2012 Communication Surveys

Wind Power GeoPlanner™

AM and FM Radio Report

Ball Hill Wind Energy Project, LLC

Prepared on Behalf of
Duke Energy

November 16, 2012

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Table of Contents

1. Introduction

In this report, Comsearch analyzed AM and FM radio broadcast stations whose service could potentially be affected by the proposed Ball Hill Wind Energy Project in Chautauqua County, New York.

2. Summary of Results

AM Radio Analysis

Comsearch found two database records[1] for AM stations within approximately 30 kilometers of the project, as shown in Table 1 and Figure 1. These records represent station WDOE, which is located in the city of Dunkirk, New York. WDOE operates at two different power levels, a higher transmit power for daytime operations and a lower transmit power for nighttime operations.

ID	Call Sign	Status[2]	Frequency (kHz)	Transmit ERP[3] (kW)	City	State	Distance to Nearest Turbine (km)
1	WDOE	LIC	1410	1.0	DUNKIRK	NY	16.32
2	WDOE	LIC	1410	0.5	DUNKIRK	NY	16.32

Table 1: AM Radio Stations

[1] 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.

[2] LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit

[3] ERP = Transmit Effective Radiated Power

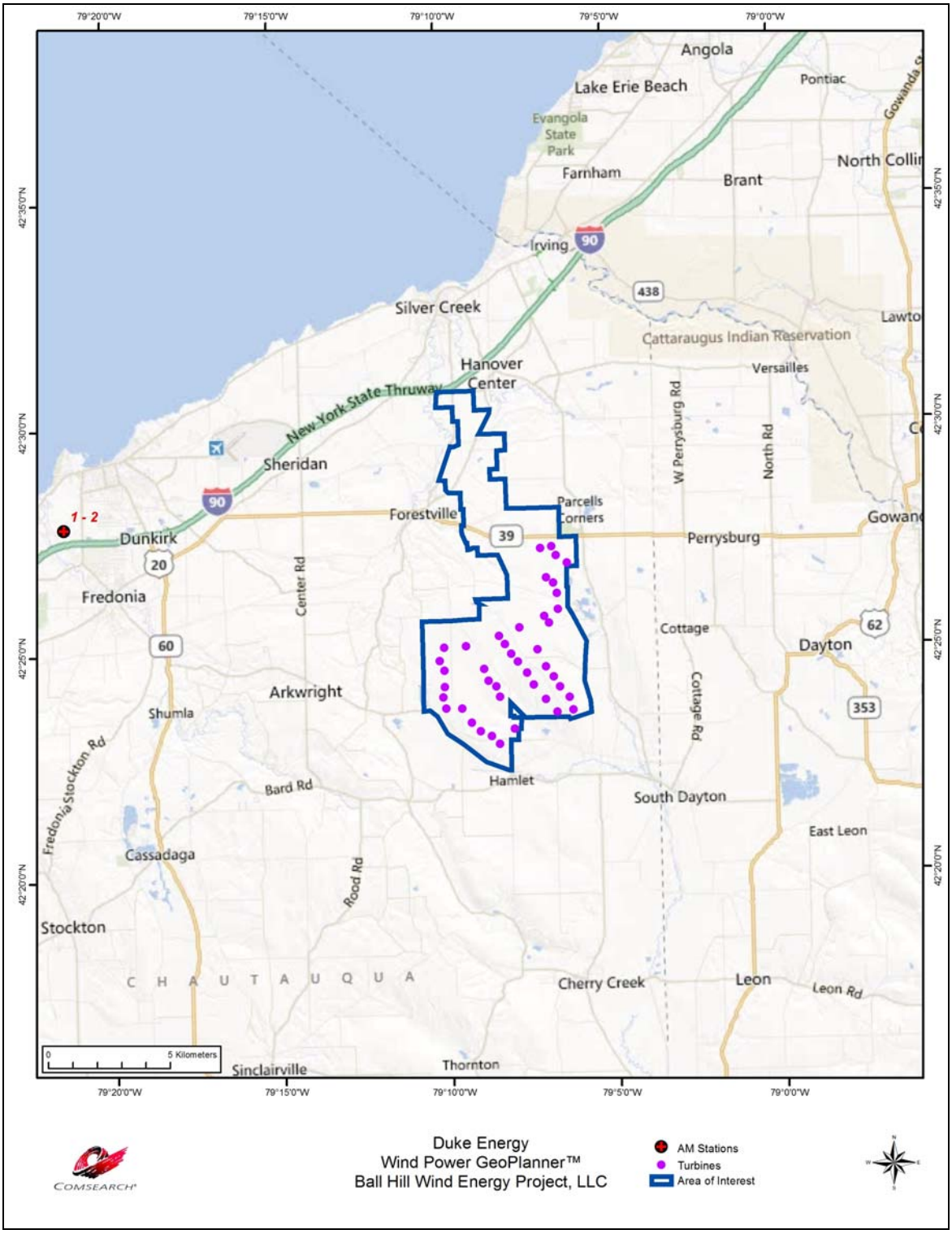

Figure 1: Plot of AM Radio Stations

FM Radio Analysis

Comsearch determined that there were nineteen database records for FM stations within a 30 kilometer radius of the Ball Hill Wind Energy Project, as shown in Table 2 and Figure 2. Only eleven of these stations are currently licensed and operational, five of which are low-power or translator stations that operate with limited range.

ID	Call Sign	Status	Frequency (MHz)	Transmit ERP (kW)	City	State	Distance to Nearest Turbine (km)
1	W203AW	LIC	88.5	0.019	FREDONIA	NY	11.67
2	NEW	APP	100.5	0.027	DUNKIRK	NY	11.67
3	NEW	APP	104.9	0.013	DUNKIRK	NY	11.67
4	NEW	APP	105.9	0.013	DUNKIRK	NY	11.67
5	NEW	APP	98.7	0.1	DUNKIRK	NY	12.45
6	NEW	APP	100.3	0.055	DUNKIRK	NY	14.19
7	WCVF-FM	LIC	88.9	0.13	FREDONIA	NY	14.46
8	W236BJ	APP	94.9	0.2	DUNKIRK	NY	18.34
9	W236BJ	LIC	95.1	0.01	DUNKIRK	NY	18.34
10	WBKX	LIC	96.5	1.4	FREDONIA	NY	18.34
11	WCOM-FM	LIC	89.3	8.0	SILVER CREEK	NY	18.44
12	W252CG	LIC	98.3	0.007	WESTFIELD	NY	25.54
13	NEW	APP	98.7	0.1	EDEN	NY	25.84
14	NEW	APP	98.7	0.1	EDEN	NY	25.84
15	WYRR	LIC	88.9	0.42	LAKEWOOD	NY	27.15
16	WUBJ	LIC	88.1	2.7	JAMESTOWN	NY	27.90
17	W203BV	LIC	88.5	0.009	JAMESTOWN	NY	28.61
18	W254AQ	LIC	98.7	0.01	JAMESTOWN	NY	28.61
19	WHUG	LIC	101.9	6.0	JAMESTOWN	NY	28.61

Table 2: FM Radio Stations

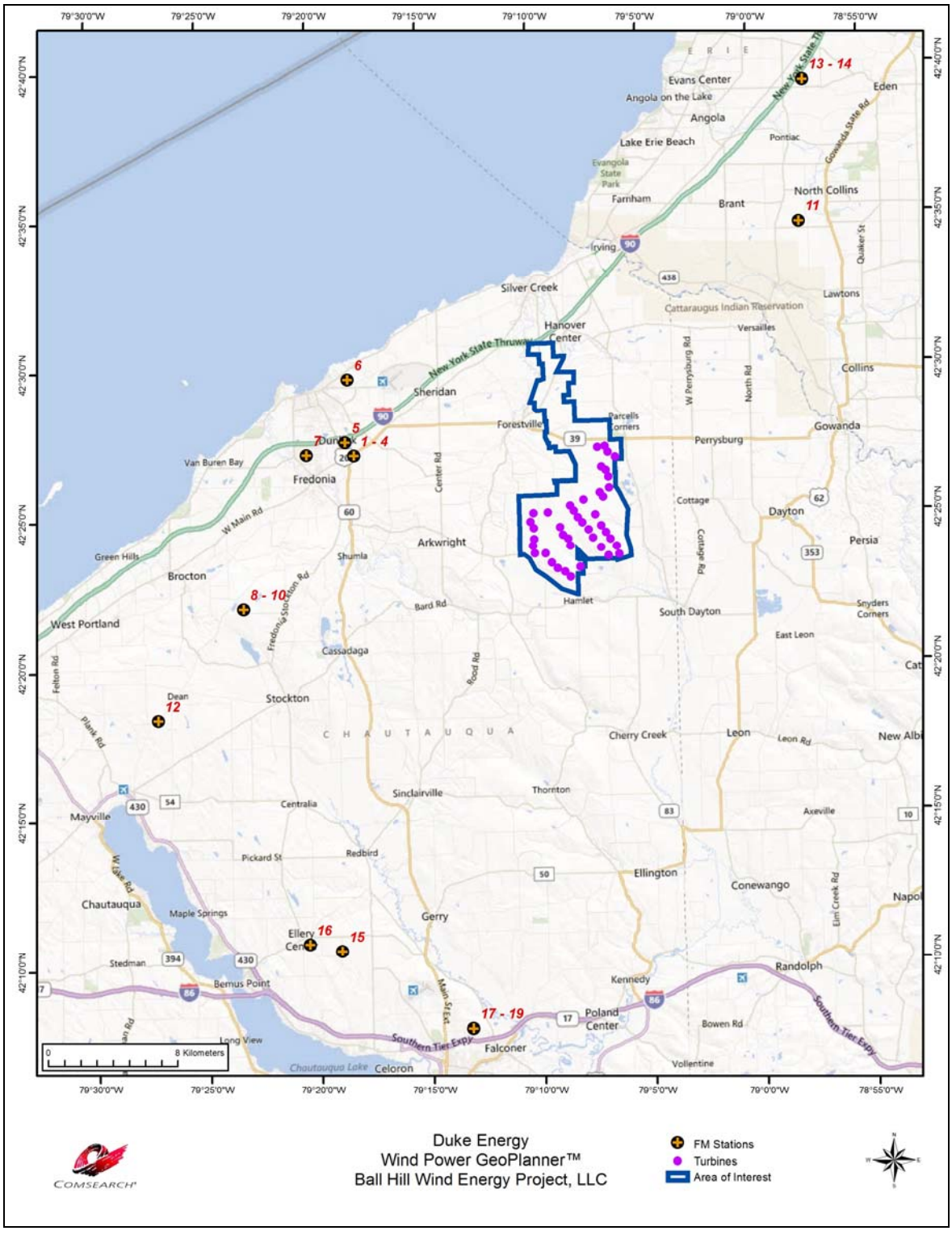

Figure 2: Plot of FM Radio Stations

3. Impact Assessment

Potential problems with AM broadcast coverage are only anticipated when AM broadcast stations with directive antennas are within 3.2 kilometers of wind turbine towers and AM broadcast stations with non-directive antennas are within 0.8 kilometers. The closest station to the Ball Hill Wind Energy Project, WDOE, is directive and located more than 16.3 kilometers from the nearest turbine. Therefore, the proposed wind farm should not impact the coverage of local AM stations.

The coverage of FM stations, when the stations are at distances greater than 4.0 kilometers from wind turbines, is not subject to degradation. The closest operational station to the Ball Hill Wind Energy Project, W203AW, is more than 11.6 kilometers from the nearest turbine location, and falls well outside the area potentially impacted by the turbines.

4. Recommendations

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

5. Contact Us

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

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Off-Air TV Analysis

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1. Introduction

In this report, Comsearch analyzed the off-air television stations whose service could potentially be affected by the proposed Ball Hill Wind Energy Project in Chautauqua County, New York. Off-air stations are television broadcasters that transmit signals that can be received directly on a television receiver from terrestrially located broadcast facilities. Comsearch examined the coverage of the off-air TV stations and the communities in the area that could potentially have degraded television reception because of the location of the proposed wind energy projects.

2. Summary of Results

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

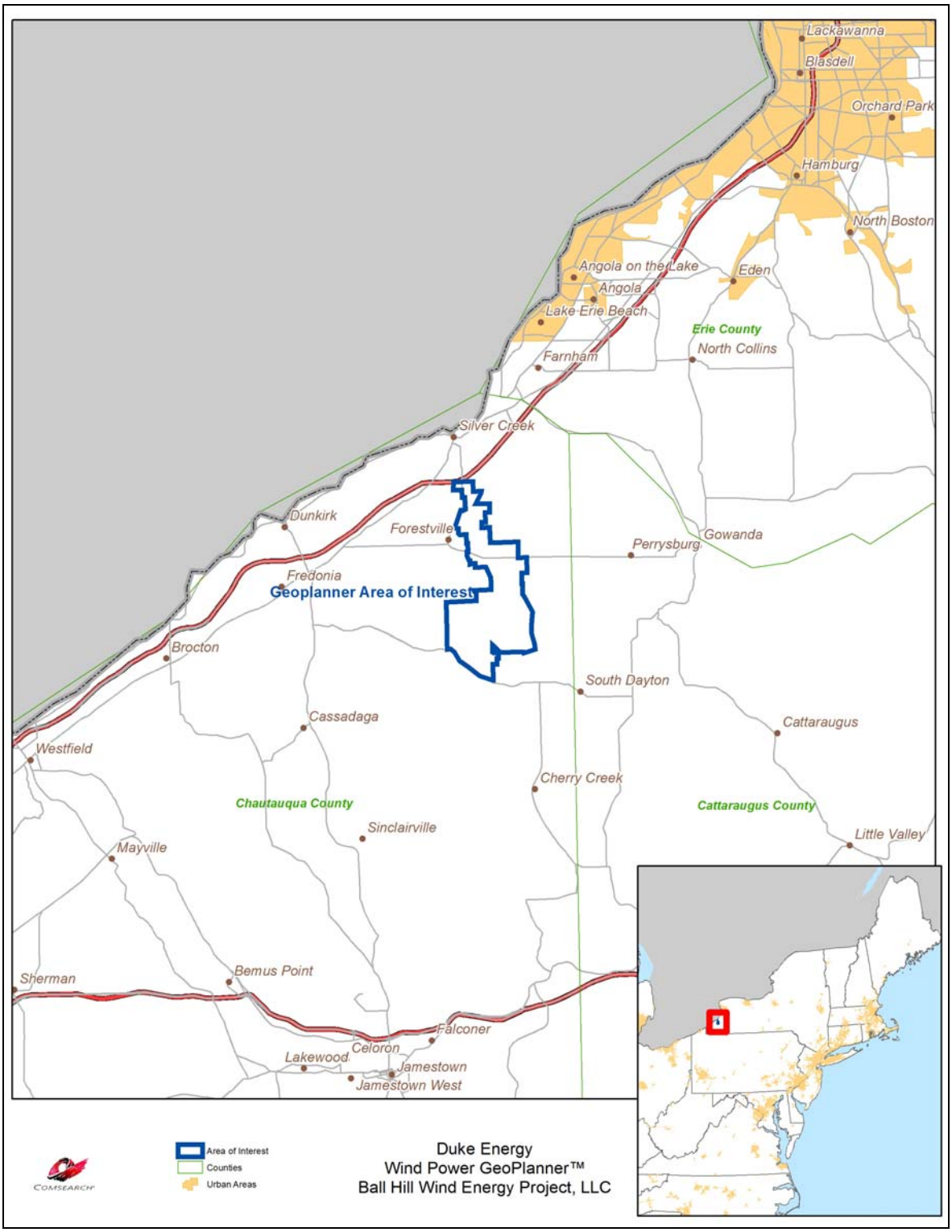

Figure 1: Wind Farm Project Area and Local Communities

To begin the analysis, Comsearch compiled all off-air television stations[1] within 150 kilometers of the wind project area of interest (AOI). Appendix A contains a tabular summary of these stations. A plot depicting their locations appears in Figure 2, below.

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

[1] 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.

TV stations at a distance of 65 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 these locations is provided in Figure 3. There are a total of twenty database records for stations within approximately 65 kilometers of the wind energy project. Of these stations, eight are currently licensed and operating, two 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. The six remaining operational stations in Table 1 broadcast at full power and are licensed under call signs WNYB, WBBZ-TV, WKBW-TV, WIBV-TV, WGRZ, and WNYO-TV.

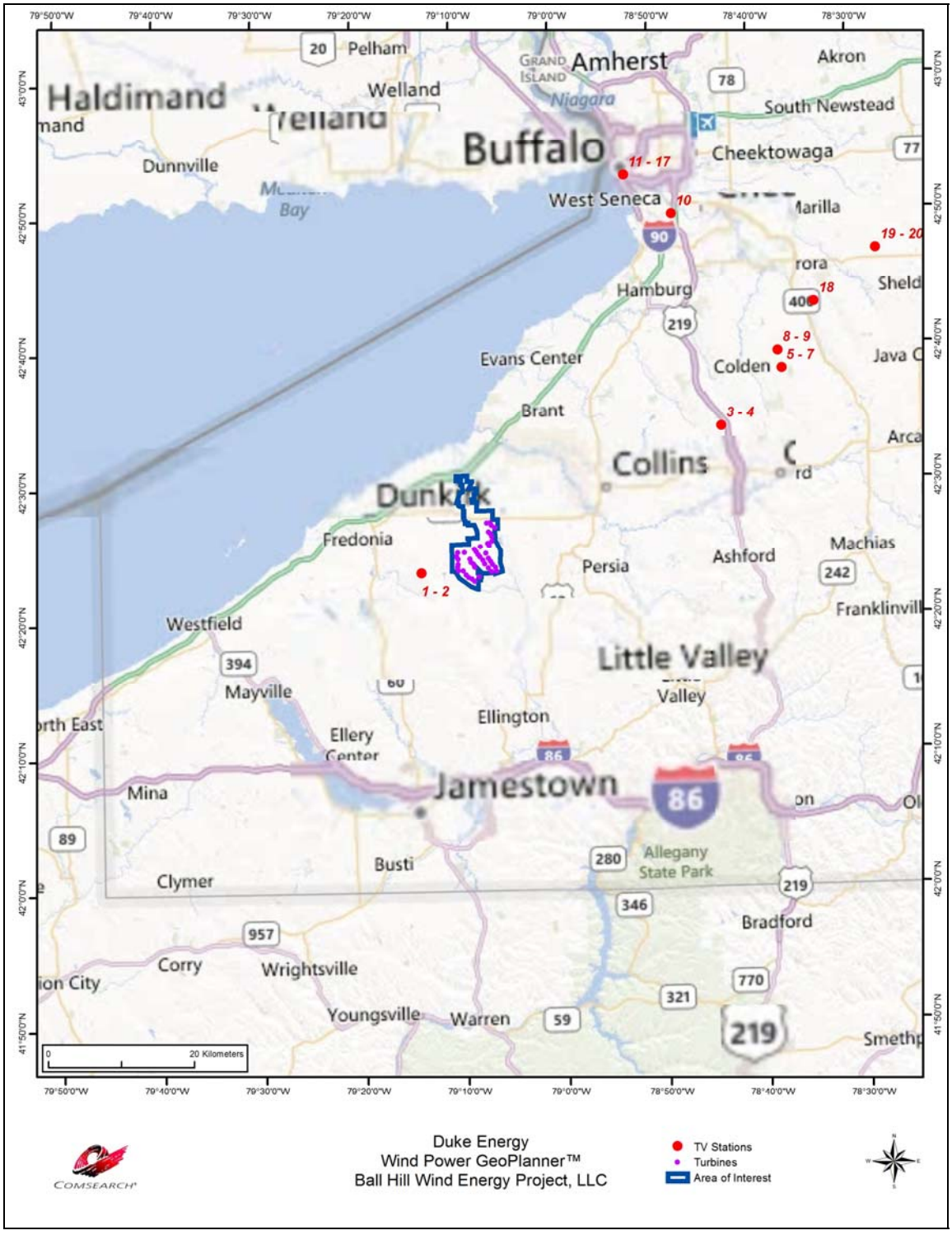

Figure 3: Plot of Off-Air TV Stations within 65 Kilometers of Project Area

ID	Call Sign	Status	Service[2]	Channel	City	State	Distance to Nearest Turbine (km)
1	WNYB	LIC	DT	26	JAMESTOWN	NY	5.04
2	WNYB	APP	DT	26	JAMESTOWN	NY	5.04
3	WBBZ-TV	LIC	DT	7	SPRINGVILLE	NY	34.08
4	WBBZ-TV	APP	DS	7	SPRINGVILLE	NY	34.11
5	WKBW-TV	LIC	DT	38	BUFFALO	NY	45.06
6	WBBZ-TV	APP	DT	46	SPRINGVILLE	NY	45.06
7	WNGS-DM	APP	DM	7	SPRINGVILLE	NY	45.07
8	WIVB-TV	LIC	DT	39	BUFFALO	NY	45.81
9	WIVB-TV	CP	DX	39	BUFFALO	NY	45.81
10	WDTB-LP	LIC	TX	39	HAMBURG	NY	49.10
11	WBXZ-LP	LIC	TX	56	BUFFALO	NY	51.05
12	WDTB-LP	CP	TX	28	BUFFALO	NY	51.06
13	WDTB-LP	STA	TX	40	BUFFALO	NY	51.06
14	NEW	APP	LD	48	BUFFALO	NY	51.06
15	WBXZ-LP	CP	LD	17	BUFFALO	NY	51.08
16	WDTB-LP	CP	LD	29	BUFFALO	NY	51.08
17	WBXZ-LP	APP	LD	48	BUFFALO	NY	51.08
18	WGRZ	LIC	DT	33	BUFFALO	NY	53.69
19	WNYO-TV	LIC	DT	49	BUFFALO	NY	64.83
20	WNYO-TV	CP	DT	49	BUFFALO	NY	64.83

Table 1: Off-Air TV Stations within 65 Kilometers of Project Area

[2] Definitions of service and status codes:
DT – Digital television broadcast station
LD – Low power digital television broadcast station
TX – Translator station
DS – Digital special temporary authority (STA)
LIC – Licensed and operational station
CP – Construction permit granted
CP MOD – Modification of construction permit
APP – Application for construction permit, not yet operational
STA – Special transmit authorization, usually granted by FCC for temporary operation

3. Impact Assessment

The six full-power digital stations may have their reception disrupted in and around the Ball Hill Wind Energy Project, primarily in locations on the opposite side of the project area, relative to the station antennas. Communities and homes to the east of the project may have degraded reception of station WNYB, which is located directly west of the project area, after the wind turbines are installed. However, because WNYB is located only five kilometers from the project area and since its transmit antenna is at a height of 313 meters above ground level, the overall coverage of the station should largely be unaffected by the turbines which are at a height of 152 meters.

Stations WBBZ-TV, WKBW-TV, WIBV-TV, WGRZ, and WNYO-TV, which broadcast from northeast of the project area, may have diminished reception in communities directly to the west and southwest of the project. These five stations to the northeast include three network broadcasters, one independent station, and one network called New York television. Because of their large distance to the project area, the television signals may be difficult to receive inside the project area and to the southwest of the project area, due to the receivers being in the fringe area of reception.

Overall, based on the low number of full-power TV channels available in the immediate vicinity of the project area, it is unlikely that off-air television stations are the primary mode of television service for the local communities. TV cable service, where available, and direct broadcast satellite service (DBS) are more likely the dominant modes of service delivery. In Chautauqua County, Time Warner is the main cable service provider to the local communities. In rural areas without cable service, the main alternative to off-air broadcasters will be DBS.

4. Recommendations

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 Us

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6. Appendix A

ID	Call Sign	Status	Service[3]	Channel	City	State / Province	Distance to Nearest Turbine (km)
1	WNYB	LIC	DT	26	JAMESTOWN	NY	5.04
2	WNYB	APP	DT	26	JAMESTOWN	NY	5.04
3	WBBZ-TV	LIC	DT	7	SPRINGVILLE	NY	34.08
4	WBBZ-TV	APP	DS	7	SPRINGVILLE	NY	34.11
5	WKBW-TV	LIC	DT	38	BUFFALO	NY	45.06
6	WBBZ-TV	APP	DT	46	SPRINGVILLE	NY	45.06
7	WNGS-DM	APP	DM	7	SPRINGVILLE	NY	45.07
8	WIVB-TV	LIC	DT	39	BUFFALO	NY	45.81
9	WIVB-TV	CP	DX	39	BUFFALO	NY	45.81
10	WDTB-LP	LIC	TX	39	HAMBURG	NY	49.10
11	WBXZ-LP	LIC	TX	56	BUFFALO	NY	51.05
12	WDTB-LP	CP	TX	28	BUFFALO	NY	51.06
13	WDTB-LP	STA	TX	40	BUFFALO	NY	51.06
14	NEW	APP	LD	48	BUFFALO	NY	51.06
15	WBXZ-LP	CP	LD	17	BUFFALO	NY	51.08
16	WDTB-LP	CP	LD	29	BUFFALO	NY	51.08
17	WBXZ-LP	APP	LD	48	BUFFALO	NY	51.08
18	WGRZ	LIC	DT	33	BUFFALO	NY	53.69
19	WNYO-TV	LIC	DT	49	BUFFALO	NY	64.83
20	WNYO-TV	CP	DT	49	BUFFALO	NY	64.83
21	WUTV	LIC	DT	14	BUFFALO	NY	65.21
22	WBNF-CD	APP	LD	15	BUFFALO	NY	65.21
23	WBNF-CD	LIC	DC	15	BUFFALO	NY	65.21
24	WBXZ-LP	CP	LD	34	BUFFALO	NY	65.21
25	WBXZ-LP	APP	LD	49	BUFFALO	NY	65.21
26	WNLO	LIC	DT	32	BUFFALO	NY	65.83
27	WNED-TV	LIC	DT	43	BUFFALO	NY	65.83
28	W20AB	LIC	TX	20	OLEAN	NY	65.57

[3] Definitions of service and status codes :
TV – Analog television broadcast station
DT – Digital television broadcast station
DS – Digital special temporary authority (STA)
LP – Low power analog television broadcast station
LD – Low power digital television broadcast station
CA – Class A analog television broadcast station
DC – Class A digital television broadcast station
TX – Translator station
LIC – Licensed and operational station
CP – Construction permit granted
CP MOD – Modification of construction permit
APP – Application for construction permit, not yet operational
STA – Special transmit authorization, usually granted by FCC for temporary operation

ID	Call Sign	Status	Service[3]	Channel	City	State / Province	Distance to Nearest Turbine (km)
29	WVTT-CA	LIC	CA	25	OLEAN	NY	68.07
30	WVTT-CA	CP	DC	25	OLEAN	NY	68.07
31	W30BW	LIC	TX	30	OLEAN	NY	68.11
32	W30BW	APP	LD	30	OLEAN	NY	68.11
33	W30BW	APP	LD	30	OLEAN	NY	68.11
34	W45EC-D	CP	LD	45	ERIE	PA	72.53
35	NEW	APP	LD	30	ERIE	PA	73.28
36	NEW	APP	TX	29	ERIE	PA	73.59
37	NEW	APP	DM	56	ARCADE	NY	73.80
38	W32DH-D	APP	LD	32	ERIE	PA	73.99
39	NEW	APP	LD	47	ERIE	PA	75.69
40	WSEE-TV	LIC	DT	16	ERIE	PA	78.38
41	WICU-TV	APP	DT	12	ERIE	PA	78.45
42	WSEE-TV	APP	DT	16	ERIE	PA	78.45
43	WICU-TV	LIC	DT	12	ERIE	PA	78.45
44	NEW	APP	LD	30	ERIE	PA	78.45
45	DWLEP-LP	APP	TX	9	ERIE	PA	83.76
46	WLEP-LD	LIC	LD	43	ERIE	PA	83.76
47	W48CH	LIC	TX	48	ERIE	PA	83.90
48	WQLN	LIC	DT	50	ERIE	PA	83.91
49	WQLN	CP	DT	50	ERIE	PA	83.91
50	W32DH-D	LIC	LD	32	ERIE	PA	83.93
51	NEW	APP	LD	34	ERIE	PA	83.93
52	W36EK-D	CP	LD	36	ERIE	PA	83.93
53	WFXP	LIC	DT	22	ERIE	PA	84.31
54	WJET-TV	LIC	DT	24	ERIE	PA	84.31
55	NEW	APP	LD	35	ERIE	PA	84.31
56	WJET-TV	APP	DT	58	ERIE	PA	84.31
57	WPXJ-TV	LIC	DT	23	BATAVIA	NY	102.18
58	WPXJ-TV	APP	DT	53	BATAVIA	NY	102.18
59	W17DU-D	CP	LD	17	DUBOIS	PA	106.87
60	W19EI-D	CP	LD	19	DUBOIS	PA	106.87
61	W21DO-D	CP	LD	21	DUBOIS	PA	106.87
62	W28EO-D	CP	LD	28	DUBOIS	PA	106.87
63	W06AR	LIC	TX	6	HORNELL	NY	118.33
64	W16BE-D	LIC	LD	16	HORNELL, ALFRED	NY	118.33
65	W52BO	CP	LD	28	MEADVILLE	PA	119.11
66	W52BO	APP	TX	46	MEADVILLE	PA	119.12
67	W52BO	APP	TX	44	MEADVILLE	PA	119.14
68	W48CH	APP	LD	48	ERIE	PA	128.20
69	W64AK	LIC	TX	64	CONNEAUT	OH	138.46
70	W64AK	CP	LD	39	CONNEAUT	OH	138.48

ID	Call Sign	Status	Service[3]	Channel	City	State / Province	Distance to Nearest Turbine (km)
71	W45BT-D	LIC	LD	45	BROOKVILLE	PA	140.22
72	WGCE-CA	LIC	CA	6	GREECE/ROCHESTER	NY	141.06
73	WGCE-CA	CP	DC	25	GREECE/ROCHESTER	NY	141.06
74	WBGT-CA	CP	DC	46	ROCHESTER	NY	141.96
75	WBGT-CA	APP	DC	46	ROCHESTER	NY	141.96
76	WBGT-CA	LIC	CA	40	ROCHESTER	NY	141.99
77	WUHF	LIC	DT	28	ROCHESTER	NY	145.88
78	WHSH-LD	CP	LD	8	ROCHESTER	NY	145.91
79	WAWW-LP	LIC	TX	20	ROCHESTER	NY	145.91
80	DWROH-LP	CP	LD	22	ROCHESTER	NY	145.91
81	WHSH-LP	LIC	TX	36	ROCHESTER	NY	145.91
82	W42CO-D	LIC	LD	42	ROCHESTER	NY	145.91
83	WAWW-LD	CP	LD	48	ROCHESTER	NY	145.91
84	WHAM-TV	LIC	DT	13	ROCHESTER	NY	145.99
85	WXXI-TV	LIC	DT	16	ROCHESTER	NY	145.99
86	WXXI-TV	CP	DT	16	ROCHESTER	NY	145.99
87	WHEC-TV	APP	DT	10	ROCHESTER	NY	146.00
88	WHEC-TV	LIC	DT	10	ROCHESTER	NY	146.02
89	WROC-TV	LIC	DT	45	ROCHESTER	NY	146.02

Table A-1: U.S. Off-Air TV Stations within 150 Kilometers of Project Area

ID	Call Sign	Status	Class[4]	Channel	City	Province	Distance to Nearest Turbine (km)
CA-1	CKVP-DT	AU	R	42	Fonthill	ON	68.06
CA-2	CBLN-TV-6	OP	A	44	Normandale	ON	98.50
CA-3	CHCJ-DT	AU	R	35	Hamilton	ON	99.42
CA-4	CITS-DT	OP	R	36	Hamilton	ON	99.42
CA-5	CHCH-DT	OP	VU	18	Hamilton	ON	99.42
CA-6	CHCH-DT(3)	AU	R	15	Hamilton	ON	99.42
CA-7	CHCH-DT	AU	R	11	Hamilton	ON	99.42
CA-8	CBLT	OP	R	5	Toronto	ON	133.84
CA-9	CFTO-TV	OP	R	9	Toronto	ON	133.84
CA-10	CJMT-DT(2)	AU	R	40	Toronto	ON	133.84
CA-11	CITY-DT	OP	R	44	Toronto	ON	133.84
CA-12	CFTO-DT	OP	VU	40	Toronto	ON	133.84
CA-13	CBLT-DT	AU	R	20	Toronto	ON	133.84
CA-14	CBLT-DT	OP	VL	20	Toronto	ON	133.84
CA-15	CBLFT-DT	OP	C	24	Toronto	ON	133.84
CA-16	CFTO-DT(1)	AU	R	9	Toronto	ON	133.84
CA-17	CBLFT	OP	D	25	Toronto	ON	133.84
CA-18	CJMT-DT(1)	AU	R	51	Toronto	ON	133.84
CA-19	CFMT-DT	OP	R	47	Toronto	ON	133.84
CA-20	CIII-DT-41	OP	R	41	Toronto	ON	133.84
CA-21	CBLFT-DT(1)	AU	R	25	Toronto	ON	133.84
CA-22	CICA-DT	OP	R	19	Toronto	ON	133.84
CA-23	CJMT-DT	TO	R	51	Toronto	ON	134.47
CA-24	CJMT-DT	OP	VU	44	Toronto	ON	134.47
CA-25	CIII-DT	OP	R	6	Paris	ON	140.22
CA-26	CBLN-TV-1	AU	C	29	Kitchener	ON	140.22
CA-27	CICO-DT-28	OP	R	28	Kitchener	ON	140.31
CA-28	CITY-DT-2	OP	R	31	Woodstock	ON	148.50

Table A-2: Canadian Off-Air TV Stations within 150 Kilometers of Project Area

[4] Definitions of class codes:
R – Regular VHF Television Broadcast Station
S – Super-power VHF Television Broadcast Station
LP – Low Power Television Broadcast Station
VU – Digital Class VU Broadcast Station
VL – Digital Class VL Broadcast Station
A – Class A Television Broadcast Station
B – Class B Television Broadcast Station
C – Class C Television Broadcast Station
D – Class D Television Broadcast Station

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Licensed Microwave Report

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1. Introduction

The use of wind energy, one of the oldest forms of harnessing a natural energy source, is now one of the world's fastest growing alternative energy sources. The United States is committed to the use of wind energy, and over the next several years billions of dollars will be spent on wind power projects. However, as new wind turbine generators are installed around the country, it is important to note that they may pose an interference threat to existing microwave systems and broadcast stations licensed to operate in the United States.

Wind turbines can interfere with microwave paths by physically blocking the line-of-sight between two microwave transmitters. Additionally, wind turbines have the potential to cause blockage and reflections ("ghosting") to television reception. Blockage is caused by the physical presence of the turbines between the television station and the reception points. Ghosting is caused by multipath interference that occurs when a broadcast signal reflects off of a large reflective object—in this case a wind turbine—and arrives at a television receiver delayed in time from the signal that arrives via direct path.

Many states and other jurisdictions recognize the need for regulations addressing interference to radio signal transmissions from the wind turbine installations. Specifically, local planning authorities typically require project developers to ensure wind turbines will not cause interference. In some cases they require developers to notify the telecommunication operators in the area of the proposed wind turbine installation. Other factors prompting developers to undertake proactive investigation into potential interference include the need to prevent legal and regulatory problems and the desire to promote goodwill within the community—a good neighbor approach.

Comsearch has developed and maintains comprehensive technical databases containing information on licensed microwave networks throughout the United States. Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz). 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 non-federal government microwave systems. Comsearch provides additional wind energy services, a description of which is available upon request.

2. Summary of Results

An overall summary of results appears below.

Project Information

Name: Ball Hill Wind Energy Project, LLC

County: Chautauqua

State: New York

Total Microwave Paths	Paths with Obstructions	Total Turbines	Turbine Obstructions
6	0	42	0

Methodology

Our obstruction analysis was performed using Comsearch's proprietary microwave database, which contains all non-government licensed paths from 0.9 - 23 GHz[1]. First, we determined all microwave paths that intersect the area of interest[2]. The area of interest was defined by the client and encompasses the planned turbine locations. Next, for each microwave path that intersected the project area, we calculated a Worst Case Fresnel Zone (WCFZ). The mid-point of a full microwave path is the location where the widest (or worst case) Fresnel zone occurs. Fresnel zones were calculated for each path using the following formula.

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

Where,

R_n = Fresnel Zone radius at a specific point in the microwave path, meters
n = Fresnel Zone number, 1
F_{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

For worst case Fresnel zone calculations, $d_1 = d_2$

[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.

The calculated WCFZ radius, giving the linear path an area or swath, buffers each microwave path in the project area. See the Tables and Figures section for a summary of paths and WCFZ distances. In general, this is the two-dimensional area where the planned wind turbines should be avoided, if possible. A depiction of the WCFZ overlaid on topographic basemaps can be found in the Tables and Figures section, and is also included on the enclosed spreadsheet and shapefiles[3,4].

Discussion of Potential Obstructions

For this project, 42 turbines were considered in the analysis.

None of the turbines were found to have a potential conflict with the incumbent microwave paths.

[3] The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 17 projected coordinate system.

[4] 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.

3. Tables and Figures

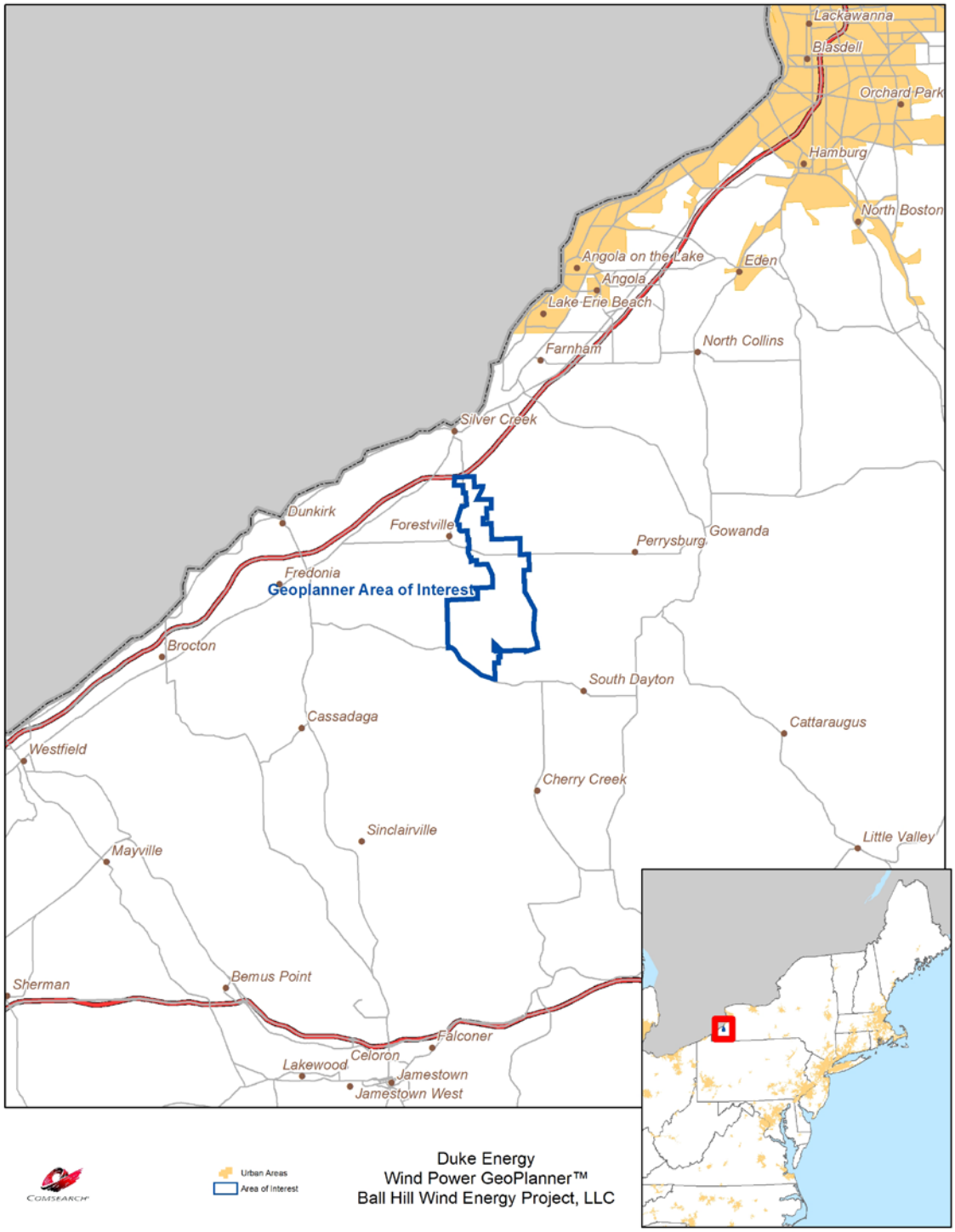


Figure 1: Area of Interest

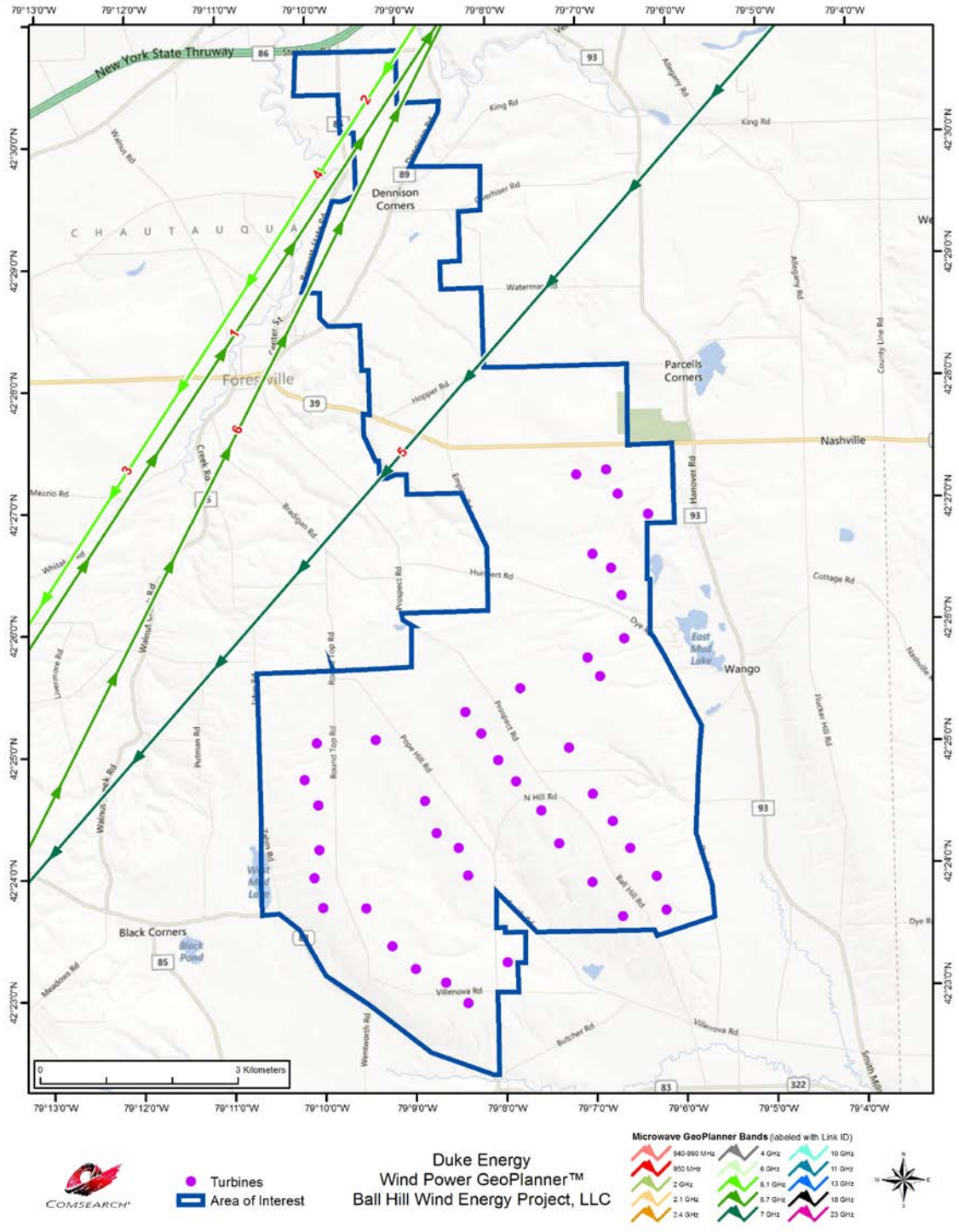


Figure 2: Microwave Paths that Intersect the Area of Interest

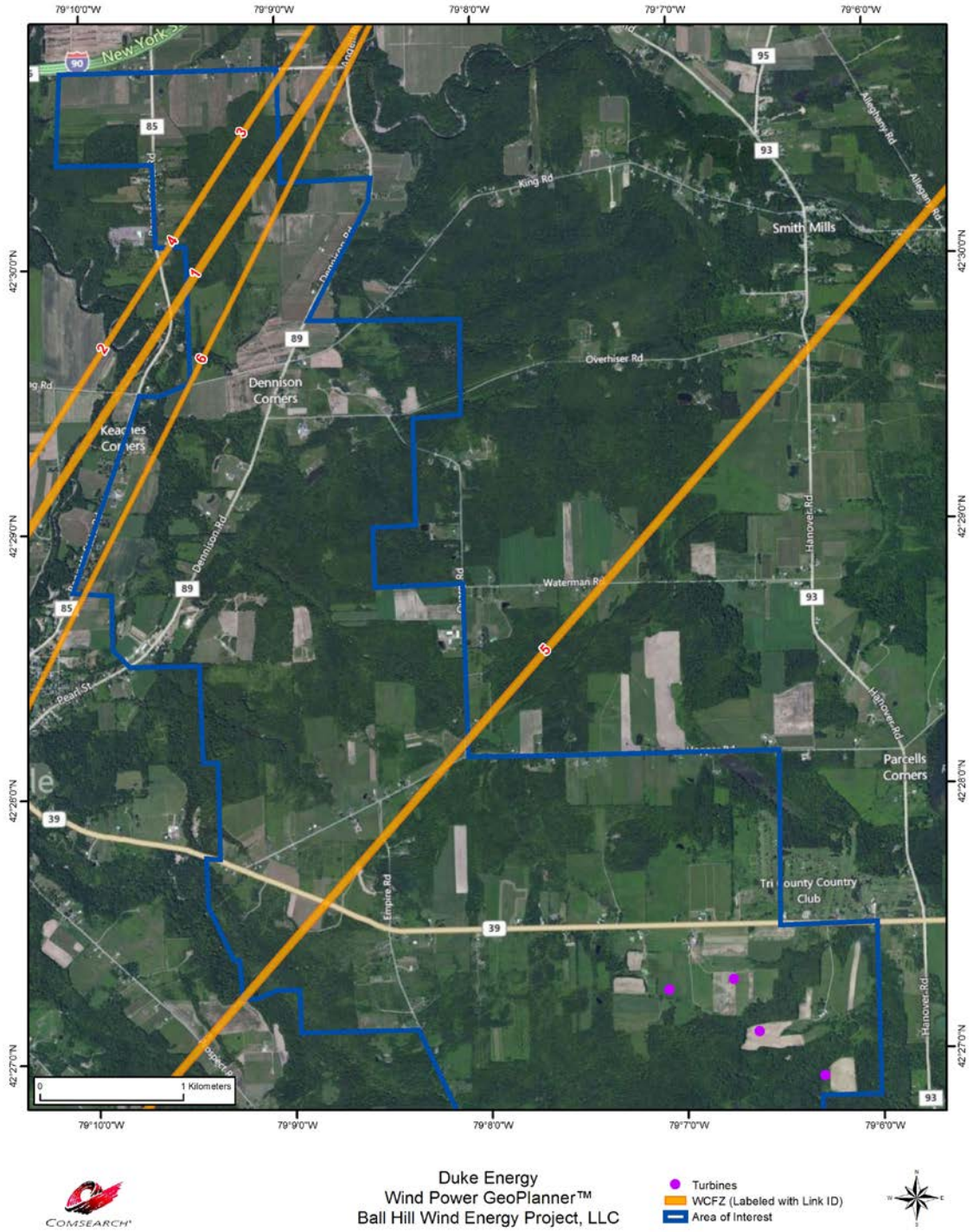


Figure 3: Microwave Paths with WCFZ Buffers

ID	Site Name 1	Site Name 2	Callsign 1	Callsign 2	Band	Licensee	WCFZ (m)
1	ARKWRIGHT	BUFFALO	WBB742	WBH542	Upper 6 GHz	Norfolk Southern Railway	26.81
2-4	ANGOLA	ARKWRIGHT	WMP200	WQJF244	Lower 6 GHz	Upstate Cellular Network	18.59
5	BIG TREE RD	ARKWRIGHT	WPNF351	RXONLY	7 GHz	FAITH BROADCASTING NETWORK, INC.	24.39
6	PRB1010A	PRB1013C	WQFB461	WQFB462	Upper 6 GHz	New York State Office for Technology SWN	15.02

Table 1: Microwave Paths that Intersect the Area of Interest

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

4. Contact Us

For questions or information regarding the Licensed Microwave Report, contact:

Contact person:	Denise Finney
Title:	Account Manager
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5650
Fax:	703-726-5595
Email:	dfinney@comsearch.com
Web site:	www.comsearch.com

Wind Power GeoPlanner™

Land Mobile and Emergency Services Report

Ball Hill Wind Energy Project, LLC

Prepared on Behalf of
Duke Energy

November 16, 2012

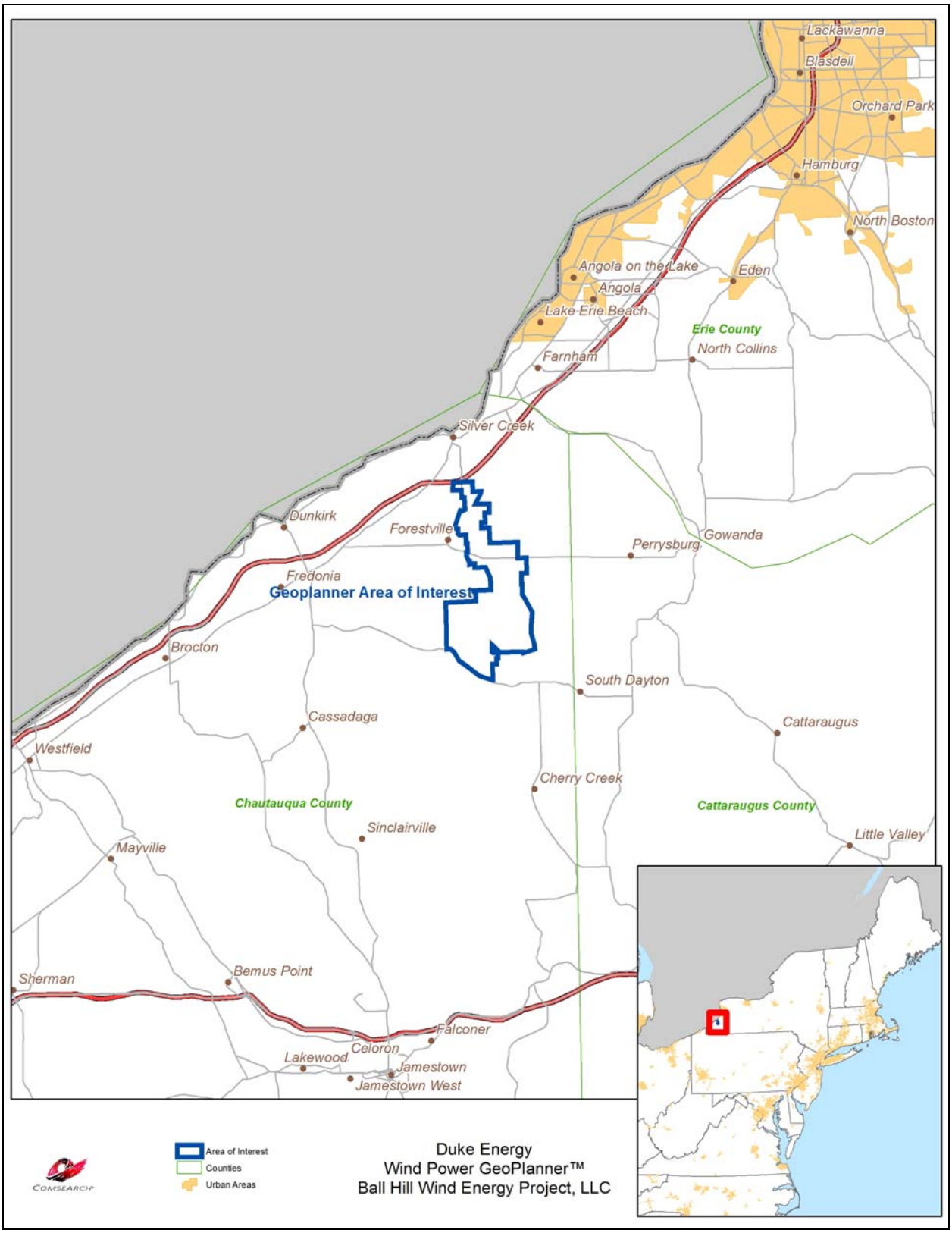
COMSEARCH®
A CommScope Company

Table of Contents

1. Introduction

An assessment of the emergency services in the Ball Hill Wind Energy 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 Chautauqua County, New York, appears below.

This study was performed on behalf of Duke Energy.


Lackawanna
Blasdell
Orchard Park
Hamburg
North Boston
Angola on the Lake
Angola
Eden
Lake Erie Beach
Erie County
North Collins
Farnham
Silver Creek
Dunkirk
Forestville
Perrysburg
Gowanda
Fredonia
Geoplanner Area of Interest
Brocton
South Dayton
Cassadaga
Cattaraugus
Westfield
Cherry Creek
Chautauqua County
Cattaraugus County
Sinclairville
Little Valley
Mayville
Sherman
Bemus Point
Falconer
Celoron
Lakewood
Jamestown
Jamestown West
Area of Interest
Counties
Urban Areas
Duke Energy
Wind Power GeoPlanner™
Ball Hill Wind Energy Project, LLC

2. Summary of Results

Our land mobile and emergency services incumbent data[1] 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. The site-based licenses were imported into GIS software and geographically mapped within 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 provided in a data table. A depiction of the fixed-site licenses in the project area appears in Figure 1, below.

[1] 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

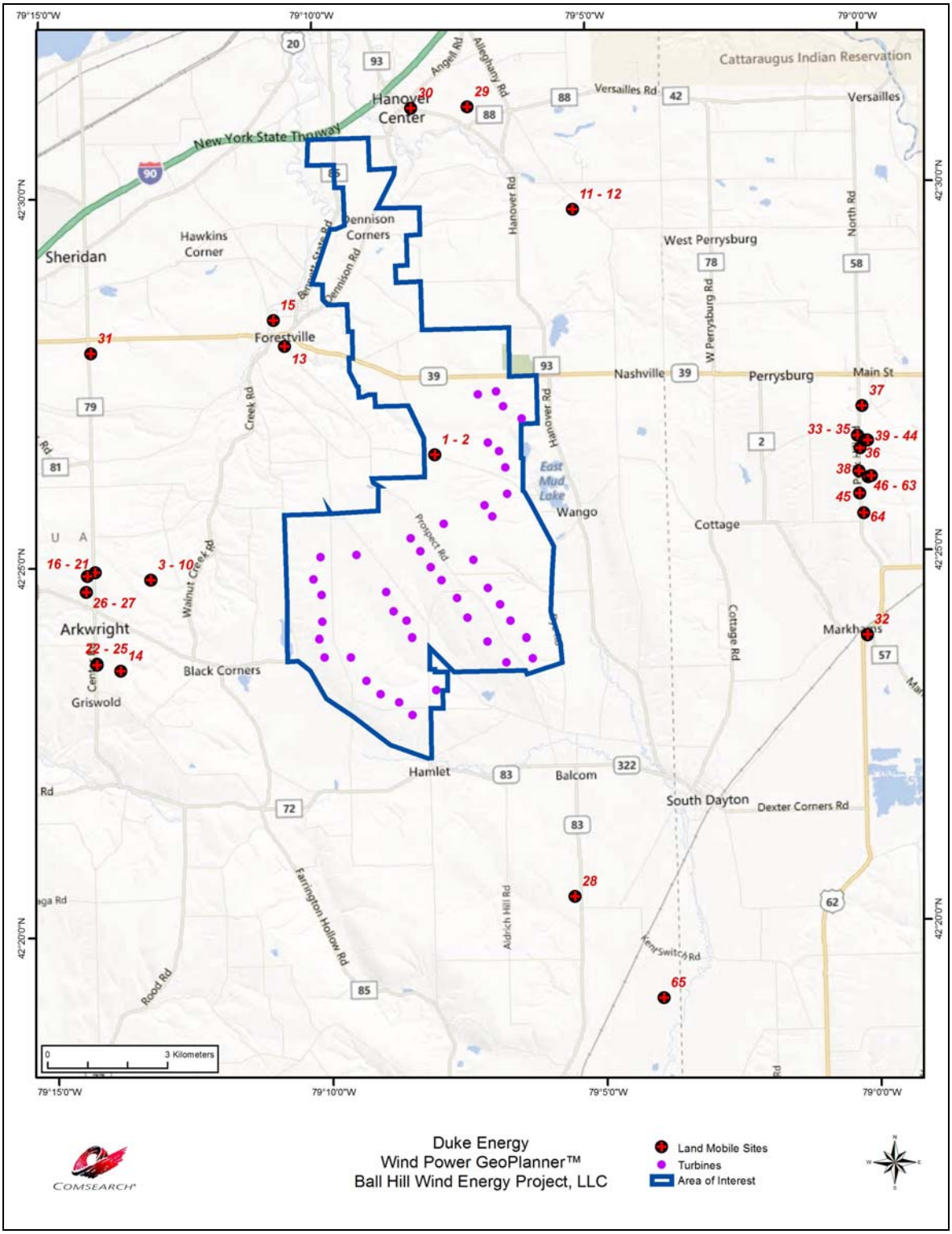


Figure 1: Land Mobile & Emergency Service Sites near the Project Area of Interest

Site-Based Licenses

Figure 1 identifies sixty-five site-based licenses near the project area of interest. Some of these sites are licensed to first responder entities that provide critical public safety and emergency communications to the Ball Hill Wind Energy Project area. Specific information about these sites is provided in Table 1, including location coordinates, frequency band, antenna height above ground level, and licensee name.

ID	Call Sign	Frequency Band (MHz)	Licensee	Antenna Height AGL (m)	City	State	Latitude (NAD83)	Longitude (NAD83)
1	KNRS991	800/900	NEXTEL WIP LICENSE CORP	61.0	FORESTVILLE	NY	42.440611	-79.131694
2	KNRT703	800/900	NEXTEL WIP LICENSE CORP	61.0	FORESTVILLE	NY	42.440611	-79.131694
3	KIT533	450-470	GEORGE ORTOLANO INC	52.0	SILVER CREEK	NY	42.413667	-79.218944
4	KNGQ592	450-470	TIME WARNER CABLE NORTHEAST	52.0	ARKWRIGHT	NY	42.413667	-79.218944
5	WNAD644	450-470	A SAM & SONS PRODUCE CO INC	52.0	FREDONIA	NY	42.413667	-79.218944
6	WNCU997	450-470	DON FRAME TRUCKING INC	58.0	FREDONIA	NY	42.413667	-79.218944
7	WNXQ602	150-174	W C A SERVICES CORP	52.0	FREDONIA	NY	42.413667	-79.218944
8	WNXQ602	450-470	W C A SERVICES CORP	9.0	FREDONIA	NY	42.413667	-79.218944
9	WPGH563	450-470	S ST GEORGE ENTERPRISES INC	55.0	FREDONIA	NY	42.413667	-79.218944
10	WQOA377	450-470	COMMUNICATION SERVICES OF WNY & PA INC	52.0	FREDONIA	NY	42.413667	-79.218944
11	KZX603	25-50	NATIONAL FUEL GAS SUPPLY CORP	34.0	SILVER CREEK	NY	42.495333	-79.088083
12	WNXC831	450-470	NATIONAL FUEL GAS SUPPLY CORP	34.0	FORESTVILLE	NY	42.495333	-79.088083
13	WQKN310	72-76	FORESTVILLE CENTRAL SCHOOL DIST	12.2	FORESTVILLE	NY	42.465806	-79.176722
14	WPLR869	450-470	FAITH BROADCASTING NETWORK INC	323.0	ARKWRIGHT	NY	42.393389	-79.228667
15	KMB262	25-50	FORESTVILLE, VILLAGE OF	21.0	FORESTVILLE	NY	42.471722	-79.180028
16	WNBK721	450-470	HARVEY, ROBERT D	55.0	DUNKIRK	NY	42.415611	-79.235889
17	WNMI645	450-470	ERIE 2 CHAUTAUQUA CATTARAUGUS BOCES	55.0	DUNKIRK	NY	42.415611	-79.235889

ID	Call Sign	Frequency Band (MHz)	Licensee	Antenna Height AGL (m)	City	State	Latitude (NAD83)	Longitude (NAD83)
18	WNMM500	450-470	LOTTER ENTERPRISES INC DBA PATTON ELECTRIC COMPANY	55.0	DUNKIRK	NY	42.415611	-79.235889
19	WPCP419	450-470	CARRIER COACH INC	55.0	DUNKIRK	NY	42.415611	-79.235889
20	WQEK811	450-470	STATE ELECTRONICS CO INC	55.0	DUNKIRK	NY	42.415611	-79.235889
21	WPJY947	800/900	USA MOBILITY WIRELESS	44.0	ARKWRIGHT	NY	42.414778	-79.238250
22	WPVX592	150-174	CHAUTAUQUA, COUNTY OF	45.7	ARKWRIGHT	NY	42.395056	-79.235889
23	KAN682	450-470	CHAUTAUQUA COUNTY EMS	58.0	ARKWRIGHT	NY	42.394778	-79.235889
24	KEB392	150-174	CHAUTAUQUA, COUNTY OF	58.0	ARKWRIGHT	NY	42.394778	-79.235889
25	KEB909	25-50	CHAUTAUQUA, COUNTY OF	46.0	ARKWRIGHT	NY	42.394778	-79.235889
26	KQD357	150-174	NORFOLK SOUTHERN RAILWAY COMPANY	-	ARKWRIGHT	NY	42.411167	-79.238667
27	KQD357	150-174	NORFOLK SOUTHERN RAILWAY COMPANY	13.0	ARKWRIGHT	NY	42.411167	-79.238667
28	KNHF422	450-470	PINE VALLEY CENTRAL SCHOOL	11.6	SOUTH DAYTON	NY	42.340306	-79.091944
29	WPPM543	800/900	NEXTEL WIP LICENSE CORP	78.0	HANOVER	NY	42.518944	-79.119472
30	KNIQ932	25-50	HANOVER HOSE CO 1 INC	17.0	SILVER CREEK	NY	42.518944	-79.136694
31	KXM941	150-174	SHERIDAN, TOWN OF	18.0	SHERIDAN	NY	42.465056	-79.235861
32	WPFD378	150-174	DAYTON, TOWN OF	11.0	MARKHAM	NY	42.397833	-79.001139
33	KEA338	25-50	NEW YORK STATE ELECTRIC & GAS CORPORATION	34.0	PERRYSBURG	NY	42.442833	-79.002806
34	KEB395	25-50	CATTARAUGUS, COUNTY OF	18.0	PERRYSBURG	NY	42.442833	-79.002806
35	WPAT680	150-174	CATTARAUGUS, COUNTY OF	18.0	PERRYSBURG	NY	42.442833	-79.002806
36	WQES833	150-174	NEW YORK STATE ELECTRIC & GAS CORPORATION	-	PERRYSBURG	NY	42.439944	-79.002083
37	KB74646	450-470	CATTARAUGUS, COUNTY OF	-		NY	42.449500	-79.001139
38	WNAW505	450-470	NORTH COLLINS CYLINDER GAS CO INC	35.0	PERRYSBURG	NY	42.434778	-79.002528

ID	Call Sign	Frequency Band (MHz)	Licensee	Antenna Height AGL (m)	City	State	Latitude (NAD83)	Longitude (NAD83)
39	KFR572	25-50	GOWANDA, VILLAGE OF	55.0	PERRYSBURG	NY	42.441722	-79.000583
40	WPAM447	450-470	SAIA COMMUNICATIONS	55.0	PERRYSBURG	NY	42.441722	-79.000583
41	WPEF360	450-470	GERNATT ASPHALT PRODUCTS INC	61.0	PERRYSBURG	NY	42.441722	-79.000583
42	WNPS479	450-470	FULLONE TRUCKING INC	55.0	PERRYSBURG	NY	42.441722	-79.000306
43	WPRU503	450-470	SAIA COMMUNICATIONS	-		NY	42.441722	-79.000306
44	KNHX379	450-470	UNION CONCRETE & CONSTRUCTION CORP	55.0	PERRYSBURG	NY	42.441722	-78.999750
45	WNXQ445	25-50	CATTARAUGUS, COUNTY OF	61.0	DAYTON	NY	42.429778	-79.002528
46	KNHF422	450-470	PINE VALLEY CENTRAL SCHOOL	-	SOUTH DAYTON	NY	42.433389	-78.999750
47	KNHF422	450-470	PINE VALLEY CENTRAL SCHOOL	61.0	DAYTON	NY	42.433389	-78.999750
48	WPFK784	450-470	FM COMMUNICATIONS INC	61.0	DAYTON	NY	42.433389	-78.999750
49	WPPD218	421-430	SAIA COMMUNICATIONS	61.0	DAYTON	NY	42.433389	-78.999750
50	WQDH314	450-470	SAIA COMMUNICATIONS	-	DAYTON	NY	42.433389	-78.999750
51	KNBM988	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
52	WNDG723	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
53	WNSA527	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
54	WPCV445	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
55	WPDS893	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
56	WPGI437	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
57	WPLU261	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
58	WPRK249	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
59	WPRU503	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
60	WPTF699	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
61	WQDH314	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806

ID	Call Sign	Frequency Band (MHz)	Licensee	Antenna Height AGL (m)	City	State	Latitude (NAD83)	Longitude (NAD83)
62	WRP914	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
63	WYL502	450-470	SAIA COMMUNICATIONS	59.4	DAYTON	NY	42.433611	-78.998806
64	WQEQ315	450-470	CARRIER COACH INC	60.6	DAYTON	NY	42.425278	-79.001389
65	KM4122	450-470	WHDH-TV	-	BOSTON	MA	42.317000	-79.065583

Table 1: Summary of Land Mobile & Emergency Service Sites near the Project Area of Interest

Area-Wide Licenses

The regional area-wide licenses are compiled from FCC data sources and identified for each county in the wind project area. The Ball Hill Wind Energy Project is located in Chautauqua County, New York, part of Public Safety Region #55, which contains all of the counties in Western New York. The regional public safety operation is overseen by the entity listed below.

Steven C. Sharpe
Chairperson
Genesee County
Director of Emergency Communications
165 Park Road
Batavia, NY 14020
phone: 585-345-3000 ext. 3400
fax: 585-343-9129
email: ssharpe@co.genesee.ny.us

The chairperson for Region #55 is a representative for all public safety entities in the region 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, twenty-six licenses were found for the State of New York and eight for the County of Chautauqua (see Table 2). These area-wide licenses are designated for mobile use only.

ID	Frequency Band (MHz)	Licensee	Area of Operation
1	25-50, 450-470	AMERICAN NATIONAL RED CROSS	Statewide: NY
2	150-174	BERGEN VOLUNTEER FIRE DEPARTMENT	Statewide: NY
3	150-174	BUSTI, TOWN OF	Countywide: Chautauqua

ID	Frequency Band (MHz)	Licensee	Area of Operation
4	25-50	CASSADAGA VALLEY CENTRAL SCHOOL SYSTEM	Countywide: Chautauqua
5	150-174	CENTRAL ISLIP HAUPPAUGE VOLUNTEER AMBULANCE INC	Statewide: NY
6	25-50, 150-174, 450-470, 800/900, 2450-2500, 4940-4990	CHAUTAUQUA, COUNTY OF	Countywide: Chautauqua
7	150-174	CHAUTAUQUA COUNTY AIRPORT - JAMESTOWN	Countywide: Chautauqua
8	25-50	CHAUTAUQUA COUNTY DPF	Countywide: Chautauqua
9	150-174	CLYMER, TOWN OF	Countywide: Chautauqua
10	25-50, 150-174, 421-430, 450-470	ERIE, COUNTY OF	Statewide: NY
11	150-174	MASSASAUGA SEARCH AND RESCUE INC	Statewide: NY
12	450-470	MAYVILLE, VILLAGE OF	Countywide: Chautauqua
13	150-174	MOHAWK VALLEY PSYCHIATRIC CENTER	Statewide: NY
14	150-174	NATIONAL SKI PATROL SYSTEM INC	Statewide: NY
15	150-174, 450-470, 769-775/799-805, 800/900, 4940-4990	NEW YORK, CITY OF	Statewide: NY
16	150-174	NEW YORK CITY POLICE DEPARTMENT	Statewide: NY
17	0-10, 25-50, 150-174, 450-470, 800/900, 2450-2500, 4940-4990	NEW YORK, STATE OF	Statewide: NY
18	150-174, 450-470, 4940-4990	NEW YORK STATE DEPARTMENT OF CORRECTIONAL SERVICES	Statewide: NY
19	25-50, 150-174	NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION OFFICE OF PUBLIC PROTECTION	Statewide: NY
20	25-50, 150-174, 450-470	NEW YORK STATE DEPARTMENT OF HEALTH BUREAU OF EMS	Statewide: NY
21	4940-4990	NEW YORK STATE DEPARTMENT OF TRANSPORTATION	Statewide: NY
22	150-174, 450-470, 2450-2500	NEW YORK STATE DIVISION OF STATE POLICE	Statewide: NY
23	0-10, 25-50, 150-174, 220-222, 4940-4990	NEW YORK STATE EMERGENCY MANAGEMENT OFFICE	Statewide: NY

ID	Frequency Band (MHz)	Licensee	Area of Operation
24	150-174, 450-470	NEW YORK STATE OFFICE OF PARKS, RECREATION AND HISTORIC PRESERVATION (OPRHP)	Statewide: NY
25	150-174	NEW YORK STATE OPRHP - NIAGARA REGION	Statewide: NY
26	150-174	NEW YORK STATE OPRHP - PALISADES REGION	Statewide: NY
27	150-174	NIAGARA FRONTIER SEARCH AND RESCUE	Statewide: NY
28	150-174	NORTHEAST MOBILE SEARCH AND RESCUE INC	Statewide: NY
29	25-50, 150-174	NORTHEASTERN FOREST FIRE PROTECTION COMPACT	Statewide: NY
30	25-50, 450-470	OSSINING, VILLAGE OF	Statewide: NY
31	150-174	SHERMAN CENTRAL SCHOOL DISTRICT	Countywide: Chautauqua
32	4940-4990	TRIBOROUGH BRIDGE AND TUNNEL AUTHORITY	Statewide: NY
33	150-174	WESTERN NEW YORK SEARCH DOGS INC	Statewide: NY
34	4940-4990	WOODBURY, TOWN OF	Statewide: NY

Table 2: Summary of 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 Chautauqua County in Table 3, below.

Service[2]	Mobile Phone Carrier	County	State
AWS / CELL / PCS	AT&T	Chautauqua	NY
PCS	Blue Wireless	Chautauqua	NY
AWS	Cricket Wireless	Chautauqua	NY
AWS	Metro PCS	Chautauqua	NY
PCS	Sprint Nextel	Chautauqua	NY
AWS / PCS	T-Mobile	Chautauqua	NY
AWS / CELL / PCS	Verizon	Chautauqua	NY

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

[2] AWS: Advanced Wireless Service at 1.7/2.1 GHz
CELL: Cellular Service at 800 MHz
PCS: Personal Communication Service at 1.9 GHz

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 Ball Hill Wind Energy 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 in regards 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, and 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 & Mitigation Measures

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 Us

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

Contact person:	Denise Finney
Title:	Account Manager
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5650
Fax:	703-726-5595
Email:	dfinney@comsearch.com
Web site:	www.comsearch.com

2015 Communication Surveys

Wind Power GeoPlanner™

AM and FM Radio Report

Ball Hill Wind

Prepared on Behalf of
Ball Hill Wind Energy, LLC

November 23, 2015

COMSEARCH®
A CommScope Company

Table of Contents

1. Introduction

Comsearch analyzed AM and FM radio broadcast stations whose service could potentially be affected by the proposed Ball Hill Wind project in Chautauqua County, New York.

2. Summary of Results

AM Radio Analysis

Comsearch found two database records[1] for AM stations within approximately 30 kilometers of the project, as shown in Table 1 and Figure 1. These records represent station WDOE, which broadcasts out of Dunkirk, New York, to the west of the project. This station two different power levels, a higher transmit power for daytime operations and a lower transmit power for nighttime operations.

ID	Call Sign	Status[2]	Frequency (kHz)	Transmit ERP[3] (kW)	Operation Time	Latitude (NAD 27)	Longitude (NAD 27)	Required Separation Distance[4] (km)	Distance to Nearest Turbine (km)
1	WDOE	LIC	1410	1.0	Daytime	42.463611	-79.355833	0.21	16.20
2	WDOE	LIC	1410	0.031	Nighttime	42.463611	-79.355833	0.21	16.20

Table 1: AM Radio Stations within 30 Kilometers

[1] 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.

[2] LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit.

[3] ERP = Transmit Effective Radiated Power.

[4] 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.

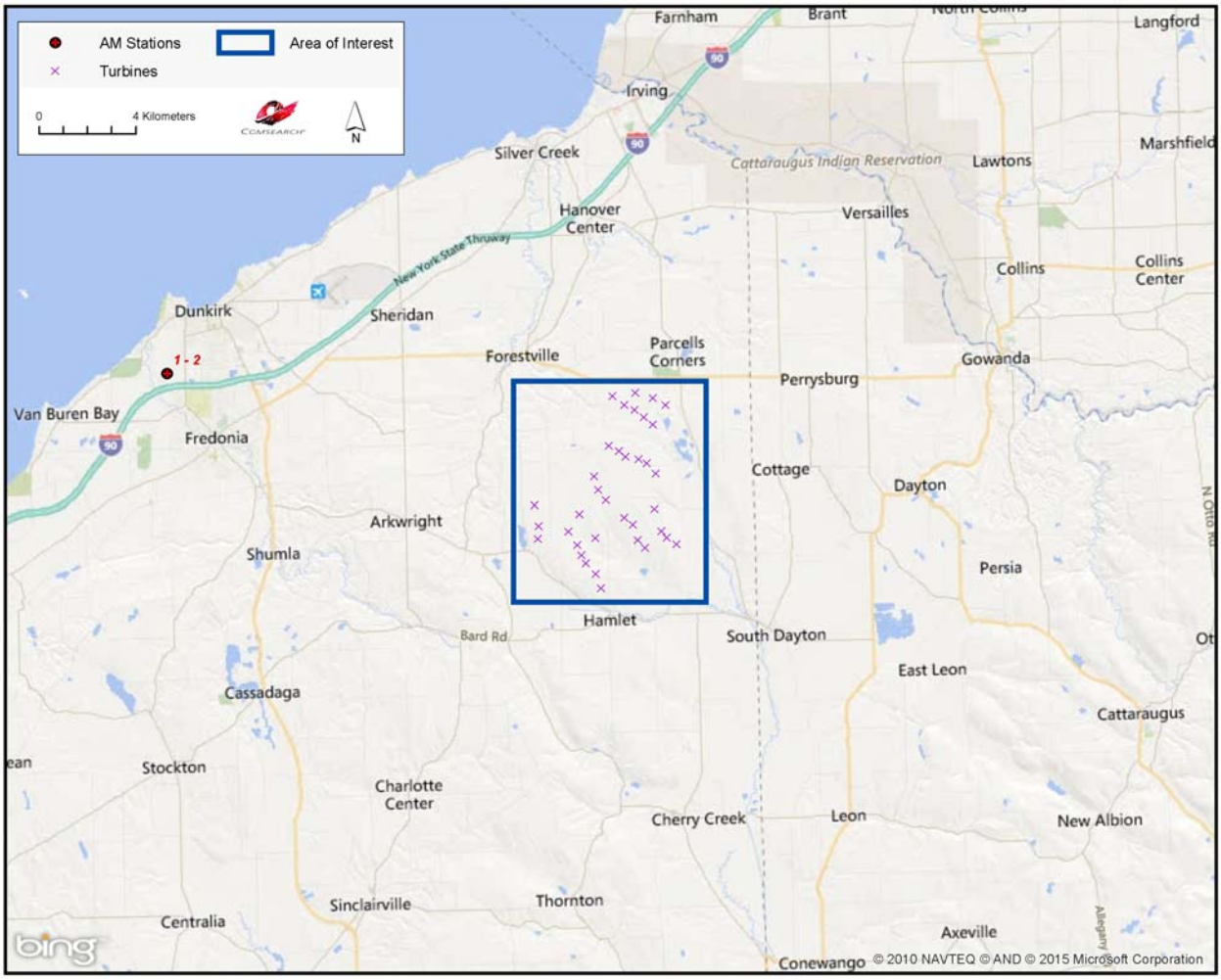


Figure 1: AM Radio Stations within 30 Kilometers

FM Radio Analysis

Comsearch determined that there were twelve records for FM stations within a 30-kilometer radius of the Ball Hill Wind project, as shown in Table 2 and Figure 2. Only eleven of these stations are currently licensed and operating, five of which are translator stations that operate with limited range.

ID	Call Sign	Status[5]	Service[6]	Frequency (MHz)	Transmit ERP[7] (kW)	Latitude (NAD 27)	Longitude (NAD 27)	Distance to Nearest Turbine (km)
1	W263CN	CP MOD	FX	100.5	0.18	42.432028	-79.277750	9.01
2	W203AW	LIC	FX	88.5	0.019	42.451667	-79.301667	11.57
3	WCVF-FM	LIC	FM	88.9	0.13	42.452222	-79.337222	14.34
4	W235BP	LIC	FX	94.9	0.2	42.367222	-79.386667	18.15
5	WBKX	LIC	FM	96.5	1.4	42.367222	-79.386667	18.15
6	WCOM-FM	LIC	FM	89.3	8.0	42.578056	-78.963056	18.56
7	W252CG	LIC	FX	98.3	0.007	42.305833	-79.452222	25.42
8	WYRR	LIC	FM	88.9	0.42	42.175833	-79.317222	27.03
9	WUBJ	LIC	FM	88.1	2.7	42.179722	-79.341389	27.82
10	W203BV	LIC	FX	88.5	0.009	42.131389	-79.220278	28.43
11	W254AQ	LIC	FX	98.7	0.01	42.131389	-79.220278	28.43
12	WHUG	LIC	FM	101.9	6.0	42.131389	-79.220278	28.43

Table 2: FM Radio Stations within 30 Kilometers

[5] LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit.

[6] FM = FM broadcast station; FX = FM translator station; FL = FM low-power station; FB = FM booster station.

[7] ERP = Transmit Effective Radiated Power.

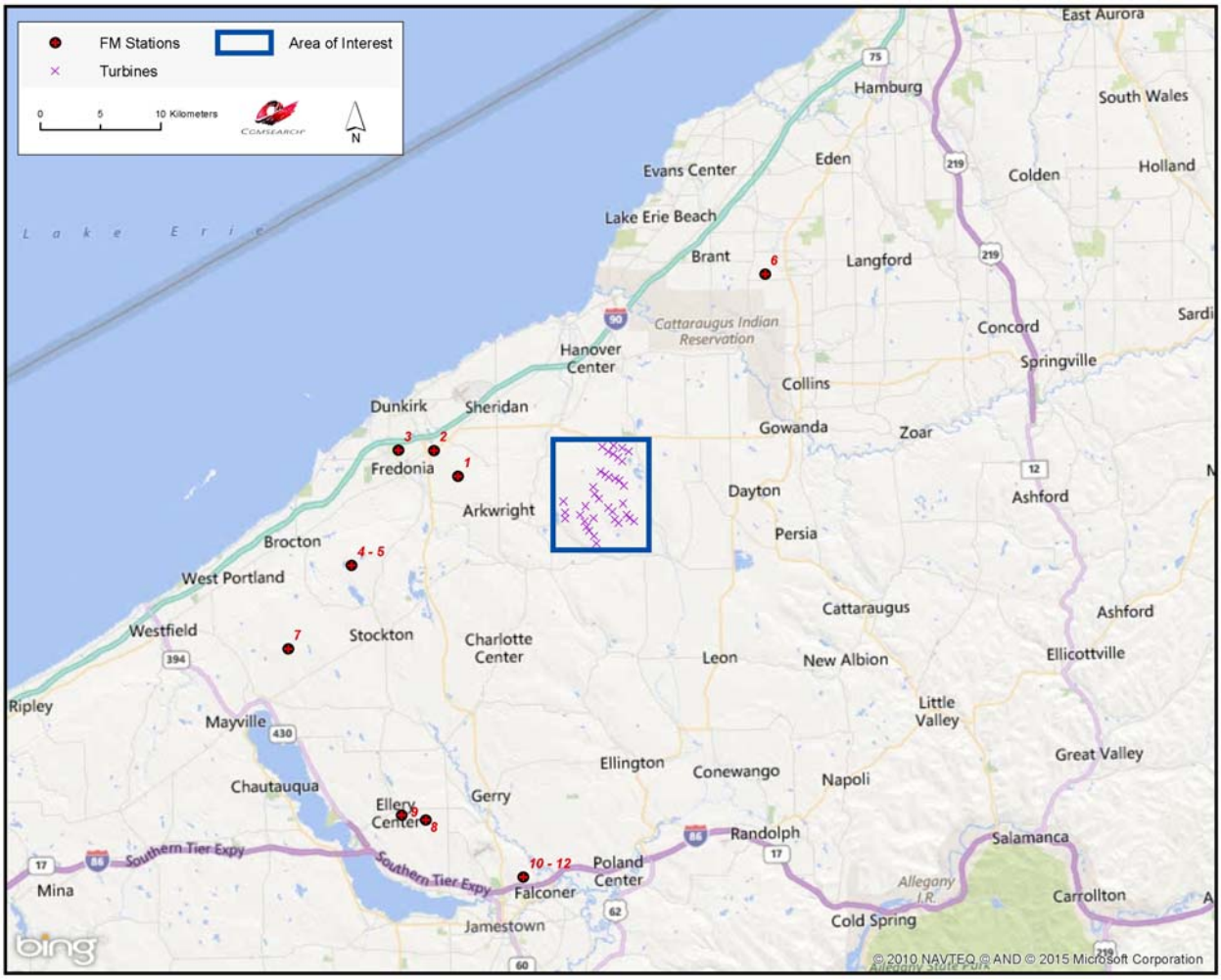


Figure 2: FM Radio Stations within 30 Kilometers

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 AM station to the Ball Hill Wind project, WDOE, is more than 16.2 kilometers from the nearest turbine. As there were no stations found within 3 kilometers of the 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. The closest operational station to the Ball Hill Wind project, W203AW, is located more than 9.0 kilometers from the nearest turbine. At this distance, there should be 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:	Denise Finney
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Company:	Comsearch
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Telephone:	703-726-5650 (office) / 703-726-5595 (fax)
Email:	dfinney@comsearch.com
Web site:	www.comsearch.com

Wind Power GeoPlanner™

Microwave Study

Ball Hill Wind

Prepared on Behalf of
Ball Hill Wind Energy, LLC

November 19, 2015

COMSEARCH
A CommScope Company

Table of Contents

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: Ball Hill Wind

County: Chautauqua

State: New York

Number of Turbines: 36

Blade Diameter: 116 meters

Hub Height: 94 meters

Figure 1: Area of Interest

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[1]. First, we determined all microwave paths that intersect the area of interest[2] and listed them in Table 1. This path and the area of interest that encompasses the planned turbine locations are shown in Figure 2.

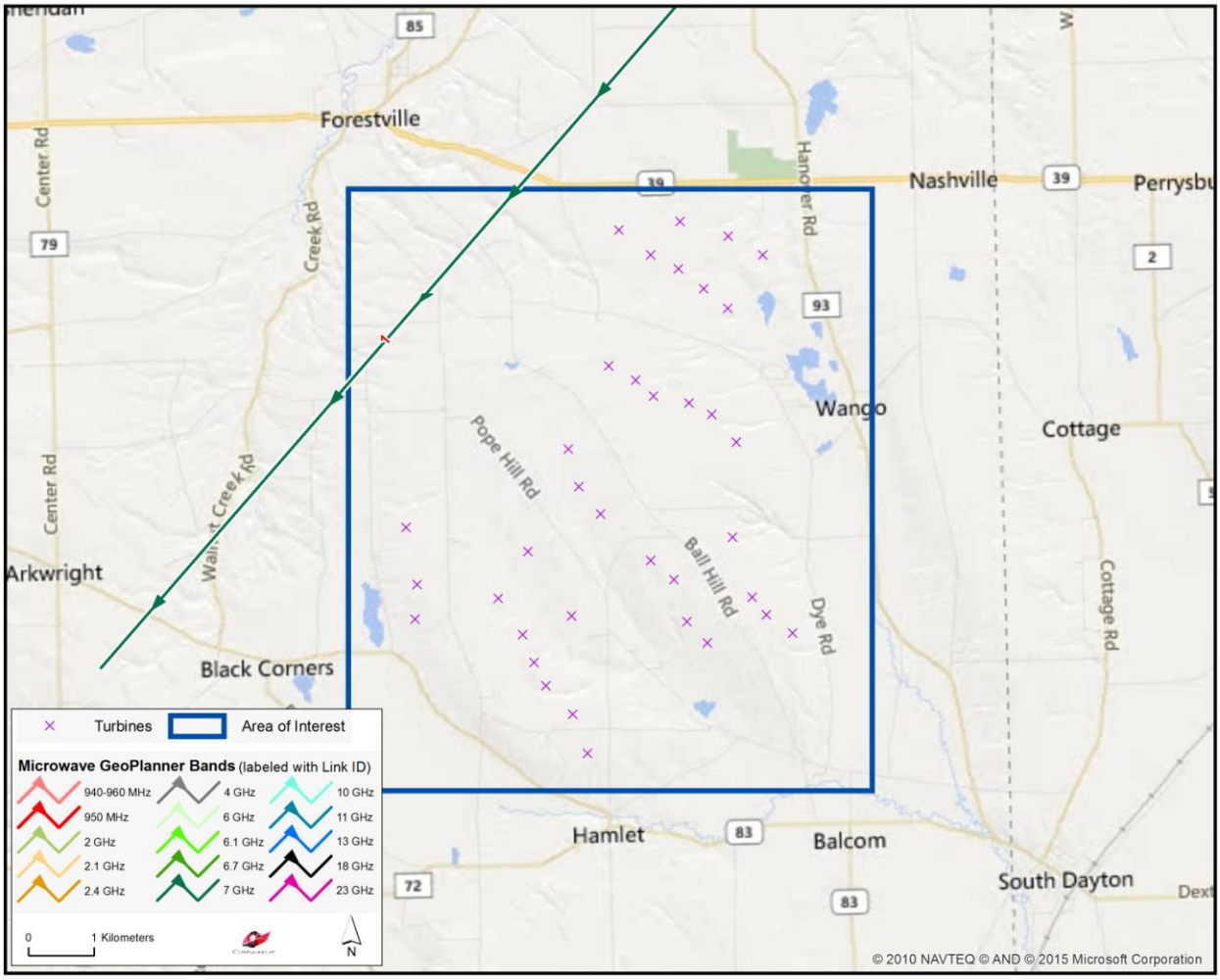


Figure 2: Microwave Paths that Intersect the Area of Interest

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

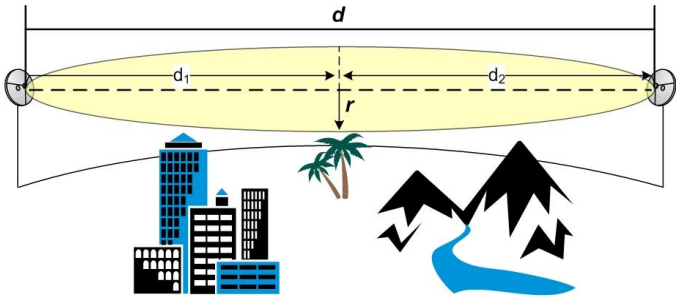
[2] We use FCC-licensed coordinates to determine which paths intersect the area of interest. It is possible that as-built coordinates may differ slightly from those on the FCC license.

ID	Status	Callsign 1	Callsign 2	Band	Path Length (km)	Licensee
1	Licensed	WPNF351	RXONLY	7 GHz	55.63	FAITH BROADCASTING NETWORK, 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 this 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
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

In general, this is the area where the planned wind turbines should be avoided, if possible. A depiction of the Fresnel Zones for the microwave path listed can be found in Figure 3, and is also included in the enclosed shapefiles[3,4].

[3] The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 17 projected coordinate system.

[4] 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.

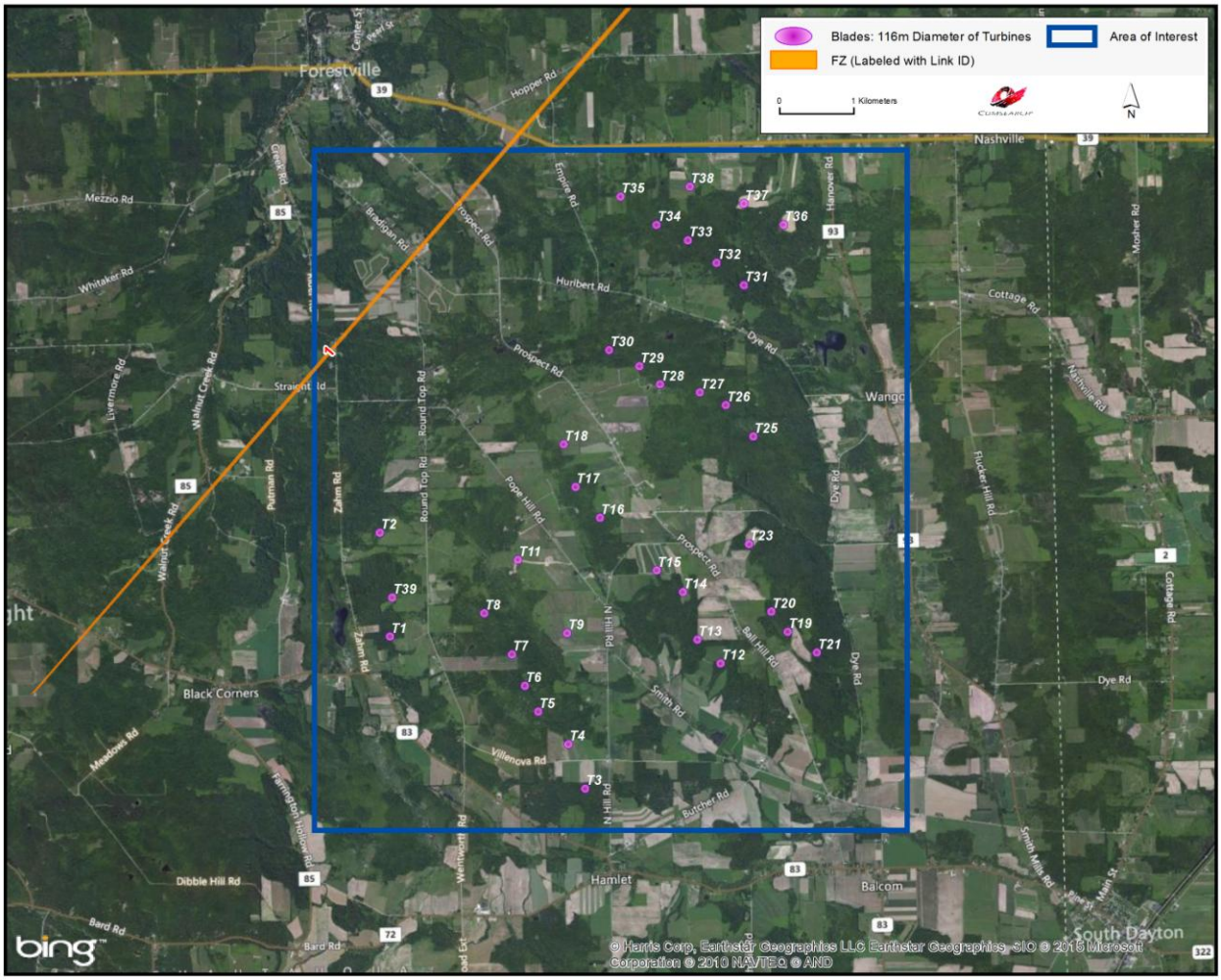


Figure 3: Microwave Paths with Fresnel Zones

4. Conclusion

Total Microwave Paths	Paths with Affected Fresnel Zones	Total Turbines	Turbines intersecting the Fresnel Zones
1	0	36	0

Table 2: Fresnel Zone Analysis Result

Our study identified one microwave path intersecting the Ball Hill Wind area of interest. The Fresnel Zones for this microwave path was calculated and mapped in order to assess the potential impact from the turbines. A total of 36 turbines were considered in the analysis, each with a blade diameter of 116 meters and turbine hub height of 94 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:

Contact person: Denise Finney
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Company: Comsearch
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Email: dfinney@comsearch.com
Web site: www.comsearch.com

Wind Power GeoPlanner™

Off-Air TV Analysis

Ball Hill Wind

Prepared on Behalf of
Ball Hill Wind Energy, LLC

November 23, 2015

COMSEARCH®
A CommScope Company

Table of Contents

1. Introduction

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 Ball Hill Wind project in Chautauqua County, New York. 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.

2. Summary of Results

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

Figure 1: Wind Farm Project Area and Local Communities

To begin the analysis, Comsearch compiled all off-air television stations[1] within 150 kilometers of the center of the project area of interest (AOI). Appendix A contains a tabular summary of these stations. A plot depicting their locations appears in Figure 2, below.

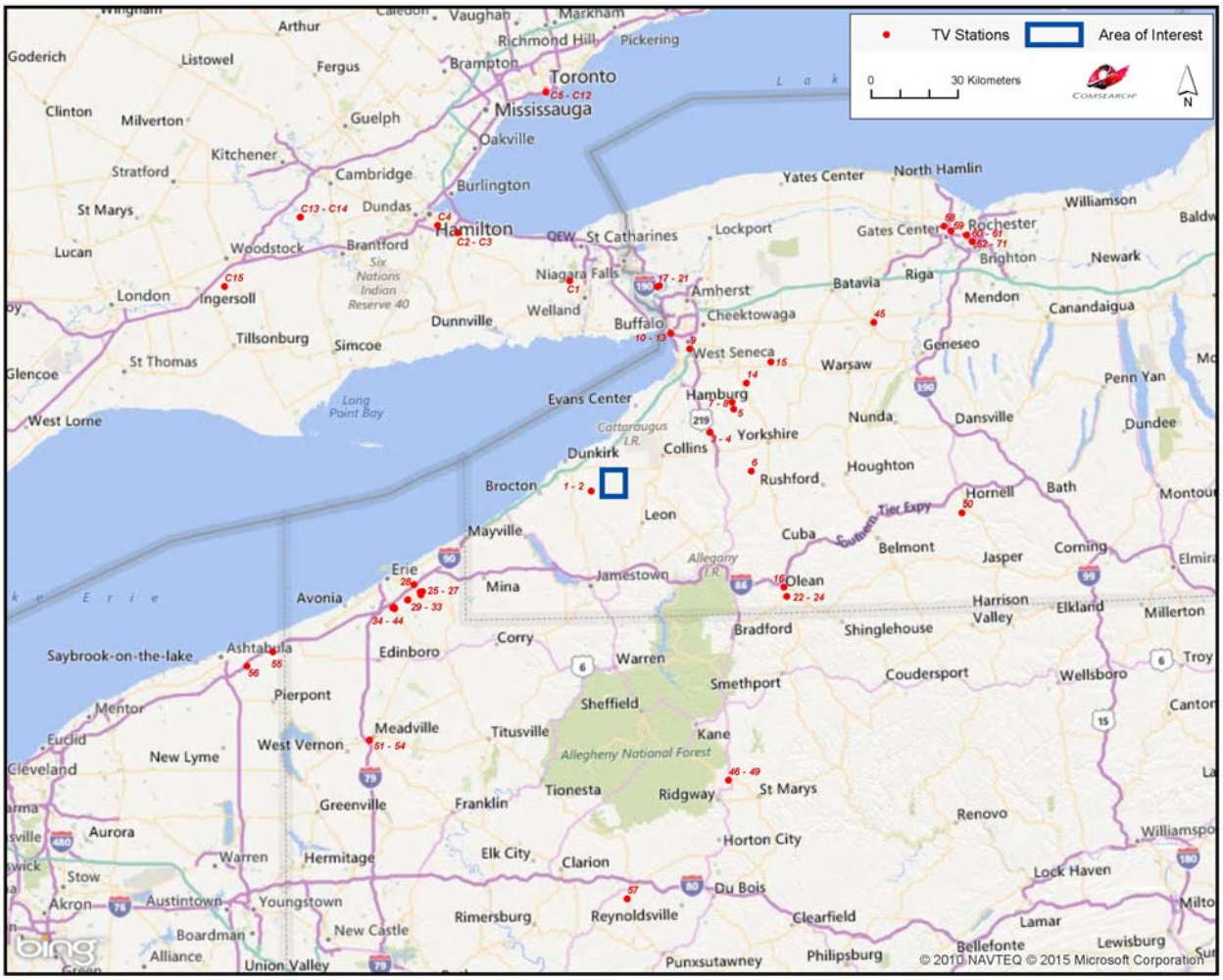

Figure 2: Plot of Off-Air TV Stations within 150 Kilometers of Project Area

TV stations at a distance of 75 kilometers or less are the most likely to provide off-air coverage to the project area and neighboring communities. These stations are listed in Tables 1 and 2, below, and a plot depicting their locations is provided in Figure 3. There are a total of twenty-nine database records for stations within approximately 75 kilometers of the limits of the project AOI. Of these stations, only sixteen are currently licensed and operating, seven of which are low-power stations or translators. Translator stations are low-power stations that receive

[1] 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.

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. The nine remaining records represent stations WNYB, WBBZ-TV, WKBW-TV, WIVB-TV, WGRZ, WNYO-TV, WUTV, WNLO, AND WNED-TV, which broadcast at full power.

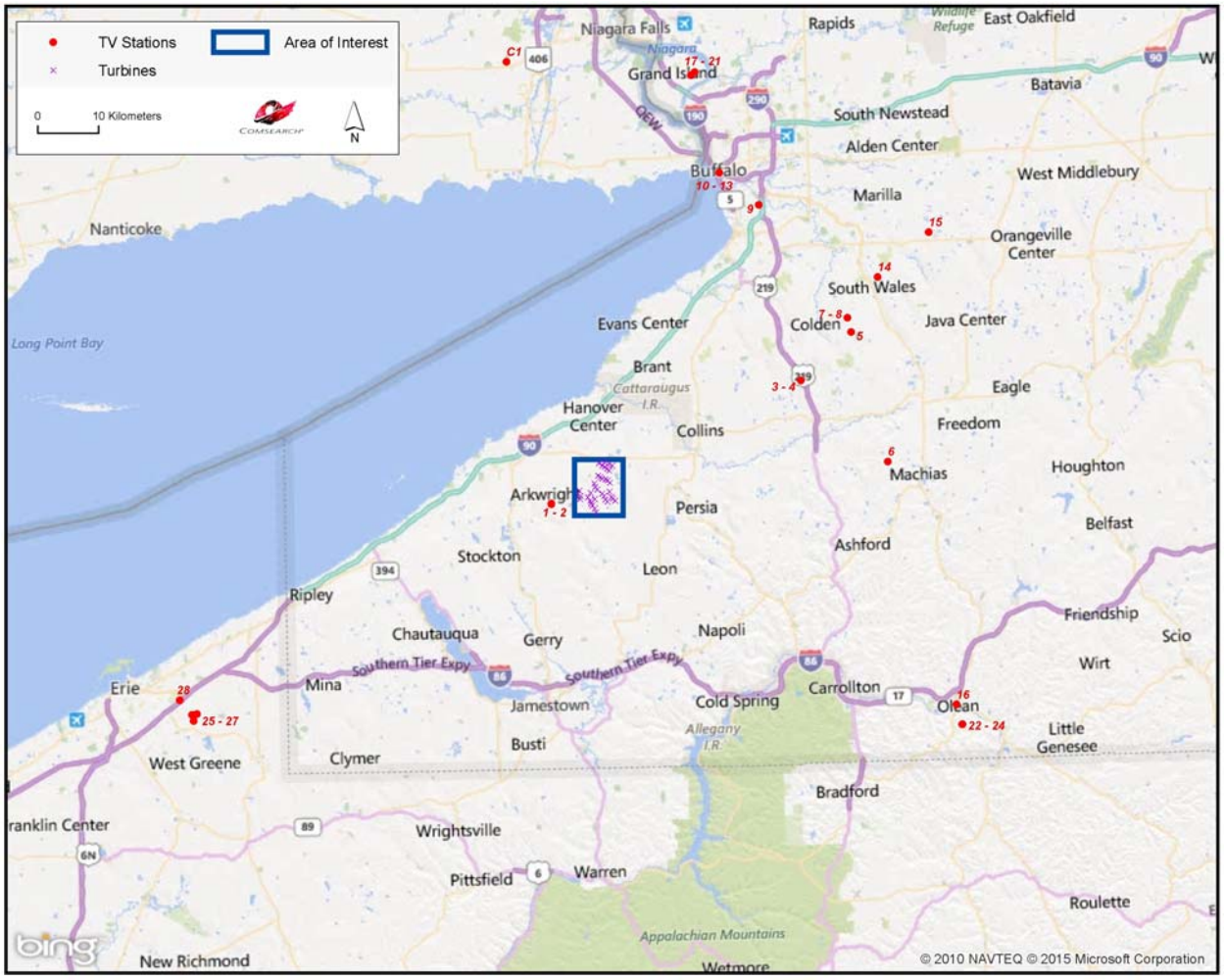

Figure 3: Plot of Off-Air TV Stations within 75 Kilometers of Project Area

ID	Call Sign	Status	Service[2]	Channel	Transmit ERP[3] (kW)	Latitude (NAD 27)	Longitude (NAD 27)	Distance to Nearest Turbine (km)
1	WNYB	LIC	DT	26	243.0	42.393333	-79.228889	4.85
2	WNYB	APP	DT	26	450.0	42.393333	-79.228889	4.85
3	WBBZ-TV	LIC	DT	7	26.9	42.567778	-78.723333	34.05
4	WBBZ-TV	APP	DS	7	26.9	42.567861	-78.722972	34.08
5	WKBW-TV	LIC	DT	38	358.0	42.637444	-78.619972	45.04
6	WVTT-CD	LIC	DC	34	15.0	42.443611	-78.553056	45.38
7	WIVB-TV	LIC	DT	39	790.0	42.659167	-78.625833	45.79
8	WIVB-TV	CP	DX	39	112.0	42.659167	-78.625833	45.79
9	WDTB-LP	LIC	TX	39	16.9	42.830556	-78.798333	49.37
10	WDTB-LP	STA	TX	40	0.004	42.879722	-78.876389	51.40
11	NEW	APP	LD	48	15.0	42.879722	-78.876389	51.40
12	WBXZ-LP	LIC	LD	17	15.0	42.880000	-78.876667	51.42
13	WDTB-LP	CP	LD	29	15.0	42.880000	-78.876667	51.42
14	WGRZ	LIC	DT	33	480.0	42.718611	-78.563056	53.67
15	WNYO-TV	LIC	DT	49	198.0	42.782778	-78.457778	64.81
16	W20AB	LIC	TX	20	12.5	42.080556	-78.430556	65.48
17	WUTV	LIC	DT	14	1000.0	43.025556	-78.928611	65.52
18	WBNF-CD	APP	LD	15	4.6	43.025556	-78.928611	65.52
19	WBNF-CD	LIC	DC	15	15.0	43.025556	-78.928611	65.52
20	WNLO	LIC	DT	32	1000.0	43.030000	-78.920833	66.16
21	WNED-TV	LIC	DT	43	156.0	43.030000	-78.920833	66.16
22	WVTT-CD	CP	DC	25	3.0	42.051111	-78.420278	68.00
23	W30BW	LIC	TX	30	5.9	42.051111	-78.419722	68.04
24	W30BW	CP	LD	30	1.0	42.051111	-78.419722	68.04
25	W45EC-D	CP	LD	45	15.0	42.090278	-79.943611	72.44
26	NEW	APP	LD	30	2.5	42.089361	-79.953278	73.19
27	NEW	APP	TX	29	4.0	42.079722	-79.950556	73.51
28	W32DH-D	APP	LD	32	1.35	42.111333	-79.977722	73.88

Table 1: Off-Air TV Stations within 75 Kilometers of Project Area (United States)

[2] Definitions of service and status codes:
DT – Digital television broadcast station
DS – Digital special temporary authority (STA)
LD – Low power digital television broadcast station
DC – Class A digital television broadcast station
TX – Translator station
LIC – Licensed and operational station
CP – Construction permit granted
APP – Application for construction permit, not yet operational
STA – Special transmit authorization, usually granted by FCC for temporary operation

[3] ERP = Transmit Effective Radiated Power

ID	Call Sign	Status	Class[4]	Channel	Transmit ERP (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to Nearest Turbine (km)
C1	CKVP-DT	OP	R	42	5.0	43.051667	-79.300833	68.07

Table 2: Off-Air TV Stations within 75 Kilometers of Project Area (Canada)

3. Impact Assessment

The full-power digital stations WNYB, WBBZ-TV, WKBW-TV, WIVB-TV, WGRZ, WNYO-TV, WUTV, WNLO, AND WNED-TV may have their reception disrupted in and around the Ball Hill Wind 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 three stations. This is due to multipath interference caused by signal scattering as TV signals are reflected by the rotating wind turbine blades and mast.

In addition, the contour of Class A station WVTT-CD overlaps with the project area. Potential disruption of this station would occur under similar LOS conditions as above.

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 stations mentioned above, especially those that would have line-of-sight to at least one wind turbine but not to a respective 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.

[4] Definitions of class and status codes:
R – Regular VHF Television Broadcast Station
OP – Licensed and operational station

5. Contact

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

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Email:	dfinney@comsearch.com
Web site:	www.comsearch.com

Appendix A

ID	Call Sign	Status	Service[5]	Channel	Transmit ERP[6] (kW)	Latitude (NAD 27)	Longitude (NAD 27)	Distance to Nearest Turbine (km)
1	WNYB	LIC	DT	26	243.0	42.393333	-79.228889	4.85
2	WNYB	APP	DT	26	450.0	42.393333	-79.228889	4.85
3	WBBZ-TV	LIC	DT	7	26.9	42.567778	-78.723333	34.05
4	WBBZ-TV	APP	DS	7	26.9	42.567861	-78.722972	34.08
5	WKBW-TV	LIC	DT	38	358.0	42.637444	-78.619972	45.04
6	WVTT-CD	LIC	DC	34	15.0	42.443611	-78.553056	45.38
7	WIVB-TV	LIC	DT	39	790.0	42.659167	-78.625833	45.79
8	WIVB-TV	CP	DX	39	112.0	42.659167	-78.625833	45.79
9	WDTB-LP	LIC	TX	39	16.9	42.830556	-78.798333	49.37
10	WDTB-LP	STA	TX	40	0.004	42.879722	-78.876389	51.40
11	NEW	APP	LD	48	15.0	42.879722	-78.876389	51.40
12	WBXZ-LP	LIC	LD	17	15.0	42.880000	-78.876667	51.42
13	WDTB-LP	CP	LD	29	15.0	42.880000	-78.876667	51.42
14	WGRZ	LIC	DT	33	480.0	42.718611	-78.563056	53.67
15	WNYO-TV	LIC	DT	49	198.0	42.782778	-78.457778	64.81
16	W20AB	LIC	TX	20	12.5	42.080556	-78.430556	65.48
17	WUTV	LIC	DT	14	1000.0	43.025556	-78.928611	65.52
18	WBNF-CD	APP	LD	15	4.6	43.025556	-78.928611	65.52
19	WBNF-CD	LIC	DC	15	15.0	43.025556	-78.928611	65.52
20	WNLO	LIC	DT	32	1000.0	43.030000	-78.920833	66.16
21	WNED-TV	LIC	DT	43	156.0	43.030000	-78.920833	66.16
22	WVTT-CD	CP	DC	25	3.0	42.051111	-78.420278	68.00
23	W30BW	LIC	TX	30	5.9	42.051111	-78.419722	68.04
24	W30BW	CP	LD	30	1.0	42.051111	-78.419722	68.04
25	W45EC-D	CP	LD	45	15.0	42.090278	-79.943611	72.44
26	NEW	APP	LD	30	2.5	42.089361	-79.953278	73.19
27	NEW	APP	TX	29	4.0	42.079722	-79.950556	73.51
28	W32DH-D	APP	LD	32	1.35	42.111333	-79.977722	73.88

[5] Definitions of service and status codes :
TV – Analog television broadcast station
DT – Digital television broadcast station
DS – Digital special temporary authority (STA)
LP – Low power analog television broadcast station
LD – Low power digital television broadcast station
CA – Class A analog television broadcast station
DC – Class A digital television broadcast station
TX – Translator station
LIC – Licensed and operational station
CP – Construction permit granted
CP MOD – Modification of construction permit
APP – Application for construction permit, not yet operational
STA – Special transmit authorization, usually granted by FCC for temporary operation

[6] ERP = Transmit Effective Radiated Power

ID	Call Sign	Status	Service[5]	Channel	Transmit ERP[6] (kW)	Latitude (NAD 27)	Longitude (NAD 27)	Distance to Nearest Turbine (km)
29	WSEE-TV	LIC	DT	16	75.0	42.064444	-80.005278	78.30
30	WICU-TV	APP	DT	12	7.8	42.063833	-80.005778	78.36
31	WSEE-TV	APP	DT	16	363.0	42.063833	-80.005778	78.36
32	WICU-TV	LIC	DT	12	5.4	42.063889	-80.005833	78.37
33	NEW	APP	LD	30	1.0	42.063889	-80.005833	78.37
34	DWLEP-LP	APP	TX	9	0.1	42.039167	-80.060833	83.68
35	WLEP-LD	LIC	LD	43	12.0	42.039167	-80.060833	83.68
36	W48CH	LIC	TX	48	10.2	42.038889	-80.062500	83.81
37	WQLN	LIC	DT	50	300.0	42.042778	-80.065556	83.83
38	W32DH-D	LIC	LD	32	2.07	42.037778	-80.062222	83.85
39	NEW	APP	LD	34	2.0	42.037778	-80.062222	83.85
40	W36EK-D	CP	LD	36	10.0	42.037778	-80.062222	83.85
41	WXTM-LD	CP MOD	LD	47	1.6	42.037778	-80.062222	83.85
42	WFXP	LIC	DT	22	850.0	42.040278	-80.069167	84.23
43	WJET-TV	LIC	DT	24	523.0	42.040278	-80.069167	84.23
44	NEW	APP	LD	35	15.0	42.040278	-80.069167	84.23
45	WPXJ-TV	LIC	DT	23	455.0	42.895000	-78.015556	102.16
46	W17DU-D	CP	LD	17	1.0	41.482222	-78.683889	106.64
47	W19EI-D	CP	LD	19	1.0	41.482222	-78.683889	106.64
48	W21DO-D	CP	LD	21	1.0	41.482222	-78.683889	106.64
49	W28EO-D	CP	LD	28	1.0	41.482222	-78.683889	106.64
50	W16BE-D	LIC	LD	16	0.277	42.292222	-77.674167	118.12
51	W52BO	CP	LD	28	15.0	41.627778	-80.170833	119.19
52	W52BO	LIC	TX	52	5.7	41.627778	-80.170833	119.19
53	W52BO	APP	TX	46	0.057	41.627500	-80.170556	119.19
54	W52BO	APP	TX	44	21.6	41.627500	-80.170833	119.21
55	W48CH	CP	LD	48	4.0	41.905556	-80.571111	128.09
56	DW64AK	CP	LD	39	12.0	41.860833	-80.679722	138.37
57	W45BT-D	LIC	LD	45	6.32	41.119722	-79.114444	140.00
58	WGCE-CD	LIC	DC	25	4.0	43.187222	-77.702500	141.05
59	WBGT-CD	LIC	DC	46	15.0	43.170222	-77.673167	141.94
60	DW26BZ	APP	LD	22	4.5	43.156389	-77.608611	145.51
61	WGCE-CD	APP	DC	25	15.0	43.156389	-77.608611	145.51
62	WUHF	LIC	DT	28	320.0	43.134722	-77.585278	145.86
63	WHSH-LD	CP	LD	8	0.009	43.135278	-77.585278	145.89
64	WAWW-LP	LIC	TX	20	25.8	43.135278	-77.585278	145.89
65	WHSH-LP	LIC	TX	36	16.0	43.135278	-77.585278	145.89
66	W42CO-D	LIC	LD	42	8.0	43.135278	-77.585278	145.89
67	WHAM-TV	LIC	DT	13	18.0	43.135278	-77.584167	145.97
68	WXXI-TV	APP	DS	16	236.6	43.135278	-77.584167	145.97
69	WXXI-TV	LIC	DT	16	236.6	43.135278	-77.584167	145.97
70	WHEC-TV	LIC	DT	10	18.1	43.135556	-77.583889	146.00

ID	Call Sign	Status	Service[5]	Channel	Transmit ERP[6] (kW)	Latitude (NAD 27)	Longitude (NAD 27)	Distance to Nearest Turbine (km)
71	WROC-TV	LIC	DT	45	1000.0	43.135556	-77.583889	146.00

Table A: Off-Air TV Stations within 150 Kilometers of Project Area (United States)

ID	Call Sign	Status	Class[7]	Channel	Transmit ERP (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to Nearest Turbine (km)
C1	CKVP-DT	OP	R	42	5.0	43.051667	-79.300833	68.07
C2	CHCH-DT	OP	R	15	132.0	43.207500	-79.774167	99.06
C3	CITS-DT	OP	R	36	473.0	43.207500	-79.774167	99.06
C4	CHCJ-DT	OP	R	35	390.0	43.231667	-79.859167	105.11
C5	CFTO-DT	OP	R	9	10.8	43.642500	-79.387222	133.91
C6	CJMT-DT	OP	R	40	19.5	43.642500	-79.387222	133.91
C7	CITY-DT	OP	R	44	21.0	43.642500	-79.387222	133.91
C8	CBLT-DT(1)	AU	R	20	106.9	43.642500	-79.387222	133.91
C9	CFMT-DT	OP	R	47	22.2	43.642500	-79.387222	133.91
C10	CBLFT-DT(1)	AU	R	25	106.2	43.642500	-79.387222	133.91
C11	CICA-DT	OP	R	19	106.5	43.642500	-79.387222	133.91
C12	CIII-DT-41	OP	R	41	100.0	43.642500	-79.387222	133.91
C13	CIII-DT(1)	AU	R	17	165.0	43.260833	-80.443889	139.97
C14	CICO-DT-28	OP	R	28	20.2	43.261389	-80.444722	140.06
C15	CITY-DT-2	OP	R	31	20.0	43.046111	-80.767778	148.51

Table A-2: Off-Air TV Stations within 150 Kilometers of Project Area (Canada)

[7] Definitions of class and status codes:
R – Regular VHF Television Broadcast Station
C – Class C Television Broadcast Station
OP – Licensed and operational station
AU – Authorized, not yet fully operational