

# **Appendix D**

## **Telecommunication Studies**

### **(Comsearch Reports)**

- **Communication Tower Study**
- **AM and FM Radio Report**
- **Microwave Study**
- **Land Mobile & Emergency Services Report**
- **Off-Air TV Analysis**

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# Wind Power GeoPlanner™

## Communication Tower Study

Plum Creek



Prepared on Behalf of  
Plum Creek Wind  
Farm, LLC

July 5, 2019





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## **1. Introduction**

This Communication Tower Study was performed for the Plum Creek Wind Project in Murray, Redwood, and Cottonwood Counties, Minnesota to identify the tower structures as well as FCC-licensed communication antennas that exist in or near the project area. This information is useful in the planning stages of the wind energy facilities to identify turbine setbacks and to prevent disruption to the services provided by the tenants on the towers. This data can be used in support of the wind energy facilities communications needs in addition to avoiding any potential impact to the current communications services provided in the region.

## **2. Summary of Results**

The communication towers and antennas in the study area were derived from a variety of sources including the FCC's Antenna Structure Registration (ASR) database, Universal Licensing System (ULS), national and regional tower owner databases, and the local planning and zoning boards. The data<sup>1</sup> was imported into GIS software and the structures mapped in the wind energy area of interest. Each tower location is identified with a unique ID number associated with detailed structure and contact information provided in a spreadsheet attachment.

Three tower structure and twelve communication antennas were identified within or near the Plum Creek Wind Project area using the data sources described in our methodology above. All three structures are registered with the FCC, and contain five of the twelve communication antennas. The remaining antennas may be located on a variety of structure types such as guyed towers, monopoles, silos, rooftops or portable structures. The specific type of structure would normally need to be determined by an on-site visit.

Detailed information about the tower structures and communication antennas is provided in Table 1 and Table 2 including location coordinates, structure height above ground level, and owner-operator name<sup>2</sup>.

A discussion of turbine setback distances is provided in section three.

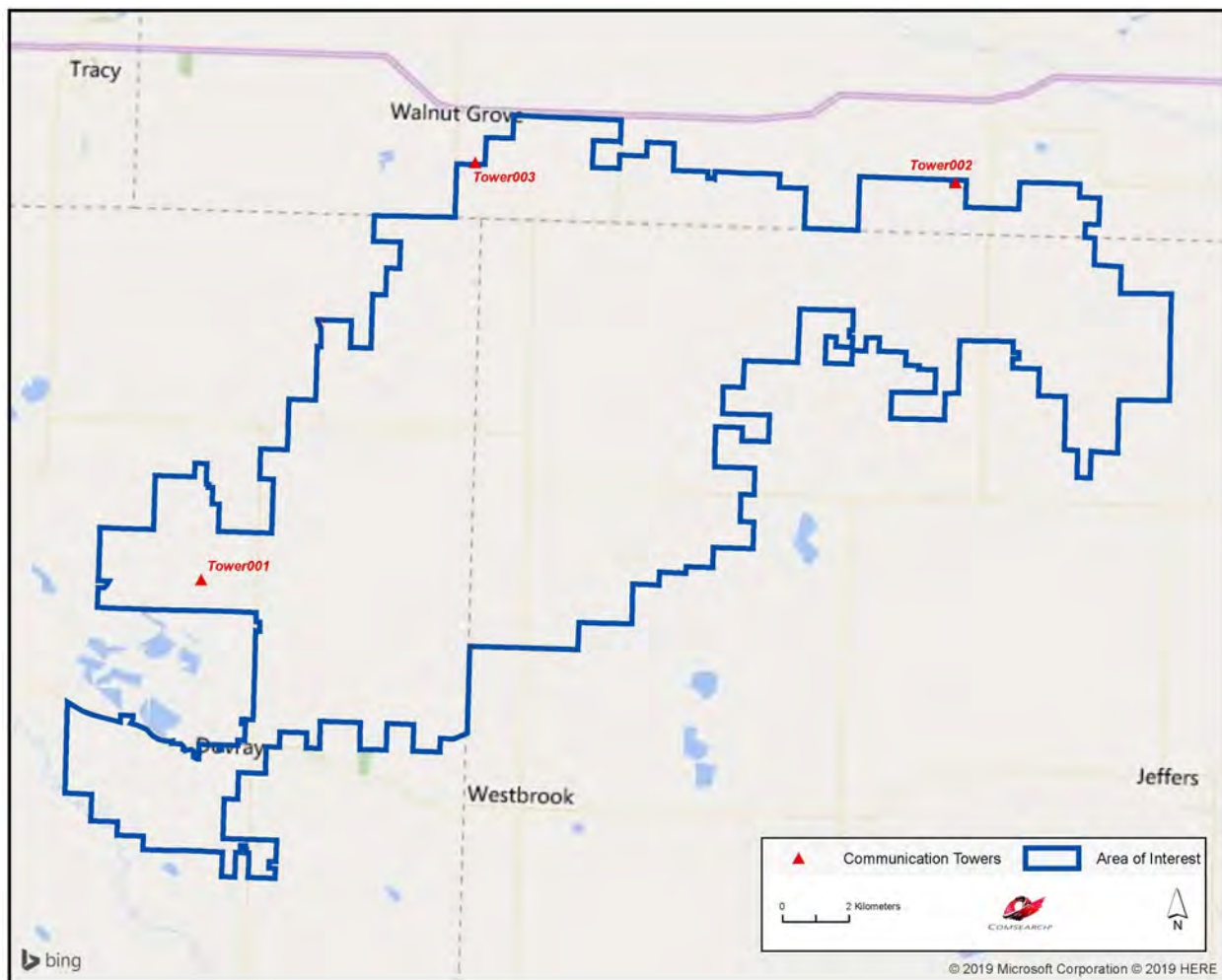
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<sup>1</sup> Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data provided in this report is governed by Comsearch's data license notification and agreement located at [http://www.comsearch.com/files/data\\_license.pdf](http://www.comsearch.com/files/data_license.pdf).

<sup>2</sup> Please note that this report analyzes all known operators on the towers from data sources available to Comsearch. Unidentified operators may exist on the towers due to unlicensed or federal government systems, mobile phone operators with proprietary locations, erroneous data on the FCC license, and other factors beyond our control.

| Tower ID | ASR Number | Owner              | Structure Height AGL (m) | Latitude (NAD83) | Longitude (NAD83) |
|----------|------------|--------------------|--------------------------|------------------|-------------------|
| Tower001 | 1023799    | Alltel Corporation | 143.3                    | 44.095556        | -95.563889        |
| Tower002 | 1205179    | Alltel Corporation | 76.2                     | 44.209167        | -95.284167        |
| Tower003 | 1308704    | Alltel Corporation | 76.2                     | 44.210944        | -95.465528        |

*Table 1: Summary of Tower Structures*

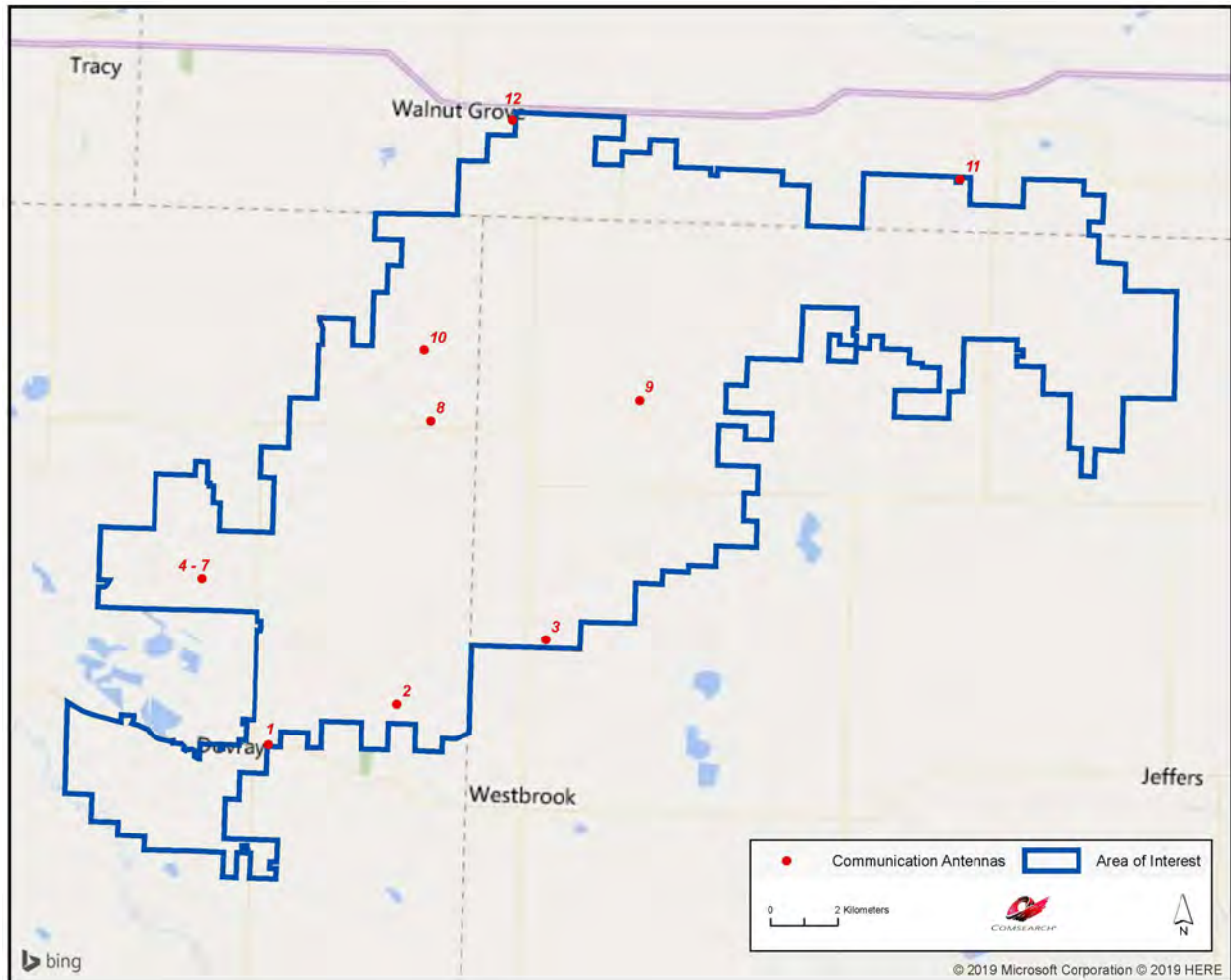


*Figure 1: Communication Towers within or near the Area of Interest*

| ID | Tower ID | Callsign | Service Type | Licensee                                 | Antenna Height AGL (m) | Latitude (NAD83) | Longitude (NAD83) |
|----|----------|----------|--------------|--|------------------------|------------------|-------------------|
| 1  |          | WNVT846  | Land Mobile  | MC CLELLAN, GENE                         | 17.00                  | 44.05136111      | -95.53694444      |
| 2  |          | WQUW212  | Land Mobile  | Dibble, Warren                           | 23.00                  | 44.06338889      | -95.48938889      |
| 3  |          | RXONLY   | Microwave    | Light, Power, Water & Building Commissio | 35.05                  | 44.08191667      | -95.43444444      |
| 4  | Tower001 | WQQP729  | Microwave    | Verizon Wireless (VAW) LLC (ND,MN,SD,NE) | 57.91                  | 44.09555556      | -95.56388889      |
| 5  | Tower001 | WRAI509  | Microwave    | Woodstock Telephone Company              | 75.3                   | 44.09555556      | -95.56388889      |
| 6  | Tower001 | KNKN290  | Cellular     | ALLTEL Corporation                       | 143.00                 | 44.09555556      | -95.56388889      |
| 7  | Tower001 | KNKN422  | Cellular     | ALLTEL Corporation                       | 143.00                 | 44.09555556      | -95.56388889      |
| 8  |          | WQDF201  | Land Mobile  | RED ROCK RURAL WATER SYSTEMS             | 9.10                   | 44.14000000      | -95.48002778      |
| 9  |          | WPSI792  | Land Mobile  | VAN GELDEREN, KRAIG                      | 12.00                  | 44.14716667      | -95.40194444      |
| 10 |          | WQZP588  | Microwave    | Minnesota Valley TV Improvement          | 35.05                  | 44.15894444      | -95.48319444      |
| 11 | Tower002 | WQPN399  | Microwave    | Verizon Wireless (VAW) LLC (ND,MN,SD,NE) | 44.81/67.06            | 44.20916667      | -95.28416667      |
| 12 |          | WNAQ291  | Land Mobile  | MEADOWLAND FARMERS COOP                  | 41.20                  | 44.22188889      | -95.45255556      |

*Table 2: Summary of Communication Antennas*





*Figure 2: Communication Antennas within or near the Area of Interest*

### 3. Discussion of Separation Distances

In planning the wind energy turbine locations, a conservative approach would dictate not locating any turbines in close proximity to existing tower structures to avoid any possible impact to the communications services provided by the structures. Reasonable distance between communication towers and wind turbine towers is a function of two things: (1) the physical turning radius of the wind turbine blades and (2) the characteristics of the communication systems on the communication tower.

Since wind turbine blades can rotate 360°, the first consideration of separation distance to other structures is clearance of the blades. If the blade radius is 50 meters, then a separation distance greater than 50 meters is necessary. From a practical standpoint, a setback distance greater than the maximum height of the turbine is necessary to insure a “fall” safety zone in the unlikely event of a turbine tower failure. Setback requirements for “fall” safety are typically specified by the local zoning ordinances.



The required separation distance based on the characteristics of the communication systems will vary depending on the type of communication antennas that are installed on the tower. For example, AM broadcast antennas should be separated by distances that allow for normal coverage which can extend up to 3 kilometers. For land mobile and mobile phone systems, setback distances are based on FCC interference emission limits from electrical devices in the land mobile and mobile phone frequency bands.

Finally, the tower structures identified could be a potential benefit in support of communications network needs for the wind energy facility. An example would be the implementation of a Supervisory Control and Data Acquisition (SCADA) system that monitors and provides communications access to the wind energy facility.

## **4. Conclusions**

Our study identified three tower structure and twelve communication antennas within or near the Plum Creek Wind project area. They are used for microwave, cellular, and land mobile services in the area.

## **5. Contact Us**

For questions or information regarding the Communication Tower Study, please contact:

|                 |  |
|-----------------|--|
| Contact person: | David Meyer  |
| Title:          | Senior Manager   |
| Company:        | Comsearch  |
| Address:        | 19700 Janelia Farm Blvd., Ashburn, VA 20147                    |
| Telephone:      | 703-726-5656   |
| Fax:            | 703-726-5595   |
| Email:          | <a href="mailto:dmeyer@comsearch.com">dmeyer@comsearch.com</a> |
| Web site:       | <a href="http://www.comsearch.com">www.comsearch.com</a>       |

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# Wind Power GeoPlanner™

## AM and FM Radio Report

Plum Creek Wind



Prepared on Behalf of  
Plum Creek Wind Farm,  
LLC

July 5, 2019





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## 1. Introduction

Comsearch analyzed AM and FM radio broadcast stations whose service could potentially be affected by the proposed Plum Creek Wind project in Murray, Redwood, and Cottonwood Counties, Minnesota.

## 2. Summary of Results

### AM Radio Analysis

Comsearch found three database records<sup>1</sup> for AM stations within approximately 30 kilometers of the project, as shown in Table 1 and Figure 1. These records represent station KDOM, which broadcasts out of Windom, Minnesota, to the southeast of the project area of interest (AOI), and station KMHL, out of Marshall, to the northwest. KDOM is licensed separately for daytime and nighttime operations, with a higher transmit power permitted during daytime hours.

| ID | Call Sign | Status <sup>2</sup> | Frequency (kHz) | Transmit ERP <sup>3</sup> (kW) | Operation Time | Latitude (NAD 27) | Longitude (NAD 27) | Required Separation Distance <sup>4</sup> (km) | Distance to Project AOI (km) |
|----|-----------|---------------------|-----------------|--------------------------------|----------------|-------------------|--------------------|--|------------------------------|
| 1  | KDOM      | LIC                 | 1580            | 1.0                            | Daytime        | 43.861389         | -95.097222         | 1.90   | 31.71                        |
| 2  | KDOM      | LIC                 | 1580            | 0.002                          | Nighttime      | 43.861389         | -95.097222         | 1.90   | 31.71                        |
| 3  | KMHL      | LIC                 | 1400            | 1.0                            | Unlimited      | 44.449722         | -95.761944         | 0.21   | 34.99                        |

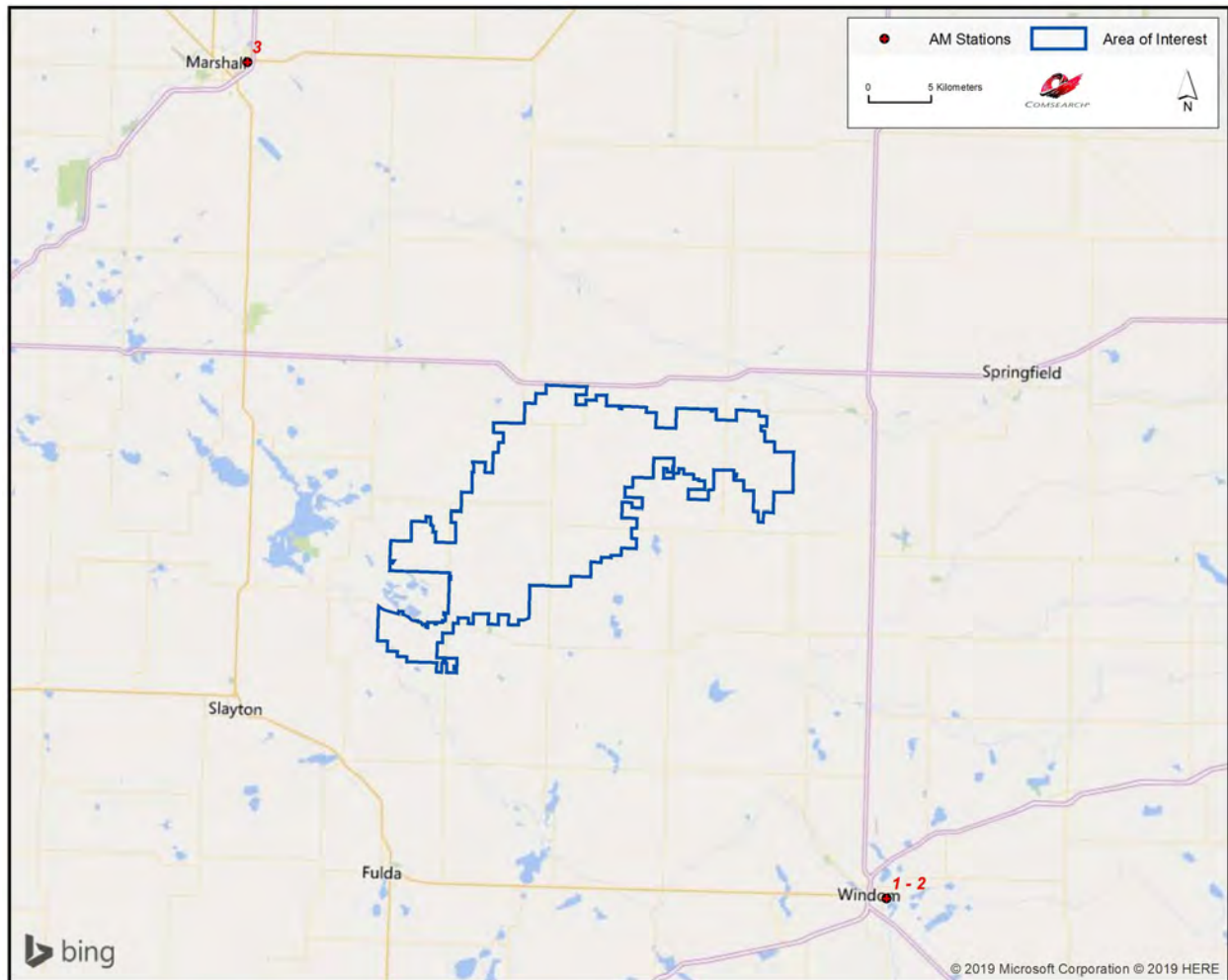
*Table 1: AM Radio Stations within 30 Kilometers of Project Area*

<sup>1</sup> 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 AM/FM station's FCC license and governed by Comsearch's data license notification and agreement located at [http://www.comsearch.com/files/data\\_license.pdf](http://www.comsearch.com/files/data_license.pdf). The coordinates provided for AM station KVWC were adjusted slightly based on aerial imagery.

<sup>2</sup> LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit.

<sup>3</sup> ERP = Transmit Effective Radiated Power.

<sup>4</sup> The required separation distance is based on the lesser of 10 wavelengths or 3 kilometers for directional antennas and 1 wavelength for non-directional antennas.



*Figure 1: AM Radio Stations within 30 Kilometers of Project Area*



## FM Radio Analysis

Comsearch determined that there were fourteen database records for FM stations within approximately 30 kilometers of the Plum Creek Wind project AOI, as shown in Table 2 and Figure 2. Only twelve of these stations are currently licensed and operating, five of which are translator stations that broadcast with limited range.

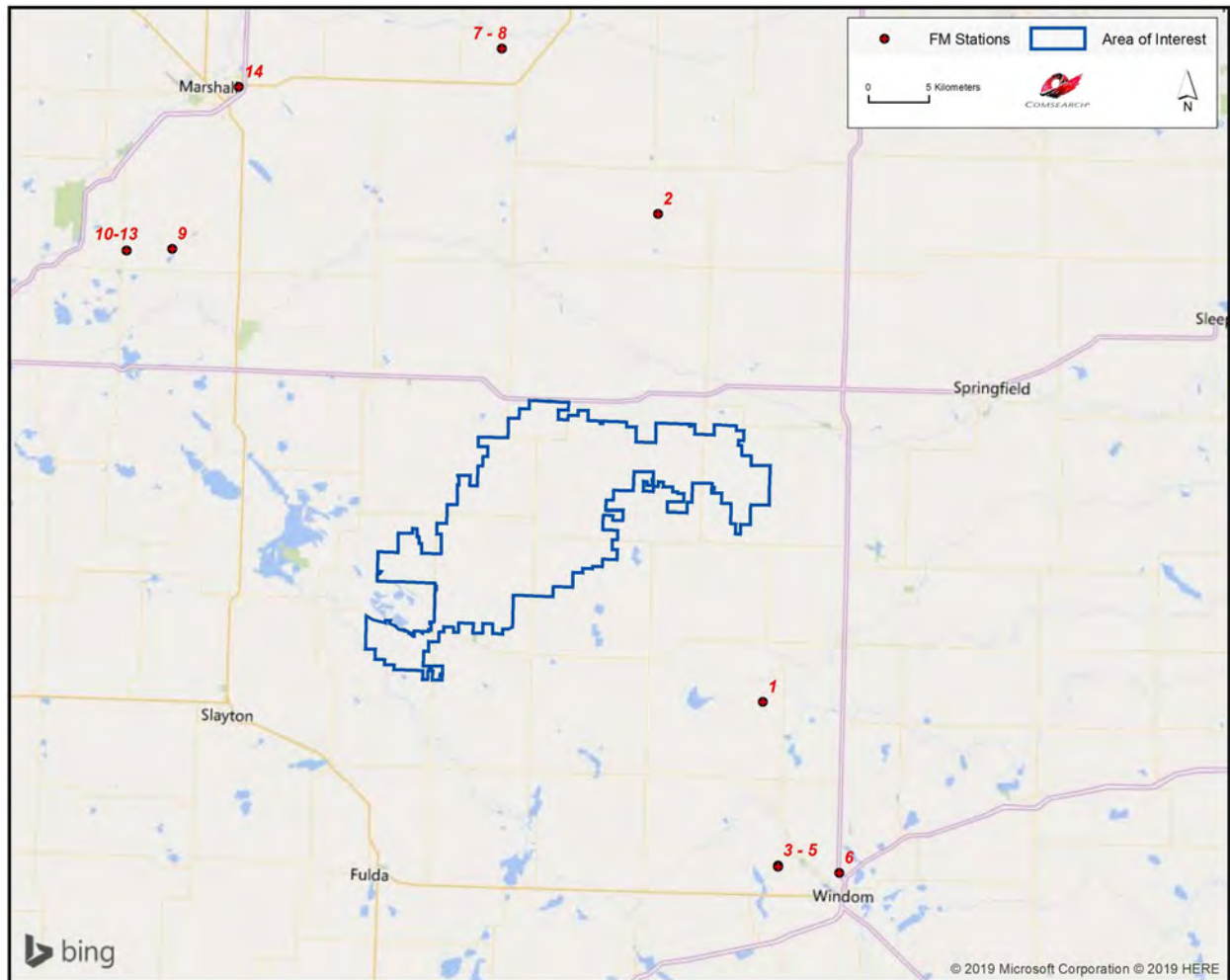
| ID | Call Sign | Status <sup>5</sup> | Service <sup>6</sup> | Frequency (MHz) | Transmit ERP <sup>7</sup> (kW) | Latitude (NAD 27) | Longitude (NAD 27) | Distance to Project AOI (km) |
|----|-----------|---------------------|----------------------|-----------------|--------------------------------|-------------------|--------------------|------------------------------|
| 1  | KJWR      | LIC                 | FM                   | 90.9            | 25.0                           | 44.006111         | -95.202500         | 13.96                        |
| 2  | KARZ      | LIC                 | FM                   | 94.7            | 50.0                           | 44.365000         | -95.324167         | 17.16                        |
| 3  | KDOM-FM   | LIC                 | FM                   | 94.3            | 5.7                            | 43.885000         | -95.182222         | 27.50                        |
| 4  | KRLP      | LIC                 | FM                   | 88.1            | 0.6                            | 43.884167         | -95.182222         | 27.60                        |
| 5  | K276GN    | CP                  | FX                   | 103.1           | 0.25                           | 43.884167         | -95.182222         | 27.60                        |
| 6  | K246BG    | LIC                 | FX                   | 97.1            | 0.18                           | 43.880833         | -95.119444         | 29.09                        |
| 7  | KRGM      | LIC                 | FM                   | 89.9            | 4.25                           | 44.484167         | -95.490833         | 29.07                        |
| 8  | K269GR    | LIC                 | FX                   | 101.7           | 0.25                           | 44.484167         | -95.490833         | 29.07                        |
| 9  | K227AN    | LIC                 | FX                   | 93.3            | 0.14                           | 44.327778         | -95.825000         | 29.62                        |
| 10 | K212FH    | LIC                 | FX                   | 90.3            | 0.115                          | 44.325556         | -95.871944         | 32.26                        |
| 11 | K277AI    | LIC                 | FX                   | 103.3           | 0.25                           | 44.325556         | -95.871944         | 32.26                        |
| 12 | KARL      | LIC                 | FM                   | 105.1           | 45.0                           | 44.325556         | -95.871944         | 32.26                        |
| 13 | KNSG      | LIC                 | FM                   | 107.5           | 15.0                           | 44.325556         | -95.871944         | 32.26                        |
| 14 | K269GR    | CP                  | FX                   | 101.7           | 0.25                           | 44.449444         | -95.761667         | 34.95                        |

*Table 2: FM Radio Stations within 30 Kilometers of Project Area*

<sup>5</sup> LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit.

<sup>6</sup> FM = FM broadcast station; FX = FM translator station; FL = Low-power FM station; FS = FM auxiliary (backup) station; FB = FM booster station.

<sup>7</sup> ERP = Transmit Effective Radiated Power.



*Figure 2: FM Radio Stations within 30 Kilometers of Project Area*

### **3. Impact Assessment**

The exclusion distance for AM broadcast stations varies as a function of the antenna type and broadcast frequency. For directional antennas, the exclusion distance is calculated by taking the lesser of 10 wavelengths or 3 kilometers. For non-directional antennas, the exclusion distance is simply equal to 1 wavelength. Potential problems with AM broadcast coverage are only anticipated when AM broadcast stations are located within their respective exclusion distance limit from wind turbine towers. The closest operational AM station to the Plum Creek Wind project, KDOM, is more than 31.7 kilometers from the limit of the project AOI. As there were no stations found within 3 kilometers of project, which is the maximum possible exclusion distance based on a directional AM antenna broadcasting at 1000 KHz or less, the project should not impact the coverage of local AM stations.

The coverage of FM stations is generally not susceptible to interference caused by wind turbines, especially when large objects, such as wind turbines, are sited in the *far field* region of the radiating FM antenna in order to avoid the risk of distorting the antenna's radiation pattern. However, at distances less than 450 meters, radiation pattern distortion can become a factor. Signal attenuation is also possible but is difficult to quantify without precise field measurements. The closest FM station to the Plum Creek Wind project, KJWR, is approximately 14 kilometers from the project area, which should provide adequate separation to avoid radiation pattern distortion.

### **4. Recommendations**

Since no impact on the licensed and operational AM or FM broadcast stations was identified in our analysis, no recommendations or mitigation techniques are required for this project.

### **5. Contact**

For questions or information regarding the AM and FM Radio Report, please contact:

|                 |  |
|-----------------|--|
| Contact person: | David Meyer  |
| Title:          | Senior Manager   |
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| Fax:            | 703-726-5595   |
| Email:          | <a href="mailto:dmeyer@comsearch.com">dmeyer@comsearch.com</a> |
| Web site:       | <a href="http://www.comsearch.com">www.comsearch.com</a>       |

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# Wind Power GeoPlanner™

## Microwave Study

Plum Creek Wind



Prepared on Behalf of  
Plum Creek Wind  
Farm, LLC

July 5, 2019





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Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz). Comsearch has developed and maintains comprehensive technical databases containing information on licensed microwave networks throughout the United States. These systems are the telecommunication backbone of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services. This report focuses on the potential impact of wind turbines on licensed, proposed and applied non-federal government microwave systems.

**Hub Height: TBD**



### 3. Fresnel Zone Analysis

#### Methodology

Our obstruction analysis was performed using Comsearch's proprietary microwave database, which contains all non-government licensed, proposed and applied paths from 0.9 - 23 GHz<sup>1</sup>. First, we determined all microwave paths that intersect the area of interest<sup>2</sup> and listed them in Table 1. These paths and the area of interest that encompasses the planned turbine locations are shown in Figure 2.

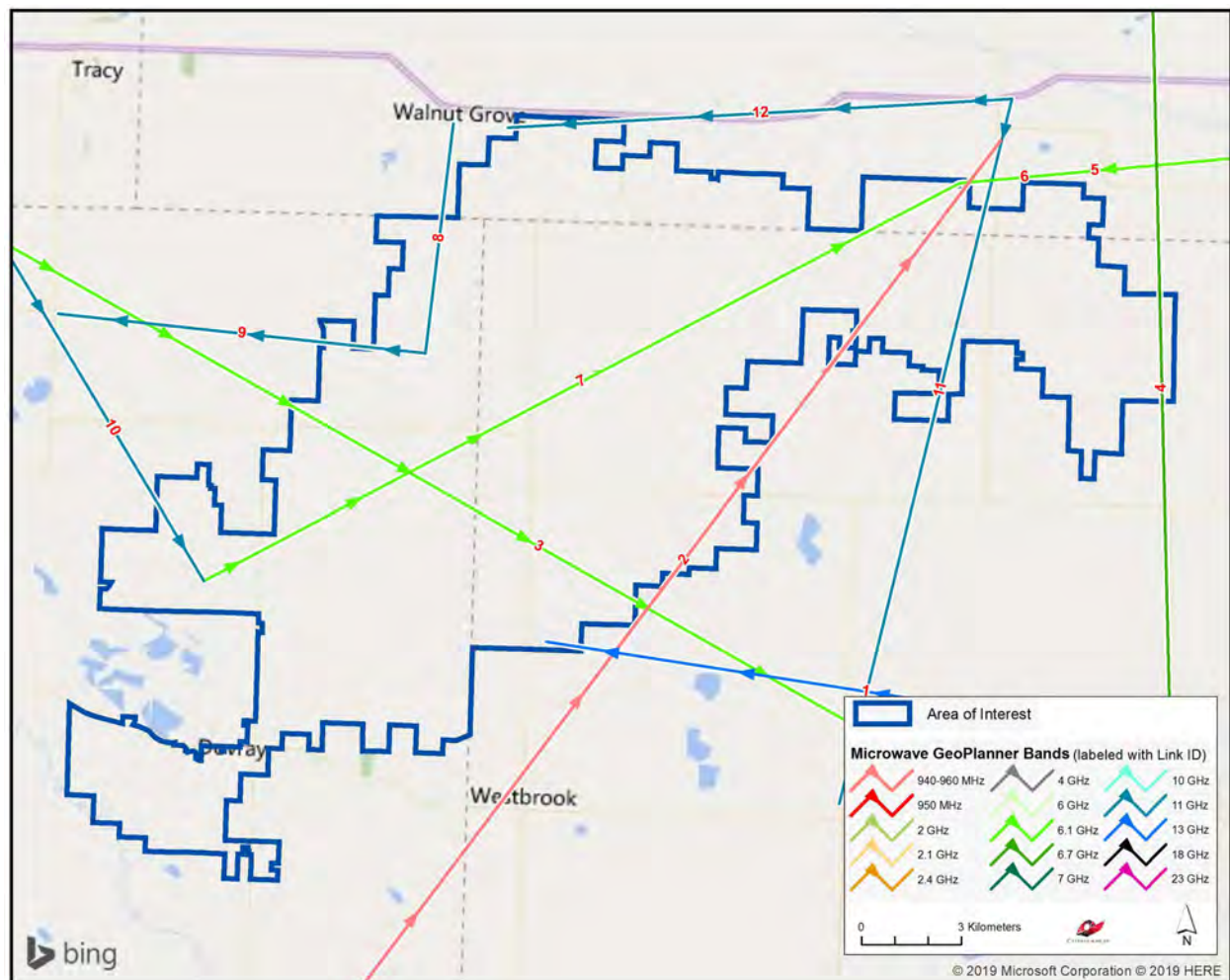


Figure 2: Microwave Paths that Intersect the Area of Interest

<sup>1</sup> Please note that this analysis does not include unlicensed microwave paths or federal government paths that are not registered with the FCC.

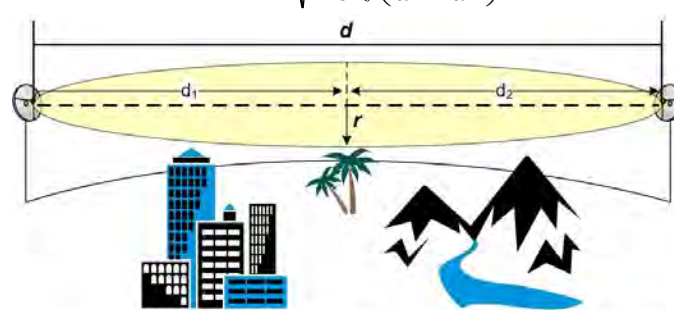
<sup>2</sup> We use FCC-licensed coordinates to determine which paths intersect the area of interest. It is possible that as-built coordinates may differ slightly from those on the FCC license.

| ID | Status   | Callsign 1 | Callsign 2 | Band        | Path Length (km) | Licensee                                 |
|----|----------|------------|------------|-------------|------------------|--|
| 1  | Licensed | WLY660     | RXONLY     | 13 GHz      | 19.45            | Light, Power, Water & Building Commissio |
| 2  | Licensed | WNTR211    | WNTR212    | 940-960 MHz | 46.82            | Interstate Power and Light Company       |
| 3  | Licensed | WQDT290    | WQDT291    | Lower 6 GHz | 48.38            | Northern Border Pipeline Company         |
| 4  | Licensed | WQOK494    | WQMG988    | Upper 6 GHz | 29.08            | Minnesota, State of (DOT)                |
| 5  | Licensed | WQPQ909    | WQPN399    | Lower 6 GHz | 26.13            | Verizon Wireless                         |
| 6  | Proposed | WQPQ909    | WQPN399    | Lower 6 GHz | 26.13            | Verizon Wireless                         |
| 7  | Licensed | WQQP729    | WQPN399    | Lower 6 GHz | 25.69            | Verizon Wireless                         |
| 8  | Licensed | WQZP588    | WQZP352    | 11 GHz      | 6.97             | Minnesota Valley TV Improvement          |
| 9  | Licensed | WQZP588    | WQZP587    | 11 GHz      | 11.11            | Minnesota Valley TV Improvement          |
| 10 | Licensed | WRAI508    | WRAI509    | 11 GHz      | 14.69            | Woodstock Telephone Company              |
| 11 | Licensed | WRBN748    | WRBN736    | 11 GHz      | 21.83            | New Ulm Telecom, Inc                     |
| 12 | Licensed | WRBN748    | WRBN746    | 11 GHz      | 15.18            | New Ulm Telecom, Inc                     |

*Table 1: Summary of Microwave Paths that Intersect the Area of Interest*

(See enclosed *mw\_geopl.xlsx* for more information and  
*GP\_dict\_matrix\_description.xls* for detailed field descriptions)

Next, we calculated a Fresnel Zone for each path based on the following formula:

$$r \cong 17.3 \sqrt{\frac{n}{F_{\text{GHz}}} \left( \frac{d_1 d_2}{d_1 + d_2} \right)}$$


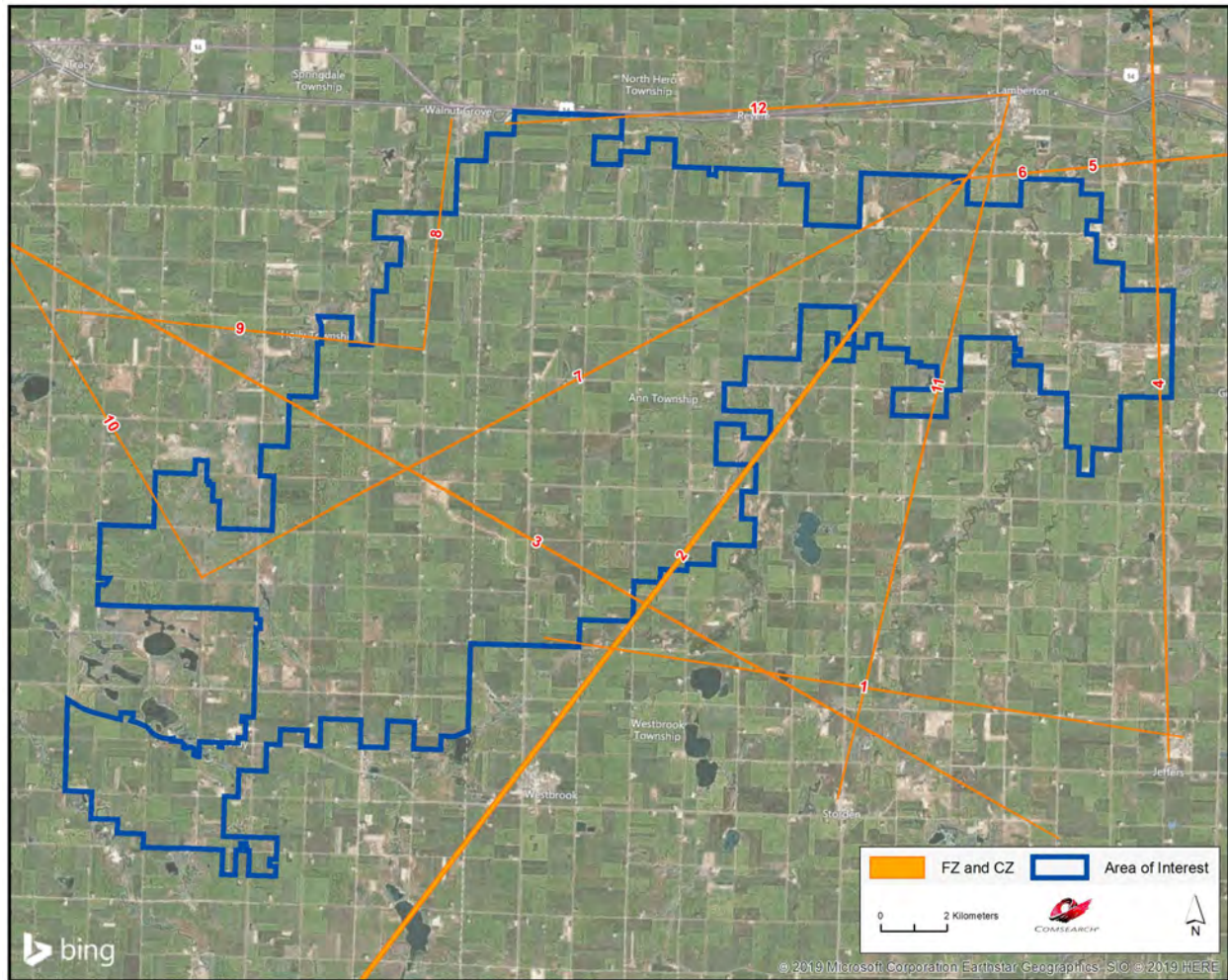
Where,

- r = Fresnel Zone radius at a specific point in the microwave path, meters
- n = Fresnel Zone number, 1
- $F_{\text{GHz}}$  = Frequency of microwave system, GHz
- $d_1$  = Distance from antenna 1 to a specific point in the microwave path, kilometers
- $d_2$  = Distance from antenna 2 to a specific point in the microwave path, kilometers

The calculated Fresnel Zone shows the narrow area of signal swath and is calculated for each microwave path in the project area. In general, this is the area where the planned wind turbines should be avoided, if possible. Likewise, Comsearch recommends that an area directly in front of each microwave antenna should be avoided. This corresponds to the Consultation Zone



which measures 1 kilometer along the main beam of the antenna and 24 ft (7.3 meters) wide. A depiction of the individual Fresnel and Consultation Zones is shown in Figure 3, and is also included in the shapefiles<sup>3,4</sup>.



*Figure 3: Fresnel Zones in the Area of Interest*

<sup>3</sup> The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 15 projected coordinate system.

<sup>4</sup> Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data provided in this report is governed by Comsearch's data license notification and agreement located at [http://www.comsearch.com/files/data\\_license.pdf](http://www.comsearch.com/files/data_license.pdf).

## Discussion of Potential Obstructions

| Total Microwave Paths | Paths with Affected Fresnel Zones | Total Turbines | Turbines intersecting Fresnel Zones |
|-----------------------|-----------------------------------|----------------|-------------------------------------|
| 12                    | N/A                               | N/A            | N/A                                 |

For this project, turbine locations were not provided; thus we could not determine if any potential obstructions exist between the planned wind turbines and the incumbent microwave paths. If the latitude and longitude values for turbine locations are provided, Comsearch can identify where a potential conflict might exist.

## 4. Conclusion

Our study identified 12 microwave paths intersecting the Plum Creek Wind Project area. The Fresnel and Consultation Zones for these microwave paths were calculated and mapped. We recommend that all turbines be sited in locations that will not encroach these exclusion zones.

## 5. Contact

For questions or information regarding the Microwave Study, please contact:

Contact person: David Meyer  
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Email: [dmeyer@comsearch.com](mailto:dmeyer@comsearch.com)  
Web site: [www.comsearch.com](http://www.comsearch.com)

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# Wind Power GeoPlanner™

## Land Mobile & Emergency Services Report

### Plum Creek Wind



Prepared on Behalf of  
Plum Creek Wind Farm,  
LLC

August 7, 2019



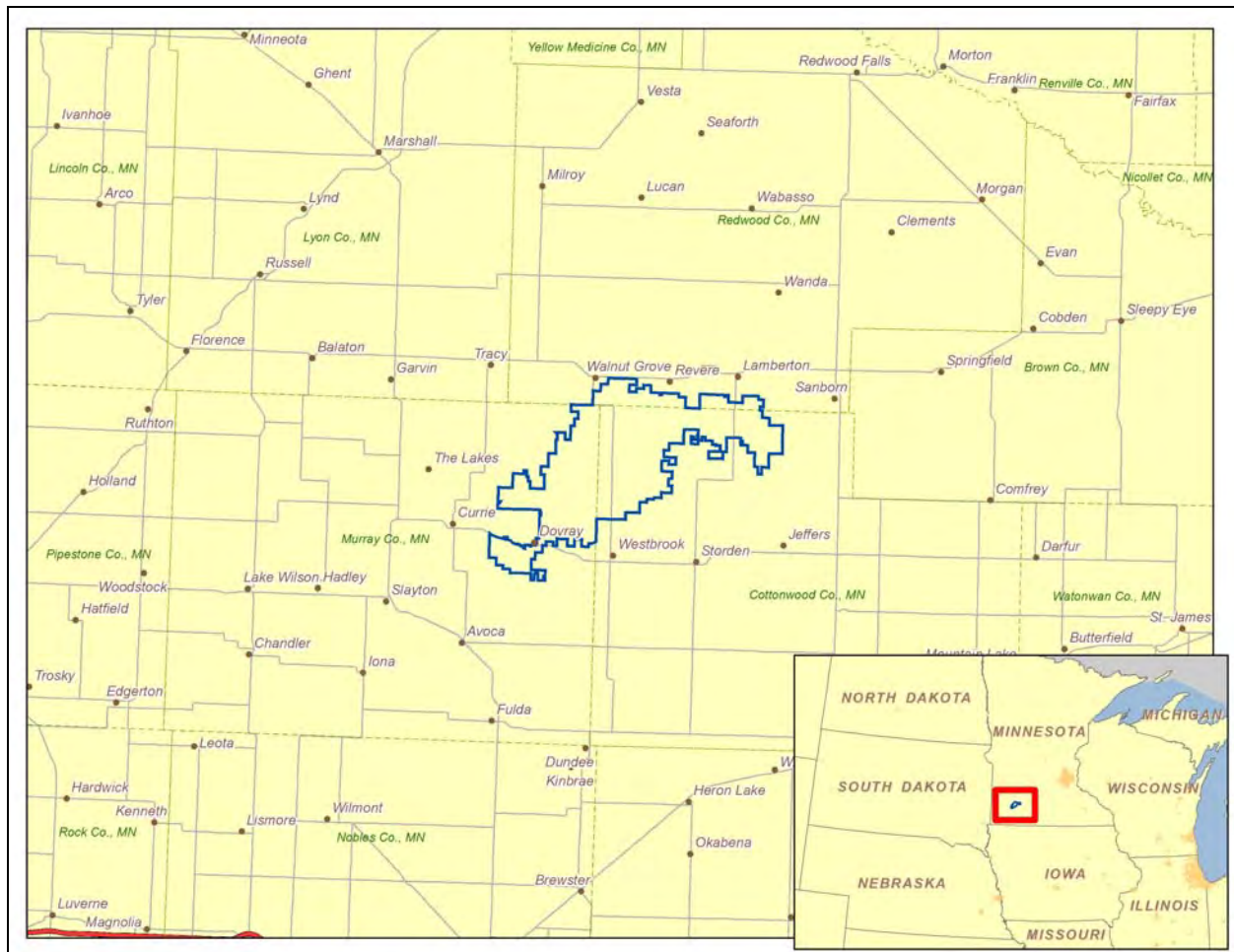


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## 1. Introduction

An assessment of the emergency services in the Plum Creek Wind 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 Murray, Redwood, and Cottonwood Counties, Minnesota, appears below in Figure 1.



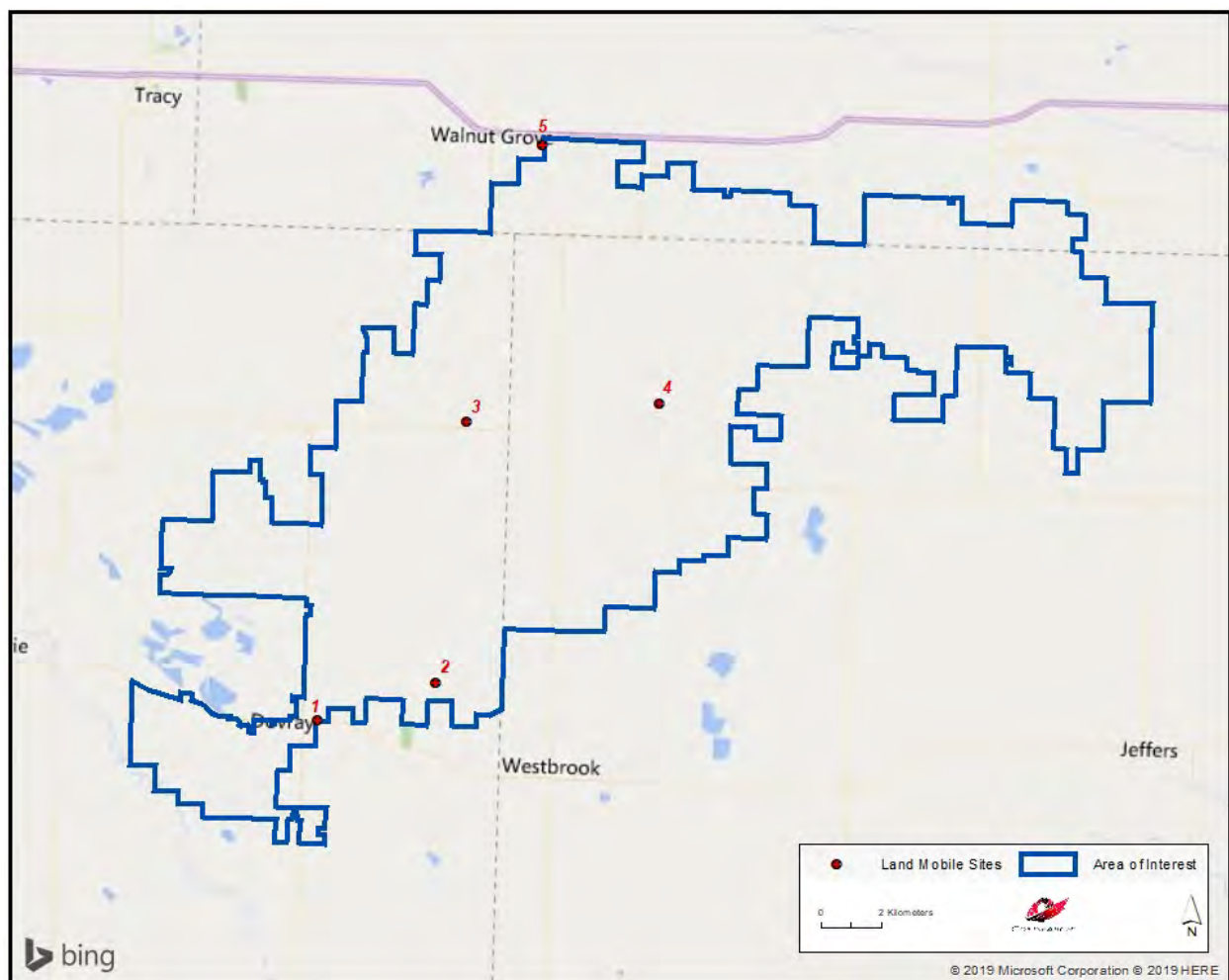
**Figure 1: Area of Interest (AOI)**

## 2. Summary of Results

Our land mobile and emergency services incumbent data<sup>1</sup> 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**



Figure 2 identifies five site-based licenses in and around the Plum Creek Wind 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 Center of AOI (km) |
|----|-----------|----------------------|------------------------------|------------------------|------------------|-------------------|--------------------------------|
| 1  | WNVT846   | 450-470              | McClellan, Gene              | 17.0                   | 44.051361        | -95.536944        | 13.10                          |
| 2  | WQUW212   | 450-470              | Dibble, Warren               | 23.0                   | 44.063389        | -95.489389        | 9.75                           |
| 3  | WQDF201   | 150-174              | Red Rock Rural Water Systems | 9.1                    | 44.140000        | -95.480028        | 4.22                           |
| 4  | WPSI792   | 150-174              | Van Gelderen, Kraig          | 12.0                   | 44.147167        | -95.401944        | 2.23                           |
| 5  | WNAQ291   | 150-174              | Meadowland Farmers Co-Op     | 41.2                   | 44.221889        | -95.452256        | 9.40                           |

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

### Area-Wide Licenses

The regional area-wide licenses were compiled from FCC data sources and identified for each county intersected by the wind energy project area. The Plum Creek Wind project is located in Murray, Redwood, and Cottonwood Counties, Minnesota, part of Public Safety Region #22, which contains all of the counties in Minnesota. The regional public safety operations are overseen by the entity listed below.

**James Mohn**

*Chairperson, Public Safety Region #22*  
Minnesota Department of Transportation  
Office of Statewide Radio Communications  
1500 W CR B2  
Roseville, MN 55113  
phone: 651-234-7969  
email: james.mohn@state.mn.us

The chairperson for Region #22 serves as the representatives for all public safety entities in the area 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, thirteen licenses were found for the State of Minnesota, one for the County of Cottonwood, and two each for the Counties of Murray and Redwood (see Table 2). These area-wide licenses are designated for mobile use only.

<sup>1</sup> 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](http://www.comsearch.com/files/data_license.pdf)

| ID | Licensee                                     | Area of Operation      | Frequency Band (MHz)   |
|----|--|------------------------|--|
| 1  | American National Red Cross                  | Statewide: Minnesota   | 25-50  |
| 2  | Cart, Inc.                                   | Statewide: Minnesota   | 150-174  |
| 3  | Cottonwood, County of                        | Countywide: Cottonwood | 150-174, 4940-4990   |
| 4  | Greater Northwest Emergency Medical Services | Statewide: Minnesota   | 450-470  |
| 5  | Hennepin, County of                          | Statewide: Minnesota   | 25-50, 150-174, 406-413, 450-470, 800/900                              |
| 6  | Minneapolis, City of                         | Statewide: Minnesota   | 2450-2500  |
| 7  | Minnesota, State of                          | Statewide: Minnesota   | 0-10, 150-174, 450-470, 769-775/799-805, 800/900, 2450-2500, 4940-4990 |
| 8  | Minnesota Canine Search Rescue and Tracking  | Statewide: Minnesota   | 150-174  |
| 9  | Minnesota Department of Public Safety        | Statewide: Minnesota   | 150-174  |
| 10 | Murray, County of                            | Countywide: Murray     | 150-174  |
| 11 | Murray County Memorial Hospital              | Countywide: Murray     | 150-174  |
| 12 | National Ski Patrol System, Inc.             | Statewide: Minnesota   | 150-174  |
| 13 | Nevada Division of Forestry                  | Statewide: Minnesota   | 150-174  |
| 14 | North Memorial Health Care                   | Countywide: Redwood    | 150-174  |
| 15 | Northstar Search and Rescue                  | Statewide: Minnesota   | 150-174  |
| 16 | Redwood, County of                           | Countywide: Redwood    | 150-174, 4940-4990   |
| 17 | Rochester City of                            | Statewide: Minnesota   | 150-174  |
| 18 | Saint Louis, County of                       | Statewide: Minnesota   | 150-174, 450-470, 800/900  |

**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 Murray, Redwood, and Cottonwood Counties, Minnesota in Table 3.

| Mobile Phone Carrier             | Service <sup>2</sup>         |                             |                                  |
|----------------------------------|------------------------------|-----------------------------|----------------------------------|
|                                  | Cottonwood County, Minnesota | Murray County, Minnesota    | Redwood County, Minnesota        |
| AT&T                             | AWS, Cellular, WCS, 700 MHz  | AWS, Cellular, WCS, 700 MHz | AWS, Cellular, PCS, WCS, 700 MHz |
| DISH Network                     | AWS, 700 MHz                 | AWS, 700 MHz                | AWS, 700 MHz                     |
| Sprint                           | PCS                          | PCS                         | PCS                              |
| Standing Rock Telecommunications | PCS                          | PCS                         | PCS                              |
| TerreStar                        | AWS                          | AWS                         | AWS                              |
| T-Mobile                         | AWS, PCS, 700 MHz            | AWS, PCS, 700 MHz           | AWS, PCS, 700 MHz                |
| Verizon                          | AWS, Cellular, PCS, 700 MHz  | AWS, Cellular, PCS, 700 MHz | AWS, Cellular, PCS, 700 MHz      |

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

<sup>2</sup> AWS: Advanced Wireless Service at 1.7/2.1 GHz  
CELL: 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 Plum Creek Wind 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 with regard 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**

For questions or information regarding the Land Mobile & Emergency Services Report, please contact:

|                 |   |
|-----------------|---|
| Contact person: | David Meyer                                 |
| Title:          | Senior Manager                              |
| Company:        | Comsearch                                   |
| Address:        | 19700 Janelia Farm Blvd., Ashburn, VA 20147 |
| Telephone:      | 703-726-5656                                |
| Fax:            | 703-726-5595                                |
| Email:          | dmeyer@comsearch.com                        |
| Web site:       | www.comsearch.com                           |

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# Wind Power GeoPlanner™

## Off-Air TV Analysis

Plum Creek Wind



Prepared on Behalf of  
Plum Creek Wind Farm,  
LLC

July 5, 2019







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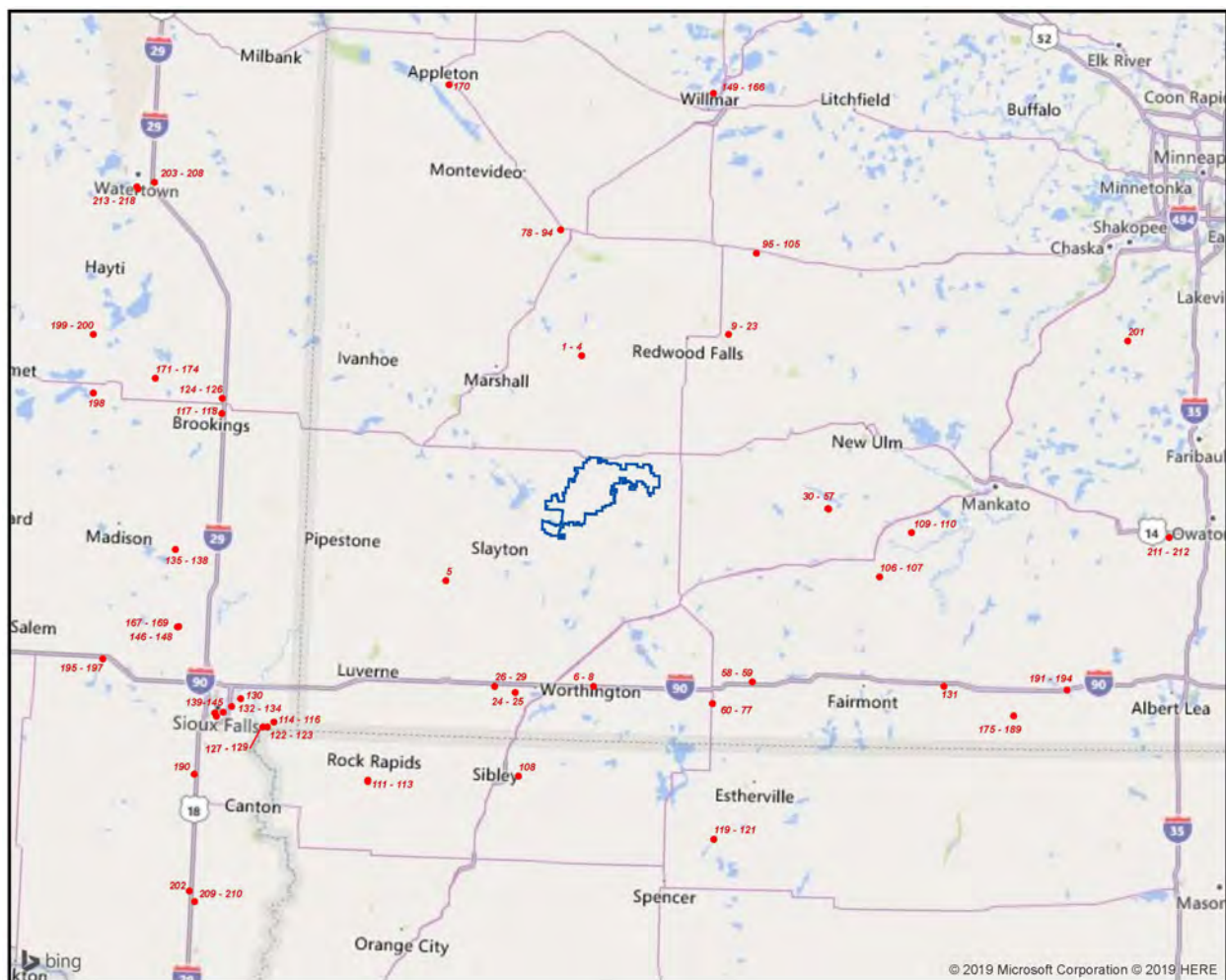
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Off-air television stations broadcast signals from terrestrially-based facilities directly to television receivers. Comsearch identified those off-air stations whose service could potentially be affected by the proposed Plum Creek Wind project in Murray, Redwood, and Cottonwood Counties, Minnesota. Comsearch then examined the coverage of the stations and the communities in the area that could potentially have degraded television reception due to the location of the proposed wind turbines.

The proposed wind energy project area and local communities are depicted in Figure 1, below.



To begin the analysis, Comsearch compiled all off-air television stations<sup>1</sup> within 150 kilometers of the project area of interest (AOI). TV stations at a distance of 150 kilometers or less are the most likely to provide off-air coverage to the project area and neighboring communities. These stations are listed in Table 1, below, and a plot depicting their locations is provided in Figure 2. There are a total of 218 database records for stations within approximately 150 kilometers of the limits of the project AOI. Of these stations, only 151 are currently licensed and operating, 139 of which are low-power stations or translators. Translator stations are low-power stations that receive signals from distant broadcasters and retransmit the signal to a local audience. These stations serve local audiences and have limited range, which is a function of their transmit power and the height of their transmit antenna.



**Figure 2: Plot of Off-Air TV Stations within 150 Kilometers of Project Area**

<sup>1</sup> 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 TV station's FCC license and governed by Comsearch's data license notification and agreement located at [http://www.comsearch.com/files/data\\_license.pdf](http://www.comsearch.com/files/data_license.pdf).

| ID | Call Sign | Status | Service <sup>2</sup> | Channel | Transmit ERP <sup>3</sup> (kW) | Latitude (NAD 83) | Longitude (NAD 83) | Distance to the Project Area (km) |
|----|-----------|--------|----------------------|---------|--------------------------------|-------------------|--------------------|-----------------------------------|
| 1  | KRWF      | LIC    | DT                   | 27      | 58.000                         | 44.484167         | -95.491111         | 29.07                             |
| 2  | K43MH-D   | CP     | LD                   | 34      | 5.000                          | 44.484167         | -95.491111         | 29.07                             |
| 3  | K43MH-D   | CP     | LD                   | 34      | 5.000                          | 44.484167         | -95.491111         | 29.07                             |
| 4  | K43MH-D   | LIC    | LD                   | 43      | 5.500                          | 44.484167         | -95.491111         | 29.07                             |
| 5  | KSMN      | LIC    | DT                   | 15      | 200.000                        | 43.897778         | -95.947500         | 30.98                             |
| 6  | K20LV-D   | CP     | LD                   | 20      | 1.000                          | 43.639556         | -95.414028         | 42.83                             |
| 7  | K24KZ-D   | CP     | LD                   | 24      | 1.000                          | 43.639556         | -95.414028         | 42.83                             |
| 8  | K44LS-D   | CP     | LD                   | 44      | 1.000                          | 43.639556         | -95.414028         | 42.83                             |
| 9  | K39CH-D   | LIC    | LD                   | 15      | 0.370                          | 44.549694         | -94.966944         | 43.49                             |
| 10 | K46FY-D   | LIC    | LD                   | 16      | 0.500                          | 44.549694         | -94.966944         | 43.49                             |
| 11 | K17BV-D   | LIC    | LD                   | 17      | 0.398                          | 44.549694         | -94.966944         | 43.49                             |
| 12 | K19CV-D   | LIC    | LD                   | 19      | 0.395                          | 44.549694         | -94.966944         | 43.49                             |
| 13 | K22KU-D   | LIC    | LD                   | 22      | 0.390                          | 44.549694         | -94.966944         | 43.49                             |
| 14 | K25II-D   | LIC    | LD                   | 25      | 0.387                          | 44.549694         | -94.966944         | 43.49                             |
| 15 | K28LL-D   | LIC    | LD                   | 28      | 0.382                          | 44.549694         | -94.966944         | 43.49                             |
| 16 | K48GQ-D   | LIC    | LD                   | 29      | 0.500                          | 44.549694         | -94.966944         | 43.49                             |
| 17 | K33LB-D   | LIC    | LD                   | 33      | 0.375                          | 44.549694         | -94.966944         | 43.49                             |
| 18 | K50KF-D   | LIC    | LD                   | 35      | 0.500                          | 44.549694         | -94.966944         | 43.49                             |
| 19 | K36KW-D   | LIC    | LD                   | 36      | 0.373                          | 44.549694         | -94.966944         | 43.49                             |
| 20 | K39CH-D   | LIC    | LD                   | 39      | 0.369                          | 44.549694         | -94.966944         | 43.49                             |
| 21 | K46FY-D   | LIC    | LD                   | 46      | 0.360                          | 44.549694         | -94.966944         | 43.49                             |
| 22 | K48GQ-D   | LIC    | LD                   | 48      | 0.357                          | 44.549694         | -94.966944         | 43.49                             |
| 23 | K50KF-D   | LIC    | LD                   | 50      | 0.354                          | 44.549694         | -94.966944         | 43.49                             |
| 24 | K18MO-D   | LIC    | LD                   | 18      | 2.500                          | 43.617111         | -95.689056         | 45.58                             |
| 25 | K18MO-D   | LIC    | LD                   | 22      | 1.800                          | 43.617111         | -95.689056         | 45.58                             |
| 26 | K17MA-D   | CP     | LD                   | 17      | 1.000                          | 43.631861         | -95.761861         | 45.68                             |
| 27 | K27ML-D   | CP     | LD                   | 27      | 1.000                          | 43.631861         | -95.761861         | 45.68                             |
| 28 | K42LR-D   | CP     | LD                   | 42      | 1.000                          | 43.631861         | -95.761861         | 45.68                             |
| 29 | K50NJ-D   | CP     | LD                   | 50      | 1.000                          | 43.631861         | -95.761861         | 45.68                             |
| 30 | K16CG-D   | LIC    | LD                   | 16      | 1.800                          | 44.107778         | -94.598889         | 48.47                             |
| 31 | K17MW-D   | LIC    | LD                   | 17      | 0.500                          | 44.107778         | -94.598889         | 48.47                             |
| 32 | K41IZ-D   | LIC    | LD                   | 18      | 0.400                          | 44.107778         | -94.598889         | 48.47                             |
| 33 | K19LI-D   | LIC    | LD                   | 19      | 0.500                          | 44.107778         | -94.598889         | 48.47                             |

<sup>2</sup> Definitions of service and status codes:

DT – Digital television broadcast station

TX – Translator station

LD – Low power digital television broadcast station

LIC – Licensed and operational station

CP – Construction permit granted

APP – Application for construction permit, not yet operational

<sup>3</sup> ERP = Transmit Effective Radiated Power

| ID | Call Sign | Status | Service <sup>2</sup> | Channel | Transmit ERP <sup>3</sup> (kW) | Latitude (NAD 83) | Longitude (NAD 83) | Distance to the Project Area (km) |
|----|-----------|--------|----------------------|---------|--------------------------------|-------------------|--------------------|-----------------------------------|
| 34 | K20LP-D   | LIC    | LD                   | 20      | 1.300                          | 44.107778         | -94.598889         | 48.47                             |
| 35 | K21DG-D   | CP     | LD                   | 21      | 0.350                          | 44.107778         | -94.598889         | 48.47                             |
| 36 | K22MQ-D   | LIC    | LD                   | 22      | 0.500                          | 44.107778         | -94.598889         | 48.47                             |
| 37 | K23MF-D   | LIC    | LD                   | 23      | 1.300                          | 44.107778         | -94.598889         | 48.47                             |
| 38 | K24JV-D   | LIC    | LD                   | 24      | 1.800                          | 44.107778         | -94.598889         | 48.47                             |
| 39 | K24JV-D   | CP     | LD                   | 24      | 0.350                          | 44.107778         | -94.598889         | 48.47                             |
| 40 | K29IE-D   | LIC    | LD                   | 29      | 3.000                          | 44.107778         | -94.598889         | 48.47                             |
| 41 | K31KV-D   | LIC    | LD                   | 31      | 1.800                          | 44.107778         | -94.598889         | 48.47                             |
| 42 | K35KI-D   | LIC    | LD                   | 35      | 1.800                          | 44.107778         | -94.598889         | 48.47                             |
| 43 | K17MW-D   | LIC    | LD                   | 40      | 1.800                          | 44.107778         | -94.598889         | 48.47                             |
| 44 | K22MQ-D   | LIC    | LD                   | 45      | 1.800                          | 44.107778         | -94.598889         | 48.47                             |
| 45 | K28OH-D   | LIC    | LD                   | 49      | 3.000                          | 44.107778         | -94.598889         | 48.47                             |
| 46 | K23MF-D   | CP     | LD                   | 51      | 3.000                          | 44.107778         | -94.598889         | 48.47                             |
| 47 | K14KE-D   | LIC    | LD                   | 14      | 1.500                          | 44.106944         | -94.595833         | 48.73                             |
| 48 | K21DG-D   | LIC    | LD                   | 21      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 49 | K26CS-D   | LIC    | LD                   | 26      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 50 | K26CS-D   | CP     | LD                   | 26      | 1.700                          | 44.106944         | -94.595833         | 48.73                             |
| 51 | K28OH-D   | LIC    | LD                   | 28      | 0.500                          | 44.106944         | -94.595833         | 48.73                             |
| 52 | K30FN-D   | LIC    | LD                   | 30      | 12.000                         | 44.106944         | -94.595833         | 48.73                             |
| 53 | K30FN-D   | CP     | LD                   | 30      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 54 | K32GX-D   | LIC    | LD                   | 32      | 1.200                          | 44.106944         | -94.595833         | 48.73                             |
| 55 | K34JX-D   | LIC    | LD                   | 34      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 56 | K41IZ-D   | LIC    | LD                   | 41      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 57 | K19LI-D   | LIC    | LD                   | 44      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 58 | K33MW-D   | CP     | LD                   | 33      | 2.000                          | 43.661222         | -94.853472         | 60.26                             |
| 59 | K39MD-D   | CP     | LD                   | 39      | 2.000                          | 43.661222         | -94.853472         | 60.26                             |
| 60 | K17MY-D   | LIC    | LD                   | 17      | 2.000                          | 43.603333         | -94.992778         | 61.56                             |
| 61 | K19HZ-D   | LIC    | LD                   | 19      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 62 | K36IV-D   | LIC    | LD                   | 22      | 1.900                          | 43.603333         | -94.992778         | 61.56                             |
| 63 | K23FO-D   | LIC    | LD                   | 23      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 64 | K27NF-D   | LIC    | LD                   | 27      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 65 | K28OI-D   | LIC    | LD                   | 28      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 66 | K29LV-D   | LIC    | LD                   | 29      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 67 | K30KQ-D   | LIC    | LD                   | 30      | 2.100                          | 43.603333         | -94.992778         | 61.56                             |
| 68 | K31NT-D   | LIC    | LD                   | 31      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 69 | K34NU-D   | LIC    | LD                   | 34      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 70 | K35IZ-D   | LIC    | LD                   | 35      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 71 | K36IV-D   | LIC    | LD                   | 36      | 1.500                          | 43.603333         | -94.992778         | 61.56                             |
| 72 | K17MY-D   | LIC    | LD                   | 40      | 2.100                          | 43.603333         | -94.992778         | 61.56                             |
| 73 | K27NF-D   | LIC    | LD                   | 41      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 74 | K28OI-D   | LIC    | LD                   | 43      | 2.100                          | 43.603333         | -94.992778         | 61.56                             |
| 75 | K29LV-D   | LIC    | LD                   | 45      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |



| ID  | Call Sign | Status | Service <sup>2</sup> | Channel | Transmit ERP <sup>3</sup> (kW) | Latitude (NAD 83) | Longitude (NAD 83) | Distance to the Project Area (km) |
|-----|-----------|--------|----------------------|---------|--------------------------------|-------------------|--------------------|-----------------------------------|
| 76  | K31NT-D   | LIC    | LD                   | 50      | 2.100                          | 43.603333         | -94.992778         | 61.56                             |
| 77  | K34NU-D   | LIC    | LD                   | 51      | 3.100                          | 43.603333         | -94.992778         | 61.56                             |
| 78  | K14OL-D   | LIC    | LD                   | 14      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 79  | K16CP-D   | LIC    | LD                   | 16      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 80  | K21LF-D   | LIC    | LD                   | 19      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 81  | K21LF-D   | LIC    | LD                   | 21      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 82  | K22DO-D   | LIC    | LD                   | 22      | 1.700                          | 44.804722         | -95.580556         | 65.34                             |
| 83  | K24CS-D   | LIC    | LD                   | 24      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 84  | K40MC-D   | LIC    | LD                   | 26      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 85  | K29JW-D   | LIC    | LD                   | 29      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 86  | K31PG-D   | LIC    | LD                   | 31      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 87  | K32DR-D   | LIC    | LD                   | 32      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 88  | K45DJ-D   | LIC    | LD                   | 33      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 89  | K35DK-D   | LIC    | LD                   | 35      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 90  | K49LV-D   | LIC    | LD                   | 36      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 91  | K40MC-D   | LIC    | LD                   | 40      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 92  | K31PG-D   | LIC    | LD                   | 41      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 93  | K45DJ-D   | LIC    | LD                   | 45      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 94  | K49LV-D   | LIC    | LD                   | 49      | 1.800                          | 44.804722         | -95.580556         | 65.34                             |
| 95  | K47JE-D   | CP     | LD                   | 15      | 1.000                          | 44.759139         | -94.873333         | 67.56                             |
| 96  | K18IR-D   | LIC    | LD                   | 18      | 0.790                          | 44.759139         | -94.873333         | 67.56                             |
| 97  | K20JY-D   | LIC    | LD                   | 20      | 0.790                          | 44.759139         | -94.873333         | 67.56                             |
| 98  | K38LC-D   | LIC    | LD                   | 21      | 0.790                          | 44.759139         | -94.873333         | 67.56                             |
| 99  | K23FP-D   | LIC    | LD                   | 23      | 0.790                          | 44.759139         | -94.873333         | 67.56                             |
| 100 | K49AJ-D   | CP     | LD                   | 31      | 0.790                          | 44.759139         | -94.873333         | 67.56                             |
| 101 | K51AL-D   | LIC    | LD                   | 34      | 0.790                          | 44.759139         | -94.873333         | 67.56                             |
| 102 | K38LC-D   | LIC    | LD                   | 38      | 0.790                          | 44.759139         | -94.873333         | 67.56                             |
| 103 | K47JE-D   | LIC    | LD                   | 47      | 0.620                          | 44.759139         | -94.873333         | 67.56                             |
| 104 | K49AJ-D   | LIC    | LD                   | 49      | 0.790                          | 44.759139         | -94.873333         | 67.56                             |
| 105 | K51AL-D   | LIC    | LD                   | 51      | 0.790                          | 44.759139         | -94.873333         | 67.56                             |
| 106 | KEYC-TV   | LIC    | DT                   | 12      | 52.700                         | 43.936944         | -94.410833         | 67.71                             |
| 107 | KMNF-LD   | CP     | LD                   | 13      | 0.350                          | 43.936750         | -94.410833         | 67.72                             |
| 108 | K26JI-D   | LIC    | LD                   | 26      | 14.000                         | 43.403333         | -95.668611         | 68.64                             |
| 109 | K43JE-D   | CP     | LD                   | 25      | 7.500                          | 44.051500         | -94.299972         | 73.03                             |
| 110 | K43JE-D   | LIC    | LD                   | 43      | 10.820                         | 44.051500         | -94.299972         | 73.03                             |
| 111 | K43LX-D   | CP     | LD                   | 33      | 15.000                         | 43.379167         | -96.196667         | 86.68                             |
| 112 | K43LX-D   | LIC    | LD                   | 43      | 15.000                         | 43.379167         | -96.196667         | 86.68                             |
| 113 | K43LX-D   | CP MOD | LD                   | 33      | 15.000                         | 43.376583         | -96.196822         | 86.93                             |
| 114 | KELO-TV   | LIC    | DT                   | 11      | 30.000                         | 43.518611         | -96.535000         | 93.97                             |
| 115 | KSFY-TV   | LIC    | DT                   | 13      | 22.700                         | 43.518611         | -96.535000         | 93.97                             |
| 116 | KABY-LD   | LIC    | LD                   | 20      | 13.200                         | 43.518611         | -96.535000         | 93.97                             |
| 117 | K50DG-D   | LIC    | LD                   | 25      | 4.500                          | 44.300833         | -96.766667         | 95.49                             |

| ID  | Call Sign | Status | Service <sup>2</sup> | Channel | Transmit ERP <sup>3</sup> (kW) | Latitude (NAD 83) | Longitude (NAD 83) | Distance to the Project Area (km) |
|-----|-----------|--------|----------------------|---------|--------------------------------|-------------------|--------------------|-----------------------------------|
| 118 | K50DG-D   | LIC    | LD                   | 50      | 4.500                          | 44.300833         | -96.766667         | 95.49                             |
| 119 | K18KG-D   | LIC    | LD                   | 18      | 6.900                          | 43.255556         | -94.976667         | 95.60                             |
| 120 | KBVK-LP   | CP     | LD                   | 20      | 6.800                          | 43.255556         | -94.976667         | 95.60                             |
| 121 | KBVK-LP   | LIC    | LD                   | 21      | 6.800                          | 43.255556         | -94.976667         | 95.60                             |
| 122 | KDLT-TV   | CP     | DT                   | 21      | 589.000                        | 43.505000         | -96.556389         | 96.27                             |
| 123 | KDLT-TV   | LIC    | DT                   | 47      | 1000.000                       | 43.505000         | -96.556389         | 96.27                             |
| 124 | K17NF-D   | LIC    | LD                   | 17      | 7.014                          | 44.339444         | -96.768889         | 96.68                             |
| 125 | K17NF-D   | CP     | LD                   | 17      | 4.270                          | 44.339444         | -96.768889         | 96.68                             |
| 126 | K17NF-D   | LIC    | TX                   | 40      | 13.500                         | 44.339444         | -96.768889         | 96.68                             |
| 127 | KTTW      | LIC    | DT                   | 7       | 7.500                          | 43.505278         | -96.572222         | 97.26                             |
| 128 | KWSD      | LIC    | DT                   | 36      | 36.900                         | 43.505278         | -96.572222         | 97.26                             |
| 129 | KWSD      | APP    | DT                   | 36      | 1000.000                       | 43.505278         | -96.572222         | 97.26                             |
| 130 | KCSD-TV   | LIC    | DT                   | 24      | 80.900                         | 43.574417         | -96.655583         | 98.42                             |
| 131 | K45MN-D   | CP     | LD                   | 45      | 1.000                          | 43.658556         | -94.176750         | 98.88                             |
| 132 | K22KD-D   | CP     | LD                   | 22      | 3.000                          | 43.553889         | -96.685000         | 101.64                            |
| 133 | K56GF     | CP     | LD                   | 23      | 15.000                         | 43.553889         | -96.685000         | 101.64                            |
| 134 | K56GF     | LIC    | TX                   | 56      | 10.100                         | 43.553889         | -96.685000         | 101.64                            |
| 135 | K21LK-D   | CP     | LD                   | 21      | 2.000                          | 43.949417         | -96.909833         | 104.54                            |
| 136 | K30LV-D   | CP     | LD                   | 30      | 2.000                          | 43.949417         | -96.909833         | 104.54                            |
| 137 | K33LR-D   | CP     | LD                   | 33      | 2.000                          | 43.949417         | -96.909833         | 104.54                            |
| 138 | NEW       | APP    | LD                   | 48      | 2.000                          | 43.949417         | -96.909833         | 104.54                            |
| 139 | K04RR-D   | CP     | LD                   | 4       | 3.000                          | 43.538083         | -96.714306         | 104.59                            |
| 140 | K06QJ-D   | CP     | LD                   | 6       | 3.000                          | 43.538083         | -96.714306         | 104.59                            |
| 141 | KAUN-LP   | CP     | TX                   | 25      | 0.880                          | 43.535556         | -96.743056         | 106.70                            |
| 142 | KCWS-LP   | CP     | TX                   | 27      | 0.680                          | 43.535556         | -96.743056         | 106.70                            |
| 143 | KAUN-LP   | LIC    | TX                   | 42      | 0.880                          | 43.535528         | -96.743083         | 106.71                            |
| 144 | KCWS-LP   | LIC    | TX                   | 44      | 0.680                          | 43.535528         | -96.743083         | 106.71                            |
| 145 | KCPO-LP   | LIC    | TX                   | 26      | 7.570                          | 43.526750         | -96.738167         | 106.89                            |
| 146 | K18IW-D   | LIC    | LD                   | 18      | 3.000                          | 43.752278         | -96.885389         | 107.07                            |
| 147 | K31KU-D   | LIC    | LD                   | 31      | 3.000                          | 43.752278         | -96.885389         | 107.07                            |
| 148 | K32JG-D   | LIC    | LD                   | 32      | 3.000                          | 43.752278         | -96.885389         | 107.07                            |
| 149 | K14LF-D   | LIC    | LD                   | 14      | 0.475                          | 45.166111         | -95.043889         | 107.37                            |
| 150 | K15IS-D   | CP     | LD                   | 15      | 0.400                          | 45.166111         | -95.043889         | 107.37                            |
| 151 | K15IS-D   | CP MOD | LD                   | 15      | 2.000                          | 45.166111         | -95.043889         | 107.37                            |
| 152 | K17FA-D   | LIC    | LD                   | 17      | 0.500                          | 45.166111         | -95.043889         | 107.37                            |
| 153 | K19IH-D   | LIC    | LD                   | 19      | 0.550                          | 45.166111         | -95.043889         | 107.37                            |
| 154 | K44AE-D   | LIC    | LD                   | 22      | 0.700                          | 45.166111         | -95.043889         | 107.37                            |
| 155 | K39FE-D   | LIC    | LD                   | 26      | 0.700                          | 45.166111         | -95.043889         | 107.37                            |
| 156 | K28IF-D   | LIC    | LD                   | 28      | 0.650                          | 45.166111         | -95.043889         | 107.37                            |
| 157 | K30FZ-D   | LIC    | LD                   | 30      | 11.000                         | 45.166111         | -95.043889         | 107.37                            |
| 158 | K46AC-D   | LIC    | LD                   | 33      | 0.700                          | 45.166111         | -95.043889         | 107.37                            |
| 159 | K34HO-D   | LIC    | LD                   | 34      | 0.650                          | 45.166111         | -95.043889         | 107.37                            |

| ID  | Call Sign | Status | Service <sup>2</sup> | Channel | Transmit ERP <sup>3</sup> (kW) | Latitude (NAD 83) | Longitude (NAD 83) | Distance to the Project Area (km) |
|-----|-----------|--------|----------------------|---------|--------------------------------|-------------------|--------------------|-----------------------------------|
| 160 | K48AH-D   | LIC    | LD                   | 35      | 0.700                          | 45.166111         | -95.043889         | 107.37                            |
| 161 | K50HZ-D   | LIC    | LD                   | 36      | 0.700                          | 45.166111         | -95.043889         | 107.37                            |
| 162 | K39FE-D   | LIC    | LD                   | 39      | 0.650                          | 45.166111         | -95.043889         | 107.37                            |
| 163 | K44AE-D   | LIC    | LD                   | 44      | 0.700                          | 45.166111         | -95.043889         | 107.37                            |
| 164 | K46AC-D   | LIC    | LD                   | 46      | 0.700                          | 45.166111         | -95.043889         | 107.37                            |
| 165 | K48AH-D   | LIC    | LD                   | 48      | 0.550                          | 45.166111         | -95.043889         | 107.37                            |
| 166 | K50HZ-D   | LIC    | LD                   | 50      | 0.540                          | 45.166111         | -95.043889         | 107.37                            |
| 167 | K18IW-D   | CP     | LD                   | 18      | 3.000                          | 43.751389         | -96.889444         | 107.41                            |
| 168 | K31KU-D   | CP     | LD                   | 31      | 3.000                          | 43.751389         | -96.889444         | 107.41                            |
| 169 | K32JG-D   | CP     | LD                   | 32      | 3.000                          | 43.751389         | -96.889444         | 107.41                            |
| 170 | KWCM-TV   | LIC    | DT                   | 10      | 50.000                         | 45.167500         | -96.000833         | 113.54                            |
| 171 | K27LB-D   | CP     | LD                   | 27      | 2.000                          | 44.383222         | -97.010500         | 116.56                            |
| 172 | K38NI-D   | CP     | LD                   | 38      | 2.000                          | 44.383222         | -97.010500         | 116.56                            |
| 173 | K42KO-D   | CP     | LD                   | 42      | 2.000                          | 44.383222         | -97.010500         | 116.56                            |
| 174 | K45LV-D   | CP     | LD                   | 45      | 2.000                          | 44.383222         | -97.010500         | 116.56                            |
| 175 | K14KD-D   | LIC    | LD                   | 14      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 176 | K40JS-D   | LIC    | LD                   | 16      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 177 | K47MI-D   | LIC    | LD                   | 17      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 178 | K49JG-D   | LIC    | LD                   | 19      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 179 | K21KF-D   | LIC    | LD                   | 21      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 180 | K23FY-D   | LIC    | LD                   | 23      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 181 | K27FI-D   | LIC    | LD                   | 27      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 182 | K29IF-D   | LIC    | LD                   | 29      | 3.100                          | 43.585833         | -93.929722         | 119.99                            |
| 183 | K31EF-D   | LIC    | LD                   | 31      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 184 | K51KB-D   | LIC    | LD                   | 34      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 185 | K35IU-D   | LIC    | LD                   | 35      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 186 | K40JS-D   | LIC    | LD                   | 40      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 187 | K47MI-D   | LIC    | LD                   | 47      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 188 | K49JG-D   | LIC    | LD                   | 49      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 189 | K51KB-D   | LIC    | LD                   | 51      | 3.000                          | 43.585833         | -93.929722         | 119.99                            |
| 190 | NEW       | APP    | LD                   | 35      | 15.000                         | 43.376667         | -96.805500         | 120.96                            |
| 191 | K22LG-D   | CP     | LD                   | 22      | 1.000                          | 43.652528         | -93.742222         | 129.67                            |
| 192 | K26MG-D   | CP     | LD                   | 26      | 1.000                          | 43.652528         | -93.742222         | 129.67                            |
| 193 | K28MU-D   | CP     | LD                   | 28      | 1.000                          | 43.652528         | -93.742222         | 129.67                            |
| 194 | K50NB-D   | CP     | LD                   | 50      | 1.000                          | 43.652528         | -93.742222         | 129.67                            |
| 195 | K33NF-D   | CP     | LD                   | 33      | 1.000                          | 43.659861         | -97.147444         | 130.38                            |
| 196 | K35LZ-D   | CP     | LD                   | 35      | 1.000                          | 43.659861         | -97.147444         | 130.38                            |
| 197 | K38OZ-D   | CP     | LD                   | 38      | 1.000                          | 43.659861         | -97.147444         | 130.38                            |
| 198 | KESD-TV   | LIC    | DT                   | 8       | 15.000                         | 44.337778         | -97.228611         | 132.45                            |
| 199 | K35GR-D   | LIC    | TX                   | 35      | 11.900                         | 44.487500         | -97.239167         | 137.27                            |
| 200 | K35GR-D   | LIC    | LD                   | 35      | 6.760                          | 44.487500         | -97.239167         | 137.27                            |
| 201 | KILW-LD   | CP MOD | LD                   | 28      | 15.000                         | 44.548056         | -93.536389         | 138.85                            |

| ID  | Call Sign | Status | Service <sup>2</sup> | Channel | Transmit ERP <sup>3</sup> (kW) | Latitude (NAD 83) | Longitude (NAD 83) | Distance to the Project Area (km) |
|-----|-----------|--------|----------------------|---------|--------------------------------|-------------------|--------------------|-----------------------------------|
| 202 | K38NJ-D   | CP     | LD                   | 38      | 2.000                          | 43.077000         | -96.804861         | 143.70                            |
| 203 | K19KH-D   | CP     | LD                   | 19      | 2.000                          | 44.884889         | -97.048306         | 143.78                            |
| 204 | K20KZ-D   | CP     | LD                   | 20      | 2.000                          | 44.884889         | -97.048306         | 143.78                            |
| 205 | K22KF-D   | CP     | LD                   | 22      | 15.000                         | 44.884889         | -97.048306         | 143.78                            |
| 206 | K23LI-D   | CP     | LD                   | 23      | 15.000                         | 44.884889         | -97.048306         | 143.78                            |
| 207 | K30LU-D   | CP     | LD                   | 30      | 2.000                          | 44.884889         | -97.048306         | 143.78                            |
| 208 | K39LN-D   | CP     | LD                   | 39      | 2.000                          | 44.884889         | -97.048306         | 143.78                            |
| 209 | KUSD-TV   | LIC    | DT                   | 34      | 277.000                        | 43.050278         | -96.783889         | 144.79                            |
| 210 | NEW       | APP    | LD                   | 35      | 10.000                         | 43.050278         | -96.783889         | 144.79                            |
| 211 | K48KJ-D   | CP     | LD                   | 21      | 5.000                          | 44.045528         | -93.384083         | 145.97                            |
| 212 | K48KJ-D   | LIC    | LD                   | 48      | 4.920                          | 44.045528         | -93.384083         | 145.97                            |
| 213 | K32DK-D   | LIC    | LD                   | 32      | 2.280                          | 44.865556         | -97.105833         | 146.24                            |
| 214 | K42FI-D   | CP     | LD                   | 28      | 6.516                          | 44.871111         | -97.109722         | 146.84                            |
| 215 | K42FI-D   | CP     | LD                   | 28      | 6.516                          | 44.871111         | -97.109722         | 146.84                            |
| 216 | K42FI-D   | CP MOD | LD                   | 28      | 4.920                          | 44.871111         | -97.109722         | 146.84                            |
| 217 | K42FI-D   | LIC    | TX                   | 42      | 10.000                         | 44.871111         | -97.109722         | 146.84                            |
| 218 | K42FI-D   | LIC    | LD                   | 42      | 6.516                          | 44.871111         | -97.109722         | 146.84                            |

*Table 1: Off-Air TV Stations within 150 Kilometers of Project Area*

### 3. Impact Assessment

Based on a contour analysis of the licensed stations within 150 kilometers of the Plum Creek Wind project, it was determined that seven of the full-power digital stations, identified below in Table 2, along with eleven low-power digital stations, may have their reception disrupted in and around the project. The areas primarily affected would include TV service locations within 10 kilometers of the wind energy project that have clear line-of-sight (LOS) to a proposed wind turbine but not to the respective station. After the wind turbines are installed, communities and homes in these locations may have degraded reception of these stations. This is due to multipath interference caused by signal scattering as TV signals are reflected by the rotating wind turbine blades and mast.

| ID  | Call Sign | Status | Service <sup>4</sup> | Channel | Transmit ERP <sup>5</sup> (kW) | Latitude (NAD 83) | Longitude (NAD 83) | Distance to the Project Area (km) |
|-----|-----------|--------|----------------------|---------|--------------------------------|-------------------|--------------------|-----------------------------------|
| 1   | KRWF      | LIC    | DT                   | 27      | 58.000                         | 44.484167         | -95.491111         | 29.07                             |
| 4   | K43MH-D   | LIC    | LD                   | 43      | 5.500                          | 44.484167         | -95.491111         | 29.07                             |
| 5   | KSMN      | LIC    | DT                   | 15      | 200.000                        | 43.897778         | -95.947500         | 30.98                             |
| 40  | K29IE-D   | LIC    | LD                   | 29      | 3.000                          | 44.107778         | -94.598889         | 48.47                             |
| 45  | K28OH-D   | LIC    | LD                   | 49      | 3.000                          | 44.107778         | -94.598889         | 48.47                             |
| 47  | K14KE-D   | LIC    | LD                   | 14      | 1.500                          | 44.106944         | -94.595833         | 48.73                             |
| 48  | K21DG-D   | LIC    | LD                   | 21      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 49  | K26CS-D   | LIC    | LD                   | 26      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 52  | K30FN-D   | LIC    | LD                   | 30      | 12.000                         | 44.106944         | -94.595833         | 48.73                             |
| 54  | K32GX-D   | LIC    | LD                   | 32      | 1.200                          | 44.106944         | -94.595833         | 48.73                             |
| 55  | K34JX-D   | LIC    | LD                   | 34      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 56  | K41IZ-D   | LIC    | LD                   | 41      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 57  | K19LI-D   | LIC    | LD                   | 44      | 2.000                          | 44.106944         | -94.595833         | 48.73                             |
| 106 | KEYC-TV   | LIC    | DT                   | 12      | 52.700                         | 43.936944         | -94.410833         | 67.71                             |
| 114 | KELO-TV   | LIC    | DT                   | 11      | 30.000                         | 43.518611         | -96.535000         | 93.97                             |
| 115 | KSFY-TV   | LIC    | DT                   | 13      | 22.700                         | 43.518611         | -96.535000         | 93.97                             |
| 123 | KDLT-TV   | LIC    | DT                   | 47      | 1000.000                       | 43.505000         | -96.556389         | 96.27                             |
| 170 | KWCM-TV   | LIC    | DT                   | 10      | 50.000                         | 45.167500         | -96.000833         | 113.54                            |

*Table 2: Licensed Off-Air TV Stations Subject to Degradation*

<sup>4</sup> Definitions of service and status codes:  
DT – Digital television broadcast station  
LD – Low power digital television broadcast station  
LIC – Licensed and operational station

<sup>5</sup> ERP = Transmit Effective Radiated Power



## **4. Recommendations**

While TV signals are reflected by wind turbines, which can cause multipath interference to the TV receiver, modern digital TV receivers have undergone significant improvements to mitigate the effects of signal scattering. When used in combination with a directional antenna, it becomes even less likely that signal scattering from wind farms will cause interference to digital TV reception.

Nevertheless, signal scattering could still impact certain areas currently served by the TV station mentioned above, especially those that would have line-of-sight to at least one wind turbine but not to the station antenna. In the unlikely event that interference is observed in any of the TV service areas, it is recommended that a high-gain directional antenna be used, preferably outdoors, and oriented towards the signal origin in order to mitigate the interference.

Both cable service and direct broadcast satellite service will be unaffected by the presence of the wind turbine facility and may be offered to those residents who can show that their off-air TV reception has been disrupted by the presence of the wind turbines after they are installed.

## **5. Contact**

For questions or information regarding the Off-Air TV Analysis, please contact:

|                 |  |
|-----------------|--|
| Contact person: | David Meyer  |
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| Company:        | Comsearch  |
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| Email:          | <a href="mailto:dmeyer@comsearch.com">dmeyer@comsearch.com</a> |
| Web site:       | <a href="http://www.comsearch.com">www.comsearch.com</a>       |