

Wind Power GeoPlanner™

Microwave Study

Tatanka Wind Project



Prepared on Behalf of
Tatanka Ridge Wind, LLC

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1. Introduction

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.

2. Project Overview

Project Information

Name: Tatanka Wind Project
County: Deuel
State: South Dakota

Number of Turbines: 62
Blade Diameter: 127 meters
Hub Height: 88.6 meters

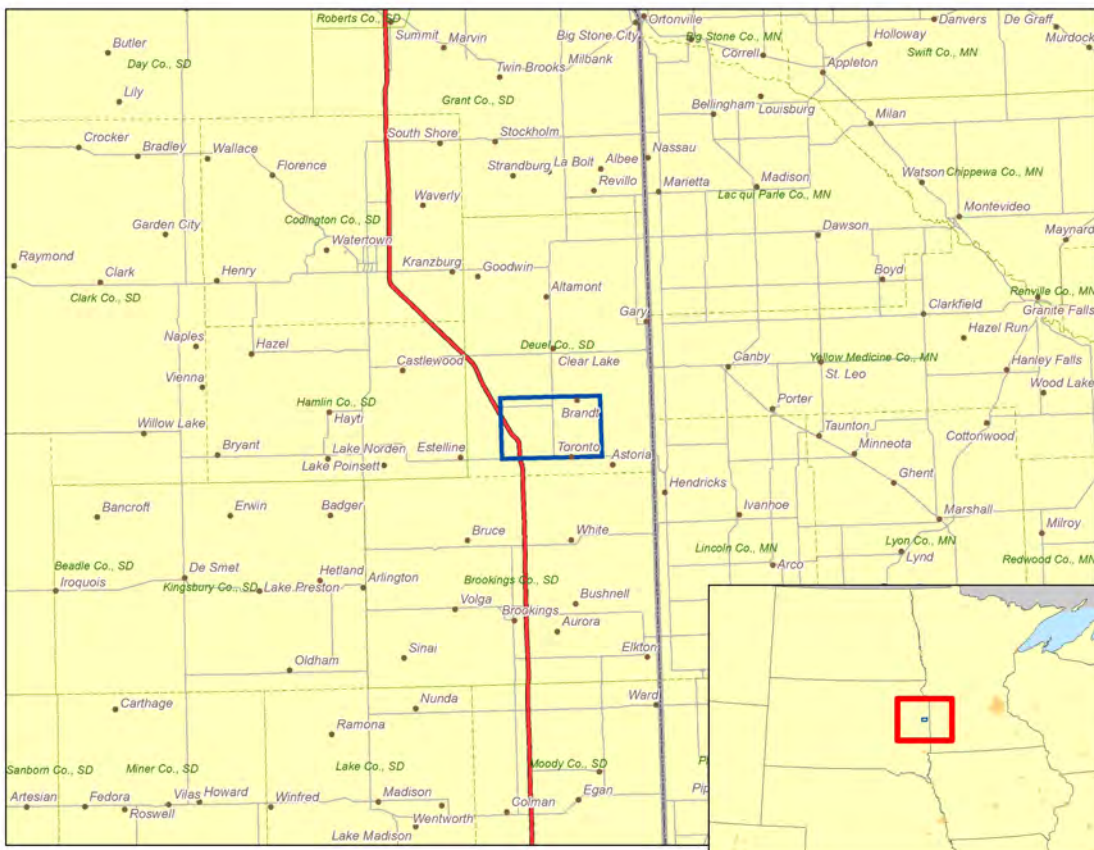


Figure 1: Area of Interest

3. Two-Dimensional 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 GHz¹. First, we determined all microwave paths that intersect the area of interest² and listed them in Table 1. These paths and the area of interest that encompasses the planned turbine locations are shown in Figure 2.

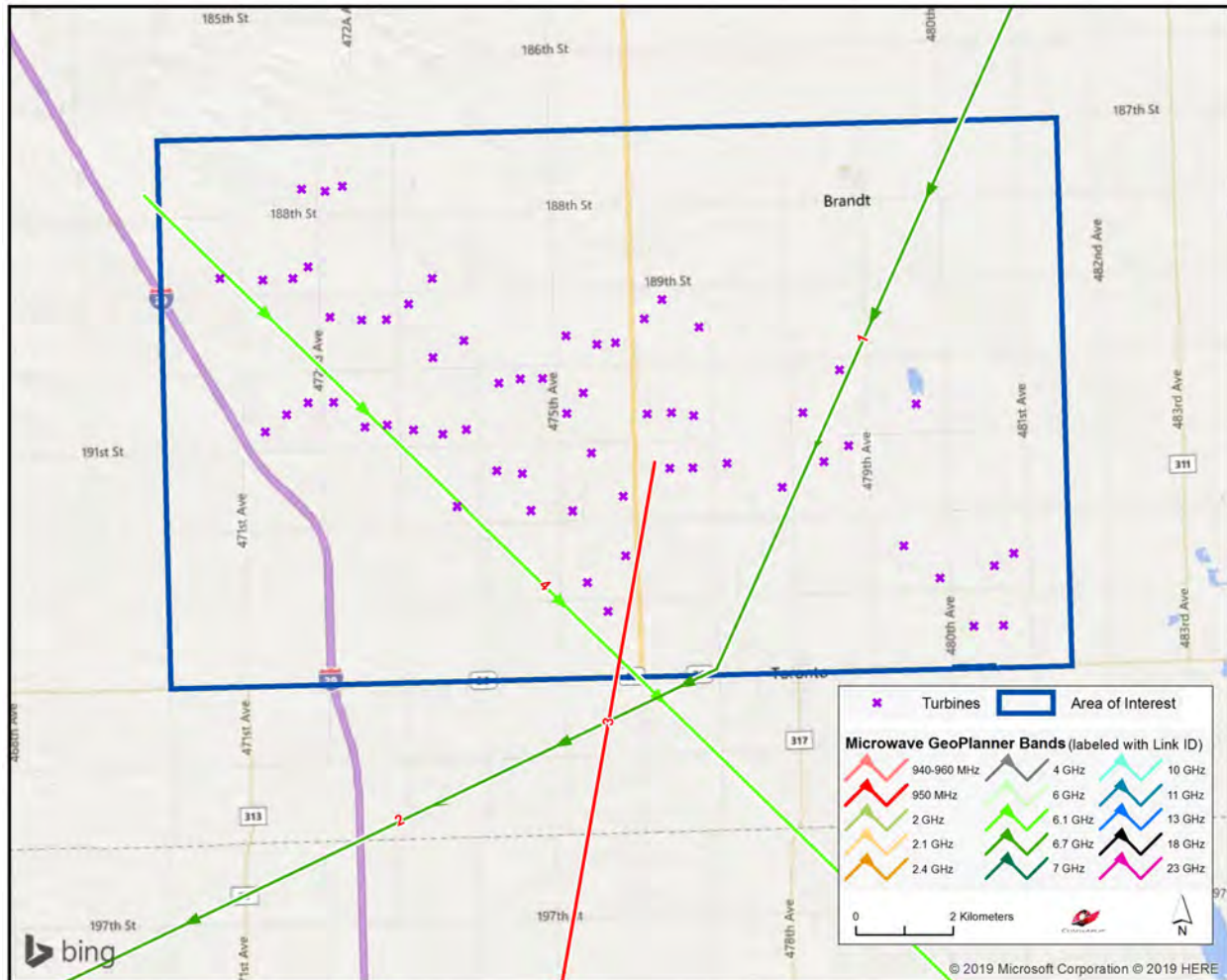


Figure 2: Microwave Paths that Intersect the Area of Interest

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

² 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	WHI614	WHI615	6.7 GHz	34.05	Otter Tail Power Company
2	Licensed	WHI615	WQRX854	6.7 GHz	47.55	Otter Tail Power Company
3	Licensed	WPUI339	RXONLY	950 MHz	35.03	Alpha 3E Licensee, LLC
4	Licensed	WQDT287	WQDT289	6.1 GHz	38.91	Northern Border Pipeline Company

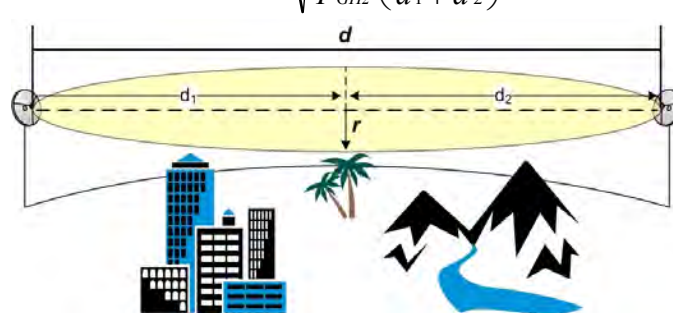
Table 1: Summary of Microwave Paths that Intersect the Area of Interest

(See enclosed mw_geopl.xlsx for more information and GP_dict_matrix_description.xls for detailed field descriptions)

Verification of Coordinate Accuracy

It is possible that as-built coordinates may differ from those on the FCC license. For this project, three paths cross within close proximity of the proposed turbines and the tower locations for these paths will have a critical impact on the result. Therefore, we verified these locations using aerial photography. Some of the towers were found to be slightly off and were moved to their locations based on the aerial photos³.

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_{GHz} = Frequency of microwave system, GHz
- d₁ = Distance from antenna 1 to a specific point in the microwave path, kilometers
- d₂ = 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

³ See enclosed mw_geopl.shp (adjusted locations based on aerial photography/basis for report images and results) and mw_geopl_fcc.shp (locations solely based on FCC licensed information) for details.

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 Figures 3 through 5, and is also included in the shapefiles^{4,5}.

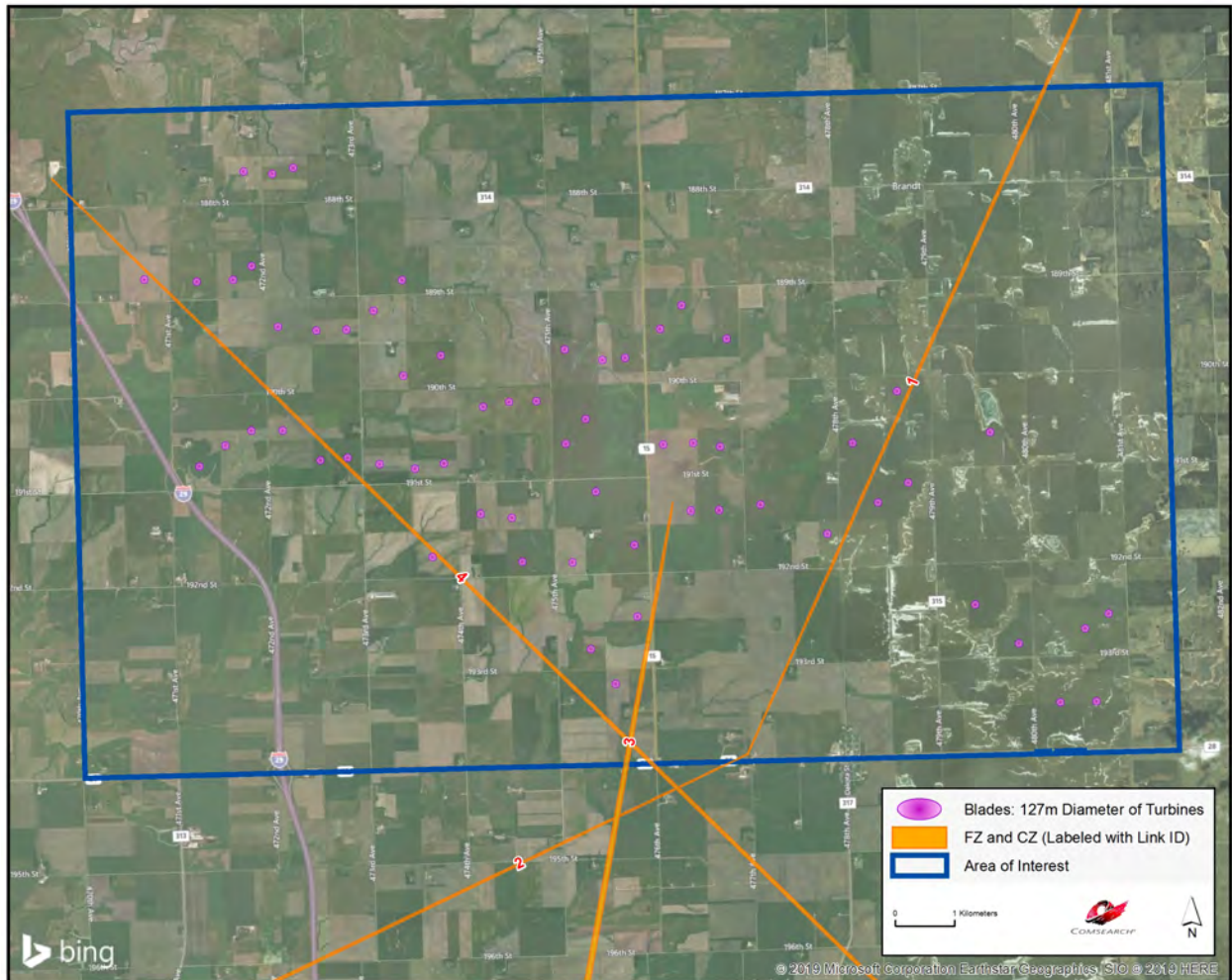


Figure 3: Microwave Paths with Fresnel and Consultation Zones

⁴ The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 14 projected coordinate system.

⁵ 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.



Figure 4: Microwave Paths with Fresnel and Consultation Zones

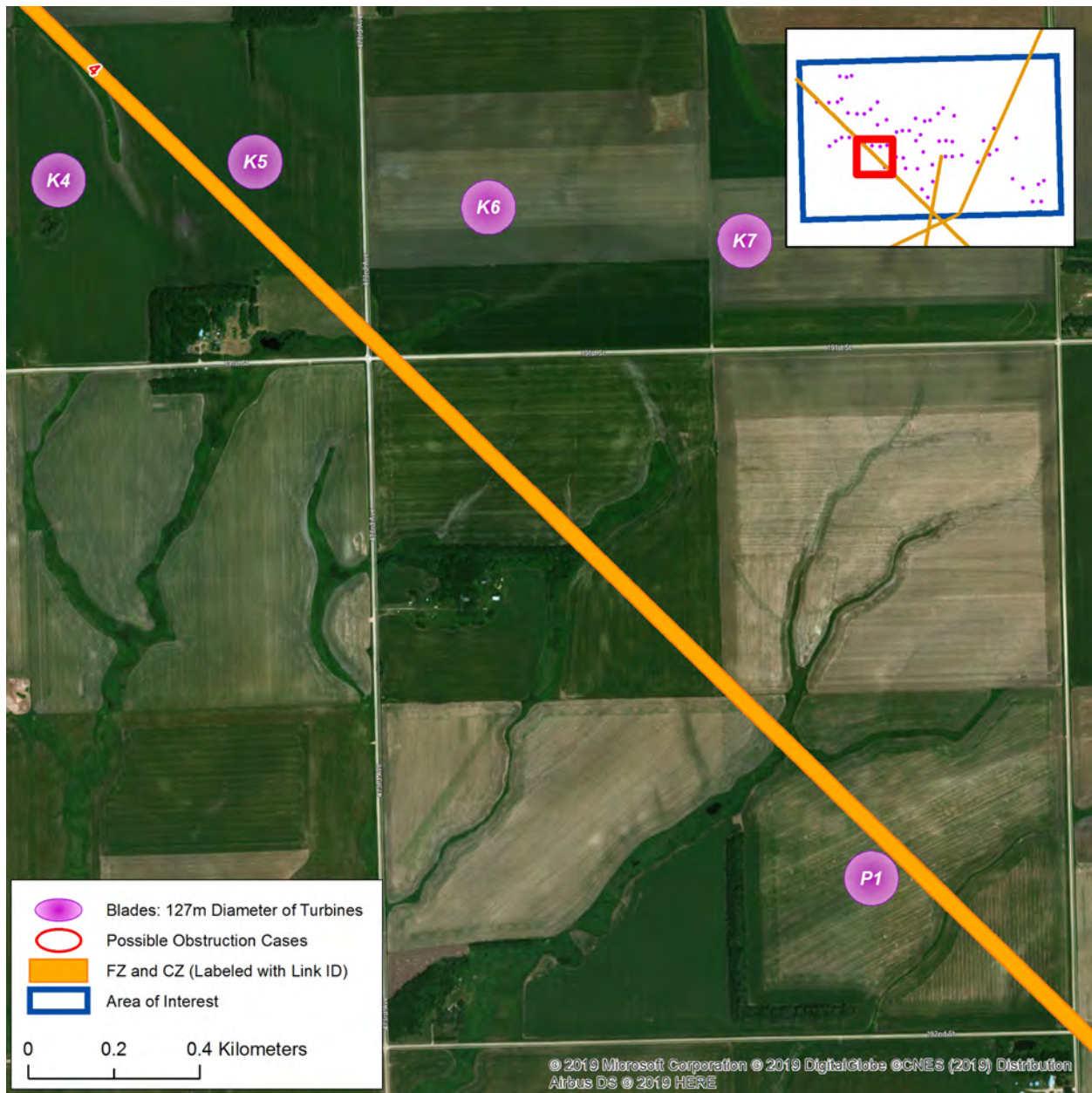


Figure 5: Microwave Paths with Fresnel and Consultation Zones

4. Conclusion

Total Microwave Paths	Paths with Affected Fresnel Zones	Total Turbines	Turbines intersecting the Fresnel Zones
4	0	62	0

Table 2: Fresnel Zone Analysis Result

Our study identified four microwave paths intersecting the Tatanka Wind Project area of interest. The Fresnel Zones for these microwave paths were calculated and mapped in order to assess the potential impact from the turbines. A total of 62 turbines were considered in the analysis, each with a blade diameter of 127 meters and a hub height of 88.6 meters. Of those turbines, none were found to have potential obstruction with the microwave systems in the area.

5. Contact

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

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