrigerator. Do you agree with that?
A No. There's no -- nothing that you can compare it to. It's not a constant sound. It's not particularly loud, but it does have a time variance to it that kind of calls attention to itself, and it depends on the specific wind conditions and how much turbulence there is and time of day. All kinds of factors go into it so, yeah, it's more noticeable than other things.
Q So that that you're referring to is the swishing sound or the noise amplitude?
A Yeah. And that -- that does occur, but that is not always the principal characteristic. In fact, I spent a lot of time at wind projects, and it's more or less a steady kind of -- I use the word churning sound. It's -- but there's not -- you don't always

or often see pronounced swishing or amplitude modulation.

Q Would you -- is it fair to say then that the sound from turbines combines three separate variables or parameters: one is audible sound in the dBA range; two is low frequency or infrasound in the very low to nonaudible range; and three would be the amplitude modulation from the -- from the pulsating action of the turbine blades?

A Yeah. I think the first and the third one are kind of related, but --

Q Well, is it fair to say that there's a difference in the ability of folks to sleep, for instance, if the sound is like white noise, just steady, as opposed to pulsating noise?

MR. SCRENOCK: I'm going to object, Your Honor. I'm not sure that Mr. Hessler's been qualified as an expert on sleep disorders.

EXAMINER NEWMARK: He has testified on people's reactions to sound, I think. Isn't that what he's been saying?

MS. NEKOLA: No, I don't think that's accurate.

EXAMINER NEWMARK: No? People complain, certain distances and --

MS. NEKOLA: Well, that's correct, but not specific health or sleep reactions, just complaints.

MR. REYNOLDS: Well, he's done investigation on complaints. He's analyzed ideal -- I mean, it's a pretty simple question. I mean, I'm not calling him to ask him an opinion to a reasonable certainty, but just a correlation between this aspect of wind turbine noise and sleep disturbance.

EXAMINER NEWMARK: Yeah.

MR. SCRENOCK: I understood his question to be asking the witness whether a particular parameter as he described it, wind turbine noise, what would cause someone to have difficulty sleeping, and I don't believe that is within the realm of what Mr. Hessler's been testifying on.

EXAMINER NEWMARK: Well, I'm going to let him answer. He can say he doesn't know.

THE WITNESS: You know what I would say to that is, I think it's the highly variable nature of wind turbine noise that appears to lead to sleep disturbance because you can be standing next to a turbine and it makes -- it will be making a certain sound, and then the next minute it will suddenly get louder and then get quieter again. And I think

those changes, I think, may be associated with
people waking up and having problems sleeping.
BY MR. REYNOLDS:
Q How about the whistling sound that Mr. Bump talked about?
A You know, that -- well, I think he said it was a foghorn sound. That's the way I would describe it. That's with a hydraulic pump that's in the nacelle of every one of those turbines, and it is a constant mechanical noise. He mentioned that it varied, but what he's really talking about is the yaw mechanism to move the nacelle back and forth, that's variable, that comes and goes, but the hydraulic noise is constant. That's just a feature of that particular model turbine.
Q All right. You have made a recommendation -- well, let me ask you this first. With respect to the modeling, you took a look at the Applicant's model, which predicted using the N100 predicted 45 residents would be potentially over 45 dBA, right? You saw that info?
A Yeah. That was with the -- I think the initial application where they were using a ground absorption coefficient of zero.
Q That's right. And when you used a ground absorption

coefficient of .5, you found that it would be 45 -- four houses above 45 dBA?
A Yes. That's correct.
Q And would you agree with me that if you're going to err on the side of public safety, that a more conservative model is probably a better way to plan a prospective wind farm?
A Well, when we first started analyzing wind projects 10 years ago or more, and we didn't know if the model was accurate or not, they would put on a safety factor and so on. Now since that time, we've had the opportunity to do a lot of testing and compared what's actually measured to what's predicted, and we found the best agreement, the most realistic agreement, is when you use .5 ground absorption. That gives the closest correlation to what's actually found out there.
Q All right. But you agree with me that models -- your data shows that the models are generally consistent but not perfectly on track with reality?
A Yeah. What the model gives you is the long-term average level from the project at a given point, and what we always made clear in our reports is that that is the average, and the actual level is going to vary commonly by plus or minus 5 dBA, sometimes by more.

It will get noise spikes like we were looking at a few minutes ago in that example. That's just the nature of a wind turbine.
Q So the 45 dBA which you're advocating for is not a maximum, it's an average?
A Yeah. That's a given. I'm glad you brought that up. Yeah. In this paper where we recommend that, we say what should be limited to 45 is the main long-term average level at each house. There's no practical way to maintain a level below a threshold like 45 or even 50 all of the time. That never happens. There's always spikes due to weather conditions and things. They're short-lived, but they're almost unavoidable.
Q All right. So then for a 45 dBA average, then you might have spikes up to, say, 45, but probably not over 50?
A I got mixed up in that. Can you --
Q All right. If you had the ideal target of 40 dBA, if that were -- if that were basically the target here measured by the model, and that would mean that there would be levels at the farm of up to 45 but probably not beyond 50 dBA?
A Yes. Yeah, it would go -- if you say designed to 40 at a particular point, the actual level would vary

above and below that up to 45, within the 35-45 range, and there would be probably rare spikes to 50, even more than 50.
Q So with respect to your ideal level, that's based upon your evaluation of various venues and examining available complaints from residents?
A Right, right. And those levels -- well, you know, those -- that phenomenon where the level varies happens at every site. So what we did was we measured the main long-term level at all of these houses, and that's what's tabulated there is how many people were complaining between 40 and 44. That's the main long-term level between that range. You know, so at any given house they might be exposed to, let's say, a level 43, but the actual level might have gone up to 50 at times and down to 35. That happens everywhere. So I'm trying to keep everything on a level playing field.
Q All right. Now, assuming that the project could be redesigned for a 40 dBA, making that assumption, that would be your preferred dBA limit, would it not?
A Well, it would be better for everyone if that were the actual performance of the project, but typically it's not practical or feasible to achieve that level at most projects. I would say 90 percent.

Q So are we talking about economic development versus the public interest to be free of noise complaints?
A I think it's just fundamental economics of the project. To make 40 at a given site, you may -- oftentimes you have to remove so many turbines that the project just becomes not viable.
Q All right. But assuming for the sake of this question that this project could be redesigned for 40 dBA.
A Uh-huh.
Q You would recommend that based upon your work, right?
A That would be a good thing if that were possible, yes.
Q And there are other jurisdictions such as New York that have 38 to 40 dBA; isn't that right? I think these are noticed in your paper. California, New York. Page 98.
A Yeah. Now there that's what we talked about a little while earlier. Those are relative limits that are, like, converted to an absolute number. In New York the methodology for years has been to measure the background and then you could go over that by 5. So I think the 38 is just based on a typical background level of 33, plus 5. That's where that number comes from.

Q All right. I think you testified to this earlier that there is a significant impact with respect to noise if the ambient level is very low and with wind turbines coming in with a higher noise threshold; is that right?
A Yeah. If you had a -- in the specific example there, if the project level were higher than 45 and the background level were 16 below that, that means that the project would be dominant, the only thing you could hear pretty much. That's that situation. But the absolute limits that we're putting forward of 40-45 are based on the -- the typical setting that all of these projects normally are in. In other words, rural farm country. Those levels appear to be to our mind satisfactory given that sort of an environment.
Q This is -- is it fair to say that the Town of Forest is unique because of its very quiet background levels?
A No, I wouldn't agree with that at all. That project site is very similar to dozens and dozens of other ones that I could think of.
Q Well, but we're talking about -- what areas where people live in are quieter than these at the 20 dBA level for ambient noise?

A Well, those are the kind of levels we find in every one of these sites that's in rural farm country. When the wind is calm, the level is always 20, 25 dBA, and that happens everywhere. It's really the wind. It's really the background level when the wind is blowing that has some relevance.
Q So with respect to -- back to the Shirley Wind Project. Given the fact that the applicant here is recommending the potential use of the same machines, of the same kind of configurations at the Highland Project as the Shirley Project, would you have concerns about potential impacts in the Town of Forest that have been reported in Shirley?
A Yeah. As I think I mentioned earlier, I think the issues there are related specifically to the -- to that model turbine, and I think until that's better understood, I don't see any reason why it wouldn't repeat itself if that same turbine were used somewhere else.
Q Do you -- now, with respect to the difficulty of you being able to test at Glenmore -- are you having the same problem at Glacier Hills?
A Yeah. We asked for permission, and same sort of no response thing. Went on for a long time, and then I think, oh, what was it, the other day they officially

said, no, we don't want to do that.
Q All right. And do you think that it's -- that the Applicants would be -- that it's in the nature of good science to prevent scientists like you from gathering data?
A Yeah. You know, I think what needs doing is -- is some field testing to understand this thing.
Q And we agree that it's not completely understood?
A That's correct. Yeah.
Q And do you agree with the environmental assessment here that a certain percentage of -- of Town of Forest residents will suffer a decrease in quality of their life if this project is approved?
MR. SCRENOCK: I object to that, Your Honor. I'm not sure that Mr. Hessler's been qualified as a quality of life expert.
EXAMINER NEWMARK: Yeah. I think it's too ambiguous of a question.
BY MR. REYNOLDS:
Q All right. Have you read the environmental assessment?
A Yes. Uh-huh.
Q All right. And you -- do you remember a part in there where the environmental assessment assumes that if this project goes forward, there will be a small

percentage of Town of Forest residents who will be adversely affected as designed?
A Yeah. I would say that's a very typical conclusion at least. I mean, there's hardly any site where you can sit back and comfortably say everybody's going to be fine. I don't -- there's hardly any situation that falls into that. I can only think of one project, and it was on an island and nobody lived there, but -- but for most projects, the norm is to conclude there will probably be some small impact.
Q And so especially if the same turbines are used at Shirley, you would expect the same result in the Town of Forest?
A Well, I don't have any reason to believe that it wouldn't -- that whatever is going on there would not repeat itself.
MR. REYNOLDS: That's all I have.
EXAMINER NEWMARK: Okay. Other cross?
MR. SCRENOCK: I do, Your Honor.
EXAMINER NEWMARK: Oh, go ahead.
MR. SCRENOCK: Just a few questions.

CROSS-EXAMINATION

BY MR. SCRENOCK:
Q Mr. Hessler, I note that in your testimony, I don't need to point to any specific points, but you refer

throughout, or at least at different points, about the incidence of complaints. And in response to one of Ms. Bensky's questions earlier, you used the phrase pretty significant adverse impact. By that were you referring to the same thing in terms of incidence of complaints?
A Yeah. I'm talking about complaints and that study we were talking about before.
Q Thank you. And you had a lengthy discussion about the wind speed monitor and the level from ground where those measurements were taken. You were talking about normalizing the wind speeds to 10 meters. Was the purpose of that to essentially equate a -- excuse me -- that I'm assuming, and I guess I want to know if my assumption is correct, that the way that the model works or the reason that you normalize the time of year is that there's assumed sort of graduation of wind speed throughout the elevations and that a wind speed at 50 meters normalized to 10 meters will equate to a specific wind speed up at the hub height. Is that the purpose of the normalization?
A Yes. The -- the primary reason that I normalized it to 10 meters is because that's what we always do in these assessments. So I wanted to look at it in the

way that we normally look at field data.
Q Okay.
A I wanted to keep it consistent so I can tell what it meant relative to other sites and other situations.
Q Okay. Now, you had talked with Mr. Reynolds a little bit about the 0.0 ground absorption coefficient versus the 0.5, and I think you indicated that you used that process frequently; is that right, that type of modeling with those coefficients?
A Well, what we always do is assume .5 ground because, as I mentioned, we get the best agreement between modeled and measured results in a particular point.
Q So you don't do that for the purpose of skewing the results?
A Oh, no. No. What I'm after is, I want to know what it's really going to be at a given house.
Q And you had indicated that when you ran your model with the 0.5 ground absorption coefficient for the Highland Project, that you found that there were four houses that you identified that would be within -- above the 45 decibels. Do you know whether those houses represent participating or nonparticipating landowners?
A I didn't at the time. I have heard recently that they are all participants.

Q Okay.
A Not sure about that, though.
Q And with -- Mr. Reynolds asked you about the use of the similar model turbines from the Shirley Project, I believe that's the N100 here, and you indicated that you don't have any reason to think that the problems -- the experiences of folks wouldn't reoccur. Do you have any reason to believe that they would?
A Well, I would say we don't fully understand why there's problems at Shirley, but my belief is that it's associated with a specific turbine model and possibly the blade regulation, whether it's pitch or stall regulated. I think I would be leery about using that turbine again before more is known about it.
Q If one of the other two turbine models that were discussed being used for this project were being used, what would be your perception?
A I would be more comfortable with that because I think the other ones are the Siemens. I don't know of any other model, Siemens and one other one, but I don't -- I've never noticed any problems with those.
Q So based on whatever is going on at Shirley that we're not sure what it is, you wouldn't have reason

to expect those issues to reoccur with either of the other two models?
A That's right.
MR. SCRENOCK: Thank you. I have nothing further.
EXAMINER NEWMARK: Okay. Other questions? I believe staff goes first.

CROSS-EXAMINATION

BY MR. LORENCE:
Q Mr. Hessler, are you familiar with the PSC noise measurement protocol?
A Yes.
Q Is any part of that protocol oriented towards infrasound?
A Well, I believe the intent of it was to try to quantify low frequency sounds by involving the C-weighted sound level and pre-construction measurements and post-construction measurements. That sounds good on paper, but the problem with C-weighted levels is that they're extremely sensitive to wind induced pseudo-noise that we talked about earlier. That wind blowing over the microphone affects only the lower -- the low end of the frequency spectrum, and the C-weighted level is directly dependent on what's going on in the low end

of the frequency spectrum. So any little breeze blowing over the microphone gives you a very high obstensible C-weighted sound level.

So to answer your question, the protocol has -- calls for C-weighted measurements, but -- and we've taken that data, and what we found is that the levels before the project and after the project are identical because they're purely a function of how fast the wind was blowing.

Q So the pre-construction measurements of the protocol are you saying are not capable of measuring infrasound?

A Yeah. That's right. That you get a result from taking those measurements, but it has no actual meaning. It's a false signal that's almost purely a function of the wind speed of the microphone.

MR. LORENCE: No further questions. Thank you.

EXAMINER NEWMARK: Go ahead.

MS. BENSKY: I have a follow-up.

RECROSS-EXAMINATION

BY MS. BENSKY:

Q How do you solve that problem? How should the protocol be different to account for that?

EXAMINER NEWMARK: I think he answered

that. You lay the microphone down on the ground with a board, is that --

THE WITNESS: Can I answer?

EXAMINER NEWMARK: Well, did you answer that already?

THE WITNESS: Not exactly.

EXAMINER NEWMARK: Okay.

THE WITNESS: No. You could use that technique that I referred to, but the problem with it is a practical nature. These surveys last -- or need to last for a period of weeks to get -- catch all kinds of wind speeds and times of day, and you can't leave a microphone sitting on the ground. You know, if it rains or snows, it destroys the equipment. So those kinds of measurements have to be attended. So to -- I suppose if you wanted to document the pre-existing conditions, you would take much shorter term measurements using -- perhaps using that technique and taking short band sample, but it's very -- it's a very challenging thing to measure.

BY MS. BENSKY:

Q And are you aware of any -- switching gears a little bit. Are you aware of any study that correlates wind turbine make and model with a particular number of

complaints? Is there anything that the Commission can look at that would be helpful in deciding the turbine model that would likely produce the least amount of complaints?
A No. Most turbine models have no known noise issues associated with them. The only ones -- there's only one or two that I'm aware of that have -- that are kind of special cases and have issues. I mentioned the Vestas V82, or at least in the format what used to be built five years ago. That -- I think that one's a problem. But -- but of the ones being considered here, only the Nordex appears to have possibly something going on with it.
Q So is the answer that you're not aware that that has been studied?
A No, it hasn't been specifically studied.
Q And one last question. To maintain absolute limit of 45 dBA that is never exceeded, what would -- what should the project be designed at?
A Yeah, that's a good question. It has to be substantially lower than that to allow for temporary noise spikes, up to 10 dBA below. Now, that issue has been around for a while of these temporary exceedances. What I suggested, and I wrote some siting guidelines for Minnesota Public Utilities

Commission, and what I say in there is that, well, if the measured level is in compliance 95 percent of the time or more, then I would consider it in compliance. So there has to be some allowance for these temporary excursions because they're essentially unavoidable.
Q But that -- but that 10 decibel drop is consistent with your recommendation in your paper that 35 dBA at night should be the limit ideally, correct?
A Well, that wasn't the conclusion of the paper, but --
Q Are those two consistent?
A Yeah.
MS. BENSKY: Thank you.
MR. REYNOLDS: Have one follow-up question.
EXAMINER NEWMARK: One. All right.

RECROSS-EXAMINATION

BY MR. REYNOLDS:
Q I wanted to show you, and I just want to identify this. I marked it as Hessler A. I don't have copies, but I just want to know if this is the paper that shows that -- that you referred to that shows that larger turbines above .2 -- .23 have higher low frequency levels than less than 2? Is that the paper you were referring to?
A Yes, I believe that's what this paper says. As I

said, I haven't read it for years.

MR. REYNOLDS: Okay. And -- yeah, it's Hessler Exhibit No. 8. I just wrote on it.

MS. NEKOLA: Your Honor, we object. We haven't seen this.

MR. REYNOLDS: Yeah, I understand. I am just marking it so that he can identify it.

EXAMINER NEWMARK: What's his next exhibit?

MS. NEKOLA: It would be 7.

MR. REYNOLDS: Okay.

EXAMINER NEWMARK: It would be 7 anyway. Okay. Are you trying to move it in now at this point?

MR. REYNOLDS: I don't have to move it in now. I just wanted him to identify it and then I have one follow-up question.

EXAMINER NEWMARK: Well, based on this exhibit?

MR. REYNOLDS: Well, okay. Let me do a backup question.

BY MR. REYNOLDS:

Q What is the title of the exhibit that you're looking at?

A Low frequency noise from large wind turbines.

Q And is the premise of that article that large wind turbines above point -- 2.3 megawatts tend to have more low frequency sound than turbines less than 2 megawatts?

EXAMINER NEWMARK: He's already answered that. No. He's already answered.

MR. REYNOLDS: Okay.

BY MR. REYNOLDS:

Q Do you know, the other turbines that are proposed here are above 2.3 megawatts, are they not?

A There's been so much focus on the N100 that I don't even remember what the other two models were.

Q Well, if -- if I told you that they were above 2.3 megawatts, then they would -- those turbines would fall within the definition of larger turbines as outlined in that paper, right?

A Yeah, I suppose so, but I would point to a figure in that paper --

EXAMINER NEWMARK: Okay. Let's hold on, though. We're really running far afield if we're going to be digging into this exhibit since there's an objection already based on entering it in the record. Any response to that objection? You want to move it?

MR. REYNOLDS: Well, yeah. I think it's

relevant because the testimony about low frequency noise, I think this witness has talked about that it's not a big deal, and here we may have an answer with respect to why there's a difference between the wind turbines at Shirley, which are 2.5, and the lack of low frequency symptoms at Glacier Hills, which are less than 2, and the fact that this witness thinks there are low frequency problems at Shirley. So that the question is, well, we could use the other turbine, but there's still within the gamut of these larger turbines. So I think it's relevant to that, and I -- I'm certainly willing to give the -- my colleagues a chance to look at this. I only had one copy. It came up, you know.

EXAMINER NEWMARK: Timing has been an issue here. Do you guys have a response? Clean?

MS. NEKOLA: Just -- it's the same response. We haven't had a chance to look at this. Mr. Hessler hasn't seen it for a long time, and I don't see the relevance. I'm confused really what you're trying to do here.

MR. REYNOLDS: Difference between Glacier Hills and Shirley is --

EXAMINER NEWMARK: I'm going to leave it out.

MR. REYNOLDS: Okay.
EXAMINER NEWMARK: We're not going to put it in, and I think he's actually answered these questions anyway. It's already on the record, so it would be repetitive at this point. And let's move on.
MS. NEKOLA: Can we go off the record a minute?
(Discussion off the record.)
EXAMINER NEWMARK: All right. Back on the record. Do you have anything else?
MR. SCRENOCK: No.
EXAMINER NEWMARK: All right. I had some questions, but at the risk of opening up another whole round of cross, I'll forgo it.
Any redirect?
MS. BRANT: Yeah, we have some redirect.
REDIRECT EXAMINATION
BY MS. BRANT:
Q Mr. Hessler, you talked with Ms. Bensky about your Exhibit 3 in this proceeding?
A Yes. Uh-huh.
Q Can you just clarify for us the purpose of Exhibit 3?
A Yeah. It was just to give a generic example of actual measurements of wind turbine sound compared to

EXAMINER NEWMARK: Okay.

DIRECT EXAMINATION

BY MR. REYNOLDS:

Q Could you state your name, please.

A Wes Slaymaker, S-L-A-Y-M-A-K-E-R.

Q And Mr. Slaymaker, you filed some direct testimony in this case?

A That's correct.

Q Is it true and correct to the best of your knowledge?

A It is.

MR. REYNOLDS: All right. That's it.

EXAMINER NEWMARK: Okay. You're excused.

(Witness excused.)

EXAMINER NEWMARK: All right. Who's next?

MR. REYNOLDS: Dr. SCHOMER.

PAUL SCHOMER, TOWN OF FOREST WITNESS, DULY SWORN

EXAMINER NEWMARK: Okay.

DIRECT EXAMINATION

BY MR. REYNOLDS:

Q Can you state your name, please.

A Paul Schomer.

Q All right. And have you filed testimony in this case?

A Yes.

Q All right. In the form of direct?

A Yes.
Q And rebuttal?
A Surrebuttal.
Q Yeah, whatever.
A Yes.
Q Did you bring that testimony with you?
A I did not.
Q All right. And since giving that testimony, have you received other information such as Roberts surrebuttal or listening to the testimony of Mr. Hessler? Do you have anything to add to that testimony that you've already given in written form?
A I would have comment on what Mr. Hessler said this morning.
Q All right.
A That would be all.
Q Go ahead.
A There's two points I would make very briefly and very simply. One has to do with the pseudo-noise, and he's talked about it. We've talked about it a lot. It's a very important issue in terms of being able to measure things around a wind farm, and Mr. Hessler's introduced it. He and his father did a study which was published in NCEJ, which he referred to this morning.

And when you're dealing with wind noise -- I'm going to try to make this very simple -- there's two kinds of turbulence. Turbulence is the air moving around for one reason or another. One kind of turbulence is just like the -- if you put a stick in water, a stream, and you see the line go out behind the stick, and that's called wake turbulence because it's just like a wake from a boat.

And there's another kind of turbulence called intrinsic turbulence. This is the air moving around on its own, heating the air against the ground or being turned over by buildings nearby or stones or shrubbery or whatever makes the air mixed up and not steady. So there's these two kinds of turbulence that is pseudo-noise, and this is what we're trying to get rid of so that we can make measurements that are accurate.

Q Okay. So what's your comment on Mr. Hessler's comment?

A The comment is that Mr. Hessler and his father measured only the wake turbulence in the wind tunnel because it was very smooth flow. It didn't have intrinsic turbulence, and the intrinsic turbulence is the much more dominating factor. And so the numbers he quotes for -- for what turbulence causes are quite

low compared to what you measure in reality.
Q All right. And how is that relevant to what we're considering here?
A That's relevant in the difference between the level of the turbine noise and the level of the background, that the level of the turbine compared to the level of the background exceeds 10 dBA. It's not less than 10 dBA.
Q And why is that important?
A That is -- 10 dBA is thought of when you start to have serious problems with a new noise source compared to what was existing. And so this exceedance is significant, and the numbers presented by Mr. Hessler are identical to what has been published for just the total pseudo-noise.
Q All right. Do you have any comments on the issue of low frequency sound emanated from large turbines defined as above 2.3 megawatts versus low turbines, smaller turbines, less than 2 megawatts?
A I would expect in just about any machine, as the machine gets bigger, the dimensions get bigger. It's how it couples energy out of it. As the sound radiated will get bigger, which means the wavelength is longer. The fundamental dimension to the sound gets bigger, which means it's lower frequency. This

would -- I would expect from any machine, and I'm not surprised to see the data for this machine go that way.
Q And would that explain the wide or rather consistent complaints of health effects from the residents at Shirley that have 2.5 megawatt machines as opposed to other wind farms?
MR. WILSON: I'm going to object to that question to the extent that it goes to health impact. I don't think he's qualified as a health expert.
EXAMINER NEWMARK: Okay. I'll sustain that.
BY MR. REYNOLDS:
Q You have given testimony on the -- do you have information about the relative impacts of low frequency sound on health?
A Yes.
MR. WILSON: Objection.
MR. REYNOLDS: This has been the part of it. He's testified to this. We've had Mr. Hankard who testified about annoyance versus health.
EXAMINER NEWMARK: The first question, did you say complaints or did you say health?
MS. BENSKY: That was just a foundational

question.

MR. REYNOLDS: Yes. Exactly.

EXAMINER NEWMARK: That's fine. Let him answer.

THE WITNESS: What question am I answering now?

EXAMINER NEWMARK: None. Let him think.

BY MR. REYNOLDS:

Q All right. There has been testimony about -- from the Shirley Wind residents who have machines that are 2.5 megawatts, and then we've had testimony about -- from complaints that -- that are more of the sleep category as opposed to the nausea, headache, earache category, okay? You've given testimony that the infrasound impacts to human health focus on those kinds of symptoms like headache, nausea, vertigo, feeling of ill at ease, right?

A Yes.

Q Would the size of the turbines at Shirley and its likely higher production of low frequency noise have a potential explanation for why the folks at Shirley are having such difficulty?

A I think it's a potential explanation, but I think I could come up with -- there's other explanations maybe. But that's certainly a potential explanation.

Q All right. Well, the whole -- the point of this hearing is to try to determine whether the project as designed for the Town of Forest is -- is appropriate.
A Yes.
Q And size of turbines is one factor?
A It is a factor.
Q What else?
A I think that -- that the -- to me, one of the important factors has been the nature of the community being somewhat unique. This is -- the basic things that have been talked about here are most important. The testimony you had yesterday, although I was not here, I've heard that kind of thing before, and I think that the issue before us is whether that's going to continue. The people are being taken out of their homes by the sound. This is not new. As I've pointed out in my testimony, this has been going on for 30 years, not with wind farms but with low frequency noise, and especially pulsating noise.
The notion that wind farms is somehow different is just not -- makes sense. And that we know and we've known for years that these same symptoms have occurred over time with different kinds of sources of low frequency sound, and the result is

always the same. There's a fraction of the population, we don't think it's a large fraction, that has these symptoms to the point where some are driven out of their homes.

EXAMINER NEWMARK: Okay. Sir, I think wasn't the question what -- what was your question, what things can be done to prevent this, to reduce this?

MR. REYNOLDS: Yes.

BY MR. REYNOLDS:

Q Okay. So there are -- in your view, you've made a recommendation that if this project is -- is -- is approved, that the -- that the noise limits be reduced?

A I have made a recommendation that the noise limits be reduced and that the -- I have made a recommendation that the prediction based upon the average is not consistent with what's been put together as the procedures in Wisconsin.

Q All right. Explain that.

EXAMINER NEWMARK: Well, is this in his testimony already? He said he explained this.

MR. REYNOLDS: All right. Yeah.

EXAMINER NEWMARK: Okay.

BY MR. REYNOLDS:

Q Well, let me ask you this. We've been talking about average noise limits and maximum noise limits.
A Correct.
Q What are the limits that we should be shooting for here?
A Well, what I think about always is are things logical, is this what was meant. And as I understand it in Wisconsin and in this proceeding, people have said there's a 45 dB nighttime limit, and it has to be designed for 100 percent of the houses, the homes of nonparticipating residents meet 45 dB. It wouldn't be acceptable for 50 percent of the homes to meet 45 dB.
And then I ask the question, if 100 percent of the homes have to meet 45 dB, how can you have 100 percent of the homes meeting it half the time is somehow different than half the homes meeting it all the time. To me the two are the very same thing, just on a basis of logic that if you have a rule of 45 dB, it should be that way. You can't have it -- it's met half the time at all the houses but it -- the two are the same.
Q So is that the -- is your recommendation for a 39 dB limit designed then to make sure that the maximum doesn't exceed 45?

A No. I was saying that we should model using zero at a minimum, model using zero as the modeling rather than .5.
Q Okay.
A So that there is -- you get closer to this realization that you have a limit met all the time at all the houses and not -- well, all the time at some of the houses you wouldn't permit, but some of the time at all the houses is permitted. And the two are identical, so it's difficult to understand the distinction.
Q So when you first looked at this, the model that you looked at in the application was based upon a zero coefficient?
A The original material presented, I think it was called Appendix V as I recall, had zero for the modeling.
Q And you thought that was an appropriate number?
A I believe that is an appropriate number.
Q And why be conservative in modeling?
A Well, one of the reasons I came to this -- two reasons I come to this. One is the one I've just illuminated, that if you have a rule that all the houses meet it and then you say half the time, and then you say but you can't have -- it's met 100

percent of the time at half the houses, there's no logic there.

The other reason is that this is supposed to be done in terms of the ISO standard. People say we're applying ISO 9613, and ISO 9613 calls for -- if you follow it, it says we're making a conservative prediction and that the only permissible way and to say you're using 9613 is to make the prediction, and then if you want to have a time average according to ISO 9613, there's a specific procedure in the standard for doing that, and that's not being followed.

So I do it on the basis of logic, of what the rule is, and I've come to that conclusion on the basis of following the standards, which have not been followed.

Q So is it -- is it fair to say that a conservative model will err, if at all, on the side of public safety?

A I wouldn't call it erring, but it will certainly be on the side of public safety.

MR. REYNOLDS: Okay. That's all I have.

EXAMINER NEWMARK: Okay. Other questions?

CROSS-EXAMINATION

BY MR. WILSON:

Q Mr. Schomer, have you visited the site?
A No.
Q So that means you haven't taken any data at the site?
A No.
Q You testified in response to some questions from Mr. Reynolds that the nature of this community was very unique. If you haven't been to the site, how can you understand whether this community is unique or not?
A I find the unique factor in the activities this community has engaged in in terms of trying to maintain the quiet, rural nature of the community, and I find that to be similar to situations I've seen in other parts of the country where that kind of community existed, and I've seen very unique reactions when that exists.
Q So if I understood your testimony, what's unique about this community is that they're -- at least some people in the community are fighting the project?
A No. I said that in the testimony I've read that's been put in place in this, that this community has a land use plan of some kind. I don't profess to be a planner and get all the terms right, but that this community has gone out and said we want to maintain the quiet, rural nature of this community, we don't

want to plan for industry, we want a plan for five-acre homes and the maintenance of farms. That's where they're unique.

And the similarity I find that was I -- plans that the FAA tried to implement some probably 25 or 30 years ago, and probably the one example I can think of where the FAA was eventually stopped by Congress because of the uproar. And I find this -- the dynamics of this community to be along those lines.

Q So you've reviewed the comprehensive plan for the Town of Forest?

A I've reviewed the testimony.

Q But you haven't reviewed the plan?

A I've not reviewed the document, no.

Q Are you familiar with the fact that in Wisconsin, most local communities have to do some type of comprehensive plan by law?

A Yes.

Q Okay. So they're not unique from that perspective?

A No.

Q Okay. You don't have any medical training; is that right?

A That's correct.

Q You have an engineering degree?

A Correct.
Q So if you take a look at page 2 of your direct testimony. You have a copy of your testimony with you?
A I wasn't asked to bring them, so I am at the mercy of somebody to give me a copy.
MR. REYNOLDS: What do you want, direct?
MR. WILSON: For the time being, yes.
MR. REYNOLDS: All right.
MR. WILSON: He'll need sur, too.
MR. REYNOLDS: He is on direct.
THE WITNESS: All right. Page 2.
BY MR. WILSON:
Q Line 17 and 18, I find within a reasonable degree of engineering certainty that there will be significant health impacts. Can you explain to me the relationship between engineering and health impacts?
A I think that we've heard Mr. Hessler testify, and I think that on the same basis we have been observing and learning about these problems for many years. And, no, we're not going to give prescriptions out and -- but we understand better the acoustics and the physics, and I think that there's a shared burden to do these things properly, but we are part of the team.

Q Okay. Are you saying that -- you've already testified you're not a health expert; is that correct?
A I have testified, and I'm certainly not trained as a health expert.
Q Are you a health expert?
A I think I understand something about the health effects of noise from the literature that I follow. Does that say I'm a doctor, no.
MR. WILSON: Did you give him his sur?
MR. REYNOLDS: He's got it.
BY MR. WILSON:
Q So at page 11 of your sur, you're talking about your conclusion that the 0.00 contour is appropriate?
THE WITNESS: I have to ask for page 11 of the sur.
MR. REYNOLDS: I'm sorry?
THE WITNESS: The surrebuttal.
MR. REYNOLDS: It's right there.
THE WITNESS: It is?
MR. REYNOLDS: Yeah. It's all tabbed together.
THE WITNESS: Oh, right behind that?
MR. REYNOLDS: Yep.
THE WITNESS: Okay. That should be easy.

Page 11.

MR. WILSON: Yes.

BY MR. WILSON:

Q So at 11 there, you are testifying at line 15 about the appropriateness of the zero contour, correct?

A Correct.

Q And you would agree that that contour is the most conservative possible?

A It's the most conservative possible using 9613.

Q Okay. Now, if we could go back to your direct testimony on page 9. On page 9 in the middle of the page there you're describing your Exhibit 2, which is, you know, the results of you running a model, and in this case you used -- you used both zero and .5; is that correct --

A Yes.

Q -- to produce Exhibit 2?

A That is true.

Q Okay. And reviewing your testimony here on page 9, there's nowhere where you indicate in your direct testimony here that using the .5 is inappropriate?

A At that point in time, we had not received the operation of the source levels from proponent as perhaps you recall, and I was trying to make sense out of this with data that we had been able to

collect off the internet, which were apparently
precursor data to the real data. And my whole
original testimony is somewhat screwed up because we
didn't have the source data that should have been a
part of the application.
Q Are you done?
A I'm saying I did the best I could given the data we
did and didn't have.
Q Fair enough.
A And I did analysis of .5, but the analysis I did of
.5 was equal to the zero case because the source data
that I found were that much higher.
Q Okay. But you used a ground factor of .5 in your
initial creation of Exhibit 2, correct?
A That was one of the numbers I looked at.
Q Okay. And why did you not at that time use zero for
the entire run to create Exhibit 2?
A As I just told you, I was trying to figure out what
was going on because I could not understand even what
was being recommended by proponent, whether it was
zero or .5, what the data were that were to be used.
When I made my .5 predictions, they came out zero.
The zero predictions of the report, I didn't know if
the report was labeled wrong, whether there was 141
houses as Mr. Hessler criticized my report for. It

was just -- would have been much better if we had the source data.
Q Okay. You have a fundamental belief that these models should be run using the zero contour, correct?
A I think that that's something that I thought about. I've not articulated it.
Q But you articulated it in your testimony?
A In this. Not up until here. I have -- I've come to that conclusion for Wisconsin for two reasons. One is because the standard that you say is being used calls for it. And the second is, when I read the rule, or as I understand the rule, and I have read the rule, there just doesn't seem to be a difference between the application two different ways. I have made predictions using the annual average for sources that call for that specifically. When you make predictions for an airport, it calls for the annual average. When you make predictions for a highway, these are called for. I didn't see that they were called for here. I saw a different kind of thing.
Q Okay. So you testified that you just recently came to the conclusion that zero is appropriate only here in Wisconsin; is that correct?
A No. I think it's probably a good idea all over, but it's something that we haven't done in this country

in transportation noise sources.
Q Okay. But this was a recent revelation that you've had; is that correct?
A This actually occurred serendipitously. I was asked to give a lecture this coming November on ISO 9613. And when I started to put the lecture together, I realized that it was calling for this conservative prediction and that indeed I had been misusing the standard, and I was on the committee that wrote it when it was written.
Q So does this revelation occur between the time that you submitted your direct testimony and the time you submitted your surrebuttal testimony?
A That part of it does, yes.
Q Yeah. So that explains why you were willing to use a .5 in your direct testimony but not in your surrebuttal testimony?
A No. The .5, as I've tried to say, is lots of reasons for it being there. Part of it is I tried to understand what was going on.
MR. WILSON: I think that's all we have.
EXAMINER NEWMARK: May or may not be. I want to let you know before you stop, I've decided to allow that Schomer page 6 on surrebuttal in. Basically we have so many standards at this point in

the record, and the studies we let in refer to WHO and all kinds of European standards, day and night standards. Let's just put it all in, and I'll give you a chance to cross him on that if you need to. None?

MR. WILSON: We're just fine with your ruling.

EXAMINER NEWMARK: All right. Any other questions?

MS. BENSKY: I have a few.

CROSS-EXAMINATION

BY MS. BENSKY:

Q We've talked a lot about this ISO 9613 standard. You said you were on the committee that wrote it?

A Correct.

Q Mr. McKeever is passing them out to everyone so I think it will be helpful to --

A I can't hear so well at my -- you have to speak up a little bit.

Q You spent too much time around wind turbines? Sorry. That was a joke. It was funny.

So you've just been handed a piece of paper. Is this the international standard 9613-2 that you helped create?

A Yes.

Q And this was designed in 1996, correct?
A This was first edition it says 1996, December 15th.
Q And has it been revised since then?
A No.
Q Was this standard designed specifically for wind turbine noise?
A No.
Q And if you turn to page -- I don't know what page it is -- the pages don't appear to be numbered. If you turn five pages in, it says acoustics.
A Okay. Maybe you have a clause number.
Q Part 2, acoustics attenuation of sound during propagation outdoors. It's the fifth page in.
A I'm not sure I know what -- there's Clause 2 is the following -- there's normative references. Are you in the --
EXAMINER NEWMARK: I think you have it right in front there.
THE WITNESS: Part 2, yes. That's all dealing with Part 2. Part 1 is air absorption, tables of air absorption.
EXAMINER NEWMARK: Can I have that back, please? I'm going to follow along.
THE WITNESS: Okay. Part 2.
BY MS. BENSKY:

Q And there are two columns on this page, and the right-hand column, the second paragraph beginning with the word, this method is applicable. Do you see where I am? That's on the right-hand column near the top.
A This method is applicable, yes.
Q Uh-huh. And it says, it is applicable directly or indirectly to most situations concerning road or rail traffic, industrial noise sources, construction activities, and many other ground-based noise sources. Is a wind turbine a ground-based noise source?
A Probably not. There's no other standard to use.
Q So this is the best standard, but it's not quite right?
A It's not going to be quite right.
Q But this standard specifically does not apply to sound from aircraft and flight or blast waves from mining, right?
A Okay. That was probably inserted by me.
Q Is one of the reasons why you are calling for using this very conservative absorption coefficient because of this limitation?
A That would be one of the reasons. We have -- we studied in my laboratory air to ground versus ground

to ground propagation by having one experiment where we had 100-foot-high tower that we did sound propagation measurements for, and then we had a source on the ground that we did the propagation measurements for, and the difference of 100-foot-high tower versus on the ground was -- oh, I've got published papers on it. I don't know that I remember the exact numbers. The levels -- the higher levels are about the same, but they're three times more often, then you're up 100 feet.
Q   What happens if you're up 100 meters?
A   It's going to possibly be even more frequent. Possibly be the same. I guess that didn't answer much, but that's the best I can do.
Q   Well, the point is that we just don't know?
A   Well, I know it won't be less, but I don't know that -- I haven't reached the saturation or that it's going to continue to grow.
Q   Having this in your hand, and if you can do it very quickly, can you point to other paragraphs that encourage the model to be used in a conservative manner?
A   Say that again, please.
Q   Well, you talked about after looking through this, you realized that the intention was to obtain

conservative results; is that correct?
A Yes.
Q And I'm asking you where in the document we should look to get that information.
A Okay. That is one place. When it talks about the cement, and I just have to find where it talks about that. Well, in 3.2 in definitions it gives equivalent continuous downwind octave band sound pressure level, and downwind is a shorthand name for sound -- propagated sound where it travels in the louder manner. Because as everybody knows, you're downwind outdoors, it's louder than if you're upwind, and that's what the downwind means here, that you're getting a prediction that's hearing-enhanced propagation. So in 3.2, the definition of downwind indicates this. And then it talks about predicting the downwind. Let's see. I think on Equation 5 and 6 -- in 5 it talks about the downwind again.
EXAMINER NEWMARK: That's meteorological conditions, number five? Is that where you're at?
THE WITNESS: No. I'm on Equation 5 on the unknown page, but it's in the end of Clause 6.
EXAMINER NEWMARK: Oh.
THE WITNESS: And this is the basic equation for using ISO 9613, and it talks about

downwind. And as I said, if one wants to calculate the long-term -- the long-term averages, if you look at the bottom of just before you get to 7, there's -- you go up two paragraphs, it says the long-term average weighted sound pressure LAT, paren, LT for long-term, shall be calculated according to the equation there, and that's not been done.

BY MS. BENSKY:

Q In this project?

A In this project.

Q And what's the significance of that?

A Well, this is the procedure that was designed in the standard for going from downwind to long-term if long-term wanted to be used. What this does is it says that if you're up in the air, which is what I just -- we know we are, they recognized when this was written, they being -- this was really based upon a German standard initially -- that when you have an elevated source, you're going to get this high level more of the time, as I said, three times as often, which was a whole lot of the time from 100-foot high. When you look at this case, this standard says that you never have anything but the high levels from an elevated source and that the -- the average that's used for other sources shouldn't be used for this because it is elevated, and I think that's the difference that comes in here.

MS. BENSKY: Thank you.

EXAMINER NEWMARK: Anything else?

MS. BENSKY: Briefly.

BY MS. BENSKY:

Q Is it necessary for you to visit a site to be able to analyze data that was taken at that site?

A No.

Q Is this something that you do all the time in your professional work?

A Well, I like to judge the people that have made the measurements and have some feel for things, but I would say that things that are done by Mr. Hankard or Mr. Hessler, I believe the measurements in general. Now, I've said that I thought he was wrong on the empty pseudo-noise, but that's a separate thing.

Q And even though that you -- so, is your own experimentation necessary to be able to reach the opinions that you've reached in this case? Is it necessary for you personally to conduct experiments in order for you to reach the opinions that you have reached in this case?

A No. As I've said, even if I had done studies that

would be part of the team, that I think that nothing is done by one person alone.
Q And in fact, whoever uses this model is to some extent relying on your work, right?
A They're relying on my work. They're relying on the Deutsches In -- DIN, Deutsches Institut fur Normung.
Q So even though you've not been to the site, and even though you haven't done your own experimentation, can you still state the opinions that you stated in this case to a reasonable degree of scientific certainty?
A Yes, I do.
MS.
MS. BENSKY: Thank you.
EXAMINER NEWMARK: Okay. Other questions?
RECROSS-EXAMINATION
BY MR. WILSON:
Q Just a couple questions following up on ISO 9613-2. When you testified earlier that you were implementing a method incorrectly, was it this method that you were --
A I'm sorry? I don't quite follow the question.
Q Well, you told me -- you told me before when I was asking you questions that you had this recent epiphany which is the result now of using -- you're saying you use the zero ground contour, and you told

me that up until recently something had been -- had been implemented improperly by yourself as well.
A Yes. I had forgotten. I don't -- you know, I don't use 9613 that often. It's used for this, but it's not used -- I use 9613 for this, and I use it for small arms ranges occasionally.
Q Okay.
A But when you're doing airports or highways or other things, there's models put out by the DOT for those kinds of sources. So if you do general work, which I do in all kinds of noise areas, you use different things at different times. What I was saying is until I had looked over this to prepare this lecture for Brazil when I'll be there, I remembered that this was for the downwind situation, which is also called for in ISO 1996, which I do know because I'm chairman of that committee.
Q Okay. I just have one other question for you. Have you done any studies that implement this standard with your new recollection against actual sound measurements to be able to tell whether it's a good fit?
A Well, you're not looking for a good fit. When you're --
Q That's not my -- my question is this, have you

compared your calculations using this method against actual sound measurements with your recent recollection that you've got to do in a certain way?
A Well, of course I haven't.
MR. WILSON: Thank you. That's all.
EXAMINER NEWMARK: Okay. Redirect?
MR. REYNOLDS: Just a couple questions.
MR. LORENCE: Your Honor --
EXAMINER NEWMARK: Oh.
MR. LORENCE: -- I may have a question before we get to redirect.
MR. REYNOLDS: Sorry. Go ahead.
EXAMINER NEWMARK: While you're doing that, I was going to take a minute. Did we verify his testimony?
MR. REYNOLDS: If I didn't -- I thought I did.
EXAMINER NEWMARK: Did you? You know what, just do it again just in case because I don't remember.

FURTHER DIRECT EXAMINATION

BY MR. REYNOLDS:
Q Dr. Schomer, do you verify that the rebuttal or surrebuttal that you've given, or direct and surrebuttal, is true and correct?

A Yes.
MR. REYNOLDS: Okay.
EXAMINER NEWMARK: And these Exhibits 1 through 4 as well?
MR. WILSON: Your Honor, I think given the discussion of this document, it probably ought to go in as an exhibit.
MR. McKEEVER: Yes.
MR. LORENCE: I'm going to ask a couple questions on it, so you may want to hold off on that.
EXAMINER NEWMARK: Okay. Let me just have him answer. Are Exhibits 1 through 4 -- sir? Mr. Schomer, Exhibits 1 through 4, were they filed -- are they correct to the best of your knowledge?
THE WITNESS: I'm sorry?
EXAMINER NEWMARK: Your Exhibits 1 through 4, are they correct to the best of your knowledge?
THE WITNESS: Yes.
EXAMINER NEWMARK: Okay. Thanks.
All right. Commission staff.

CROSS-EXAMINATION

BY MR. LORENCE:
Q Dr. Schomer, on page 12 of your surrebuttal

testimony, and I'm looking on lines 6 through 8.
A Uh-huh. I guess I'm not fast enough. All right. I got to page 12.
Q On lines 6 through 8 you say, ISO 1996 requires what is termed "downwind" or weather-enhanced propagation conditions so that model predictions are only infrequently exceeded. Do you see that sentence?
A Yes.
Q I have never seen ISO 9613-2 before today. Could you tell me where that's required in this -- in this ISO 9613?
A Those are the questions we just answered, but I can go through it again.
Q Well, you talked about the downwind stuff, but you say it says that it's only infrequently exceeded, and I'm wondering if it says that in here anywhere?
A That's what the downwind nomenclature means, and I believe it's in either 9613 -- I know it's in either 9613 or in 1996, which 9613 incorporates by reference.
Q I have one more question, and again this shows my complete ignorance on this standard. In Section 7.3, that's called ground effects, and again there's not a page number here, but if you could turn to that.
A Okay. 7.3. 7.3, ground effects, yes.

Q Is this section equivalent of the ground factor that we've been talking about the last two days?
A This section is -- makes use of the ground factor. It's not equivalent. This is where the ground factor comes in. What you have is on the next page there's graphs showing the -- what the sound propagation is in different octave bands. And then in the implementation there's a table on the next page, Table 3, and in Table 3 if you look in there, there's A sub S or A sub R in the middle column at the top, and that's for the source or receiver region. We've been talking about there's really three factors, the .5 or the zero whatever. You have a factor for the source region, a factor for the middle, and a factor for the receiver region. And if you look at the formulas under A sub R of the middle column, you'll see a G. That's the ground factor that goes between zero and 1.
Q And that's the ground factor we have been talking about for two days?
A There's three of them technically: one for the source, one for the receiver, and one for the middle.
Q So if we turn back one page where it begins with the letter A, then it says hard ground.
A Hard ground, yes.

Q That first paragraph ends -- it says, for hard ground G equals zero. So this is the ground factor zero that we've been talking about, correct?
A Correct.
Q And then for porous ground in B, it's G equals 1?
A Correct.
Q And then for mixed ground, it says it's someplace in between zero and 1. Do you see that?
A I see that.
Q So this is the ground factor we've been talking about here?
A Yes. But to understand that is a question that was earlier. You've got a source up in the air and not on the ground, so does this standard really apply. And my answer was, it's the best we have, but you can't apply it exactly the way you would if it was on the ground because the source is as high in the air, it changes what the propagation is. So that the definition of what is hard and what is soft, you have a source that's 100 meters in the air on average. That's not on the ground as one of the other counsel's pointed out.
Q But it has to get to the ground -- the sound has to get to the ground eventually, doesn't it?
A It has to get to the ground eventually.

Q And once it's on the ground, won't it travel along the ground?
A No. It's only -- the only thing you have is an effect of the microphone height at your receiver. The other -- it doesn't -- it doesn't come down to the ground and then travel across the ground like this. It doesn't do that. What you're interested in is the path that goes straight from this up in the air source to your receiver, which may be near the ground, but you don't have any other path. If you do, it's because you don't have good propagation. Then it's poor propagation conditions.
MR. LORENCE: Thank you. I have no further questions.
MS. BENSKY: Your Honor, can I follow up on that? This is really important, and I want to make sure I understand.

RECROSS-EXAMINATION

BY MS. BENSKY:
Q So are you saying that if we have a flat -- if we have a flat ground, if there's a source that's close to the ground emanating sound, that sound can just go and be absorbed in the ground, correct?
A Ground absorption -- what happens, and this is more related to people's experience. You know, if we went

through all the details, it would be complicated, but I think people's experience is useful here. First of all, the first rule is that if you're downwind, it's louder than if you're upwind, and there's -- the reason is the downwind, and this is going to seem strange, we think of sound almost as rays, sound rays rather than waves.

And let's put it this way. Let's say you were behind the barrier. You expect it to be quieter. It's quieter because there's no direct path from the sound to you. It has to come around the corner just like if you had a -- something to stop the sun or a reflector of light. You go behind it, it's not as light as in front of it. Sound is the same thing. If you have a barrier or something that prevents the sound from getting to you, it's quieter than if you don't have that. Well, on a sunny day and you're upwind, you don't hear things. But if you're downwind, you do.

Another thing -- example, if you're out in a boat, do you hear things far away out in a boat? You've seen that? This is the hard surface of the water, and frequently above the water there's a temperature inversion because of the cooling and heating of the water. And those two can form two layers that the sound gets trapped in, and then you have very -- you hear the people whispering on the shore, and it's like they're 10 feet away from you. I'm sure many of you have experienced this. This has to do with the propagation downwind versus upwind, has to do with the propagation.

The physics is complicated, but the effects -- same thing. Ever hear sources very early in the morning? You wake up at 5:00 a.m. and you hear a distant train or horns or the wheels? Have you experienced that? That again has -- at that time of day, you've got a direct path from the source, which is -- you don't hear the rest of the day to you. It has to do with the physics of the situation.

I'm not going to attempt to go into the physics, but I'm trying to give you different examples out of your daily life that show you this is what goes on. We don't want to really go into the details of what's going on.

Q So if there's a source up in the air that's emitting sound, the sound's going to come down and it's going to hit the receptor before it hits the ground and absorbs; is that correct?

A It's going to hit the receptor directly. There will be -- it gets confusing.

Q That's for sure.
A The ground is important only that it gives a reflection that can enhance or interfere with the direct path. But it does hit the microphone, that's the first thing it hits in time. The sound will arrive at the microphone before -- it comes directly from the source, so it will arrive first.
Q So somebody standing outside near a wind turbine or any source up in the air, that sound wave is going to travel down, and it's going to hit that person's ear before it goes down to the ground and gets absorbed?
A Well, won't be totally absorbed but, yes, it does hit you before it's absorbed. And I think your point is good, that as you're traveling along the ground, from ground to ground it will be absorbing some of the sounds, and that alone is -- that's part of the reason that the air-to-ground path is louder.
Q And so do you think it's proper to assume no absorption and use that 0.0 coefficient for this reason?
A That's part of the reason. Part of the reason is the -- in order to have a prediction that is what is called for in the standard, which is a prediction that is -- if you like the term conservative, a prediction that predicts what's going to happen 90

percent of the time or 95 percent of the time or some percentage of the time, I actually think that from the data that I know of, the prediction is probably the -- about 85 percent of the time would be included, and 15 percent of the time you would be above what's being predicted with the 0.00 prediction. It's not the most conservative prediction in the world by any means.

Q But considering we have to use this model because we don't have anything better, the best way to use this model for a source that's 100 meters in the air is to use that 0.0 coefficient?

A 0.00 is the best you can do with this.

MS. BENSKY: Great. That's very helpful. Thank you.

MR. REYNOLDS: Couple questions on redirect.

REDIRECT EXAMINATION

BY MR. REYNOLDS:

Q Dr. Schomer, is it the heart of it that the challenge of creating a model to reflect what the citizens of Forest will actually experience, is that the heart of why it's better to have conservative estimates than not conservative estimates of sound? Because we're trying to figure out what's going to happen to the citizens in Forest.

A I think there's probably lots of reasons I can think of for doing this. Again, we're dealing with a low frequency sound primarily. The A-weighted sound is going to correlate with it as it does with nearly all noise sources.

I think it's important to understand how the ear hears because that's all a part of this, and the ear doesn't hear all frequencies equally. It doesn't process all frequencies equally, and it gets very different at low frequencies. The ear gets very different at low frequencies, and this is one of the reasons I would say this is important. We -- I think Mr. Hessler testified that the threshold of hearing changes, or maybe it was in that paper that was passed out, but the threshold of hearing is very different from one person to another.

But what's even more important is that at the middle frequencies, like 1,000 hertz, a change of 10 decibels is a doubling or a cutting in half of loudness. At these low frequencies, like let's say 10 hertz, at 10 hertz, about a 2 dB change is a doubling of loudness. So at low frequencies, anything that you're off gets magnified by the ear. If you're off by 5 dB at low frequencies, that's a

factor of four in loudness. Whereas if you're off by 5 dB at a middle frequency in a prediction, that's not even a factor of two in loudness. So errors get magnified at the low frequencies just because of how we hear.
Q That was one of the reasons for looking at the more conservative model. Are there any others?
A Well, let's see. I've talked about the standard calling for it. I've talked about it makes sense from the -- from the way the rule is written. Certainly it makes sense from being conservative from just the standpoint of how the ear hears. I think that just what we've talked about, the health effects and the fact that there's people that may be affected just like in one other community, somehow it seems like it calls for us to be cautious.
I think that if -- if it were some other area where government was involved directly, let's say, we're going to install -- we're going to license fire detectors that only work 90 percent of the time and 10 percent of the time people aren't warned about the fire protector, but that's good enough. People wouldn't say that's good enough, so the fire protection has to work all the time. And I think when we're talking about people literally being

driven out of their homes, we have to be a little bit cautious.

MR. REYNOLDS: Thank you. I don't have anything else.

EXAMINER NEWMARK: Highland?

MR. WILSON: No.

EXAMINER NEWMARK: All right. What are we doing with our ISO 9613-2?

MS. BENSKY: I'd like to move it into evidence.

EXAMINER NEWMARK: All right. Any objections?

MR. LORENCE: I guess I'd like to talk about that for a second.

EXAMINER NEWMARK: Okay.

MR. LORENCE: We've kept out all kinds of reports and exhibits today because they didn't come in at the proper time. Professor Schomer could have put it in at any time with his exhibits. I recognize that counsel here is not -- is not -- his witness is not asking this. But I guess I would ask the ALJ that under the theory that, you know, we've been keeping out late-filed things and this is awfully dense information, whether this should go in the record.

EXAMINER NEWMARK: Okay.

MR. LORENCE: And I just as a second aside for counsel, I'm not positive, but I think that these are usually under copyright, and is this something that we would be able to place on our website and make available to the world if -- I don't want to get you in any kind of copyright trouble if that's the case.

MR. McKEEVER: I'll just say I got it on the internet.

MR. LORENCE: Yeah.

MR. REYNOLDS: And this is the standard that has been used by all the measurers of sound, so this is -- this is kind of the bible of sound measurement.

MR. LORENCE: And I guess that reinforces my question then. Anybody could have put it in. Any of the experts could have put it in from direct testimony on it. So whether we get it here at this late hour or not, I'll defer to the decision, but I'm -- given what we've done today with other things, I just wanted to raise that point.

MS. BENSKY: I guess the nature of this exhibit is totally different. This exhibit doesn't give any opinions. It's just a standard that everybody -- all the sound people in this case have used and relied upon. So I think it would be helpful to have it in. And even if it wasn't in, I think it's the type of material that could be quoted and briefed anyway, so --

EXAMINER NEWMARK: Let's not get into that.

MR. WILSON: I think at the risk of making it look like Ms. Bensky and I are on the same team --

EXAMINER NEWMARK: We would like to see that.

MR. WILSON: I agree.

EXAMINER NEWMARK: Okay.

MR. WILSON: It should come in.

EXAMINER NEWMARK: I understand.

MR. WILSON: There's a lot of testimony on it.

EXAMINER NEWMARK: Let me say the overarching concern I have or rationale for letting it in is we've cited to equations and all kinds of portions of this document which I think can only be correctly or adequately explained or referenced by having the document. So for the abundance of caution for making the record even larger, I think it would enhance the Commissioner's review of the testimony we've just heard. So what's the number for this one? It's 9, Schomer 9, is that --

MR. REYNOLDS: I thought it was 5.

EXAMINER NEWMARK: Well, I don't know if we ever marked your other ones. I might have mentioned on the record because Mr. Schomer, I was not accepting his Exhibits 5 through 8, and I am pretty sure I referenced that at the beginning of the hearing. So we're just going to call this 9.

MS. BENSKY: Okay.

(Schomer Exhibit No. 9 marked and received.)

EXAMINER NEWMARK: All right. I think you're done.

THE WITNESS: Thanks.

EXAMINER NEWMARK: You're excused.

(Witness excused.)

EXAMINER NEWMARK: 3 o'clock. Let's take 15 minutes.

(Break taken from 3:05 p.m. to 3:20 p.m.)

EXAMINER NEWMARK: Well, got enough people back, I guess. You want to start off the record?

MR. McKEEVER: Yeah.

(Discussion held off the record.)

EXAMINER NEWMARK: All right. Next?

Exhibit C

Freeborn Wind Hearing Exhibit AFCL 35

p. 15 of Wayne Brandt's lease with Invenergy

(20183-140948-08)

Wayne Brant

I have many reasons why these windmills are of great concern. After reading the easement, I have many reservations about what is stated. Without reading the entire easement, I will quote a few troubling statements. With respect for time, I will only read my comments and, hopefully, you will read the Easement at a later time.

Refer to 7-B. __Acquisition of Interest__ (page 10 of Easement): "The acquisition of all or any portion of Grantee's interest in the Property or the Windpower Facilities or the Easement by another person shall not require the advance consent of Owner or constitute a breach of any provision or a default under this Agreement, and Owner shall recognize the person as Grantee's proper successor."

COMMENT: It appears that any person or company may purchase this wind farm, whether it be from the United States, Russia, Iran, China, or anywhere else. Wouldn't that be nice.

Refer to 9-C. __New Easement to Mortgagee__ (page 13 of Easement): "If the Easement or this Agreement terminates because of Grantee's default, or if the Easement is foreclosed, or if the Easement or this Agreement is rejected or dis-affirmed pursuant to bankruptcy law or other law affecting creditors' rights – the Owner shall, upon written request from any Easement Mortgagee within 90 days after such event, enter into a new Easement for the Property on the following terms and conditions.

Refer to 9-C (iii) At the option of the Easement Mortgagee, the new easement may be executed by a designee of such Easement Mortgagee without the Easement Mortgagee assuming the burdens and obligations of Grantee."

COMMENT: It appears there is no guarantee that a new Mortgagee, if found, would be required to purchase the old Mortgage Easement. It also appears that, under

EXHIBIT
AFCL-35
Exhibit C

9-C (section 3), if a new Easement Mortgagee is found, they would not have to assume the burdens and obligations of the Grantee.

On another subject, will Grantee ever fulfill their so-called promise to remove these eyesores upon termination? The Easement states that if Grantee fails to fulfill their obligation within one year, then the Owner may do so, and the Owner will be reimbursed for reasonable and documented costs.

Even if the Owner was to take these wind turbines down, they should not have to be responsible for finding cranes and equipment to do so. The astronomical costs to remove the towers and access roads could be more than $100,000 per turbine, probably more than what farmers could afford.

If this wind project can be built in a year, why can't the turbines be taken down in a year? It should be much easier to take down than to build for the Grantees. In my opinion, I firmly believe Grantees have no intention of taking these wind turbines down. I believe that about a year from their final termination, they will deed the wind turbines back to the Owner, relieving the Grantee of all obligations to do so. The Grantee will be long gone shortly thereafter with no address or phone number to be found and no one to be held accountable.

If there are any removal costs, and I quote, "they will be determined by the Grantee acting in good faith," as stated in section 10-D of the easement. This doesn't sound very promising for the Owners or those who have to look at these turbines.

Refer to 11-B. Confidentiality (page 16 of Easement): "To the fullest extent allowed by law, Owner shall maintain and shall cause its Related Persons to maintain, in the strictest confidence, for the sole benefit of Grantee, all information pertaining to the financial terms of or payments under this Agreement, the Grantee's site or product design, methods of operation, methods of construction, power production or availability of the Windpower Facilities, and the like, whether disclosed by Grantee or discovered by Owner, unless such information either (i) is in the public domain by reason of prior publication through no act or omission of Owner or its employees or agents, or (ii) was already known to Owner, at the time of disclosure and which Owner is free to use or disclose without breach of any obligation to any person or entity. To the full extent permitted by law, Owner shall not use such information for its own benefit, publish or otherwise disclose it to others, or permit its use by others for their benefit or to the detriment of Grantee."

COMMENT: Could it be that the Grantee has a lot to hide, and they are willing to prosecute any person who talks about their easement and how much one Owner received that the other Owners did not. Isn't it a shame that they can, to the fullest extent of the law, prosecute a person who talks about what he or she signed?

In closing, I would like to know how our townships are going to be protected from all the damage that will be incurred during the reverse procedure of removing these eyesores. We will have to contend with considerable damage to our roads because the huge cranes and trucks will cause great damage once again. Another issue not mentioned in this Easement was the miles of gravel roads that will be left in the fields for our future farmers to contend with. They didn't address this issue anywhere, I'm sure, because they have no intention of removing these roads or even being around at that point in time.

I would ask the Public Utilities Commission to take a good look into the R-E-S wind project in the Waltham-Sargent area where many people are very upset with promises made by RES and not kept.

Also, I don't understand why the energy produced by these wind projects in Minnesota is allowed to go to other states and doesn't stay here where we can benefit from it. If they want to send the energy out of state, then let those states look at the wind turbines – not us. Sad – Sad – Sad.

There are hundreds, maybe thousands, of these towers sitting idle, rusting across the sunsets of our planet. It's a shame that this is allowed to happen, and it is happening.

Every morning and evening in early spring, summer and fall, my wife and I enjoy sitting on our porch looking out at the rich and productive soil and beautiful countryside surrounding our home. It is really sad that will be an enjoyment of the past because these eyesores could consume our once beautiful countryside.

Finally, there's one more thing I would miss, and that is watching the migration of the geese in the early spring and late fall. Their path is directly over our farm, but no more if the wind turbines take over the landscape. I'm sure there could be many dead geese before they finally realize the danger and change their course.

In addition to the geese, we have witnessed eagles flying through our farmyard and have seen them on wires, in the trees and on the roads in our area, which is 3/4 of a mile from the nearest proposed wind turbine. I have pictures of an eagle sitting on a nest about 6 miles from our home. Environmentalists should be encouraged to take action to help these protected species. Wind turbines should be prohibited from being constructed in the habitat of our national birds.

These are my opinions as I see it. Please consider what I've said, and I thank you for your time.

C:testimony-Wayne 2-20-18.odt

7. **Assignment.**

a. Assignments. Grantee shall have the right, without obtaining the consent of Owner, to do any of the following with respect to all or any portion of the Property: finance Windpower Facilities; grant co-easements, separate easements, subeasements, licenses or similar rights (however denominated) to one or more persons (an "**Assignee**"); or sell, convey, lease, assign, mortgage, encumber or transfer to one or more Assignees the Easement, or any or all right or interest in the Easement or in this Agreement, or any or all right or interest of Grantee in the Property or in any or all of the Windpower Facilities that Grantee or any Assignee party may now or hereafter install on the Property. Grantee shall notify Owner in writing of any such assignment, and any such Assignee shall assume in writing the obligations of Grantee under this Agreement which Grantee will no longer be fulfilling pursuant to the terms and conditions of such assignment with respect to the Property assigned. To the extent provided for in each conveyance document, an Assignee shall have all of the rights and benefits of Grantee under and pursuant to this Agreement. Grantee shall be relieved of all of its obligations under this Agreement upon the sale, conveyance, lease, assignment or transfer ("**Transfer**") of its entire interest hereunder or, if only a partial interest is Transferred and such Transfer is to an affiliate of Grantee, Grantee shall be relieved of only those obligations under this Agreement relating to the partial interest Transferred to its affiliate.

#7 b. [redacted]. The acquisition of all or any portion of Grantee's interest in the Property or the Windpower Facilities or the Easement by another person shall not require the advance consent of Owner or constitute a breach of any provision or a default under this Agreement, and Owner shall recognize the person as Grantee's proper successor.

c. Assignment by Owner. This Agreement shall not be construed to limit Owner's right to sell, transfer or convey, lease, mortgage, grant easements, licenses or similar rights or otherwise encumber the Property (each, a "**Owner Transfer**"); provided, however, in each case, any such Owner Transfer shall be subject and subordinate to the rights of Grantee hereunder and under the Easement.

8. Collection/Transmission Facilities.

a. Grant of Collection/Transmission Facilities Easement. Upon the request of Grantee during the term of the Easement, Owner shall grant to Grantee one or more easements for the construction, laying down, installation, use, replacement, relocation, removal, operation and maintenance of underground and aboveground electric collection and transmission facilities including electric transmission and distribution lines, communication lines, interconnections and switching stations on, under, over and across designated portions of the Property ("**Collection/Transmission Facilities Easement**"). Any such Collection/Transmission Facilities Easement shall contain all of the rights and privileges for Windpower Facilities as are set forth in this Agreement.

b. Access. Any Collection/Transmission Facilities Easement shall also include the right of ingress to and egress from the Collection/Transmission Facilities (whether located on the Property, on adjacent property or elsewhere) over and along the Property by means

Easement Mortgagee or other party has ownership of the easement estate or possession of the Property.

(v) Neither the bankruptcy nor the insolvency of Grantee shall be grounds for terminating the Easement as long as all material obligations of Grantee under the terms of the Easement and this Agreement are performed by the Easement Mortgagee in accordance with the terms of the Easement and this Agreement.

(vi) Nothing herein shall be construed to extend the Easement beyond the Term or to require an Easement Mortgagee to continue foreclosure proceedings after the default has been cured. If the default is cured and the Easement Mortgagee discontinues foreclosure proceedings, the Easement shall continue in full force and effect.

#9 c. New Easement to Mortgagee. If the Easement or this Agreement terminates because of Grantee's default or if the Easement is foreclosed, or if the Easement or this Agreement is rejected or disaffirmed pursuant to bankruptcy law or other law affecting creditors' rights, the Owner shall, upon written request from any Easement Mortgagee within ninety (90) days after such event, enter into a new easement for the Property, on the following terms and conditions:

(i) The terms of the new easement shall commence on the date of termination, foreclosure, rejection or disaffirmance and shall continue for the remainder of the terms of the Easement, at the same rent and subject to the same terms and conditions set forth in this Agreement.

(ii) The new easement shall be executed within thirty (30) days after receipt by Owner of written notice of the Easement Mortgagee's election to enter a new easement, provided said Easement Mortgagee: (i) pays to Owner all rent and other monetary charges payable by Grantee under the terms of the Easement and this Agreement up to the date of execution of the new easement, as if the Easement had not been terminated, foreclosed, rejected or disaffirmed; (ii) performs all other obligations of Grantee under the terms of the Easement and this Agreement, to the extent performance is then due and susceptible of being cured and performed by the Easement Mortgagee; and (iii) agrees in writing to perform, or cause to be performed, all non-monetary obligations which have not been performed by Grantee and would have accrued under the Easement and this Agreement up to the date of commencement of the new easement, except those obligations which constitute non-curable defaults as defined above. Any new easement granted to the mortgagee shall enjoy the same priority as the Easement over any lien, encumbrances or other interest created by Owner.

#9c (iii) At the option of the Easement Mortgagee, the new easement may be executed by a designee of such Easement Mortgagee without the Easement Mortgagee assuming the burdens and obligations of Grantee thereunder.

(iv) If more than one Easement Mortgagee makes a written request for a new easement pursuant hereto, the new easement shall be delivered to the Easement delivered to Owner by Grantee after wind turbines have been installed on the Property, such notice shall be accompanied by a statement by Grantee setting forth how Grantee shall comply with the provisions of Section 10(c).

b. Owner's Right to Terminate. Except as qualified by Section 9, Section 10(e) and Section 10(f) below, Owner shall have the right to terminate the Easement if all or any portion of its rights in this Agreement and the easements granted hereunder if (i) Grantee has not commenced construction of Windpower Facilities for the Project on or near the Property within seven (7) years of the Effective Date or (ii) a material default in the performance of Grantee's obligations under this Agreement shall have occurred and remains uncured following the applicable notice and cure periods provided herein.

c. Effect of Termination. Upon termination of the Easement, Grantee shall, as soon as practicable thereafter, remove above-ground and below-ground (to a depth of four (4) feet below grade) Windpower Facilities from the Property. All Property disturbed by Grantee shall be restored to a condition reasonably similar to its original condition. Reclamation shall include, as reasonably required, leveling, terracing, mulching and other reasonably necessary steps to prevent soil erosion. If Grantee fails to remove such Windpower Facilities within twelve (12) months of termination of the Easement, or such longer period as Owner may provide by extension, Owner may do so, in which case Grantee shall reimburse Owner for reasonable and documented costs of removal and restoration incurred by Owner.

10 d. Security for Removal of Windpower Facilities. On or by the fifteenth (15^{th}) anniversary of the Operation Date, Grantee shall obtain and deliver to Owner a letter of credit, or similar financial assurance, in form and substance reasonably satisfactory to Owner securing performance of Grantee's obligation to remove the Windpower Facilities located on the Property (the "**Removal Security**"). The Removal Security shall be equal to the estimated amount, if any, (the "**Net Removal Costs**") by which the cost of removing the Windpower Facilities exceeds the salvage value of such Windpower Facilities. To the extent that the Net Removal Costs are zero (or negative), the Removal Security shall not be required on the part of the Grantee, provided, however that Grantee shall re-evaluate the need for the Removal Security at least annually after the fifteenth (15^{th}) anniversary of the Operations Date. Grantee shall not be required to deliver such Removal Security to Owner if Grantee (i) is in the process of repowering or otherwise redeveloping the power generating units on the Property with new power generating units (or commits in writing with notice to Owner to do so within two (2) years after the fifteenth (15^{th}) anniversary of the Operations Date), or (ii) has delivered such Removal Security, or similar financial assurance, in connection with the permitting of the Property or any other portion of the Windpower Facilities for Grantee's Wind Turbines. Once in place, Grantee shall keep such Removal Security, or similar financial assurance, in force throughout the remainder of the Operations Term and Extended Term, as applicable. ~~The Net Removal Costs shall be determined~~ [redacted] If any requirement or right provided in this Section contradicts or opposes any state or local laws, such state or local laws shall take precedence over this provision and such requirement or right shall be invalidated.

e. Default. If a Party (the "**Defaulting Party**") fails to perform an obligation under this Agreement the other Party (the "**Non-Defaulting Party**") shall not have the right to exercise any remedies hereunder if the default is cured within sixty (60) days of the Defaulting

Party receiving written notice of such default specifying in detail the default and the required remedy from the Non-Defaulting Party; provided,, that if the nature of the default requires, in the exercise of commercially reasonable diligence, more than sixty (60) days to cure, then the Defaulting Party shall not be in default as long as it commences performance of the cure within sixty (60) days and thereafter completes such cure with commercially reasonable diligence. Further, if the Parties have a good faith dispute as to whether a payment is due hereunder, the alleged Defaulting Party may deposit the amount in controversy (not including claimed consequential, special, exemplary or punitive damages) in escrow with any reputable third party escrow, or by interpleading the same, which amount shall remain undistributed and shall not accrue interest penalties, and no default shall be deemed to have occurred, until final decision by a court of competent jurisdiction or upon agreement by the Parties. No such deposit shall constitute a waiver of the Non-Defaulting Party's right to institute legal action for recovery of such amounts.

f. Remedies. Except as qualified by Section 9 regarding Mortgagee Protections, should a default remain uncured by the Defaulting Party beyond the applicable cure periods, the Non-Defaulting Party shall have and shall be entitled to exercise any and all remedies available to it at law or in equity, all of which remedies shall be cumulative, including the right to enforce this Agreement by injunction, specific performance or other equitable relief. Notwithstanding anything in this Agreement to the contrary or any rights or remedies Owner might have at law or in equity, if any of Grantee's Windpower Facilities are then located on the Property and Grantee fails to perform any of its non-monetary obligations hereunder, then Owner shall be limited to pursuing damages and Owner shall not commence any action to terminate or cancel this Agreement.

11. **Miscellaneous.**

a. Force Majeure. If performance of the Easement or of any obligation hereunder is prevented or substantially restricted or interfered with by reason of an event of Force Majeure (defined below), the affected Party, upon giving notice to the other Party, shall be excused from such performance to the extent of and for the duration of such prevention, restriction or interference. The affected Party shall use its reasonable efforts to avoid or remove such causes of nonperformance and shall continue performance hereunder whenever such causes are removed. **"Force Majeure"** means fire, earthquake, flood, or other casualty, condemnation or accident; strikes or labor disputes; war, civil strife or other violence; any law, order, proclamation, regulation, ordinance, action, demand or requirement of any government agency or utility; or any other act or condition beyond the reasonable control of a Party hereto.

#11 b. Confidentiality. To the fullest extent allowed by law, Owner shall maintain, and shall cause its Related Persons to maintain, in the strictest confidence, for the sole benefit of Grantee, all information pertaining to the financial terms of or payments under this Agreement, Grantee's site or product design, methods of operation, methods of construction, power production or availability of the Windpower Facilities, and the like, whether disclosed by Grantee or discovered by Owner, unless such information either (i) is in the public domain by reason of prior publication through no act or omission of Owner or its employees or agents, or (ii) was already known to Owner, at the time of disclosure and which Owner is free to use or disclose without breach of any obligation to any person or entity. To the full extent permitted by law, Owner shall

Exhibit C

not use such information for its own benefit, publish or otherwise disclose it to others, or permit its use by others for their benefit or to the detriment of Grantee.

c. Successors and Assigns. The Easement and the terms of this Agreement shall inure to the benefit of and be binding upon Owner and Grantee and, to the extent provided in any assignment or other transfer under Section 7 hereof, any Assignee, and their respective heirs, transferees, successors and assigns, and all persons claiming under them. References to Grantee in this Agreement shall be deemed to include Assignees that hold a direct ownership interest in the Easement or this Agreement and actually are exercising rights under the Easement or this Agreement to the extent consistent with such interest.

d. Grant of Easements. Owner and Grantee agree and acknowledge that the terms and conditions of this Agreement are in addition to the terms and conditions of the Grant of Easements, which terms and conditions are incorporated herein by reference.

e. Notices. All notices or other communications required or permitted by this Agreement, including payments to Owner, shall be in writing and shall be deemed given when personally delivered to Owner or Grantee, or in lieu of such personal delivery services, five (5) days after deposit in the United States mail, first class, postage prepaid, certified, addressed as follows:

If to Owner:

<Landowner Name>
<Address 1>
<Address 2>
Phone: <Insert>
Email: <Insert>

If to Grantee:

Invenergy Wind Development LLC
One South Wacker Drive
Suite 1800
Chicago, Illinois 60606
Attn: General Counsel

Any Party may change its address for purposes of this paragraph by giving written notice of such change to the other parties in the manner provided in this paragraph.

f. Entire Agreement; Amendments. This Agreement, together with all exhibits attached hereto, constitutes the entire agreement between Owner and Grantee respecting its subject matter, and supersedes any and all oral or written agreements. Any agreement, understanding or representation respecting the Property, the Easement, or any other matter referenced herein not expressly set forth in this Agreement or a subsequent writing signed by both parties is null and void. This Agreement shall not be modified or amended except in a writing signed by both parties. No purported modifications or amendments, including without limitation any oral agreement (even if supported by new consideration), course of conduct or absence of a response to a unilateral communication, shall be binding on either Party. Provided that no material default in the performance of Grantee's obligations under this Agreement shall have occurred and remain uncured, Owner shall cooperate with Grantee in amending this Agreement from time to time to include any provision that may be reasonably requested by Grantee for the purpose of implementing the provisions contained in this Agreement or for the purpose of preserving the security interest of any Assignee or Easement Mortgagee.

Exhibit D

AFCL IR-9 to Xcel Energy

Xcel's Response

☐ **Not Public Document – Not For Public Disclosure**
☐ **Public Document – Not Public Data Has Been Excised**
☒ **Public Document**

Xcel Energy		Information Request No. 9
Docket No.:	IP-6946/WS-17-410	
Response To:	Association of Freeborn County Landowners	
Requestor:	Carol A. Overland	
Date Received:	August 29, 2019	

<u>Question:</u>
Referring to Site Permit Amendment Application, Attachment J, p. 4 of 8, Freeborn Wind/Xcel states:

> As owner and operator of Project facilities, Xcel Energy will bear the financial responsibility for decommissioning activities and Project area restoration…

a. Is Xcel Energy amenable to permit condition requiring Xcel Energy to bear the financial responsibility for decommissioning activities and Project area restoration?
b. If no, why not?

<u>Response:</u>

Although the Company does not oppose including such a permit condition in principle, adding the quoted language from the Company's Decommissioning Plan as a permit condition is unnecessary. Section 11.2 of the Site Permit already requires the Company "to dismantle and remove from the site all towers, turbine generators, transformers, overhead and underground cables and lines, foundations, buildings, and ancillary equipment to a depth of four feet" and, "to the extent feasible," to "restore and reclaim the site to its pre-project topography and topsoil quality."

Preparer:	Matt Harris
Title:	Principal Attorney
Department:	General Counsel
Telephone:	612-330-7641
Date:	September 9, 2019

Exhibit E

AFCL IR-10 to Xcel Energy

Xcel's Response

☐ **Not Public Document – Not For Public Disclosure**
☐ **Public Document – Not Public Data Has Been Excised**
☒ **Public Document**

Xcel Energy		Information Request No. 10
Docket No.:	IP-6946/WS-17-410	
Response To:	Association of Freeborn County Landowners	
Requestor:	Carol A. Overland	
Date Received:	August 29, 2019	

Question:

Referring to AFCL-35, Wayne Brant Public Comment (p. 15 of lease), see also hearing testimony of Wayne Brandt, Tr. Public Hearing, p. 133-139, and lease's "Effect of Termination" clause:

> *If Grantee fails to remove such Windpower Facilities within twelve (12) months of termination of the Easement, or such longer period as Owner may provide by extension, Owner may do so, in which case grantee shall reimburse Owner for reasonable and documented costs of removal and restoration incurred by Owner.*

a. Is Xcel willing to amend participant leases to remove the lease paragraph above?
b. Is Xcel willing to amend participant leases to add the statement that "*As owner and operator of Project facilities, Xcel Energy will bear the financial responsibility for decommissioning activities and Project area restoration.*"
c. Is Xcel Energy amenable to a permit condition requiring Xcel Energy amend participant leases to release participants from financial responsibility for decommissioning activities and Project area restoration?
d. If no, why not?

Response:

a. No. This is a standard term of easement agreements with landowners, and we believe this is an important protection for landowners.
b. No. This proposed statement is unnecessary. Section 10.c. of the Easement Agreement requires the Company to, "remove above-ground and below-ground (to a depth of four (4) feet below grade) Windpower Facilities from the Property," and if the Company fails to do so within a year of terminating the easement, provides the landowner with the option to remove the same facilities and seek reimbursement from the Company. Additionally, Section 10.d of the

Exhibit E

Easement requires the Company to provide "a letter of credit, or similar financial assurance" that "secur[es] performance" of the Company's "obligation to remove the Windpower Facilities located on the Property," in an amount "equal to the estimated amount" by which "the cost of removing the Windpower Facilities exceeds the salvage value of such Windpower Facilities."

c. No. This is unnecessary for the reasons set forth above in part b.
d. See parts b and c above.

Preparer:	Matt Harris
Title:	Principal Attorney
Department:	General Counsel
Telephone:	612-330-7641
Date:	September 9, 2019

Exhibit F

Decommissioning cost estimate

Palmers Creek wind project, $7,355,822 for 18 turbines

(IP-6979/WS-17-265)

9.7.4 Construction Financing

The Applicant has already secured both construction financing through its balance sheet and parent company equity investment.

9.7.5 Permanent Financing

The Applicant has already secured both construction and permanent financing.

9.7.6 Expected Commercial Operation Date

The anticipated commercial operation date (COD) is March 2018 following installation of the permanent tap.

9.8 ENERGY PROJECTIONS

When built, the Project will have a nameplate capacity of 44.6 MW. Assuming net capacity factors of approximately 39.2 percent, projected average annual output will be approximately 153,400 MWh. Net calculations take into account, among other factors, energy losses in the gathering system, mechanical availability, array losses and system losses.

9.8.1 Proposed Array Spacing for Wind Turbines

The turbines and associated facilities will be sited on agricultural land in Chippewa County, Minnesota. The Applicant's proposed siting layout (included) optimizes wind and land resources at the site while minimizing Project impacts. The turbines will have a rotor diameter (RD) of 116 meters (380 ft.), and the Project will have, on average, east-west spacing between individual turbines of 6 RD and north-south spacing of 10 RD. A final as-built siting layout and site plan will be provided for approval prior to the pre-construction meeting.

9.8.2 Base Energy Projections

When built, the Project will have a nameplate capacity of 44.6 MW. Assuming net capacity factors of approximately 39.2 percent, projected average annual output will be approximately 153,400 MWh. Net calculations consider, among other factors, energy losses in the gathering system, mechanical availability, array losses and system losses.

9.9 DECOMMISSIONING AND RESTORATION

Decommissioning will occur at the end of the project life or facility abandonment. For the purposes of this section, "facility abandonment" shall mean the ceasing of electricity generation for a period of not less than 12 continuous months, unless the company produces evidence of mitigating circumstances. Such evidence may include long delays in spare part procurement or a force majeure event that interrupts the generation of electricity. As used here, a "force majeure" event means an instance such as fire, earthquake, flood, tornado, or other act of God and natural disasters; strikes or labor disputes; war; any law, order, proclamation, regulation, ordinance, action, demand or requirement of any government agency; suspension of operations of all or a portion of the project for overhaul, upgrade, or reconditioning; or any other act or condition beyond the reasonable control of the Project Sponsor.

All decommissioning and restoration activities will adhere to requirements of appropriate governing authorities and will be in accordance with all applicable federal, state, and local laws.

The decommissioning plan and anticipated costs shall be reviewed and updated every five years by the Applicant.

9.9.1 Anticipated Life of the Project

The expected life of the Project is approximately 30 years (leases for the Project are for the life of the PPA, with an option to upgrade turbines and extend leases for an additional 20 years).

9.9.2 Cost to Decommission

The estimated cost to decommission Palmer's Creek Wind Farm was provided by Fagen, Inc., construction contractor, in a letter dated November 16, 2016. The estimate is considered to be the current dollar value (at time of approval) of salvage value and removal costs.

The estimated salvage value of each turbine will be based upon the worst-case scenario assuming the only salvage value of the turbine is from scrapping the steel. The estimate was based upon the total weight of one turbine, which is 275 tons consisting primarily of steel. Because it does not separate the scrap value of all the constituent materials, the estimate is very conservative. Also, it is highly likely that there would be opportunities for re-sale for reuse of all or some of the turbines or turbine components.

Based on the current estimate, the cost of decommissioning is $7,385,822 with a potential scrap return value of $445,500. These anticipated costs shall be reviewed and updated every five years by the Applicant.

9.9.3 List of Decommissioning and Restoration Activities

The decommissioning and restoration process includes the removal of above- ground structures (turbines); removal of below-ground structures (foundations and underground cables); and topsoil restoration.

9.9.3.1 Wind Turbines

Dismantling the wind turbines will require the use of cranes and heavy equipment. Electronic components, controls and internal cables will be disconnected and removed. The rotor and nacelle will be lowered to the ground for disassembly. The tower sections will be lowered to the ground where they will be further disassembled for transporting. The Applicant will attempt to identify a purchaser of the intact wind turbine components. If a buyer cannot be found, the rotor, nacelle, and tower sections will be reduced to shipping dimensions for transport to an offsite facility for reconditioning, salvage, recycling, or disposal.

If resold and not scrapped, tower sections and rotors will be transported in the same manner as their delivery to the site. It is assumed that transportation costs will be the responsibility of the purchaser of the scrap material.

9.9.3.2 Transformers

Transformer removal will consist of disconnecting the electrical connection system from the base transformer. Any sellable components will be removed and transported offsite.

9.9.3.3 Turbine foundations

Turbine foundations will be excavated to a depth of 48 inches below grade to sufficiently expose and remove all anchor bolts, rebar, conduits and pedestal concrete. The excavation will be filled with clean sub-grade material, compacted to a density similar to surrounding sub-grade material, and finished with topsoil.

9.9.3.4 Substation

The Applicant does not intend to decommission the substation.

9.9.3.5 Underground Cables

All underground cables at depths less than 36 inches below finished grade will be removed. All underground cables at depths greater than 48 inches below finished grade will be abandoned in place if it is determined that their presence does not adversely impact land use and they do not pose a safety hazard.

9.9.3.6 Road Materials

All road materials will be allowed to remain on-site. All township, county, or state roads, impacted by Project decommissioning activity, if any, will be restored to original condition upon completion of decommissioning.

9.9.3.7 Soil Restoration

Soil decompaction in agricultural production areas will also occur by salvaging topsoil prior to construction and tilling soils during restoration. Once all of the above and below ground components designated for disposal or salvage have been removed, the remaining decommissioning work will consist of regrading and reseeding disturbed areas. All disturbed areas will be restored to pre-existing conditions and contours. All construction clean-up work and permanent erosion control measures will be done in accordance with the formal SWPPP for the Project.

9.9.3.8 Access

During decommissioning activities, appropriate agencies, such as Chippewa County, Department of Commerce, and other appropriate agency staff, shall have access to the site, pursuant to reasonable notice, to inspect the results of complete decommissioning. All decommissioning and restoration activities will be in accordance will all applicable federal, state, and local permits and requirements.

Exhibit G

Decommissioning cost estimate

Nobles Wind Project decommissioning cost

IP-6646/WS-09-584

414 Nicollet Mall
Minneapolis, MN 55401

February 8, 2011

—VIA ELECTRONIC FILING—

Burl W. Haar
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
St. Paul, MN 55101

RE: COMPLIANCE FILING
201 MW NOBLES WIND ENERGY PROJECT
DOCKET NO. IP-6646/WS-09-584

Dear Dr. Haar:

Northern States Power Company, a Minnesota corporation ("Xcel Energy" or "the Company"), submits to the Minnesota Public Utilities Commission (the "Commission") this compliance filing in the above-referenced matter. This filing is being made pursuant to Section G.1 of the Site Permit transferred to Xcel Energy by Commission Order dated August 25, 2010. As specified by the Commission's Order at Section G.1:

> *"…Permittee shall submit to the Commission a Decommissioning Plan documenting the manner in which the Permittee anticipates decommissioning the Project in accordance with the requirement of Minnesota Rules part 7836.0500, subp. 13…"*

DECOMMISSIONING/RESTORATION/ABANDOMENT

The Nobles Wind Energy Project ("the project") is an important part of Xcel Energy's renewable energy generation portfolio and our continued commitment to the State's and the Commission's policies of promoting renewable generation and reducing carbon emissions. The project was placed in service in December 2010 with an estimated useful project life of 25 years, resulting in an estimated decommissioning date of December 2035. However, as with all capital projects, the remaining life of the project will be periodically reassessed in the subsequent Annual Remaining Lives Filings and the possibility exists that the project will continue to operate beyond 2035.

When the Company decommissions the project site, Xcel Energy will be responsible for all costs associated with decommissioning and shall restore and reclaim the site to its pre-project topography pursuant to the terms and conditions specified in Section 11.0 of the individual landowners' Easement Agreement. Restoration activities will include and not be limited to removal of all physical material and equipment related to the project to a dept of 48 inches. The land will be restored to the condition it was in at the time the easement was granted, including returning the land to the same grade and filling the land with topsoil comparable to the topsoil that existed as of the date of signing of the landowner Easement Agreements.

To ensure that adequate recovery is made to cover future decommissioning and restoration costs, an adjustment is made to the depreciation expense calculated for the project. As part of the decommissioning process, the Company will likely salvage and recycle most of the generation equipment, material and cables, which will go toward off-setting the costs associated with decommissioning the project. The savage value of the equipment is factored into the net salvage rate.

In the 2010 Remaining Lives Filing, E002-D-10-173, the Commission approved a net salvage rate of -8.7% to be used for the project. This means that an additional 8.7% of the value of all the project's assets will be recovered as part of the ratepayers' service rate. These funds collected for removal and restoration are included in the accumulated reserve for the project, but tracked separately from the reserve for the asset itself. A conservative estimate for a decommissioning expense is approximately four-hundred forty-five thousand dollars ($445,000) per turbine (2009 dollars).[1]

Xcel Energy is a regulated utility governed by the laws of the State of Minnesota and will observe all regulatory requirements with respect to decommissioning the project including removal of all facilities and restoration of the land.

We have served a copy on the Minnesota Attorney General's Office- Residential Utilities Division and all parties on the attached service list.

---

[1] Includes allowance for salvage value and based on total dismantling cost estimate for the project of 8.7% of the total plant balance of $510,965,406, equaling an estimated dismantling cost $44.5 million or $445,000 per turbine.

We have served a copy on the Minnesota Attorney General's Office- Residential Utilities Division and all parties on the attached service list.

If you have any questions or concerns regarding this matter, please contact me at (612) 330-5641 or brian.r.zelenak@xcelenergy.com.

SINCERELY,

/s/

BRIAN R. ZELENAK
MANAGER, REGULATORY ADMINISTRATION

cc: Service Lists
- IP-6646/WS-09-584
- E002/CN-08-1437

Exhibit H

Decommissioning cost estimate

Lake Benton Decommissioning Plan

IP-6903/WS-18-179

Lake Benton Power Partners II, LLC

September 11, 2019

VIA ELECTRONIC FILING

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place E, Suite 350
St. Paul, MN 55101

Re: ***In the Matter of the Application of Lake Benton Power Partners II, LLC for a Site Permit Amendment for the up to 100.2 MW Lake Benton II Wind Farm in Pipestone County, Minnesota*, Docket No. IP-6903/WS-18-179**

Compliance filing – Section 11.1 – Decommissioning Plan

Dear Mr. Wolf:

In compliance with Section 11.1 of Lake Benton Power Partners II, LLC's ("LBII") Site Permit, LBII hereby submits its Decommissioning Plan for the repowered facility as Attachment 1. Consistent with Section 11.1, LBII is also providing the Decommissioning Plan to Pipestone County.

Section 11.1 of the LBII Site Permit states as follows:

> The Permittee shall refile the July 26, 2018 decommission plan, as revised at least forty-five 45 days prior to the start of decommissioning of the existing project.
>
> With regard to the repowered project, the Permittee shall submit a decommissioning plan to the Commission at least fourteen 14 days prior to the pre-operation meeting, and provide updates to the plan every five years thereafter.
>
> The plan shall provide information identifying all surety and financial securities established for decommissioning and site restoration of the project in accordance with the requirements of Minn. R. 7854.0500, subp. 13. The decommissioning plan shall provide an itemized breakdown of costs of decommissioning all project components, which shall include labor and equipment. The plan shall identify cost estimates for the removal of turbines, turbine foundations, underground collection cables, access roads, crane pads, substations, and other project components. The plan may also include anticipated costs for the replacement of turbines or repowering the project by upgrading equipment.

The Permittee shall also submit the decommissioning plan to the local unit of government having direct zoning authority over the area in which the project is located. The Permittee shall ensure that it carries out its obligations to provide for the resources necessary to fulfill its requirements to properly decommission the project at the appropriate time. The Commission may at any time request the Permittee to file a report with the Commission describing how the Permittee is fulfilling this obligation.

Respectfully submitted,

/s/ Brian J. Murphy

Brian J. Murphy
Managing Attorney
NextEra, Energy Resources, LLC
700 Universe Blvd.
Juno Beach, FL 33408
(561) 694-3814
Brian.J.Murphy@nee.com

ATTACHMENT 1

LBII DECOMMISSIONING PLAN

DECOMMISSIONING PLAN

Lake Benton II Wind Energy Facility

Lake Benton Power Partners II, LLC

September 11, 2019

Exhibit H

<u>Decommissioning Plan for the Lake Benton II Wind Energy Facility</u>

1.0 INTRODUCTION

1.1 Background

Lake Benton Power Partners II, LLC ("LBII") has prepared this Decommissioning Plan ("Plan") to provide documentation of activities necessary to decommission the Lake Benton II Wind Energy Facility (Project) and restore the Project area in accordance with the requirements of Minn. R7854.0500, subp.13.

On May 3, 2018, LBII filed an application with the Minnesota Public Utilities Commission ("Commission") to construct and operate the repowered 100.2 megawatt ("MW") wind energy facility (MPUC Docket Number: IP-6903/WS-18-179). The proposed Project includes the installation of up to 44 wind turbines, associated access roads, underground collection system, an operations and maintenance facility, and associated facilities. A Site Permit for the repowered facility was granted by the Commission on May 30, 2019.

1.2 Anticipated Life of the Project

LBII expects the Project to be in service for 25 years. This estimate is based on LBII's experience operating projects, turbine models, and technology.

2.0 DECOMMISSIONING AND RESTORATION

2.1 Decommissioning Preparation Activities

The wind farm will be disconnected from the gird to allow for the safe dismantling of the Project.

2.2 Removal of Facilities

<u>2.2.1 Turbines and MET Towers</u>

The disassembly and removal of this equipment will essentially be the same as its installation, but in reverse order. For turbines, the rotor (hub and blades) are removed from the nacelle and, with the help of a smaller crane, turned horizontally and set on the ground. Next, the nacelle will be removed from the top of the tower, followed by each portion of the tower. Once the turbine rotor has been removed, a crew and small crane will disassemble it into the hub and three loose turbine blades. When the rotor is disassembled, the blades will be placed into a carrying frame, which can then be loaded onto a truck for removal from the site. The hub can also be removed once it is disassembled from the blades. Turbine foundations will be removed to a depth of four feet. LBII will work with landowners regarding whether the landowner prefers to keep extracted concrete on their property. If landowners prefer to keep extracted concrete, the concrete will be crushed and provided to the landowner.

MET towers will also be removed in a similar fashion to the turbines. A small crane will be used to dismantle the structures from the top down and will be loaded onto trucks to be removed from the site.

2.2.2 Access Roads

LBII will work with landowners regarding whether the landowner prefers to keep the access road in place. In the event landowners do not want to keep the access road, or portions thereof, the access roads will be removed and the land will be restored.

2.2.3 Underground Collection and Pad Mounted Transformers

Where feasible, all underground collection lines buried above four feet below the surface will be removed. Underground collection buried greater than four feet below the surface will be abandoned in place unless requested by the landowner or other entity. LBII will work with landowners or applicable entities to determine if underground collection lines may be abandoned in place when located above four feet below the surface to minimize impacts to the environment. If the cables are to be removed, a trench will be opened and the cables pulled out. The cables will be cut into manageable sections and removed from the site.

Pad mounted transformers will be disconnected from the collection system and wind turbine generators once the electrical system has been shut off and hauled offsite. The concrete pads will be crushed and either hauled offsite or provided to the landowner, if requested.

2.2.4 Collection Substation and O&M

All above ground structures at the collection substation including the conductors, switches, transformers, fencing, and other components will be dismantled and removed from the site. Additionally, the structures at the Project O&M facilities will be removed. All concrete foundations will be crushed and either hauled offsite or provided to the landowner, if requested. Where feasible, all underground infrastructure associated with the substation or O&M, including underground conduits and grounding wires, will also be removed to a depth of four feet, unless it has been negotiated with the landowner that this infrastructure may be abandoned in place.

2.3 Salvage and Disposal

After dismantling the Project, high value components will be removed for scrap value. The remaining materials will be left on the landowner property where expressly requested by the landowner, or will be reduced to transportable size and removed from the site for disposal. Materials will be disposed where disposal is permitted and where there is capacity for the disposal. Generally, turbines, transformers, electrical components, and towers are refurbished and resold or are recycled for scrap. All unsalvageable materials will be disposed of at authorized sites in accordance with applicable regulations. Decommissioning of the existing turbines will include removal and transport of generators and towers offsite to disposal facilities and/or sale of towers and generators.

2.4 Restoration

Following the dismantling and removal of Project infrastructure, LBII will return the Project Area as close to preconstruction conditions as reasonable. LBII will implement the following:

- All areas where existing infrastructure has been removed will be graded and reseeded, as Appropriate.
    - LBII will coordinate with local NRCS staff to revegetate non-cropland and pasture areas disturbed during decommissioning with native seed mixes appropriate to the region. Reseeding with native seed mixtures will be used on restoration areas except in cropland areas and in areas where landowners indicate preference for other seeding plans. Reseeding of cropland areas will be conducted in coordination with the landowner.
    - After removal of all foundation materials, the areas will be filled with clean compatible sub-grade material compacted to a density similar to the surrounding sub-grade material.
- Topsoil will be removed prior to removal of structures from all work areas and stockpiled and separated from other excavated material. The topsoil will be replaced to original depth and original surface contours reestablished where possible. Any topsoil deficiency and trench settling shall be mitigated with imported topsoil consistent with the quality of the affected site
- Areas compacted by equipment used in the decommissioning may be tilled in a manner adequate to restore the topsoil and subgrade material to a density consistent with the surrounding areas and then will be reseeded. The depth of compaction relief will depend on site-specific conditions.

3.0 COST ESTIMATE

1.0 Turbines and Towers		**Cost Estimate**
	1.1 Dismantle Turbine & Towers	$ 5,000,000
	1.2 Removal of Transformers	$ 200,000
2.0 Tower Foundations		
	2.1 Foundation Removal, Disposal and Grading	$ 1,200,000
	2.2 Transformer Pad Removal and Disposal	$ 125,000
3.0 Other Structures		
	3.1 MET Towers, O&M Building Salvage, Fence Removal	$ 50,000
	3.2 Grading	$ 100,000
4.0 Tower Access and Site Roads		
	4.1 Remove Access Roads	$ 1,000,000
5.0 Collection System		
	5.1 Remove Collection System Terminations	$ 200,000
6.0 Substation		
	6.1 Substation Foundations, Fence, Steel and Grading	$ 300,000
	6.2 Substation Equipment	$ 200,000
7.0 Mobilization/Demobilization		
	7.1 Mobilization/Demobilize	$ 300,000
8.0 Project Salvage Value		
	8.1 Project Steel Salvage Value	($ 2,200,000)
	TOTAL:	**$ 6,475,000**

4.0 DECOMMISSIONING SECURITY

LBII will establish performance bonds with Pipestone County for the total amount of infrastructure located within those communities.

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

In the Matter of the Application of Lake Benton Power Partners II, LLC for a Site Permit Amendment for the up to 100.2 MW Lake Benton II Wind Farm in Pipestone County, Minnesota	)))))))	MPUC Docket Nos. IP-6903/WS-18-179 **CERTIFICATE OF SERVICE**

The undersigned hereby certifies that true and correct copies of the **Lake Benton Power Partners II, LLC's Compliance filing – Section 11.1 – Decommissioning Plan** was served upon the following:

Name	Email/Address	Delivery Method
Generic – Commerce Attorneys	commerce.attorneys@ag.state.mn.us	Electronic
Ian Dobson	residential.utilities@ag.state.mn.us	Electronic
Sharon Ferguson	sharon.ferguson@state.mn.us	Electronic
Danell Herzig	danell.herzig@neteraenergy.com	Electronic
Brian Meloy	brian.meloy@stinson.com	Electronic
Brian J. Murphy	Brian.J.Murphy@nee.com	Electronic
Stephan Roos	Stephan.roos@state.mn.us	Electronic
Daniel P. Wolf	dan.wolf@state.mn.us	Electronic

Dated this 11th day of September, 2019.

/s/ Joel T. Baker
JOEL T. BAKER

Exhibit H

Exhibit I

Decommissioning cost estimate

Pleasant Valley decommission cost estimate

IP-6828/WS-09-1197

414 Nicollet Mall
Minneapolis, MN 55401

October 16, 2015

—VIA ELECTRONIC FILING—

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
St. Paul, MN 55101

RE: COMPLIANCE FILING
PLEASANT VALLEY WIND, LLC
DOCKET NO. IP-6828/WS-09-1197

Dear Mr. Wolf:

Northern States Power Company, a Minnesota corporation ("Xcel Energy" or "the Company"), submits to the Minnesota Public Utilities Commission (the "Commission") this compliance filing in the above-referenced matter. This filing is being made pursuant to Section 9.1 of the Large Wind Energy Conversion System (LWECS) Site Permit (as amended) for Pleasant Valley Wind, LLC (PVW) which requires a decommissioning plan be prepared and submitted to the Commission documenting the manner in which PVW anticipates decommissioning the Pleasant Valley Wind Project (the project.)

Xcel Energy is under contract to purchase PVW, and will own and operate the project at the commencement of commercial operations.[1] Xcel Energy has shared this filing with RES Americas, the developer of PVW; to ensure that all parties agree that the plan being filed is consistent with discussions they had during the development of the plan.

[1] See *In the Matter of the Petition of Xcel Energy for Approval of the Acquisition of 600 MW of Wind Generation,* Docket No. E-002/M-13-603, Order Approving Acquisition with Conditions (December 13, 2013)

DECOMMISSIONING/RESTORATION/ABANDOMENT

The Pleasant Valley Wind Project ("the project") is an important part of Xcel Energy's renewable energy generation portfolio and our continued commitment to the State's and the Commission's policies of promoting renewable generation and reducing carbon emissions. The project is expected be placed in service in late fall 2015 with an estimated useful project life of 25 years[2], resulting in an estimated decommissioning date of October 2040. However, as with all capital projects, the remaining life of the project will be periodically reassessed in the subsequent Annual Remaining Lives filings; the possibility exists that the project will continue to operate beyond 2040.

When the Company decommissions the project site, Xcel Energy will be responsible for all costs associated with decommissioning and shall restore and reclaim the site to its pre-project topography pursuant to the terms and conditions specified in the individual landowners' Easement Agreement. Restoration activities will include and not be limited to removal of all physical material and equipment related to the project to a depth of 48 inches. The land will be restored to the condition it was in at the time the easement was granted, including returning the land to the same grade and filling the land with topsoil comparable to the topsoil that existed as of the date of signing of the landowner Easement Agreements.

To ensure that adequate recovery is made to cover future decommissioning and restoration costs, an adjustment is made to the depreciation expense calculated for the project. As part of the decommissioning process, the Company will likely salvage and recycle most of the generation equipment, material and cables, which will go toward off-setting the costs associated with decommissioning the project. The salvage value of the equipment is factored into the net salvage rate.

In the 2015 Remaining Lives Filing, E002-D-15-0046, the Company requested that the Commission approve a net salvage rate of -8.5 percent to be used for the Project. This means that an additional 8.5 percent of the value of all the project's assets will be recovered as part of the ratepayers' service rate. These funds collected for removal and restoration are included in the accumulated reserve for the project, but tracked separately from the reserve for the asset itself. There are currently no site-specific

[2] See *In the Matter of the Application of Northern States Power Company for Authority to Increase Rates for Electric Service in Minnesota,* Docket No. E002/GR-13-868, DIRECT TESTIMONY AND SCHEDULES OF LISA H. PERKETT, Page 28, Lines 9-12 (November 4, 2013)

studies to rely on for the Project since it remains under construction, but the net salvage rates of other wind facilities owned by Xcel Energy were used as a guideline for the 2015 Annual Review of the Remaining Lives filing. A conservative estimate for a decommissioning expense is approximately two-hundred ninety thousand dollars ($290,000) per turbine (2015 dollars)[3].

Xcel Energy is a regulated utility governed by the laws of the State of Minnesota and will observe all regulatory requirements with respect to decommissioning the project including removal of all facilities and restoration of the land.

We have served a copy on the Minnesota Attorney General's Office- Residential Utilities Division and all parties on the attached service list.

If you have any questions or concerns regarding this matter, please contact me at amy.s.fredregill@xcelenergy.com or (612) 215-5367.

SINCERELY,

/s/

Amy S. Fredregill
Manager Resource Planning & Strategy

---

[3] Includes allowance for salvage value and based on total dismantling cost estimate for the project of 8.5% of the total plant balance of $341,505,777, equaling an estimated dismantling cost $29.0 million or $290,000 per turbine.

Exhibit J

Freeborn Wind Hearing Exhibit AFCL 21, IR 16, Dan Litchfield response

January 12, 2018

LEGALECTRIC
1110 WEST AVENUE
RED WING, MN 55066
(612) 227-8638
OVERLAND@LEGALECTRIC.ORG

Freeborn Wind Project - Information Request #16 to Freeborn Wind

Docket Number: PUC Docket No.: IP-6946/WS-17-410 Request Date: January 2, 2018
OAH Docket No.: 80-2500-34633 ☐NonPublic ☒Public

Requested From: Freeborn Wind, Christina Brusven & Lisa Agrimonti, Attorneys for Freeborn Wind

Party Requesting Information: Carol A. Overland for Assoc. of Freeborn Co. Landowners

If you feel your responses are trade secret or privileged, please indicate this on your response.

Request No.	**Freeborn Wind Project**

16. Referring to Freeborn Application, p. 110:

10.10.2 Cost to Decommission

Project decommissioning has not yet been determined. The Applicant will create a thorough decommissioning cost estimate prior to construction begins as part of a decommissioning plan.

10.10.3 Method of Ensuring Funds Will Be Available for Decommissioning and Restoration

Sufficient funds will be set aside to fund Project decommissioning and site restoration efforts following the cessation of Project operation. These funds will be supplemental to the extent that the salvage value of Project facilities do not cover final decommissioning costs. Availability of funds will be discussed in the decommissioning plans.

Please produce decommissioning plan, complete with estimate of funds needed, in addition to salvage value, for decommissioning.

How will funds be set aside? Held by what entity? A bond, insurance, deposit with Commission, or some other means?

EXHIBIT
tabbies
AFCL-21
Exhibit J

What assurance does applicant provide that if LLC should go bankrupt, be sold or transferred, or dissolve, that decommissioning fund would be available?

How would spending of decommissioning fund be authorized?

If "The Project" re-evaluates and/or updates decommissioning alternatives, costs, and/or funding, what efforts will be made to notify the Commission, participants, interested parties, and the public?

These requests are continuing, and if new or additional information is discovered, please supplement your responses as soon as possible.

Electronic format preferred, via email or CD/flash drive.

Response:

Freeborn Wind will comply with the terms of the Site Permit as it relates to the preparation, content and distribution of a decommissioning plan. See Section 11.0 of the Draft Site Permit.

Response Date: January 12, 2018

Response by: Dan Litchfield