Technical Report Supporting a Form 349 Minor Change in Licensed Facility Construction Permit Application

Pursuant to 47 C.F.R. Section 74:

for

K281CJ.L - Omaha, NE
(Facility ID: 153185)

THIS FORM 349 FILING IS
BEING FILED AS A
FOOTNOTE 22 - 250 MILE (POST) 2016
WINDOW APPLICATION

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as a

Commercial, Fill-In
AM Translator for
KOBM(AM) - Omaha, NE

January, 2019

Asher Broadcast Consulting, LLC
justinasher@consultant.com
1(202)875-2986

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Supplemental Appendix(s):

Explanation of Technical Report 1

EXPLANATION OF PROPOSAL: This Form 349 Filing and accompanying technical report supports a Minor Change in Licensed Facility Construction Permit Application for FM Translator K281CJ.L - Omaha, NE (Facility ID: 153185). This Form 349 Filing is being filed as a "*Footnote 22 - 250 Mile (Post) 2016 Window Application*" in response to the *Revitalization of the AM Radio Service*, First Report and Order (MB Docket No. 13-249 (FCC 15-142), released October 23, 2015; subsequent *Public Notice DA 15-1215*, released October 26, 2015; final *Public Notice DA 1491*, released December 23, 2015; and the *Second Report and Order*, MD Docket No. 13-249, released February 24, 2017; see Footnote 22. Operation on the new frequency of CH293D (106.5 MHz) with a power of 0.250 kW ERP (circular polarization) at the new antenna COR of 418 meters AMSL is requested. This Form 349 Filing will continue to specify rebroadcast of Class C, AM Primary Station KOBM(AM) - Omaha, NE (1490 kHz); Facility ID No. 74104. The Translator requests relicensing to the new community of Council Bluffs, IA.

The applicant would like to note a request for 47 C.F.R. Section 73.3517 Contingent Processing between applications for FM Translators K293CJ - Omaha, NE (Facility ID: 156454) and K281CJ - Omaha, NE (Facility ID: 153185). Both applications have been filed concurrent with one another and reference this Section 73.3517 Contingent Processing Request within each filing.

FACILITY COMPLIANCE SHOWINGS: A map of the proposed 60 dBµ service contour has been included in ***Exhibit 1***. The proposed 60 dBµ contour of the Translator lies wholly inside the larger of the AM primary daytime 2.0 mV/m contour or a 25 mile radius around the AM site. The primary station service contour relationship has been plotted in ***Exhibit 2***.

The proposed facility will be located on the tower bearing Antenna Structure Registration Number 1202733. In support of the requested site location, a copy of the existing ASRN has been included in ***Exhibit 3***. A depiction of the tower and antenna configuration has been included in ***Exhibit 4***. Further notification to the FAA or ASR governing authorities is not required as this proposal will not increase the overall tower height.

The applicant would like to note use of the NED 03 second terrain database for all allocation, contour and HAAT showings contained herein. A copy of the proposed HAAT calculation has been included in ***Exhibit 5***.

ALLOCATION COMPLIANCE SHOWINGS: The proposed Translator remains in compliance with 47 C.F.R. Section 74.1204 toward all allocation protection concerns with the exception of KKCD(FM) - Omaha, NE (CH290C2) and KOPW(FM) - Plattsmouth, NE (CH295C3). A general allocation study for this proposal is found in ***Exhibit 6***.

Concerning protection of K293CJ - Omaha, NE, the applicant has previously noted a request for 47 C.F.R. Section 73.3517 Contingent Processing between applications for FM Translators K293CJ - Omaha, NE (Facility ID: 156454) and K281CJ - Omaha, NE (Facility ID: 153185). K293CJ will concurrently move to CH294D - Lincoln, NE (or well outside the scope of this proposed allocation footprint). Therefore, the present K293CJ facilities need not be protected.

The applicant would like to note the existence of multiple 47 C.F.R. Section 74.1204(d) Second/Third Adjacent Channel Given Interference Waiver Requests toward KKCD(FM) - Omaha, NE (CH290C2) and KOPW(FM) - Plattsmouth, NE (CH295C3) as noted in ***Exhibit 8***. Protection of the worst case calculated 121.2 dBµ F(50:10) Interference Contour, corresponding to the 81.2 dBµ F(50:50) Protected Contour, has been demonstrated through a downward radiation study. The worst case calculated Interference Contour will not reach the ground nor a seven meter artificial plane representing a standard two story home when taking into account the downward radiation characteristics of the antenna as supplied by the antenna manufacturer. A copy of the antenna manufacturer specifications has been included in ***Exhibit 9***.

There are two additional facilities, existing or proposed, close enough to merit further study. Therefore, a supplemental contour protection study has been provided toward each facility as included in ***Exhibit(s) 7(a-b)***.

Regarding protection of international concerns, the facility is, and will remain, more than 320 km from the common border between the United States and Canada or Mexico. As a result, no further international protection showings are believed required.

ENVIRONMENTAL COMPLIANCE SHOWINGS: The proposed facility complies with the maximum permissible radiofrequency electromagnetic exposure limits for controlled and uncontrolled environments as set forth under §1.1310 and/or §1.1307(b)(3) of the Commission's rules and the guidelines for RF radiation protection guidelines as set forth in OET Bulletin No. 65 (Edition 97-01), and the accompanying Supplement A, (Edition 97-01). Compliance has been demonstrated in the attached ***RF Appendix 1*** of this filing. The facility is, or will be, properly marked with signs. Entry is, or will be, restricted by means of fencing, locked doors or gates. In addition, coordination with other users of the site will be secured to reduce power or cease operation as necessary to protect persons having access to the site, tower or antenna from radiofrequency electromagnetic fields in excess of FCC guidelines.

Regarding compliance with the NEPA, Nationwide Programmatic Agreement and NHPA Section 106 for tower co-location, compliance with the Agreement is not required where no new tower construction is being proposed and the tower is not being substantially altered. Specifically, compliance is not necessary where only an antenna and feed-line are being added to an existing structure, as here. However, should the Commission determine compliance is necessary, upon notification to the applicant, the applicant will file FCC Form 621.

CERTIFICATION OF TECHNICAL CONSULTANT: *I declare, under penalty of perjury, that the contents of this report are true and accurate to the best of my knowledge and belief. I further certify I have over nineteen years of experience as a broadcast technical consultant before the Federal Communications Commission ("the FCC"); and am familiar with the Code of Federal Regulations Title 47 ("the Rules") as pertaining to this report and its contents herein. The underlying data utilized in this report was taken directly from FCC databases or indirectly through third party software vendors securing data directly from FCC databases. This firm cannot be held liable for errors or omissions resulting from the underlying data. The information contained herein is believed accurate to the date reported below.*

Justin W. Asher

Justin W. Asher, Technical Consultant
January 02, 2019

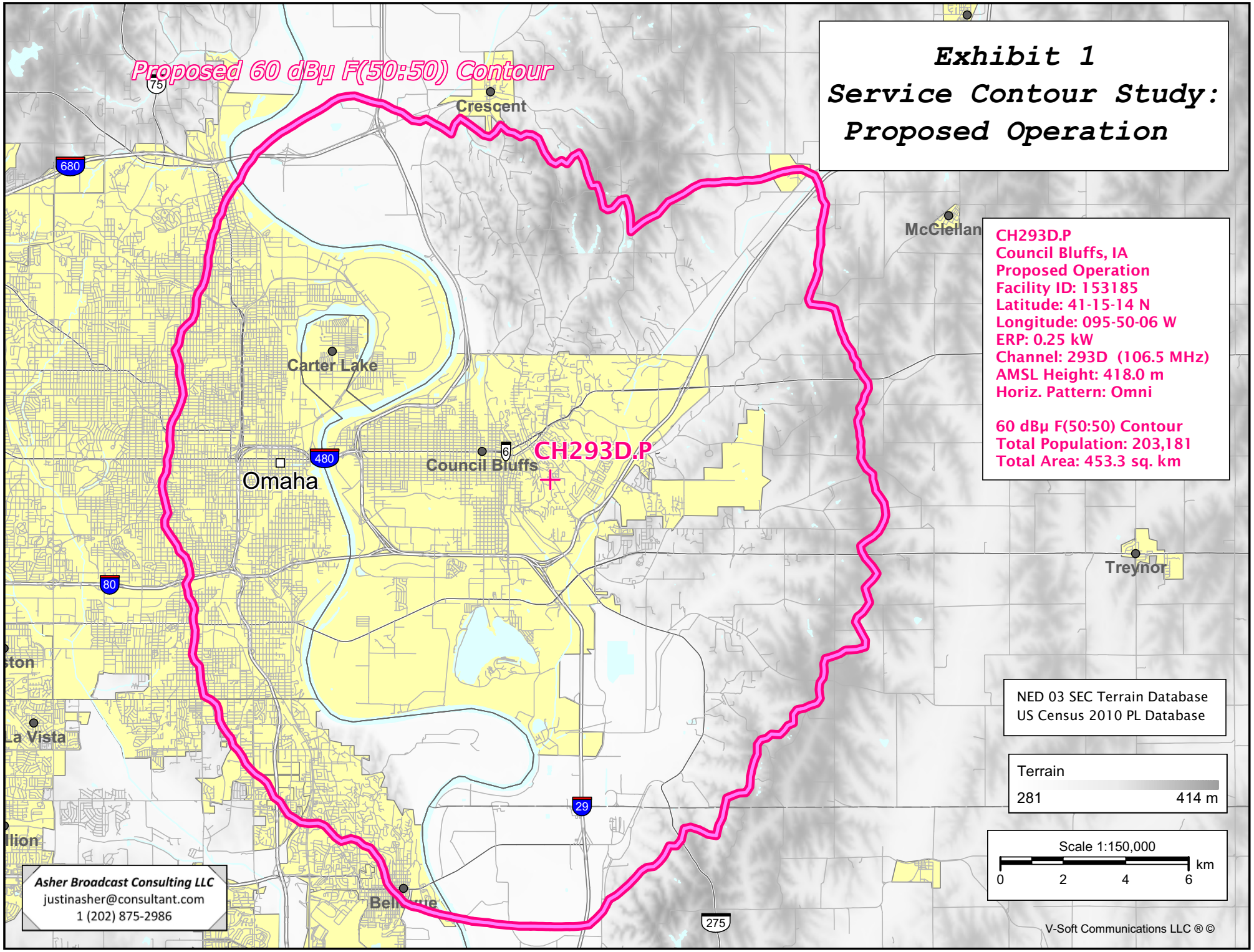
Exhibit 1
Service Contour Study:
Proposed Operation
Proposed 60 dBμ F(50:50) Contour
CH293D.P
Council Bluffs, IA
Proposed Operation
Facility ID: 153185
Latitude: 41-15-14 N
Longitude: 095-50-06 W
ERP: 0.25 kW
Channel: 293D (106.5 MHz)
AMSL Height: 418.0 m
Horiz. Pattern: Omni
60 dBμ F(50:50) Contour
Total Population: 203,181
Total Area: 453.3 sq. km
NED 03 SEC Terrain Database
US Census 2010 PL Database
Terrain
281
414 m
Scale 1:150,000
0
2
4
6
km
Asher Broadcast Consulting LLC
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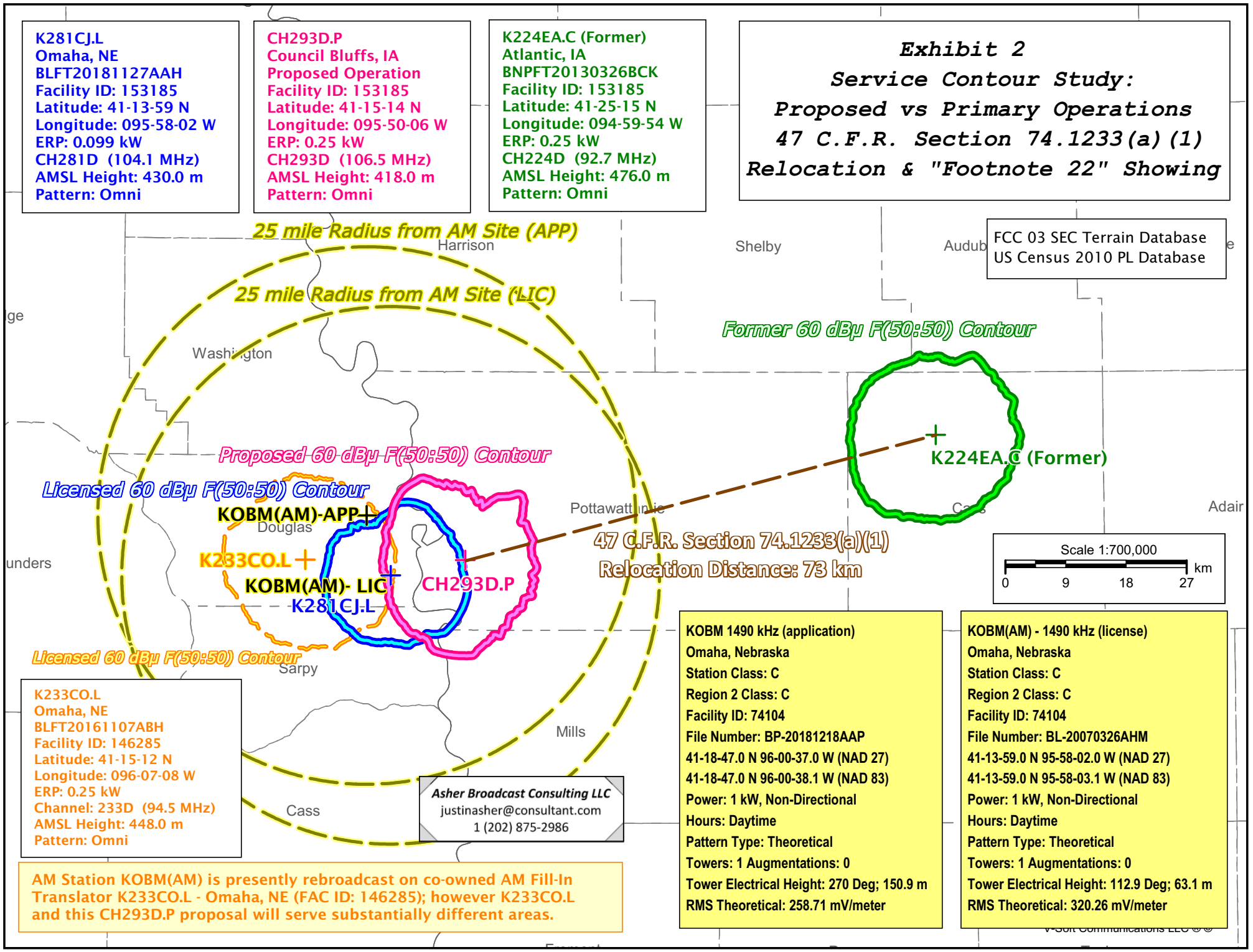
1 (202) 875-2986
V-Soft Communications LLC ® ©
Crescent
McClellan
Carter Lake
Omaha
Council Bluffs
Treynor
La Vista
680
75
480
80
29
275
6


K281CJ.L
Omaha, NE
BLFT20181127AAH
Facility ID: 153185
Latitude: 41-13-59 N
Longitude: 095-58-02 W
ERP: 0.099 kW
CH281D (104.1 MHz)
AMSL Height: 430.0 m
Pattern: Omni
CH293D.P
Council Bluffs, IA
Proposed Operation
Facility ID: 153185
Latitude: 41-15-14 N
Longitude: 095-50-06 W
ERP: 0.25 kW
CH293D (106.5 MHz)
AMSL Height: 418.0 m
Pattern: Omni
K224EA.C (Former)
Atlantic, IA
BNPFT20130326BCK
Facility ID: 153185
Latitude: 41-25-15 N
Longitude: 094-59-54 W
ERP: 0.25 kW
CH224D (92.7 MHz)
AMSL Height: 476.0 m
Pattern: Omni
Exhibit 2
Service Contour Study:
Proposed vs Primary Operations
47 C.F.R. Section 74.1233(a)(1)
Relocation & "Footnote 22" Showing
FCC 03 SEC Terrain Database
US Census 2010 PL Database
25 mile Radius from AM Site (APP)
25 mile Radius from AM Site (LIC)
Former 60 dBμ F(50:50) Contour
Proposed 60 dBμ F(50:50) Contour
Licensed 60 dBμ F(50:50) Contour
KOBM(AM)-APP
K233CO.L
KOBM(AM)- LIC
K281CJ.L
CH293D.P
K224EA.C (Former)
47 C.F.R. Section 74.1233(a)(1)
Relocation Distance: 73 km
Scale 1:700,000
0 9 18 27 km
Harrison
Shelby
Washington
Douglas
Pottawattamie
Adair
Sarpy
Mills
Cass
Asher Broadcast Consulting LLC
justinasher@consultant.com
1 (202) 875-2986
K233CO.L
Omaha, NE
BLFT20161107ABH
Facility ID: 146285
Latitude: 41-15-12 N
Longitude: 096-07-08 W
ERP: 0.25 kW
Channel: 233D (94.5 MHz)
AMSL Height: 448.0 m
Pattern: Omni
AM Station KOBM(AM) is presently rebroadcast on co-owned AM Fill-In Translator K233CO.L - Omaha, NE (FAC ID: 146285); however K233CO.L and this CH293D.P proposal will serve substantially different areas.
KOBM 1490 kHz (application)
Omaha, Nebraska
Station Class: C
Region 2 Class: C
Facility ID: 74104
File Number: BP-20181218AAP
41-18-47.0 N 96-00-37.0 W (NAD 27)
41-18-47.0 N 96-00-38.1 W (NAD 83)
Power: 1 kW, Non-Directional
Hours: Daytime
Pattern Type: Theoretical
Towers: 1 Augmentations: 0
Tower Electrical Height: 270 Deg; 150.9 m
RMS Theoretical: 258.71 mV/meter
KOBM(AM) - 1490 kHz (license)
Omaha, Nebraska
Station Class: C
Region 2 Class: C
Facility ID: 74104
File Number: BL-20070326AHM
41-13-59.0 N 95-58-02.0 W (NAD 27)
41-13-59.0 N 95-58-03.1 W (NAD 83)
Power: 1 kW, Non-Directional
Hours: Daytime
Pattern Type: Theoretical
Towers: 1 Augmentations: 0
Tower Electrical Height: 112.9 Deg; 63.1 m
RMS Theoretical: 320.26 mV/meter

ASR Registration Search

Registration 1202733

Map Registration

Exhibit 3
Copy of Existing Antenna Structure Registration
(public record copy)

Registration Detail

Reg Number	1202733	Status	Constructed
File Number	A0145874	Constructed	09/13/1999
EMI	No	Dismantled	
NEPA	No		

Antenna Structure

Structure Type: TOWER - Free standing or Guyed Structure used for Commu

Location (in NAD83 Coordinates)

Lat/Long	41-15-14.0 N 095-50-07.0 W	Address	1119 Skyline Drive
City, State	Council Bluffs , IA		
Zip	51503	County	POTTAWATTAMIE
Center of AM Array		Position of Tower in Array	

Heights (meters)

Elevation of Site Above Mean Sea Level	Overall Height Above Ground (AGL)
381.0	42.6
Overall Height Above Mean Sea Level	Overall Height Above Ground w/o Appurtenances
423.6	36.5

Painting and Lighting Specifications

None

FAA Notification

FAA Study	99-ACE-0923-OE	FAA Issue Date	08/26/1999

Owner & Contact Information

FRN: 0002354801

Owner Entity Type:

Owner

ATS Mobile Telephone Inc
2902 Harney St
Omaha , NE 68131

P: (402)345-6400
F:
E:

Contact

Welch , Timothy E
1330 New Hampshire Ave NW, Ste 113
Washington , DC 20036

P: (202)775-0070
F:
E: welchlaw@clark.net

Last Action Status

Status	Constructed	Received	10/24/2000
Purpose	Notification	Entered	10/24/2000
Mode	Interactive		

Related Applications

10/24/2000	A0145874 - Notification (NT)
09/13/1999	A0095097 - New (NE)

Comments

Comments

None

History

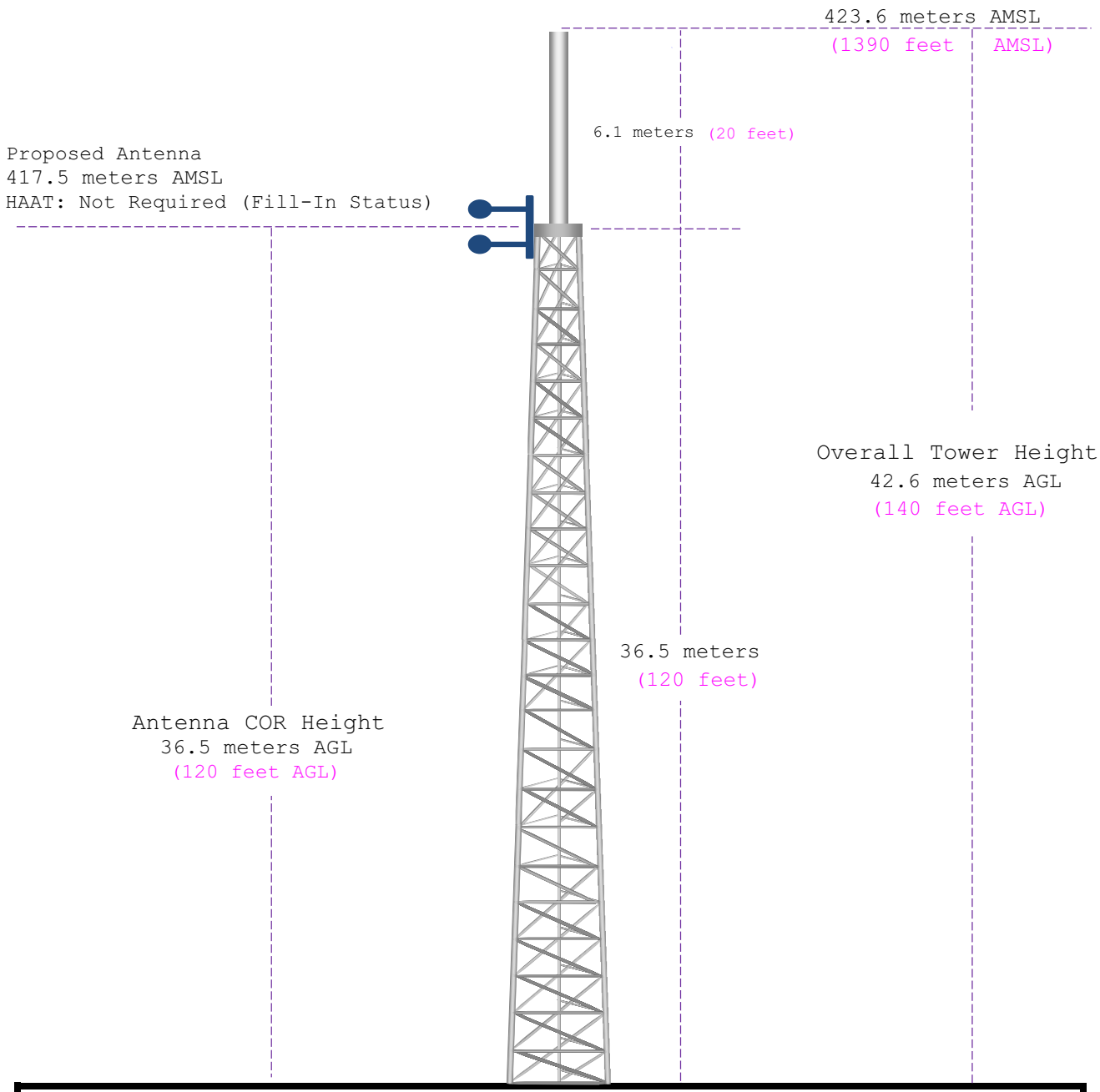
Date	Event
10/24/2000	Construction Notification Received
09/25/2000	Construction Reminder Letter Sent
09/15/1999	Registration Printed

All History (4)

Automated Letters

09/25/2000	Construction Reminder, Reference 74315
09/15/1999	Authorization, Reference 21761

Exhibit 4
Vertical Plan of Antenna System



Ground Elevation: 381.0 meters AMSL (1250 feet AMSL)		
Address: 1119 Skyline Drive **City:** Council Bluffs **County:** Pottawattamie **State:** Iowa	**Latitude (D M S)** **Longitude (D M S)** NAD 27 datum values: 41 15 14.00612 95 50 5.95878 NAD 83 datum values: 41 15 14.00000 95 50 7.00000	
Antenna Structure Registration 1202733	Drawing Is Not To Scale	***Asher Broadcast Consulting, LLC*** justinasher@consultant.com 1(202)875-2986

Exhibit 5
HAAT and Miscellaneous Coordinate Information

HAAT Calculation (1927):

N. Lat. = 411514.0 W. Lng. = 955006.0
HAAT and Distance to Contour,
FCC, FM 2-10 Mi, 51 pts Method - NED 03 SEC

Azi.	AV EL	HAAT	ERP kW	dBk	Field	60-F5
000	358.5	59.5	0.2500	-6.02	1.000	10.14
030	347.2	70.8	0.2500	-6.02	1.000	10.94
060	353.4	64.6	0.2500	-6.02	1.000	10.51
090	356.8	61.2	0.2500	-6.02	1.000	10.27
120	348.7	69.3	0.2500	-6.02	1.000	10.85
150	337.5	80.5	0.2500	-6.02	1.000	11.61
180	295.3	122.7	0.2500	-6.02	1.000	14.22
210	311.1	106.9	0.2500	-6.02	1.000	13.30
240	318.4	99.6	0.2500	-6.02	1.000	12.84
270	326.4	91.6	0.2500	-6.02	1.000	12.33
300	320.8	97.2	0.2500	-6.02	1.000	12.69
330	301.1	116.9	0.2500	-6.02	1.000	13.89

Ave El= 331.26 M HAAT= 86.74 M AMSL= 418

NAD 1983 to NAD 1927 Conversion:

	Latitude	Longitude
NAD 27 datum values:	41 15 14.00612	95 50 5.95878
NAD 83 datum values:	41 15 14.00000	95 50 7.00000

Various Coordinate Conversion Calculations (NAD 1983):

Position Type	Lat Lon
Degrees Lat Long	41.2538889°, -095.8352778°
Degrees Minutes	41°15.23333', -095°50.11667'
Degrees Minutes Seconds	41°15'14.0000", -095°50'07.0000"
UTM	15T 262453mE 4570819mN
UTM centimeter	15T 262453.32mE 4570819.05mN
MGRS	15TTF6245370819
Grid North	-1.9°
GARS	169LY18
Maidenhead	EN21BG90SW44
GEOREF	FJKM09881523

Exhibit 6
Tabulation of Proposed Allocation

Blue Text indicates contour protection studies toward select stations as included in ***Exhibit(s) 7(a-b)***.

Yellow Highlighted Text denotes the existence multiple 47 C.F.R. Section 74.1204(d) Second/Third Adjacent Channel Given Interference Waiver Requests as included in ***Exhibit 8***.

Green Text denotes a request for 47 C.F.R. Section 73.3517 Contingent Processing between applications for FM Translators K293CJ - Omaha, NE (Facility ID: 156454) and K281CJ - Omaha, NE (Facility ID: 153185). K293CJ will concurrently move to CH294D - Lincoln, NE (or well outside the scope of this proposed allocation footprint). Therefore, the present K293CJ facilities need not be protected.

REFERENCE CH# 293D - 106.5 MHz, Pwr= 0.25 kW, HAAT= 86.7 M, COR= 418 M DISPLAY DATES
41 15 14.0 N. Average Protected F(50-50)= 12.01 km DATA 12-19-18
95 50 06.0 W. Omni-directional SEARCH 12-20-18

CH CALL / CITY	TYPE ANT / STATE	AZI <--	DIST / FILE #	LAT / LNG	PWR(kW) / HAAT(M)	INT(km) / COR(M)	PRO(km) / LICENSEE	*IN* (Overlap in km)	*OUT*
290C2 KKCD Omaha	LIC NCN NE	239.4 59.3	11.50 BLH19941125KB	41 12 04.0 95 57 12.0	50.000 146	6.0 469	52.2 Sm-kkcd, Llc	-7.3*<	-41.8*<
293D K293CJ Omaha	LIC _C_ NE	291.7 111.6	17.25 BLFT20160928ACR	41 18 40.0 96 01 37.0	0.060	39.8 486	12.0 Hickory Radio, Llc	-35.2*<	-38.3*<
295C3 KOPW Plattsmouth	LIC _C_ NE	150.8 330.9	12.58 BLH19990827AAA	41 09 18.0 95 45 42.0	25.000 100	4.3 429	40.7 Nrg License Sub, L.l.c.	-3.2<	-29.2*<
292C1 KFRX Lincoln	LIC NC_ NE	228.4 47.9	87.71 BLH20010511AAC	40 43 40.0 96 36 50.0	100.000 214	95.9 607	64.8 Alpha 3e Licensee Llc	-21.3*<	3.2
294C1 KQKX Norfolk	LIC _CX NE	296.8 115.6	171.00 BLH20080401AXA	41 55 59.0 97 40 49.0	100.000 274	102.4 802	70.2 Wjag Incorporated	56.0	82.1
294C3 KIKD Lake City	LIC _CN IA	41.0 221.7	128.35 BLH19970317KA	42 07 14.0 94 48 49.0	25.000 100	55.3 476	34.7 Carroll Broadcasting Compa	60.3	74.6
296A KDSN-FM Denison	LIC _CX IA	25.6 206.0	96.59 BLH20040204AAT	42 02 10.0 95 19 44.0	6.000 92	2.8 495	28.4 Crawford County Broadcasti	83.6	67.1
239C3 KSWI Atlantic	LIC ZC_ IA	76.1 256.8	86.22 BLH20000718AAJ	41 26 07.0 94 50 00.0	20.000 109	1.6 504	15.4 Meredith Communications, L	11.5R	74.7M
296C1 KNWI Osceola	RSV-A ___ IA	93.8 274.9	150.13	41 09 06.0 94 02 43.0	100.000 299	10.0 648	71.7 University Of Northwestern	129.5	77.4
296C1 KNWI Osceola	APP _CX IA	93.8 274.9	150.13 BPED20180410AAJ	41 09 06.0 94 02 43.0	100.000 299	9.9 646	71.5 University Of Northwestern	129.6	77.5
293C1 WDAF-FM Liberty	LIC _CX MO	154.2 335.1	268.18 BMLH20040802BEU	39 04 24.0 94 29 06.0	100.000 299	173.1 565	73.2 Entercom License, Llc	82.8	152.7
291C2 KEXS-FM Ravenwood	LIC _CX MO	134.3 315.1	131.67 BLED20080618AAV	40 25 15.0 94 43 20.0	50.000 129	2.7 363	26.5 Catholic Radio Network, In	118.2	104.0
294L1 KZLX-LP Maryville	LIC ____ MO	140.8 321.4	127.63 BLL20020528ABC	40 21 36.0 94 53 00.0	0.042 46	375	Northwest Foundation, Inco	109.4	107.5

Terrain database is NED 03 SEC , R= 73.215 qualifying spacings or FCC minimum Spacings in KM, M= Margin in KM
Contour distances are on direct line to and from reference station. Reference zone= West Zone, Co to 3rd adjacent.
All separation margins (if shown) include rounding.
Ant Column: (D= DA Standard, Z= DA 73.215, N= Not DA 73.215, _= Omni), Polarization (C,H,V,E), Beamtilt(Y,N,X)
"*"affixed to 'IN' or 'OUT' values = site inside restricted contour.
« = Station meets FCC minimum distance spacing for its class.
< = Contour Overlap

Exhibit 7a
Contour Protection Studies Toward Select Allocation Concern(s)

FMCommander Single Allocation Study - 12-20-2018 - NED 03 SEC
CH293D.P's Overlaps (In= -21.34 km, Out= 3.16 km)

CH293D.P CH 293 D
Lat= 41 15 14.0, Lng= 95 50 06.0
0.25 kW 86.7 m HAAT, 418 m COR
Prot.= 60 dBu, Intef.= 54 dBu

KFRX CH 292 C1 73.215 N BLH20010511AAC
Lat= 40 43 40.0, Lng= 96 36 50.0
100.0 kW 214 m HAAT, 607 m COR
Prot.= 60 dBu, Intef.= 54 dBu

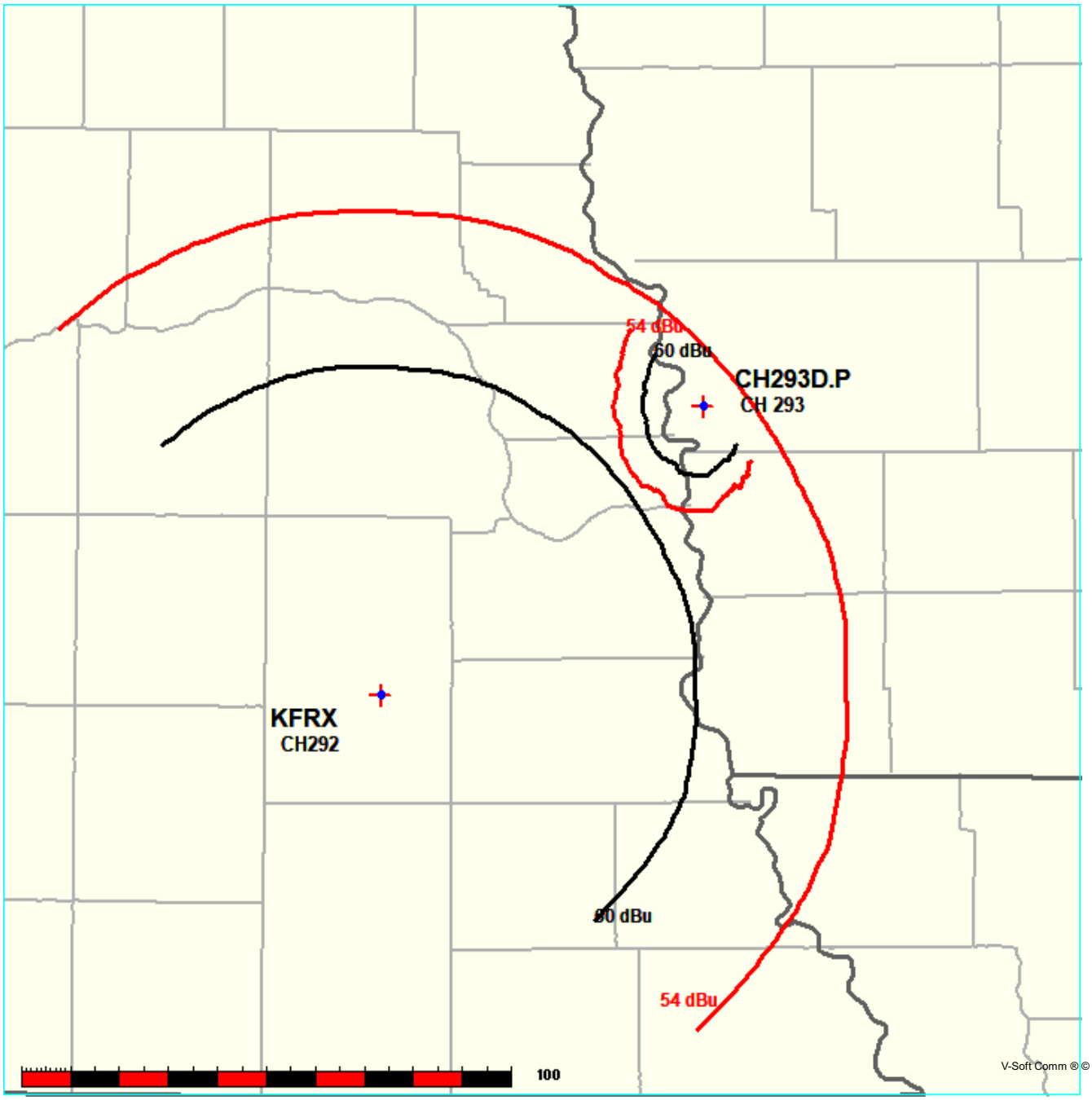


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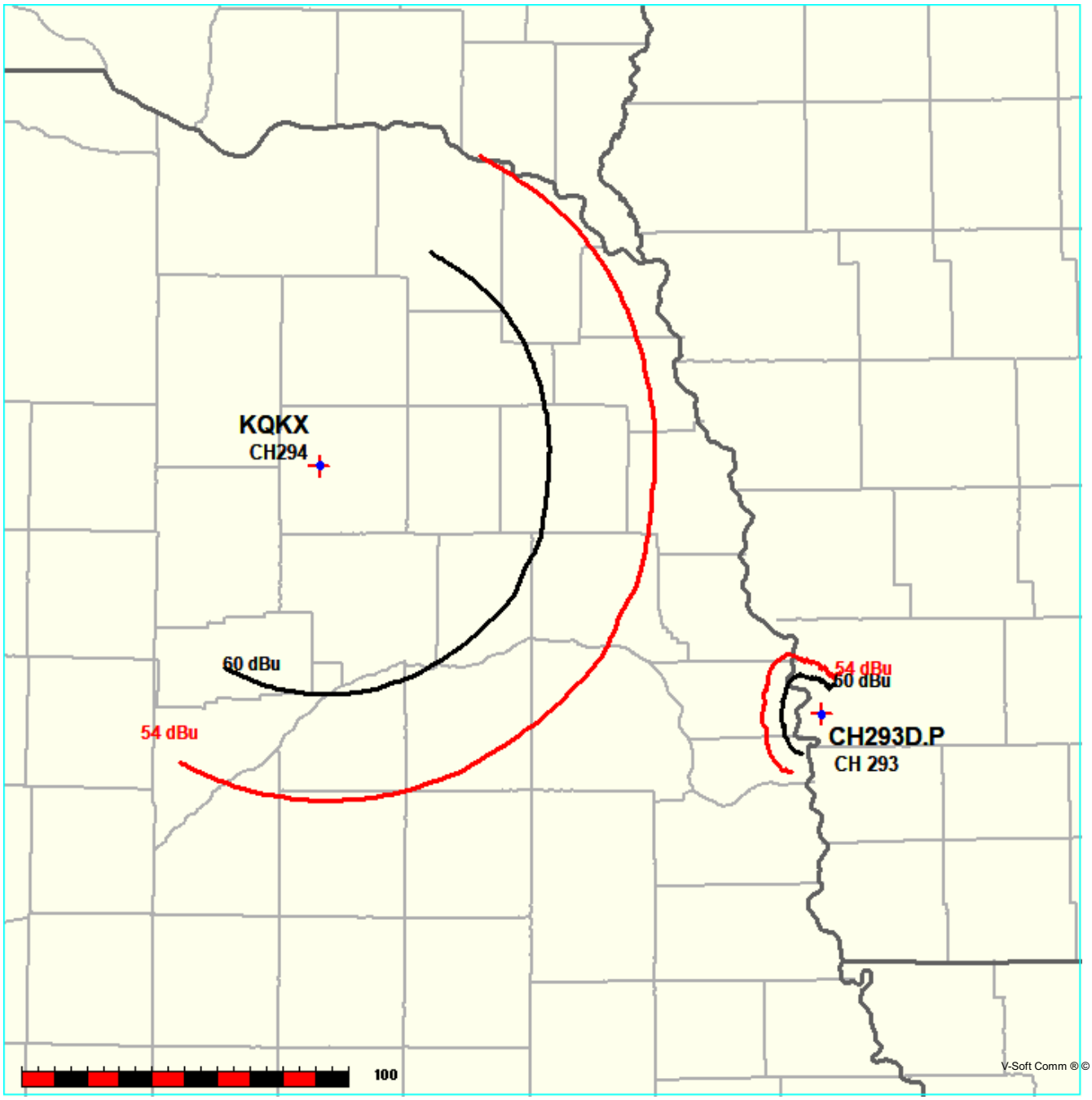
Exhibit 7b
Contour Protection Studies Toward Select Allocation Concern(s)

FMCommander Single Allocation Study - 12-20-2018 - NED 03 SEC
CH293D.P's Overlaps (In= 55.95 km, Out= 82.08 km)

CH293D.P CH 293 D
Lat= 41 15 14.0, Lng= 95 50 06.0
0.25 kW 86.7 m HAAT, 418 m COR
Prot.= 60 dBu, Intef.= 54 dBu

KQKX CH 294 C1 BLH20080401AXA
Lat= 41 55 59.0, Lng= 97 40 49.0
100.0 kW 273.9 m HAAT, 801.6 m COR
Prot.= 60 dBu, Intef.= 54 dBu



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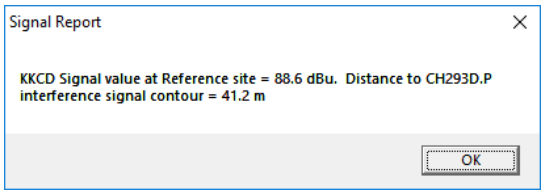
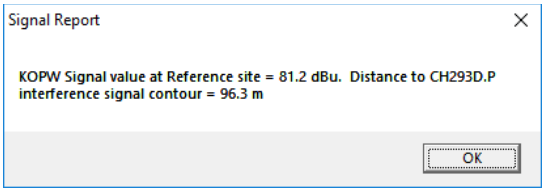
justinasher@consultant.com
1(202)875-2986

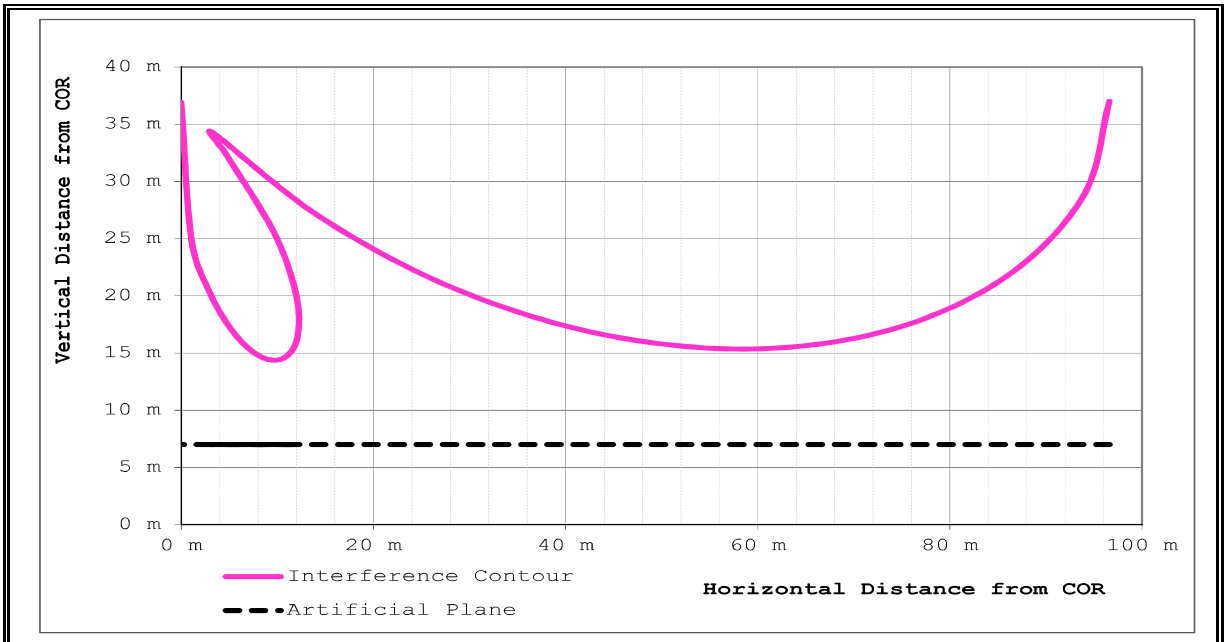
Exhibit 8

47 C.F.R. Section 74.1204(d) Second / Third Adjacent Given Interference Waiver Request

Yellow Highlighted Text denotes the existence of a 47 C.F.R. Section 74.1204(d) Second/Third Adjacent Channel Given Interference Waiver Request toward KKCD(FM) - Omaha, NE (CH290C2) and KOPW(FM) - Plattsmouth, NE (CH295C3) as noted in ***Exhibit 8***. Protection of the worst case calculated 121.2 dBµ F(50:10) Interference Contour, corresponding to the 81.2 dBµ F(50:50) Protected Contour, has been demonstrated through a downward radiation study. The worst case calculated Interference Contour will not reach the ground nor a seven meter artificial plane representing a standard two story home when taking into account the downward radiation characteristics of the antenna as supplied by the antenna manufacturer. A copy of the antenna manufacturer specifications has been included in ***Exhibit 9***.







Proposed Antenna: SWR FMxx/2-0.75WS (Two Bay)
Proposed Power: 0.250 kW
Antenna Height AGL: 37.0 meters
Protection Plane Height: 7.0 meters
Protected Contour: 81.2 dBµ f(50:50)
Interference Contour: 121.2 dBµ f(50:10)

Field Strength (dBu) Equation
106.92-(20*(LOG10[DistMeters]/1000)))+[ERPin dBk]

Distance (Free Space) Equation:
(10^((106.92-[desired dBu]+[ERP in dBk])/20))*1000

Angle Below Horizon	Vertical Antenna Properties Relative Field	ERP in kW	ERP in dBk	Meters from Antenna to Int. Contour	Meters from Antenna to Artificial Plane	Meters from Antenna to Ground Level	Field Strength at Protection Plane (dBµ)	Field Strength at Ground Level (dBµ)
0°	1.000	0.250	-6.02	96.60 m				
-5°	0.976	0.238	-6.23	94.28 m	344.21 m	424.53 m	109.95 dBµ	108.13 dBµ
-10°	0.905	0.205	-6.89	87.42 m	172.76 m	213.07 m	115.28 dBµ	113.46 dBµ
-15°	0.795	0.158	-8.01	76.80 m	115.91 m	142.96 m	117.62 dBµ	115.80 dBµ
-20°	0.655	0.107	-9.70	63.27 m	87.71 m	108.18 m	118.36 dBµ	116.54 dBµ
-25°	0.498	0.062	-12.08	48.11 m	70.99 m	87.55 m	117.82 dBµ	116.00 dBµ
-30°	0.337	0.028	-15.47	32.55 m	60.00 m	74.00 m	115.89 dBµ	114.07 dBµ
-35°	0.182	0.008	-20.82	17.58 m	52.30 m	64.51 m	111.73 dBµ	109.91 dBµ
-40°	0.044	0.000	-33.15	4.25 m	46.67 m	57.56 m	100.39 dBµ	98.57 dBµ
-45°	0.070	0.001	-29.12	6.76 m	42.43 m	52.33 m	105.25 dBµ	103.43 dBµ
-50°	0.157	0.006	-22.10	15.17 m	39.16 m	48.30 m	112.96 dBµ	111.14 dBµ
-55°	0.217	0.012	-19.29	20.96 m	36.62 m	45.17 m	116.35 dBµ	114.53 dBµ
-60°	0.249	0.016	-18.10	24.05 m	34.64 m	42.72 m	118.03 dBµ	116.21 dBµ
-65°	0.257	0.017	-17.82	24.83 m	33.10 m	40.82 m	118.70 dBµ	116.88 dBµ
-70°	0.245	0.015	-18.24	23.67 m	31.93 m	39.37 m	118.60 dBµ	116.78 dBµ
-75°	0.216	0.012	-19.33	20.87 m	31.06 m	38.31 m	117.74 dBµ	115.92 dBµ
-80°	0.175	0.008	-21.16	16.90 m	30.46 m	37.57 m	116.08 dBµ	114.26 dBµ
-85°	0.125	0.004	-24.08	12.07 m	30.11 m	37.14 m	113.26 dBµ	111.44 dBµ
-90°	0.001	0.000	-66.02	0.10 m	30.00 m	37.00 m	71.36 dBµ	69.54 dBµ

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justinasher@consultant.com
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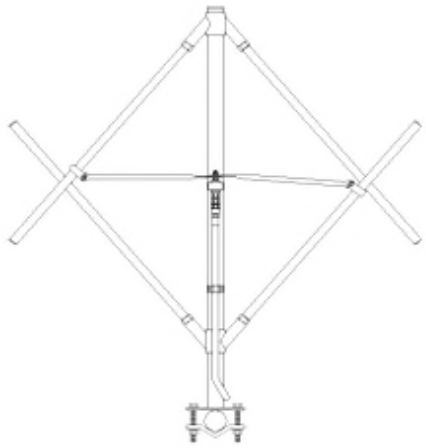
Exhibit 9
Copy of Manufacturer's Vertical Antenna Pattern Documentation
(public record copy)

FMEC SERIES
CIRCULAR POLARIZED
LOW POWER FM ANTENNAS



Product Specifications:

Frequency Range	88 – 108 MHz
Polarization	Circular
Power Rating	500 Watts per bay
System Input	Type N Male
VSWR	1.3:1 ± 150 kHz
Bay Dimensions	H 43.50" / W 38.5" / D 19"

Features:

•**BUILT WITH LOW POWER BROADCASTERS IN MIND.** Stations or translators that require circular, horizontal, or vertical polarizations.

•**POWER RATING.** Each bay is rated at 500 watts with a maximum power of 2 kW for four bays.

•**RUGGED CONSTRUCTION.** Each bay is constructed from rugged, heavy wall copper and naval brass. All joints are tig-welded.

•**PRESSURIZATION NOT REQUIRED.**

•**CUSTOM DIRECTIONAL PATTERNS.** FM directional antennas designed to the customer's specified mounting structure and FCC filing documentation are available.

•**WEATHERIZATION (OPTIONAL).** Radomes or electrical deicers available for areas that experience periods of heavy icing and/or snow conditions.

•**STANDARD MOUNTING BRACKETS.** Fits up to 4" tower leg or pipe. Supplied with antenna.

•**WARRANTY.** 2-year limited warranty on defects and workmanship to the original purchaser.

Notes:

1. Power rating is based on 40 degrees C ambient. Degeneration occurs above 2000 ft.
2. Antenna weight, windload, aperture and dimensions are based on mid-band operation (98.1 MHz).
3. Antennas with 3 or more bays come with input power divider.
4. SWR, Inc. maintains a continuous program of product improvement and therefore reserves the right to change specifications without notice.

Full Wave Spaced
Electrical and Mechanical Specifications

Bays	Power Rating (watts)	Power Gain	dB Gain	Net. Weight (lbs)	Windload (lbs)
1	500	0.441	-3.556	15	35
2	1000	0.959	-0.182	35	85
3	1500	1.495	1.746	50	120
4	2000	2.044	3.105	65	155
5	2000	2.590	4.133	80	190
6	2000	3.160	4.997	95	225
8	2000	4.311	6.346	110	260
10	2000	5.456	7.369	130	295

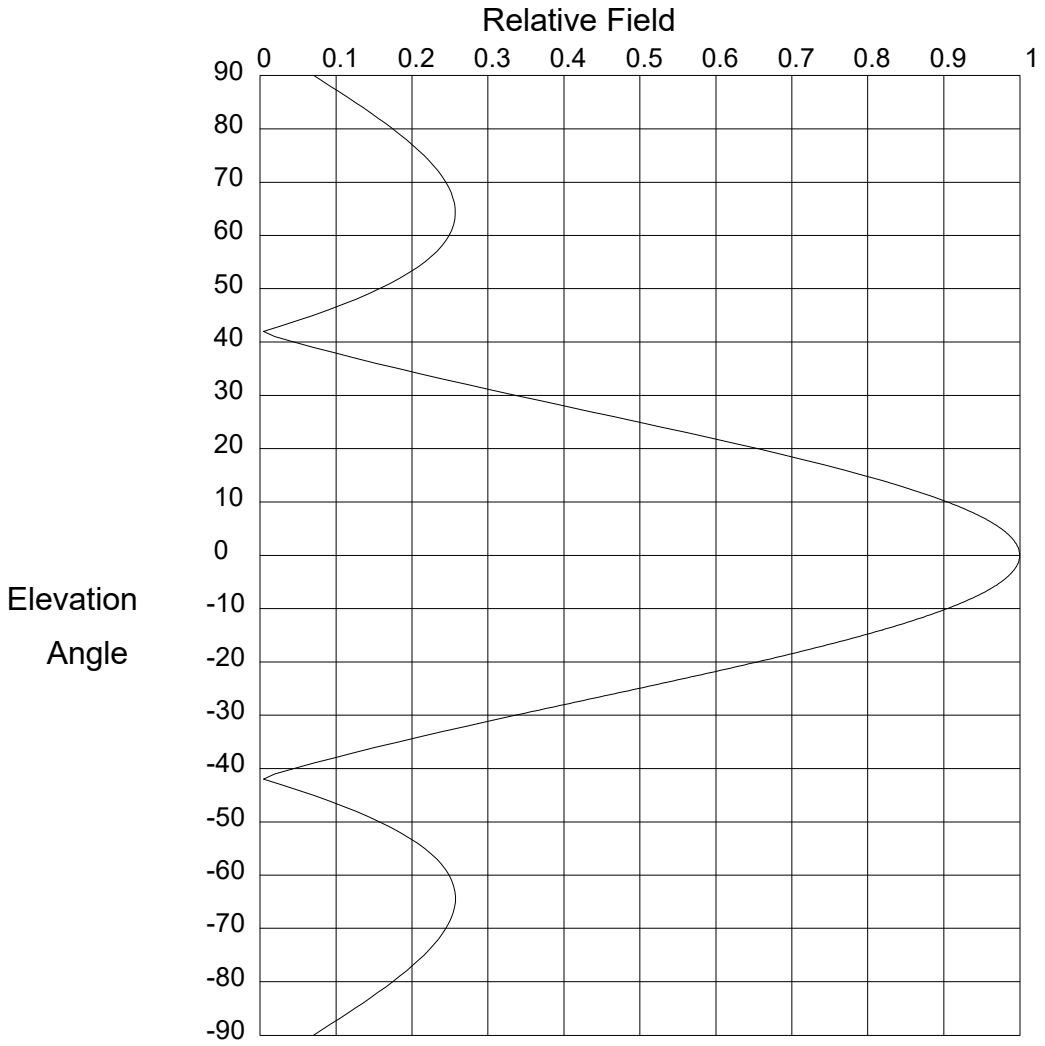
Half Wave Spaced
Electrical and Mechanical Specifications

Bays	Power Rating (watts)	Power Gain	dB Gain	Net. Weight (lbs)	Windload (lbs)
1	500	0.441	-3.556	15	35
2	1000	0.695	-1.580	35	85
3	1500	1.012	0.052	50	120
4	2000	1.313	1.183	65	155
5	2000	1.623	2.103	80	190
6	2000	1.924	2.842	95	225
8	2000	2.528	4.028	110	260
10	2000	3.129	4.954	125	295

3/4 Wave Spaced
Electrical and Mechanical Specifications

Bays	Power Rating (watts)	Power Gain	dB Gain	Net. Weight (lbs)	Windload (lbs)
1	500	0.441	-3.556	15	35
2	1000	.935	-0.292	35	85
3	1500	1.396	1.449	50	120
4	2000	1.845	2.660	65	155
5	2000	2.301	3.619	80	190
6	2000	2.756	4.403	95	225
8	2000	3.664	5.640	110	260
10	2000	4.590	6.618	125	295

Exhibit 9
Copy of Manufacturer's Vertical Antenna Pattern Documentation
(public record copy)



Elevation Pattern

Scale: Linear

Units: Field, Relative

Systems With Reliability

Date: 11/28/2016

CLIENT:
ANTENNA TYPE: FMxx/2-0.75WS
FREQUENCY: 98.1 MHz
PATTERN POL.: Circular
DIRECTIVITY(Peak): 1.87/2.719 dBd
DIRECTIVITY(Horiz): 1.87/2.719 dBd

Beam Tilt (Deg.) : *0*
Null Fill(s)(%) : *0, 0, 0*

Micro-Tek Eng. Ver. 2.6

Exhibit 9
Copy of Manufacturer's Vertical Antenna Pattern Documentation
(public record copy)

Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)
90.0	.071 (-23.01)	52.0	.184 (-14.681)	14.0	.819 (-1.73)
89.0	.082 (-21.746)	51.0	.172 (-15.314)	13.0	.843 (-1.485)
88.0	.093 (-20.65)	50.0	.157 (-16.058)	12.0	.865 (-1.259)
87.0	.104 (-19.686)	49.0	.142 (-16.942)	11.0	.886 (-1.054)
86.0	.114 (-18.828)	48.0	.126 (-18.003)	10.0	.905 (-0.868)
85.0	.125 (-18.059)	47.0	.108 (-19.302)	9.8	.909 (-0.833)
84.0	.135 (-17.364)	46.0	.09 (-20.937)	9.6	.912 (-0.799)
83.0	.146 (-16.734)	45.0	.07 (-23.09)	9.4	.916 (-0.765)
82.0	.156 (-16.161)	44.0	.049 (-26.15)	9.2	.919 (-0.733)
81.0	.165 (-15.637)	43.0	.027 (-31.25)	9.0	.923 (-0.701)
80.0	.175 (-15.158)	42.0	.004 (-47.007)	8.8	.926 (-0.669)
79.0	.184 (-14.72)	41.0	.019 (-34.211)	8.6	.929 (-0.639)
78.0	.192 (-14.32)	40.0	.044 (-27.054)	8.4	.932 (-0.609)
77.0	.201 (-13.955)	39.0	.07 (-23.066)	8.2	.935 (-0.58)
76.0	.208 (-13.622)	38.0	.097 (-20.263)	8.0	.938 (-0.552)
75.0	.216 (-13.32)	37.0	.125 (-18.088)	7.8	.941 (-0.524)
74.0	.223 (-13.047)	36.0	.153 (-16.305)	7.6	.944 (-0.498)
73.0	.229 (-12.802)	35.0	.182 (-14.79)	7.4	.947 (-0.472)
72.0	.235 (-12.585)	34.0	.212 (-13.474)	7.2	.95 (-0.446)
71.0	.24 (-12.394)	33.0	.242 (-12.309)	7.0	.953 (-0.422)
70.0	.245 (-12.23)	32.0	.273 (-11.266)	6.8	.955 (-0.398)
69.0	.249 (-12.091)	31.0	.305 (-10.321)	6.6	.958 (-0.374)
68.0	.252 (-11.979)	30.0	.337 (-9.459)	6.4	.96 (-0.352)
67.0	.254 (-11.893)	29.0	.369 (-8.669)	6.2	.963 (-0.33)
66.0	.256 (-11.833)	28.0	.401 (-7.94)	6.0	.965 (-0.309)
65.0	.257 (-11.8)	27.0	.433 (-7.265)	5.8	.967 (-0.289)
64.0	.257 (-11.795)	26.0	.466 (-6.638)	5.6	.97 (-0.269)
63.0	.256 (-11.819)	25.0	.498 (-6.055)	5.4	.972 (-0.25)
62.0	.255 (-11.873)	24.0	.53 (-5.512)	5.2	.974 (-0.232)
61.0	.252 (-11.958)	23.0	.562 (-5.005)	5.0	.976 (-0.214)
60.0	.249 (-12.078)	22.0	.593 (-4.532)	4.8	.978 (-0.197)
59.0	.245 (-12.233)	21.0	.624 (-4.09)	4.6	.979 (-0.181)
58.0	.239 (-12.428)	20.0	.655 (-3.676)	4.4	.981 (-0.166)
57.0	.233 (-12.664)	19.0	.685 (-3.291)	4.2	.983 (-0.151)
56.0	.225 (-12.948)	18.0	.714 (-2.931)	4.0	.984 (-0.137)
55.0	.217 (-13.284)	17.0	.742 (-2.597)	3.8	.986 (-0.124)
54.0	.207 (-13.679)	16.0	.769 (-2.285)	3.6	.987 (-0.111)
53.0	.196 (-14.141)	15.0	.795 (-1.997)	3.4	.989 (-0.099)

Systems With Reliability

CLIENT:

Date: 11/28/2016

ANTENNA TYPE: FMxx/2-0.75WS

FREQUENCY: 98.1 MHz

PATTERN POL.: Circular

DIRECTIVITY(Peak): 1.87/2.719 dBd

Beam Tilt (Deg.) : *0*

DIRECTIVITY(Horiz): 1.87/2.719 dBd

Null Fill(s)(%) : *0, 0, 0*

Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)
3.2	.99 (-0.088)	-4.4	.981 (-0.166)	-12.0	.865 (-1.259)
3.0	.991 (-0.077)	-4.6	.979 (-0.181)	-12.2	.861 (-1.303)
2.8	.992 (-0.067)	-4.8	.978 (-0.197)	-12.4	.856 (-1.347)
2.6	.993 (-0.058)	-5.0	.976 (-0.214)	-12.6	.852 (-1.392)
2.4	.994 (-0.049)	-5.2	.974 (-0.232)	-12.8	.847 (-1.438)
2.2	.995 (-0.041)	-5.4	.972 (-0.25)	-13.0	.843 (-1.485)
2.0	.996 (-0.034)	-5.6	.97 (-0.269)	-13.2	.838 (-1.532)
1.8	.997 (-0.028)	-5.8	.967 (-0.289)	-13.4	.834 (-1.58)
1.6	.997 (-0.022)	-6.0	.965 (-0.309)	-13.6	.829 (-1.629)
1.4	.998 (-0.017)	-6.2	.963 (-0.33)	-13.8	.824 (-1.679)
1.2	.999 (-0.012)	-6.4	.96 (-0.352)	-14.0	.819 (-1.73)
1.0	.999 (-0.009)	-6.6	.958 (-0.374)	-14.2	.815 (-1.782)
.8	.999 (-0.005)	-6.8	.955 (-0.398)	-14.4	.81 (-1.834)
.6	1.00 (-0.003)	-7.0	.953 (-0.422)	-14.6	.805 (-1.888)
.4	1.00 (-0.001)	-7.2	.95 (-0.446)	-14.8	.80 (-1.942)
.2	1.00 (0)	-7.4	.947 (-0.472)	-15.0	.795 (-1.997)
.0	1.00 (0)	-7.6	.944 (-0.498)	-15.2	.79 (-2.053)
-.2	1.00 (0)	-7.8	.941 (-0.524)	-15.4	.784 (-2.11)
-.4	1.00 (-0.001)	-8.0	.938 (-0.552)	-15.6	.779 (-2.167)
-.6	1.00 (-0.003)	-8.2	.935 (-0.58)	-15.8	.774 (-2.226)
-.8	.999 (-0.005)	-8.4	.932 (-0.609)	-16.0	.769 (-2.285)
-1.0	.999 (-0.009)	-8.6	.929 (-0.639)	-16.2	.763 (-2.346)
-1.2	.999 (-0.012)	-8.8	.926 (-0.669)	-16.4	.758 (-2.407)
-1.4	.998 (-0.017)	-9.0	.923 (-0.701)	-16.6	.753 (-2.469)
-1.6	.997 (-0.022)	-9.2	.919 (-0.733)	-16.8	.747 (-2.533)
-1.8	.997 (-0.028)	-9.4	.916 (-0.765)	-17.0	.742 (-2.597)
-2.0	.996 (-0.034)	-9.6	.912 (-0.799)	-17.2	.736 (-2.662)
-2.2	.995 (-0.041)	-9.8	.909 (-0.833)	-17.4	.73 (-2.728)
-2.4	.994 (-0.049)	-10.0	.905 (-0.868)	-17.6	.725 (-2.795)
-2.6	.993 (-0.058)	-10.2	.901 (-0.904)	-17.8	.719 (-2.863)
-2.8	.992 (-0.067)	-10.4	.897 (-0.94)	-18.0	.714 (-2.931)
-3.0	.991 (-0.077)	-10.6	.894 (-0.977)	-18.2	.708 (-3.001)
-3.2	.99 (-0.088)	-10.8	.89 (-1.015)	-18.4	.702 (-3.072)
-3.4	.989 (-0.099)	-11.0	.886 (-1.054)	-18.6	.696 (-3.144)
-3.6	.987 (-0.111)	-11.2	.882 (-1.093)	-18.8	.69 (-3.217)
-3.8	.986 (-0.124)	-11.4	.878 (-1.134)	-19.0	.685 (-3.291)
-4.0	.984 (-0.137)	-11.6	.873 (-1.175)	-19.2	.679 (-3.366)
-4.2	.983 (-0.151)	-11.8	.869 (-1.217)	-19.4	.673 (-3.442)

Systems With Reliability

CLIENT:
Date: 11/28/2016

ANTENNA TYPE: FMxx/2-0.75WS
FREQUENCY: 98.1 MHz
PATTERN POL.: Circular
DIRECTIVITY(Peak): 1.87/2.719 dBd
Beam Tilt (Deg.) : *0*
DIRECTIVITY(Horiz): 1.87/2.719 dBd
Null Fill(s)(%) : *0, 0, 0*

Exhibit 9
Copy of Manufacturer's Vertical Antenna Pattern Documentation
(public record copy)

Relative Field Tabulation

Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)	Elev. Angle	Rel. Fld(dB)
-19.6	.667 (-3.519)	-27.2	.427 (-7.396)	-54.0	.207 (-13.679)
-19.8	.661 (-3.597)	-27.4	.42 (-7.529)	-55.0	.217 (-13.284)
-20.0	.655 (-3.676)	-27.6	.414 (-7.663)	-56.0	.225 (-12.948)
-20.2	.649 (-3.757)	-27.8	.407 (-7.8)	-57.0	.233 (-12.664)
-20.4	.643 (-3.838)	-28.0	.401 (-7.94)	-58.0	.239 (-12.428)
-20.6	.637 (-3.921)	-28.2	.394 (-8.081)	-59.0	.245 (-12.233)
-20.8	.631 (-4.005)	-28.4	.388 (-8.224)	-60.0	.249 (-12.078)
-21.0	.624 (-4.09)	-28.6	.382 (-8.37)	-61.0	.252 (-11.958)
-21.2	.618 (-4.176)	-28.8	.375 (-8.518)	-62.0	.255 (-11.873)
-21.4	.612 (-4.263)	-29.0	.369 (-8.669)	-63.0	.256 (-11.819)
-21.6	.606 (-4.351)	-29.2	.362 (-8.822)	-64.0	.257 (-11.795)
-21.8	.60 (-4.441)	-29.4	.356 (-8.977)	-65.0	.257 (-11.8)
-22.0	.593 (-4.532)	-29.6	.349 (-9.135)	-66.0	.256 (-11.833)
-22.2	.587 (-4.624)	-29.8	.343 (-9.296)	-67.0	.254 (-11.893)
-22.4	.581 (-4.717)	-30.0	.337 (-9.459)	-68.0	.252 (-11.979)
-22.6	.575 (-4.812)	-31.0	.305 (-10.321)	-69.0	.249 (-12.091)
-22.8	.568 (-4.908)	-32.0	.273 (-11.266)	-70.0	.245 (-12.23)
-23.0	.562 (-5.005)	-33.0	.242 (-12.309)	-71.0	.24 (-12.394)
-23.2	.556 (-5.104)	-34.0	.212 (-13.474)	-72.0	.235 (-12.585)
-23.4	.549 (-5.204)	-35.0	.182 (-14.79)	-73.0	.229 (-12.802)
-23.6	.543 (-5.305)	-36.0	.153 (-16.305)	-74.0	.223 (-13.047)
-23.8	.537 (-5.408)	-37.0	.125 (-18.088)	-75.0	.216 (-13.32)
-24.0	.53 (-5.512)	-38.0	.097 (-20.263)	-76.0	.208 (-13.622)
-24.2	.524 (-5.618)	-39.0	.07 (-23.066)	-77.0	.201 (-13.955)
-24.4	.517 (-5.725)	-40.0	.044 (-27.054)	-78.0	.192 (-14.32)
-24.6	.511 (-5.834)	-41.0	.019 (-34.211)	-79.0	.184 (-14.72)
-24.8	.504 (-5.944)	-42.0	.004 (-47.007)	-80.0	.175 (-15.158)
-25.0	.498 (-6.055)	-43.0	.027 (-31.25)	-81.0	.165 (-15.637)
-25.2	.492 (-6.169)	-44.0	.049 (-26.15)	-82.0	.156 (-16.161)
-25.4	.485 (-6.284)	-45.0	.07 (-23.09)	-83.0	.146 (-16.734)
-25.6	.479 (-6.4)	-46.0	.09 (-20.937)	-84.0	.135 (-17.364)
-25.8	.472 (-6.518)	-47.0	.108 (-19.302)	-85.0	.125 (-18.059)
-26.0	.466 (-6.638)	-48.0	.126 (-18.003)	-86.0	.114 (-18.828)
-26.2	.459 (-6.76)	-49.0	.142 (-16.942)	-87.0	.104 (-19.686)
-26.4	.453 (-6.883)	-50.0	.157 (-16.058)	-88.0	.093 (-20.65)
-26.6	.446 (-7.009)	-51.0	.172 (-15.314)	-89.0	.082 (-21.746)
-26.8	.44 (-7.136)	-52.0	.184 (-14.681)	-90.0	.071 (-23.01)
-27.0	.433 (-7.265)	-53.0	.196 (-14.141)	90.0	.00 (-50)

Systems With Reliability

CLIENT:

Date: 11/28/2016

ANTENNA TYPE: FMxx/2-0.75WS

FREQUENCY: 98.1 MHz

PATTERN POL.: Circular

DIRECTIVITY(Peak): 1.87/2.719 dBd

Beam Tilt (Deg.) : *0*

DIRECTIVITY(Horiz): 1.87/2.719 dBd

Null Fill(s)(%) : *0, 0, 0*