# Technical Report Supporting a Form 349 Minor Construction Permit Modification Application

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

*for*

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

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*"Correction of Non-Directional Antenna Make & Model Designation"*

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*as a*

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

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February, 2017

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

# *Table of Contents*



## Supplemental Appendix(s):

# *Explanation of Technical Report 1*

**EXPLANATION OF PROPOSAL:** This Form 349 Filing and accompanying technical report supports a Minor Construction Permit Modification Application for FM Translator authorization K281CJ.C - Omaha, NE (Facility ID: 153185), File Number BPFT-20160831ABC. This FCC Form 349 Filing requests a simple correction of the broadcast antenna from a Shively (SHI) 6812B-1 (1-Bay, "Ring and Stub") antenna to a Shively (SHI) 6832 (1-Bay, "Opposed V Dipole") antenna. This correction was an oversight picked up at the time of construction. No other changes are requested. Continued non-directional operation on CH281D (104.1 MHz) with 0.250 kW ERP (Circular Polarization) at 448 meters AMSL is requested. This Form 349 Filing will continue to specify rebroadcast of Class C, AM Primary Station KOMJ(AM) - Omaha, NE (1490 kHz); Facility ID No. 74104. The Translator will remain licensed to the community of Omaha, NE.

**FACILITY COMPLIANCE SHOWINGS**: A map of the proposed 60 dBµ service contour in relation to the present 60 dBµ service contour has been included in ***Exhibit 1***. The minor change proposed service area will overlap a portion of the present service area as noted in the exhibit. The proposed 60 dBµ contour of the Translator lies wholly inside of the AM primary daytime 2.0 mV/m contour and 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 1025322. In support of this filing, 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 C.F.R. Section 74.1204 toward all allocation protection concerns with the exception of KSRZ(FM) - Omaha, NE (CH283C0) and KXKT(FM) - Glenwood, IA (CH279C0). A general allocation study for this proposal is found in ***Exhibit 6***. The applicant would like to note the existence of a C.F.R. 47 Section 74.1204(d) Second/Third Adjacent Channel Given Interference Waiver Request toward KSRZ(FM) - Omaha, NE (CH283C0) and KXKT(FM) - Glenwood, IA (CH279C0) as noted in ***Exhibit 8***. At the Translator site location, protection of the worst case calculated 141.0 dBµ F(50:10) Interference Contour, corresponding to the worst case protected 101.0 dBµ F(50:50) protected contour, has been demonstrated through a downward radiation study as included herein. Full protection will be afforded all concerns as the interference area 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 a worst case, one bay, isotrophic antenna. Additional antenna manufacturer's data has been included in **Exhibit 9**. There is one additional facility, existing or proposed, close enough to merit further study. Therefore, a supplemental contour protection study has been provided toward this facility as included in ***Exhibit 7***. It is believed sufficient clearance exists, precluding the need for additional contour protection showings.

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 with 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 seventeen 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, Technical Consultant
February 16, 2017

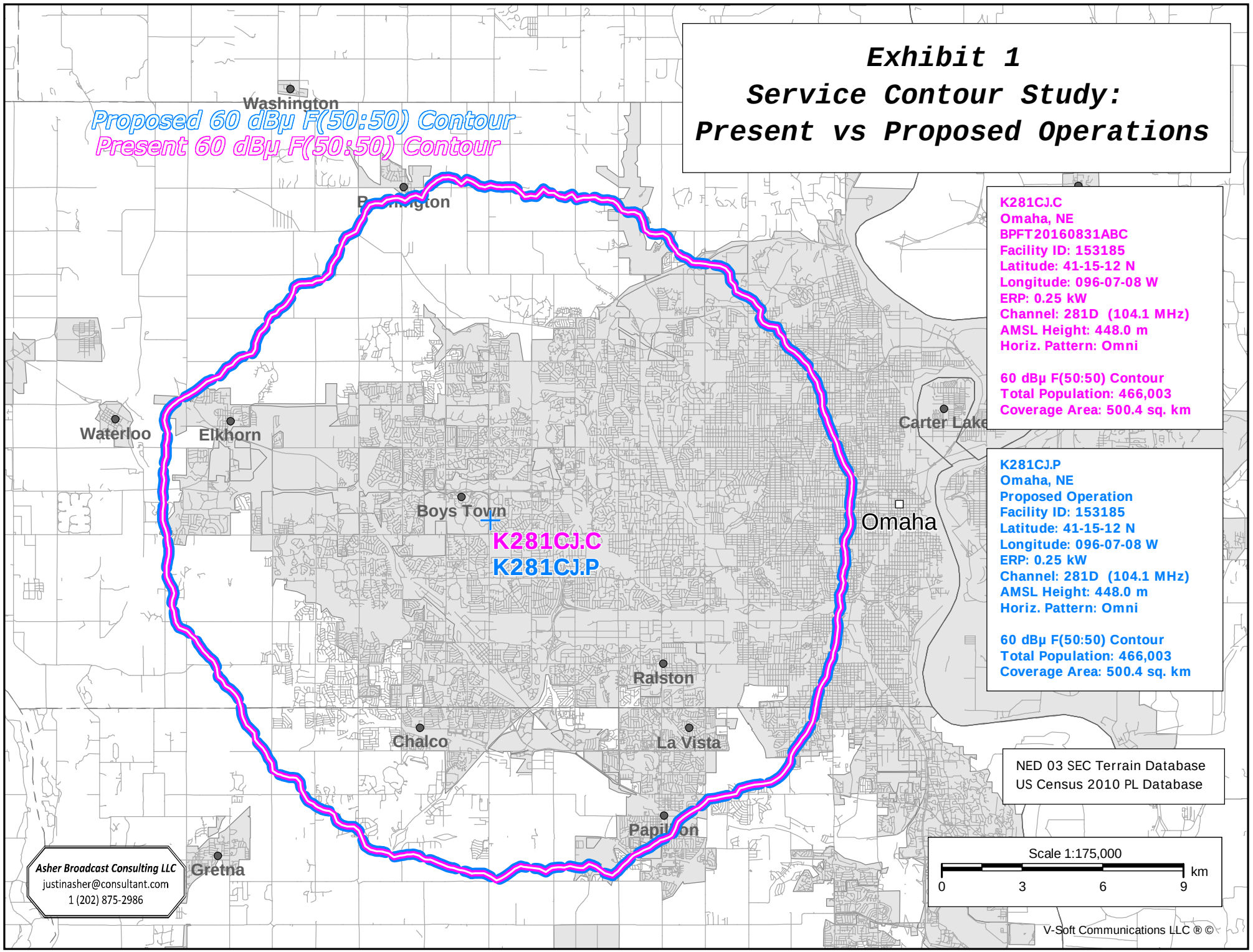
Exhibit 1
Service Contour Study:
Present vs Proposed Operations
Proposed 60 dBμ F(50:50) Contour
Present 60 dBμ F(50:50) Contour
Washington
Waterloo
Elkhorn
Boys Town
K281CJ.C
K281CJ.P
Omaha
Carter Lake
Ralston
Chalco
La Vista
Papillion
Gretna
K281CJ.C
Omaha, NE
BPFT20160831ABC
Facility ID: 153185
Latitude: 41-15-12 N
Longitude: 096-07-08 W
ERP: 0.25 kW
Channel: 281D (104.1 MHz)
AMSL Height: 448.0 m
Horiz. Pattern: Omni
60 dBμ F(50:50) Contour
Total Population: 466,003
Coverage Area: 500.4 sq. km
K281CJ.P
Omaha, NE
Proposed Operation
Facility ID: 153185
Latitude: 41-15-12 N
Longitude: 096-07-08 W
ERP: 0.25 kW
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60 dBμ F(50:50) Contour
Total Population: 466,003
Coverage Area: 500.4 sq. km
NED 03 SEC Terrain Database
US Census 2010 PL Database
Scale 1:175,000
0 3 6 9 km
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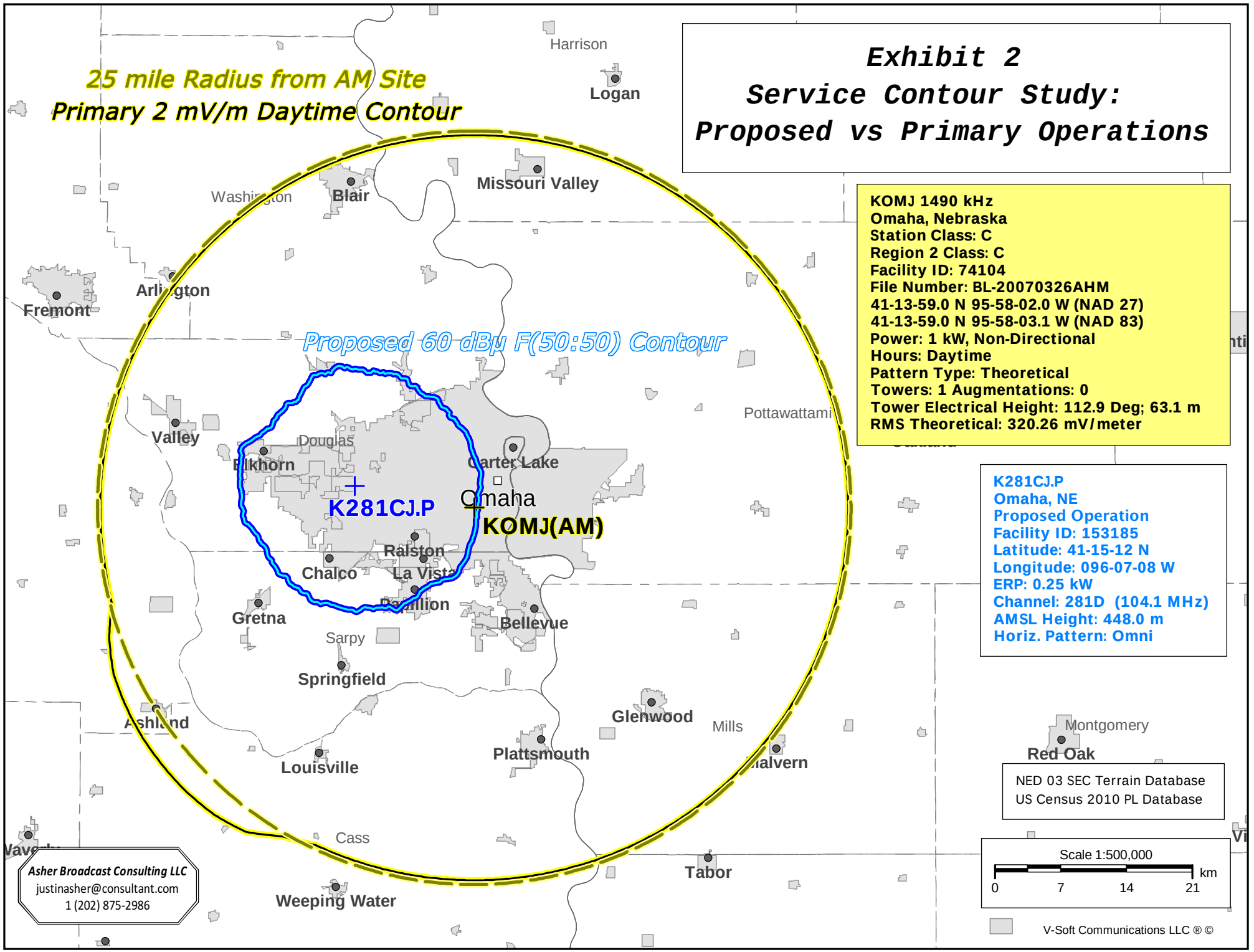
Exhibit 2
Service Contour Study:
Proposed vs Primary Operations
25 mile Radius from AM Site
Primary 2 mV/m Daytime Contour
Proposed 60 dBμ F(50:50) Contour
KOMJ 1490 kHz
Omaha, Nebraska
Station Class: C
Region 2 Class: C
Facility ID: 74104
File Number: BL-20070326AHM
41-13-59.0 N 95-58-02.0 W (NAD 27)
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
K281CJ.P
Omaha, NE
Proposed Operation
Facility ID: 153185
Latitude: 41-15-12 N
Longitude: 096-07-08 W
ERP: 0.25 kW
Channel: 281D (104.1 MHz)
AMSL Height: 448.0 m
Horiz. Pattern: Omni
K281CJ.P
KOMJ(AM)
Harrison
Logan
Missouri Valley
Blair
Washington
Fremont
Arlington
Valley
Douglas
Elkhorn
Carter Lake
Omaha
Pottawattami
Ralston
Chalco
La Vista
Papillion
Bellevue
Gretna
Sarpy
Springfield
Ashland
Louisville
Plattsmouth
Glenwood
Mills
Montgomery
Red Oak
Malvern
Cass
Tabor
Weeping Water
NED 03 SEC Terrain Database
US Census 2010 PL Database
Scale 1:500,000
0 7 14 21 km
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ASR Registration Search

# Registration 1025322

Map Registration

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

### Registration Detail

| | | | |
|---|---|---|---|
| Reg Number | 1025322 | Status | Constructed |
| File Number | A0151421 | Constructed | 10/01/1981 |
| EMI | No | Dismantled | |
| NEPA | No | | |

### Antenna Structure

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

### Location (in NAD83 Coordinates)

| | | | |
|---|---|---|---|
| Lat/Long | 41-15-12.0 N 096-07-09.0 W | Address | 132ND & HARNEY ST |
| City, State | OMAHA , NE | | |
| Zip | 68154 | County | DOUGLAS |
| Center of AM Array | | Position of Tower in Array | |

### Heights (meters)

| Elevation of Site Above Mean Sea Level | Overall Height Above Ground (AGL) |
|---|---|
| 375.0 | 91.0 |
| **Overall Height Above Mean Sea Level** | **Overall Height Above Ground w/o Appurtenances** |
| 466.0 | 88.0 |

### Painting and Lighting Specifications

FAA Chapters 4, 8, 13
Paint and Light in Accordance with FAA Circular Number 70/7460-1J

### FAA Notification

| | | | |
|---|---|---|---|
| FAA Study | 99-ACE-0222-OE | FAA Issue Date | 03/13/1999 |

### Owner & Contact Information

FRN: 0004721726
Owner Entity Type:

**Owner**

METROPOLITAN UTILITIES DISTRICT
Attention To: CORY O BRIEN
3100 S 61ST AVE
OMAHA , NE 68106-3621

P: (402)554-7902
F:
E: CORY_O'BRIEN@MUDNEBR.COM

**Contact**

P:
F:
E:

### Last Action Status

| | | | |
|---|---|---|---|
| Status | Constructed | Received | 11/20/2000 |
| Purpose | Notification | Entered | 12/01/2000 |
| Mode | Mail In (Manual) | | |

### Related Applications

| | |
|---|---|
| 11/20/2000 | A0151421 - Notification (NT) |
| 08/02/1999 | A0093938 - Notification (NT) |
| 08/02/1999 | A0093940 - Modification (MD) |

Related applications (5)

### Comments

**Comments**

None

### History

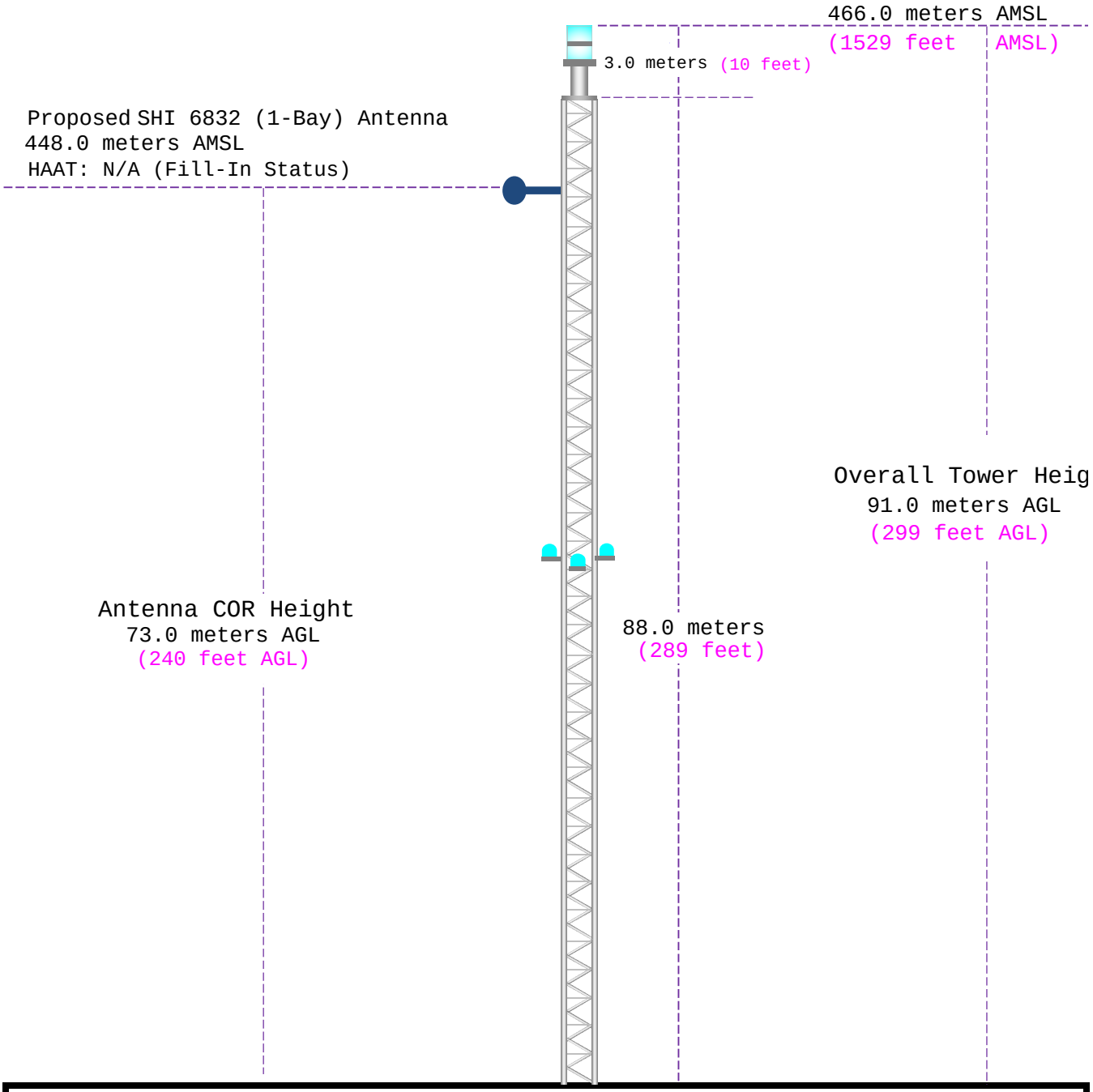
| Date | Event |
|---|---|
| 12/01/2000 | Construction Notification Received |
| 09/05/2000 | Construction Reminder Letter Sent |
| 09/01/1999 | Registration Printed |

All History (6)

### Automated Letters

| | |
|---|---|
| 09/05/2000 | Construction Reminder, Reference 71444 |
| 09/01/1999 | Authorization, Reference 20595 |
| 09/01/1999 | Authorization, Reference 20597 |

# *Exhibit 4*
# *Vertical Plan of Antenna System*




**Ground Elevation:** 375.0 meters AMSL (1230 feet AMSL)

**Address:** 132nd & Harney Street
**City:** Omaha
**County:** Douglas
**State:** Nebraska

| | Latitude (D M S) | Longitude (D M S) |
|---|---|---|
| NAD 27 datum values: | 41 15 12.00373 | 96 07 7.92750 |
| NAD 83 datum values: | 41 15 12.00000 | 96 07 9.00000 |

**Antenna Structure Registration**
1025322

Drawing Is Not To Scale

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# *Exhibit 5*
# *HAAT and Miscellaneous Coordinate Information*

## HAAT Calculation (1927):

N. Lat. = 411512.0  W. Lng. = 960708.0
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 | 354.6 | 93.4 | 0.2500 | -6.02 | 1.000 | 12.45 |
| 030 | 357.3 | 90.7 | 0.2500 | -6.02 | 1.000 | 12.27 |
| 060 | 349.2 | 98.8 | 0.2500 | -6.02 | 1.000 | 12.79 |
| 090 | 339.5 | 108.5 | 0.2500 | -6.02 | 1.000 | 13.39 |
| 120 | 330.2 | 117.8 | 0.2500 | -6.02 | 1.000 | 13.95 |
| 150 | 337.7 | 110.3 | 0.2500 | -6.02 | 1.000 | 13.50 |
| 180 | 342.2 | 105.8 | 0.2500 | -6.02 | 1.000 | 13.22 |
| 210 | 354.9 | 93.1 | 0.2500 | -6.02 | 1.000 | 12.43 |
| 240 | 366.6 | 81.5 | 0.2500 | -6.02 | 1.000 | 11.67 |
| 270 | 358.6 | 89.4 | 0.2500 | -6.02 | 1.000 | 12.19 |
| 300 | 371.6 | 76.4 | 0.2500 | -6.02 | 1.000 | 11.33 |
| 330 | 371.3 | 76.7 | 0.2500 | -6.02 | 1.000 | 11.35 |

Ave El= 352.79 M  HAAT= 95.21 M  AMSL= 448.0

## NAD 1983 to NAD 1927 Conversion:

| | Latitude | Longitude |
|---|---|---|
| NAD 27 datum values: | 41 15 12.00373 | 96 07 7.92750 |
| NAD 83 datum values: | 41 15 12.00000 | 96 07 9.00000 |

## Various Coordinate Conversion Calculations (NAD 1983):

| **Position Type** | Lat Lon |
|---|---|
| **Degrees Lat Long** | 41.2533333°, -096.1191667° |
| **Degrees Minutes** | 41°15.20000', -096°07.15000' |
| **Degrees Minutes Seconds** | 41°15'12.0000", -096°07'09.0000" |
| **UTM** | 14T 741365mE 4570883mN |
| **UTM centimeter** | 14T 741365.89mE 4570883.03mN |
| **MGRS** | 14TQL4136570883 |
| **Grid North** | 1.9° |
| **GARS** | 168LY28 |
| **Maidenhead** | EN11WG50QT82 |
| **GEOREF** | FJJM52851520 |

# *Exhibit 6*
# *Tabulation of Proposed Allocation Spacings Study*

*Red text indicates the existence of a C.F.R. 47 Section 74.1204(d) Second/Third Adjacent Channel Given Interference Waiver Request toward KSRZ(FM) - Omaha, NE (CH283C0) and KXKT(FM) - Glenwood, IA (CH279C0) as noted in* ***Exhibit 8.*** *At the Translator site location, protection of the worst case calculated 141.0 dBµ F(50:10) Interference Contour, corresponding to the worst case protected 101.0 dBµ F(50:50) protected contour, has been demonstrated through a downward radiation study as included herein. Full protection will be afforded all concerns as the interference area 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 a worst case, one bay, isotrophic antenna. Additional antenna manufacturer's data has been included in* ***Exhibit 9.***

*Yellow Highlighted Text indicates contour protection studies toward select allocation concern(s) as included in* ***Exhibit 7.***

Vss Catholic Communications, Inc.

REFERENCE CH# 281D - 104.1 MHz, Pwr= 0.25 kW, HAAT= 0.0 M, COR= 448 M — DISPLAY DATES
41 15 12.0 N. — Average Protected F(50-50)= 7.09 km — DATA 02-15-17
96 07 08.0 W. — Omni-directional — SEARCH 02-15-17

| CH CITY | CALL STATE | TYPE ANT | AZI <-- | DIST FILE # | LAT LNG | PWR(kW) HAAT(M) | INT(km) COR(M) | PRO(km) LICENSEE | *IN* (Overlap in km) | *OUT* |
|---|---|---|---|---|---|---|---|---|---|---|
| 283C0 | KSRZ | LIC _C_ | 53.1 | 9.48 | 41 18 16.0 | 100.000 | 10.5 | 74.2 | -13.5*< | -65.8*< |
| Omaha | NE | | 233.2 | BMLH20050610AIL | 96 01 41.0 | 332 | 673 | Scripps Broadcasting Holdi | | |
| 279C0 | KXKT | LIC _CX | 51.5 | 9.92 | 41 18 32.0 | 100.000 | 10.5 | 74.3 | -13.4*< | -65.5*< |
| Glenwood | IA | | 231.6 | BLH20060531ANQ | 96 01 33.0 | 331 | 674 | Capstar Tx, Llc | | |
| 281D | K281CJ | CP _C_ | 0.0 | 0.00 | 41 15 12.0 | 0.250 | 42.8 | 12.4 | -55.3* | -55.3* |
| Omaha | NE | | 0.0 | BPFT20160831ABC | 96 07 08.0 | | 448 | Vss Catholic Communication | | |
| 281C2 | KIBZ | LIC _CX | 214.0 | 98.27 | 40 31 06.0 | 31.000 | 133.3 | 52.9 | -47.4*< | 2.8 |
| Crete | NE | | 33.5 | BMLH20140911ACG | 96 46 06.0 | 187 | 614 | Alpha 3e Licensee Llc | | |
| 281C | KMYR | RSV-A ___ | 67.9 | 197.82 | 41 54 09.0 | 100.000 | 198.0 | 92.0 | -13.3*< | 60.8 |
| Ames | IA | | 249.3 | | 93 54 15.0 | 600 | 906 | Saga Communications Of Iow | | |
| 281C1 | WNAX-FM | LIC _CY | 333.6 | 172.53 | 42 38 24.0 | 100.000 | 168.7 | 69.5 | -8.0< | 62.5 |
| Yankton | SD | | 153.0 | BLH19891026KA | 97 03 21.0 | 299 | 726 | Saga Communications, Inc. | | |
| 281C | KMYR | APP _CX | 67.9 | 197.82 | 41 54 09.0 | 100.000 | 187.4 | 83.8 | -2.7< | 69.0 |
| Ames | IA | | 249.3 | BPH20150603ABB | 93 54 15.0 | 451 | 757 | Saga Communications Of Iow | | |
| 227C3 | KFFF | LIC _CX | 88.0 | 12.97 | 41 15 26.0 | 8.500 | 13.0 | 8.5 | 11.5R | 1.5M |
| Bennington | NE | | 268.1 | BLH20140505AAR | 95 57 50.9 | 170 | 500 | Capstar Tx, Llc | | |
| 281C0 | KMYR | LIC _CN | 67.9 | 197.82 | 41 54 09.0 | 100.000 | 173.4 | 73.4 | 11.3 | 79.4 |
| Ames | IA | | 249.3 | BLH19861229KC | 93 54 15.0 | 308 | 615 | Saga Communications Of Iow | | |
| 228C3 | KRSS | LIC _CX | 135.8 | 113.32 | 40 31 11.0 | 11.000 | 13.0 | 8.5 | 11.5R | 101.8M |
| Tarkio | MO | | 316.4 | BMLH20080328ABB | 95 11 03.0 | 149 | 468 | Radio Free Ministries, Inc | | |
| 280C2 | KNZA | LIC _CN | 165.6 | 192.11 | 39 34 41.0 | 50.000 | 75.6 | 50.0 | 103.2 | 122.2 |
| Hiawatha | KS | | 346.0 | BLH19940622KA | 95 33 46.0 | 150 | 471 | Knza, Inc. | | |
| 228C1 | KKOT | LIC _CN | 284.3 | 134.34 | 41 32 28.0 | 100.000 | 13.0 | 8.5 | 21.5R | 112.8M |
| Columbus | NE | | 103.3 | BLH19910822KC | 97 40 45.0 | 299 | 808 | Alpha 3e Licensee Llc | | |
| 280C1 | KNLV-FM | LIC _C_ | 287.2 | 258.43 | 41 54 06.9 | 100.000 | 105.7 | 72.9 | 140.1 | 166.7 |
| Ord | NE | | 105.2 | BLH20170103ABI | 99 06 11.0 | 286 | 997 | Mwb Broadcasting Ii, Llc | | |
| 280C3 | KRFS-FM | LIC _CX | 233.4 | 210.58 | 40 06 20.0 | 12.000 | 48.7 | 30.9 | 150.3 | 162.9 |
| Superior | NE | | 52.1 | BLH20130328APA | 98 06 21.0 | 100 | 627 | Ck Broadcasting, Inc. | | |

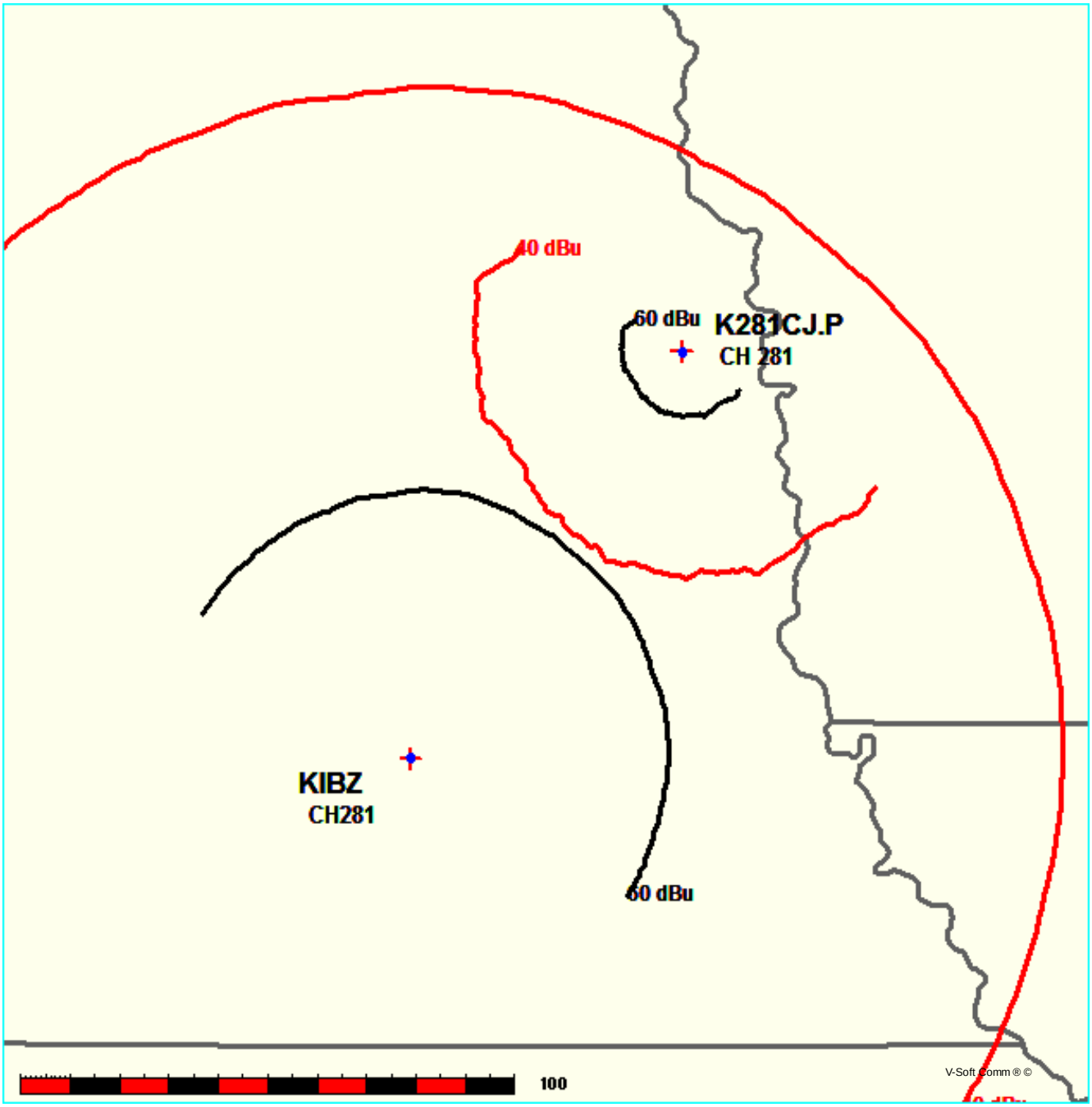
Terrain database is NED 03 SEC , R= 73.215 qualifying spacings or FCC minimum Spacings in KM, M= Margin in KM
Contour distances are on direct line to and from reference station. Reference zone= West Zone, Co to 3rd adjacent.
All separation margins (if shown) include rounding.
Ant Column: (D= DA Standard, 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.
< = Contour Overlap

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

FMCommander Single Allocation Study - 02-15-2017 - NED 03 SEC
K281CJ.P's Overlaps (In= -47.36 km, Out= 2.81 km)

K281CJ.P CH 281 D
Lat= 41 15 12.0,  Lng= 96 07 08.0
0.25 kW  0 m HAAT, 448 m COR
Prot.=  60 dBu,  Intef.=  40 dBu

KIBZ CH 281 C2  BMLH20140911ACG
Lat= 40 31 06.0,  Lng= 96 46 06.0
31.0 kW  187 m HAAT, 614 m COR
Prot.=  60 dBu,  Intef.= 40 dBu

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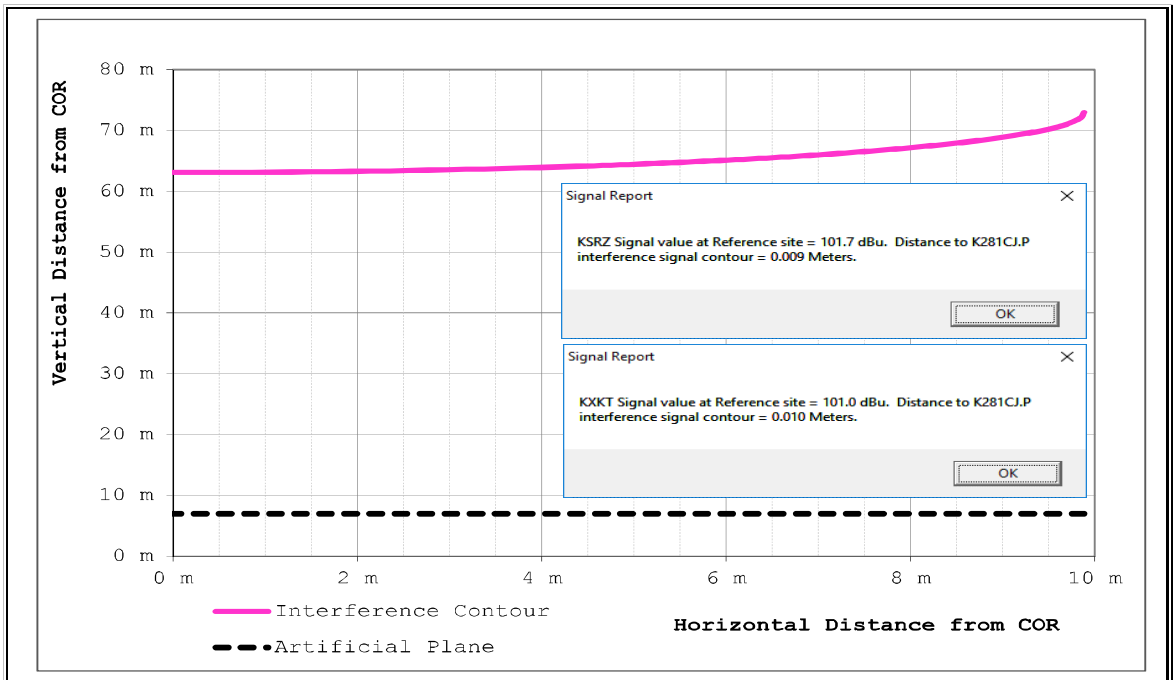
# *Exhibit 8*
# *Second / Third Adjacent Given Interference Waiver Request*

*The applicant would like to note the existence of a C.F.R. 47 Section 74.1204(d) Second/Third Adjacent Channel Given Interference Waiver Request toward KSRZ(FM) - Omaha, NE (CH283C0) and KXKT(FM) - Glenwood, IA (CH279C0) as noted in* ***Exhibit 8****. At the Translator site location, protection of the worst case calculated 141.0 dBµ F(50:10) Interference Contour, corresponding to the worst case protected 101.0 dBµ F(50:50) protected contour, has been demonstrated through a downward radiation study as included herein. Full protection will be afforded all concerns as the interference area 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 a worst case, one bay, isotrophic antenna. Additional antenna manufacturer's data has been included in* ***Exhibit 9****.*




**Proposed Antenna:** Worst Case 1 Bay Isotrophic Antenna
**Proposed Power:** 0.250 kW
**Antenna Height AGL:** 73.0 meters
**Protection Plane Height:** 7.0 meters
**Protected Contour:** 101.00 dBµ f(50:50)
**Interference Contour:** 141.00 dBµ f(50:50)

**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 | 9.88 m | | | | |
| -5° | 1.000 | 0.250 | -6.02 | 9.88 m | 757.27 m | 837.58 m | 103.31 dBµ | 102.44 dBµ |
| -10° | 1.000 | 0.250 | -6.02 | 9.88 m | 380.08 m | 420.39 m | 109.30 dBµ | 108.43 dBµ |
| -15° | 1.000 | 0.250 | -6.02 | 9.88 m | 255.00 m | 282.05 m | 112.77 dBµ | 111.89 dBµ |
| -20° | 1.000 | 0.250 | -6.02 | 9.88 m | 192.97 m | 213.44 m | 115.19 dBµ | 114.31 dBµ |
| -25° | 1.000 | 0.250 | -6.02 | 9.88 m | 156.17 m | 172.73 m | 117.03 dBµ | 116.15 dBµ |
| -30° | 1.000 | 0.250 | -6.02 | 9.88 m | 132.00 m | 146.00 m | 118.49 dBµ | 117.61 dBµ |
| -35° | 1.000 | 0.250 | -6.02 | 9.88 m | 115.07 m | 127.27 m | 119.68 dBµ | 118.80 dBµ |
| -40° | 1.000 | 0.250 | -6.02 | 9.88 m | 102.68 m | 113.57 m | 120.67 dBµ | 119.79 dBµ |
| -45° | 1.000 | 0.250 | -6.02 | 9.88 m | 93.34 m | 103.24 m | 121.50 dBµ | 120.62 dBµ |
| -50° | 1.000 | 0.250 | -6.02 | 9.88 m | 86.16 m | 95.29 m | 122.19 dBµ | 121.32 dBµ |
| -55° | 1.000 | 0.250 | -6.02 | 9.88 m | 80.57 m | 89.12 m | 122.78 dBµ | 121.90 dBµ |
| -60° | 1.000 | 0.250 | -6.02 | 9.88 m | 76.21 m | 84.29 m | 123.26 dBµ | 122.38 dBµ |
| -65° | 1.000 | 0.250 | -6.02 | 9.88 m | 72.82 m | 80.55 m | 123.65 dBµ | 122.78 dBµ |
| -70° | 1.000 | 0.250 | -6.02 | 9.88 m | 70.24 m | 77.68 m | 123.97 dBµ | 123.09 dBµ |
| -75° | 1.000 | 0.250 | -6.02 | 9.88 m | 68.33 m | 75.58 m | 124.21 dBµ | 123.33 dBµ |
| -80° | 1.000 | 0.250 | -6.02 | 9.88 m | 67.02 m | 74.13 m | 124.38 dBµ | 123.50 dBµ |
| -85° | 1.000 | 0.250 | -6.02 | 9.88 m | 66.25 m | 73.28 m | 124.48 dBµ | 123.60 dBµ |
| -90° | 1.000 | 0.250 | -6.02 | 9.88 m | 66.00 m | 73.00 m | 124.51 dBµ | 123.63 dBµ |


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**Exhibit 9 - Copy of Manufacturer's Antenna Data**
**(public record copy)**

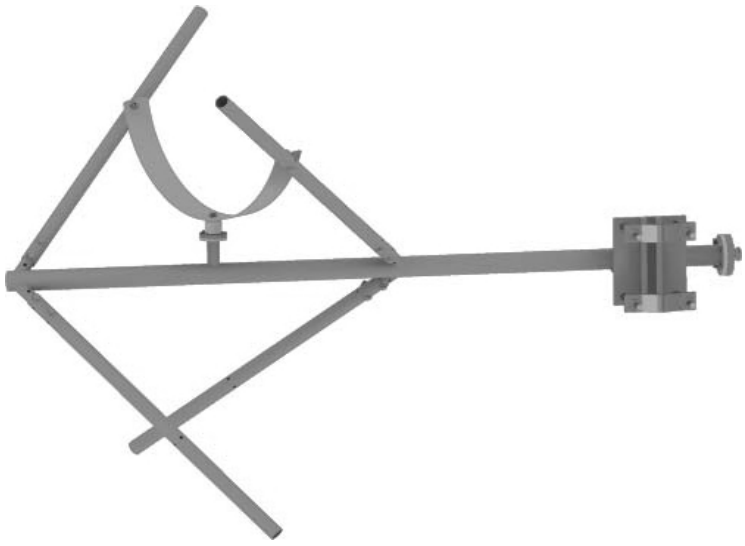
Shively Labs®

# Model 6832 FM Antenna

Elliptically polarized

Broadband

Up to 2.5 kW rating per bay



## Features:

- Broadband without retuning
- Non-pressurized connectors
- Easy to install - minimum maintenance
- Easily disassembled for shipment by small-package carrier

## Performance specifications:

Bandwidth: 87.5 - 108 MHz

Polarization: Circular.

VSWR: 1.35 : 1 or better.

Azimuth pattern circularity: Horizontal component ± 1.5 dB on pole.

Input connection: 1 bay: 7/16 DIN
2 bays: 7/8 EIA 50 Ω
3-8 bays: 1-5/8" EIA, 50 Ω

Bay spacing: 98" (249 cm)

Mounts to fit: 1-1/2" OD to 3-1/2" OD (38-89 mm) outrigged pole (supplied by customer).

## Electrical specifications:

| No. of Bays | Gain | | Power Rating | No. of Bays | Gain | | Power Rating |
|---|---|---|---|---|---|---|---|
| | Power | dB | kW | | Power | dB | kW |
| 1 | 0.46 | -3.369 | 2.5 | 5 | 2.518 | 4.01 | 12.5 |
| 2 | 0.994 | -0.027 | 5 | 6 | 3.024 | 4.806 | 15 |
| 3 | 1.512 | 1.797 | 7.5 | 8 | 4.044 | 6.068 | 15* |
| 4 | 2.016 | 3.044 | 10 | | | | |

* Higher-power arrays available. Contact factory for power divider requirements.

## Notes:

1. Our gain figures are calculated by factoring the directivity to allow for losses in the radiating system. Due to this conservative approach, you are assured of radiating maximum ERP by using Shively's published gain figures.

   Gain is provided for one polarization and is equal in circularly polarized antennas for both horizontal and vertical components.

   Gain is computed for 98 MHz and will vary across the band.

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# Exhibit 9 - Copy of Manufacturer's Antenna Data
## (public record copy)

## Model 6832 size and weight:

| No. of Bays | Vertical Tower Space | | | | | | Weight | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Antenna Radiation Aperture | | Pipe Length Required | | Total Tower Space Recommended | | Without ice | With 1/2" (1.2 cm) radial ice | With 1" (2.54 cm) radial ice | With 2" (5.1 cm) radial ice |
| | ft | m | ft | m | ft | m | lb | lb | lb | lb |
| 1 | 4.1 | 1.25 | 10 | 3.05 | 20 | 6.1 | 59 | 84 | 120 | 165 |
| 2 | 8.2 | 2.5 | 18.5 | 5.6 | 28.2 | 8.6 | 121 | 187 | 286 | 417 |
| 3 | 16.3 | 5 | 26.4 | 8.05 | 36.4 | 11.1 | 169 | 278 | 448 | 678 |
| 4 | 24.5 | 7.5 | 34.5 | 10.5 | 44.5 | 13.6 | 224 | 368 | 591 | 895 |
| 5 | 32.7 | 10 | 42.7 | 13.01 | 52.7 | 16.06 | 278 | 479 | 800 | 1243 |
| 6 | 40.8 | 12.43 | 50.8 | 15.48 | 60.8 | 18.53 | 324 | 564 | 947 | 1474 |
| 8 | 57.2 | 17.43 | 67.2 | 20.48 | 77.2 | 23.53 | 448 | 808 | 1398 | 2217 |

## Windload:

| No. of Bays | TIA-222-G | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Without ice | | With 1/2" (1.2 cm) radial ice | | With 1" (2.54 cm) radial ice | | With 2" (5.1 cm) radial ice | |
| | $EPA_N$ $ft^2$ ($m^2$) | $EPA_T$ $ft^2$ ($m^2$) | $EPA_N$ $ft^2$ ($m^2$) | $EPA_T$ $ft^2$ ($m^2$) | $EPA_N$ $ft^2$ ($m^2$) | $EPA_T$ $ft^2$ ($m^2$) | $EPA_N$ $ft^2$ ($m^2$) | $EPA_T$ $ft^2$ ($m^2$) |
| 1 | 2.4 (0.22) | 1.2 (0.11) | 3.3 (0.31) | 1.7 (0.16) | 4.1 (0.38) | 2.2 (0.20) | 5.0 (0.46) | 2.9 (0.27) |
| 2 | 6.5 (0.60) | 4.1 (0.38) | 10.3 (0.96) | 7.0 (0.65) | 13.8 (1.28) | 10.0 (0.93) | 17.4 (1.62) | 13.1 (1.22) |
| 3 | 10.5 (0.98) | 6.9 (0.64) | 18.1 (1.68) | 13.3 (1.24) | 25.4 (2.36) | 19.7 (1.83) | 32.7 (3.04) | 26.3 (2.44) |
| 4 | 13.9 (1.29) | 9.1 (0.85) | 24 (2.23) | 17.5 (1.63) | 33.6 (3.12) | 26.1 (2.42) | 43.3 (4.02) | 34.9 (3.24) |
| 5 | 19.2 (1.78) | 13.2 (1.23) | 35.2 (3.27) | 27.1 (2.52) | 50.7 (4.71) | 41.3 (3.84) | 66.2 (6.15) | 55.6 (5.17) |
| 6 | 22.9 (2.13) | 15.7 (1.46) | 42.0 (3.90) | 32.2 (2.99) | 60.4 (56.1) | 49.1 (4.56) | 78.9 (7.33) | 66.3 (6.16) |

## Notes:

3. Antenna radiation aperture is the distance from the center of the top bay to the center of the bottom bay. Five ft (1.5 meters) of pipe is required above the top of the top bay and below the bottom of the bottom bay. Total tower space recommended allows ten ft (3 m) of clear tower space above the center line of the top bay and below the center line of the bottom bay, to protect from pattern interference by other antennas.
4. Windload and weight tabulations include the bay, interbay feedline, input connection, and power dividers.
5. Antenna areas and weights calculated in accordance with TIA-222-G. See figures, next page.
6. Ask for technical assistance at Shively if you are planning to mount antennas on AM towers or install them at altitudes over 3,000 ft (915 m) above mean sea level.