

# Tatanka Wind Project

Avangrid Renewables

*Deuel County, South Dakota*

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Microwave Path Analysis

April 2, 2019



Capitol Airspace Group

[capitolairspace.com](http://capitolairspace.com)

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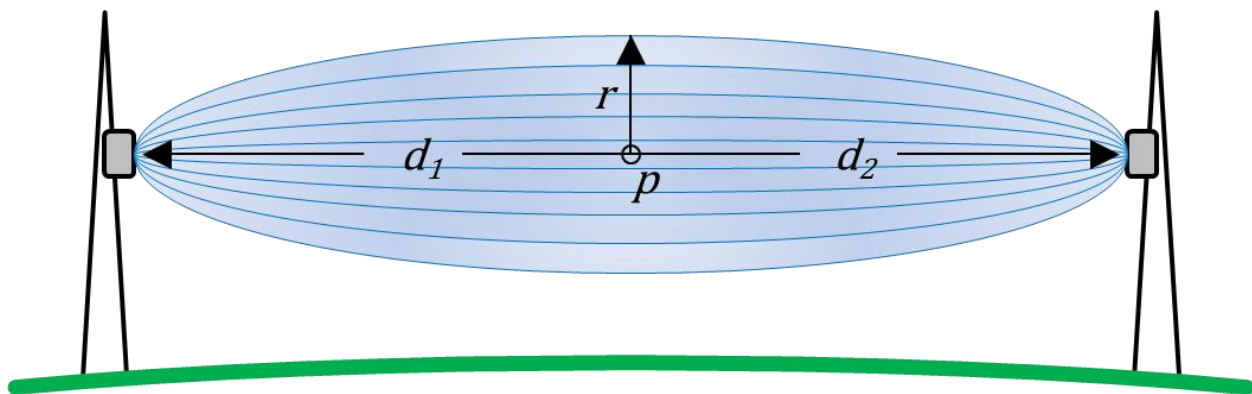




## Methodology

Capitol Airspace studied the proposed project based upon location information provided by Avangrid Renewables. Using this information, Capitol Airspace used a Geographic Information System (GIS) to determine proximity to both licensed and applied coordinated non-federal microwave paths contained in the Federal Communication Commission (FCC) Universal Licensing System (ULS) database.

This analysis considers impact on microwave paths resulting from the physical blockage of the first Fresnel zone (**Figure 2**). The first Fresnel zone is a three dimensional volume whose radius at a given point is calculated using the path frequency and distance from the transmitting and receiving antennas. The Fresnel zone radius is largest at the path midpoint (where  $d_1 = d_2$ ). Lower frequencies result in larger Fresnel zone radii for a given path and are typically associated with longer paths. Higher frequencies result in smaller Fresnel zone radii for a given path and are typically associated with shorter paths.



**Figure 2: Fresnel zone example**

In many cases, ULS database microwave transmitter and receiver antenna locations are inaccurate (e.g. **Figure 3**). Available satellite and aerial imagery was used to improve the coordinates for locations associated with microwave paths in proximity to the defined study area.



**Figure 3: Example of using aerial imagery to correct erroneous ULS database antenna location**



## Findings

Six paths associated with four microwave links overlie the Tatanka wind project ([Table 1](#) & [Figure 4](#)).

| Licensee                         | Call Sign               | Path | Status   | Transmitter          | Receiver            | Frequency (MHz) <sup>1</sup> |
|----------------------------------|-------------------------|------|----------|----------------------|---------------------|------------------------------|
| ALPHA 3E LICENSEE LLC            | <a href="#">WPUJ339</a> | 1    | Licensed | TEC studio           | KDBX site           | 945.50                       |
| Northern Border Pipeline Company | <a href="#">WQDT287</a> | 2    | Licensed | CS11                 | Lake Shokatan       | 6226.89                      |
|                                  | <a href="#">WQDT289</a> | 1    | Licensed | Lake Shokatan        | CS11                | 5974.85                      |
| NorthWestern Corporation         | <a href="#">WPTA307</a> | 4    | Licensed | BANCROFT             | TORONTO M/W STATION | 958.75                       |
| OTTER TAIL POWER COMPANY         | <a href="#">WHI614</a>  | 5    | Licensed | STATION <sup>2</sup> | Toronto             | 6675.63                      |
|                                  | <a href="#">WHI615</a>  | 2    | Licensed | TORONTO              | GARY <sup>2</sup>   | 6835.63                      |

*Table 1: Microwave paths with Fresnel zones overlying the Tatanka study area*

## Conclusion

The results of this analysis indicate that six paths associated with four unique microwave links overlie the Tatanka wind project. However, none of the proposed wind turbines (including their rotor swept volume) should obstruct licensed or applied non-federal microwave link Fresnel zones.

If micrositing is required or additional locations are planned, wind turbines should be sited outside of the lateral boundaries of the Fresnel zones (green, [Figure 4](#)) in order to avoid the likelihood of signal blockage. Due to the relatively narrow size of most microwave path Fresnel zones, it is likely that impact on these paths can be avoided through micrositing. However, wind turbines (including the rotor-swept area) could be sited within the lateral boundaries of Fresnel zones provided they do not penetrate the three-dimensional Fresnel zone.

If you have any questions regarding the findings of this study, please contact [Dan Underwood](#) or [Orlando Olivas](#) at (703) 256-2485.

<sup>1</sup> Microwave paths may be licensed to operate using more than one frequency. For the purposes of calculating Fresnel zone radii, the lowest frequency was used to create the largest Fresnel zone.

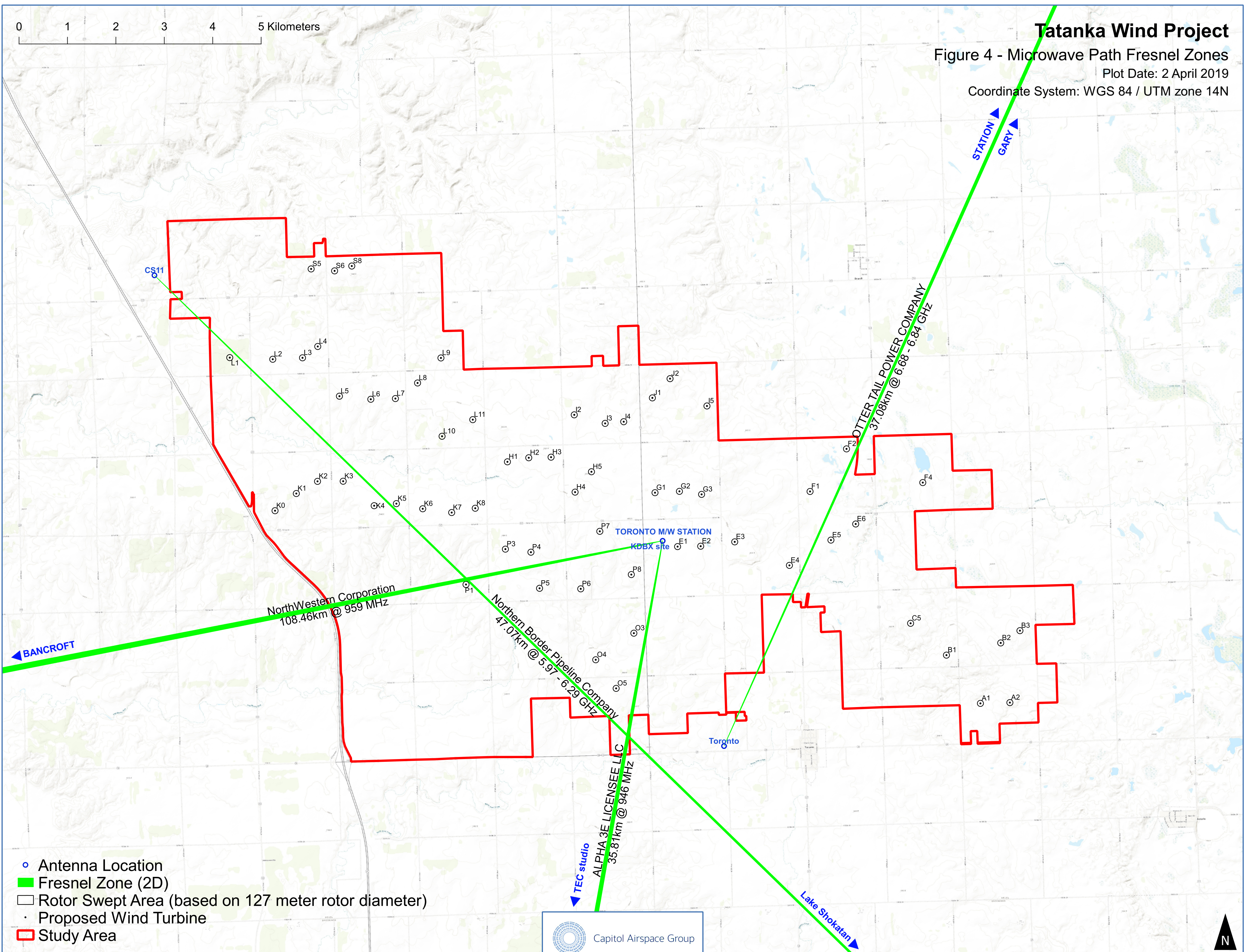
<sup>2</sup> This microwave link antenna location could not be associated with a single antenna structure due to the multiple antenna structures in close proximity. As a result, Capitol Airspace increased the Fresnel zone radius at this antenna location in order to encompass all of the potential antenna structure candidates.

# Tatanka Wind Project

Figure 4 - Microwave Path Fresnel Zones

Plot Date: 2 April 2019

Coordinate System: WGS 84 / UTM zone 14N



0 1 2 3 4 5 Kilometers

CS11

STATION  
GARY

OTTER TAIL POWER COMPANY  
37.08km @ 6.68 - 6.84 GHz

NorthWestern Corporation  
108.46km @ 959 MHz

Northern Border Pipeline Company  
47.07km @ 5.97 - 6.29 GHz

TEC studio  
ALPHA 3E LICENSEE LLC  
35.87km @ 946 MHz

Toronto

TORONTO M/W STATION  
KDBX site

- Antenna Location
- Fresnel Zone (2D)
- Rotor Swept Area (based on 127 meter rotor diameter)
- Proposed Wind Turbine
- ▭ Study Area

