

Wind Power GeoPlanner™

Microwave Study

Big Blue River Wind Farm



Prepared on Behalf of
Big Blue River Wind
Farm, 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: Big Blue River Wind Farm
County: Henry
State: Indiana

Number of Turbines: 38
Blade Diameter: 127 meters
Hub Height: 89 meters

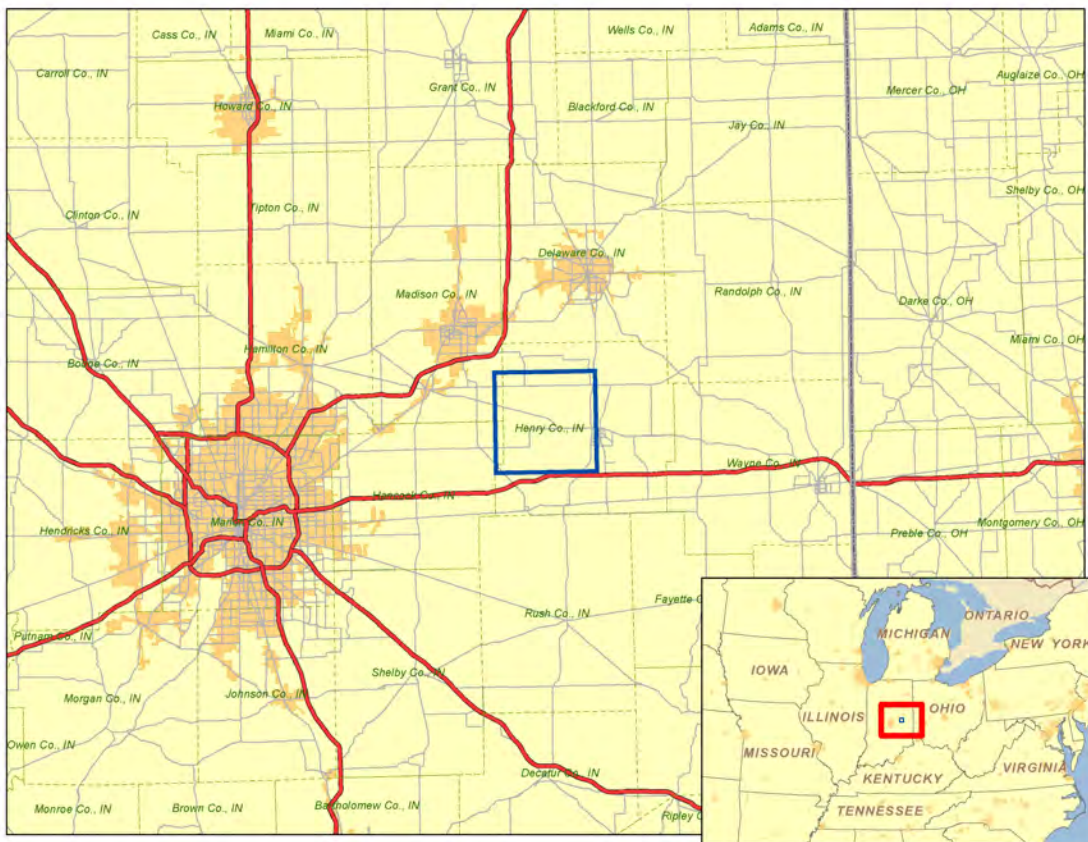


Figure 1: Area of Interest

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.

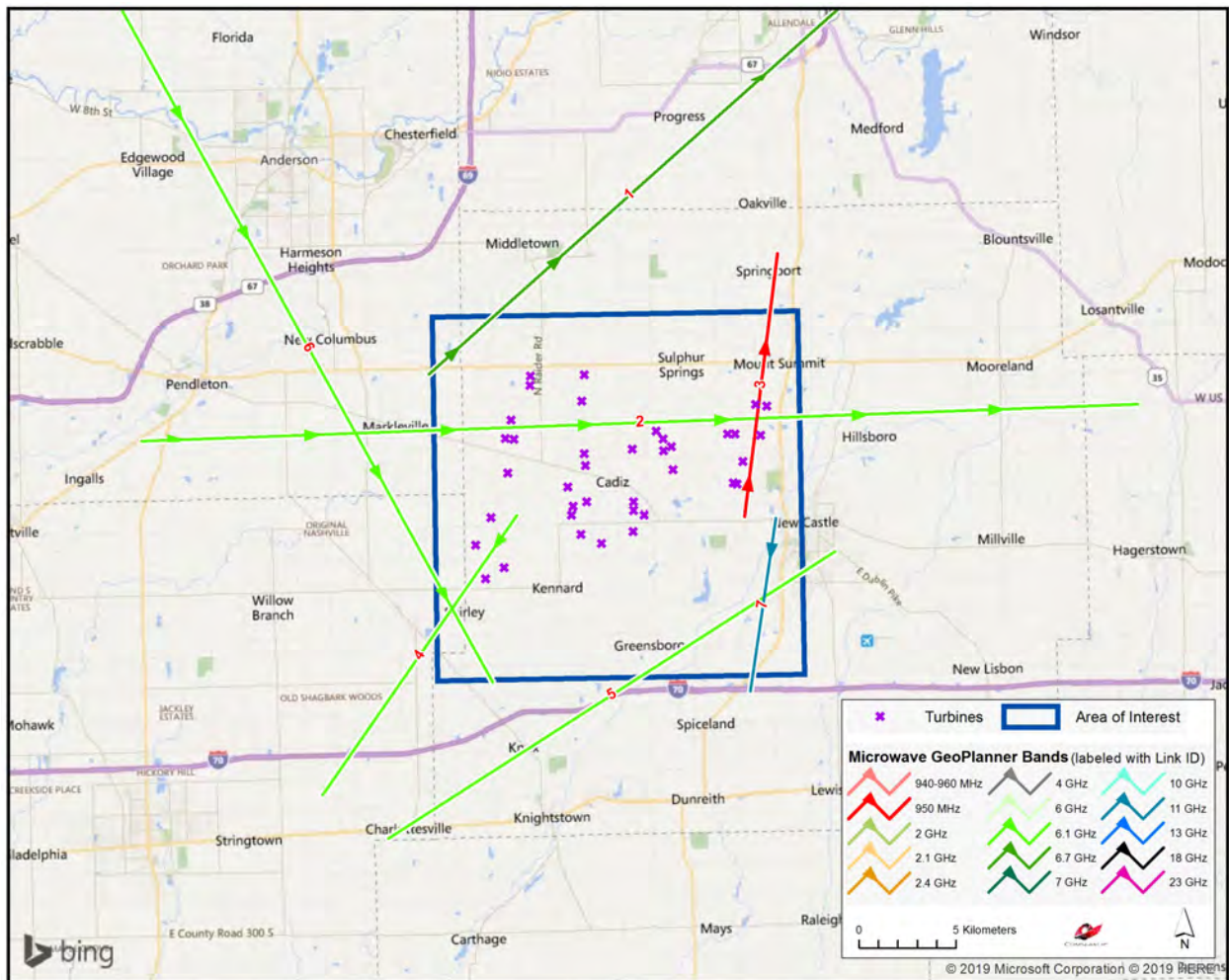


Figure 2: Microwave Paths that Intersect the Area of Interest

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	KJI68	KJI67	Upper 6 GHz	38.80	Panhandle Eastern Pipe Line Company, L.P
2	Licensed	KSJ25	KSM74	Lower 6 GHz	51.43	Indiana, State of (IPSC)
3	Licensed	WBB474	RXONLY	950 MHz	13.61	Radio License Holding CBC, LLC
4	Licensed	WQRI905	WLL684	Lower 6 GHz	17.54	GTE Mobilnet of Indiana Ltd Partnership
5	Licensed	WQTX495	KCT21	Lower 6 GHz	27.33	Duke Energy Business Services, LLC.
6	Licensed	WQUG859	WQUG860	Lower 6 GHz	56.36	W.A.T.C.H. TV Company Inc.
7	Licensed	WQXC271	WQXC270	11 GHz	9.00	T-Mobile License LLC

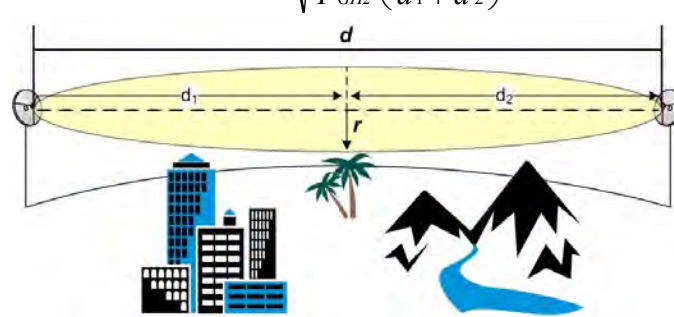
Table 1: Summary of Microwave Paths that Intersect the Area of Interest

(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:

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


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

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.

The calculated Fresnel Zone shows the narrow area of signal swath and is calculated for each microwave path in the project area. In general, the Fresnel Zone 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 Figures 3 and 4, and is also included in the shapefiles^{4,5}.

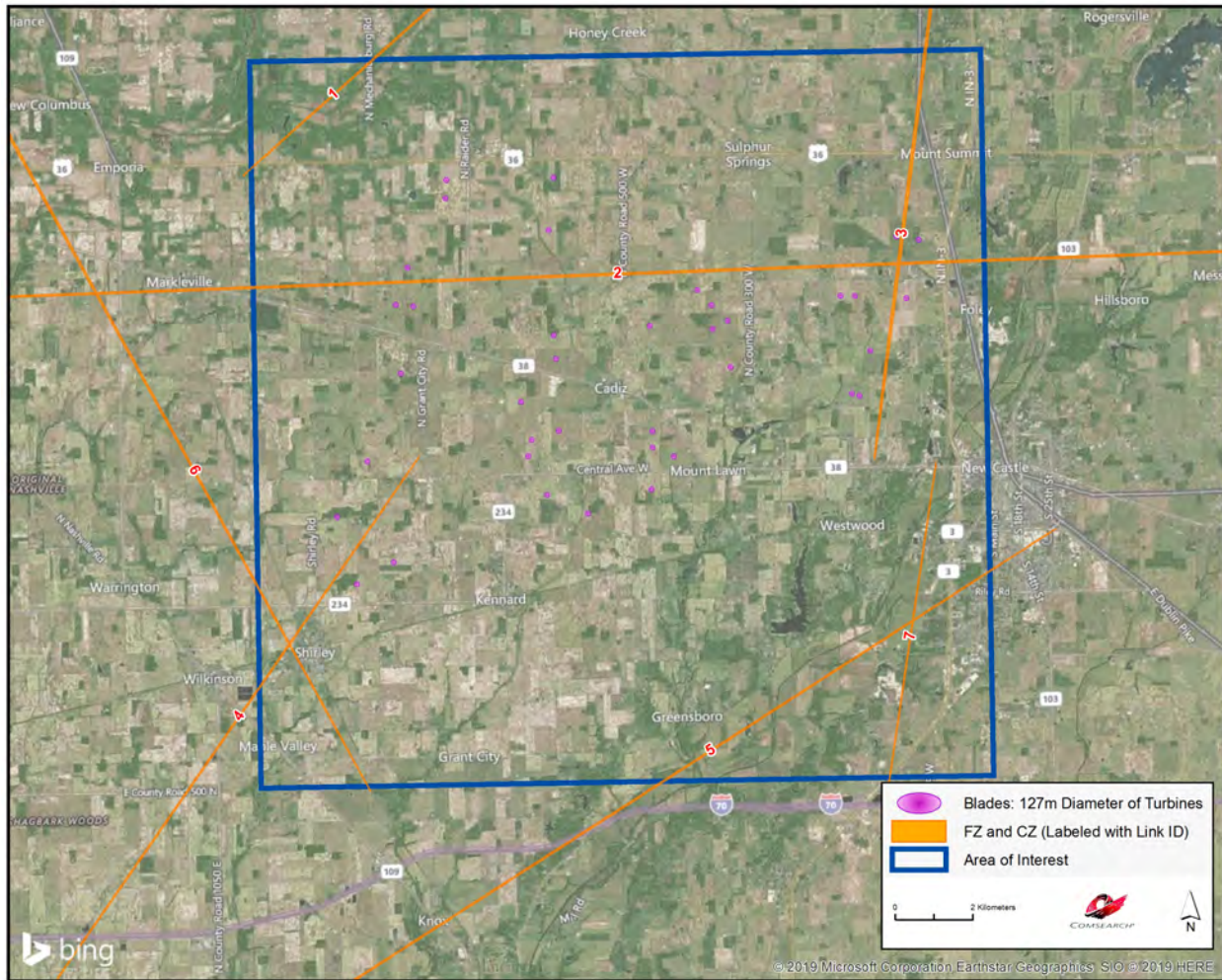


Figure 3: Microwave Paths with Fresnel and Consultation Zones

⁴ The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 16 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.

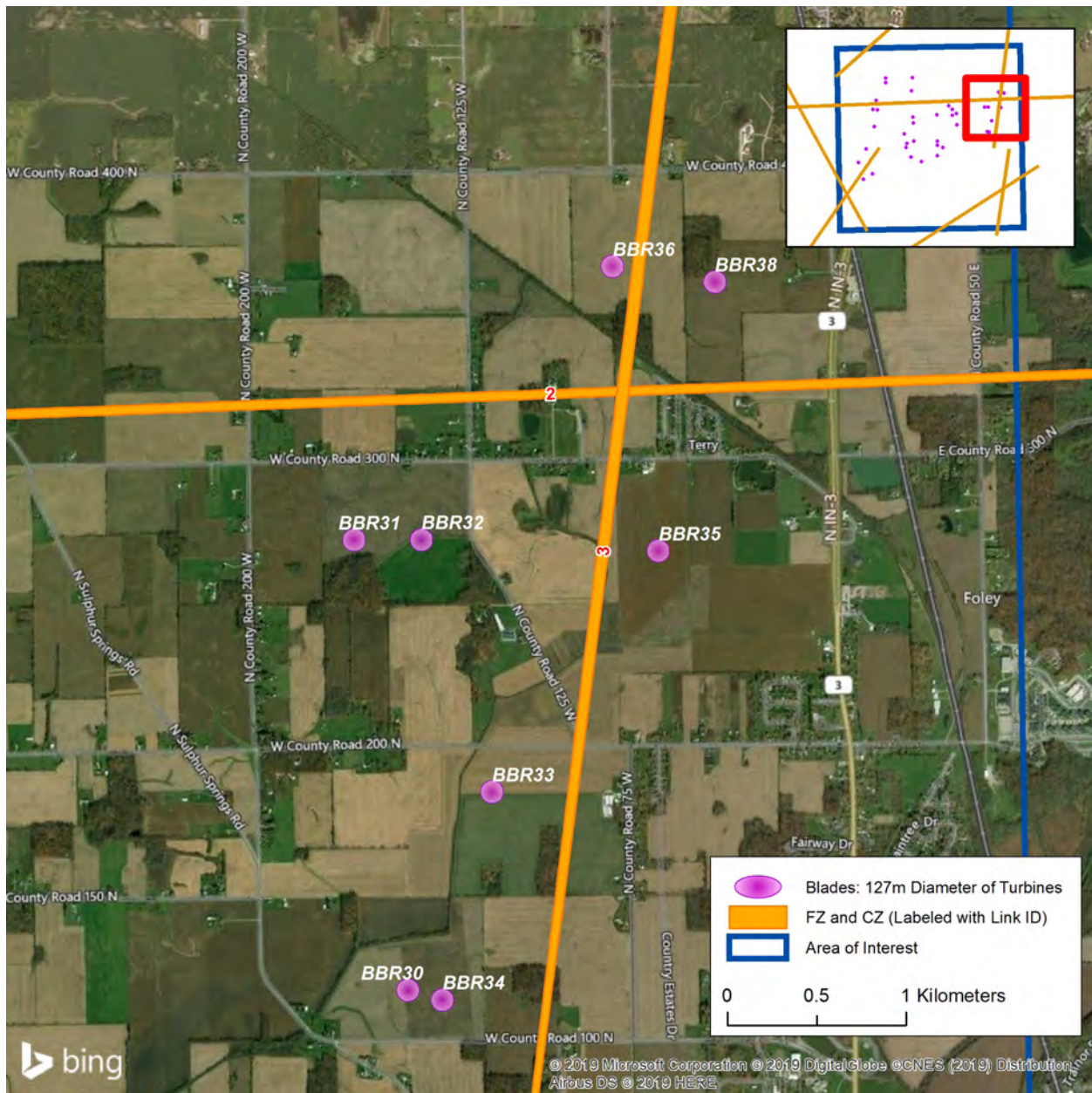


Figure 4: Microwave Paths with Fresnel and Consultation Zones

4. Conclusion

Total Microwave Paths	Paths with Affected Fresnel and Consultation Zones	Total Turbines	Turbines intersecting the Fresnel and Consultation Zones
7	0	38	0

Table 2: Fresnel Zone Analysis Result

Our study identified seven microwave paths intersecting the Big Blue River Wind Farm 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 38 turbines were considered in the analysis, each with a blade diameter of 127 meters and a hub height of 89 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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