

SHADOW FLICKER ANALYSIS REPORT

Dakota Range III Wind Project Roberts & Grant Counties, South Dakota

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1.0 EXECUTIVE SUMMARY

The Dakota Range III Wind Project (the Project) is a proposed wind power electric generation facility expected to consist of up to 36 wind turbines in Roberts and Grant Counties, South Dakota. Epsilon Associates, Inc. (Epsilon) has been retained by Dakota Range III, LLC (DRIII) to conduct a shadow flicker modeling study for the Project. This report presents results of the study.

Shadow flicker modeling was conducted for 36 turbines. All wind turbines for this Project are proposed to be Goldwind GW136-4.2 units. The purpose of this assessment is to predict the expected annual duration of shadow flicker at modeled locations in the vicinity of the Project due to the operation of the proposed wind turbines and to evaluate the Project with respect to the shadow flicker requirements in the Roberts and Grant County regulations.

Using the Project specific data provided by DRIII, the annual expected duration of shadow flicker was modeled at occupied and unoccupied structures, all conservatively modeled as “sensitive receptors”. In Roberts County, the maximum expected annual shadow flicker resulting from the operation of the proposed wind turbines is 34 hours, 31 minutes. This occurs at a participating receptor. There are four (4) other receptors modeled to experience over 30 hours of annual shadow flicker, and all are participating. The maximum expected annual flicker at a non-participating receptor in Roberts County is 24 hours, 17 minutes. The Project complies with the shadow flicker regulation in Roberts County.

In Grant County, the maximum expected annual duration of shadow flicker at a sensitive receptor resulting from the operation of the proposed wind turbines is 66 hours, 11 minutes. This receptor is a participating receptor. There are 30 other receptors modeled to experience over 30 hours of annual shadow flicker, and all are participating. The maximum expected annual flicker at a non-participating receptor in Grant County is 23 hours, 31 minutes. Therefore, the Project complies with the shadow flicker regulation in Grant County.

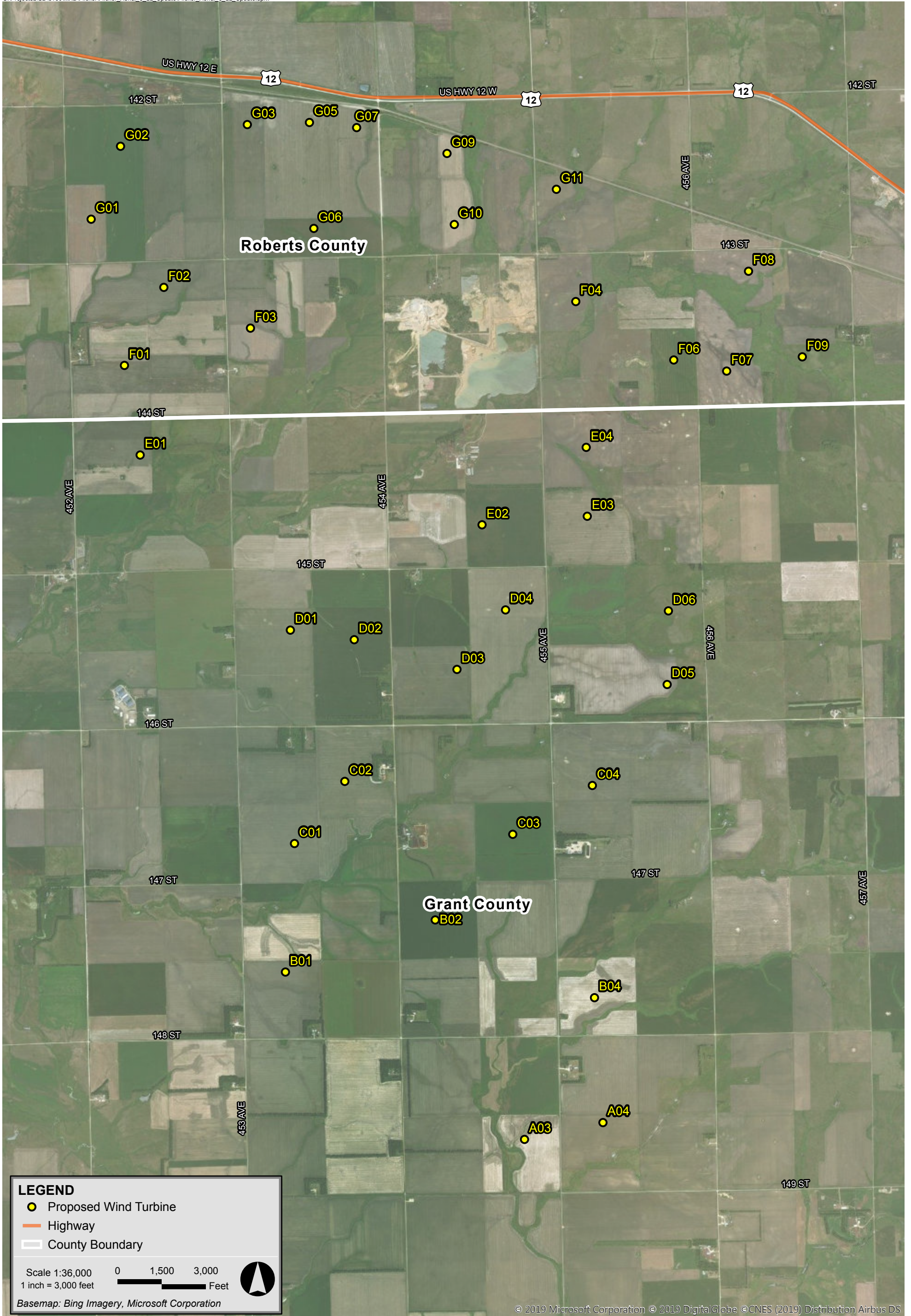
The modeling results are conservative in that modeling receptors were treated as “greenhouses”, i.e. there was a window on each side of a building, and the surrounding area was assumed to be without vegetation or structures (“bare earth”).

2.0 INTRODUCTION

The Dakota Range III Wind Project to be located in Roberts and Grant Counties, South Dakota will consist of 36 wind turbines. The wind turbines will be Goldwind GW136-4.2 units. The GW136-4.2 wind turbines have a hub height of 110 meters and a rotor diameter of 136 meters. Figure 2-1 shows the locations of the 36 proposed wind turbines over aerial imagery in Roberts and Grant Counties.

With respect to wind turbines, shadow flicker can be defined as an intermittent change in the intensity of light in a given area resulting from the operation of a wind turbine due to its interaction with the sun. While indoors, an observer experiences repeated changes in the brightness of the room as shadows cast from the wind turbine blades briefly pass by windows as the blades rotate. In order for this to occur, the wind turbine must be operating, the sun must be shining, and the window must be within the shadow region of the wind turbine, otherwise there is no shadow flicker. A stationary wind turbine only generates a stationary shadow similar to any other structure.

This report presents the findings of a shadow flicker modeling analysis for the Project. The wind turbines were modeled with the WindPRO software package using information provided by DRIII. The expected annual duration of shadow flicker was calculated at discrete receptor points and shadow flicker isolines for the area surrounding the Project were generated. The results of this analysis are found within this report.



Dakota Range III Roberts County/Grant County, South Dakota

3.0 REGULATIONS

3.1 Federal Regulations

There are no federal shadow flicker regulations applicable to this Project.

3.2 State Regulations

There are no state shadow flicker regulations applicable to this Project.

3.3 Local Regulations

3.3.1 Roberts County

The section of the proposed Dakota Range III Wind Project within Roberts County, SD is subject to the following shadow flicker requirements in Section 1603.03(10) of Ordinance #20 of Roberts County, Flicker Analysis subsection of General Provisions for Wind Energy System (WES) Requirements:

A Flicker Analysis shall include the duration and location of flicker potential for all schools, churches, businesses and occupied dwellings within a one (1) mile radius of each turbine within a project. The applicant shall provide a site map identifying the locations of shadow flicker that may be caused by the project and the expected durations of the flicker at these locations from sun-rise to sun-set over the course of a year. The analysis shall account for topography but not for obstacles such as accessory structures and trees. Flicker at any receptor shall not exceed thirty (30) hours per year within the analysis area.

Subsection (a) of the Flicker Analysis section provides exceptions to the county limit:

The Board of Adjustment may allow for a greater amount of flicker than identified above if the participating or non-participating landowners agree to said amount of flicker. If approved, such agreement is to be recorded and filed with the Roberts County Zoning Officer. Said agreement shall be binding upon the heirs, successors, and assigns of the title holder and shall pass with the land.

Therefore, the schools, churches, businesses and occupied dwellings within a one (1) mile radius of each turbine within the Project in Roberts County were evaluated in this analysis against the 30 hours per year limit.

3.3.2 Grant County

The section of the proposed Dakota Range III Wind Project within Grant County, SD is subject to the following shadow flicker requirements in Section 1211.04(9) of the Grant County Compiled Zoning Ordinances, Flicker Analysis subsection of General Provisions for Wind Energy System (WES) Requirements:

A Flicker Analysis shall include the duration and location of flicker potential for all schools, churches, businesses and occupied dwellings within a one (1) mile radius of each turbine within a project. The applicant shall provide a site map identifying the locations of shadow flicker that may be caused by the project and the expected durations of the flicker at these locations from sun-rise to sun-set over the course of a year. The analysis shall account for topography but not for obstacles such as accessory structures and trees. Flicker at any receptor shall not exceed thirty (30) hours per year within the analysis area.

Subsection (a) of the Flicker Analysis section provides exceptions to the county limit:

The Board of Adjustment may allow for a greater amount of flicker than identified above if the participating or non-participating landowners agree to said amount of flicker. If approved, such agreement is to be recorded and filed with the Grant County Register of Deeds. Said agreement shall be binding upon the heirs, successors, and assigns of the title holder and shall pass with the land.

Therefore, the schools, churches, businesses and occupied dwellings within a one (1) mile radius of each turbine within the Project in Grant County were evaluated in this analysis against the 30 hours per year limit.

4.0 SHADOW FLICKER MODELING

4.1 Modeling Methodology

Shadow flicker was modeled using a software package, WindPRO version 3.2. WindPRO is a software suite developed by EMD International A/S and is used for assessing potential environmental impacts from wind turbines. Using the Shadow module within WindPRO, worst-case shadow flicker in the area surrounding the wind turbines was calculated based on data inputs including: location of the wind turbines, location of discrete receptor points, wind turbine dimensions, flicker calculation limits, and terrain data. Based on these data, the model was able to incorporate the appropriate sun angle and maximum daily sunlight for this latitude into the calculations. The resulting worst-case calculations assume that the sun is always shining during daylight hours and that the wind turbine is always operating. The WindPRO Shadow module can be further refined by incorporating sunshine probabilities and wind turbine operational estimates by wind direction over the course of a year. The values produced by this further refinement, also known as the “expected” shadow flicker, are presented in this report.

The proposed wind turbine layout for the Project dated August 12, 2019 was provided by DRIII. Locations of the turbines are shown in Figure 4-1 and the coordinates are provided in Appendix A. All wind turbines are proposed to be Goldwind GW136-4.2 units with a 110 meter hub height and a 136 meter rotor diameter. Each wind turbine has the following characteristics based on the technical data provided by DRIII:

		<u>Goldwind GW136-4.2</u>
◆ Rated Power	=	4,200 kW
◆ Hub Height	=	110 meters
◆ Rotor Diameter	=	136 meters
◆ Cut-in Wind Speed	=	2.5 m/s
◆ Cut-out Wind Speed	=	25 m/s
◆ Maximum RPM	=	11.2 rpm

To-date, there are no federal, state, or local regulations regarding the maximum radial distance from a wind turbine to which shadow flicker should be analyzed applicable to this Project. In the United States, shadow flicker is commonly evaluated out to a distance of ten times the rotor diameter because this is the generally accepted distance beyond which shadow flicker impacts are minimal. For this Project, ten times the rotor diameter of the proposed wind turbine corresponds to a distance of 0.85 miles (1,360 m). Conservatively, this analysis includes shadow flicker calculations out to 1.25 miles (2,012 m) from each wind turbine in the model for the proposed layout.

A modeling receptor dataset was provided by DRIII on March 21, 2019. This dataset included 204 occupied and 369 unoccupied structures. The total 573 receptors from this dataset (210 in Roberts County, 363 in Grant County) were input into the model. These

were all conservatively treated as sensitive receptors and modeled as discrete points and are shown on Figure 4-1. Each modeling point was assumed to have a window facing all directions (“greenhouse” mode) which yields conservative results. Participation status for each of the 573 modeling receptors was assigned based on information provided in the dataset. The receptors are indicated as either participating or non-participating on Figure 4-1. The model was set to limit calculations to 2,012 meters from a wind turbine, the equivalent of 1.25 miles. Consequently, shadow flicker at any of the 573 modeling receptors greater than the corresponding limitation distance from a wind turbine was zero. In addition to modeling discrete receptors, shadow flicker was calculated at grid points in the area surrounding the modeled wind turbines to generate flicker isolines. A 20-meter spacing was used for this grid.

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. Conservatively, obstacles, i.e. buildings and vegetation, were excluded from the analysis. This is effectively a “bare earth” scenario which is conservative. When accounted for in the shadow flicker calculations, such obstacles may significantly mitigate or eliminate the flicker effect depending on their size, type, and location. In addition, shadow flicker durations were calculated only when the angle of the sun was at least 3° above the horizon.

Monthly sunshine probability values were input for each month from January to December. These numbers were obtained from a publicly available historical dataset for Huron, South Dakota from the National Oceanic and Atmospheric Administration’s (NOAA) National Centers for Environmental Information (NCEI).¹ Table 4-1 shows the percentage of sunshine hours by month used in the shadow flicker modeling. These values are the percentages that the sun is expected to be shining during daylight hours.

The number of hours the wind turbines are expected to operate for the 16 cardinal wind directions was input into the model. The number of operational hours per wind direction sector for a hub height of 105 meters was provided by DRIII. Wind conditions at a hub height of 110 meters are expected to be comparable. These hours per wind direction sector are used by WindPRO to estimate the “wind direction” and “operation time” reduction factors. Based on this dataset, the wind turbines would operate 96% of the year. Table 4-2 shows the distribution of operational hours for the 16 wind directions.

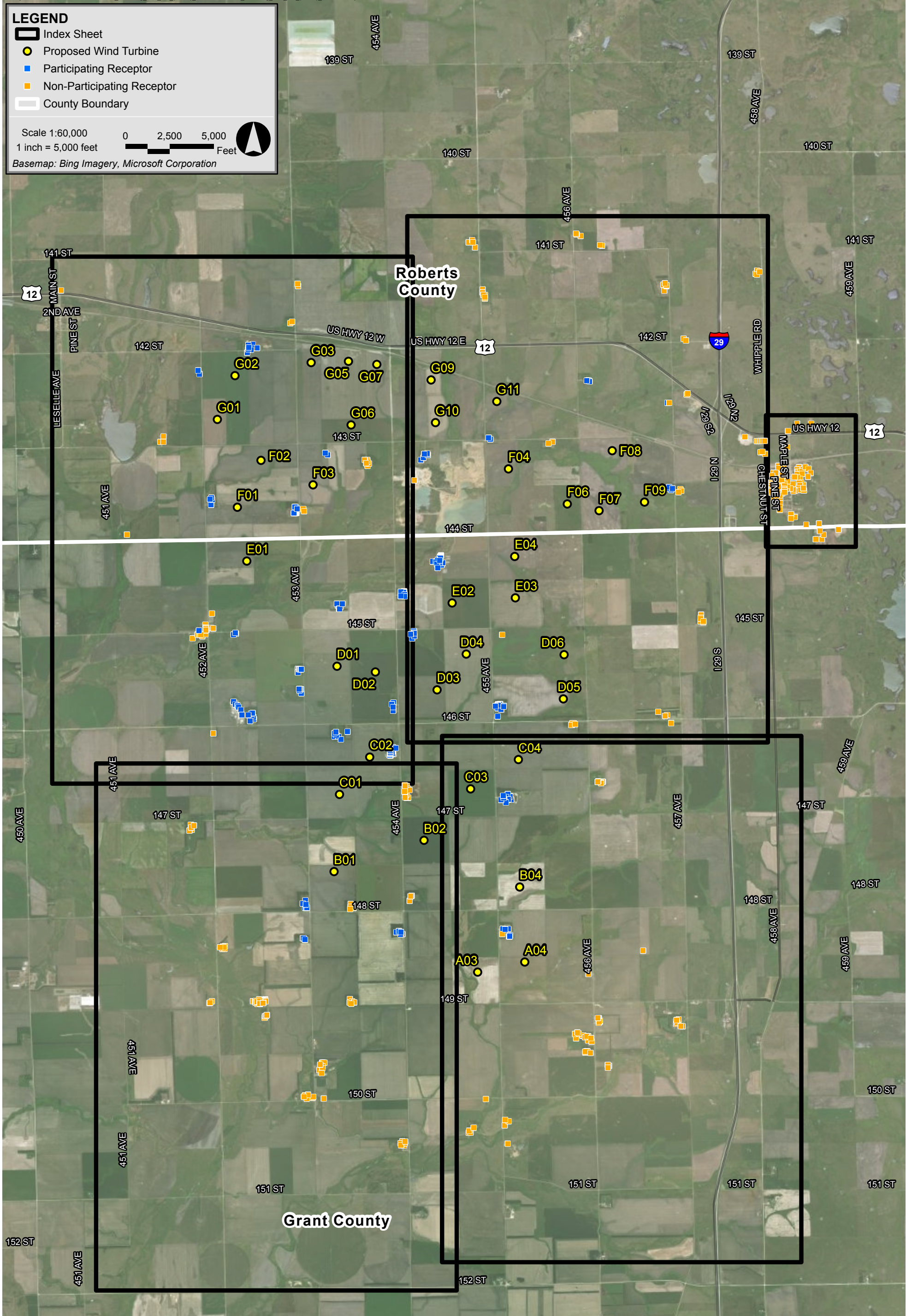
¹ NCEI (formerly NCDC), <http://www1.ncdc.noaa.gov/pub/data/ccd-data/pctpos15.dat>. Accessed in August 2019.

Table 4-1 Monthly Percent of Possible Sunshine

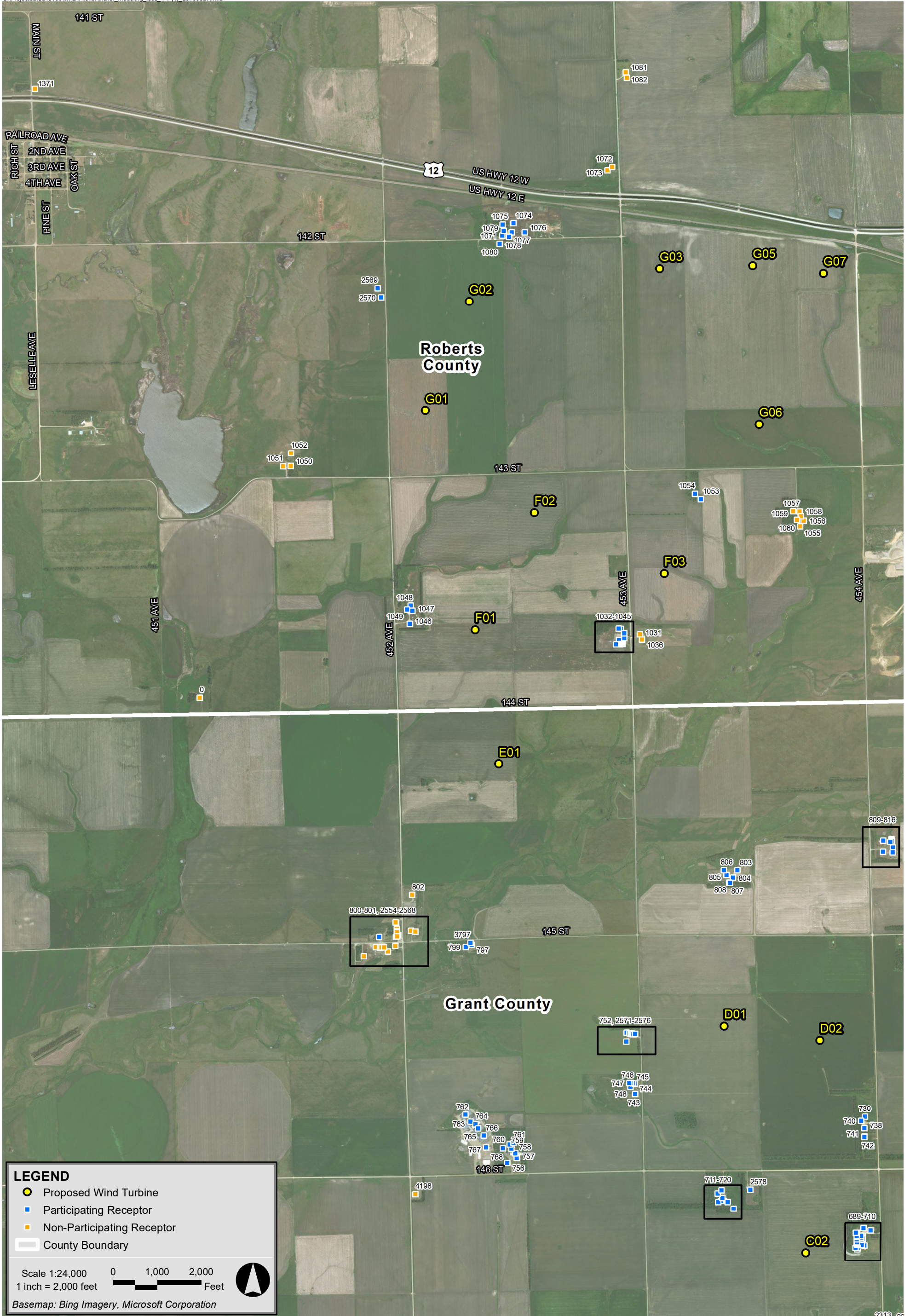
Month	Possible Sunshine
January	62%
February	62%
March	62%
April	59%
May	66%
June	69%
July	76%
August	74%
September	69%
October	59%
November	51%
December	51%

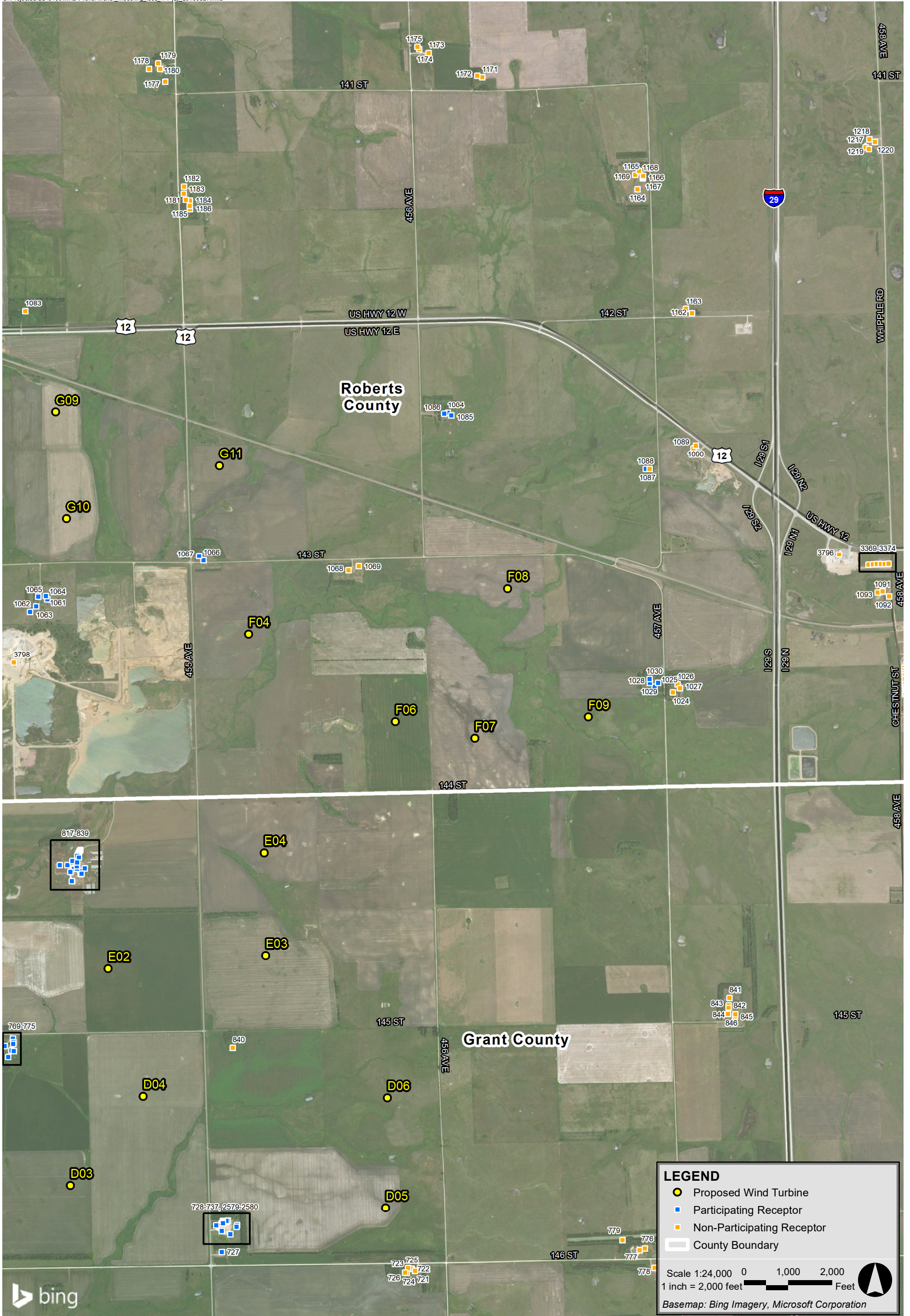
Table 4-2 Operational Hours per Wind Direction Sector

Wind Sector	Operational Hours
N	522
NNE	574
NE	364
ENE	279
E	349
ESE	428
SE	415
SSE	357
S	582
SSW	650
SW	498
WSW	498
W	520
WNW	687
NW	881
NNW	785
Annual	8,391



Dakota Range III Roberts County/Grant County, South Dakota





Dakota Range III Roberts County/Grant County, South Dakota







Dakota Range III Roberts County/Grant County, South Dakota

4.2 Results

Following the modeling methodology outlined in Section 4.1, WindPRO was used to calculate shadow flicker at the 573 discrete receptor points in Roberts and Grant Counties and generate shadow flicker isolines based on the grid calculations.

Table B-1 in Appendix B presents the shadow flicker modeling results for the 210 receptors in Roberts County. The predicted expected annual shadow flicker duration at the occupied and unoccupied receptors ranged from 0 hours, 0 minutes per year to 34 hours, 31 minutes per year. The majority of the receptors in Roberts County (142) were predicted to experience no annual shadow flicker. Eighteen (18) locations were predicted to experience some shadow flicker but less than 10 hours per year. The modeling results showed that 45 locations would be expected to have 10 to 30 hours of shadow flicker per year, while five (5) locations would be expected to have over 30 hours of shadow flicker per year. All of these receptors are participating receptors. The maximum annual duration of shadow flicker at a non-participating sensitive receptor in Roberts County (#1026) is 24 hours, 17 minutes. Figure 4-2 displays the modeled flicker isolines over aerial imagery in relation to modeled wind turbines and receptors.

Table B-2 in Appendix B presents the shadow flicker modeling results for the 363 receptors in Grant County. The predicted expected annual shadow flicker duration at the occupied and unoccupied receptors ranged from 0 hours, 0 minutes per year to 66 hours, 11 minutes per year. Many of the receptors (174) in Grant County were predicted to experience no annual shadow flicker. One hundred and eight (108) locations were predicted to experience some shadow flicker but less than 10 hours per year. The modeling results showed that 68 locations would be expected to have 10 to 30 hours of shadow flicker per year while 31 locations would be expected to have over 30 hours of shadow flicker per year. All of these receptors are participating receptors. The maximum annual duration of shadow flicker at a non-participating sensitive receptor in Grant County (#840) is 23 hours, 31 minutes. Figure 4-2 displays the modeled flicker isolines over aerial imagery in relation to modeled wind turbines and receptors.

5.0 EVALUATION

5.1 Roberts County

Five (5) out of 210 modeling receptors in Roberts County were predicted to experience over 30 hours per year of shadow flicker from the proposed wind turbine layout. All of these receptors are unoccupied participating receptors. The maximum annual duration of shadow flicker at a receptor in Roberts County (#1080) is 34 hours, 31 minutes. The maximum annual duration of shadow flicker at a non-participating receptor in Roberts County (#1026) is 24 hours, 17 minutes. The Project meets the regulatory limit of 30 hours per year of shadow flicker in Roberts County.

5.2 Grant County

Thirty-one (31) out of 363 modeling receptors in Grant County were predicted to experience over 30 hours per year of shadow flicker from the proposed wind turbine layout. All of these receptors are participating receptors and 29 are unoccupied. The maximum annual duration of shadow flicker at a receptor in Grant County (#702) is 66 hours, 11 minutes. The maximum annual duration at a non-participating receptor in Grant County (#727) is 23 hours, 31 minutes. The Project meets the regulatory limit of 30 hours per year of shadow flicker in Grant County.

6.0 CONCLUSIONS

A shadow flicker analysis was conducted to determine the duration of shadow flicker in the vicinity of the proposed Dakota Range III Wind Project within Roberts and Grant Counties, SD. Shadow flicker resulting from the operation of the proposed wind turbine layout was calculated at 573 sensitive receptors, and isolines were generated from a grid encompassing the area surrounding the wind turbines.

In Roberts and Grant Counties shadow flicker from a wind energy system is limited to 30 hours per year at schools, churches, businesses and occupied dwellings.

Five (5) out of 210 modeling receptors in Roberts County were predicted to experience over 30 hours per year of shadow flicker from the proposed wind turbine layout. All of these receptors are unoccupied participating receptors. The maximum annual duration of shadow flicker at a non-participating receptor in Roberts County (#1026) is 24 hours, 17 minutes; therefore, the Project complies with the shadow flicker regulation in Roberts County.

Thirty-one (31) out of 363 modeling receptors in Grant County were predicted to experience over 30 hours per year of shadow flicker from the proposed wind turbine layout. All of these receptors are participating receptors and 29 are unoccupied. The maximum annual duration at a non-participating receptor in Grant County (#727) is 23 hours, 31 minutes; therefore, the Project complies with the shadow flicker regulation in Grant County.

The modeling results are conservative in that modeling receptors were treated as “greenhouses” and the surrounding area was assumed to be without vegetation or structures (“bare earth”).

Appendix A

Wind Turbine Coordinates

Table A-1: Wind Turbine Coordinates (Layout Date: August 12, 2019)

Wind Turbine ID	Coordinates NAD83 UTM Zone 14N (meters)	
	X (Easting)	Y (Northing)
A03	648550.55	5010167.89
A04	649361.55	5010341.75
B01	646078.29	5011898.34
B02	647627.16	5012437.01
B04	649274.15	5011633.29
C01	646172.00	5013227.00
C02	646692.12	5013869.38
C03	648428.99	5013322.19
C04	649252.00	5013827.00
D01	646129.26	5015433.54
D02	646789.72	5015334.55
D03	647852.00	5015027.00
D04	648354.10	5015642.49
D05	650025.44	5014871.27
D06	650038.45	5015632.43
E01	644576.16	5017243.74
E02	648111.37	5016522.39
E03	649199.33	5016610.85
E04	649188.49	5017323.04
F01	644413.60	5018170.33
F02	644820.83	5018977.35
F03	645716.57	5018555.79
F04	649080.58	5018830.64
F06	650093.66	5018226.66
F07	650640.88	5018111.76
F08	650820.16	5019104.17
F09	651423.03	5018259.05
G01	644069.37	5019682.13
G02	644372.97	5020436.04
G03	645711.50	5020663.11
G05	646326.44	5020682.18
G06	646372.00	5019587.00
G07	646814.64	5020629.19
G09	647748.85	5020361.86
G10	647824.65	5019627.47
G11	648880.05	5019991.34

Appendix B

Shadow Flicker Modeling Results: Sensitive Receptors

Table B-1: Shadow Flicker Modeling Results at Sensitive Receptors in Roberts County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
0	642512.13	5017700.01	Non-Participating	Yes	1:24
669	654426.49	5017892.36	Non-Participating	Yes	0:00
670	654209.18	5017869.34	Non-Participating	Yes	0:00
956	654009.01	5018003.84	Non-Participating	Yes	0:00
957	653947.62	5018047.23	Non-Participating	Yes	0:00
958	653727.49	5018884.37	Non-Participating	Yes	0:00
959	653644.94	5018764.78	Non-Participating	Yes	0:00
960	653647.06	5018716.10	Non-Participating	Yes	0:00
961	653686.22	5018751.02	Non-Participating	Yes	0:00
962	653727.49	5018733.03	Non-Participating	Yes	0:00
963	653732.78	5018803.94	Non-Participating	Yes	0:00
964	653775.12	5018820.87	Non-Participating	Yes	0:00
965	653779.35	5018775.37	Non-Participating	Yes	0:00
966	653796.28	5018756.32	Non-Participating	Yes	0:00
967	653812.16	5018729.86	Non-Participating	Yes	0:00
968	653789.93	5018684.35	Non-Participating	Yes	0:00
969	653801.57	5018650.48	Non-Participating	Yes	0:00
970	653830.15	5018654.72	Non-Participating	Yes	0:00
971	653872.48	5018648.37	Non-Participating	Yes	0:00
972	653824.86	5018766.90	Non-Participating	Yes	0:00
973	653821.68	5018837.81	Non-Participating	Yes	0:00
974	653773.00	5018844.16	Non-Participating	Yes	0:00
975	653729.61	5018837.81	Non-Participating	Yes	0:00
976	654082.03	5018861.09	Non-Participating	Yes	0:00
977	654097.91	5018818.76	Non-Participating	Yes	0:00
978	654051.34	5018819.82	Non-Participating	Yes	0:00
979	654060.87	5018781.72	Non-Participating	Yes	0:00
980	654100.02	5018783.83	Non-Participating	Yes	0:00
981	654098.97	5018738.32	Non-Participating	Yes	0:00
982	654058.75	5018740.44	Non-Participating	Yes	0:00
983	654134.95	5018784.89	Non-Participating	Yes	0:00
984	654136.01	5018744.67	Non-Participating	Yes	0:00
985	654104.26	5018656.83	Non-Participating	Yes	0:00
986	654054.52	5018682.23	Non-Participating	Yes	0:00
987	654011.12	5018692.82	Non-Participating	Yes	0:00
988	654193.16	5018864.27	Non-Participating	Yes	0:00
989	654247.13	5018830.40	Non-Participating	Yes	0:00
990	654284.17	5018758.43	Non-Participating	Yes	0:00
991	654237.61	5018695.99	Non-Participating	Yes	0:00
992	654160.35	5018557.35	Non-Participating	Yes	0:00
993	654118.02	5018592.27	Non-Participating	Yes	0:00
994	654088.38	5018585.92	Non-Participating	Yes	0:00
995	654096.85	5018546.77	Non-Participating	Yes	0:00
996	654075.68	5018498.08	Non-Participating	Yes	0:00
997	654075.68	5018466.33	Non-Participating	Yes	0:00
998	654167.76	5018458.92	Non-Participating	Yes	0:00
999	654156.12	5018498.08	Non-Participating	Yes	0:00
1000	654013.24	5018454.69	Non-Participating	Yes	0:00
1001	653986.78	5018446.22	Non-Participating	Yes	0:00
1002	653980.43	5018480.09	Non-Participating	Yes	0:00

Table B-1: Shadow Flicker Modeling Results at Sensitive Receptors in Roberts County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
1003	653975.14	5018568.99	Non-Participating	Yes	0:00
1004	653933.87	5018491.73	Non-Participating	Yes	0:00
1005	653876.72	5018492.79	Non-Participating	Yes	0:00
1006	653880.95	5018543.59	Non-Participating	Yes	0:00
1007	653833.32	5018607.09	Non-Participating	Yes	0:00
1008	653789.93	5018604.97	Non-Participating	Yes	0:00
1009	653789.93	5018572.17	Non-Participating	Yes	0:00
1010	653785.70	5018529.83	Non-Participating	Yes	0:00
1011	653792.05	5018446.22	Non-Participating	Yes	0:00
1012	653793.11	5018411.30	Non-Participating	Yes	0:00
1013	653755.01	5018415.53	Non-Participating	Yes	0:00
1014	653746.54	5018463.16	Non-Participating	Yes	0:00
1015	653702.09	5018464.22	Non-Participating	Yes	0:00
1016	653707.38	5018314.99	Non-Participating	Yes	0:00
1017	653758.18	5018316.05	Non-Participating	Yes	0:00
1018	653751.83	5018374.26	Non-Participating	Yes	0:00
1019	653660.82	5018297.00	Non-Participating	Yes	0:00
1020	653758.18	5018239.85	Non-Participating	Yes	0:00
1021	653751.83	5018171.06	Non-Participating	Yes	0:00
1022	653750.77	5018124.49	Non-Participating	Yes	0:00
1023	653942.33	5017978.44	Non-Participating	Yes	0:00
1024	652007.10	5018428.62	Non-Participating	Yes	21:08
1025	651904.31	5018493.71	Participating	Yes	29:14
1026	652040.04	5018481.80	Non-Participating	No	24:17
1027	652055.92	5018455.21	Non-Participating	No	21:52
1028	651881.29	5018466.72	Participating	No	28:54
1029	651848.75	5018492.91	Participating	No	31:44
1030	651846.37	5018518.31	Participating	No	33:30
1031	645549.34	5018139.28	Non-Participating	No	9:42
1032	645441.78	5018112.69	Participating	No	9:25
1033	645405.27	5018099.60	Participating	No	9:32
1034	645417.57	5018175.80	Participating	No	5:59
1035	645401.70	5018177.38	Participating	No	6:11
1036	645562.04	5018101.98	Non-Participating	Yes	11:06
1037	645441.78	5018144.84	Participating	Yes	7:16
1038	645429.08	5018071.42	Participating	No	11:55
1039	645424.32	5018071.42	Participating	No	11:50
1040	645417.57	5018071.42	Participating	No	11:42
1041	645412.41	5018071.02	Participating	No	11:36
1042	645405.27	5018070.62	Participating	No	11:28
1043	645398.13	5018069.83	Participating	No	11:24
1044	645391.78	5018069.83	Participating	No	11:14
1045	645384.63	5018069.43	Participating	No	11:08
1046	643962.03	5018210.66	Participating	No	31:54
1047	643979.49	5018300.61	Participating	No	30:35
1048	643968.38	5018335.54	Participating	No	28:41
1049	643942.45	5018308.02	Participating	Yes	26:29
1050	643141.20	5019297.31	Non-Participating	Yes	19:16
1051	643087.63	5019295.33	Non-Participating	No	15:58
1052	643142.39	5019386.61	Non-Participating	No	12:14

Table B-1: Shadow Flicker Modeling Results at Sensitive Receptors in Roberts County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
1053	645969.02	5019070.40	Participating	No	13:09
1054	645928.01	5019106.78	Participating	No	8:28
1055	646654.96	5018883.21	Non-Participating	No	10:04
1056	646678.77	5018921.57	Non-Participating	No	11:24
1057	646650.99	5018984.41	Non-Participating	No	16:40
1058	646657.60	5018952.66	Non-Participating	No	14:43
1059	646606.01	5018985.74	Non-Participating	No	17:34
1060	646631.14	5018927.53	Non-Participating	Yes	14:14
1061	647630.61	5019088.92	Participating	Yes	10:15
1062	647573.72	5018982.43	Participating	No	11:25
1063	647616.72	5019021.46	Participating	No	14:01
1064	647692.13	5019070.40	Participating	No	8:37
1065	647682.86	5019092.23	Participating	No	8:18
1066	648770.30	5019338.96	Participating	No	20:18
1067	648739.88	5019368.72	Participating	Yes	17:25
1068	649770.43	5019268.18	Non-Participating	Yes	18:27
1069	649840.55	5019297.28	Non-Participating	No	16:42
1071	644598.95	5020889.63	Participating	Yes	23:33
1072	645356.99	5021362.71	Non-Participating	Yes	15:19
1073	645326.03	5021338.90	Non-Participating	No	13:27
1074	644677.53	5020973.77	Participating	No	14:28
1075	644602.13	5020963.45	Participating	No	10:25
1076	644754.53	5020911.06	Participating	No	28:54
1077	644664.04	5020911.86	Participating	No	23:49
1078	644646.58	5020880.90	Participating	No	28:02
1079	644610.06	5020920.59	Participating	Yes	18:42
1080	644582.28	5020830.89	Participating	No	34:31
1081	645450.73	5022016.36	Non-Participating	Yes	0:00
1082	645459.86	5021977.07	Non-Participating	No	0:00
1083	647540.28	5021057.51	Non-Participating	No	17:00
1084	650455.16	5020356.05	Participating	No	1:26
1085	650478.98	5020337.00	Participating	No	1:21
1086	650430.29	5020350.23	Participating	Yes	1:32
1087	651845.75	5019968.54	Non-Participating	Yes	6:16
1088	651820.09	5019967.22	Participating	No	6:23
1089	652148.21	5020111.75	Non-Participating	No	2:37
1090	652165.41	5020130.93	Non-Participating	No	2:34
1091	653419.21	5019117.51	Non-Participating	No	0:00
1092	653498.58	5019091.05	Non-Participating	No	0:00
1093	653454.27	5019124.78	Non-Participating	Yes	0:00
1095	653878.92	5019204.82	Non-Participating	Yes	0:00
1096	653892.81	5019481.31	Non-Participating	Yes	0:00
1097	654050.90	5019609.63	Non-Participating	Yes	0:00
1098	654293.66	5019607.65	Non-Participating	Yes	0:00
1162	652138.05	5021042.12	Non-Participating	Yes	0:00
1163	652096.38	5021072.55	Non-Participating	No	0:00
1164	651763.66	5021900.70	Non-Participating	No	0:00
1165	651747.13	5021999.92	Non-Participating	No	0:00
1166	651799.38	5021975.44	Non-Participating	No	0:00
1167	651800.70	5021983.38	Non-Participating	No	0:00

Table B-1: Shadow Flicker Modeling Results at Sensitive Receptors in Roberts County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
1168	651802.69	5021991.98	Non-Participating	No	0:00
1169	651774.25	5022027.04	Non-Participating	Yes	0:00
1171	650692.76	5022671.96	Non-Participating	No	0:00
1172	650657.04	5022683.21	Non-Participating	No	0:00
1173	650323.00	5022839.31	Non-Participating	No	0:00
1174	650256.86	5022865.77	Non-Participating	No	0:00
1175	650244.29	5022880.98	Non-Participating	Yes	0:00
1177	648505.80	5022642.72	Non-Participating	No	0:00
1178	648394.67	5022729.51	Non-Participating	No	0:00
1179	648456.06	5022768.67	Non-Participating	No	0:00
1180	648470.34	5022730.04	Non-Participating	Yes	0:00
1181	648648.67	5021826.75	Non-Participating	Yes	0:00
1182	648635.97	5021919.35	Non-Participating	No	0:00
1183	648632.80	5021869.08	Non-Participating	No	0:00
1184	648676.72	5021823.04	Non-Participating	No	0:00
1185	648673.54	5021782.83	Non-Participating	Yes	0:00
1186	648675.66	5021761.13	Non-Participating	No	0:00
1217	653334.91	5022188.01	Non-Participating	No	0:00
1218	653362.03	5022242.91	Non-Participating	No	0:00
1219	653358.73	5022176.11	Non-Participating	No	0:00
1220	653401.72	5022226.38	Non-Participating	Yes	0:00
1371	641377.12	5021901.76	Non-Participating	No	0:00
2464	653885.69	5018617.60	Non-Participating	Yes	0:00
2569	643740.41	5020526.47	Participating	Yes	16:03
2570	643763.90	5020463.66	Participating	No	18:10
3369	653357.06	5019308.47	Non-Participating	Yes	0:00
3370	653386.66	5019309.46	Non-Participating	Yes	0:00
3371	653412.09	5019310.84	Non-Participating	Yes	0:00
3372	653442.11	5019311.42	Non-Participating	Yes	0:00
3373	653467.54	5019311.97	Non-Participating	Yes	0:00
3374	653494.22	5019312.94	Non-Participating	Yes	0:00
3769	653603.40	5018596.29	Non-Participating	Yes	0:00
3770	653604.82	5018578.43	Non-Participating	Yes	0:00
3771	653605.25	5018559.25	Non-Participating	Yes	0:00
3772	653606.32	5018544.38	Non-Participating	Yes	0:00
3773	653606.78	5018519.91	Non-Participating	Yes	0:00
3774	653738.12	5018572.85	Non-Participating	Yes	0:00
3775	653833.37	5018573.34	Non-Participating	Yes	0:00
3776	653746.30	5018527.91	Non-Participating	Yes	0:00
3777	653783.39	5018643.52	Non-Participating	Yes	0:00
3778	653830.24	5018539.59	Non-Participating	Yes	0:00
3779	653824.23	5018486.98	Non-Participating	Yes	0:00
3780	653711.74	5018495.32	Non-Participating	Yes	0:00
3781	653836.59	5018462.57	Non-Participating	Yes	0:00
3782	653835.10	5018431.80	Non-Participating	Yes	0:00
3783	653698.14	5018375.86	Non-Participating	Yes	0:00
3784	653712.83	5018413.97	Non-Participating	Yes	0:00
3785	653654.57	5018423.59	Non-Participating	Yes	0:00
3786	653610.61	5018419.39	Non-Participating	Yes	0:00
3787	653608.95	5018483.21	Non-Participating	Yes	0:00

Table B-1: Shadow Flicker Modeling Results at Sensitive Receptors in Roberts County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
3788	653609.72	5018462.71	Non-Participating	Yes	0:00
3789	653612.12	5018445.52	Non-Participating	Yes	0:00
3790	653731.26	5018526.38	Non-Participating	Yes	0:00
3791	653653.83	5018482.45	Non-Participating	Yes	0:00
3792	653684.55	5018762.40	Non-Participating	Yes	0:00
3793	653822.23	5018807.10	Non-Participating	Yes	0:00
3794	653619.64	5018711.28	Non-Participating	Yes	0:00
3795	653796.87	5018723.96	Non-Participating	Yes	0:00
3796	653153.96	5019379.44	Non-Participating	Yes	0:00
3798	647460.57	5018633.20	Non-Participating	Yes	3:23

Table B-2: Shadow Flicker Modeling Results at Sensitive Receptors in Grant County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
569	650655.61	5009314.95	Non-Participating	No	0:00
570	650655.44	5009322.09	Non-Participating	No	0:00
571	650655.88	5009328.95	Non-Participating	No	0:00
572	650812.37	5008555.08	Non-Participating	No	0:00
573	650357.33	5009074.91	Non-Participating	No	0:00
574	650361.64	5009076.05	Non-Participating	No	0:00
575	650367.78	5009075.16	Non-Participating	No	0:00
576	650373.62	5009074.85	Non-Participating	No	0:00
577	650353.13	5009075.55	Non-Participating	No	0:00
578	650418.63	5008803.51	Non-Participating	No	0:00
579	650424.60	5008803.66	Non-Participating	No	0:00
580	650430.12	5008803.94	Non-Participating	No	0:00
581	650435.65	5008803.92	Non-Participating	No	0:00
582	650440.88	5008804.04	Non-Participating	No	0:00
584	645856.45	5008543.80	Non-Participating	No	0:00
585	645863.36	5008543.59	Non-Participating	No	0:00
586	645872.28	5008610.60	Non-Participating	No	0:00
587	645881.05	5008610.62	Non-Participating	No	0:00
588	645893.33	5008612.76	Non-Participating	No	0:00
589	645913.20	5008609.50	Non-Participating	No	0:00
590	645825.23	5008480.74	Non-Participating	No	0:00
591	646381.49	5009661.58	Non-Participating	No	0:00
592	647256.80	5010821.58	Participating	No	2:43
593	647235.37	5010818.40	Participating	No	2:35
594	647223.68	5010820.21	Participating	No	2:32
595	649109.27	5010799.30	Participating	No	20:53
596	649089.51	5010782.32	Participating	No	26:49
597	649095.33	5010782.45	Participating	No	26:38
598	649102.06	5010781.94	Participating	No	26:40
638	646364.45	5011342.22	Non-Participating	No	0:00
639	645581.19	5011275.19	Participating	No	0:00
640	645600.32	5011274.27	Participating	No	0:00
641	645611.23	5011274.52	Participating	No	0:00
667	654477.01	5017621.71	Non-Participating	No	0:00
668	654369.31	5017619.71	Non-Participating	No	0:00
671	654440.66	5017764.63	Non-Participating	Yes	0:00
672	654505.30	5017699.22	Non-Participating	No	0:00
673	654765.63	5017786.32	Non-Participating	No	0:00
674	650706.84	5013445.00	Non-Participating	No	2:33
675	649055.08	5013130.33	Participating	No	36:09
676	649111.77	5013137.89	Participating	No	25:22
677	649127.84	5013136.95	Participating	No	23:15
678	649096.66	5013193.64	Participating	No	21:06
679	649108.94	5013193.64	Participating	No	20:09
680	649108.94	5013193.64	Participating	No	20:09
681	649000.27	5013158.68	Participating	No	41:23
682	648992.71	5013143.56	Participating	No	41:26
683	647329.54	5013167.93	Non-Participating	No	9:14
684	647338.47	5013168.60	Non-Participating	No	9:13
685	647346.08	5013169.92	Non-Participating	No	9:16

Table B-2: Shadow Flicker Modeling Results at Sensitive Receptors in Grant County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
686	647355.67	5013170.25	Non-Participating	No	10:32
687	647323.59	5013228.79	Non-Participating	No	8:58
688	647329.54	5013228.79	Non-Participating	No	8:58
689	647139.01	5014024.33	Participating	Yes	36:02
690	647091.06	5014040.04	Participating	No	40:21
691	647096.85	5013921.81	Participating	No	47:01
692	647085.68	5013986.57	Participating	No	44:22
693	647086.24	5013976.65	Participating	No	45:01
694	647086.79	5013967.83	Participating	No	45:24
695	647076.86	5013967.83	Participating	No	47:15
696	647075.21	5013976.65	Participating	No	46:47
697	647075.21	5013987.12	Participating	No	46:03
698	647076.86	5013934.76	Participating	No	50:01
699	647078.52	5013924.84	Participating	No	50:45
700	647048.75	5013895.07	Participating	No	64:32
701	647049.30	5013905.54	Participating	No	61:53
702	647036.63	5013905.54	Participating	No	66:11
703	647046.55	5013925.94	Participating	No	58:32
704	647043.79	5013934.76	Participating	No	57:34
705	647045.45	5013943.03	Participating	No	55:55
706	647044.89	5013963.97	Participating	No	53:43
707	647044.34	5013978.86	Participating	No	52:09
708	647043.79	5013986.57	Participating	No	51:26
709	647045.45	5014008.62	Participating	No	48:51
710	647038.28	5014008.62	Participating	No	50:03
711	646127.95	5014229.11	Participating	No	20:31
712	646121.88	5014229.11	Participating	No	20:05
713	646115.27	5014229.11	Participating	No	19:37
714	646108.65	5014229.66	Participating	No	19:07
715	646089.91	5014221.39	Participating	No	17:50
716	646153.85	5014222.49	Participating	No	22:30
717	646195.19	5014175.09	Participating	No	25:17
718	646118.02	5014249.50	Participating	No	20:20
719	646084.40	5014279.82	Participating	No	19:00
720	646111.96	5014301.87	Participating	Yes	24:15
721	650227.89	5014434.71	Non-Participating	Yes	4:48
722	650207.50	5014449.60	Non-Participating	No	5:11
723	650200.88	5014449.60	Non-Participating	No	5:19
724	650171.67	5014421.48	Non-Participating	No	5:39
725	650180.49	5014452.90	Non-Participating	No	5:41
726	650160.64	5014422.59	Non-Participating	No	5:52
727	648895.05	5014567.56	Participating	Yes	20:12
728	648857.57	5014749.46	Participating	Yes	12:59
729	648896.15	5014710.32	Participating	No	13:19
730	648954.58	5014688.27	Participating	No	12:59
731	648938.60	5014782.53	Participating	No	11:30
732	648893.40	5014764.34	Participating	No	12:13
733	648927.57	5014772.06	Participating	No	11:43
734	648928.12	5014779.77	Participating	No	11:33
735	648901.67	5014779.22	Participating	No	11:51

Table B-2: Shadow Flicker Modeling Results at Sensitive Receptors in Grant County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
736	648903.32	5014772.61	Participating	No	11:59
737	648903.32	5014764.34	Participating	No	12:03
738	647097.54	5014730.16	Participating	Yes	23:15
739	647101.94	5014808.44	Participating	No	16:35
740	647073.83	5014779.77	Participating	No	15:42
741	647096.43	5014673.39	Participating	No	21:21
742	647096.43	5014667.88	Participating	No	20:53
743	645515.54	5014966.64	Participating	No	4:22
744	645511.35	5015039.18	Participating	Yes	6:32
745	645500.11	5015039.51	Participating	Yes	8:08
746	645488.20	5015041.82	Participating	Yes	10:08
747	645475.97	5015042.48	Participating	Yes	11:35
748	645483.57	5015016.03	Participating	No	5:33
752	645456.19	5015387.96	Participating	No	17:57
756	644633.40	5014490.63	Participating	Yes	3:47
757	644699.02	5014523.97	Participating	No	1:59
758	644688.97	5014556.78	Participating	No	3:40
759	644662.51	5014589.06	Participating	No	5:45
760	644650.87	5014618.69	Participating	No	6:34
761	644676.80	5014628.74	Participating	No	6:45
762	644346.60	5014822.95	Participating	No	1:40
763	644380.46	5014773.74	Participating	No	1:51
764	644415.39	5014756.80	Participating	No	2:04
765	644433.91	5014726.64	Participating	No	2:15
766	644471.48	5014679.01	Participating	No	2:40
767	644488.94	5014596.46	Participating	Yes	3:28
768	644603.24	5014591.17	Participating	No	6:10
769	647399.27	5015986.51	Participating	Yes	20:51
770	647454.83	5016038.43	Participating	No	19:46
771	647445.90	5015956.74	Participating	No	24:40
772	647422.42	5015911.76	Participating	No	26:31
773	647459.13	5016012.97	Participating	No	21:45
774	647461.45	5015953.10	Participating	No	25:21
775	647457.48	5016001.72	Participating	No	22:25
776	651813.15	5014591.35	Non-Participating	Yes	0:55
777	651778.23	5014579.18	Non-Participating	Yes	1:02
778	651881.15	5014455.09	Non-Participating	Yes	0:48
779	651659.69	5014649.03	Non-Participating	No	1:24
797	644388.43	5015993.78	Participating	No	1:31
799	644347.42	5015979.23	Participating	No	1:22
800	643969.72	5016091.68	Non-Participating	No	0:00
801	643999.49	5016084.40	Non-Participating	Yes	0:00
802	643977.66	5016340.39	Non-Participating	Yes	0:00
803	646221.99	5016509.06	Participating	Yes	4:38
804	646190.90	5016458.79	Participating	No	6:49
805	646145.92	5016476.65	Participating	No	7:26
806	646127.40	5016510.38	Participating	No	6:53
807	646163.78	5016423.73	Participating	No	6:34
808	646171.06	5016423.07	Participating	No	6:39
809	647283.77	5016724.17	Participating	No	10:59

Table B-2: Shadow Flicker Modeling Results at Sensitive Receptors in Grant County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
810	647284.96	5016717.42	Participating	No	11:05
811	647286.15	5016710.28	Participating	No	11:08
812	647276.62	5016705.91	Participating	No	10:56
813	647227.01	5016714.64	Participating	No	8:34
814	647294.09	5016667.81	Participating	No	11:36
815	647292.90	5016636.46	Participating	No	11:42
816	647225.43	5016639.23	Participating	Yes	12:05
817	647920.06	5017342.93	Participating	No	7:20
818	647914.50	5017334.59	Participating	No	7:14
819	647910.93	5017326.66	Participating	No	7:11
820	647907.36	5017321.10	Participating	No	7:06
821	647904.58	5017314.75	Participating	No	7:03
822	647901.41	5017308.80	Participating	No	7:00
823	647897.83	5017302.45	Participating	No	6:53
824	647929.58	5017194.50	Participating	No	7:09
825	647921.25	5017194.50	Participating	No	7:06
826	647922.84	5017174.65	Participating	No	7:05
827	647929.58	5017175.84	Participating	No	7:11
828	647874.81	5017215.13	Participating	No	6:29
829	647876.80	5017207.59	Participating	No	6:38
830	647779.17	5017234.58	Participating	No	5:33
831	647831.16	5017234.18	Participating	No	6:04
832	647866.48	5017264.35	Participating	No	6:27
833	647950.22	5017211.56	Participating	No	7:31
834	647910.93	5017290.14	Participating	No	7:04
835	647897.44	5017210.37	Participating	No	6:47
836	647897.04	5017225.85	Participating	No	6:47
837	647851.40	5017188.15	Participating	No	6:18
838	647860.92	5017125.44	Participating	No	6:30
839	647898.23	5017253.63	Participating	Yes	6:53
840	648971.54	5015975.43	Non-Participating	No	23:31
841	652396.31	5016321.44	Non-Participating	No	0:00
842	652387.85	5016207.14	Non-Participating	No	0:00
843	652390.49	5016269.05	Non-Participating	No	0:00
844	652391.55	5016251.06	Non-Participating	No	0:00
845	652435.47	5016190.20	Non-Participating	No	0:00
846	652438.65	5016205.55	Non-Participating	Yes	0:00
1381	644892.87	5009700.02	Non-Participating	No	0:00
1382	644892.46	5009690.93	Non-Participating	No	0:00
1383	644892.94	5009681.23	Non-Participating	No	0:00
1384	644801.52	5009641.13	Non-Participating	No	0:00
1385	644802.36	5009635.06	Non-Participating	No	0:00
1976	647303.97	5007251.04	Non-Participating	Yes	0:00
1977	647254.71	5007256.45	Non-Participating	No	0:00
1978	647224.09	5007221.18	Non-Participating	No	0:00
1979	647282.08	5007185.04	Non-Participating	No	0:00
1980	647295.49	5007219.92	Non-Participating	No	0:00
1981	647232.96	5007186.75	Non-Participating	No	0:00
1982	648397.12	5007404.49	Non-Participating	No	0:00
1983	648429.08	5007405.89	Non-Participating	No	0:00

Table B-2: Shadow Flicker Modeling Results at Sensitive Receptors in Grant County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
1984	648407.50	5007439.13	Non-Participating	No	0:00
1985	648480.56	5007489.68	Non-Participating	Yes	0:00
1986	649016.69	5007529.25	Non-Participating	No	0:00
1987	649083.23	5007600.36	Non-Participating	No	0:00
1988	649022.20	5007623.82	Non-Participating	No	0:00
1989	649067.37	5007215.51	Non-Participating	No	0:00
2186	652004.55	5009315.55	Non-Participating	No	0:00
2187	652011.48	5009353.67	Non-Participating	No	0:00
2188	651968.05	5009280.43	Non-Participating	No	0:00
2189	651984.41	5009299.06	Non-Participating	No	0:00
2190	652079.70	5009234.35	Non-Participating	No	0:00
2191	651974.01	5009343.47	Non-Participating	No	0:00
2192	651978.16	5009341.71	Non-Participating	No	0:00
2193	652045.23	5009239.11	Non-Participating	Yes	0:00
2194	650636.03	5009296.62	Non-Participating	No	0:00
2195	650621.29	5009376.36	Non-Participating	Yes	0:00
2196	650637.75	5009375.27	Non-Participating	No	0:00
2197	650640.57	5009319.36	Non-Participating	No	0:00
2198	650789.37	5008570.83	Non-Participating	No	0:00
2199	650792.95	5008524.02	Non-Participating	No	0:00
2200	650451.20	5008993.05	Non-Participating	No	0:00
2201	650511.28	5008972.89	Non-Participating	No	0:00
2202	650454.57	5009065.19	Non-Participating	No	0:00
2203	650397.34	5009047.01	Non-Participating	No	0:00
2204	650431.62	5009062.71	Non-Participating	No	0:00
2205	650503.26	5009033.74	Non-Participating	Yes	0:00
2206	650245.22	5009028.03	Non-Participating	No	0:00
2207	650227.43	5009105.24	Non-Participating	No	0:00
2208	650291.19	5009109.20	Non-Participating	No	0:00
2209	650266.51	5009129.39	Non-Participating	No	0:03
2210	650404.49	5008782.78	Non-Participating	No	0:00
2211	650402.75	5008799.12	Non-Participating	No	0:00
2212	650493.66	5008776.86	Non-Participating	Yes	0:00
2213	645881.03	5008546.97	Non-Participating	No	0:00
2214	645840.98	5008574.90	Non-Participating	Yes	0:00
2215	645876.21	5008512.81	Non-Participating	No	0:00
2216	645901.09	5007993.08	Non-Participating	No	0:00
2217	645708.61	5008004.25	Non-Participating	Yes	0:00
2218	645720.53	5008021.46	Non-Participating	Yes	0:00
2219	645631.03	5008056.63	Non-Participating	Yes	0:00
2220	645560.46	5008023.00	Non-Participating	Yes	0:00
2221	645560.46	5008023.00	Non-Participating	No	0:00
2222	645561.02	5008023.38	Non-Participating	No	0:00
2223	645631.03	5008056.63	Non-Participating	No	0:00
2224	645631.03	5008056.63	Non-Participating	No	0:00
2225	645608.28	5007990.03	Non-Participating	No	0:00
2226	645578.93	5008048.55	Non-Participating	No	0:00
2227	644883.47	5009382.64	Non-Participating	No	0:00
2228	644887.00	5009408.03	Non-Participating	No	0:00
2229	644906.27	5009414.05	Non-Participating	No	0:00

Table B-2: Shadow Flicker Modeling Results at Sensitive Receptors in Grant County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
2230	644920.93	5009426.30	Non-Participating	Yes	0:00
2231	646350.92	5009704.64	Non-Participating	No	0:00
2232	646346.49	5009644.25	Non-Participating	No	0:00
2233	646389.71	5009664.22	Non-Participating	No	0:00
2234	646415.62	5009648.30	Non-Participating	No	0:00
2235	646427.10	5009646.11	Non-Participating	No	0:00
2236	646374.72	5009624.58	Non-Participating	Yes	0:00
2237	647150.23	5010852.56	Participating	No	2:07
2238	647194.50	5010875.61	Participating	No	2:22
2239	647229.03	5010859.63	Participating	Yes	2:35
2240	648982.24	5010914.63	Participating	Yes	1:30
2241	649080.25	5010909.13	Participating	No	0:00
2242	648974.09	5010822.91	Non-Participating	Yes	17:12
2243	650458.09	5010135.55	Non-Participating	Yes	6:08
2244	651399.84	5010537.19	Non-Participating	Yes	0:00
2270	645591.52	5011330.52	Participating	Yes	0:00
2271	646356.26	5011253.61	Non-Participating	Yes	0:00
2272	645585.78	5011401.80	Participating	No	0:00
2273	645538.58	5011347.66	Participating	No	0:00
2274	646389.47	5011293.14	Non-Participating	No	0:00
2275	646415.18	5011273.33	Non-Participating	No	0:00
2276	646361.55	5011290.46	Non-Participating	No	0:00
2277	647415.35	5011482.18	Non-Participating	Yes	5:17
2278	647379.17	5011394.43	Non-Participating	No	6:32
2293	650616.12	5013442.16	Non-Participating	Yes	3:22
2294	650696.44	5013445.94	Non-Participating	No	2:37
2295	650676.60	5013430.83	Non-Participating	No	2:56
2296	650673.76	5013421.38	Non-Participating	No	3:00
2297	650627.46	5013453.50	Non-Participating	No	3:15
2298	649069.25	5013233.33	Participating	No	21:13
2299	649041.85	5013179.47	Participating	No	29:47
2300	649080.59	5013142.62	Participating	No	31:25
2301	649008.78	5013133.17	Participating	No	39:43
2302	649037.12	5013089.70	Participating	No	34:04
2303	648954.91	5013131.28	Participating	No	40:41
2304	648997.44	5013169.08	Participating	No	41:25
2305	648987.99	5013202.15	Participating	Yes	37:00
2306	647290.87	5013273.96	Non-Participating	Yes	8:49
2307	647329.61	5013373.18	Non-Participating	No	9:57
2308	647343.79	5013329.72	Non-Participating	No	10:08
2309	647376.86	5013304.20	Non-Participating	No	10:21
2310	647304.10	5013205.93	Non-Participating	No	9:01
2311	647304.10	5013176.64	Non-Participating	No	9:07
2312	647295.15	5013319.08	Non-Participating	No	8:46
2313	647295.81	5013385.89	Non-Participating	No	9:37
2314	647298.12	5013371.00	Non-Participating	No	9:43
2423	643933.96	5009635.42	Non-Participating	Yes	0:00
2424	643946.39	5009641.33	Non-Participating	Yes	0:00
2425	643975.79	5009665.94	Non-Participating	No	0:00
2426	644853.33	5009638.98	Non-Participating	Yes	0:00

Table B-2: Shadow Flicker Modeling Results at Sensitive Receptors in Grant County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
2427	644862.14	5009641.30	Non-Participating	Yes	0:00
2428	644848.89	5009672.37	Non-Participating	No	0:00
2429	644901.25	5009666.58	Non-Participating	No	0:00
2430	644788.31	5009700.09	Non-Participating	No	0:00
2431	644753.13	5009673.55	Non-Participating	No	0:00
2432	644681.23	5009668.07	Non-Participating	No	0:00
2433	644718.39	5009658.52	Non-Participating	No	0:00
2434	644728.55	5009671.12	Non-Participating	No	0:00
2435	644759.74	5009620.13	Non-Participating	No	0:00
2436	644726.99	5009642.96	Non-Participating	No	0:00
2437	644749.25	5009654.50	Non-Participating	No	0:00
2438	644793.42	5009647.29	Non-Participating	No	0:00
2439	644803.12	5009672.33	Non-Participating	No	0:00
2440	644801.56	5009619.01	Non-Participating	No	0:00
2441	644801.96	5009626.88	Non-Participating	No	0:00
2469	645864.11	5008430.88	Non-Participating	No	0:00
2495	648692.68	5007983.40	Non-Participating	No	0:00
2496	643667.62	5012693.36	Non-Participating	Yes	0:00
2497	643627.55	5012618.92	Non-Participating	No	0:00
2498	643612.69	5012703.95	Non-Participating	No	0:00
2499	643588.71	5012604.37	Non-Participating	No	0:00
2500	643616.37	5012655.62	Non-Participating	No	0:00
2521	644116.25	5010595.94	Non-Participating	Yes	0:00
2522	644199.80	5010616.97	Non-Participating	No	0:00
2523	644157.37	5010568.03	Non-Participating	No	0:00
2524	644193.15	5010568.01	Non-Participating	No	0:00
2525	644166.97	5010609.29	Non-Participating	No	0:00
2526	644177.53	5010608.42	Non-Participating	No	0:00
2527	644178.38	5010595.40	Non-Participating	No	0:00
2528	645577.99	5010725.78	Participating	Yes	0:00
2529	645540.65	5010751.32	Participating	No	0:00
2530	645554.61	5010749.35	Participating	No	0:00
2554	643750.44	5016047.80	Participating	Yes	0:00
2555	643882.17	5016060.13	Non-Participating	No	0:00
2556	643811.08	5015949.57	Non-Participating	No	0:00
2557	643861.64	5015986.64	Non-Participating	No	0:00
2558	643864.12	5016147.92	Non-Participating	No	0:00
2559	643643.91	5015915.41	Non-Participating	No	0:00
2560	643872.16	5016102.25	Non-Participating	No	0:00
2561	643872.81	5016086.78	Non-Participating	No	0:00
2562	643871.79	5016080.04	Non-Participating	No	0:00
2563	643866.02	5016051.00	Non-Participating	No	0:00
2564	643873.30	5016052.04	Non-Participating	No	0:00
2565	643727.73	5015980.11	Non-Participating	No	0:00
2566	643755.87	5015975.78	Non-Participating	No	0:00
2567	643766.66	5015976.32	Non-Participating	No	0:00
2568	643783.89	5015976.41	Non-Participating	No	0:00
2571	645455.16	5015327.96	Participating	No	19:30
2572	645476.01	5015383.27	Participating	Yes	19:07
2573	645485.86	5015380.02	Participating	Yes	19:58

Table B-2: Shadow Flicker Modeling Results at Sensitive Receptors in Grant County

Modeling ID	Coordinates NAD83 UTM Zone 14N (meters)		Participation Status	Occupied?	Expected Shadow Flicker Hours per Year
	X (Easting)	Y (Northing)			(HH:MM/year)
2574	645493.52	5015381.73	Participating	Yes	20:23
2575	645504.71	5015378.12	Participating	Yes	21:21
2576	645515.66	5015380.47	Participating	Yes	22:00
2578	646310.24	5014306.02	Participating	Yes	28:04
2579	649001.28	5014751.92	Participating	No	11:41
2580	648997.19	5014739.07	Participating	No	11:57
2972	644922.56	5009429.71	Non-Participating	Yes	0:00
2973	649025.05	5010906.20	Participating	Yes	0:00
2974	647394.85	5011472.38	Non-Participating	Yes	5:31
2975	643939.34	5009639.68	Non-Participating	Yes	0:00
2976	644856.17	5009637.68	Non-Participating	Yes	0:00
3797	644380.38	5016007.67	Participating	Yes	1:30
4198	644000.03	5014277.21	Non-Participating	Yes	0:00