Executive Summary – Wind Power GeoPlanner™

Licensed Microwave Search & Worst Case Fresnel Zone

Comsearch performed an analysis to evaluate the potential effects of the planned CPV Cimarron Wind Energy Project (the Project) in Gray County, Kansas on existing non-Federal Government microwave telecommunication (telecom) systems.

Microwave Search Results: Comsearch's Wind Power GeoPlanner™ provides a graphical representation of affected microwave paths and provides supporting technical parameters. The microwave path data are overlaid on topographic basemaps. Comsearch identified 6 microwave paths that intersect the Project area (see Figure 1 and Table 1 below).

Comsearch then calculated a Worst Case Fresnel Zone (WCFZ) for each microwave path in the Project area. The mid-point of a full microwave path is the location where the widest (or worst case) Fresnel zone occurs. Fresnel zones are calculated for each path using the following formula.

$$Rn \cong 17.3\sqrt{\frac{n}{F_{GHz}}\left(\frac{d1d2}{d1+d2}\right)}$$

Where,
R_n = First Fresnel Zone Radius, meters (m)
n = The Number 1
F_{GHz} = Frequency of Microwave Link, gigahertz (GHz)
d1 = Distance to Wind Turbine from Microwave Station 1, kilometer (km)
d2 = Distance to Wind Turbine from Microwave Station 2, km

Note: For WCFZ calculation d1 = d2

The calculated WCFZ radius, giving the linear path an area or swath, buffers each microwave path in the Project area. The distance unit is in meters and can be found in the column attribute "WCFZ." In general, this is the XY area where the planned wind turbines should be avoided, if possible. These areas are shown in Figure 2.

Please note that because the turbine locations were not provided, we could not determine if any potential obstruction cases exist between the planned wind turbines and the microwave systems. If the latitude and longitude values for turbine locations are provided, Comsearch can identify specific microwave telecom paths and turbines where a potential XY conflict exists. Additionally, when wind turbines need to be located inside a WCFZ, Comsearch can provide a detailed clearance study, which considers the vertical Z-height clearance objectives.

Map Projection: The ESRI® Shapefiles contained in the enclosed GeoPlanner CD are in NAD 83 UTM Zone 14 projected coordinate system.

Comsearch Contact:
Denise Finney, Account Manager
Phone: (703) 726-5650 Fax: (703) 726-5595
Email: dfinney@comsearch.com

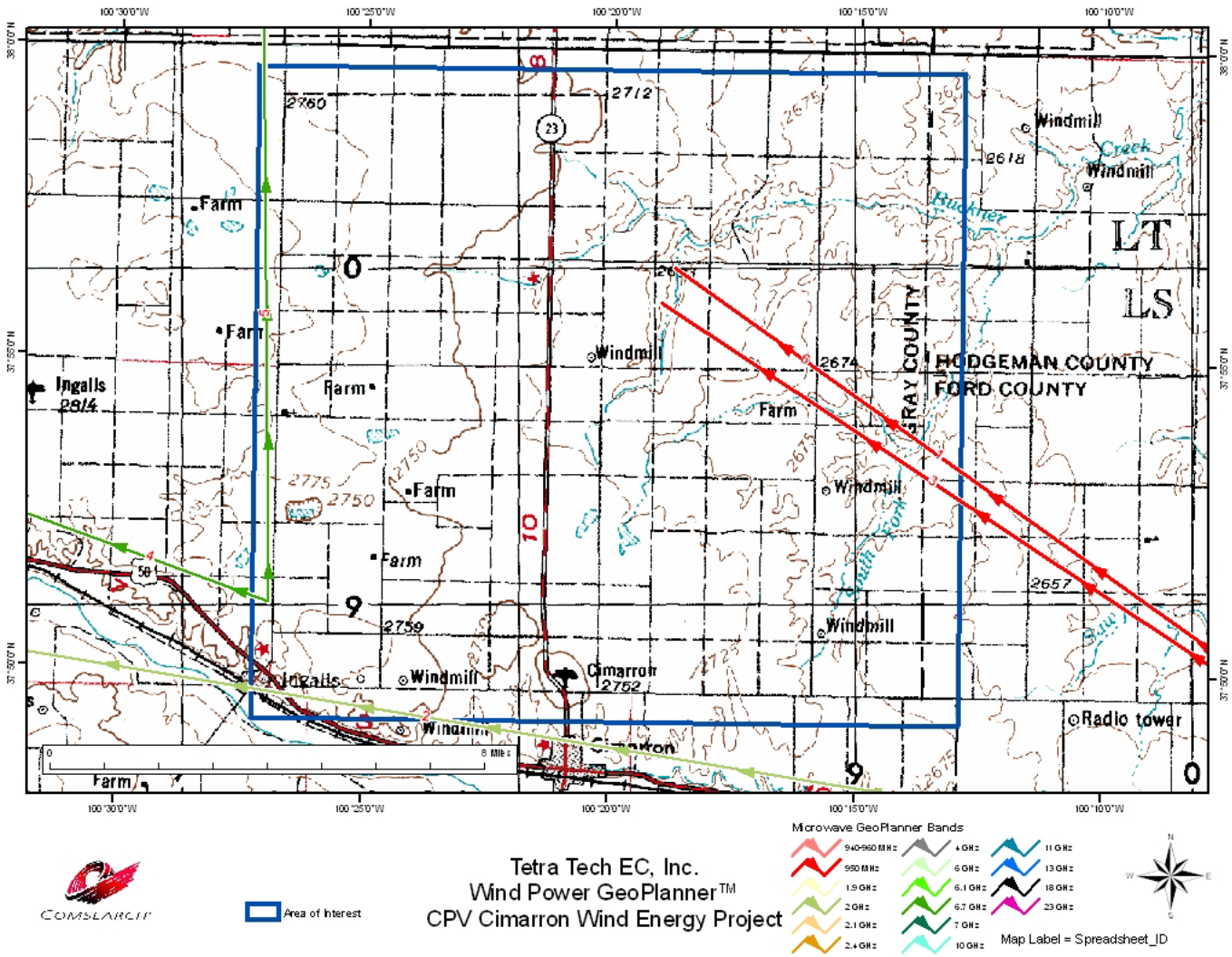

Figure 1 – Wind Power GeoPlanner™

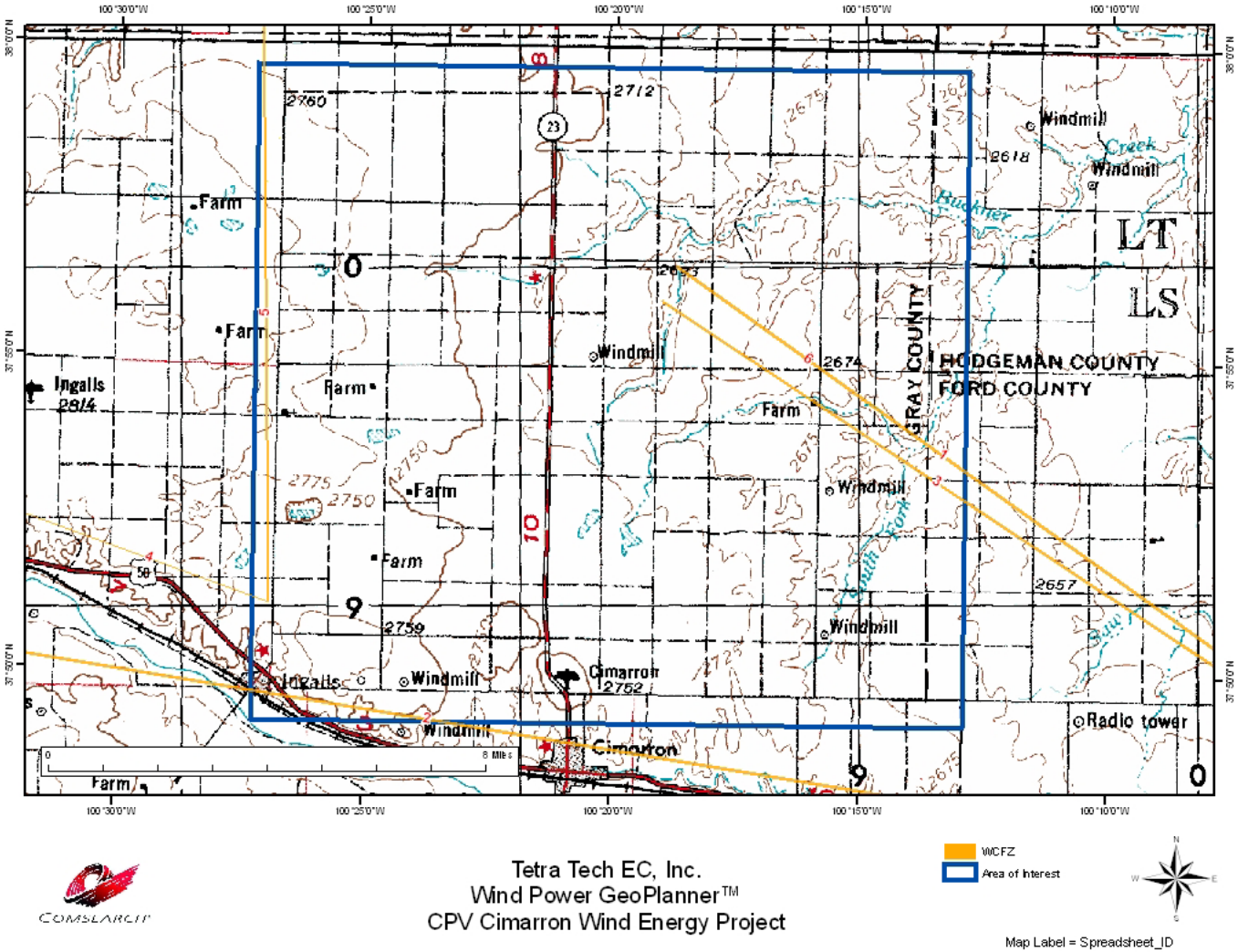

Figure 2 – Wind Power GeoPlanner™ & WCFZ

ID	Name Site 1	Name Site 2	Call Sign Site 1	Call Sign Site 2	Band Name	Licensee	WCFZ (m)
1	KMML STUDIO	KMML XMTR	KMMLSTUD	RXONLY	950 MHz	RADIOACTIVE, LLC	49.98
2	DODGE CITY	KAAS	WPJE954	RXONLY	2 GHz	Newport Television LLC	50.50
3	KRPH STUDIO	KRPH XMTR	WPSQ838	RXONLY	950 MHz	ROCKING M RADIO, INC.	49.79
4	GRAY	FINNEY	WPTD924	WPSE240	Upper 6 GHz	Kansas Department of Transportation	20.40
5	GRAY	LANE	WPTD924	WPSE237	Upper 6 GHz	Kansas Department of Transportation	25.30
6	DODGE CITY	CIMARRON TWR	WPVU645	RXONLY	950 MHz	ROCKING M RADIO, INC.	49.98

MHz = megahertz

Table 1 – Microwave GeoPlanner Links Considered in Analysis (See enclosed mw_geopl.xls for more detailed information and GP_dict_matrix_description.xls for field description)

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Analysis of AM and FM Broadcast Station Operations in the Vicinity of the CPV Cimarron Wind Energy Project in Kansas

Comsearch was contracted by Tetra Tech EC, Inc. (Tetra Tech) to determine if there would be any degradation to the operational coverage of AM and FM Radio Broadcast Stations located in the vicinity of the proposed CPV Cimarron Wind Energy Project (the Project) in Gray County, Kansas. Comsearch determined that there were two licensed AM stations within a search radius (20 miles) of the center of the Project site. Table 1 lists the two stations.

Table 1. AM Radio Stations in the Vicinity of the CPV Cimarron Wind Energy Project

Location		Call Sign	Tx-ERP	Frequency	Distance
DODGE CITY	KS	KGNO	5.0 kW	1370 kHz	16.54 mi
DODGE CITY	KS	KGNO	0.23 kW	1370 kHz	16.54 mi
DODGE CITY	KS	KDCC	1.0 kW	1550 kHz	18.58 mi
DODGE CITY	KS	KDCC	0.09 kW	1550 kHz	18.58 mi

KS= Kansas
kHz = kilohertz
kW = kilowatt
mi = mile
Tx-ERP= transmit effective radiated power

The AM stations are both located in Dodge City and have two license entries for two transmit powers of operation. The higher power is for daytime operations and the lower power is for night time operations. The stations are both located outside the Project's area-of-interest at a distance of 16.54 and 18.58 miles distance from the center of the Project site. No degradation of AM broadcast coverage will occur due to the presence of the wind turbines as long as the separation distance to the nearest wind turbine is greater than 2 miles. Potential problems with broadcast coverage are only anticipated when AM broadcast stations with directive antennas are within 2 miles of turbine towers and AM broadcast stations with non-directive antennas are within 0.5 mile. Figure 1 is a map that shows the location of the AM transmit antennas with respect to the Project site.

Comsearch determined that there were twenty-seven FM stations in the vicinity of the Project site. The stations are listed in Table 2 of this report. Seven of the FM stations are full-power stations. Two are medium-power FM stations. Eight stations are low- power FM stations. Furthermore, there are eight very low-power stations in the vicinity of the Project. Full-power stations are those with a transmit effective radiated power (TX ERP) of greater than 10 kilowatts (kW) and have a service radius of up to 60-miles, medium power stations are between 1 – 10 kW and have a service radius up to 25-miles, low-power stations are between 100 watts - 1 kWatt and have a service radius of 1.5-miles , and very-low-power FM stations are less than 100 Watts and have a service radius of 0.5-mile. Two additional stations did not have the transmit power listed and identified in the data base but based on their ownership, the Great Plains Christian Radio, Inc., the stations probably transmit at either low-power or very low-power levels. Figure 2 of this report is

a map showing the locations of the FM transmit antennas with respect to the Project site and the 20-mile search radius.

Table 2. FM Radio Stations in Vicinity of the CPV Cimarron Wind Energy Project

Location		Call Sign	Tx-ERP	Frequency	Distance
DODGE CITY	KS	NEW	0. kW	88.7 MHz	1.94 mi
DODGE CITY	KS	NEW	0. kW	89.1 MHz	25.49 mi
DODGE CITY	KS	KAIG	0. kW	89.9 MHz	1.94 mi
DODGE CITY	KS	NEW	0. kW	90.7 MHz	30.90 mi
DODGE CITY	KS	KONQ	2.6 kW	91.9 MHz	18.74 mi
DODGE CITY	KS	K225AG	0.25 kW	92.5 MHz	18.51 mi
DODGE CITY	KS	K225AG	0.25 kW	92.9 MHz	18.51 mi
CIMARRON	KS	KMML	7.1 kW	92.9 MHz	2.63 mi
CIMARRON	KS	KMML	32. kW	92.9 MHz	2.63 mi
INGALLS	KS	NEW	0.25 kW	93.1 MHz	11.16 mi
GARDEN CITY	KS	NEW	0.17 kW	93.1 MHz	29.25 mi
DODGE CITY	KS	KZRD	100. kW	93.9 MHz	1.94 mi
DODGE CITY	KS	DKMCS	0. kW *	93.9 MHz	1.84 mi
DODGE CITY	KS	NEW	0.25 kW	94.7 MHz	15.11 mi
DODGE CITY	KS	NEW	0.25 kW	94.7 MHz	19.21 mi
DODGE CITY	KS	KAHE	100. kW	95.5 MHz	18.44 mi
DODGE CITY	KS	KAHE	0. kW *	95.5 MHz	18.44 mi
INGALLS	KS	KERP	0. kW *	96.3 MHz	8.32 mi
INGALLS	KS	KERP	100. kW	96.3 MHz	2.64 mi
GARDEN CITY	KS	KKJQ	100. kW	97.3 MHz	11.16 mi
COPELAND	KS	KSKZ	100. kW	98.1 MHz	11.16 mi
COPELAND	KS	KJIL	0. kW*	99.1 MHz	29.94 mi
DODGE CITY	KS	KVPC-LP	0.035 kW	100.5 MHz	20.42 mi
DODGE CITY	KS	KODC-LP	0.1 kW	102.1 MHz	20.36 mi
COPELAND	KS	KHYM	0. kW *	103.9 MHz	29.94 mi
INGALLS	KS	KSSA	100. kW	105.9 MHz	11.16 mi
GARDEN CITY	KS	K300BC	0.25 kW	107.9 MHz	26.26 mi

MHz = Megahertz
* = Assumed low-power from database information although Tx-ERP was not listed.

The full-power and medium-power FM stations are owned and operated by commercial broadcasters. The low-power and very-low-power FM stations are owned and operated by either a private interest, religious or educational organizations. All of the FM station antennas are located at distances greater than 1.84 miles of the center of the CPV Cimarron Wind Energy Project. Eight of the FM Station antenna locations are within the Project's area-of-interest: three are full-power; one is medium-power; and four are very low-power.

The very low-power FM stations are designed for very limited coverage. Their coverage is normally no greater than 0.5 mile. Normally this is a church parking lot or a very small community. Therefore, as long as the wind turbines are installed at distances greater than the coverage of these systems they should be unaffected. The low-power FM stations normally have a range of 1.5 miles. They normally cover a special audience such as a church community or

college campus. Therefore, as long as the wind turbines are installed at distances greater than the coverage of these systems they should be unaffected.

For the full- and medium-power FM stations a separation distance of 2.5 miles should be maintained from the wind turbines if the FM Station antenna heights are below the height of the wind turbines so that the stations can maintain normal operation and coverage. The problem that may occur if wind turbines are too close to FM broadcast antennas is that the coverage pattern of the FM station will be decreased in the direction of the wind turbine because of the physical obstruction of the tower and wind turbine blades. Attenuation of the signal can be as great as 2 decibels (dB) in the azimuth that the wind turbine obstructs. This will affect reception at the perimeter of the FM station's range but not at ranges closer in to the station. The wavelength of the FM broadcast signal is long enough to wrap around the blades of a wind turbine minimizing the attenuation affect to the signal. The FM broadcast audio signal is not that noticeably affected by wind turbines for two additional reasons; mainly, the signal modulation is frequency modulated (FM) and the wind turbines have the affect of varying the amplitude of the signal which will produce distortion to an amplitude modulated signal but not to a FM signal. Also, changes to audio coverage or distortion are not that noticeable to a listener when factored together with other causes of degradation; such as being out of range of the station or signal fades. In other words, the effects to FM audio coverage from wind turbines will not be as noticeable as the distortion that will occur to a video signal.

For the full- and medium-power FM Stations located within the CPV Cimarron area-of interest the stations' antennas are all at heights that are well above the maximum tip height (130-meters) of the wind turbines planned for the facility. The antenna for Station KMML is at a height of 186-meters, the antenna for Station KERP is at a height of 213-meters and the antenna for Station KZRD is at a height of 242-meters. The antennas for each of the stations has no beam tilt so that their line-of-sight to the horizon will be unobstructed by the planned wind turbines. Therefore, no affect to the operation and coverage of the full- and medium power FM Stations located in the Project area-of-interest is expected.

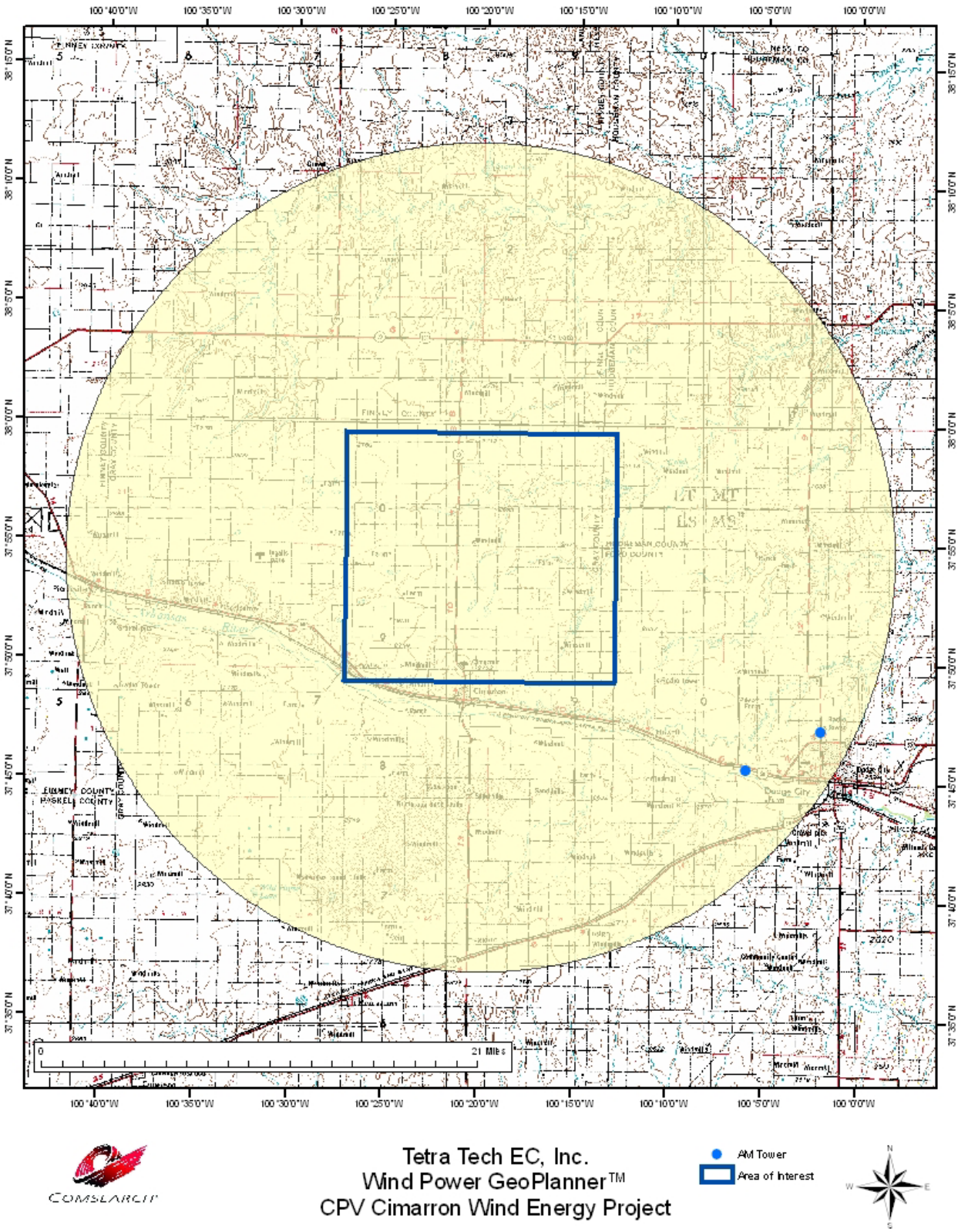

Figure 1. AM Stations in the CPV Cimarron Wind Energy Project Area

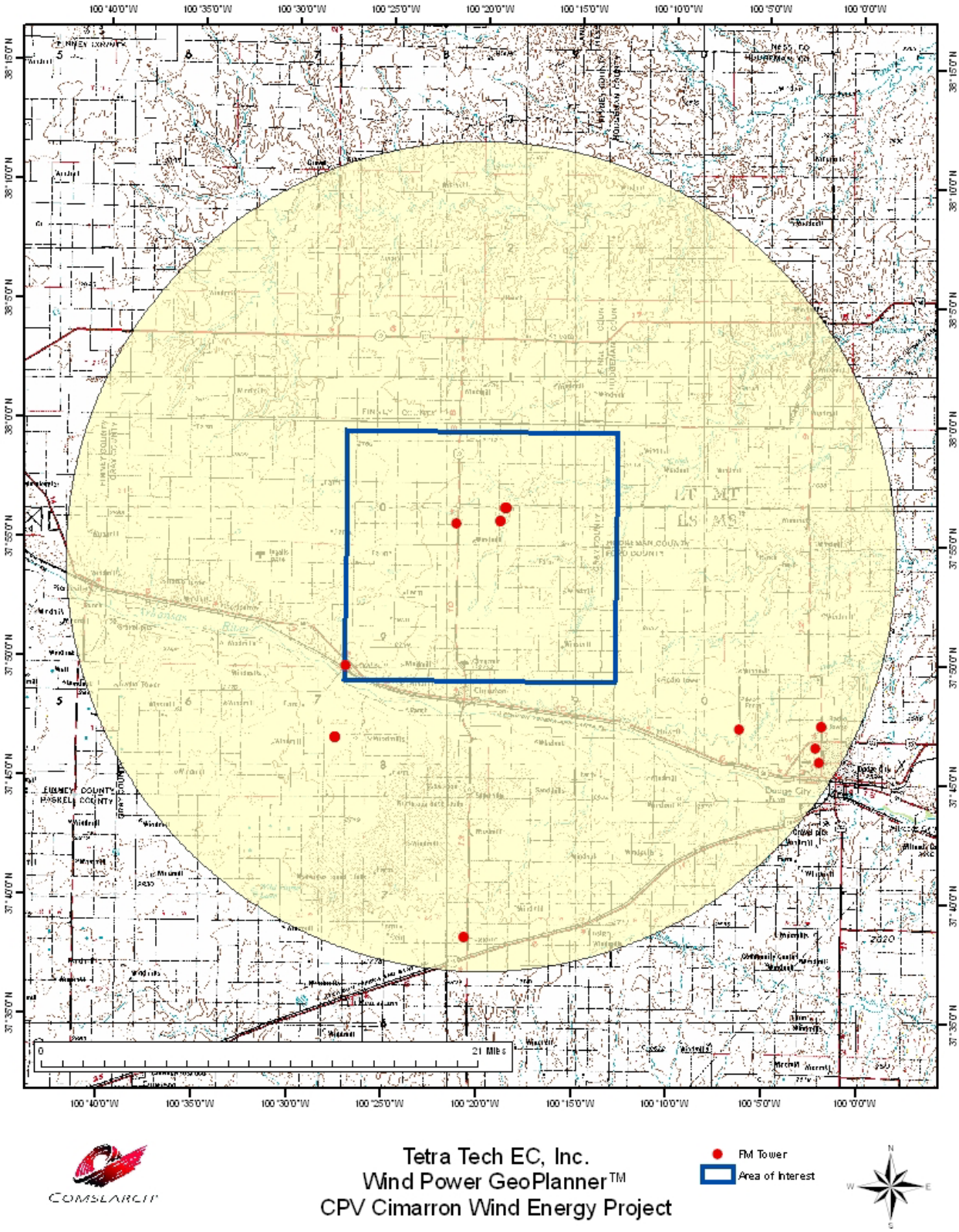

Figure 2. FM Stations in the CPV Cimarron Wind Energy Project Area

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Land Mobile Radio (LMR) in the Vicinity of the CPV Cimarron Wind Energy Project in Gray County, Kansas

Comsearch was contracted by Tetra Tech EC, Inc. (Tetra Tech) to identify and locate the Land Mobile Radio (LMR) operators in the vicinity of the CPV Cimarron Wind Energy Project (the Project) in Gray County, Kansas. Comsearch determined that there were 47 LMR systems registered in the Project area and within approximately 15 miles of the center of the Project site. Table 1 identifies the LMR systems and lists their pertinent parameters and owner/operator. Note that the majority of the LMR operators in the area are part of a governmental body, i.e., the State of Kansas, the County of Gray, various school districts and local businesses. Figure 1 shows the location of the LMR repeaters within the Project area of interest and in the adjacent areas around the CPV Cimarron Wind Energy Project.

Table 1. LMR Repeater Sites in the Vicinity of the CPV Cimarron Wind Energy Project

Location		Latitude	Longitude	Frequency (MHz)	Owner-Operator
CIMARRON	KS	37.81780555560	-100.34958333300	39.46000000	GRAY, COUNTY OF
CIMARRON	KS	37.81780555560	-100.34958333300	39.58000000	GRAY, COUNTY OF
CIMARRON	KS	37.80558333330	-100.33652777800	463.55000000	CARL LEATHERWOOD INC
INGALLS	KS	37.94141666670	-100.44958333300	463.82500000	PENNER FARMS INC
INGALLS	KS	37.80558333330	-100.33652777800	154.49000000	DONOCO FARMS INC
INGALLS	KS	37.84113888890	-100.45569444400	153.39500000	DWYRE, JIM
CIMARRON	KS	37.80725000000	-100.34541666700	35.74000000	JOES WELL SERVICE INC
INGALLS	KS	37.85141666670	-100.48236111100	464.77500000	NGALLS SCHOOL DIST 477
DODGE CITY	KS	37.90558333330	-100.19458333300	451.95000000	DASENBROCK, STEVE
CIMARRON	KS	37.80558333330	-100.33652777800	37.94000000	GRAY, COUNTY OF
INGALLS	KS	37.93891666670	-100.45319444400	152.42000000	OYLER, MAX
CIMARRON	KS	37.81669444440	-100.33986111100	155.23500000	UNIFIED SCHOOL DIST 102
INGALLS	KS	37.82641666670	-100.45180555600	464.05000000	BRADY, LEON
INGALLS	KS	37.85502777780	-100.49013888900	457.00000000	INGALLS FEED YARD INC
CIMARRON	KS	37.80502777780	-100.34736111100	457.00000000	INGALLS FEED YARD INC
INGALLS	KS	37.83336111110	-100.40875000000	158.41500000	MILLER, LOREN
INGALLS	KS	37.84750000000	-100.49972222200	160.45500000	BNSF Railway Co
CIMARRON	KS	37.80613888890	-100.34041666700	151.74500000	BURNS, CHARLES
INGALLS	KS	37.80558333330	-100.33652777800	154.62500000	RENICK, MIKE-RANCH
CIMARRON	KS	37.81780555560	-100.34875000000	47.06000000	KANSAS, STATE OF
INGALLS	KS	37.94141666670	-100.44958333300	463.82500000	IRSIK G & B FARMS INC
CIMARRON	KS	37.80419444440	-100.33652777800	152.91500000	TNT FARMS
DODGE CITY	KS	37.95336111110	-100.19291666700	463.85000000	STAPLETON, GEORGE E
INGALLS	KS	37.85447222220	-100.48986111100	451.87500000	IRSIK, BOB
INGALLS	KS	37.94141666670	-100.44958333300	463.82500000	MIDWEST FEEDERS INC
GARDEN CITY	KS	37.87780555560	-100.47541666700	151.80500000	WEHKAMP, BOB

INGALLS	KS	37.89002777780	-100.40513888900	464.15000000	WEHKAMP, TED
CIMARRON	KS	37.93225000000	-100.31763888900	463.87500000	TIM DEWEY Farms& Cattle Co
CIMARRON	KS	37.93225000000	-100.31763888900	452.52500000	TIM DEWEY Farms& Cattle Co
INGALLS	KS	37.85086111110	-100.44847222200	867.20000000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	867.93750000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	868.65000000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	821.96250000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	823.61250000	KANSAS, STATE OF
DODGE CITY	KS	37.95336111110	-100.19291666700	463.85000000	STAPLETON, GEORGE E
INGALLS	KS	37.85086111110	-100.44847222200	866.60000000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	867.31250000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	867.61250000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	867.93750000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	868.18750000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	868.65000000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	821.27500000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	821.55000000	KANSAS, STATE OF
INGALLS	KS	37.85086111110	-100.44847222200	821.55000000	KANSAS, STATE OF
CIMARRON	KS	37.82141666670	-100.36736111100	153.35000000	ROHRBAUGH BROS
CIMARRON	KS	37.81613888890	-100.37680555600	463.57500000	WARNER RANCHES LP
INGALLS	KS	37.85447222220	-100.48902777800	452.00000000	INGALLS FEED YARD INC

KS = Kansas
MHz = Megahertz

The frequencies of operation of the LMR repeaters are generally unaffected by the presence of wind turbines. Very little, if any, change in the coverage of the repeaters will occur when the wind turbines are installed. It is the intention of the wind energy site developers that their new facilities will not have an impact on existing telecommunication infra-structures including LMR. Although no impact is anticipated, the developer can be relied on to take steps to accommodate the LMR operators if a change in coverage of the LMR systems does occur after the wind turbines are installed. If there is a reported change in coverage it can be readily corrected by repositioning or adding repeaters that operate with the LMR system mobile units. This can be accomplished by adding or positioning the repeaters at locations within the wind facility. Repeater antennas can be installed on utility, meteorological or other structures in the wind facility if needed. The plans for the installation of these repeater antennas for this purpose should be given to the local government oversight authority for review and approval before actual installation is undertaken.

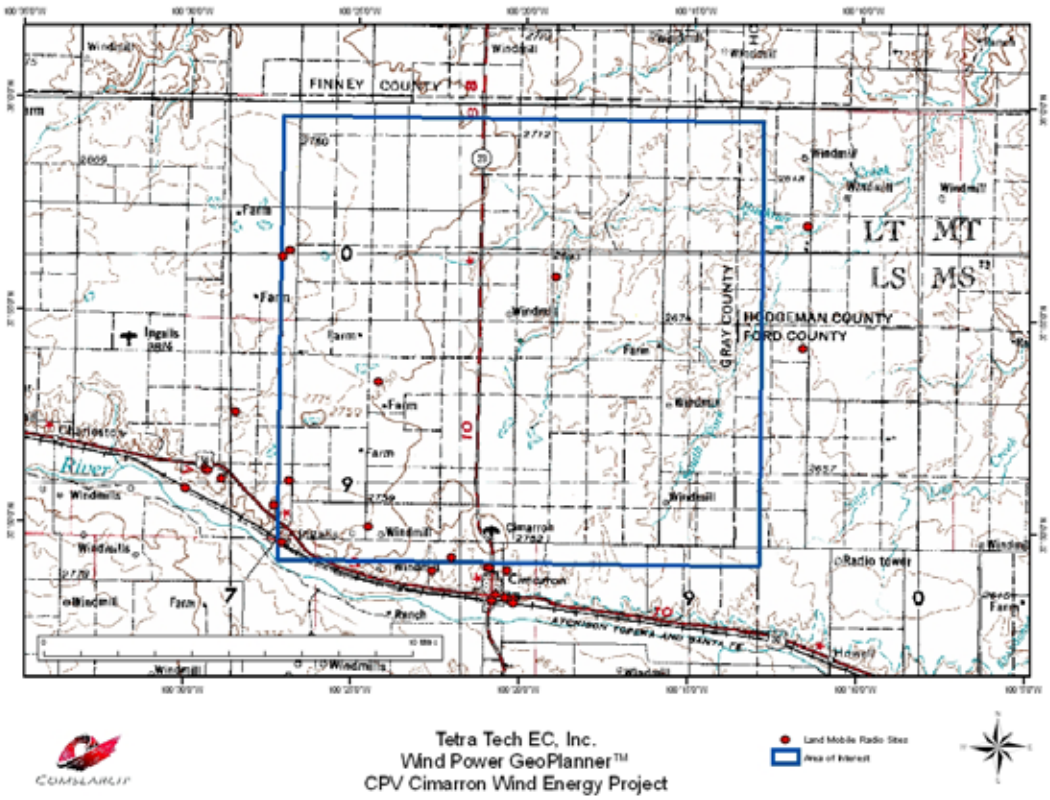

Figure 1. CPV Cimarron Wind Energy Project LMR Repeater Sites

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April 17, 2008

Mr. Ed Davison
U.S. Department of Commerce
1401 Constitution Avenue N.W.
Washington, D.C. 20230

RE: Notification of a Confidential Wind Energy Project in Gray County, Kansas

Dear Mr. Davison:

This letter and its attachments will serve as the notice to the government of a confidential wind energy project proposed in Gray County, Kansas. This project is being developed by a private company and permitted through Tetra Tech EC, Inc.

Enclosed are a data table and maps that describe the location of the project in Kansas.

- Table 1 contains the NAD 83 coordinate boundaries of project area.
- Figure 1 is a map of the general area showing the outline of the wind energy project boundaries.
- Figure 2 is a local map of the wind energy facility showing its boundaries.

The approximate dimensions of the wind turbines to be installed at this facility will be:

- Turbine Tower Hub Height, above ground level (AGL) – 80 meters
- Turbine Blade Diameter – 100 meters
- Top of Turbine Blade, AGL – 130 meters

If you have any questions with regard to this notification, please call Kurt Oliver at (703) 726-5675 or me at (703) 726-5860.

Sincerely,
COMSEARCH

Lester E. Polisky
Senior Principal Engineer
Field Services Department
Attachments

Table 1 Corner Coordinates for the Project Area in NAD 83

	Latitude		Longitude
South East	37.82670059660		100.22753186000
South West	37.82755163640		100.44693563900
North West	37.98653944280		100.44556608200
North East	37.98651876050		100.22675890500

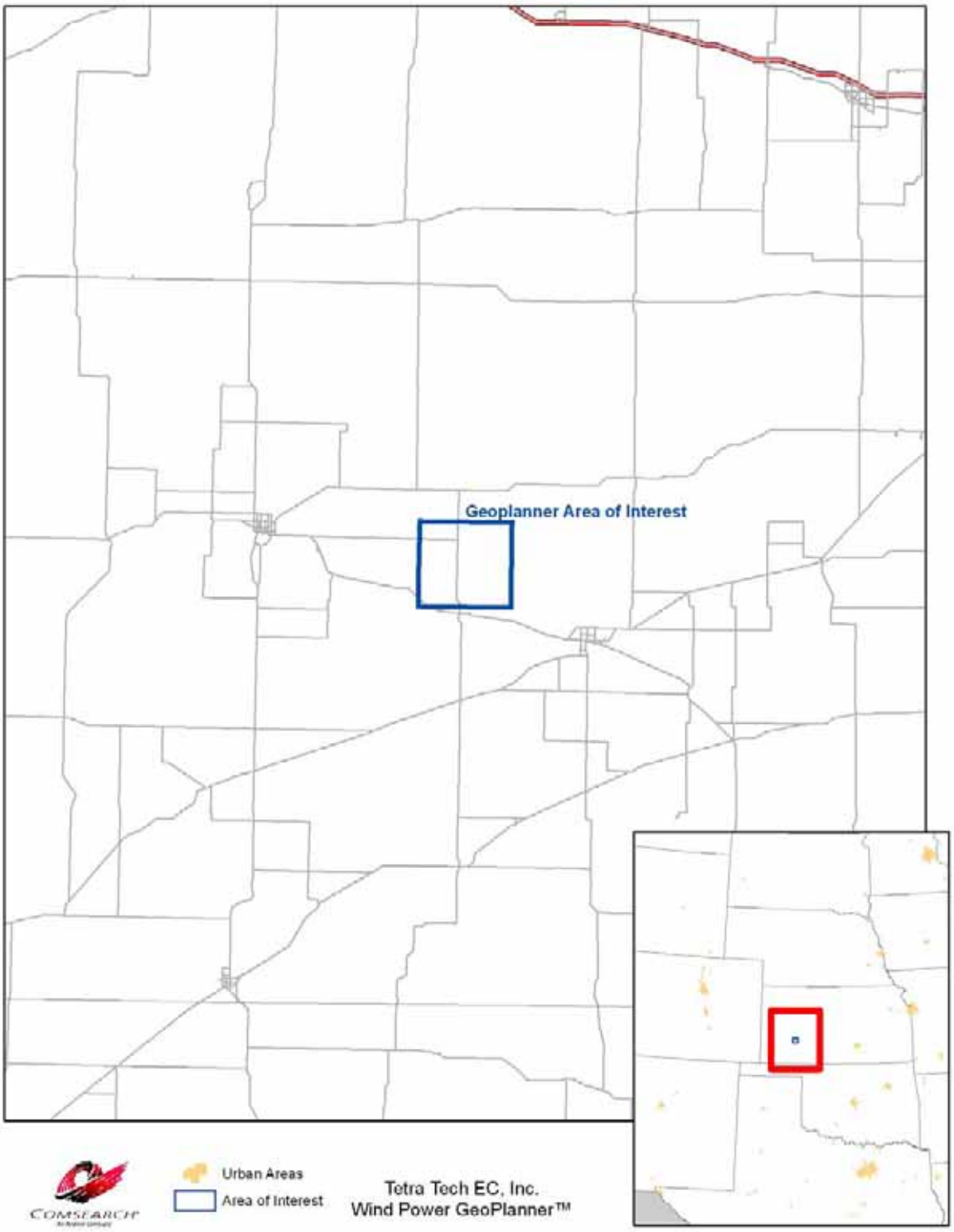

Figure 1 General Area of the Project

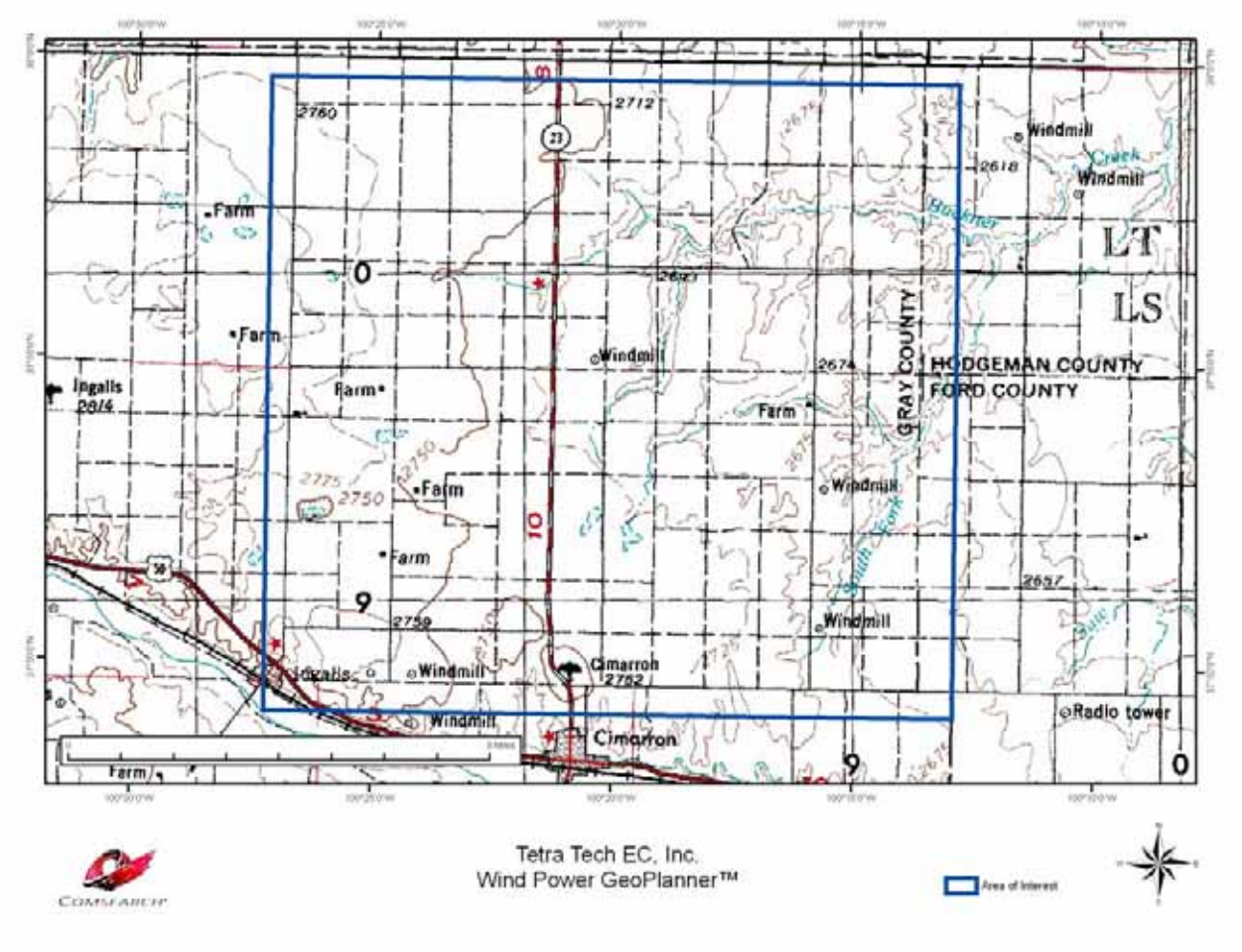

Figure 2 Local Area of the Project

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

June 16, 2008

Mr. Lester E. Polisky
Comsearch
Senior Principal Engineer
19700 Janelia Farms Blvd
Ashburn, VA 21147

Re: CPV Cimarron Wind Energy Project in Gray County, KS

Dear Mr. Polisky:

In response to your request on April 18, 2008, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the CPV Cimarron Wind Project in Gray County, KS. After a 45 day period of review, only the Department of Commerce (DOC) identified any concerns regarding blockage of their radio frequency transmissions.

The proposed CPV Cimarron Wind Energy Project in Gray County, KS will be located between approximately 13 and 26 nautical miles northwest of the Dodge City, KX Weather Surveillance Radar-1988 Doppler (WSR-88D). DOC estimates the entire proposed wind farm turbines will be in the radar line of sight of the Dodge City, KS WSR-88D and the radar will see the wind farm on a daily basis. The turbine blades will cause interference consisting of reflectivity clutter and anomalous Doppler returns at and downstream from the facility, possibly causing some beam blockage/attenuation and shadow effects. The wind farm will likely have large meteorological and hydrological impacts on the Dodge City, KS WSR-88D due to the returns from the rotating blades that the WSR-88D clutter filter will not be able to eliminate. The wind farm could possibly have an impact on Dodge City, KS Weather Forecast Office severe weather warning effectiveness near and potentially downrange of the wind ranch project.

We would be willing to further assist the developer in exploring sitting options that would reduce the impact on the Dodge City, KS WSR-88D and weather forecast office operations.

POC:
Dominic Bosco
1325 East West Hwy
Building: SSMC2
Silver Spring, MD 20910-3283
Phone: 301-713-1841 x123

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,

Edward M. Davison
Deputy Associate Administrator
Office of Spectrum Management

Wind Power GeoPlanner™

Licensed Microwave Report

Cimarron Wind Energy Project

Prepared on Behalf of
CPV Cimarron Renewable
Energy Company, LLC

April 6, 2010

COMSEARCH
A CommScope Company

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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: Cimarron Wind Energy Project

County: Gray

State: Kansas

Total Microwave Paths	Paths with Obstructions	Total Turbines	Turbine Obstructions
5	N/A	N/A	N/A

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 CD[3].

Discussion of Potential Obstructions

For this project, turbine locations were not provided; thus we could not determine if any potential obstructions exist between the planned wind turbines and the incumbent microwave paths. If the latitude and longitude values for turbine locations are provided, Comsearch can identify where a potential conflict might exist.

[3] The ESRI® shapefiles contained on the enclosed CD are in NAD 83 UTM Zone 14 projected coordinate system.

3. Tables and Figures

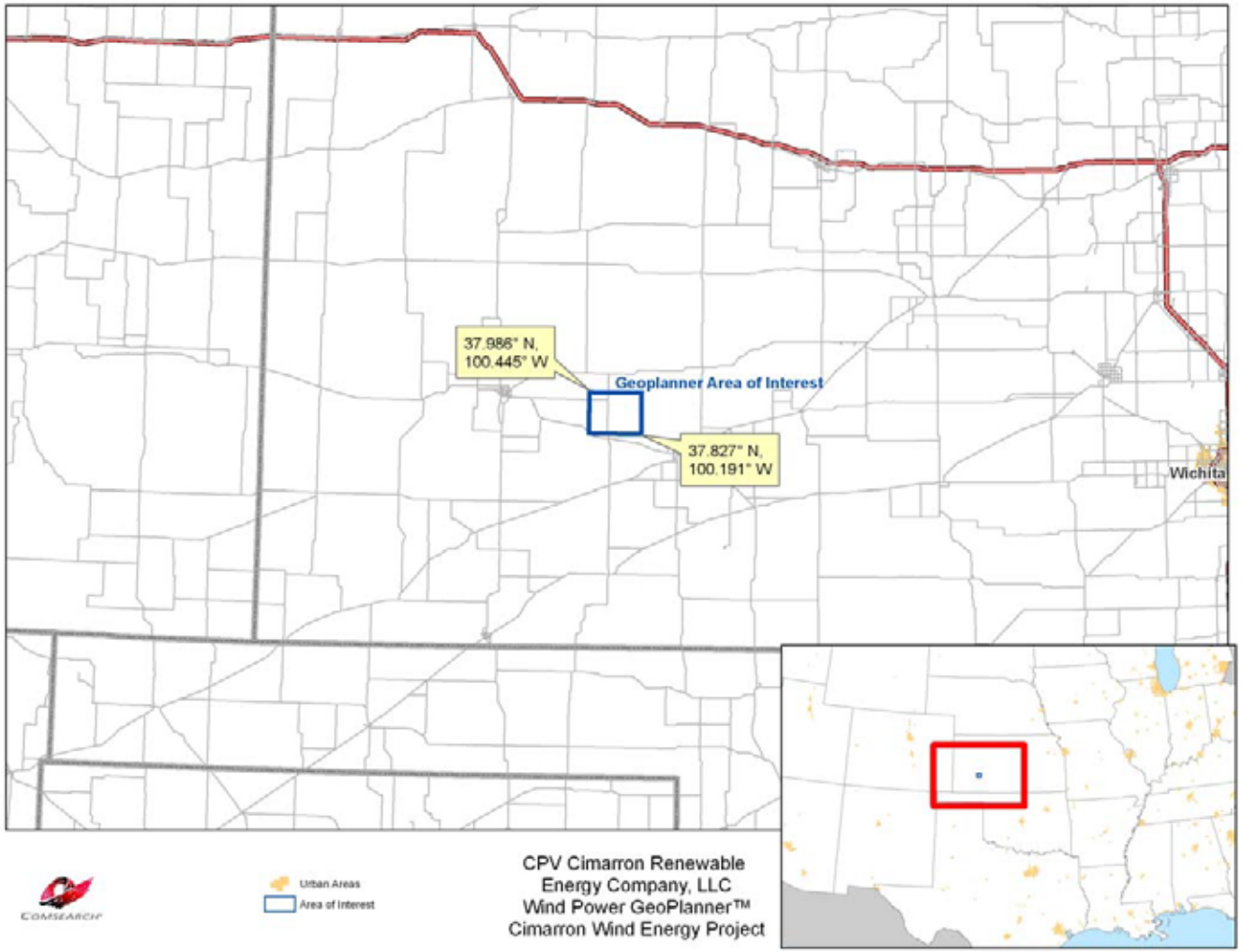

Figure 1: Area of Interest

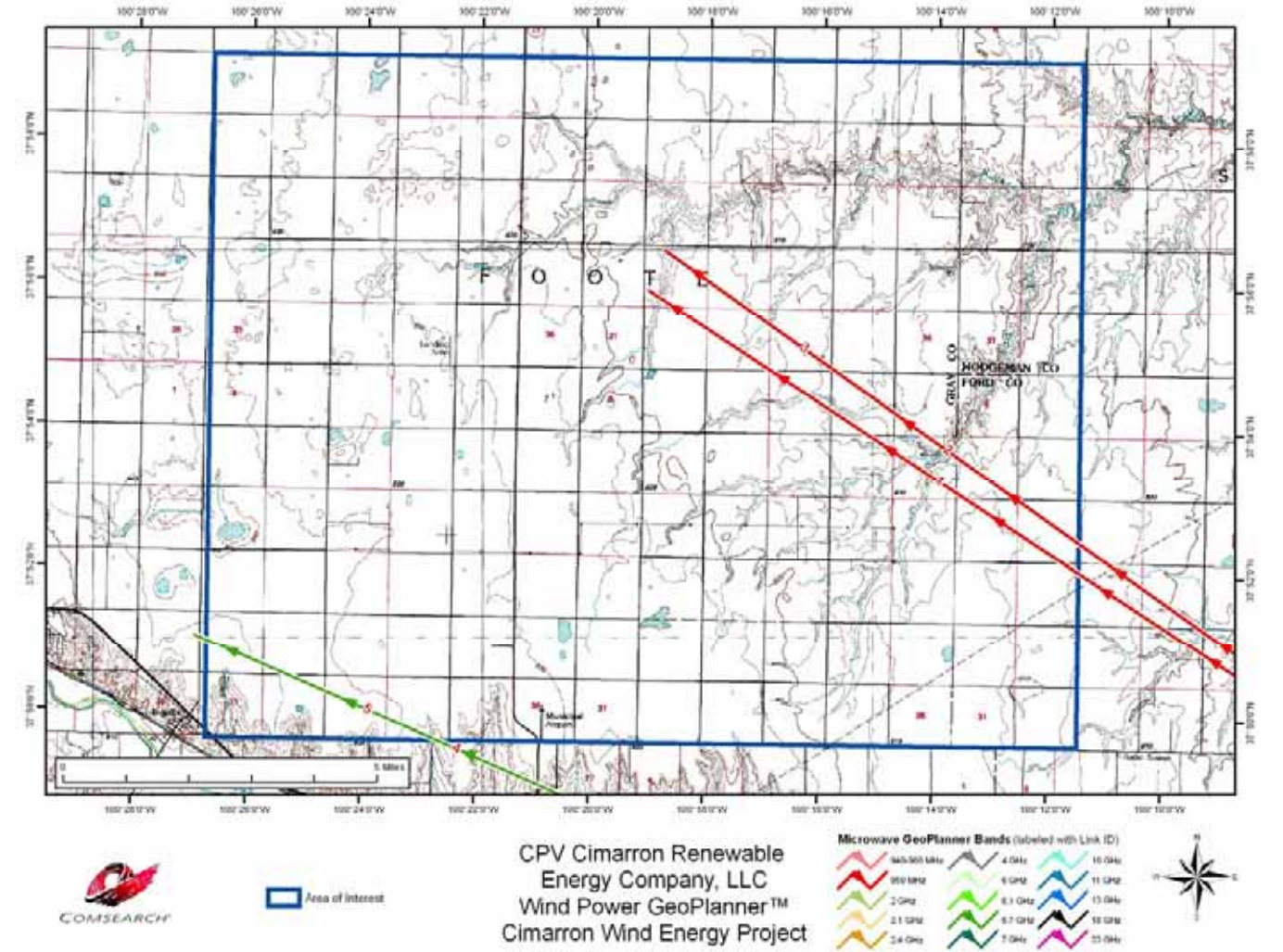

Figure 2: Microwave Paths that Intersect the Area of Interest

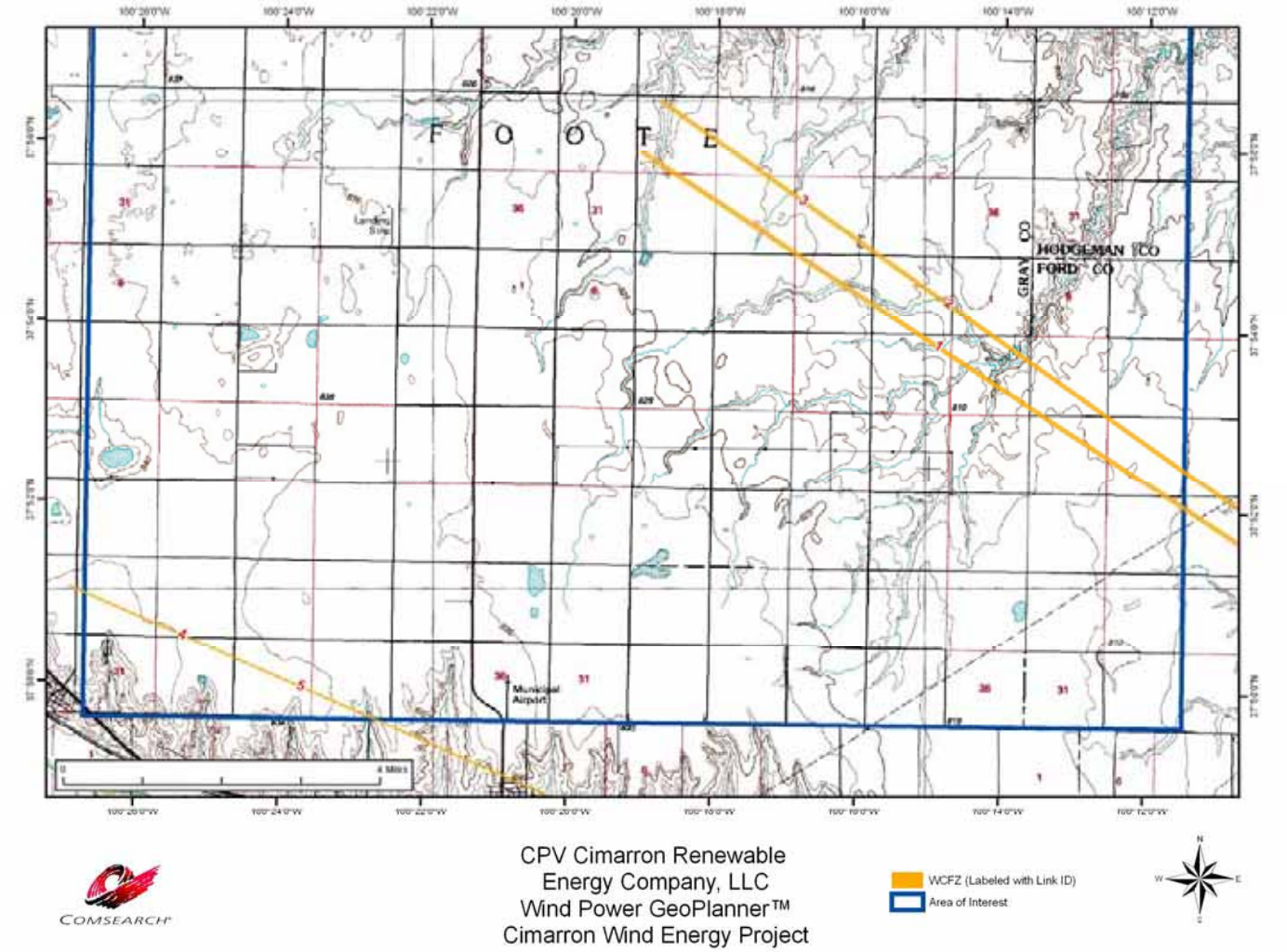

Figure 3: Microwave Paths with WCFZ Buffers

ID	Site Name 1	Site Name 2	Callsign 1	Callsign 2	Band	Licensee	WCFZ (m)
1	KRPH STUDIO	KRPH XMTR	WPSQ838	RXONLY	950 MHz	ROCKING M RADIO, INC.	49.79
2	DODGE CITY	CIMARRON TWR	WPVU645	RXONLY	950 MHz	ROCKING M RADIO, INC.	49.98
3	KMML STUDIO	KMML XMTR	WQIU269	RXONLY	950 MHz	RADIOACTIVE, LLC	49.98
4	FORD	GRAY	WQKT975	WPTD924	Lower 6 GHz	Kansas Department of Transportation	26.59
5	FORD	GRAY	WQKT975	WPTD924	Upper 6 GHz	Kansas Department of Transportation	25.53

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:

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