

**ENGINEERING EXHIBIT  
IN SUPPORT OF AN  
AMENDMENT TO AN  
APPLICATION FOR CONSTRUCTION PERMIT  
FCC FILE NO. BP-20210723AAI  
WIZZ – GREENFIELD, MASSACHUSETTS  
1520 kHz – 1.0 kW DAY/0.16 KW CRITICAL HOURS - ND-2  
FACILITY ID: 54779**

Applicant: Saga Communications of New England, LLC

November, 2021



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FCC Form 301 - Section III

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ENGINEERING STATEMENT OF CYNTHIA M. JACOBSON, P.E.  
IN SUPPORT OF AN  
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APPLICATION FOR CONSTRUCTION PERMIT  
FCC FILE NO. BP-20210723AAI  
WIZZ – GREENFIELD, MASSACHUSETTS  
1520 kHz – 1.0 kW DAY/0.16 kW CRITICAL HOURS – ND-2  
Facility ID: 54779

Applicant: Saga Communications of New England, LLC

I am a Consulting Engineer, an employee in the firm of Carl T. Jones Corporation, with offices located in Springfield, Virginia. My education and experience are a matter of record with the Federal Communications Commission. I am a Registered Professional Engineer in the Commonwealth of Virginia, Registration No. 0402027914.

GENERAL

This office has been authorized by Saga Communications of New England, LLC (“Saga”), proposed assignee of Standard Broadcast Station WIZZ, Greenfield, Massachusetts to prepare this Engineering Statement, FCC Form 301 (Section III), and the attached figures in support of an amendment to an Application for Construction Permit, FCC File No. BP-20210723AAI, to diplex with co-owned AM station WHMQ-1240 kHz, Greenfield, Massachusetts. This amendment seeks to reduce the Critical Hours

power level from 0.35 kW to 0.16 kW at the request of the FCC<sup>1</sup>. No other changes are proposed.

WIZZ is a Class D station, presently licensed to operate on 1520 kHz with a power of 10.0 kW day while employing a directional antenna.

WHMQ is licensed to operate on 1240 kHz with a daytime power of 1.0 kW daytime and nighttime using a nondirectional antenna.

The instant application proposes to co-locate WIZZ at the WHMQ site. The WHMQ site is located approximately 1.9 kilometers away at a bearing of 212 degrees True from the licensed WIZZ site. It is proposed to operate with a nondirectional antenna at a daytime power of 1.0 kW and a critical hours power of 0.16 kW.

#### ANTENNA SYSTEM AND GROUND SYSTEM

The proposed WIZZ nondirectional antenna is an existing, self-supporting, tapered, series fed tower, 83.5 electrical degrees in height, corresponding to a radiator height of 45.7 meters.

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<sup>1</sup> The content in all of the Figures have been modified with the exception of Figures 6, 6A, 6B and 6C in which only the title block on the figure has been amended.

The ground system consists of 140 evenly spaced, buried, copper wire radials about the base of the tower. The radials are 62.2 meters (0.32 wavelength at 1520 kHz) in length.

#### FAA NOTIFICATION AND TOWER REGISTRATION

The overall height of the existing antenna structure is 47.0 meters AGL. Since WIZZ is proposing to utilize an existing tower structure without physical modification, it is believed that no further notification to the Federal Aviation Administration (FAA) is necessary. The proposed transmitting antenna is an unregistered tower structure.

#### SITE AND SURROUNDING TERRAIN

The proposed antenna/transmitter location and surrounding terrain characteristics are contained in the FCC's files for WHMQ. The tower coordinates (NAD-27) for the proposed WIZZ non-directional operation are:

North Latitude: 42 - 35 - 20  
West Longitude: 72 - 37 - 05

### BLANKETING AND STATION INTERACTION

The population within the proposed WIZZ 1000 mV/m daytime and critical hours contour is less than 300 persons. The proposed 1000 mV/m contours are shown in Figure 1 as amended.

In response to all legitimate complaints of blanketing interference, the applicant will undertake steps to mitigate the interference in accordance with the requirements of Section 73.88 of the Commission’s Rules and Regulations.

There are no AM stations located within 3.2 kilometers of the proposed site with the exception of the host AM station, WHMQ. There are three licensed full-service FM stations and six licensed translator/low power FM stations located within 10 kilometers of the proposed site. There is are no TV stations located within the 10 kilometers.

It is expected that no detrimental interaction will occur with any other station as a result of the grant of the instant application. Filter circuits will be installed to minimize any interaction with co-located station WHMQ.

### COVERAGE CONTOURS

The amended Figure 2 depicts the present and proposed 25 mV/m daytime and critical hours contours.

The present and proposed 5.0 mV/m daytime and critical hours service contours are shown on the map of Figure 3, as amended. The proposed daytime 5.0 mV/m contour

will encompass 95.7% of the population and 81.6% of the area of the city of license, Greenfield, Massachusetts. The proposed critical hours 5.0 mV/m contour will encompass 82.0% of the population and 51.4% of the area of the city of license, Greenfield, Massachusetts. Therefore, the requirements of Section 73.24(i) are fully satisfied.

The proposed predicted 2.0 mV/m and 0.5 mV/m daytime and critical hours contours are shown on the amended Figures 4 and 5, respectively.

#### DAYTIME ALLOCATION STUDY

The results of the daytime allocation study are shown in Figure 6 as amended. Five stations/authorizations are considered in the daytime allocation. These stations are:

WINQ	1490 kHz	Brattleboro, Vermont;
WMEX	1510 kHz	Quincy, Massachusetts;
WTHE	1520 kHz	Mineola, New York;
WWKB	1520 kHz	Buffalo, New York; and
WTHE-CP	1530 kHz	Mineola, New York.

The distances to all groundwave contours were calculated using the equivalent distance method. Contours were calculated at 5 degree intervals using ground conductivity values shown on the FCC's M-3 soil conductivity map. Tabulations of

distances to groundwave contours and conductivity profiles are not included herein, but can be provided upon request.

Amended Figure 6 depicts the entire daytime allocation picture of those affected stations. A further breakdown of each channel relationship follows, along with the corresponding maps depicting the pertinent contours.

#### CO-CHANNEL PROTECTION

As depicted on the map of amended Figure 6A, there is no current overlap of the licensed WIZZ 0.025 mV/m interfering contour with the 0.5 mV/m protected contour of WTHE. Likewise there is no existing overlap of the licensed WIZZ 0.5 mV/m protected contour with the 0.025 mV/m interfering contour of WTHE. The proposal as described herein (represented by dashed contour lines on the map) will not result in the creation of any overlap.

WWKB is a domestic Class A station on 1520 kHz. Neither the present nor the proposed 0.005 mV/m interfering contour of WIZZ will overlap the 0.1 mV/m protected contour of WWKB. Likewise there is no existing overlap of the licensed WIZZ 0.5 mV/m protected contour with the 0.025 mV/m interfering contour of WWKB as shown in amended Figure 6A.

FIRST-ADJACENT CHANNEL PROTECTION

The map of amended Figure 6B depicts the 0.25 mV/m interfering and 0.5 mV/m protected contours of WIZZ along with those of WMEX and the construction permit (“CP”) authorization of WTHE. There is no existing or proposed prohibited overlap between WIZZ and WMEX or WTHE(CP).

SECOND-ADJACENT CHANNEL PROTECTION

There are no second-adjacent stations of concern that would require consideration.

THIRD-ADJACENT CHANNEL PROTECTION

The map of amended Figure 6C depicts the present and proposed 25.0 mV/m interfering/protected contours of WIZZ along with the 25.0 mV/m interfering/protected contours of WINQ. No overlap currently exists between the stations nor is any overlap proposed.

CRITICAL HOURS ALLOCATION STUDY

The present WIZZ radiation during Critical Hours is exceeded towards the 0.1 mV/m contour of WWKB, Buffalo, New York at the applicable vertical angles. The proposed WIZZ critical hours mode will reduce the net overlap towards WWKB within the

arc of concern. The present average margin towards WWKB is -111.8 mV/m while the median average is -126.2 mV/m. The proposed average will be -104.4 mV/m while the median average will be -114.9 mV/m. Thus, an overall decrease in overlap results with the proposal of WIZZ when compared to the present facilities of WIZZ.

The other Class A station of interest is KOKC, Oklahoma City, Oklahoma. The maximum radiation permitted towards KOKC is 1560.7 mV/m at an azimuth of 263 degrees from the proposed WIZZ facility. The proposed radiation is 120.6 mV/m, or 1440.0 mV/m less than the maximum permitted radiation. The results of the critical hours study are shown in Figure 7 as amended.

#### ENVIRONMENTAL IMPACT

The proposal described herein does not involve high intensity lighting as specified under Section 1.1307(a)(8), nor will it result in human exposure to radio-frequency radiation in excess of the standards specified in Section 1.1307(b). The applicant has determined that under the provisions of Section 1.1306, the proposal is excluded from environmental processing because no new construction will occur.

#### RADIO-FREQUENCY IMPACT

On January 1, 1986, the FCC amended its Rules to implement the National Environmental Policy Act of 1969 (NEPA). This amendment established RF radiation

protection guidelines to be used to determine if potentially harmful RF exposure is possible from an FCC-regulated transmission facility. Effective October 15, 1997, the FCC adopted revised guidelines and procedures for evaluating environmental effects of RF emissions. These revised guidelines incorporate two tiers of exposure limits based on whether exposure occurs in a “controlled” (occupational) situation or an “uncontrolled” (general population) situation. The FCC has also revised OET Bulletin No. 65 entitled, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields,” to aid the radiation exposure analysis. This bulletin, as well as other current literature, provides detailed information for conducting an analysis including mathematical equations that can be used to determine compliance with the Commission’s guidelines.

The proposed WIZZ facility will be co-located with the 1240 kHz operation of WHMQ, thus the proposed site is considered a multiple-use site.

#### CALCULATION METHODS

Verification of compliance with FCC specified guidelines for human exposure to RF radiation was obtained from OET Bulletin No. 65.

The proposed WIZZ facility will operate on 1520 kHz with a daytime power level of 1.0 kW and a critical hours power level of 0.16 kW. The electrical height of the tower at 1520 kHz is 0.23 wavelength.

The existing WHMQ facility operates on 1240 kHz with a daytime and nighttime power of 1.0 kW. At WHMQ's frequency of 1240 kHz, the antenna height is 0.19 wavelength. The daytime operating modes for both stations represent a worst-case total power of 2.0 kW.

To determine distance to compliance with the guidelines, Tables 1 and 2 of Supplement A (Edition 97-01) to OET Bulletin 65 was used. Interpolating for a worst case of 0.19 wavelength at 2.0 kW, a fence of 2.2 meters from the base of the tower would be compliant with the radio-frequency energy requirements of the FCC regarding the occupational/controlled and the general population/uncontrolled MPE limits. Any existing fencing around the base of the tower will be expanded if necessary to meet the requirements.

It is submitted that the proposed WIZZ station and the WHMQ station will not constitute a potential hazard to the quality of the human environment. Accordingly, the WIZZ proposal, as described herein, should be categorically excluded from RF environmental processing under Section 1.1307(b) of the Rules.

#### OCCUPATIONAL SAFETY

Access to the area immediately surrounding the WIZZ supporting tower base will be restricted to authorize maintenance personnel only. WIZZ ensures protection to station personnel or tower contractors working in the vicinity of the tower. Procedures will

be followed during times of service or maintenance of the transmission systems when necessary to avoid potentially harmful exposure to personnel.

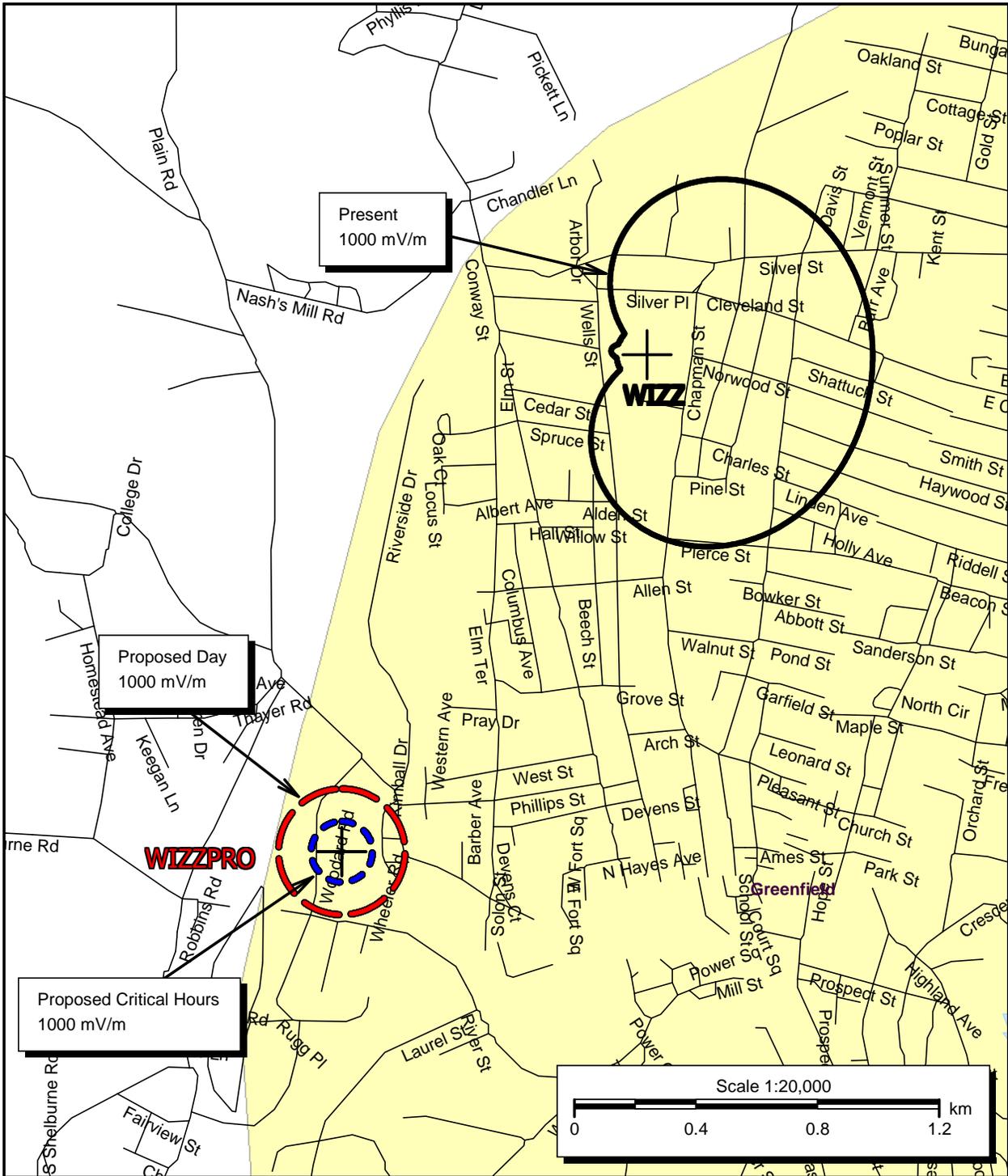
CONCLUSION

This statement and Section III of FCC Form 301 and the attached figures were prepared by me or under my direct supervision and are believed to be true and correct.

It is submitted that the proposed operation described herein complies with the technical standards of the Rules and Regulations of the Commission.

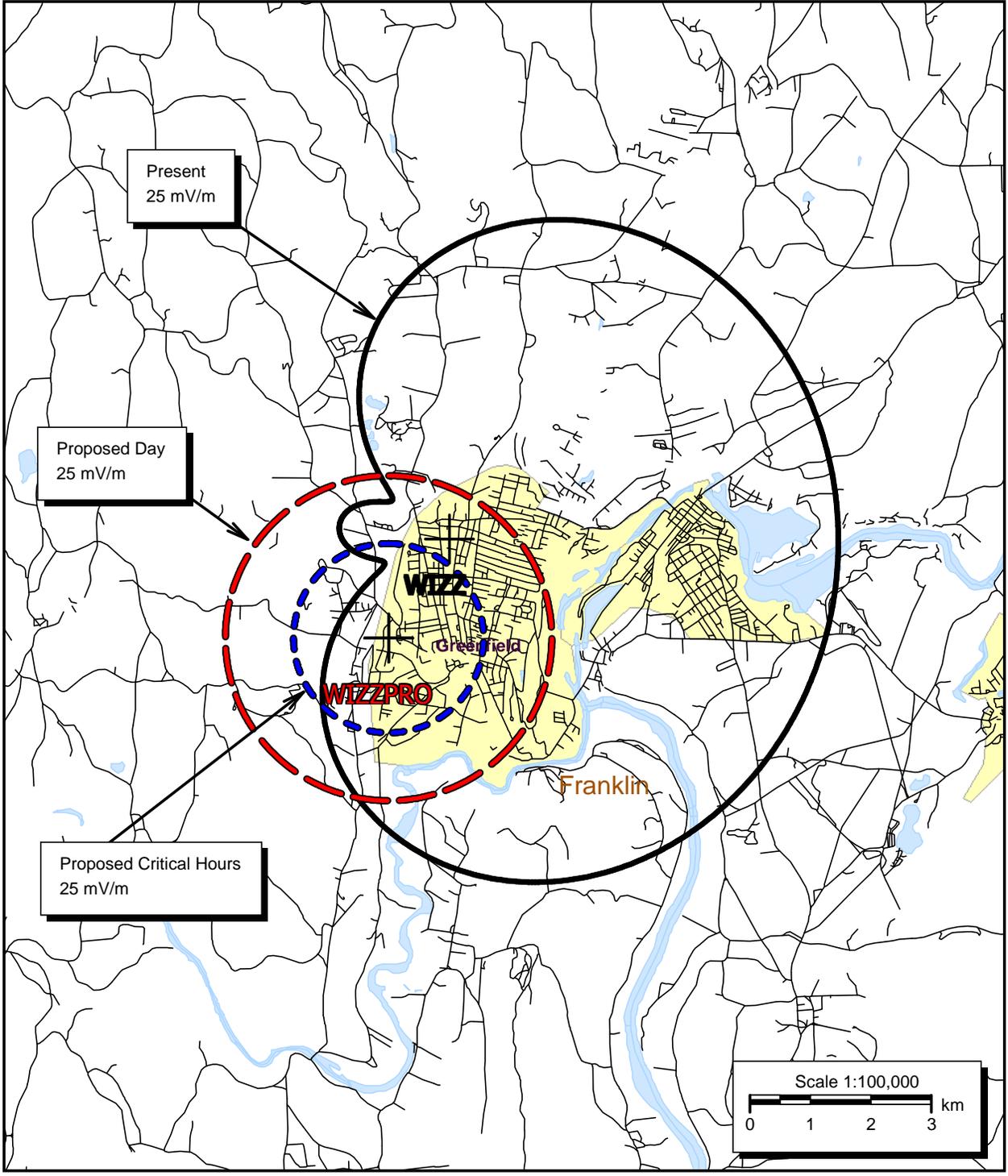
DATED: November 8, 2021





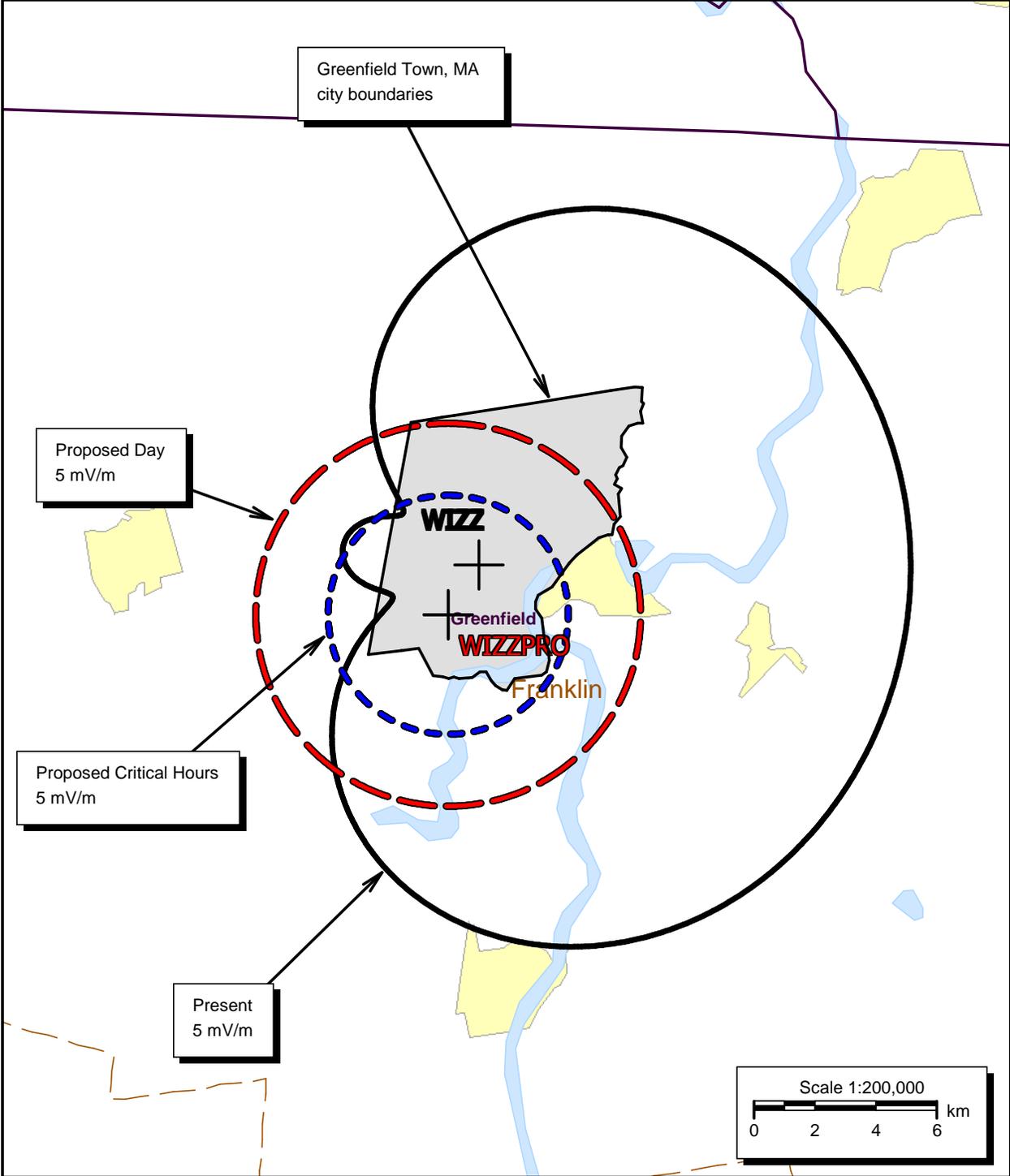
PRESENT AND PROPOSED 1000 MV/M  
 DAYTIME & CRITICAL HOURS COVERAGE CONTOURS  
 WIZZ - 1520 KHZ - GREENFIELD, MASSACHUSETTS  
 PRESENT: 10 KW DAY - DA-D  
 PROPOSED: 1.0 KW DAY/0.16 KW CRITICAL HOURS - ND-2  
 NOVEMBER, 2021





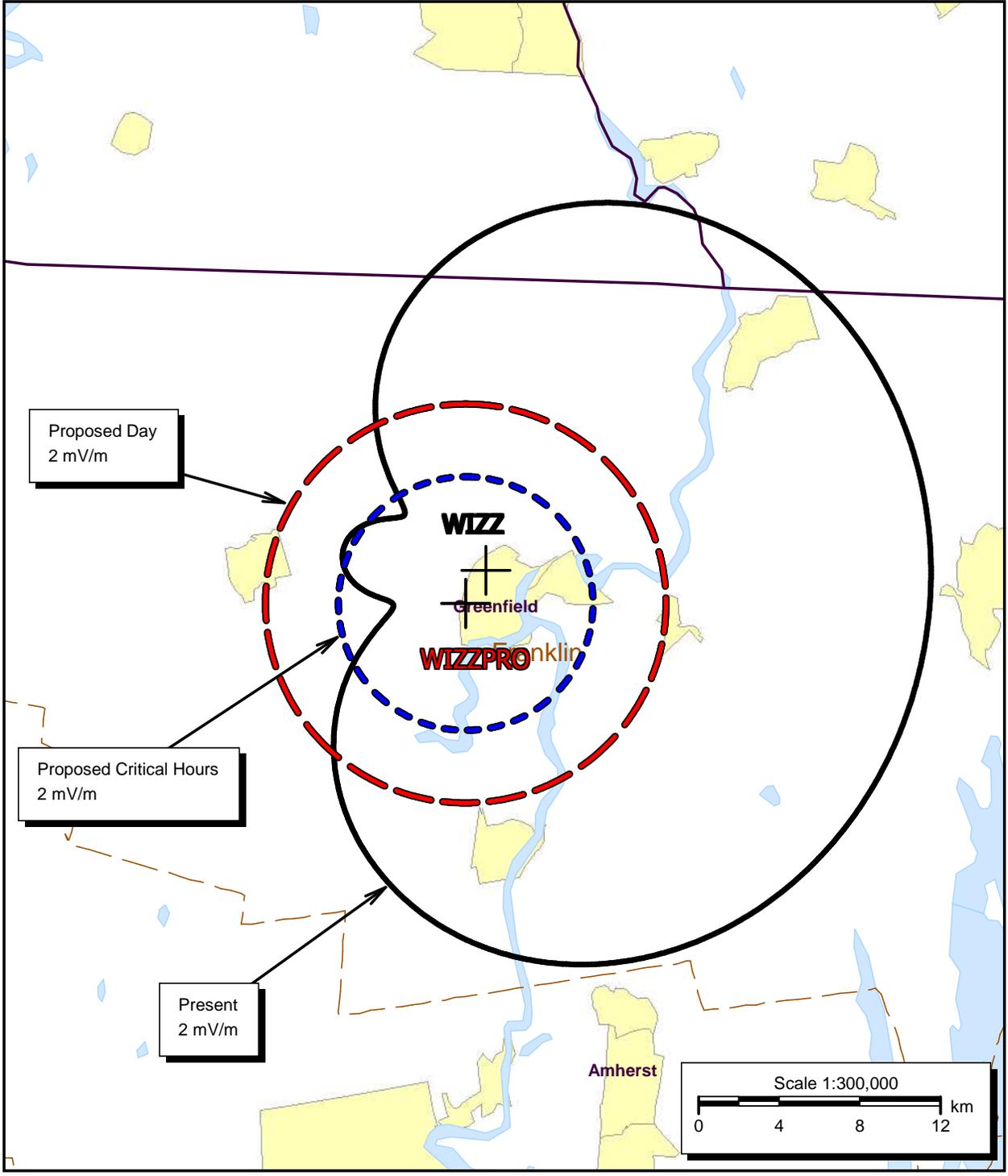
PRESENT AND PROPOSED 25 MV/M  
DAYTIME & CRITICAL HOURS COVERAGE CONTOURS  
WIZZ - 1520 KHZ - GREENFIELD, MASSACHUSETTS  
PRESENT: 10 KW DAY - DA-D  
PROPOSED: 1.0 KW DAY/0.16 KW CRITICAL HOURS - ND-2  
NOVEMBER, 2021





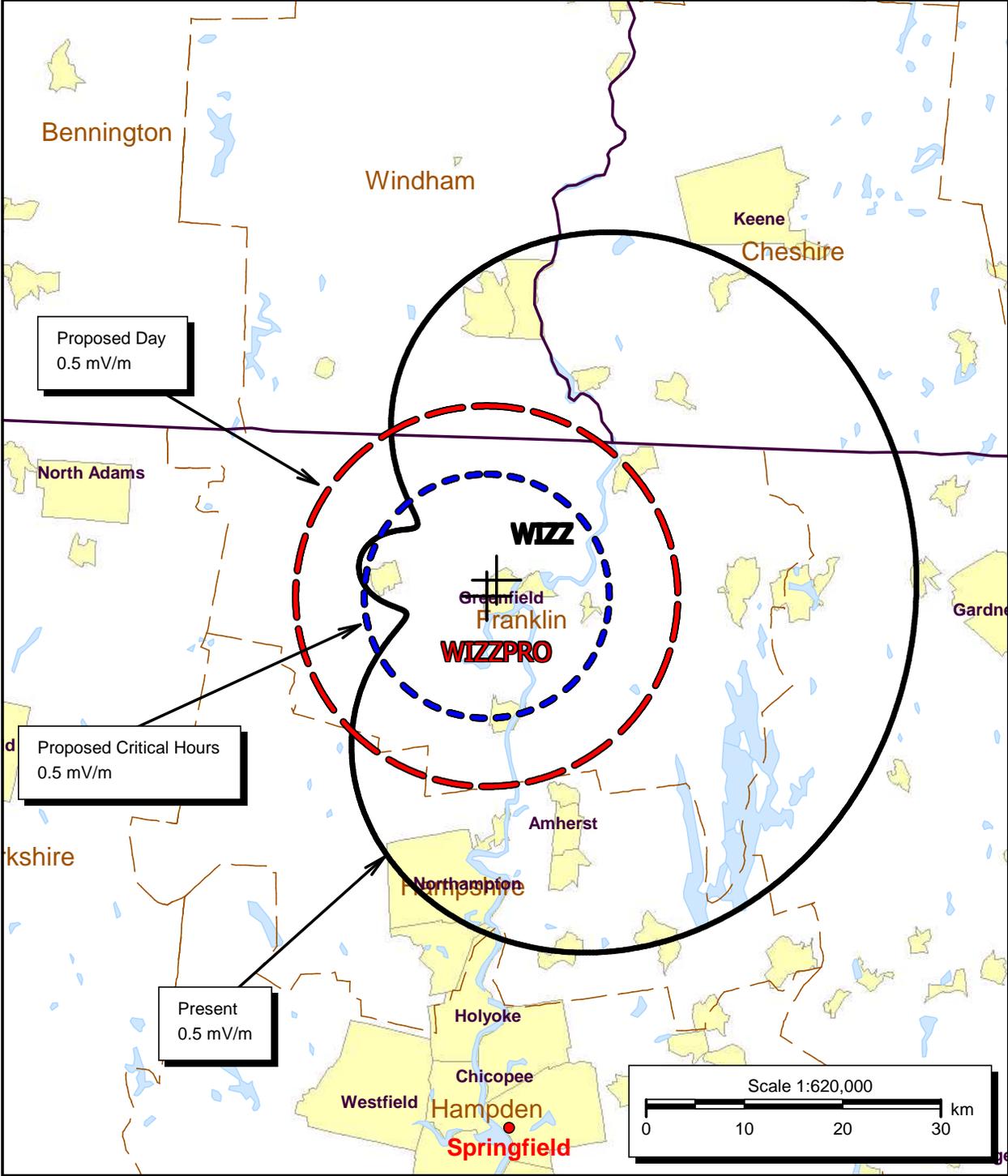
PRESENT AND PROPOSED 5.0 MV/M  
DAYTIME & CRITICAL HOURS COVERAGE CONTOURS  
WIZZ - 1520 KHZ - GREENFIELD, MASSACHUSETTS  
PRESENT: 10 KW DAY - DA-D  
PROPOSED: 1.0 KW DAY/0.16 KW CRITICAL HOURS - ND-2  
NOVEMBER, 2021





PRESENT AND PROPOSED 2.0 MV/M  
DAYTIME & CRITICAL HOURS COVERAGE CONTOURS  
WIZZ - 1520 KHZ - GREENFIELD, MASSACHUSETTS  
PRESENT: 10 KW DAY - DA-D  
PROPOSED: 1.0 KW DAY/0.16 KW CRITICAL HOURS - ND-2  
NOVEMBER, 2021

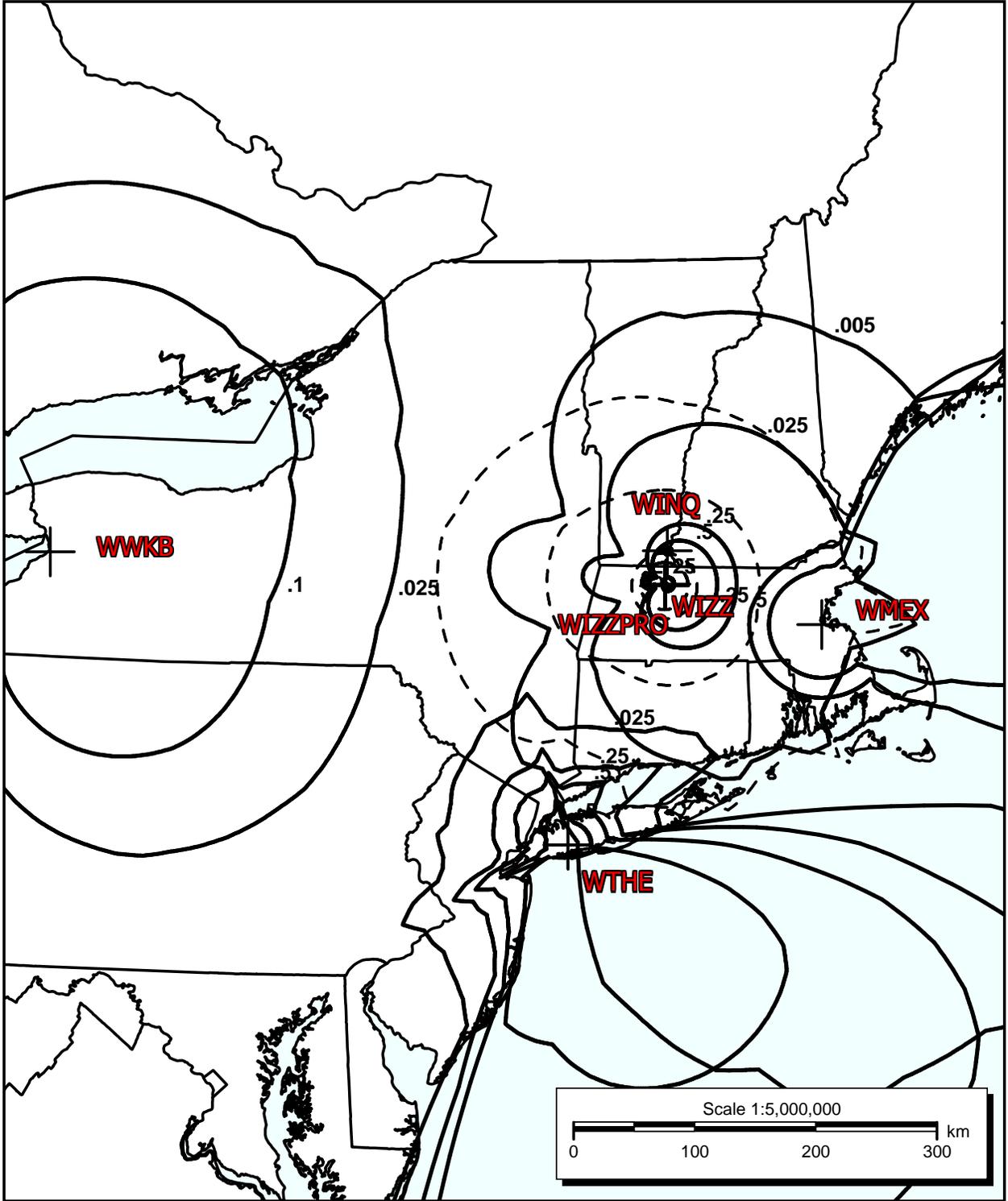




PRESENT AND PROPOSED 0.5 MV/M  
DAYTIME & CRITICAL HOURS COVERAGE CONTOURS  
WIZZ - 1520 KHZ - GREENFIELD, MASSACHUSETTS  
PRESENT: 10 KW DAY - DA-D  
PROPOSED: 1.0 KW DAY/0.16 KW CRITICAL HOURS - ND-2  
NOVEMBER, 2021



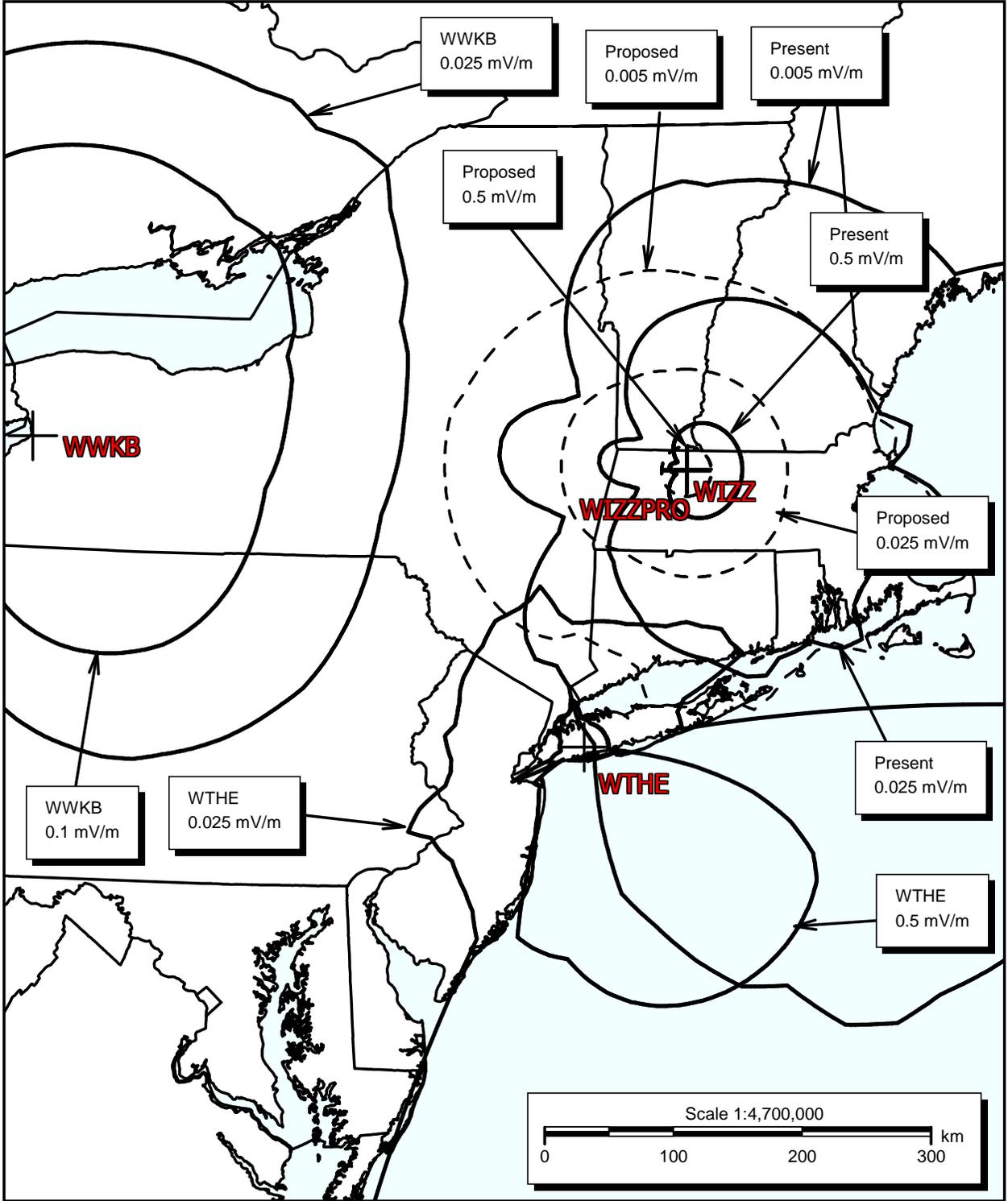
AMENDED FIGURE 6



DAYTIME ALLOCATION STUDY  
WIZZ - GREENFIELD, MASSACHUSETTS  
1520 KHZ - 1.0 KW DAY/0.16 KW CRITICAL HOURS - ND-2  
NOVEMBER, 2021



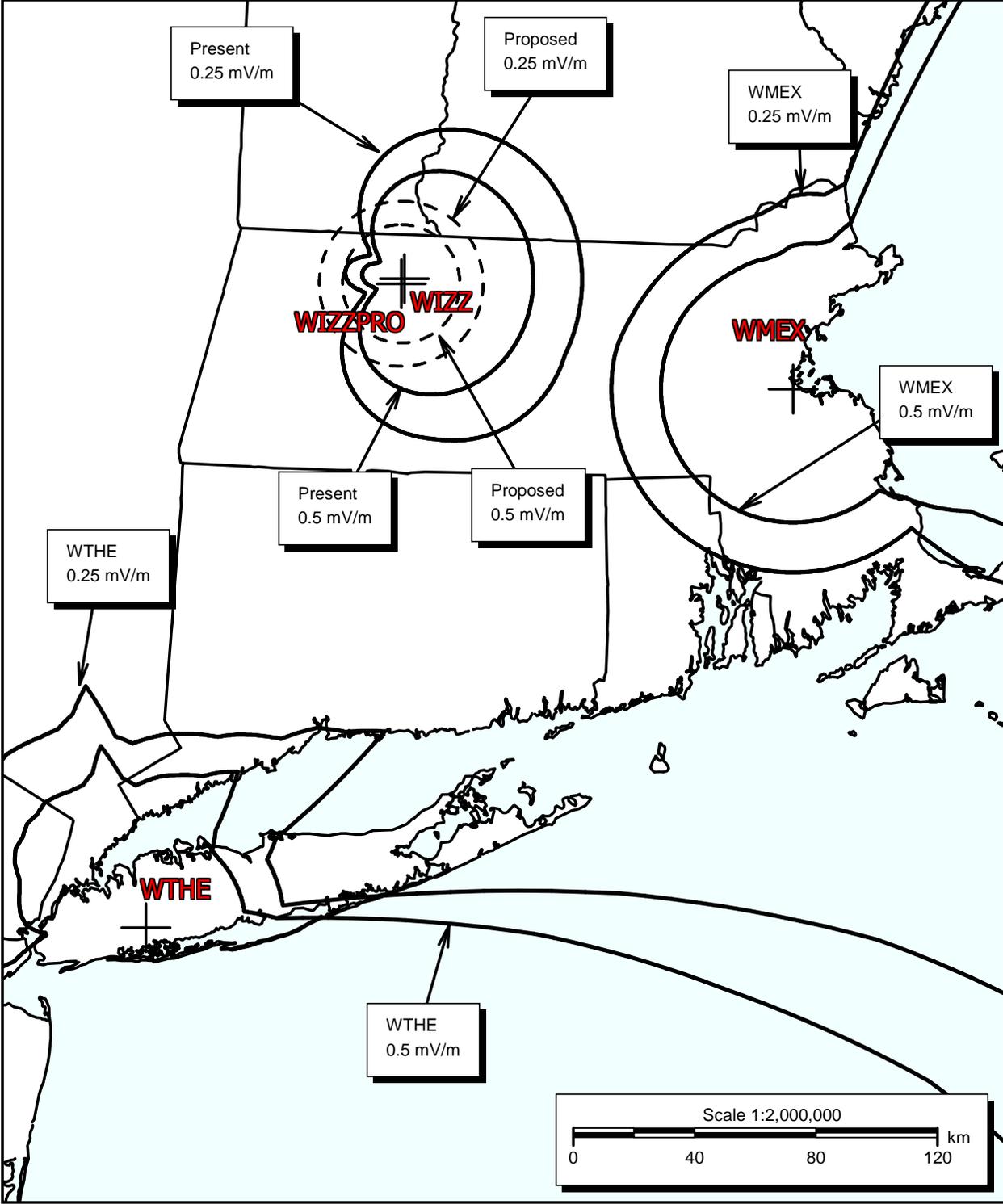
AMENDED FIGURE 6A



DAYTIME ALLOCATION STUDY  
CO-CHANNEL STATIONS  
WIZZ - GREENFIELD, MASSACHUSETTS  
1520 KHZ - 1.0 KW DAY/0.16 KW CRITICAL HOURS - ND-2  
NOVEMBER, 2021

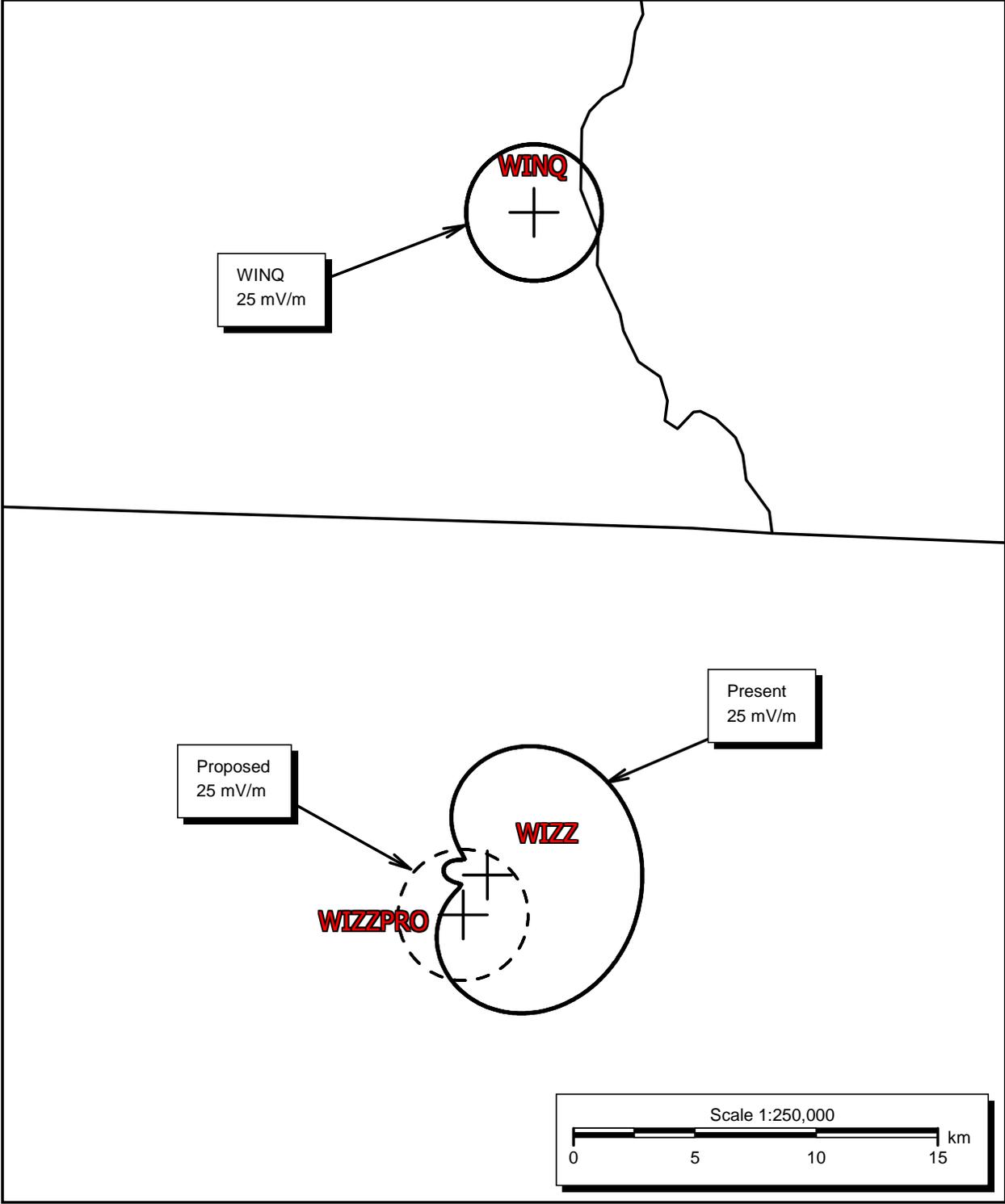


AMENDED FIGURE 6B



DAYTIME ALLOCATION STUDY  
FIRST-ADJACENT CHANNEL STATIONS  
WIZZ - GREENFIELD, MASSACHUSETTS  
1520 KHZ - 1.0 KW DAY/0.16 KW CRITICAL HOURS - ND-2  
NOVEMBER, 2021





DAYTIME ALLOCATION STUDY  
THIRD-ADJACENT CHANNEL STATIONS  
WIZZ - GREENFIELD, MASSACHUSETTS  
1520 KHZ - 1.0 KW DAY/0.16 KW CRITICAL HOURS - ND-2  
NOVEMBER, 2021



Critical Hours Radiation Report

Call: **WIZZ - LICENSED**

Freq: 1520 kHz

GREENFIELD, MA, US

Hours: D

Lat: 42-36-12 N

Lng: 072-36-21 W

Power: 10.0 kW - Custom Q Value Used: 31.623

Theo RMS: 1014.21 mV/m @ 1km @ 10.0 kW

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	109.0	0	0	0.0	0.0	0.0	0.0
2	0.920	100.0	90.0	277.0	109.0	0	0	0.0	0.0	0.0	0.0

Call: WWKB

Freq: 1520 kHz

BUFFALO, NY, US

Hours: U

Lat: 42-46-10 N

Lng: 078-50-34 W

Power: 50.0 kW

Theo RMS: 2776.12 mV/m @ 1km @ 50.0 kW

# of Augmentations: 15

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	136.0	0.0	0.0	194.7	0	0	0.0	0.0	0.0	0.0
2	1.995	69.6	120.0	77.0	194.7	0	0	0.0	0.0	0.0	0.0
3	1.000	0.0	120.0	77.0	194.7	1	0	0.0	0.0	0.0	0.0

Permissible radiation calculated using US/CA agreement formula.  
Calculations performed using distance to the class A station's 0.1 mV/m contour.

Class A Azimuth (deg)	Reference Azimuth (deg)	Distance to 0.1 mV (km) / (mi)	Max Vert Angle (deg)	Max Rad Below Ang (mV/m@1km)	Permiss Radiation (mV/m@1km)	Margin (mV/m@1km)	
143.51	253.00	426.4 / 265.0	23.2	82.62	93.8	11.1	
135.57	254.00	400.7 / 249.0	24.6	83.07	70.6	-12.5	
131.01	255.00	386.9 / 240.4	25.5	87.23	58.2	-29.0	
127.45	256.00	376.9 / 234.2	26.1	91.73	49.2	-42.5	
124.41	257.00	369.0 / 229.3	26.6	96.43	42.1	-54.3	
121.69	258.00	362.5 / 225.2	27.0	101.24	36.2	-65.0	
119.19	259.00	356.9 / 221.8	27.4	106.05	31.2	-74.8	
116.86	260.00	352.2 / 218.8	27.7	110.80	26.9	-83.9	
114.66	261.00	348.1 / 216.3	28.0	115.44	23.3	-92.2	
112.54	262.00	344.5 / 214.1	28.3	119.93	20.0	-99.9	
110.51	263.00	341.4 / 212.1	28.5	124.22	17.2	-107.0	
108.53	264.00	338.7 / 210.4	28.7	128.30	14.8	-113.5	
106.60	265.00	336.3 / 209.0	28.9	132.13	12.7	-119.5	
104.71	266.00	334.3 / 207.7	29.1	135.71	10.9	-124.8	
102.86	267.00	332.6 / 206.7	29.2	139.01	9.3	-129.7	
101.02	268.00	331.1 / 205.8	29.3	142.03	8.0	-134.0	
99.20	269.00	329.9 / 205.0	29.4	144.76	6.9	-137.8	
97.33	270.00	327.7 / 203.6	29.6	147.17	4.9	-142.2	
95.39	271.00	323.4 / 200.9	29.9	149.28	1.0	-148.3	
93.62	272.00	321.1 / 199.5	30.1	151.07	-1.0	-152.1	**
91.91	273.00	319.2 / 198.3	30.2	152.55	-2.7	-155.3	**
90.25	274.00	317.9 / 197.5	30.4	153.69	-3.9	-157.6	**
88.62	275.00	316.9 / 196.9	30.4	154.52	-4.8	-159.3	**
87.01	276.00	316.2 / 196.5	30.5	155.01	-5.4	-160.4	**
85.42	277.00	315.8 / 196.2	30.5	155.17	-5.8	-161.0	**
83.84	278.00	315.6 / 196.1	30.5	155.01	-5.9	-160.9	**
82.27	279.00	315.8 / 196.2	30.5	154.52	-5.8	-160.3	**
80.73	280.00	315.9 / 196.3	30.5	153.69	-5.7	-159.4	**
79.31	281.00	314.8 / 195.6	30.6	152.55	-6.7	-159.3	**
77.92	282.00	313.9 / 195.1	30.7	151.07	-7.5	-158.5	**
76.41	283.00	314.8 / 195.6	30.6	149.28	-6.7	-156.0	**
74.77	284.00	316.9 / 196.9	30.4	147.17	-4.8	-151.9	**
73.08	285.00	319.4 / 198.5	30.2	144.76	-2.6	-147.3	**
71.35	286.00	322.1 / 200.2	30.0	142.03	-0.1	-142.1	**
69.69	287.00	324.5 / 201.6	29.8	139.01	2.0	-137.0	
68.40	288.00	324.6 / 201.7	29.8	135.71	2.1	-133.6	
67.11	289.00	324.9 / 201.9	29.8	132.13	2.4	-129.7	
66.00	290.00	324.5 / 201.6	29.8	128.30	2.1	-126.2	
64.62	291.00	326.1 / 202.6	29.7	124.22	3.4	-120.8	
63.39	292.00	326.9 / 203.1	29.6	119.93	4.2	-115.7	
61.80	293.00	330.1 / 205.1	29.4	115.44	7.1	-108.4	
59.76	294.00	335.7 / 208.6	29.0	110.80	12.1	-98.7	
58.14	295.00	339.2 / 210.7	28.7	106.05	15.2	-90.8	

Class A Azimuth (deg)	Reference Azimuth (deg)	Distance to 0.1 mV (km) / (mi)	Max Vert Angle (deg)	Max Rad Below Ang (mV/m@1km)	Permiss Radiation (mV/m@1km)	Margin (mV/m@1km)
56.50	296.00	343.0 / 213.1	28.4	101.24	18.7	-82.6
54.80	297.00	347.3 / 215.8	28.1	96.43	22.5	-73.9
53.07	298.00	351.9 / 218.7	27.8	91.73	26.7	-65.0

\*\* Indicates that the distance was out of the range of the CA/US agreement permissible radiation formula. The calculated permissible radiation is invalid.

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 Call: KOKC  
 Freq: 1520 kHz  
 OKLAHOMA CITY, OK, US  
 Hours: D  
 Lat: 35-20-00 N  
 Lng: 097-30-16 W  
 Power: 50.0 kW  
 Theo RMS: 383.02 mV/m @ 1km @ 1kW

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	181.0	0	0	0.0	0.0	0.0	0.0

Permissible radiation calculated using US/CA agreement formula.  
 Calculations performed using distance to the class A station's 0.1 mV/m contour.

Class A Azimuth (deg)	Reference Azimuth (deg)	Distance to 0.1 mV (km) / (mi)	Max Vert Angle (deg)	Max Rad Below Ang (mV/m@1km)	Permiss Radiation (mV/m@1km)	Margin (mV/m@1km)
145.14	250.00	2277.0 / 1414.8	0.0	73.42	1759.3	1685.9
126.86	251.00	2189.9 / 1360.8	0.1	74.38	1680.9	1606.6
115.79	252.00	2149.9 / 1335.9	0.2	76.44	1644.9	1568.5
103.61	253.00	2108.8 / 1310.3	0.4	79.41	1607.9	1528.5
93.05	254.00	2078.2 / 1291.3	0.6	83.07	1580.4	1497.3
84.34	255.00	2062.4 / 1281.5	0.7	87.23	1566.2	1479.0
76.59	256.00	2062.0 / 1281.3	0.7	91.73	1565.8	1474.1
68.14	257.00	2059.9 / 1280.0	0.7	96.43	1563.9	1467.5
59.49	258.00	2060.6 / 1280.4	0.7	101.24	1564.6	1463.3
50.47	259.00	2069.7 / 1286.1	0.6	106.05	1572.8	1466.7
42.03	260.00	2071.3 / 1287.0	0.6	110.80	1574.1	1463.3
33.64	261.00	2079.3 / 1292.0	0.6	115.44	1581.4	1466.0
28.90	262.00	2065.6 / 1283.5	0.6	119.93	1569.1	1449.1

Class A Azimuth (deg)	Reference Azimuth (deg)	Distance to 0.1 mV (km)/ (mi)	Max Vert Angle (deg)	Max Rad Below Ang (mV/m@1km)	Permiss Radiation (mV/m@1km)	Margin (mV/m@1km)
24.45	263.00	2058.5 / 1279.1	0.7	124.22	1562.6	1438.4
15.19	264.00	2093.2 / 1300.7	0.5	128.30	1593.9	1465.6
4.77	265.00	2137.5 / 1328.2	0.3	132.13	1633.8	1501.6
352.55	266.00	2197.5 / 1365.5	0.0	135.71	1687.8	1552.1

Call: **WIZZ - PROPOSED**

Freq: 1520 kHz  
GREENFIELD, MA, US  
Hours: C  
Lat: 42-35-20 N  
Lng: 072-37-05 W  
Power: 0.16 kW  
Theo RMS: 301.61 mV/m @ 1km @ 1kW

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	83.5	0	0	0.0	0.0	0.0	0.0

Call: WWKB

Freq: 1520 kHz  
BUFFALO, NY, US  
Hours: U  
Lat: 42-46-10 N  
Lng: 078-50-34 W  
Power: 50.0 kW  
Theo RMS: 2776.12 mV/m @ 1km @ 50.0 kW  
# of Augmentations: 15

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	136.0	0.0	0.0	194.7	0	0	0.0	0.0	0.0	0.0
2	1.995	69.6	120.0	77.0	194.7	0	0	0.0	0.0	0.0	0.0
3	1.000	0.0	120.0	77.0	194.7	1	0	0.0	0.0	0.0	0.0

Permissible radiation calculated using US/CA agreement formula.  
Calculations performed using distance to the class A station's 0.1 mV/m contour.

Class A Azimuth (deg)	Reference Azimuth (deg)	Distance to 0.1 mV (km)/ (mi)	Max Vert Angle (deg)	Max Rad Below Ang (mV/m@1km)	Permiss Radiation (mV/m@1km)	Margin (mV/m@1km)	
136.53	254.00	402.3 / 250.0	24.6	120.64	72.1	-48.6	
131.75	255.00	387.7 / 240.9	25.4	120.64	58.9	-61.7	
128.08	256.00	377.3 / 234.4	26.1	120.64	49.6	-71.1	
124.98	257.00	369.1 / 229.3	26.6	120.64	42.2	-78.5	
122.23	258.00	362.4 / 225.2	27.0	120.64	36.2	-84.5	
119.71	259.00	356.7 / 221.7	27.4	120.64	31.1	-89.6	
117.36	260.00	351.9 / 218.7	27.8	120.64	26.7	-93.9	
115.15	261.00	347.7 / 216.0	28.1	120.64	22.9	-97.7	
113.03	262.00	344.0 / 213.8	28.3	120.64	19.6	-101.0	
110.98	263.00	340.9 / 211.8	28.6	120.64	16.8	-103.9	
109.01	264.00	338.1 / 210.1	28.8	120.64	14.3	-106.3	
107.08	265.00	335.7 / 208.6	28.9	120.64	12.1	-108.5	
105.19	266.00	333.7 / 207.3	29.1	120.64	10.3	-110.3	
103.34	267.00	331.9 / 206.2	29.2	120.64	8.7	-111.9	
101.50	268.00	330.4 / 205.3	29.4	120.64	7.4	-113.3	
99.69	269.00	329.2 / 204.5	29.5	120.64	6.3	-114.4	
97.87	270.00	327.9 / 203.8	29.6	120.64	5.1	-115.5	
95.89	271.00	323.1 / 200.8	29.9	120.64	0.8	-119.8	
94.11	272.00	320.7 / 199.3	30.1	120.64	-1.4	-122.0	**
92.40	273.00	318.8 / 198.1	30.3	120.64	-3.1	-123.7	**
90.73	274.00	317.3 / 197.2	30.4	120.64	-4.4	-125.1	**
89.10	275.00	316.3 / 196.5	30.5	120.64	-5.3	-126.0	**
87.49	276.00	315.6 / 196.1	30.5	120.64	-6.0	-126.6	**
85.90	277.00	315.1 / 195.8	30.6	120.64	-6.4	-127.1	**
84.33	278.00	314.9 / 195.7	30.6	120.64	-6.6	-127.2	**
82.76	279.00	315.0 / 195.7	30.6	120.64	-6.5	-127.2	**
81.19	280.00	315.3 / 195.9	30.6	120.64	-6.2	-126.9	**
79.75	281.00	314.4 / 195.4	30.6	120.64	-7.0	-127.7	**
78.36	282.00	313.5 / 194.8	30.7	120.64	-7.9	-128.5	**
76.92	283.00	313.5 / 194.8	30.7	120.64	-7.8	-128.5	**
75.29	284.00	315.6 / 196.1	30.5	120.64	-5.9	-126.6	**
73.62	285.00	318.0 / 197.6	30.3	120.64	-3.8	-124.4	**
71.91	286.00	320.7 / 199.3	30.1	120.64	-1.4	-122.0	**
70.16	287.00	323.6 / 201.1	29.9	120.64	1.2	-119.4	
68.77	288.00	324.2 / 201.5	29.8	120.64	1.8	-118.8	
67.53	289.00	324.3 / 201.5	29.8	120.64	1.8	-118.8	
66.34	290.00	324.3 / 201.5	29.8	120.64	1.8	-118.8	
65.08	291.00	325.1 / 202.0	29.8	120.64	2.6	-118.1	
63.73	292.00	326.6 / 202.9	29.7	120.64	3.9	-116.7	
62.42	293.00	328.1 / 203.9	29.5	120.64	5.3	-115.3	
60.35	294.00	333.9 / 207.5	29.1	120.64	10.5	-110.1	
58.64	295.00	337.8 / 209.9	28.8	120.64	14.1	-106.6	
57.01	296.00	341.5 / 212.2	28.5	120.64	17.4	-103.3	

Class A Azimuth (deg)	Reference Azimuth (deg)	Distance to 0.1 mV (km)/ (mi)	Max Vert Angle (deg)	Max Rad Below Ang (mV/m@1km)	Permiss Radiation (mV/m@1km)	Margin (mV/m@1km)
55.32	297.00	345.8 / 214.8	28.2	120.64	21.2	-99.5
53.60	298.00	350.3 / 217.7	27.9	120.64	25.3	-95.4
53.00	299.00	352.3 / 218.9	27.7	120.64	27.1	-93.6

Clipped at 0.10 mV/m

\*\* Indicates that the distance was out of the range of the CA/US agreement permissible radiation formula. The calculated permissible radiation is invalid.

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 Call: KOKC  
 Freq: 1520 kHz  
 OKLAHOMA CITY, OK, US  
 Hours: D  
 Lat: 35-20-00 N  
 Lng: 097-30-16 W  
 Power: 50.0 kW  
 Theo RMS: 383.02 mV/m @ 1km @ 1kW

#	Field Ratio	Phase (deg)	Spacing (deg)	Orient (deg)	Height (deg)	Ref Swtch	TL Swtch	A (deg)	B (deg)	C (deg)	D (deg)
1	1.000	0.0	0.0	0.0	181.0	0	0	0.0	0.0	0.0	0.0

Permissible radiation calculated using US/CA agreement formula.  
 Calculations performed using distance to the class A station's 0.1 mV/m contour.

Class A Azimuth (deg)	Reference Azimuth (deg)	Distance to 0.1 mV (km)/ (mi)	Max Vert Angle (deg)	Max Rad Below Ang (mV/m@1km)	Permiss Radiation (mV/m@1km)	Margin (mV/m@1km)
145.75	250.00	2278.7 / 1415.9	0.0	120.64	1760.9	1640.2
127.15	251.00	2189.6 / 1360.6	0.1	120.64	1680.7	1560.0
115.93	252.00	2148.7 / 1335.1	0.2	120.64	1643.8	1523.2
103.89	253.00	2108.3 / 1310.0	0.4	120.64	1607.4	1486.8
93.30	254.00	2077.4 / 1290.9	0.6	120.64	1579.7	1459.1
84.56	255.00	2061.4 / 1280.9	0.7	120.64	1565.2	1444.6
76.82	256.00	2060.7 / 1280.4	0.7	120.64	1564.6	1444.0
68.37	257.00	2058.6 / 1279.2	0.7	120.64	1562.7	1442.1
59.74	258.00	2059.2 / 1279.5	0.7	120.64	1563.3	1442.6
50.74	259.00	2068.1 / 1285.1	0.6	120.64	1571.3	1450.6
42.28	260.00	2069.7 / 1286.1	0.6	120.64	1572.8	1452.1
33.81	261.00	2078.4 / 1291.5	0.6	120.64	1580.6	1459.9
29.04	262.00	2064.7 / 1283.0	0.6	120.64	1568.2	1447.6

Class A Azimuth (deg)	Reference Azimuth (deg)	Distance to 0.1 mV (km)/ (mi)	Max Vert Angle (deg)	Max Rad Below Ang (mV/m@1km)	Permiss Radiation (mV/m@1km)	Margin (mV/m@1km)
24.73	263.00	2056.3 / 1277.7	0.7	120.64	1560.7	1440.0
15.50	264.00	2090.8 / 1299.1	0.5	120.64	1591.7	1471.1
5.04	265.00	2135.3 / 1326.8	0.3	120.64	1631.8	1511.1
353.39	266.00	2191.7 / 1361.8	0.1	120.64	1682.5	1561.8

**COMPARISON OF PRESENT AND PROPOSED MARGINS TOWARDS WWKB**

Class A Azimuth (deg)	Reference Azimuth (deg)	Present Margin (mV/m@1km)	Proposed Margin (mV/m@1km)
143.51	253.00	11.1	N/A
135.57	254.00	-12.5	-48.6
131.01	255.00	-29.0	-61.7
127.45	256.00	-42.5	-71.1
124.41	257.00	-54.3	-78.5
121.69	258.00	-65.0	-84.5
119.19	259.00	-74.8	-89.6
116.86	260.00	-83.9	-93.9
114.66	261.00	-92.2	-97.7
112.54	262.00	-99.9	-101.0
110.51	263.00	-107.0	-103.9
108.53	264.00	-113.5	-106.3
106.60	265.00	-119.5	-108.5
104.71	266.00	-124.8	-110.3
102.86	267.00	-129.7	-111.9
101.02	268.00	-134.0	-113.3
99.20	269.00	-137.8	-114.4
97.33	270.00	-142.2	-115.5
95.39	271.00	-148.3	-119.8
93.62	272.00	-152.1	-122.0
91.91	273.00	-155.3	-123.7
90.25	274.00	-157.6	-125.1
88.62	275.00	-159.3	-126.0
87.01	276.00	-160.4	-126.6
85.42	277.00	-161.0	-127.1
83.84	278.00	-160.9	-127.2
82.27	279.00	-160.3	-127.2
80.73	280.00	-159.4	-126.9
79.31	281.00	-159.3	-127.7
77.92	282.00	-158.5	-128.5
76.41	283.00	-156.0	-128.5
74.77	284.00	-151.9	-126.6
73.08	285.00	-147.3	-124.4
71.35	286.00	-142.1	-122.0
69.69	287.00	-137.0	-119.4
68.40	288.00	-133.6	-118.8
67.11	289.00	-129.7	-118.8
66.00	290.00	-126.2	-118.8
64.62	291.00	-120.8	-118.1
63.39	292.00	-115.7	-116.7
61.80	293.00	-108.4	-115.3
59.76	294.00	-98.7	-110.1
58.14	295.00	-90.8	-106.6

Class A Azimuth (deg)	Reference Azimuth (deg)	Present Margin (mV/m@1km)	Proposed Margin (mV/m@1km)
56.50	296.00	-82.6	-103.3
54.80	297.00	-73.9	-99.5
53.07	298.00	-65.0	-95.4
53.00	299.00	N/A	-93.6