Wind Power GeoPlanner™

Land Mobile & Emergency Services Report

Crocker Wind Farm

Prepared on Behalf of
Crocker Wind Farm, LLC

April 2, 2018

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1. Introduction

An assessment of the emergency services in the Crocker Wind Farm project area was performed by Comsearch to identify potential impact from the planned turbines. We evaluated the registered frequencies for the following types of first responder entities: police, fire, emergency medical services, emergency management, hospitals, public works, transportation and other state, county, and municipal agencies. We also identified all industrial and business land mobile radio (LMR) systems and commercial E911 operators within the proposed wind energy facility boundaries. This information is useful in the planning stages of the wind energy facility because the data can be used in support of facility communications needs and to evaluate any potential impact on the emergency services provided in that region. An overview of the project area, which is located in Clark County, South Dakota, appears in Figure 1.

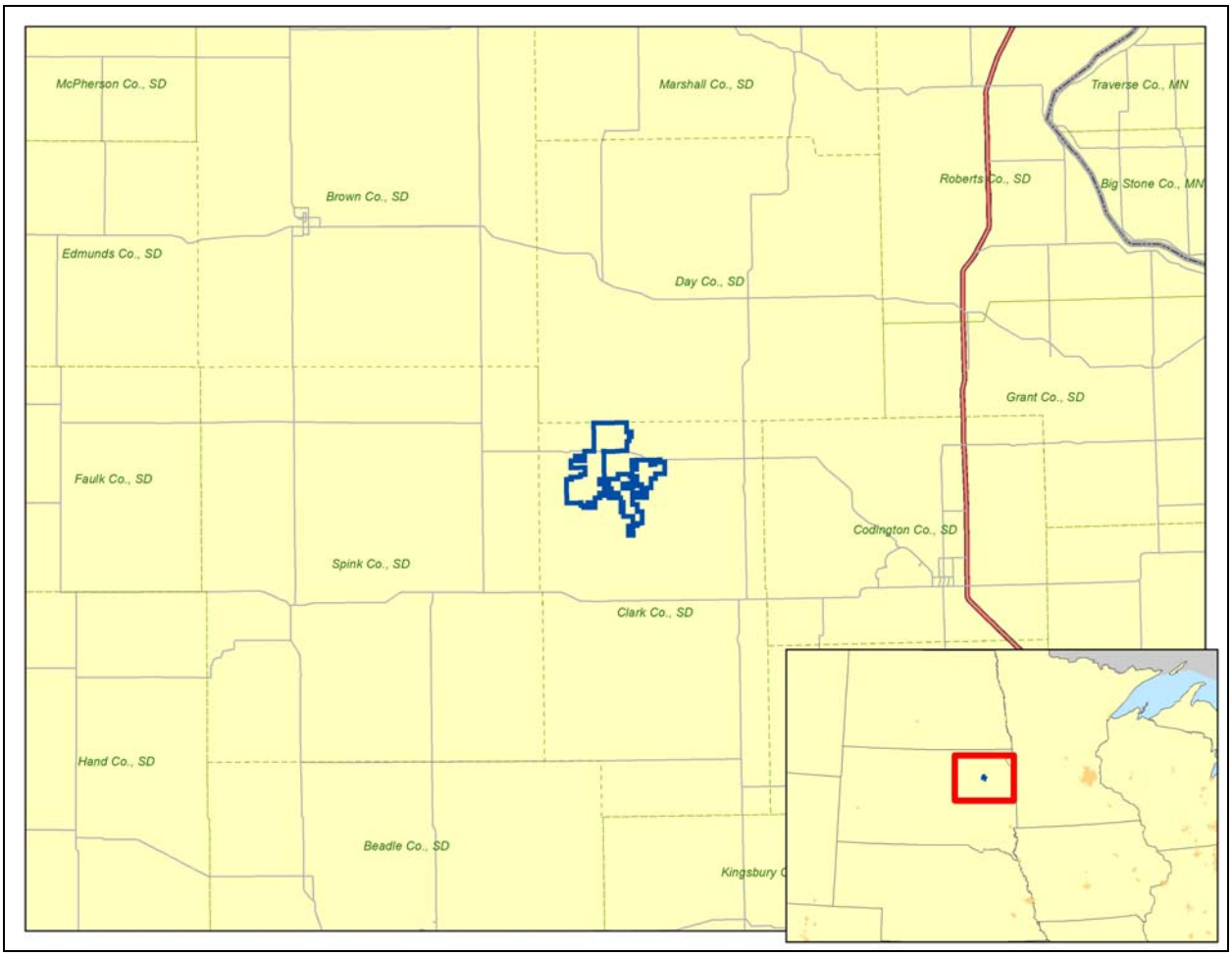

Figure 1: Area of Interest (AOI)

2. Summary of Results

Our land mobile and emergency services incumbent data[1] was derived from the FCC's Universal Licensing System (ULS) and the FCC's Public Safety & Homeland Security bureau. We identified both site-based licenses as well as regional area-wide licenses designated for public safety use.

Site-Based Licenses

The site-based licenses were imported into GIS software and geographically mapped relative to the wind energy project area of interest as defined by the customer. Each site on the map was given an ID number and associated with site information in a data table. A depiction of the fixed-site licenses in and around the project area appears in Figure 2.

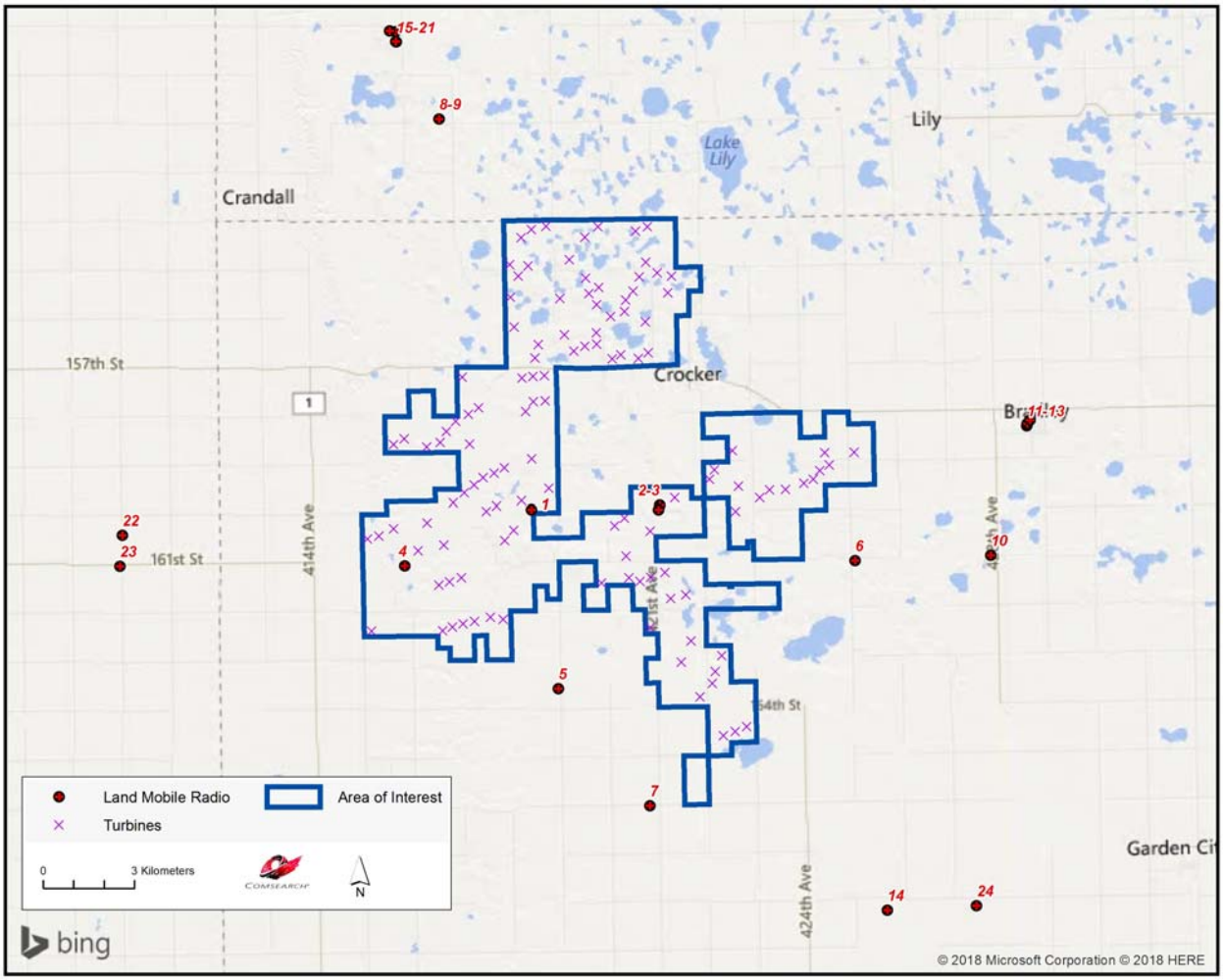

Figure 2: Land Mobile & Emergency Service Sites in Area of Interest

[1] Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data presented in this report is derived from the land mobile station's FCC license and governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf

Figure 2 identifies twenty-four site-based licenses in the Crocker Wind Farm project area of interest. Specific information about these sites is provided in Table 1.

ID	Call Sign	Frequency Band (MHz)	Licensee	Antenna Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)	Distance to Nearest Turbine (km)
1	WNWR458	150-174	Huber, David	18.0	45.066639	-97.851750	0.44
2	WQWC905	450-470	Ormat Nevada, Inc.	7.0	45.067333	-97.798083	0.56
3	WPJX963	800/900	Northern Border Pipeline Company	73.0	45.066083	-97.798694	0.67
4	WPRL543	450-470	Clark Rural Water System, Inc.	5.0	45.050528	-97.905083	0.68
5	WQTS234	450-470	Mudgett, Troy	18.3	45.013444	-97.841556	2.92
6	WRAN383	450-470	Tarbox, Paul	15.8	45.050111	-97.716917	2.99
7	WPRL543	450-470	Clark Rural Water System, Inc.	6.0	44.978306	-97.803972	3.35
8	WPWA598	150-174	BIT/State Radio Communications Engineering	67.0	45.182778	-97.888056	4.74
9	WPWF332	150-174	BIT/State Radio Communications Engineering	67.0	45.182778	-97.888056	4.74
10	WPNU436	450-470	Tarbox, Harry	24.0	45.051083	-97.660083	5.61
11	WQUN355	150-174	Bjerke, Aaron	18.3	45.089111	-97.644111	5.74
12	WQNI714	450-470	Raymer, Burton	24.0	45.089694	-97.643972	5.76
13	WQGV821	150-174	Bradley, City of	24.4	45.090778	-97.642722	5.88
14	WQZE968	450-470	Makens Oak Tree, LLP	37.0	44.946250	-97.705722	7.61
15	WPIH307	800/900	East River Electric Power Cooperative	94.0	45.205778	-97.905639	7.62
16	WQEL425	450-470	Basin Electric Power Cooperative	57.6	45.205833	-97.905556	7.62
17	WQOH612	450-470	Wilbur Ellis Air, LLC	59.4	45.206000	-97.905861	7.65
18	KNCK826	450-470	Hansmeier & Son, Inc.	55.0	45.208833	-97.905917	7.91
19	WNPW574	450-470	Overby, Philip B.	54.0	45.208833	-97.905917	7.91
20	WQEU983	450-470	A 1 Sanitation	54.0	45.208833	-97.905917	7.91
21	WQLP800	450-470	Day County Wind, LLC	59.4	45.209167	-97.908333	8.05

ID	Call Sign	Frequency Band (MHz)	Licensee	Antenna Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)	Distance to Nearest Turbine (km)
22	WQRW818	150-174	Hausvik, Randy	24.4	45.060722	-98.022750	8.07
23	WQPD221	150-174	Hausvik, Michael	18.3	45.051528	-98.024000	8.20
24	WQSS806	450-470	Hillcrest Colony	52.0	44.947194	-97.668417	9.59

Table 1: Land Mobile & Emergency Service Sites in Area of Interest

Area-Wide Licenses

The regional area-wide licenses are compiled from FCC data sources and identified for each county in the wind project area. The Crocker Wind Farm project is located in Clark County, South Dakota, part of Public Safety Region #38, which contains all of the counties in the State of South Dakota. Regional public safety operations are overseen by the entity listed below.

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The chairperson for Region #38 is a representative for all public safety entities in the region and is responsible for coordinating current and future public safety use in the wireless spectrum. In the bands licensed by the FCC for area-wide first responders, which include 220 MHz, 700 MHz, 800 MHz and 4.9 GHz, as well as the traditional Part 90 public safety pool of frequencies, nine licenses were found for the State of South Dakota and none for the County of Clark (see Table 2). These area-wide licenses are designated for mobile use only.

ID	Licensee	Area of Operation	Frequency Band (MHz)
1	American National Red Cross	Statewide: South Dakota	25-50
2	Huron, City of	Statewide: South Dakota	450-470
3	Hyde County 911	Statewide: South Dakota	150-174, 450-470
4	Lawrence, County of	Statewide: South Dakota	25-50

ID	Licensee	Area of Operation	Frequency Band (MHz)
5	National Ski Patrol System, Inc.	Statewide: South Dakota	150-174
6	Pennington, County of	Statewide: South Dakota	150-174, 450-470
7	South Dakota, State of	Statewide: South Dakota	450-470, 2450-2500
8	South Dakota Bureau of Information and Telecommunications / State Radio Communications	Statewide: South Dakota	0-10, 25-50, 150-174, 450-470
9	Watertown, City of	Statewide: South Dakota	150-174

Table 2: Regional Licenses

E911 Operators

Wireless operators are granted area-wide licenses from the FCC to deploy their cellular networks, which often include handsets with E911 capabilities. Since mobile phone market boundaries differ from service to service, we disaggregated the carriers' licensed areas down to the county level. We have identified the type of service for each carrier in Clark County, South Dakota in Table 3.

Mobile Phone Carrier	Service[2]
AT&T	AWS, Cellular, PCS, WCS, 700 MHz
Bug Tussel Wireless	AWS
DISH Network	AWS, 700 MHz
Sprint	PCS
Standing Rock Telecommunications	PCS
T-Mobile	AWS, PCS, 700 MHz
TrioTel Communications	AWS, 700 MHz
Verizon	AWS, Cellular, PCS, 700 MHz

Table 3: Mobile Phone Carriers in Area of Interest with E911 Service

[2] AWS: Advanced Wireless Service at 1.7/2.1 GHz
Cellular: Cellular Service at 800 MHz
PCS: Personal Communication Service at 1.9 GHz
WCS: Wireless Communications Service at 2.3 GHz
700 MHz: Lower 700 MHz Service

3. Impact Assessment

The first responder, industrial/business land mobile sites, area-wide public safety, and commercial E-911 communications as described in this report are typically unaffected by the presence of wind turbines, and we do not anticipate any significant harmful effect to these services in the Crocker Wind Farm project area. Although each of these services operates in different frequency ranges and provides different types of service including voice, video and data applications, there is commonality among these different networks in regards to the impact of wind turbines on their service. Each of these networks is designed to operate reliably in a non-line-of-sight (NLOS) environment. Many land mobile systems are designed with multiple base transmitter stations covering a large geographic area with overlap between adjacent transmitter sites in order to provide handoff between cells. Therefore, any signal blockage caused by the wind turbines does not materially degrade the reception because the end user is likely receiving signals from multiple transmitter locations. Additionally, the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. As a result very little, if any, change in their coverage should occur when the wind turbines are installed.

When planning the wind energy turbine locations in the area of interest, a conservative approach would dictate not locating any turbines within 77.5 meters of land mobile fixed-base stations to avoid any possible impact to the communications services provided by these stations. This distance is based on FCC interference emissions from electrical devices in the land mobile frequency bands. As long as the turbines are located more than 77.5 meters from the land mobile stations, they will meet the setback distance criteria for FCC interference emissions in the land mobile bands.

4. Recommendations

In the event that a public safety entity believes its coverage has been compromised by the presence of the wind energy facility, it has many options to improve its signal coverage to the area through optimization of a nearby base station or even adding a repeater site. Utility towers, meteorological towers or even the turbine towers within the wind project area can serve as the platform for a base station or repeater site.

5. Contact

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