

# **Appendix G**

## **Telecommunication Studies**



**ENGINEERING REPORT  
CONCERNING THE EFFECTS UPON  
FCC LICENSED RF FACILITIES  
DUE TO CONSTRUCTION OF THE  
BIG BEND WIND ENERGY PROJECT  
In  
COTTONWOOD & WATONWAN COUNTIES, MINNESOTA**

**Prepared for:  
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Charlottesville, VA**

**Revised: September 23, 2020**

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**I. INTRODUCTION**

This engineering report describes the results of a study and analysis to determine the locations of federally-licensed (FCC) fixed station radio frequency (RF) facilities that may be adversely impacted as a result of the construction of the Big Bend Wind Energy Project in Cottonwood and Watonwan Counties, Minnesota. This document describes impact zones and any necessary mitigation procedures, along with recommendations concerning individual wind turbine siting. All illustrations, calculations and conclusions contained in this document are based on FCC database records<sup>1</sup>.

Frequently, wind turbines located on land parcels near RF facilities can cause more than one mode of RF impact, and may require an iterative procedure to minimize adverse effects. This procedure is necessary in order to ensure that disruption of RF facilities either does not occur or, in the alternative, that mitigation procedures will be effective. The purpose of this study is to facilitate the siting of turbines to avoid such unacceptable impact.

The Big Bend wind project as currently planned involves the construction of up to 55 wind turbines in an 81 square mile project area on the north side of the stretch of State Route 60 between Bingham Lake and Butterfield. The wind turbines proposed to be erected will have a maximum hub height of 125 meters and a maximum rotor diameter of 163 meters. The maximum blade tip height therefore would be 206.5 meters AGL.

Using industry standard procedures and FCC databases, a search was conducted to determine the presence of land mobile, public safety and other RF facilities within or adjacent to the identified area, and determine TV and FM broadcast stations predicted to be receivable in the area. A

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<sup>1</sup> The databases used in creating the attached tables and maps are generally accurate, but anomalies have been known to occur. Generally, for wind turbine siting, an on-site verification survey is often suggested as part of the due diligence process.



specific turbine layout has been submitted for analysis. Accordingly, this report will address the potential conflicts that may be caused by the proposed turbines.

The following tabulation and analysis consists of four sections:

1. Land mobile, public safety and other communications tower sites
2. Broadcast TV and FM & AM reception
3. NTIA notification, radar stations and cellular reception
4. EMF from project transmission line

The attached figures were generated based upon the operating parameters of the FCC-licensed stations as contained in the FCC station database, with corrections of the antenna locations as needed.

The following analysis examines the pertinent FCC licensed services in the area for impact. This analysis assumes that all licensed services have been designed and constructed according to FCC requirements and good engineering practice. If this is not the case, the impacted facility must share responsibility with the wind project developer for the costs of any mitigation measures<sup>2</sup>.

Each of the RF analyses is described separately in the sections that follow.

## **II. ANALYSIS OF FIXED RADIO FACILITIES**

### **2.1 Land Mobile & Public Safety Facilities**

A search of the FCC's land mobile/public safety (LM/PS) radio database revealed 16 separately licensed land mobile and public safety transmitter stations that fall within the search area (one kilometer beyond the project area boundary). These land mobile stations are listed in Table 1 and mapped in Figures 1 and 2. The specifications on the land mobile stations can be found in the associated land mobile (LM) spreadsheet file.

Seven of these LM/PS stations are located inside the project area or at the project area boundary (those highlighted in yellow in Table 1).

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<sup>2</sup> For instance, some microwave paths may have insufficient ground clearances as they are presently configured.



| Call Sign | Location No. | Latitude (NAD-83) | Longitude (NAD-83) | Ant. Ht. (m AGL) | Freq. (MHz) | Licensee                       |
|-----------|--------------|-------------------|--------------------|------------------|-------------|--------------------------------|
| WPKR396   | 2            | 43.936972         | -95.000306         | 48.5             | 461.8375    | Adrian, Mike                   |
| WNJR411   | 1            | 43.940903         | -94.906705         | 4                | 161.04      | Union Pacific Railroad Company |
| WPTY609   | 1            | 43.941675         | -94.92234          | 40               | 453.6       | Cottonwood, County of          |
| WQTN617   | 1            | 43.941675         | -94.92234          | 25               | 451.0875    | Mountain Lake, City of         |
| WQKE867   | 1            | 43.941944         | -94.916111         | 8                | 463.8625    | Milk Specialties               |
| KNHP864   | 7            | 43.943024         | -94.909522         | 69               | 154.325     | Cottonwood, County of          |
| WQKR260   | 3            | 43.943024         | -94.909522         | 104.5            | 858.2625    | Minnesota, State of            |
| KNID340   | 1            | 43.943            | -94.918889         | 30               | 154.325     | Mountain Lake, City of         |
| WQES286   | 1            | 43.944376         | -94.879566         | 56               | 464.4       | Gove, Charles                  |
| WQNS968   | 1            | 43.947059         | -94.926841         | 125              | 463.5625    | Alpha Wireless Communications  |
| WNIM744   | 1            | 43.960439         | -94.86248          | 27               | 464.875     | Sunny Side Farms, Inc.         |
| WZN210    | 1            | 43.959759         | -94.791586         | 20               | 155.205     | Butterfield ISD 836            |
| KNJZ613   | 4            | 43.958976         | -94.785311         | 30               | 161.04      | Union Pacific Railroad Company |
| WQDF201   | 2            | 43.966523         | -94.785373         | 44.1             | 153.53      | Red Rock Rural Water Systems   |
| WNFL401   | 1            | 43.986741         | -94.774554         | 27               | 854.8375    | Adrian, Glenn                  |
| WPAE861   | 1            | 44.007039         | -94.96107          | 30               | 463.7       | Junker, Rod                    |

**Table 1 – Land Mobiles & Public Safety Stations within 1 KM of Project Area Boundary**

Multi-directional transmitting facilities, including land mobile stations, which are within 435 meters of a turbine site customarily should be further evaluated for the possibility of transmitter interference caused by wind turbines. It appears from Figures 1 and 2 that none of the land mobile stations in or near the project area are less than 435 meters from the nearest planned turbine.

Based on the current project layout, and assuming that the LM/PS stations in and near the project area are actually located at their licensed locations, or located farther away from turbines, no adverse impact is expected to be caused to the transmissions of land mobile stations that are licensed by the FCC. If any of the turbines are to be re-sited or if turbines are added, it is recommended that no turbines be closer than the following distances from the LM/PS sites listed in Table 2.

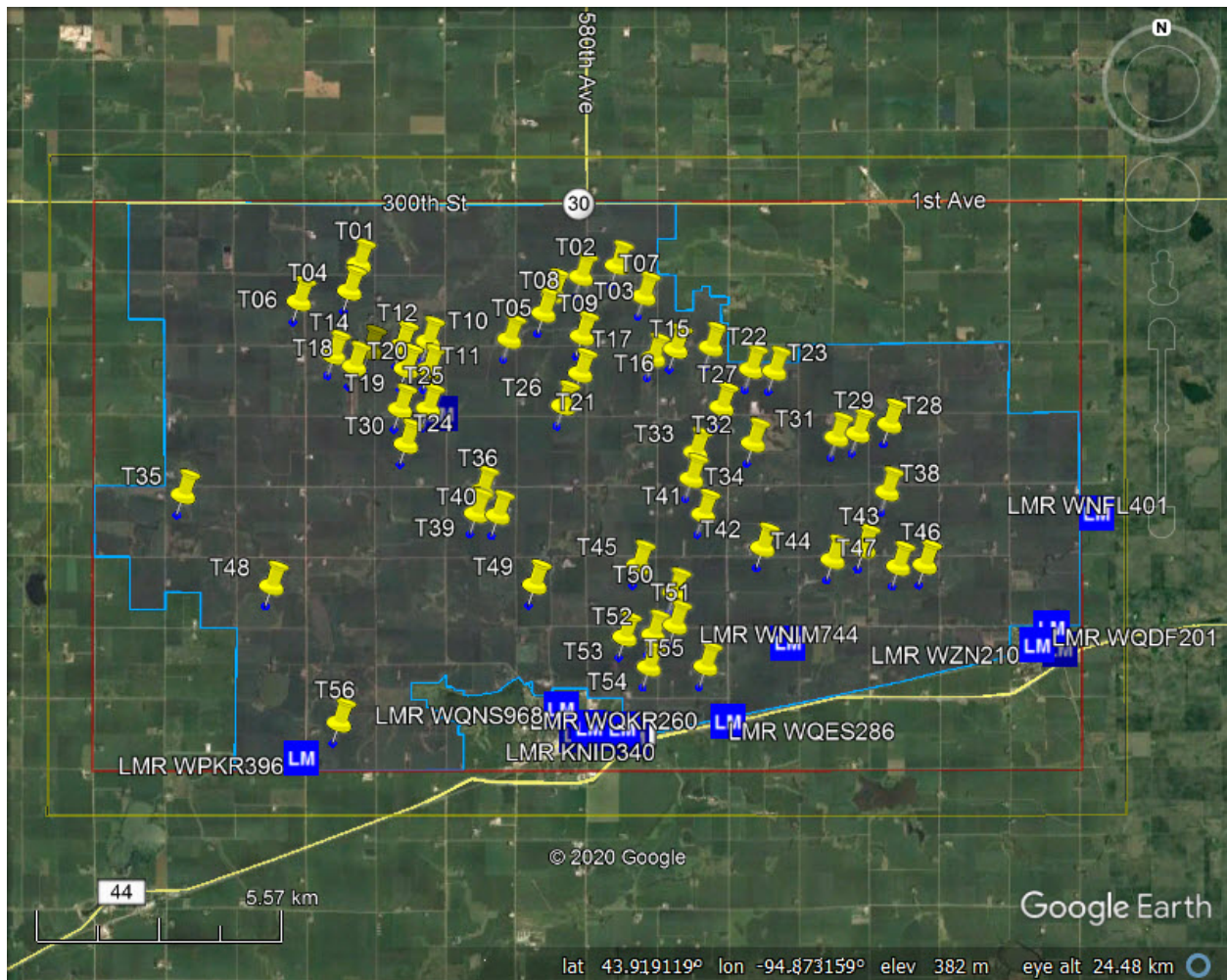


| Land Mobile or Public Safety Station | Distance (meters) |
|--------------------------------------|-------------------|
| WPKR396                              | 270               |
| KNHP864/WQKR260 <sup>3</sup>         | 435               |
| WQES286                              | 270               |
| WNIM744                              | 270               |
| WQDF201                              | 150               |
| WNFL401                              | 435               |
| WPAE861                              | 270               |

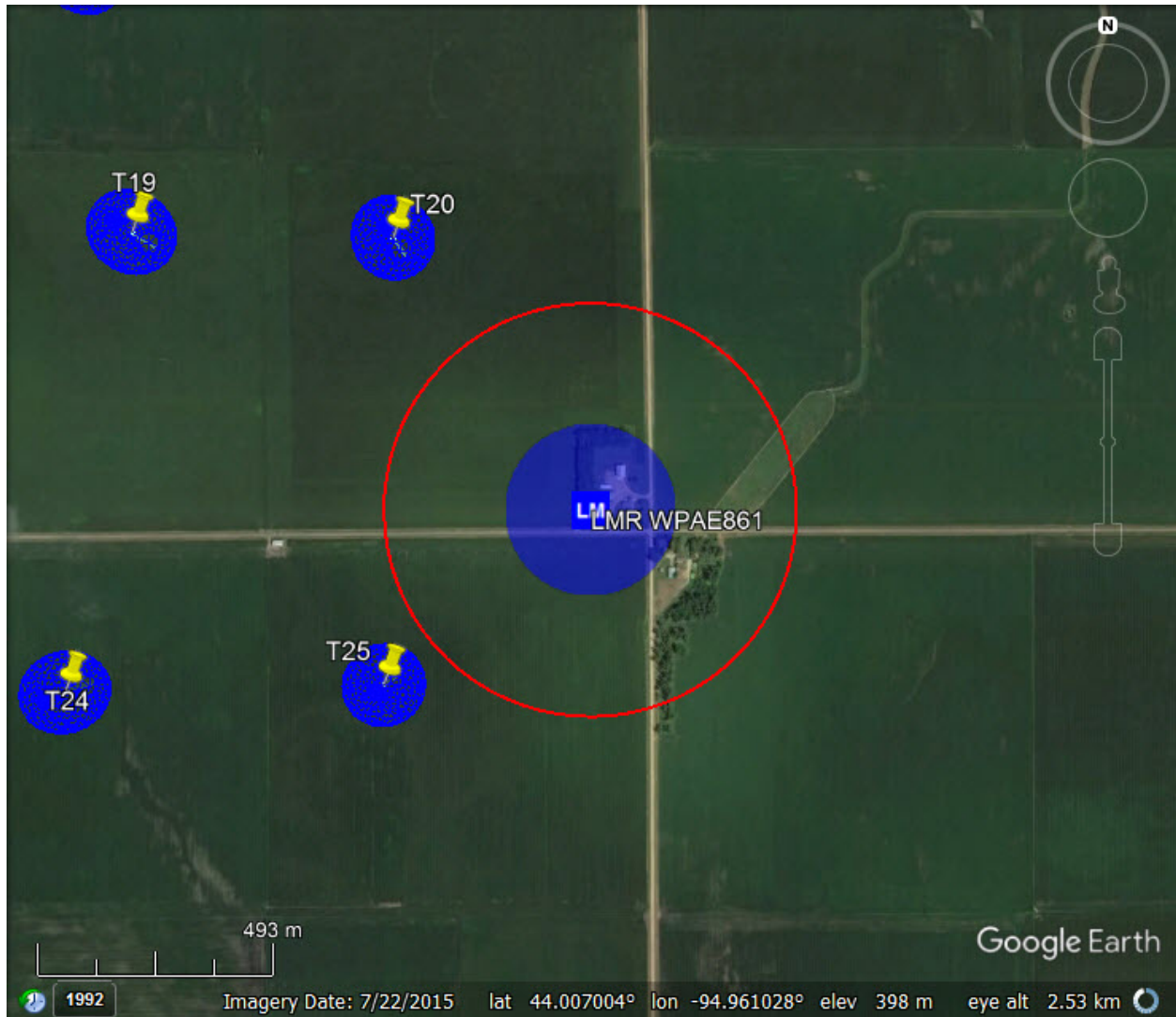
**Table 2 – Minimum Setbacks from LM/PS Stations based on Operating Frequencies**

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<sup>3</sup> Stations KNHP and WQKR260 are located at the same transmitter site.



**Figure 1 – Land Mobile/Public Safety Stations in or near Big Bend Project Area**



**Figure 2 – Land Mobile Station WPAE861 Close to Planned Turbines**

Land mobile station WPAE861, which is inside the project area, is no closer than the 435-meter recommended setback distance from any planned turbine site (represented by the red circle around the station transmitter site).



## **2.2 Other Communications Sites**

A search through the FCC registered antenna structures database reveals other communications towers located within 10 miles of the center of the proposed project area, which are listed in Table 3 and mapped in Figures 3 through 6. The antenna structure location closest to planned turbines is shown in Figure 5. It is suggested, although not required, that these sites be investigated for microwave operations that are not in the FCC database, including unlicensed microwave facilities.

As mentioned previously, multi-directional transmitting facilities within 435 meters of a planned turbine customarily should be further evaluated for the possibility of turbine-related transmitter interference. Based on the current turbine layout, and as demonstrated in Figures 3 through 5, the Big Bend project is not expected to cause any turbine-related signal transmission problems to multi-directional transmitting facilities located at any of the tower sites listed in Table 3.

Table 3 should not be considered a complete list of antenna structures in the area, since most towers under 200 feet (61 meters) in height are not required to be registered with the FCC. An on-site visual survey is suggested to identify such towers.

If changes or additions to the turbine layout are to be considered that would place turbines less than 435 meters from one or more of the tower sites listed in Table 3, it is suggested, though not required, that further investigation be done to determine whether there are transmitting facilities on such towers that were not found in the FCC database searches described in this report.



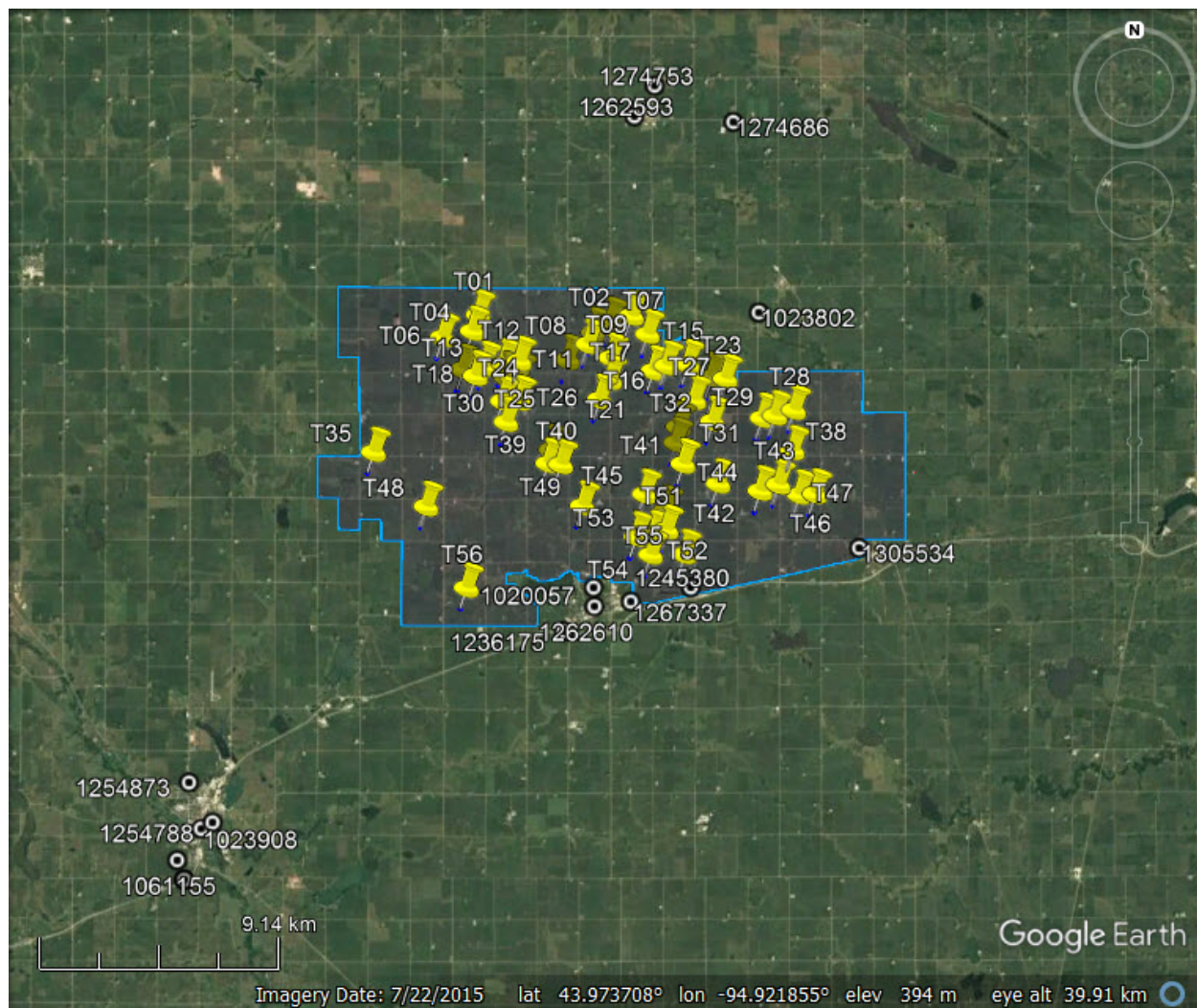
| FCC Registr. # | Owner                  | Location          | Latitude    | Longitude   | Height AGL (m) | Type of Comm. Tower |
|----------------|------------------------|-------------------|-------------|-------------|----------------|---------------------|
| 1020057        | CTI Towers Assets II   | Mountain Lake, MN | 43-56-52.0N | 94-55-38.0W | 150.8          | Land Mobile         |
| 1021986        | Minnesota, State of    | Windom, MN        | 43-50-51.0N | 95-07-19.0W | 99.4           | Microwave           |
| 1023802        | Alltel Corporation     | Comfrey, MN       | 44-02-31.5N | 94-50-54.0W | 149.4          | Unknown             |
| 1023908        | Midwest Wireless Comm. | Windom, MN        | 43-51-53.9N | 95-06-50.2W | 45.1           | Cellular            |
| 1061155        | Minn. Valley TV Corp.  | Windom, MN        | 43-51-15.0N | 95-07-31.0W | 91.0           | Unknown             |
| 1236175        | Alltel Corporation     | Mountain Lake, MN | 43-55-58.0N | 94-56-29.0W | 96.0           | Cellular            |
| 1245380        | CCATT LLC              | Mountain Lake, MN | 43-56-52.3N | 94-52-51.3W | 120.4          | Cellular            |
| 1254788        | SWWC Service Co-op     | Windom, MN        | 43-52-01.8N | 95-06-30.5W | 51.8           | Microwave           |
| 1254873        | Bud's Custom 2 Way     | Windom, MN        | 43-52-51.0N | 95-07-11.0W | 57.9           | Unknown             |
| 1262593        | SWWC Service Co-op     | Comfrey, MN       | 44-06-34.2N | 94-54-27.7W | 30.5           | Microwave           |
| 1262610        | SWWC Service Co-op     | Mountain Lake, MN | 43-56-28.8N | 94-55-36.5W | 45.7           | Microwave           |
| 1267337        | Minnesota, State of    | Mountain Lake, MN | 43-56-34.7N | 04-54-34.2W | 106.7          | LM/MW <sup>4</sup>  |
| 1274686        | Minnesota, State of    | Comfrey, MN       | 44-06-27.2N | 94-51-37.4W | 106.7          | Microwave           |
| 1274753        | ATC Iris I LLC         | Comfrey, MN       | 44-07-12.1N | 94-53-52.8W | 96.0           | Cellular            |
| 1302425        | Minnesota, State of    | Windom, MN        | 43-50-51.0N | 95-07-19.0W | 99.4           | Microwave           |
| 1305534*       | Alltel Corporation     | Butterfield, MN   | 43-57-40.5N | 94-48-02.1W | 78.9           | Unknown             |

The listed coordinates for the above structures are from documents filed with the FCC and have not been verified by this consultant. Blue-shaded records indicate towers containing land mobile facilities documented in Section II of this report.

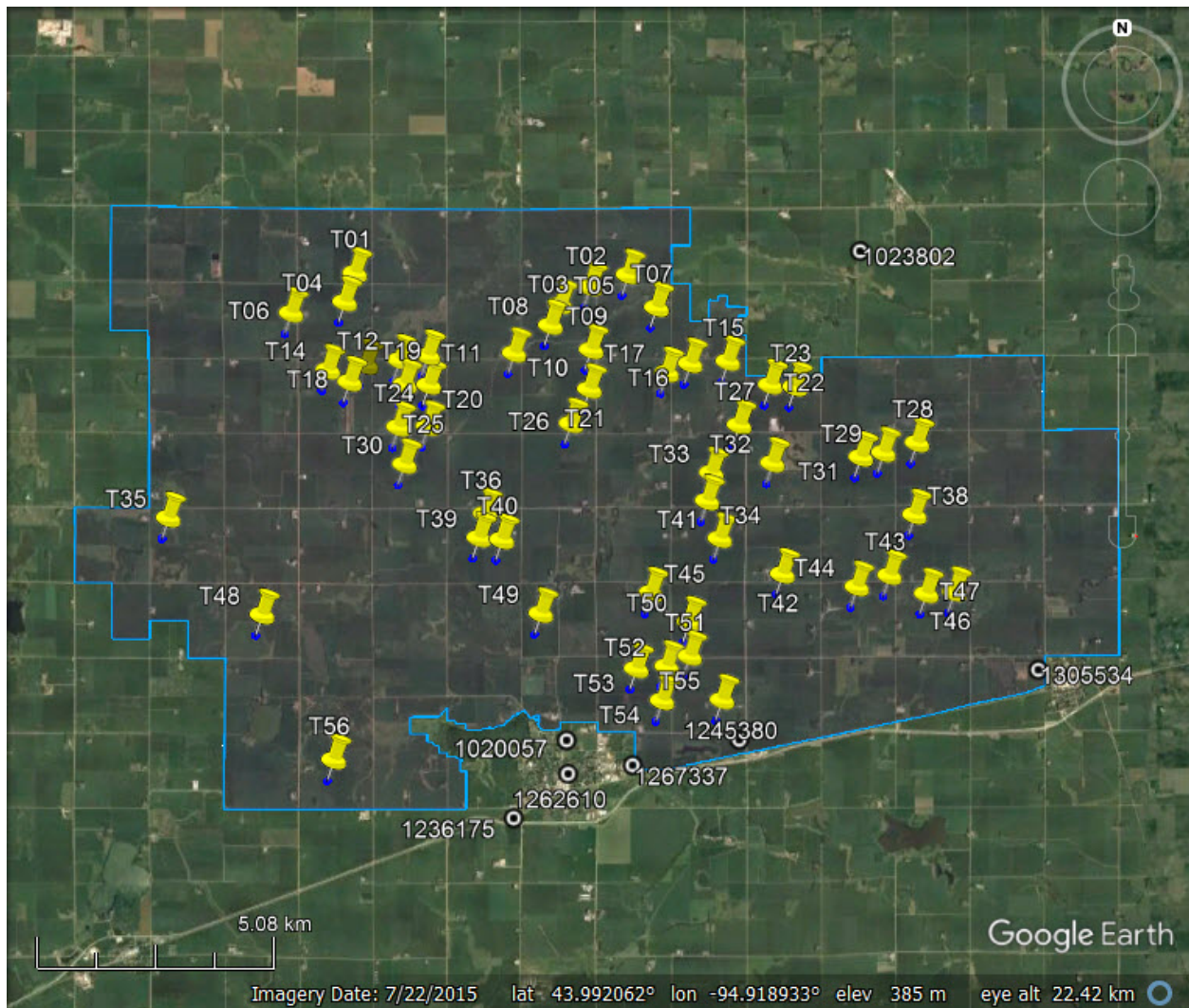
\*ASR 1305534 has not been verified to have been built.

**Table 3 – FCC-Registered Communications Towers within 10 miles of Project Area**

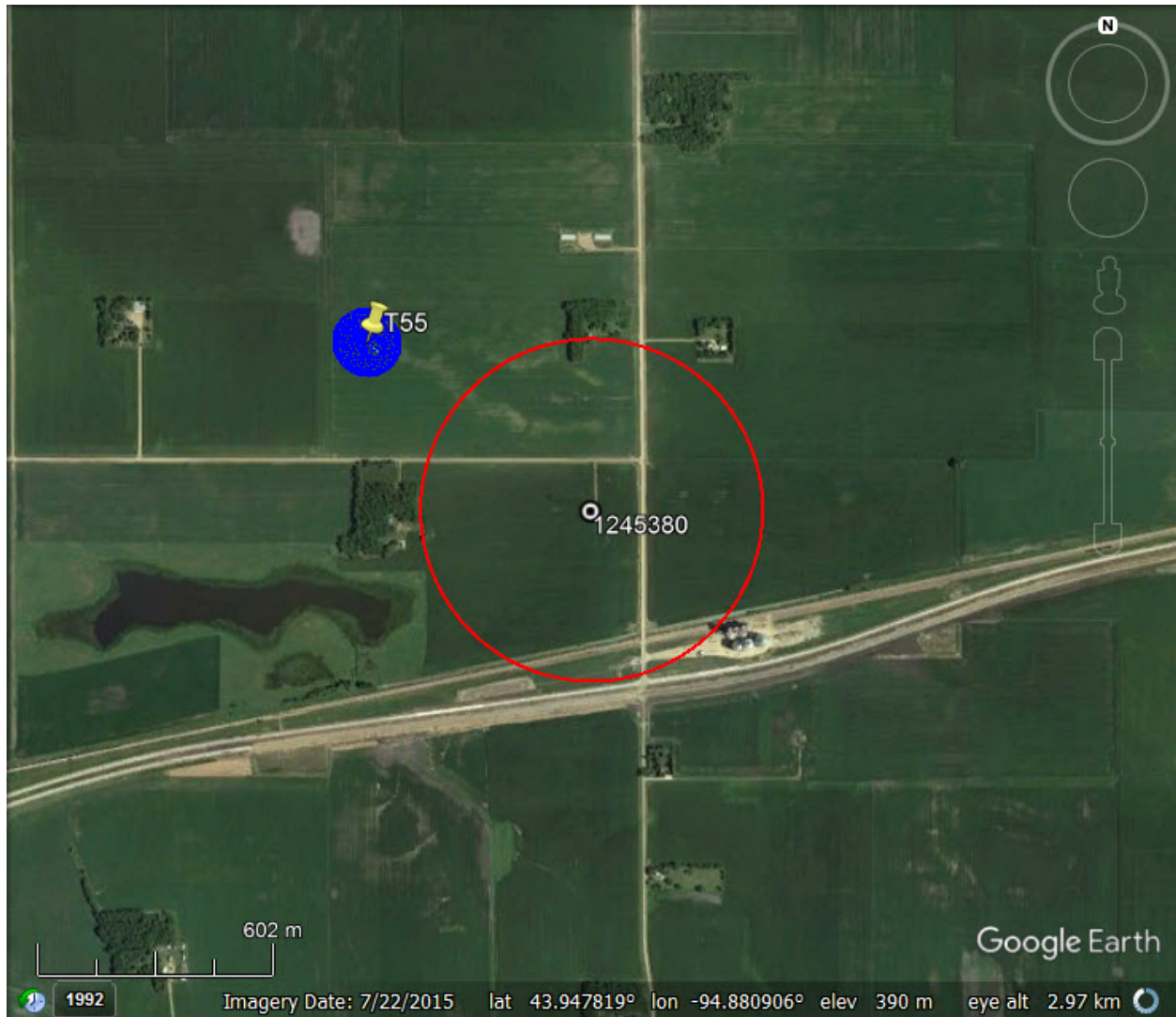
<sup>4</sup> Land Mobile and Microwave



**Figure 3 – FCC-Documented Antenna Structures within 10 miles of Center of Project Area**

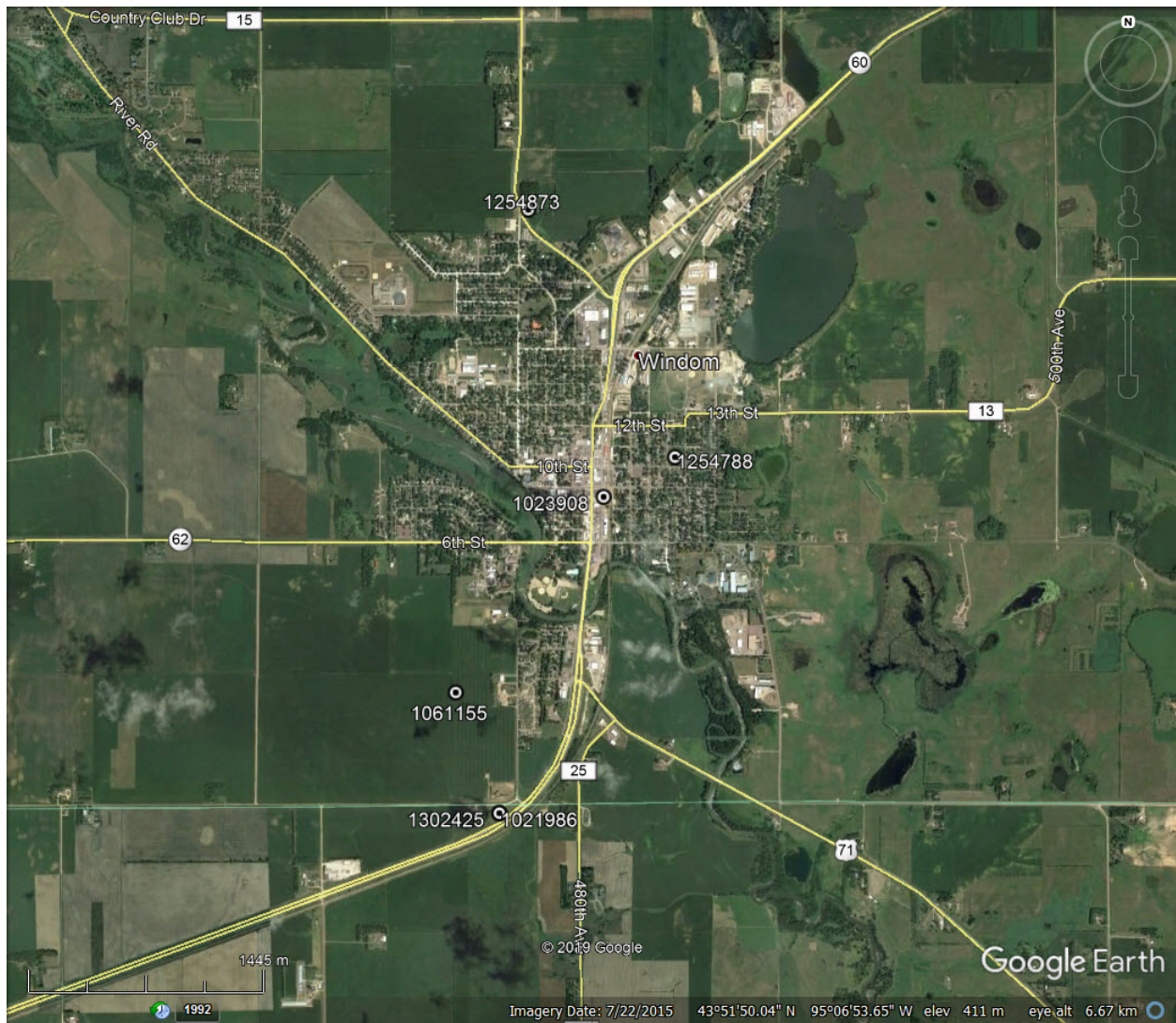


**Figure 4 – FCC-Registered Towers closest to Project Area**



**Figure 5 – FCC-Registered Tower 1245380 closest to Planned Turbines**

In the above image is shown the FCC-registered tower, at the south edge of the project area, nearest to planned turbines. As shown by the 435-meter radius circle around the tower site (ASR 1245380), the planned turbine sites exceed the worst-case recommended setback of 435 meters from the tower sites.



**Figure 6 – FCC-Registered Towers in and near the City of Windom**



### **III. ANALYSIS OF BROADCAST FACILITIES**

#### **3.1 TV Broadcast Facilities**

The rotating blades of a wind turbine have the potential to disrupt over-the-air broadcast TV reception within a few miles of the turbine, especially when the direct path from the viewer's residence is obstructed by terrain. Interference is caused when signals reflected by the blades arrive at the viewer's TV antenna along with the direct signal. This is known as "multipath interference." However, as turbine manufacturers have replaced all-metal blades with blades constructed of mostly nonmetallic materials<sup>5</sup>, this effect has been reduced. Also, the new generation of HDTV receivers is better equipped to deal with minor multipath interference (which is manifested by "pixilating" or "freezing" of the digital picture) than analog TV sets, as special circuitry is employed to suppress the weaker reflected signal. Occasionally, however, multipath interference from one or more turbines can cause video failure in HDTV receivers, especially if the receiver location is in a valley or other place of low elevation.

There is some possibility of signal disruption for residences that have to point their outdoor antennas through the turbine area, or that utilize "rabbit ear" antennas and/or older HDTV receivers. Most of this effect should be dissipated for locations three or more miles from a turbine, but some residual problems could be noted for HDTV receivers that are located below the grade level at the turbine base. Usually, a rule of thumb is that approximately 10% of the receiver locations are affected to some extent within three miles of a large turbine when the turbine is between the TV station and the receiver. The usual effect is intermittent "pixilation" or freezing of the digital TV picture. This estimate is based upon Evans Engineering's experience with similar wind energy projects.

Cottonwood County is in the Minneapolis-St. Paul, MN Designated Market Area (DMA) as defined by Nielsen Media Research, although the TV stations in that DMA are not predicted to reach the Big Bend wind project area with a sufficient signal. Watonwan County, to the east, is in the Mankato, MN DMA. The TV stations that have been determined to place a predicted FCC primary off-the-air service signal over at least a portion of the project area or its immediate environs are listed in Table 4. The TV stations' predicted service area boundaries are mapped in Figure 7.

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<sup>5</sup> Modern turbine blades are usually constructed from glass-reinforced plastic (GRP), although they usually contain some metal for strengthening, balance and grounding.



| Call Sign         | RF Ch | City of License |    | FCC File No.     | Dist.(km) | Azimuth(°T) <sup>6</sup> |
|-------------------|-------|-----------------|----|------------------|-----------|--------------------------|
| KMNF-LD(NBC/CW)   | 7     | Mankato         | MN | 90446            | 41.9      | 97.0                     |
| KEYC-TV(CBS/FOX)* | 12    | Mankato         | MN | BLCDT20120918AFE | 41.8      | 97.0                     |
| K14KE-D           | 14    | St. James       | MN | 81295            | 30.0      | 62.8                     |
| KSMN(PBS)*        | 15    | Worthington     | MN | BLEDT20051219AGX | 82.4      | 263.7                    |
| K16CG-D           | 16    | St. James       | MN | BLDTL20120625AAQ | 29.8      | 62.4                     |
| K17MW-D           | 17    | St. James       | MN | 64441            | 29.8      | 62.4                     |
| K17MY-D           | 17    | Jackson         | MN | 64443            | 42.6      | 187.0                    |
| K18NE-D           | 18    | St. James       | MN | 88224            | 29.8      | 62.4                     |
| K19HZ-D           | 19    | Jackson         | MN | BLDTT20090910AAS | 42.6      | 187.0                    |
| K19LI-D           | 19    | St. James       | MN | 64438            | 29.8      | 62.4                     |
| K20LP-D           | 20    | St. James       | MN | BLDTL20120625AAR | 29.8      | 62.4                     |
| K21DG-D           | 21    | St. James       | MN | 58900            | 29.8      | 62.4                     |
| K22MQ-D           | 22    | St. James       | MN | 64439            | 29.8      | 62.4                     |
| K22MY-D           | 22    | Jackson         | MN | 64091            | 42.6      | 187.0                    |
| K23FO-D           | 23    | Jackson         | MN | BLDTT20090811AAW | 42.6      | 187.0                    |
| K23MF-D           | 23    | St. James       | MN | 81006            | 29.8      | 62.4                     |
| K24JV-D           | 24    | St. James       | MN | 58896            | 29.8      | 62.4                     |
| K25QC-D           | 25    | Lake Crystal    | MN | 51902            | 51.0      | 81.3                     |
| K26CS-D(PBS)      | 26    | St. James       | MN | 58899            | 30.0      | 62.8                     |
| K27NF-D           | 27    | Jackson         | MN | 64446            | 42.6      | 187.0                    |
| KRWF(ABC)*        | 27    | Redwood Falls   | MN | BLCDT20080502ABG | 71.5      | 321.2                    |
| K280H-D           | 28    | St. James       | MN | 64440            | 30.0      | 62.8                     |
| K280I-D           | 28    | Jackson         | MN | 64442            | 42.6      | 187.0                    |
| K29IE-D(PBS)      | 29    | St. James       | MN | BLDTT20090817ACY | 29.8      | 62.4                     |
| K29LV-D           | 29    | Jackson         | MN | 64447            | 42.6      | 187.0                    |
| K30FN-D           | 30    | St. James       | MN | 58897            | 30.0      | 62.8                     |
| K30KQ-D(ION)      | 30    | Jackson         | MN | BLDTL20130321ACB | 42.6      | 187.0                    |
| K31NT-D           | 31    | Jackson         | MN | 64445            | 42.6      | 187.0                    |
| K31KV-D           | 31    | St. James       | MN | BLDTL20120625AAY | 29.8      | 62.4                     |
| K32GX-D(NBC)      | 32    | St. James       | MN | BLDTL20100113ADB | 30.0      | 62.8                     |
| K33MW-D           | 33    | Sherburn        | MN | BNPDTL20100510AJ | 36.4      | 170.4                    |
| K34JX-D           | 34    | St. James       | MN | BLDTL20091204ADL | 30.0      | 62.8                     |
| K34NU-D           | 34    | Jackson         | MN | 64444            | 42.6      | 187.0                    |
| K35IZ-D(CBS)      | 35    | Jackson         | MN | BLDTT20090811AAV | 42.6      | 187.0                    |
| K35KI-D           | 35    | St. James       | MN | BLDTL20120625AAV | 29.8      | 62.4                     |

\* These stations are full-power TV stations affiliated with major networks. The rest are Low Power TV stations or TV Translator stations (low power stations that re-broadcast full power stations that do not sufficiently serve the area.

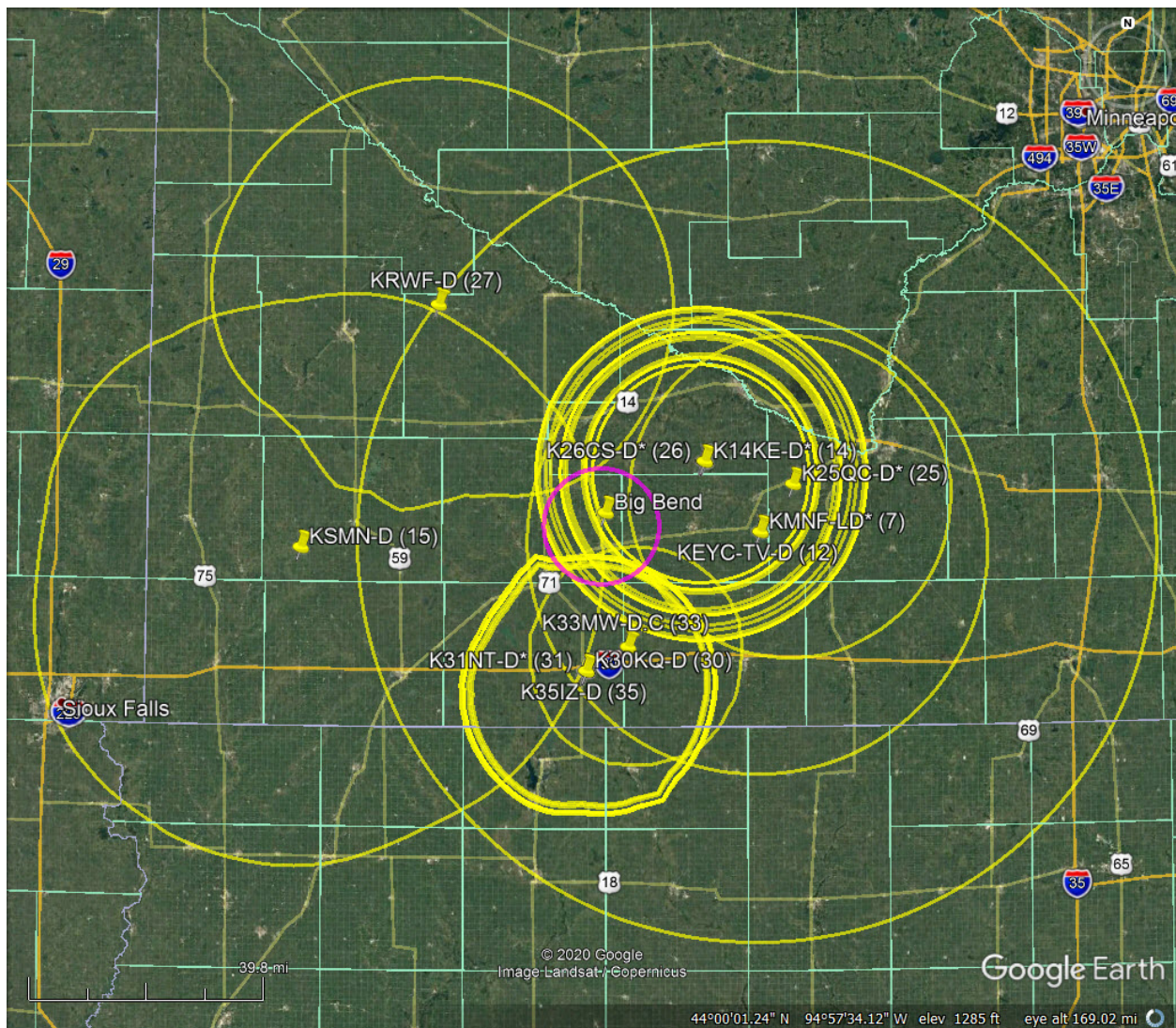
**Table 4 - TV Stations Serving Big Bend Project Area**

If the Big Bend wind project should cause disruptions to over-the-air TV viewing, methods to resolve them are available, and are as follows:

<sup>6</sup> Distance and azimuth to each station transmitter is referenced to the geographic center of the wind project area, whose coordinates are as follows: N 43-59-02.9, W 94-55-42.6.



1. Relocation of the household antenna to receive a better signal
2. Installation of a better outside antenna, or one with a higher gain
3. Installation of satellite or cable TV



**Figure 7 – Predicted Over-the-Air Television Coverage into Big Bend Project Area**



According to this engineer's calculations, there are approximately 1,738 households within an area potentially to be affected (approximately 176 square miles). It is conservatively estimated that 65%, or 701 of the households receive TV programming primarily by satellite dish or cable. This leaves an estimated 608 households relying on transmitted off-the-air TV signals. Based on the 10% criteria described previously, up to 61 TV receiving locations may be affected to varying degrees in the worst-case. Mitigation costs would be approximately \$200 per location for an upgraded outdoor antenna, or \$450 per year per location for a satellite or cable subscription.

It is the opinion of this consultant that any disruptions to over-the-air TV broadcast signals, if they occur, can be resolved satisfactorily.



### 3.2 FM Facilities

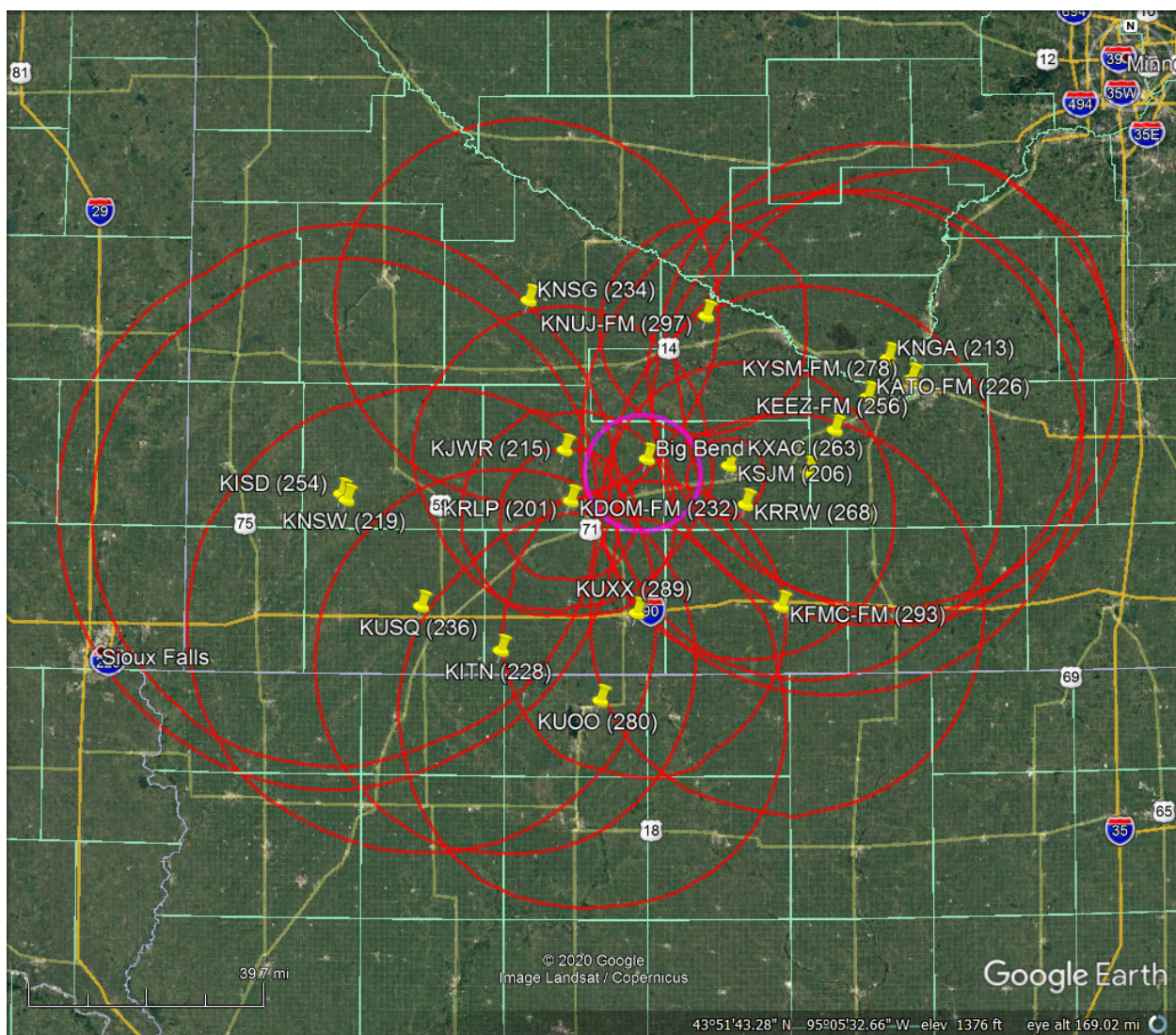
The full-service FM stations that place a predicted primary signal over at least part of the project area are listed in the following Table 5. The FM stations' service area boundaries are mapped in Figure 8.

| Call Sign | Freq. (MHz) | City of License          | Power (KW) | Ant. Height (m HAAT) | Dist. (km) | Azimuth <sup>7</sup> (°T) |
|-----------|-------------|--------------------------|------------|----------------------|------------|---------------------------|
| KUDO      | 103.9       | Spirit Lake, IA          | 50         | 150                  | 65.5       | 191.1                     |
| KRLP      | 88.1        | Windom, MN               | 0.6        | 118                  | 23.2       | 241.5                     |
| KSJM      | 89.1        | St. James, MN            | 1.0        | 20                   | 22.0       | 94.8                      |
| KNGA      | 90.5        | St. Peter, MN            | 75         | 216                  | 70.1       | 67.5                      |
| KJWR      | 90.9        | Windom, MN               | 25         | 100                  | 22.1       | 276.4                     |
| KNSW      | 91.7        | Worthington-Marshall, MN | 99         | 243                  | 81.1       | 262.4                     |
| KATO-FM   | 93.1        | New Ulm, MN              | 100        | 149                  | 61.5       | 74.5                      |
| KITN      | 93.5        | Worthington, MN          | 50         | 142                  | 64.2       | 217.6                     |
| KDOM-FM   | 94.3        | Windom, MN               | 5.7        | 102                  | 23.2       | 241.7                     |
| KNSG      | 94.7        | Springfield, MN          | 50         | 144                  | 52.9       | 323.3                     |
| KUSQ      | 95.1        | Worthington, MN          | 100        | 187                  | 72.0       | 237.1                     |
| KISD      | 98.7        | Pipestone, MN            | 100        | 330                  | 82.4       | 263.7                     |
| KEEZ-FM   | 99.1        | Mankato, MN              | 100        | 239                  | 51.0       | 81.3                      |
| KXAC      | 100.5       | St. James, MN            | 34         | 180                  | 43.3       | 94.7                      |
| KRRW      | 101.5       | St. James, MN            | 14         | 136                  | 29.1       | 114.8                     |
| KYSM-FM   | 103.5       | Mankato, MN              | 100        | 165                  | 74.2       | 73.3                      |
| KUXX      | 105.7       | Jackson, MN              | 25         | 100                  | 41.1       | 184.0                     |
| KFMC-FM   | 106.5       | Fairmont, MN             | 100        | 113                  | 53.3       | 137.6                     |
| KNUJ-FM   | 107.3       | Sleepy Eye, MN           | 4.0        | 124                  | 41.3       | 22.7                      |

**Table 5 – FM Stations Serving Big Bend Project Area**

Real-world experience with wind farms has shown that FM broadcast station signals (88 to 108 MHz) are fairly insensitive to wind turbines, even in cases where the FM transmitting antenna is surrounded by turbines that are higher than the FM antenna. Because of the “capture effect” supported by the “discriminator” in FM receivers, significant disruptions to the above facilities are not expected. Although the received signal may vary with the blade rotation at some receiver locations in the immediate area, good quality FM radios should factor out such time-varying signals.

<sup>7</sup> Distance and azimuth to each station transmitter is referenced to the geographic center of the wind project area, whose coordinates are as follows: N 43-59-02.9, W 94-55-42.6.



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### **3.3 AM Facilities**

Large metallic structures such as wind turbines can adversely affect the transmitted signals of AM broadcast stations up to three kilometers away. A search of the FCC's database revealed no AM facilities within the required notification distance of three kilometers from the wind project boundaries. There should therefore be no reasonable expectations of disruptions in transmitted radiations on the AM band due to the presence of the turbines. Occasionally, depending upon ground conditions, local AM receivers may experience slight signal changes due to local effects, but such anomalies are not recognized by the FCC or the standards of good engineering practice as having an unduly adverse effect.

## **IV. NTIA NOTIFICATION, DoD RADAR AND NEXRAD, AND CELLULAR**

### **4.1 NTIA Notification**

Operation of RF frequencies for federal government use is managed by the National Telecommunication Information Agency (NTIA), which is part of the U.S. Department of Commerce. The technical specifications for most government facilities are unavailable to the public. In order to avoid the derailment of the wind energy project due to late objections from a government agency, the NTIA should be notified of the proposed project during pre-construction planning. The NTIA has set in place a review process, wherein the Interdepartmental Radio Advisory Committee (IRAC), consisting of representatives from various government agencies, reviews new proposals for wind turbine projects for impact on government frequencies. In almost all cases, no adverse impact is found, and IRAC usually issues a determination in about 60 days.

On August 27, 2020, this office sent a revised notification<sup>8</sup> of the Big Bend wind project to the NTIA, and the NTIA is expected to respond with a determination letter by the end of October 2020.

### **4.2 DoD Radar Concerns**

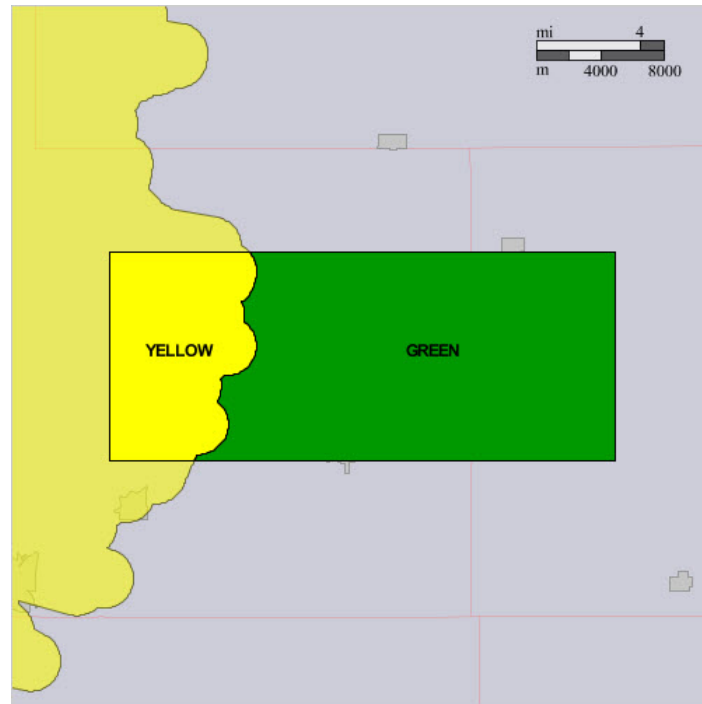
The Department of Defense (DoD) and the Department of Homeland Security *Long Range Radar Joint Program Office* "JPO" has adopted a "pre-screening tool" to evaluate the impact of wind turbines on air defense long-range radar. This tool was applied to the Big Bend project

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<sup>8</sup> The revised NTIA notification is to specify taller wind turbines. The original notification to the NTIA was sent on January 17, 2020. The NTIA's determination for the lower turbines, received March 18, 2020, stated "No Harmful Interference Anticipated" (NHIA).



area, and it returned a mixed result of “no anticipated impact” (green) and “impact likely” (yellow) to Air Defense and Homeland Security radars (see Figure 9). However, a definitive determination is obtained only after formal study by the DoD, which is triggered by the FAA 7460-1 notification process.



**Figure 9 – DoD Long-Range Radar Screening**

**Map Legend:**

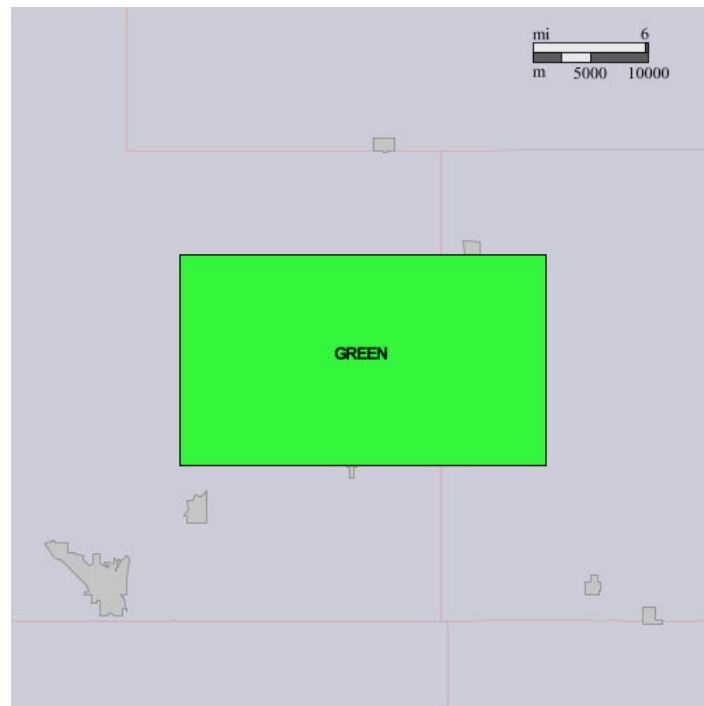
- **Green:** No anticipated impact to Air Defense and Homeland Security radars. Aeronautical study required.
- **Yellow:** Impact likely to Air Defense and Homeland Security radars. Aeronautical study required.

### **4.3 NEXRAD**

A pre-screening tool has been developed to evaluate the potential impact of obstructions to the NEXRAD Weather Surveillance Doppler Radar Stations. This tool was applied to the Big Bend



project area, and it returned a result, shown in Figure 10, of “impact not likely” to weather radar operations. However, a definitive determination is obtained only after the NTIA review process.



**Figure 10 – NEXRAD Weather Radar Screening**

**Map Legend:**

- **Green: No Impact Zone.** Impacts not likely. NOAA will not perform a detailed analysis, but would still like to know about the project.

#### **4.4 Cell Phone Reception**

There is no credible evidence known by the undersigned engineer to suggest that cell phone reception has been a problem in and around wind turbines. Since cell phone service is mobile by design, operation of mobile devices in the area should theoretically not be significantly affected. In addition, cellular antennas employ diversity and multiple base stations to compensate for any disruptions at any one location.



## **V. ELECTROMAGNETIC FIELDS FROM OVERHEAD POWER LINE**

Worst-case estimates have been made of the expected levels of electromagnetic fields, commonly referred to as EMF, which would be emitted by the overhead transmission line to be built to interconnect the Big Bend renewable energy farm with the electrical grid.

The overhead transmission line to be built for the project will be a 161 kV voltage single circuit line using either wood H-frame supports or steel monopoles. The right-of-ways will be 100 feet in width (50 feet from the center of the right-of-way to the edge) along parcel lines or 150 feet (75 feet from ROW center to edge) from the center of a public road. The Big Bend renewable energy farm (which will be a mix of wind turbines and solar panels) will have a rated maximum power output of 335 MW, which would draw a theoretical maximum current in the 161 kV transmission line of approximately 1330 amperes.

New power transmission lines are inherently designed to be compliant with regulatory EMF exposure limits. For the state of Minnesota, the regulation limit for electric field level anywhere in the right-of-way below any transmission line is 8 kilovolts per meter (kV/m). It is expected that the Big Bend transmission line would register an electric field level below 4 kV/m in the right-of-way.

There is no regulatory limit on magnetic field levels in the transmission line right-of-way in the state of Minnesota. Currently, only the states of Florida and New York have limits on magnetic field strength in the line right-of-way. Both states limit the magnetic field below the line to no greater than 200 milliGauss (mG) at the edge of the right-of-way. The maximum magnetic field level at the edge of the right-of-way (whether for 100-foot or 150-foot ROW width) due to the proposed Big Bend transmission line is not expected to exceed 150 mG.

There have been no federal standards established for power transmission line EMF. However, two expert organizations have recommended maximum EMF exposure levels to be applied to the general public. The Institute of Electrical and Electronics Engineers (IEEE) recommends a magnetic field limit of 9040 mG and an electric field limit of 10 kV/m, while the International Commission on Non-Ionizing Radiation Protection (ICNIR) recommends limits of 2000 mG magnetic field and 4.2 kV/m electric field. The expected levels due to the Big Bend energy farm would be below these recommended levels. The EMF limits adopted by states (currently seven of them) are based on the desire to not increase levels of EMF that are currently encountered by the public. To date, after over 40 years of studies on the health effects of EMF, no scientific or health agency in the US or elsewhere has made a determination of a cause-and-effect relationship between exposure to tolerable levels of EMF, such as from power lines, and risk to human health.



## **VI. CONCLUSIONS AND RECOMMENDATIONS**

1. No land mobile, public safety or other known multi-directional transmitting stations are expected to be adversely affected, assuming that the locations of the transmitters are exactly as described in the FCC licenses.
2. Over-the-air TV interference due to operating wind turbines may occur but is not expected to be an intractable problem. Effective mitigation methods to resolve any interference that may occur are available, with satellite or cable service installation providing the worst-case solution. No AM or FM radio broadcast facilities are likely to be affected.
3. The EM fields from the project power transmission line are not expected to exceed recommended or regulatory levels.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "B. Benjamin Evans", is written over a light blue horizontal line.

B. Benjamin Evans  
RF Impact Consultant

September 23, 2020



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Telecommunications and**  
**Information Administration**  
Washington, D.C. 20230

October 20, 2020

Mr. B. Benjamin Evans  
EVANS ENGINEERING SOLUTIONS, LLC  
524 Alta Loma Drive  
Thiensville, WI 53092

Re: Big Bend Project, Revision 1: Cottonwood & Watonwan Counties, MN

Dear Mr. Evans:

In response to your request on August 28, 2020, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the Big Bend Wind Project, Revision 1, located in Cottonwood and Watonwan Counties, Minnesota.

After a 45+ day period of review, of the reviewing federal agencies, none had concerns with turbine construction in the designated areas.

While the other IRAC agencies did not identify any concerns regarding radio frequency blockage, this does not eliminate the need for the wind energy facilities to meet any other requirements specified by law related to these agencies. For example, this review by the IRAC does not eliminate any need that may exist to coordinate with the Federal Aviation Administration concerning flight obstruction.

Thank you for the opportunity to review these proposals.

Sincerely,

John R. McFall  
Deputy Chief, Spectrum Services Division  
Office of Spectrum Management



**UNITED STATES DEPARTMENT OF COMMERCE**  
**National Telecommunications and**  
**Information Administration**  
Washington, D.C. 20230

March 11, 2020

Mr. B. Benjamin Evans  
EVANS ENGINEERING SOLUTIONS, LLC  
524 Alta Loma Drive  
Thiensville, WI 53092

Re: Big Bend Project: Cottonwood & Watonwan Counties, MN

Dear Mr. Evans:

In response to your request on January 17, 2020, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the Big Bend Wind Project, located in Cottonwood and Watonwan Counties, Minnesota.

After a 45+ day period of review, of the reviewing federal agencies, none had concerns with turbine construction in the designated areas.

While the other IRAC agencies did not identify any concerns regarding radio frequency blockage, this does not eliminate the need for the wind energy facilities to meet any other requirements specified by law related to these agencies. For example, this review by the IRAC does not eliminate any need that may exist to coordinate with the Federal Aviation Administration concerning flight obstruction.

Thank you for the opportunity to review these proposals.

Sincerely,

John R. McFall  
Deputy Chief, Spectrum Services Division  
Office of Spectrum Management