Appendix D
Communications Interference

ENGINEERING REPORT
CONCERNING THE EFFECTS UPON
FCC LICENSED RF FACILITIES
DUE TO CONSTRUCTION OF THE
FOUNTAIN WIND ENERGY PROJECT
In
SHASTA COUNTY, CALIFORNIA

Prepared for
Environmental Science Associates
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I. INTRODUCTION

This engineering report describes the results of a study and analysis to determine the locations of federally-licensed (FCC) microwave and fixed station radio frequency (RF) facilities that may be adversely impacted as a result of the construction of the Fountain Wind Energy Project in Shasta County, California. This document describes impact zones and any necessary mitigation procedures, along with recommendations concerning individual wind turbine siting. All illustrations, calculations and conclusions contained in this document are based on FCC database records[1].

Frequently, wind turbines located on land parcels near RF facilities can cause more than one mode of RF impact, and may require an iterative procedure to minimize adverse effects. This procedure is necessary in order to ensure that disruption of RF facilities either does not occur or, in the alternative, that mitigation procedures will be effective. The purpose of this study is to facilitate the siting of turbines to avoid such unacceptable impact.

The Fountain wind project as currently planned involves the construction of up to 72 wind turbines and five MET towers just southwest of the town of Burney, in central Shasta County, California. The wind turbine model being considered has a hub height of 125 meter above ground and a rotor diameter of 162 meters. The maximum blade tip height would thus be 206 meters above ground.

Using industry standard procedures and FCC databases, a search was conducted to determine the presence of any existing microwave paths crossing the subject property, land mobile and other RF facilities within or adjacent to the identified area and TV and AM broadcast signals receivable in the area. A specific turbine layout has been submitted for analysis. Accordingly,

[1] The databases used in creating the attached tables and maps are generally accurate, but anomalies have been known to occur.

this report will address the potential conflicts that may be caused by the individually-sited proposed turbines.

The following report and analyses consist of six sections:

1. Microwave point-to-point path analysis
2. Land mobile, public safety and other communications tower sites
3. Earth Station Facilities analysis
4. Broadcast AM Radio and TV
5. NTIA Notification

The attached figures were generated based upon the operating parameters of the FCC-licensed stations as contained in the FCC station database. Often the technical data for stations in the FCC database, including their locations, are inaccurate; in such cases, follow-up due diligence should be done to assure no impact by the turbines to the stations based on the true technical data.

The following analysis examines the pertinent FCC licensed services in the area for impact. This analysis assumes that all licensed services have been designed and constructed according to FCC requirements and good engineering practice. If this is not the case, the impacted facility must share responsibility with the wind project developer for the costs of any mitigation measures[2].

Each of the RF analyses is described separately in the sections that follow.

II. ANALYSIS OF MICROWAVE LINKS

An extensive analysis was undertaken to determine the likely effect of the new wind turbine farm upon the existing microwave paths, consisting of a Fresnel x/y/z axis study. The microwave paths have been overlaid on Google Earth™ maps, and the images of the microwave paths and the proposed turbines are also available in a KMZ file.

Important Note: Microwave path studies are based upon third party and FCC databases that normally exhibit a high degree of accuracy and reliability. Although Evans performs due diligence to ensure that all existing microwave facilities are accurately represented, we cannot be responsible for errors in FCC databases that may lead to incomplete results. However, should such situations occur, Evans would perform additional engineering analyses to determine how the additional facilities can be accommodated or, if wind turbine structures are already built, determine a method to re-direct an impacted beam path.

[2] For instance, some microwave paths may have insufficient ground clearances as they are presently configured.

For this microwave study, the *First Fresnel Zone* (FFZ) ellipsoid, with K factor of 1.333, was calculated for each microwave path. The mid-point of a microwave path is the location where the widest (or worst case) Fresnel zone occurs. The radius *R* of the First Fresnel Zone, in meters, at the midpoint of the path is calculated for each microwave link using the following formula:

$$R \cong 8.65\sqrt{\frac{D}{F_{GHz}}}$$

where *D* is the microwave path length in kilometers and F_{GHz} is the frequency in gigahertz. This value is shown for each tabulated microwave path in Table 1 below. The FFZ ellipsoid is the zone where the siting of obstructions should be avoided.

Evans Engineering Solutions has identified 72 unique licensed microwave paths from the FCC database that are within 2 miles of the project area. These are listed in Appendix A.

In order to assess the blocking impact of the wind turbines proposed to be used, 3-D models of the wind turbines and the First Fresnel Zones of the microwave paths found in the area have been placed into the geographical depiction shown in the illustrations in this report. The results of that assessment are shown in the following Figures 3 through 13. As these figures show, none of the planned turbines are in conflict with the FFZs of the microwave links in the area as described by their FCC licenses.

The KMZ file containing the microwave paths and the proposed turbines are provided for further examination and closer inspection.

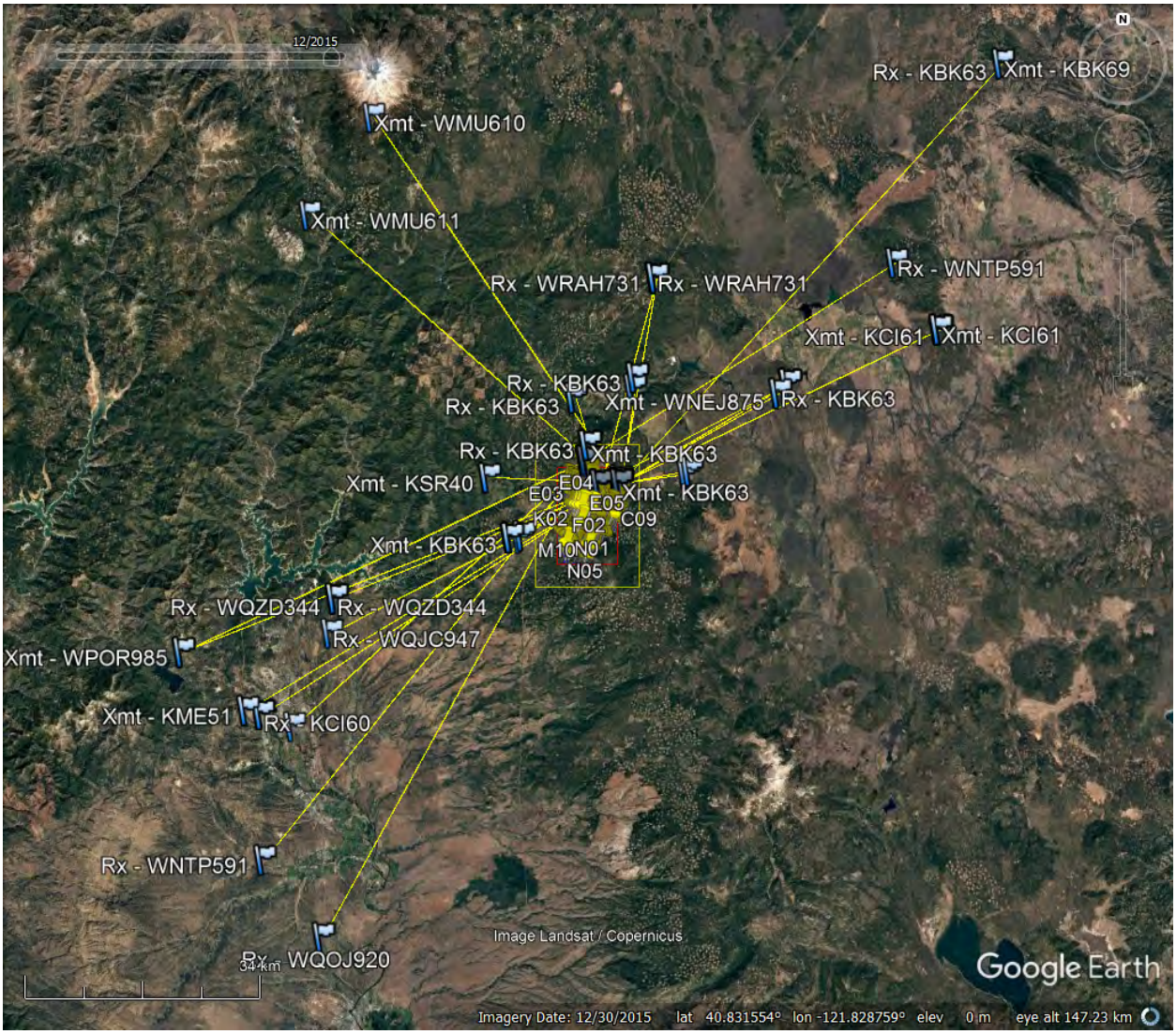

Figure 1 – Licensed Microwave Paths in or near Fountain Project Area

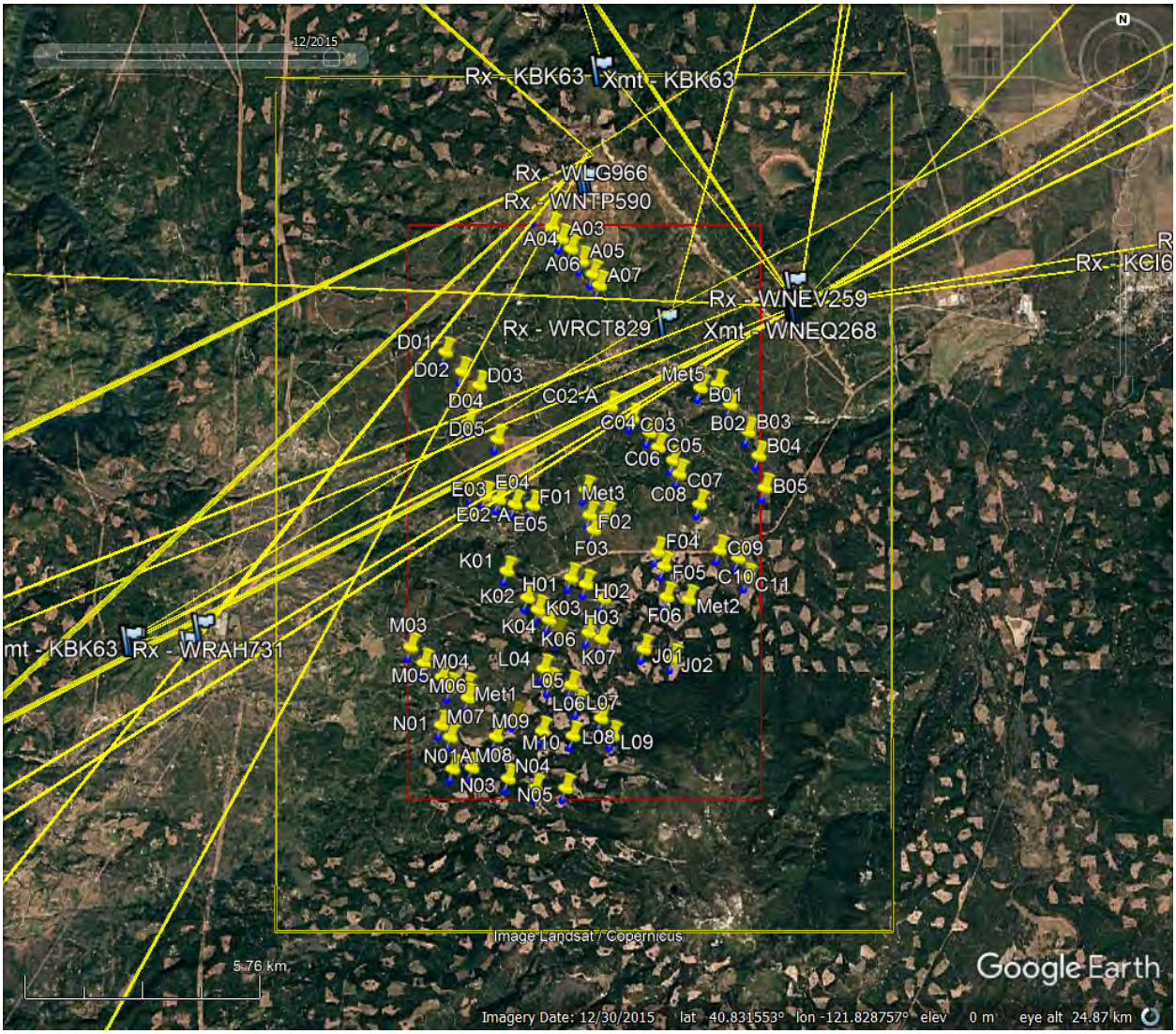

Figure 2 – Close-Up of Licensed Microwave Paths in or near Fountain Project Area

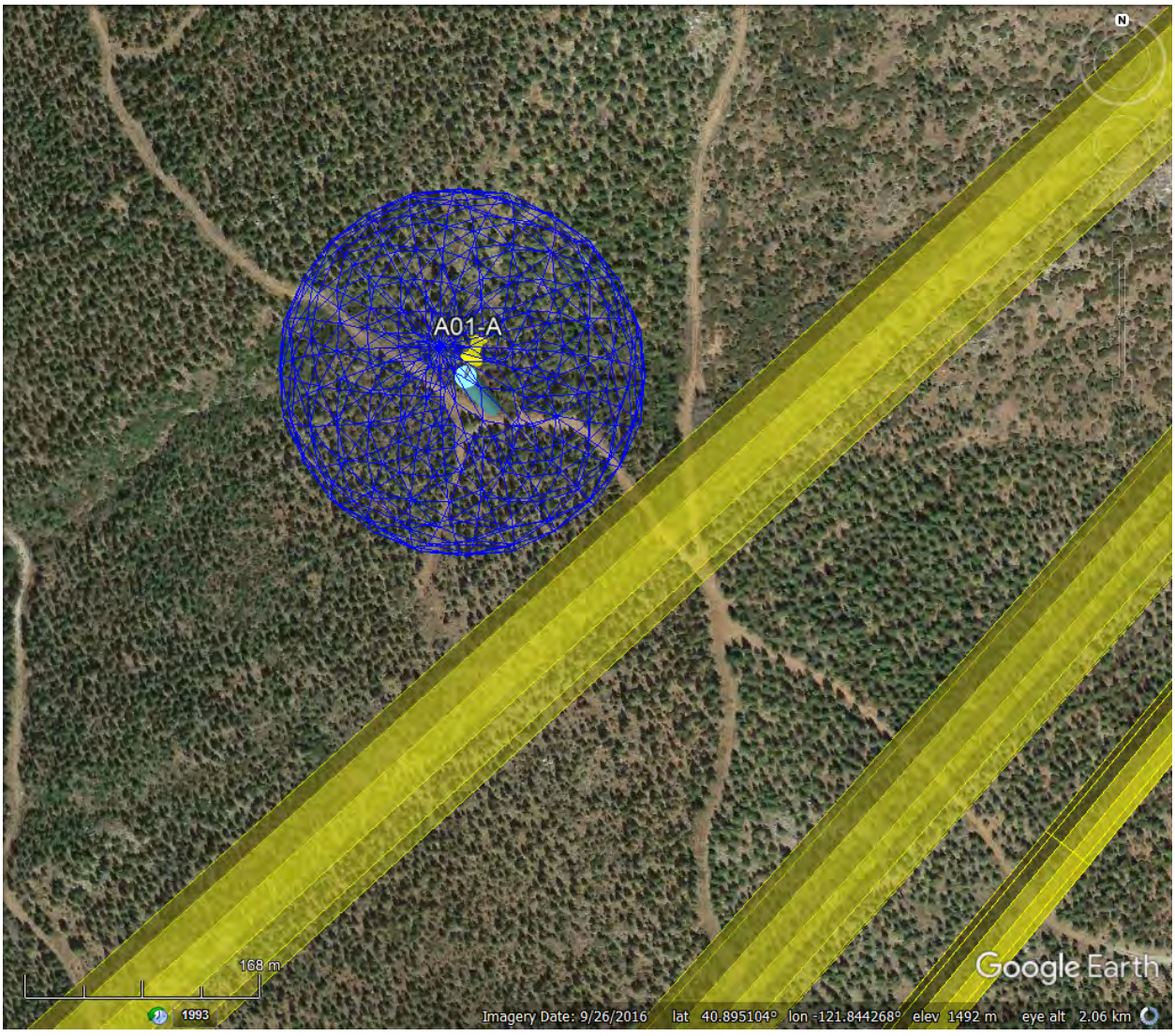

Figure 3 – Planned Turbine A01-A Close to Microwave Path

As can be seen in the image above, Turbine A01-A would not penetrate the FFZ of the FCC-licensed microwave link.

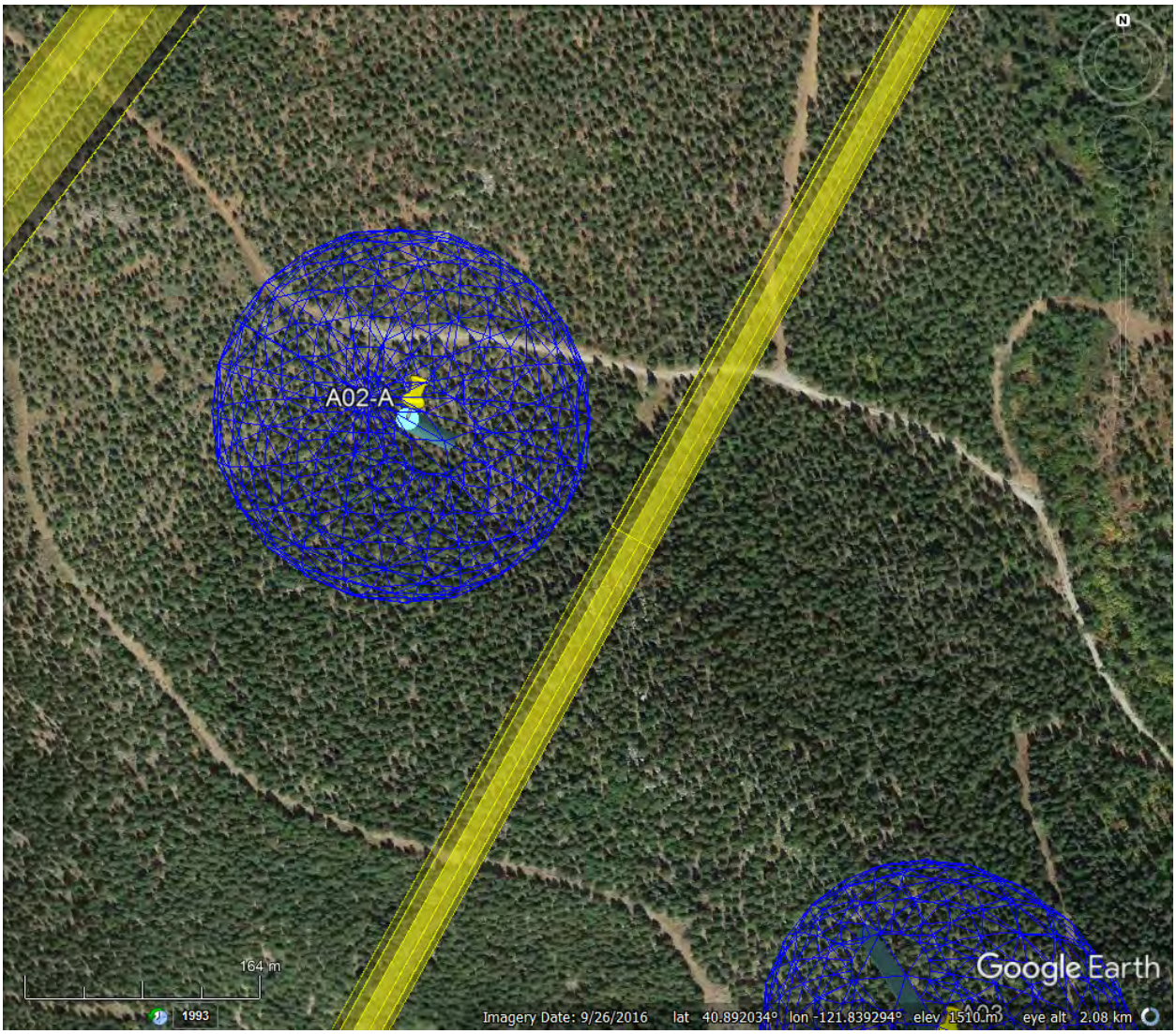

Figure 4 – Planned Turbine A02-A Close to Microwave Path

As can be seen in the image above, Turbine A02-A would not penetrate the FFZ of the FCC-licensed microwave link.

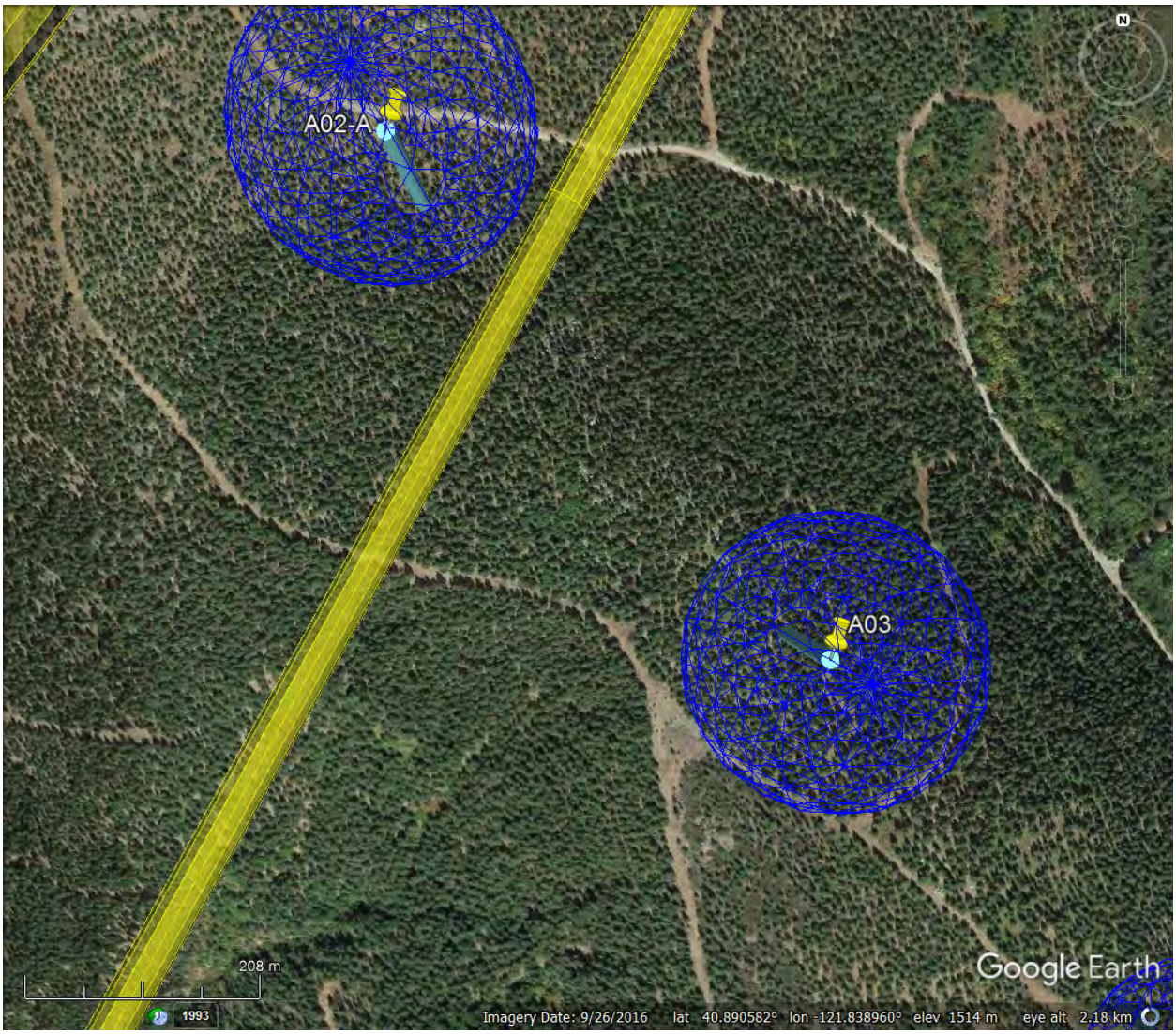

Figure 5 – Planned Turbine A03 Close to Microwave Path

As can be seen in the image above, Turbine A03 would not penetrate the FFZ of the FCC-licensed microwave link.

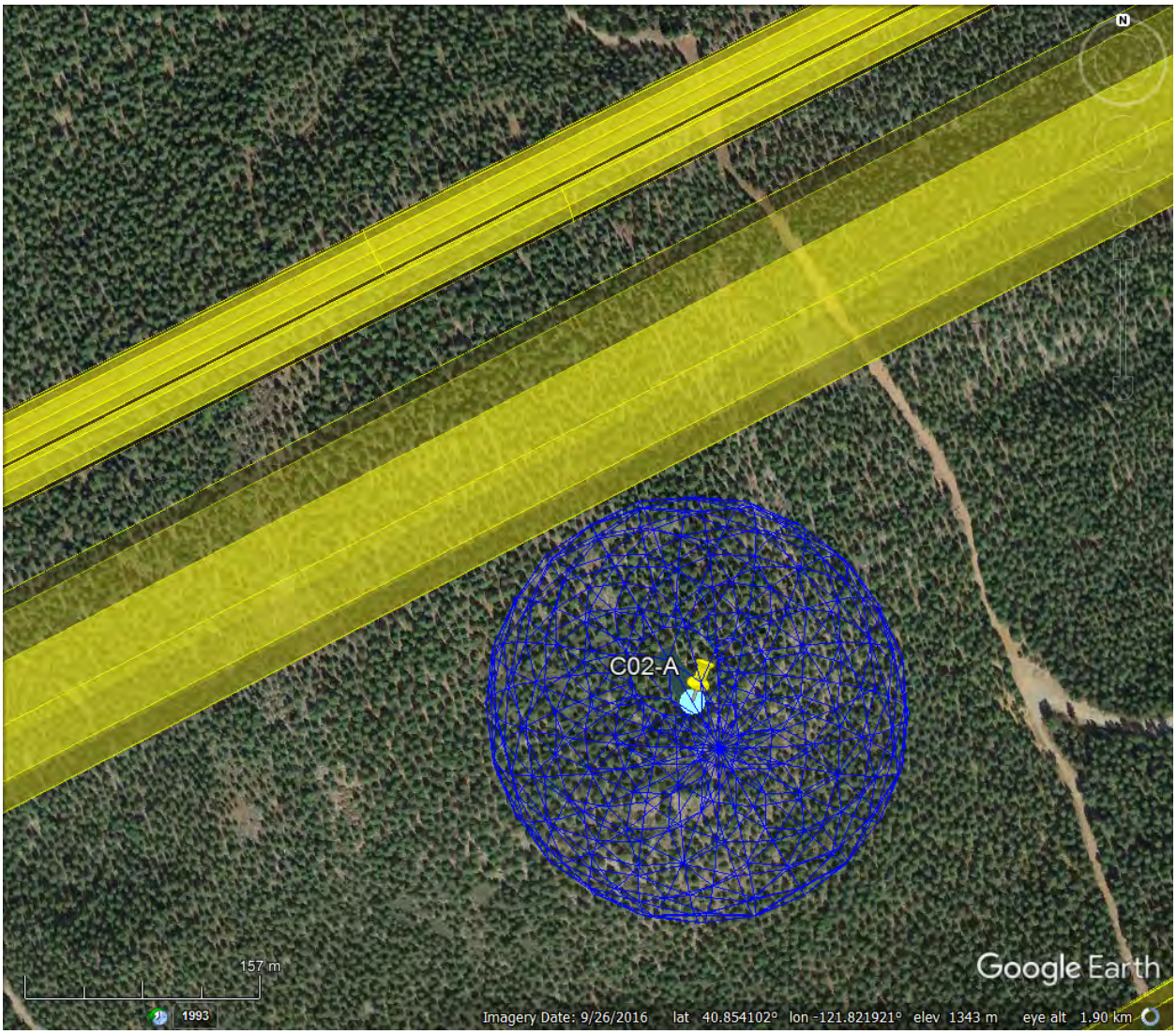

Figure 6 – Planned Turbine C02-A Close to Microwave Path

As can be seen in the image above, Turbine C02-1 would not penetrate the FFZ of the FCC-licensed microwave link.

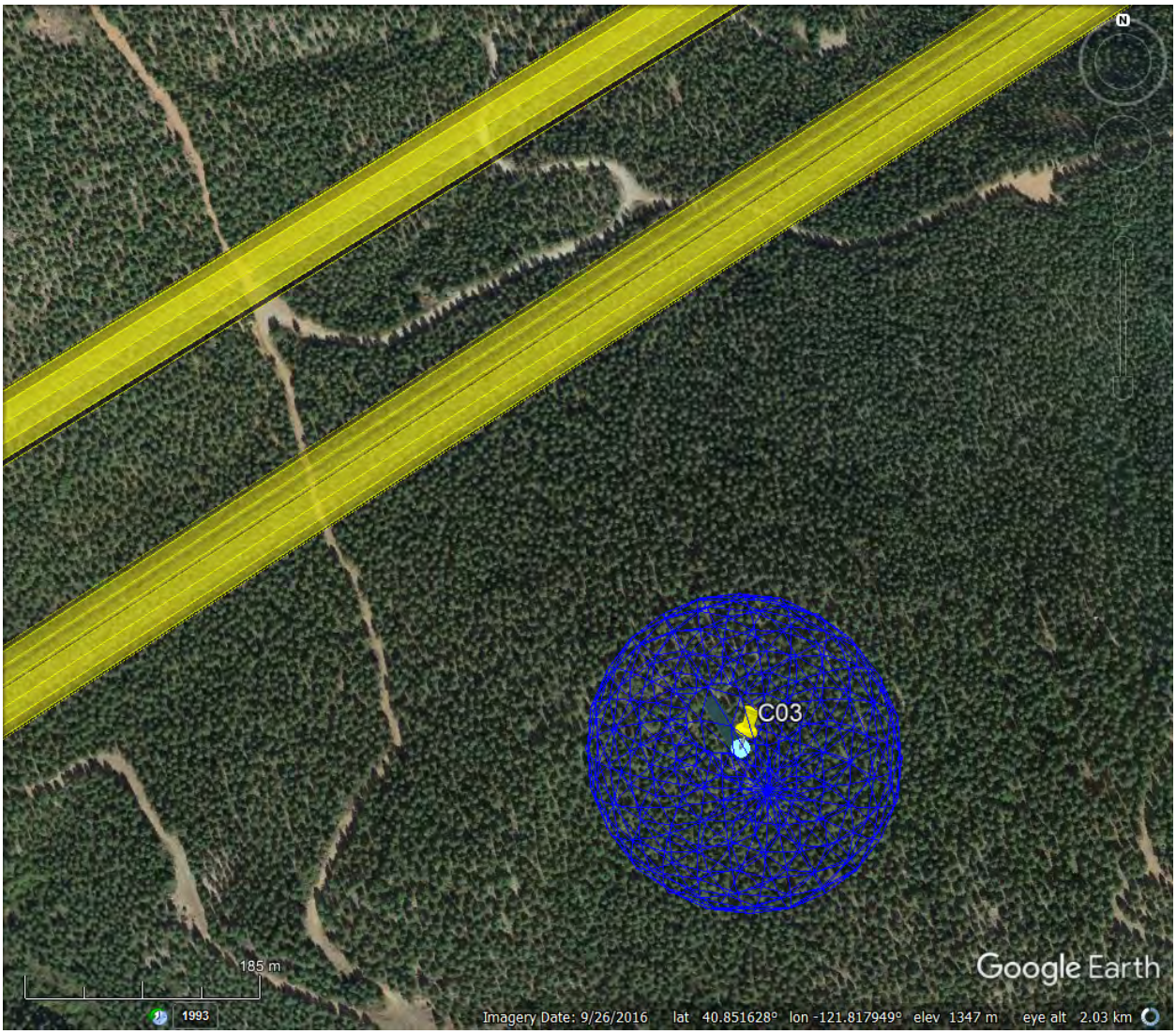

Figure 7 – Planned Turbine C03 Close to Microwave Path

As can be seen in the image above, Turbine C03 would not penetrate the FFZ of the FCC-licensed microwave link.

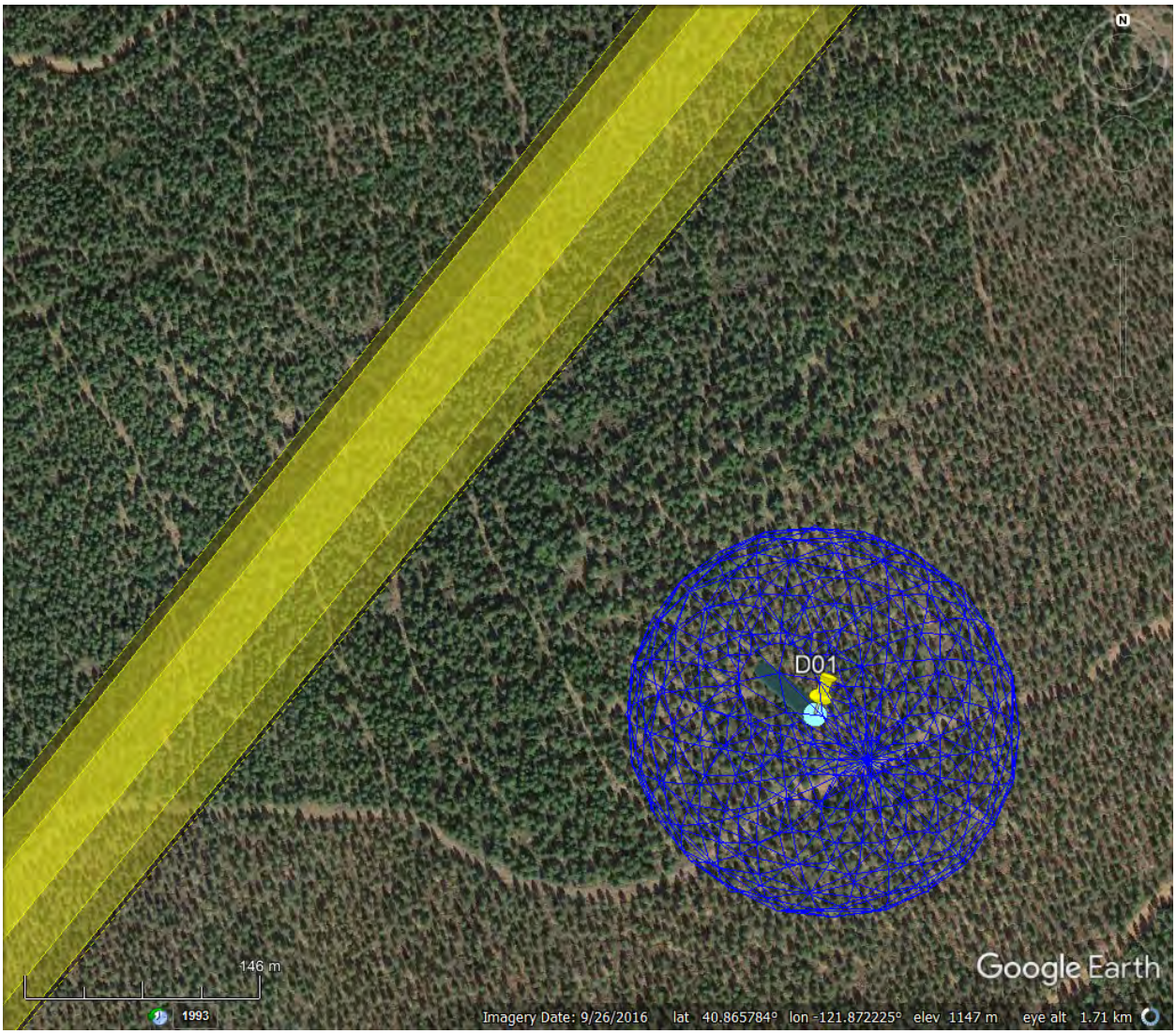

Figure 8 – Planned Turbine D01 Close to Microwave Path

As can be seen in the image above, Turbine D01 would not penetrate the FFZ of the FCC-licensed microwave link.

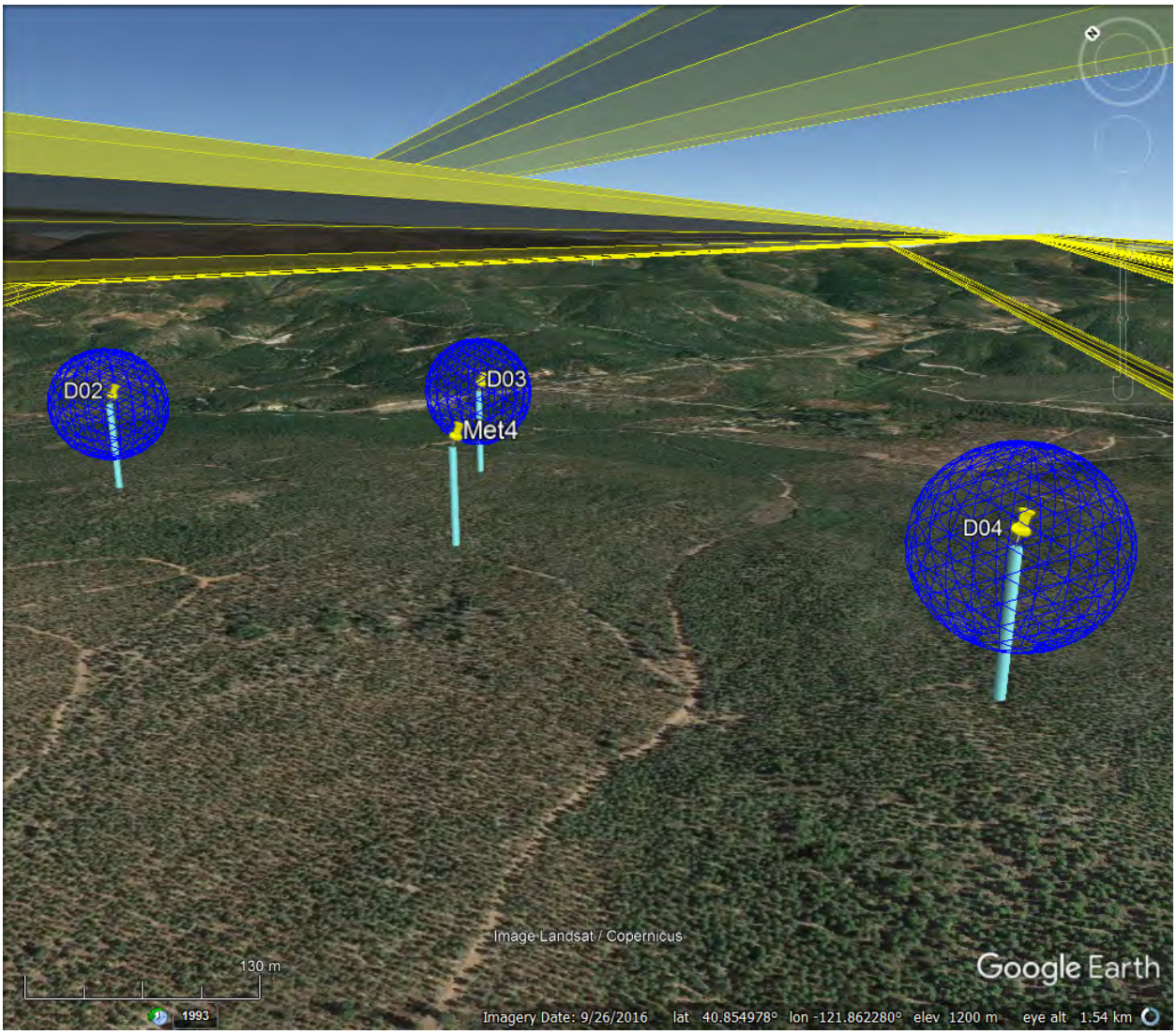

Figure 9 – Planned Turbines D02, D03 and D04 and MET 4 Close to Microwave Path

As can be seen in the image above, the turbines and MET tower would not penetrate the FFZ of the FCC-licensed microwave link.

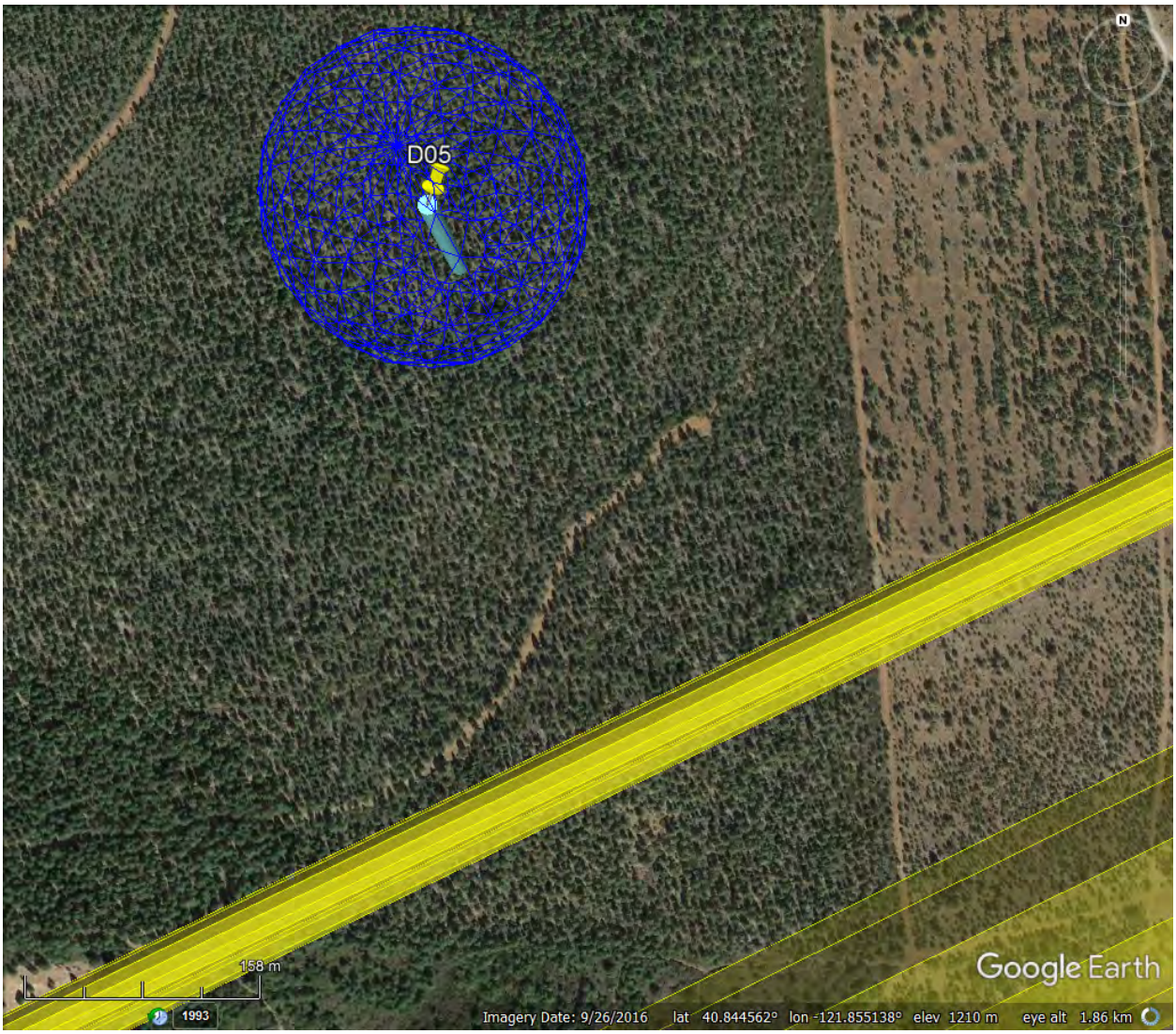

Figure 10 – Planned Turbine D05 Close to Microwave Path

As can be seen in the image above, Turbine D05 would not penetrate the FFZ of the FCC-licensed microwave link.

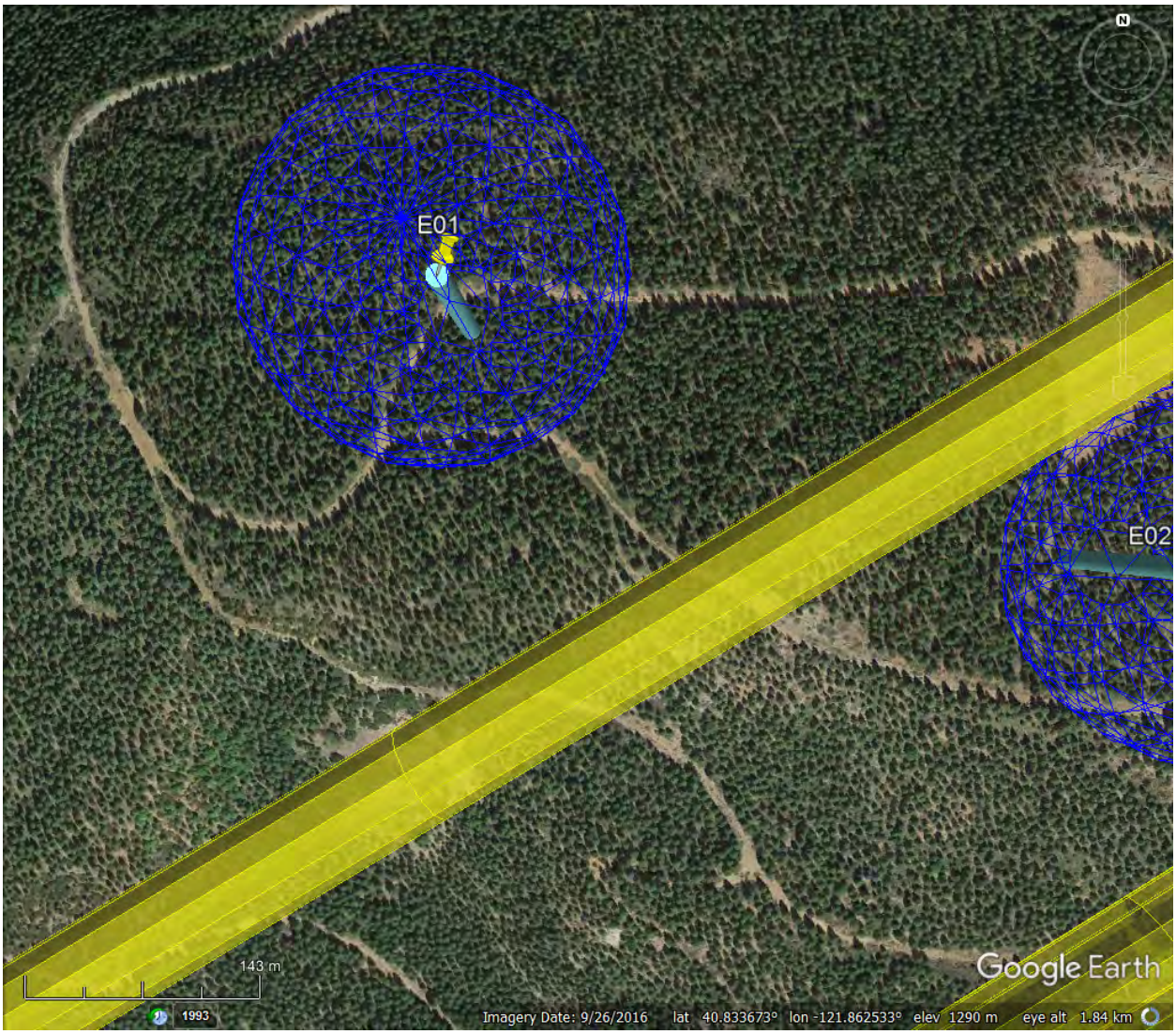

Figure 11 – Planned Turbine E01 Close to Microwave Path

As can be seen in the image above, Turbine E01 would not penetrate the FFZ of the FCC-licensed microwave link.

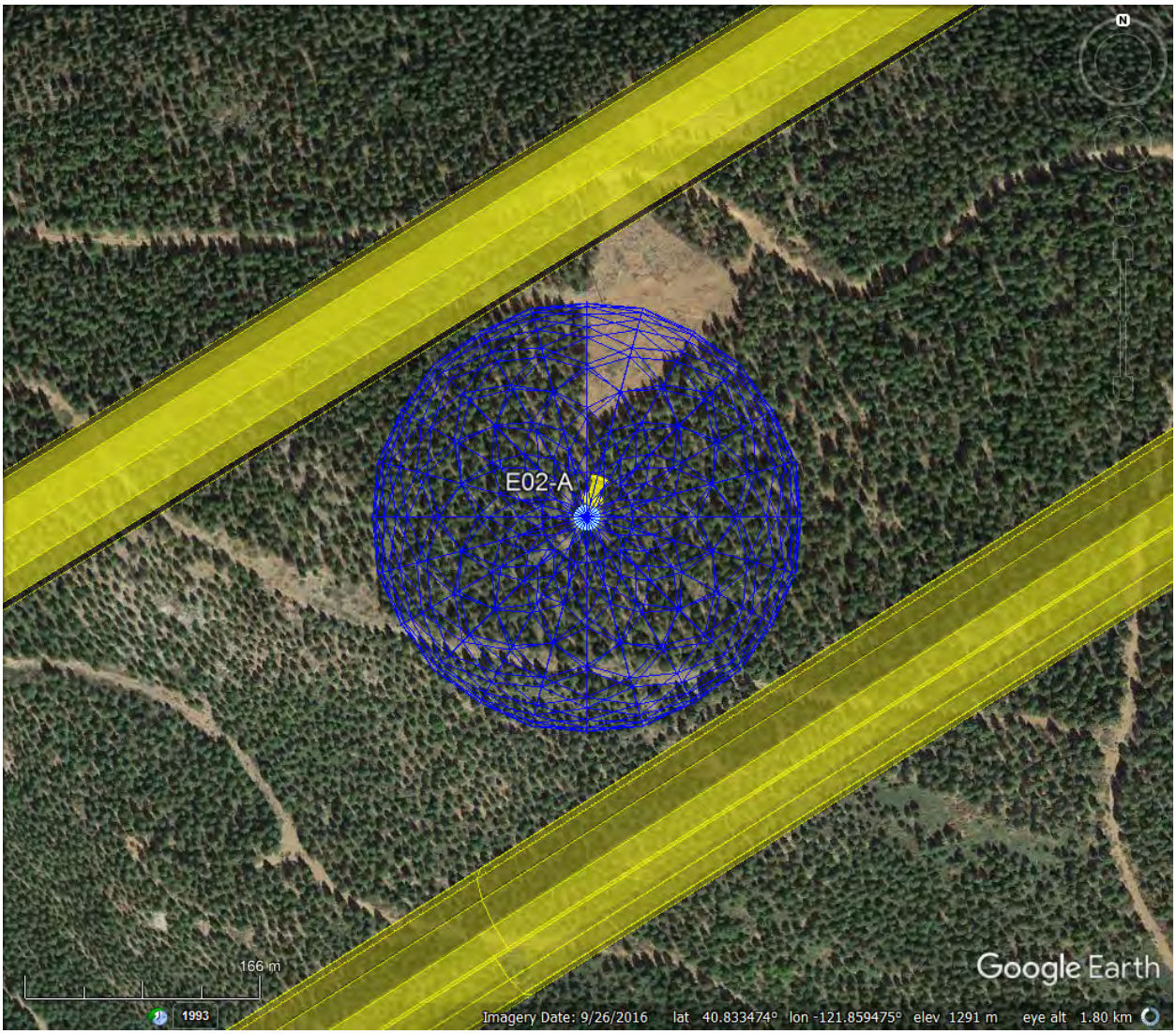

Figure 12 – Planned Turbine E02-A Close to Microwave Path

As can be seen in the image above, Turbine E02-A would not penetrate the FFZ of the FCC-licensed microwave link.

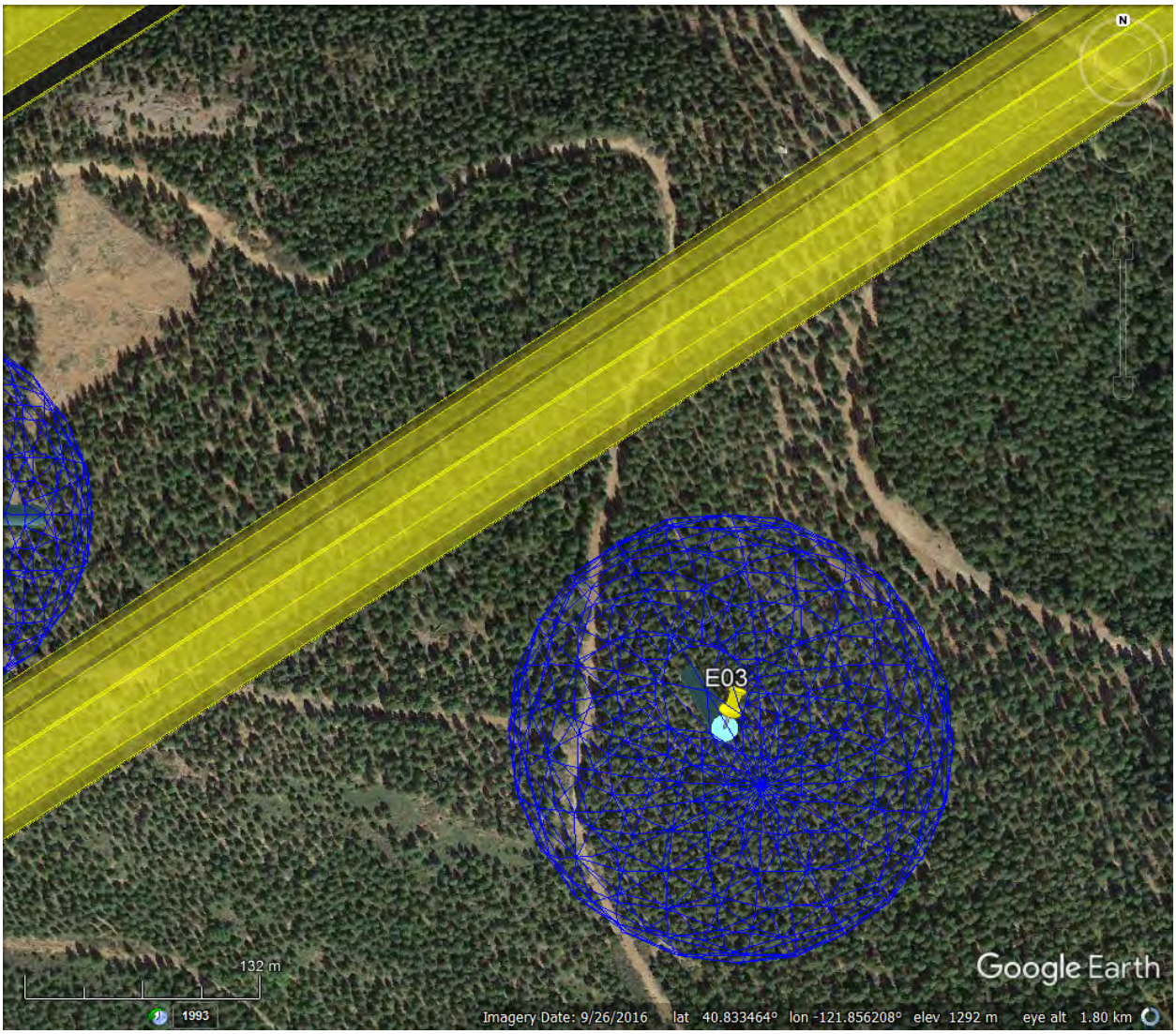

Figure 13 – Planned Turbine E03 Close to Microwave Path

As can be seen in the image above, Turbine E03 would not penetrate the FFZ of the FCC-licensed microwave link.

III. ANALYSIS OF FIXED RADIO FACILITIES

3.1 Land Mobile & Public Safety Facilities

A search of the FCC's land mobile/public safety radio database revealed 47 land mobile transmitter station that falls within the search area (about two miles beyond the project area). This land mobile station is listed in Table 2 and mapped in Figure 14. The specifications on the land mobile station can be found in the associated land mobile (LM) spreadsheet file.

In general, multi-directional transmitting facilities, including land mobile stations, that are within 425 meters of a turbine site customarily should be further evaluated for the possibility of transmitter interference caused by wind turbines. Station WRBP572 is the land mobile station nearest to turbine sites and is 592 meters from the nearest planned turbine, Turbine M08 (see Figure 15).

The reader is referred to the provided KMZ file for more magnification and closer inspection.

Based on the current project layout, and assuming that the land mobile stations in and near the project area are actually located at their licensed locations, or located farther away from turbines, no adverse impact is expected to be caused to the transmissions of land mobile stations that are licensed by the FCC.

Table 3 – Land Mobiles Stations within 2 Miles of Project Area

Call Sign	Location	Latitude (NAD-83)	Longitude (NAD-83)	Ant. Ht. (m AGL)	Highest Freq. (MHz)	Licensee
KCO756	1	40.874889	-121.771389	19	158.25	Pacific Gas & Electric Co., d/i/p
KCO756	1	40.874889	-121.771389	20	158.46	Pacific Gas & Electric Co., d/i/p
KDE673	1	40.874889	-121.771944	41.1	42.34	California, State of
KDE673	1	40.874889	-121.771944	41.1	45.14	California, State of
KDU429	1	40.875444	-121.771111	40	158.895	Shasta County Sheriff-Coroner
KER951	1	40.875444	-121.771111	12	452.8	Roseburg Forest Products Co.
KER951	1	40.875444	-121.771111	40	153.35	Roseburg Forest Products Co.
KIN68	1	40.868222	-121.884528	11	159.33	California, State of
KJM345	1	40.875444	-121.771111	39	158.985	Shasta, County of
KLR825	1	40.874611	-121.770556	11.3	151.985	Citizens Telecom. Co. of Calif. Inc.
KMA582	1	40.875444	-121.771111	23	158.73	Shasta, County of
KMH435	2	40.874889	-121.771111	19	48.86	Fruit Growers Supply Company

Call Sign	Location	Latitude (NAD-83)	Longitude (NAD-83)	Ant. Ht. (m AGL)	Highest Freq. (MHz)	Licensee
KNFD862	1	40.874889	-121.771944	40	856.9875	California, State of
KNHU243	3	40.875444	-121.771111	26	155.1	Shasta, County of
KVA377	1	40.874889	-121.771944	41	47.1	California, State of
KYQ496	2	40.875167	-121.771944	5	452.875	Shasta, County of
KYQ496	2	40.875167	-121.771944	20	463.175	Shasta, County of
WGC352	1	40.874889	-121.771944	43	151.415	California, State of
WNKI574	1	40.875	-121.771944	42.7	151.355	California, State of
WNKI574	1	40.875	-121.771944	42.7	151.175	California, State of
WNQQ340	1	40.874889	-121.771389	17	451.025	Pacific Gas & Electric Co., d/i/p
WNSU750	3	40.905306	-121.828917	7.6	46.08	Shasta, County of
WNZM801	2	40.895722	-121.792778	15	463.95	Pit River Indian Health Service Inc
WPIJ785	1	40.895722	-121.792778	8	461.775	Valley Industrial Communications
WPIN850	1	40.874889	-121.771944	43	151.235	California, State of
WPLW718	1	40.905722	-121.828333	60	455.99	SMG-Redding, LLC
WPNT829	3	40.905722	-121.827222	9	463.825	Plass, Stephen M
WPOX435	1	40.875444	-121.771111	15	150.905	Headrick II, James
WPPV640	1	40.895722	-121.792778	15	452.2	Valley Industrial Communications
WPRJ732	1	40.895722	-121.792778	15	464.925	Valley Industrial Communications
WPUN733	2	40.895722	-121.792778	15	461.225	Valley Industrial Communications
WPYA277	4	40.895722	-121.792778	15.9	49.08	Sierra Pacific Industries
WQBX262	1	40.875444	-121.771111	27	451.425	Burney Transportation, Inc.
WQCK764	1	40.875444	-121.771111	21	451.425	Burney Transportation, Inc.
WQEQ313	5	40.895722	-121.792778	6	463.4	Mckeown, James R
WQFD407	5	40.895722	-121.792778	6	152.4575	Mckeown, James R
WQNQ845	1	40.874861	-121.771917	19	452.7	Pacific Gas & Electric Co., d/i/p
WQRM807	2	40.906	-121.812	23	469.9375	Roseburg Forest Products
WQRX845	3	40.895722	-121.792778	12	152.87	Goose Valley Farming LLC
WQTG775	1	40.905806	-121.82875	8.5	463.825	Plass, Stephen M
WQW851	1	40.874889	-121.771944	43	153.755	California, State of
WQX903	2	40.895722	-121.792778	11	48.76	Sierra Pacific Industries
WQXH846	1	40.902333	-121.826111	91.4	463.55	Siemens Gamesa Renewables
WQXM677	1	40.905806	-121.82875	11.2	464.9125	Silke Communications, Inc.
WQYP430	4	40.874889	-121.771389	29	153.56	Pacific Gas & Electric Co., d/i/p
WRAT551	1	40.875	-121.770278	20	154.43	Shasta, County of
WRBP572	1	40.7785	-121.850056	47.5	462.0625	LandVest

Table 3 – Land Mobiles Stations within 2 Miles of Project Area

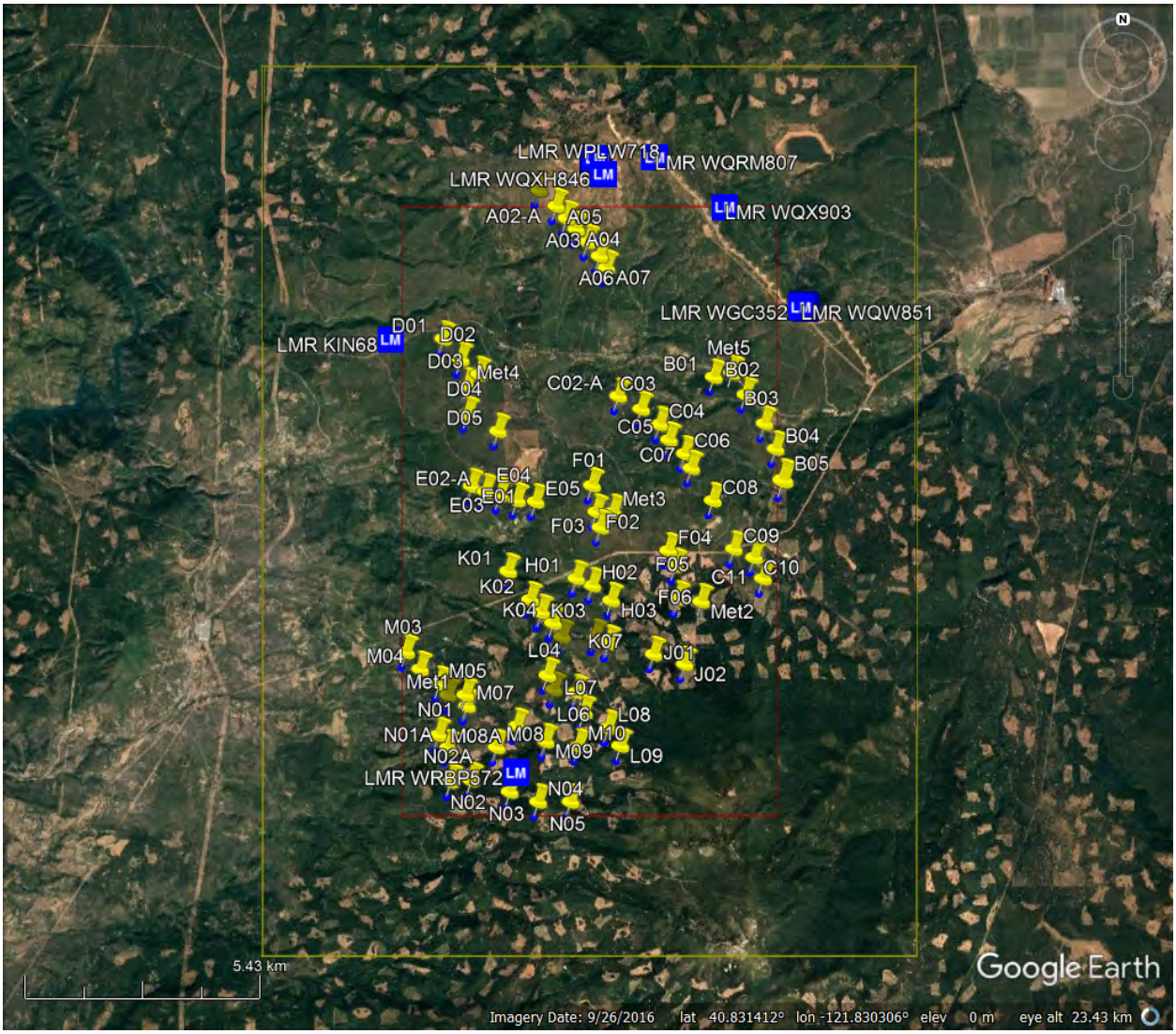

Figure 14 – Land Mobile Stations in or near Fountain Project Area

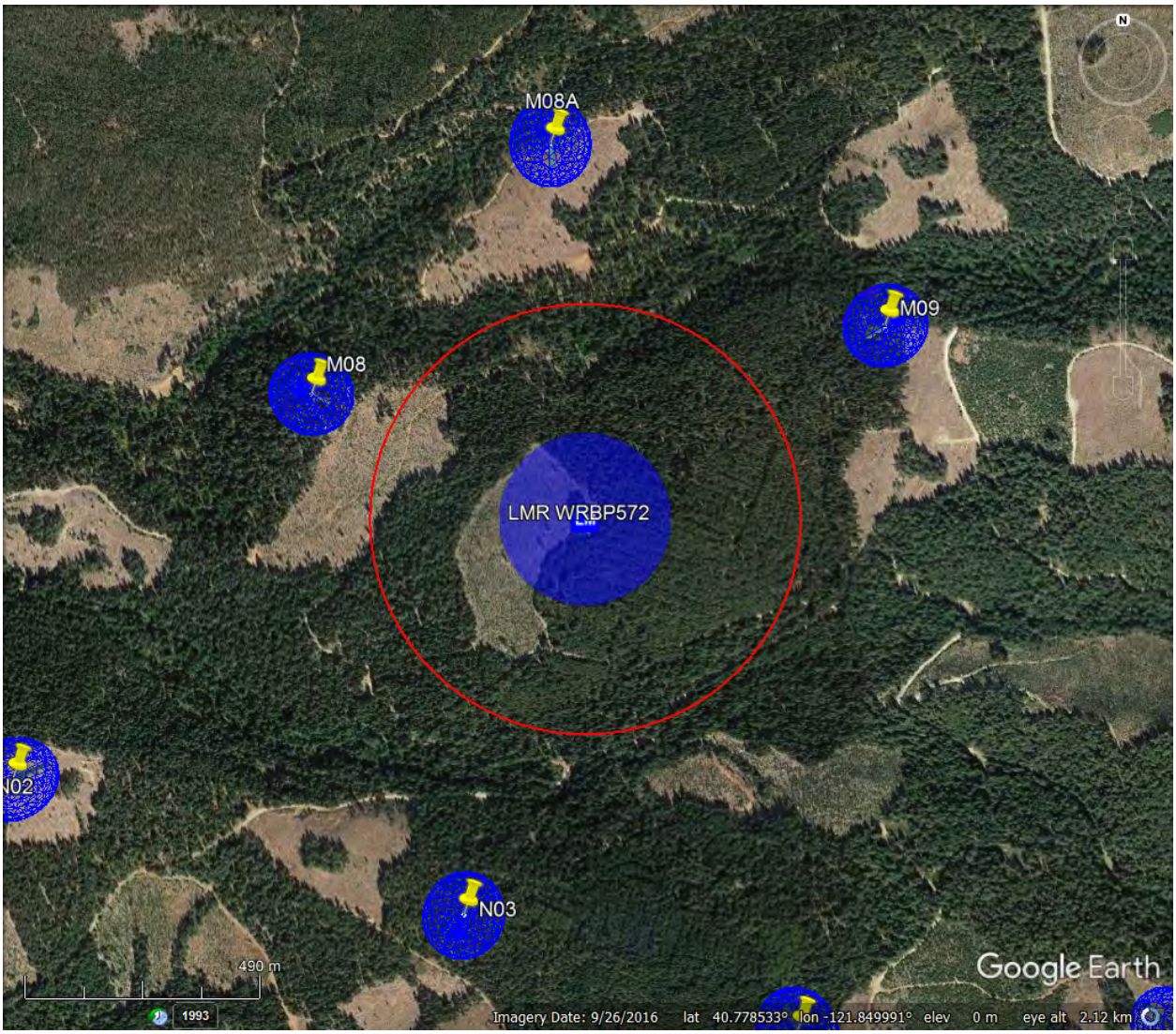

Figure 15 - Planned Turbines near Land Mobile Station WRBP572

(Red Circle represents a worst-case setback of 425 meters.)

As can be see, the planned turbines in the image above are no closer than the worst-case recommended setback of 425 meters to the land mobile site(s).

IV. EARTH STATION ANALYSIS

A search of the FCC's IBFS (International Bureau Filing System) database reveals many FCC-licensed satellite earth stations within 65 miles of the Fountain wind project area, which are shown in Appendix B. The only earth station from the list whose azimuthal range over its assigned satellite arc sweeps across the wind project (in whole or in part) is FCC Call Sign E200635, Location 44 (43710 State Highway 299 East, Fall River Mills, CA), located 41 kilometers northeast of the center of the wind project area. The proposed turbine site closest to this earth station is B03 which is 36.79 kilometers away. The highest elevation within the turbine area is 1980 meters AMSL. Based on these assumptions and assuming a flat earth (K-factor = infinity), any turbine of 206 meters blade tip height anywhere in the turbine area would be clear of the satellite arc by at least 2042 meters in vertical distance.

Thus, it is determined that no FCC-authorized satellite earth station would be adversely affected by the Fountain Wind project.

V. ANALYSIS OF BROADCAST FACILITIES

5.1 TV Broadcast Facilities

The rotating blades of a wind turbine have the potential to disrupt over-the-air broadcast TV reception within a few miles of the turbine, especially when the direct path from the viewer's residence is obstructed by terrain. Interference is caused when signals reflected by the blades arrive at the viewer's TV antenna along with the direct signal. This is known as "multipath interference." However, as turbine manufacturers have replaced all-metal blades with blades constructed of mostly nonmetallic materials[3], this effect has been reduced. Also, the new generation of HDTV receivers is better equipped to deal with minor multipath interference (which is manifested by "pixilating" or "freezing" of the digital picture) than analog TV sets, as special circuitry is employed to suppress the reflected signal. Occasionally, however, multipath interference from one or more turbines can cause video failure in HDTV receivers, especially if the receiver location is in a valley or other place of low elevation.

There is some possibility of signal disruption for residences that have to point their outdoor antennas through the turbine area, or that utilize "rabbit ear" antennas and/or older HDTV receivers. Most of this effect should be dissipated for locations three or more miles from a turbine, but some residual problems could be noted for HDTV receivers that are located below

[3] Modern turbine blades are usually constructed from glass-reinforced plastic (GRP), although they usually contain some metal for strengthening, balance and grounding.

the grade level at the turbine base. Usually, a rule of thumb is that approximately 10% of the receiver locations are affected to some extent within three miles of a large turbine when the turbine is between the TV station and the receiver. The usual effect is intermittent "pixilation" or freezing of the digital TV picture. This estimate is based upon Evans Engineering's experience with similar wind energy projects.

Shasta County is in the Chico-Redding, California Designated Market Area (DMA) as defined by Nielsen Media Research. The TV stations listed in Table 4 have been determined to place a predicted FCC primary off-the-air service signal over at least a portion of the project area or its immediate environs.

Call Sign	Type of Station	Virtual Channel	Actual Channel	City of License	Power (KW)	Ant. Height (m HAAT)	Dist. (km)	Direction
K02RK(CP)	Low Power	--	2	Redding, CA	3.0	402	61.7	WSW
K03FU(CP)	Translator	--	3	Mountain Gate, CA	0.3	325	40.9	WSW
K04EZ(CP)	Translator	--	4	Big Bend, CA	0.275	48	24.1	NNW
K05DQ	Translator	7	5	Burney, CA	0.045	309	34.9	ENE
KNNN(CP)	Low Power	--	6	Redding, CA	3.0	422	61.7	WSW
KRCR-TV	Conventional	7	7	Redding, CA	84	1095	73.9	WSW
KVFR(CP)	Low Power	8	8	Redding, CA	1.5	389	62.2	WSW
KIXE-TV	Conventional	9	9	Redding, CA	15	1090	74.0	WSW
KTVL(CP)	Conventional	10	10	Medford, OR	25	1001	157.4	NNW
K15KO	Low Power	46	15	Redding, CA	5.0	393	61.7	WSW
K16IW	Low Power	16	16	Redding, CA	5.0	394	61.7	WSW
KCVU(CP)	Conventional	20	17	Paradise, CA	500	431	97.2	S
K18LJ	Translator	10	18	Dunsmur, CA	0.015	231	58.9	NW
KNVN(CP)	Conventional	24	20	Chico, CA	300	567	67.5	SSW
KRDT	Class A	23	23	Redding, CA	3.0	402	61.7	WSW
K24MI(CP)	Low Power	--	24	Redding, CA	0.5	388	62.2	WSW
KRHT(CP)	Low Power	41	25	Redding, CA	15	457	61.9	WSW
K27MZ(CP)	Low Power	--	27	Redding, CA	5.0	388	62.2	WSW
K31PS	Low Power	12	31	Lakeshore, CA	1.32	386	52.7	W
KQSX(CP)	Low Power	--	33	Cal-Oregon, CA	1.0	259	55.8	NW
K35PG(CP)	Low Power	--	35	Redding, CA	15	392	61.7	WSW
KHSL-TV	Conventional	12	36	Chico, CA	170	462	97.6	S

"CP" = FCC Construction Permit

Table 4 - TV Stations Serving Fountain Wind Project Area

It should be noted that many of the translator and low power stations holding an FCC construction permit are currently off the air and their target dates for returning to operation are unknown.

If the Fountain wind project should cause disruptions to over-the-air TV viewing, methods to resolve them are available, and are as follows:

1. Relocation of the household antenna to receive a better signal
2. Installation of a better outside antenna, or one with a higher gain
3. Installation of satellite or cable TV

According to this engineer's calculations, there are approximately 600 households within an area likely to be affected (215 square miles). It is conservatively estimated that 55%, or 330, of the households receive TV programming primarily by satellite dish or cable. This leaves an estimated 270 households relying on transmitted off-the-air TV signals. Based on the 10% criteria described previously, up to 27 TV receiving locations may be affected to some degree in the worst-case. Mitigation costs would be approximately $200 per location for an upgraded outdoor antenna, or $400 per year per location for a satellite or cable subscription.

It is the opinion of this consultant that any disruptions to over-the-air TV broadcast signals, if they occur, can be resolved satisfactorily.

5.2 AM Facilities

Large metallic structures such as wind turbines can adversely affect the transmitted signals of AM broadcast stations up to three kilometers away. A search of the FCC's database revealed no AM facilities within the required notification distance of three kilometers from any planned turbine. There should therefore be no reasonable expectations of disruptions in transmitted radiations on the AM band due to the presence of the turbines. Occasionally, depending upon ground conditions, local AM receivers may experience slight signal changes due to local effects, but such anomalies are not recognized by the FCC or the standards of good engineering practice as having an unduly adverse effect.

VI. NTIA NOTIFICATION

Operation of RF frequencies for federal government use is managed by the National Telecommunication Information Agency (NTIA), which is part of the U.S. Department of Commerce. The technical specifications for most government facilities are unavailable to the public. In order to avoid the derailment of the wind energy project due to late objections from a government agency, the NTIA should be notified of the proposed project during pre-construction planning. The NTIA has set in place a review process, wherein the Interdepartmental Radio Advisory Committee (IRAC), consisting of representatives from various government agencies, reviews new proposals for wind turbine projects for impact on government frequencies. In

almost all cases, no adverse impact is found, and IRAC usually issues a determination in about 60 days.

On May 6, 2020, this office sent a notification of the Fountain wind project to the NTIA, and a determination is expected about the first week of July 2020.

VII. CONCLUSIONS AND RECOMMENDATIONS

1. Many FCC-licensed microwave paths crosses the project area, however, based on the FCC licenses, no turbines in the current project layout are in conflict with the path.

2. Additional due diligence with regard to the microwave antennas on Hatch Mountain are warranted. Many of the underlying licenses are in error with respect to the location coordinates. It is recommended that the microwave path licenses be contacted to ascertain their correct locations so as to determine definitively whether or not any conflicts with turbines occur.

3. If an excessive amount of time goes by before the turbines are to be constructed (six months or more), it is recommended that the microwave study be updated in case new paths have been added to the FCC's database.

4. No land mobile transmitting stations are expected to be adversely affected, assuming that their transmitters are located exactly as per their FCC licenses.

5. Over-the-air TV interference due to operating wind turbines is not expected to be an intractable problem. Effective mitigation methods to resolve any interference that may occur are available, with satellite or cable service installation providing the worst-case solution. No radio broadcast facilities are likely to be affected.

Respectfully Submitted,

B. Benjamin Evans
RF Impact Consultant

May 15, 2020

APPENDIX A

FCC-LICENSED MICROWAVE PATHS IN AND NEAR FOUNTAIN WIND PROJECT AREA

Call Sign	Site 1	Site 2	Path	FFZ Radius(m)	Freq. (MHz)	Licensee
KBK63	HATCHET MT	PR7	7	8.8	6860	Pacific Gas & Electric Co.
KBK63	PR Path 7	PIT 4 PH	7	8.8	6860	Pacific Gas & Electric Co.
KBK63	HATCHET MT	HAPPY CAMP	9	32	5974.85	Pacific Gas & Electric Co.
KBK63	HATCHET MT	BURNEY SC	10	10.6	6855	Pacific Gas & Electric Co.
KBK63	HATCHET MT	PIT 1 PH	11	17.9	6165.722	Pacific Gas & Electric Co.
KBK63	HATCHET MT	PR12	12	13.9	6004.5	Pacific Gas & Electric Co.
KBK63	PR Path 12	PIT 3 PH	12	4.6	6004.5	Pacific Gas & Electric Co.
KBK63	HATCHET MT	PR13	13	8.9	6780.625	Pacific Gas & Electric Co.
KBK63	PR Path 13	PIT 4 PH	13	8.8	6780.625	Pacific Gas & Electric Co.
KBK63	HATCHET MT	PR14	14	14.8	6004.5	Pacific Gas & Electric Co.
KBK63	PR14	Round Mtn Sub	14	4.6	6004.5	Pacific Gas & Electric Co.
KBK63	HATCHET MT	HANEY MTN	15	18.6	6093.45	Pacific Gas & Electric Co.
KBK69	HAPPY CAMP	HATCHET MT	4	31.4	6226.89	Pacific Gas & Electric Co.
KBY24	BURNEY SVC CTR	HATCHET MT	3	10.7	6695	Pacific Gas & Electric Co.
KCI60	HATCHETMTN	REDDING MW	1	26.1	6735	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BIGVALLEYCDFLO	2	23.8	6725	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BURNEYDOTMSTWR	4	10.4	6750.625	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BIGVALLEYCDFLO	5	23.7	6795	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	REDDING MW	6	25.9	6845	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BIGVALLEYCDFLO	7	23.7	6815	CALIFORNIA, STATE OF
KCI60	HATCHETMTN	BIGVALLEYCDFLO	8	23.7	6815	CALIFORNIA, STATE OF
KCI61	BIGVALLEYCDFLO	HATCHETMTN	2	23.7	6825	CALIFORNIA, STATE OF
KCI61	BIGVALLEYCDFLO	HATCHETMTN	3	24	6635	CALIFORNIA, STATE OF
KCI61	BIGVALLEYCDFLO	HATCHETMTN	5	24	6655	CALIFORNIA, STATE OF
KEU38	Pit #3 Powerhouse	PR2	2	4.5	6256.54	Pacific Gas & Electric Co.
KEU38	PR	Hatchet Mtn	2	13.6	6256.54	Pacific Gas & Electric Co.
KJI72	Round Mt Substn	PR6	6	4.5	6256.54	Pacific Gas & Electric Co.
KJI72	PR	Hatchet Mtn	6	14.5	6256.54	Pacific Gas & Electric Co.
KME51	REDDING	HATCHETT MT	1	27.5	6226.89	Citizens Telecom. Co of Calif
KMH74	HATCHETT MT	BIG VALL MT	1	25.3	5945.2	Citizens Telecom. Co of Calif
KMH74	HATCHETT MT	REDDING HUT	2	28.1	5974.85	Citizens Telecom. Co of Calif
KNI78	REDDING MW	HATCHET MTN	2	26.5	6555	CALIFORNIA, STATE OF
KNI78	REDDING MW	HATCHET MTN	7	26.2	6685	CALIFORNIA, STATE OF
KSR40	Hogback Mountain	Hatchet Mt	7	14.7	6565	Pacific Gas & Electric Co.
WAH462	BIG VALL MT	HATCHETT MT	1	24.8	6197.24	Citizens Telecom. Co of Calif
WLE341	Hatchet Mtn	Az:249,Dist:0	1	--	951.5	Southern Oregon University
WLG966	Studio	KRRX Xmtr	1	67.3	947	SMG-Redding, LLC
WLP267	Hatchet Mtn	Az:326,Dist:0	1	--	951	Southern Oregon University
WMS863	ROUND MTN	BURNEY	7	10.8	11245	New Cingular Wireless PCS

WMS863	ROUND MTN	BURNEY	8	10.8	11285	New Cingular Wireless PCS
WMS864	BURNEY	ROUND MTN	4	11	10755	New Cingular Wireless PCS
WMS864	BURNEY	ROUND MTN	5	11	10795	New Cingular Wireless PCS
WMU584	BEAR SPRINGS	S Fork Mtn	1	71.7	944.5	Southern Oregon University
WMU610	Gray Butte	Hatchet Mtn	1	70.8	945	Southern Oregon University
WMU611	MT BRADLEY	BEAR SPRINGS	1	65	948	Southern Oregon University
WNEJ875	Pit #1 Powerhouse	Hatchet Mtn	2	17.5	6417.762	Pacific Gas & Electric Co.
WNEQ268	STATION	Az:360,Dist:0	1	--	952.4625	Pacific Gas & Electric Co.
WNEQ268	STATION	Az:360,Dist:0	2	--	928.4625	Pacific Gas & Electric Co.
WNEV258	Hatchet Mountain	Hogback Mtn	1	14.5	6765	Pacific Gas & Electric Co.
WNEV258	Hatchet Mountain	Harlow Mtn	2	18.1	6865	Pacific Gas & Electric Co.
WNEV259	HARLOW MT	HATCHET MT	2	18.6	6545	Pacific Gas & Electric Co.
WNTC676	Haney Mountain	HATCHET MT	3	18.2	6345.49	Pacific Gas & Electric Co.
WNTP590	STATION	Bear Springs	2	24.5	6565	Xmssn Agency of Northern CA
WNTP591	STATION	Window Mtn	1	24.2	6735	Xmssn Agency of Northern CA
WNTP591	STATION	Olinda	2	28.6	6795	Xmssn Agency of Northern CA
WNTP592	STATION	Bear Springs	1	28.9	6635	Xmssn Agency of Northern CA
WPOR985	South Fork Mtn	Hatchet Mt n	1	26.7	7100	Paradise (KCVU-TV) Lic. Inc.
WPOR986	South Fork Mtn	Hatchet Mt n	1	27.1	6900	Sinclair-Calif Licensee, LLC
WQEN887	Pit #4 Powerhouse	PR1	1	9	6620.625	Pacific Gas & Electric Co.
WQEN887	PR	Hatchet Mtn	1	9	6620.625	Pacific Gas & Electric Co.
WQJC947	Hatchett Mountain	KJPR	1	61	946.5	Southern Oregon University
WQOF288	KKRN STUDIO	Bear Springs Pk	1	34.2	948.5	Acorn Community Enterp.
WQOJ920	BEAR SPRINGS	COTTONWOOD	1	31.4	5974.85	AC BidCo LLC
WQOJ921	COTTONWOOD	BEAR SPRINGS	1	30.8	6226.89	AC BidCo LLC
WQOX547	BURNEYDOTMSTWR	HATCHETMTN	1	10.5	6590.625	CALIFORNIA, STATE OF
WQSU930	Bear Mtn	Hatchet Mtn	4	17.4	10915	Ricketts, Curtis W
WQSU930	Bear Mtn	Hatchet Mtn	5	17.4	10915	Ricketts, Curtis W
WQZD344	Hatchet Mtn	Bear Mtn	1	17	11405	Ricketts, Curtis $
WQZD344	Hatchet Mtn	Bear Mtn	2	17	11405	Ricketts, Curtis $
WQZD344	Hatchet Mtn	HANEY MTN	3	13.9	10995	Ricketts, Curtis $
WRAG236	SC55538A	SC55540A	2	10.2	10855	T-MOBILE LICENSE LLC
WRAH727	SC55541A	SC55540A	1	14.6	10855	T-MOBILE LICENSE LLC
WRAH731	SC55540A	SC55538A	1	9.9	11345	T-MOBILE LICENSE LLC
WRAH731	SC55540A	SC55541A	2	14.2	11345	T-MOBILE LICENSE LLC
WRAH731	SC55540A	SC75001A	3	19.3	6152.75	T-MOBILE LICENSE LLC
WRAH731	SC55540A	SC75001A	4	19.5	6034.15	T-MOBILE LICENSE LLC
WRAU957	HANEY MTN	HATCHET MTN	1	13.6	11485	Com-Pair Services
WRCT829	SC75001A	SC55540A	1	19	6404.79	T-MOBILE LICENSE LLC
WRCT829	SC75001A	SC55540A	2	19.1	6286.19	T-MOBILE LICENSE LLC

APPENDIX B

FCC-LICENSED SATELLITE EARTH STATIONS WITHIN 65 MILES OF FOUNTAIN WIND PROJECT AREA

Earth Station Location Search Results

New Search Refine Search

Parameters: Latitude=40° 49' 57.2", Longitude=121° 49' 47.4", Radius=65 , Frequency Lower=0 GHz , Frequency Upper=100 GHz

Call Sign: E890126 **File Number:** SES-RWL-20090309-00270
Licensee: WINDJAMMER COMMUNICATIONS LLC
ATTN: STEPHEN FLESSNER
Phone: 561-775-1208 Fax: E-Mail: sflessner@wjcable.net
Counsel: WINDJAMMER COMMUNICATIONS LLC
ATTN:
Phone: 561-775-1208 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
9.25	40° 52' 56.6" N 121° 39' 57.0" W	NAD27	37100 MAIN STREET BURNEY, CA JALYN D. TEZIK	952.5	00003700.00000000 00004200.00000000	R

Call Sign: E200635 **File Number:** SES-REG-20181010-05943
Licensee: Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day
ATTN: Bart Eichelberger
Phone: 510-531-3200 Fax: E-Mail:
Counsel: Wiley Rein LLP
ATTN:
Phone: 202-719-4975 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
25.46	41° 1' 52.27" N 121° 25' 10.7" W	NAD27	43710 State Highway 299 East FALL RIVER MILLS, CA Bart Eichelberger 801-240-1000		00003700.00000000 00004200.00000000	R

Call Sign: E859880 **File Number:** SES-RWL-20050823-01146
Licensee: Associated Press
ATTN: OLETA J. BROWN
Phone: 816-654-1000 Fax: 816-654-1035 E-Mail: ojbrown@ap.org
Counsel: WILEY, REIN & FIELDING
ATTN:
Phone: (202) 429-7245 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
27.73	40° 42' 30.0" N 122° 19' 59.0" W	NAD83	REDDING, CA	262.0	00003700.00000000 00004200.00000000	R

Call Sign: E190802 **File Number:** SES-REG-20180919-04461
Licensee: Results Radio of Chico Licensee, LLC
ATTN: Jack W Fritz II
Phone: 707-546-9185 Fax: 707-546-9188 E-Mail: jfritz@fritzcommunications.com
Counsel: SAME AS APPLICANT
ATTN:
Phone: 707-546-9185 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
31.75	40° 38' 0.5" N 122° 22' 32.3" W	NAD83	1588 Charles Dr. Redding, CA Ronald E. Castro 530-244-9700	214.9	00003700.00000000 00004200.00000000	R

Call Sign: E190617 **File Number:** SES-REG-20180911-04284
Licensee: SMG-Redding, LLC
ATTN: Mr David P Stephens
Phone: 918-492-2660 Fax: E-Mail: david.stephens@smgok.com
Counsel: Cooley LLP
ATTN:
Phone: 202-776-2687 Fax: E-Mail:

Distance	Latitude	Site Address/	Elevation	Frequency Lo/

Distance	Longitude		Contact Information	AMSL	Frequency Hi	
32.39	40° 33' 30.2" N 122° 19' 50.1" W	NAD83	3360 Alta Mesa Drive Redding, CA Duane Davis 530-226-9500	163.68	00003700.00000000 00004200.00000000	R

Call Sign: E100107 **File Number:** SES-LIC-20100928-01201
Licensee: Pacific Cascade Communications Corporation
ATTN: PAUL BROWN
Phone: 530-222-4455 x Fax: 530-222-4484 E-Mail: pbrown@kvip.org
Counsel: PACIFIC CASCADE COMMUNICATIONS CORPORATION
ATTN:
Phone: 530-222-4455 x Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
33.05	40° 33' 46.5" N 122° 21' 0.0" W	NAD83	1139 HARTNELL AVENUE REDDING, CA PAUL E. BROWN 530-222-4455	164.0	00000011700.00000 00000012200.00000	R
					00000014000.00000 00000014500.00000	T

Call Sign: E190701 **File Number:** SES-REG-20180910-04372
Licensee: Pacific Cascade Communications Corporation
ATTN: Paul E Brown
Phone: 530-222-4455 Fax: 530-222-4484 E-Mail: pbrown@kvip.org
Counsel: SAME AS APPLICANT
ATTN:
Phone: 530-222-4455 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
33.05	40° 33' 46.5" N 122° 21' 0.0" W	NAD83	1139 Hartnell Avenue Redding, CA Paul E. Brown 530-222-4455	165.4	00003700.00000000 00004200.00000000	R

Call Sign: E040432 **File Number:** SES-RWL-20190904-01142
Licensee: Sinclair Media Licensee, LLC
ATTN: Mr Harvey Arnold
Phone: 410-568-1500 Fax: E-Mail: FCCContacts@sbgtv.com
Counsel: Lerman Senter PLLC
ATTN:
Phone: 202-416-6756 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
33.46	40° 35' 14.0" N 122° 22' 47.0" W	NAD83	755 AUDITORIUM DRIVE REDDING, CA JEFF KNOTT 530-243-7777	149.41	00003700.00000000 00004200.00000000	R

Call Sign: E180819 **File Number:** SES-REG-20180613-01434
Licensee: Sinclair Media Licensee, LLC
ATTN: Mr. Harvey Arnold
Phone: 410-568-1500 Fax: E-Mail: harnold@sbgtv.com
Counsel: SAME AS APPLICANT
ATTN:
Phone: 410-568-1500 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
33.51	40° 35' 14.0" N 122° 22' 51.0" W	NAD83	755 Auditorium Drive Redding, CA Bob Ashurst 530-243-7777	150.16	00003700.00000000 00004200.00000000	R

Call Sign: E180286 **File Number:** SES-REG-20180511-00653
Licensee: Fox Broadcasting Company
ATTN: Alastair Hamilton
Phone: 310-369-6644 Fax: E-Mail:
Counsel: SAME AS APPLICANT
ATTN:
Phone: 310-369-6644 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
33.52	40° 35' 14.0" N 122° 22' 51.9" W	NAD83	755 Auditorium Drive Redding, CA Bob Ashurt 530-722-6401	160.16	00003700.00000000 00004200.00000000	R

Call Sign: E030157 **File Number:** SES-RWL-20180606-00992
Licensee: Spectrum Pacific West, LLC
ATTN: Alexis Anderten

Phone: (303) 323-1423 Fax: E-Mail: CharterFCC@charter.com

Counsel: CHARTER COMMUNICATIONS
ATTN:
Phone: 3033231423 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
36.86	40° 29' 44.0" N 122° 22' 26.0" W	NAD83	7203 Sands Ln Anderson, CA Jim Schneringer 530-241-1591	151.18	00003700.00000000 00004200.00000000	R

Call Sign: E200880 **File Number:** SES-REG-20181016-06191

Licensee: Velocity Communications, Inc.
ATTN: Travis Finch
Phone: 530-623-3550 x3005 Fax: E-Mail: tf@velotech.net

Counsel: SAME AS APPLICANT
ATTN:
Phone: 530-623-3550 x3005 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
58.03	40° 44' 8.26" N 122° 55' 49.7" W	NAD83	121 Horseshoe Lane Weaverville, CA Travis Finch 530-623-3550	647.0	00003700.00000000 00004200.00000000	R

Call Sign: E000463 **File Number:** SES-RWL-20100620-00735

Licensee: Fox Broadcasting Company
ATTN: Paul F Beeman
Phone: 631-951-4923 Fax: 631-951-4925 E-Mail:

Counsel: SKADDEN, ARPS, SLATE, MEAGHER & FLOM LLP
ATTN:
Phone: 202-371-7574 Fax: E-Mail:

Distance	Latitude Longitude		Site Address/ Contact Information	Elevation AMSL	Frequency Lo/ Frequency Hi	
60.5	39° 57' 44.6" N 121° 42' 47.9" W	NAD83	300 MAIN STREET CHICO, CA ALAN TOMPKINS 530-893-1234	1082.04	00003700.00000000 00004200.00000000	R