

## **ENGINEERING EXHIBIT**

### **Incentive Auction Channel Reassignment**

#### **Application for Digital Television Station Construction Permit**

prepared for

#### **Woods Communications Corporation**

KLCW-TV Wolfforth, TX

Facility ID 77719

Ch. 23 127 kW 282 m

*Woods Communications Corporation* (“*Woods*”) is the licensee of digital television station KLCW-TV, Channel 43, Facility ID 77719, Wolfforth, TX. *Woods* herein proposes construction of the KLCW-TV post-auction facility on Channel 23. Reassignment of KLCW-TV from Channel 43 to Channel 23 was specified in the *Incentive Auction Closing and Channel Reassignment Public Notice* (“*CCRPN*”, DA 17-317, released April 13, 2017).

KLCW-TV presently shares an antenna with KJTV-TV (Fac ID 55031, Ch. 35, Lubbock TX). The proposed KLCW-TV Channel 23 operation will employ a new directional broadband antenna system to be top-mounted on the KLCW-TV tower that will also be shared with KJTV-TV. The antenna’s center of radiation height above ground will increase by 4.3 meters. *Woods* proposes to operate KLCW-TV with an effective radiated power (“ERP”) of 127 kW at 282 meters antenna height above average terrain (“HAAT”).

The existing tower structure corresponds to FCC Antenna Structure Registration (“ASR”) number 1248244. The proposed reconfiguration of the top of the tower will result in an increase of the structure’s overall height by 7.6 meters to 297.2 meters above ground level. The FAA will be notified of the proposed height increase and, upon receipt of an FAA Determination of No Hazard, an application to modify the FCC ASR will be submitted. At that time an amendment will be supplied to this application to supply the ASR number.<sup>1</sup>

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<sup>1</sup>As discussed with FCC staff, the ASR number is omitted on the accompanying Form 2100 because the LMS electronic filing system automatically pre-fills the overall structure height from ASR data, which presently is set to the existing height of 289.6 meters AGL. By omitting the ASR number, the proposed overall height can be

The proposed antenna is a horizontally polarized directional RFS model PPHR64U3313. The directional antenna's azimuthal pattern is supplied in Figure 1 and the elevation pattern is depicted in Figure 2.

A map is supplied as Figure 3 which depicts the standard predicted coverage contours. This map includes the location of Wolfforth, KLCW-TV's principal community. As demonstrated thereon, the proposed facility complies with §73.625(a)(1) as the entire principal community will be encompassed by the 48 dBμ contour.

The proposed noise limited service contour ("NLSC") extends beyond that of the *CCRPN* parameters of 119 kW ERP and 280 meters HAAT.<sup>2</sup> The proposal complies with §73.3700(b)(ii) as described in the following.

The *CCRPN* facility specifies a nondirectional antenna pattern corresponding to KLCW-TV's licensed Channel 43. The proposed replacement antenna for KLCW-TV's Channel 23 antenna has a wide cardioid directional pattern, having a region of mildly reduced power to the south (where population density is minimal). The use of a directional antenna results in variations of coverage contour location from the reassignment facility. Therefore, KLCW-TV qualifies under §73.3700(b)(ii)(A) for a contour extension due to the loss of coverage area that would otherwise result from implementation of the new channel assignment.

Interference study per FCC OET Bulletin 69<sup>3</sup> shows that the proposal complies with the 0.5 percent limit of new interference caused to pertinent nearby post-auction full service and Class A television stations and reassignments as required by §73.616. The interference study

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entered on the form.

<sup>2</sup>The antenna height above ground will increase by 4.3 meters. The proposed KLCW-TV antenna HAAT is recalculated to be 282.1 meters, based on FCC 30 meter terrain data developed by OET.

<sup>3</sup>FCC Office of Engineering and Technology Bulletin number 69, *Longley-Rice Methodology for Evaluating TV Coverage and Interference*, February 6, 2004 ("OET-69"). This analysis employed the FCC's current "TVStudy" software with the default application processing template settings, 2 km cell size, and 1 km terrain increment. Comparisons of various results of this computer program (run on a Mac processor) to the FCC's implementation of TVStudy show excellent correlation.

output report is provided as Table 1. This satisfies §73.3700(b)(ii)(C) for the proposed NLSC extension.

The amount of NLSC extension does not exceed one percent in any direction. Figure 4 supplies a coverage contour comparison of the proposed KLCW-TV facility to the reassignment facility's contour and a one percent extension distance of the reassignment facility's contour. Here, the contour level is adjusted with the dipole factor to match FCC application processing. Table 1's results also demonstrate that the proposed contour is within the baseline contour plus one percent. Therefore the proposed contour extension complies with §73.3700(b)(ii)(B).

The proposed KLCW-TV facility's terrain-limited population provides a 97.8 percent match of the *CCRPN* baseline facility, as detailed in the following table. The OET Bulletin 69 report summary in Table 1 also concludes that the proposed service area population is more than 95 percent of the baseline population.

**Terrain Limited Population - Match of Reassignment**

| Population Summary (2010 Census)<br>OET Bulletin 69: TVStudy | Reassignment<br>Parameters | Proposed      |
|--|----------------------------|---------------|
| Within Noise Limited Contour                                 | 376,442                    | 368,342       |
| Not affected by terrain losses                               | 376,435                    | 368,335       |
| Match of Reassignment  | ---                        | <b>97.85%</b> |

The nearest FCC monitoring station is 764 km distant at Douglas, AZ. This exceeds by a large margin the threshold minimum distance specified in §73.1030(c)(3) that would suggest consideration of the monitoring station. The site is not located within the areas requiring coordination with "quiet" zones specified in §73.1030(a) and (b). The site location is beyond the border areas requiring international coordination. There are no authorized AM stations within 3 kilometers of the site.

### **Human Exposure to Radiofrequency Electromagnetic Field (Environmental)**

The proposed operation was evaluated for human exposure to RF energy using the procedures outlined in the FCC's OET Bulletin Number 65. Based on OET-65 equation (10), and considering 15 percent antenna relative field in downward elevations (pattern data shows less than 15 percent relative field at angles 10 to 90 degrees below the antenna), the calculated

signal density near the tower at two meters above ground level attributable to the proposed facility is  $1.2 \mu\text{W}/\text{cm}^2$ , which is 0.3 percent of the general population/uncontrolled maximum permitted exposure limit. This is below the five percent threshold limit described in §1.1307(b) regarding sites with multiple emitters, categorically excluding the applicant from responsibility for taking any corrective action in the areas where the proposal's contribution is less than five percent.

The general public will not be exposed to RF levels attributable to the proposal in excess of the FCC's guidelines. RF exposure warning signs will continue to be posted. With respect to worker safety, the applicant will coordinate exposure procedures with all pertinent stations and will reduce power or cease operation as necessary to protect persons having access to the site, tower, or antenna from RF electromagnetic field exposure in excess of FCC guidelines. This exhibit is limited to the evaluation of exposure to RF electromagnetic field. No increase in structure height is proposed.

*List of Attachments*

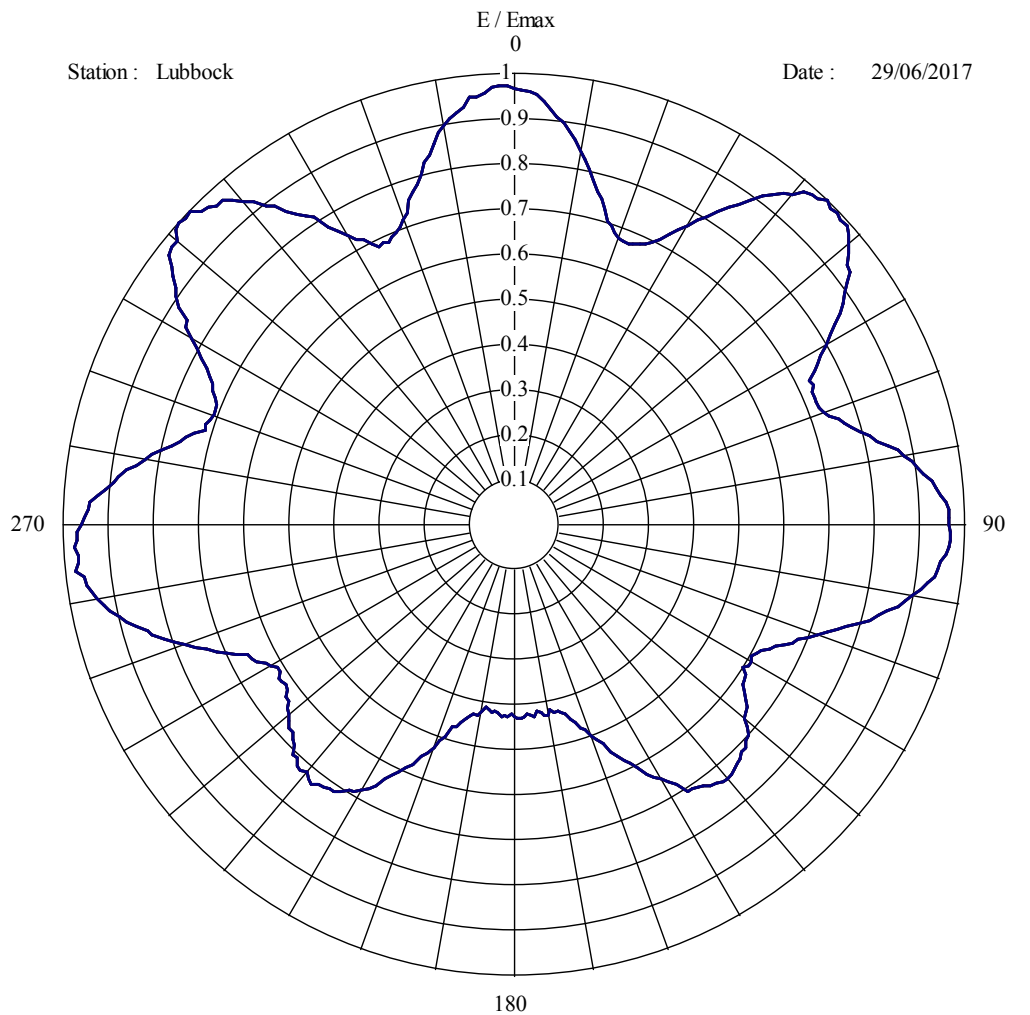
|           |   |
|-----------|---|
| Figure 1  | Antenna Azimuthal Pattern   |
| Figure 2  | Antenna Elevation Pattern   |
| Figure 3  | Proposed Coverage Contours  |
| Figure 4  | Proposed Contour Expansion  |
| Table 1   | OET Bulletin 69 Interference Study                                    |
| Form 2100 | Saved Version of Engineering Sections from FCC Form at Time of Upload |

**Chesapeake RF Consultants, LLC**

|                       |                    |              |
|-----------------------|--------------------|--------------|
| Joseph M. Davis, P.E. | July 6, 2017       |              |
| 207 Old Dominion Road | Yorktown, VA 23692 | 703-650-9600 |



## Horizontal Radiation Pattern



Model : PHP64U3313

Polarisation : Horizontal

Frequency (MHz) : 528.00

Directivity : 2.27 dB

Elevation Angle : 0.7 degrees

Horizontal Unit Pattern

File = 1\_pan\_2L\_RS\_LC-602g.pat

Pattern Tolerance +/- 5% of E<sub>max</sub>

**Figure 1**  
**Antenna Azimuthal Pattern**  
**KLCW-TV Wolfforth, TX**  
**Facility ID 77719**  
**Ch. 23 127 kW 282 m**

prepared for  
**Woods Communications Corporation**

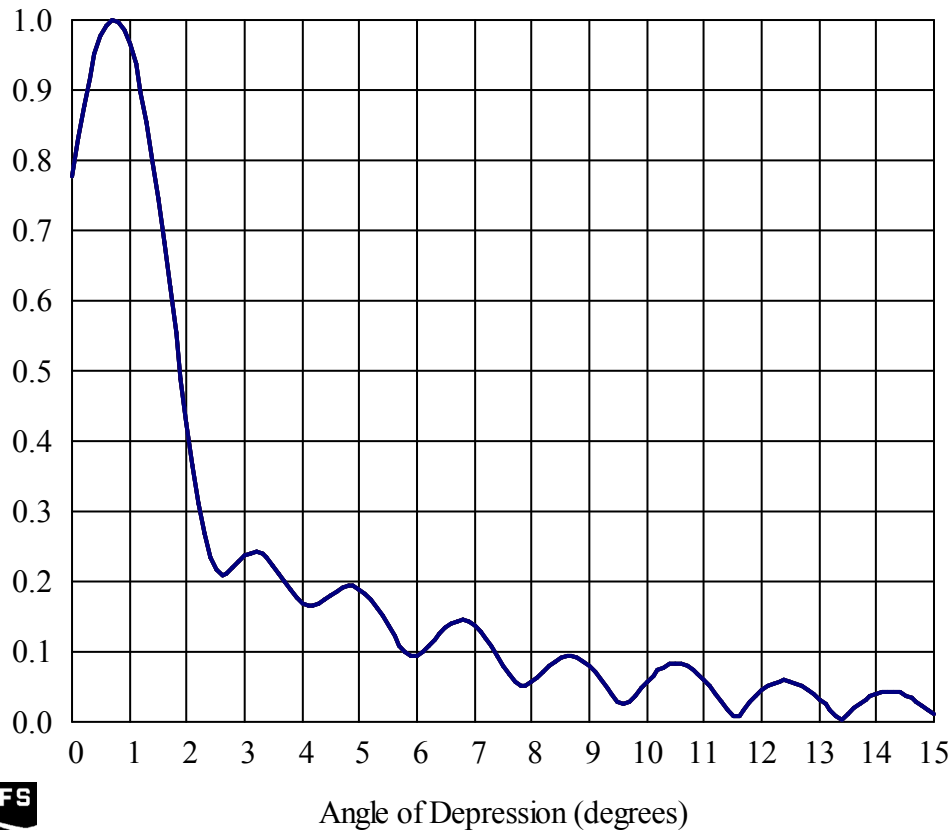
July, 2017





E / Emax

## Vertical Radiation Pattern



Date : 29/06/2017  
Station : Lubbock  
Model : PHP64U3313  
Frequency (MHz) : 528.00  
Directivity : 15.07 dBd  
Tilt : 0.7 degrees  
Azimuth Angle : 312 degrees  
Vertical Unit Pattern : PHP4S-602.vup



**Figure 2**  
**Antenna Elevation Pattern**  
**KLCW-TV Wolfforth, TX**  
**Facility ID 77719**  
**Ch. 23 127 kW 282 m**

prepared for  
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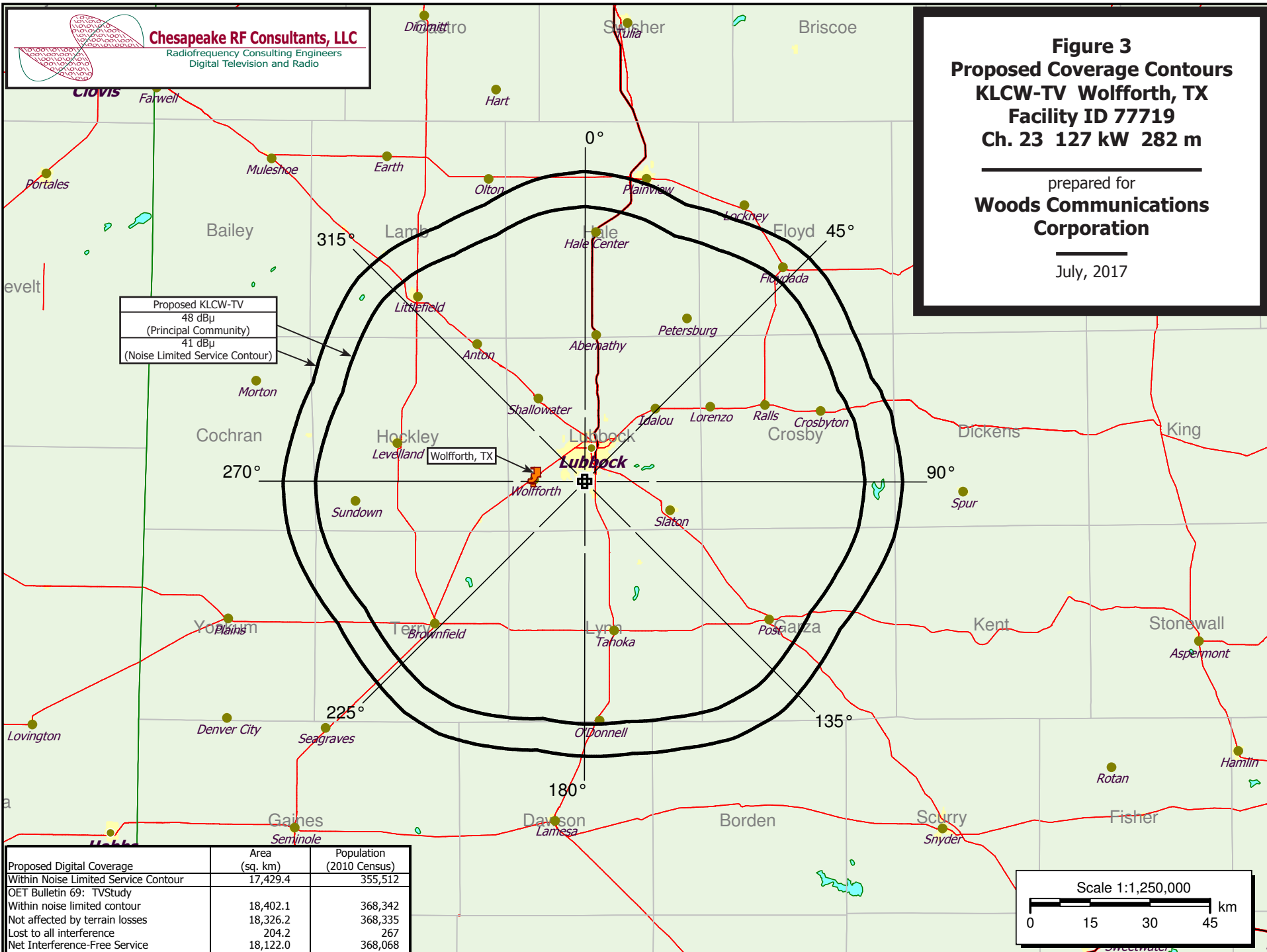
July, 2017

**Figure 3**  
**Proposed Coverage Contours**  
**KLCW-TV Wolfforth, TX**  
**Facility ID 77719**  
**Ch. 23 127 kW 282 m**

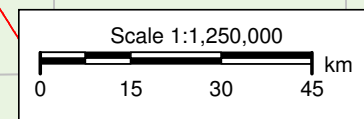
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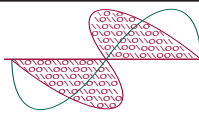
July, 2017

Proposed KLCW-TV  
48 dBu  
(Principal Community)  
41 dBu  
(Noise Limited Service Contour)



| Proposed Digital Coverage            | Area (sq. km) | Population (2010 Census) |
|--------------------------------------|---------------|--------------------------|
| Within Noise Limited Service Contour | 17,429.4      | 355,512                  |
| OET Bulletin 69: TVStudy             |               |                          |
| Within noise limited contour         | 18,402.1      | 368,342                  |
| Not affected by terrain losses       | 18,326.2      | 368,335                  |
| Lost to all interference             | 204.2         | 267                      |
| Net Interference-Free Service        | 18,122.0      | 368,068                  |





**Chesapeake RF Consultants, LLC**  
Radiofrequency Consulting Engineers  
Digital Television and Radio

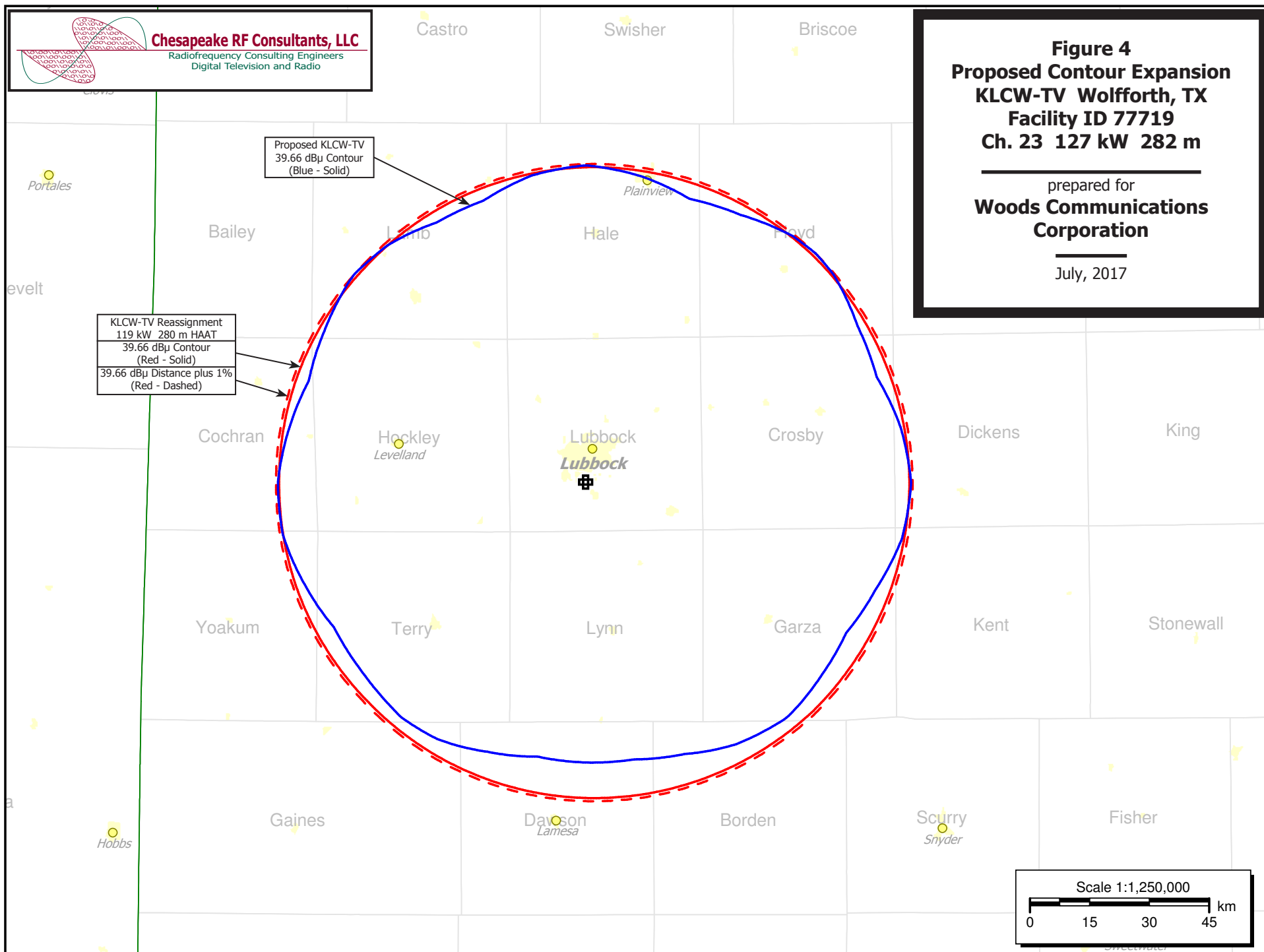
**Figure 4**  
**Proposed Contour Expansion**  
**KLCW-TV Wolfforth, TX**  
**Facility ID 77719**  
**Ch. 23 127 kW 282 m**

prepared for  
**Woods Communications Corporation**

July, 2017

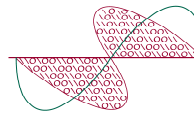
KLCW-TV Reassignment  
119 kW 280 m HAAT  
39.66 dBμ Contour  
(Red - Solid)  
39.66 dBμ Distance plus 1%  
(Red - Dashed)

Proposed KLCW-TV  
39.66 dBμ Contour  
(Blue - Solid)





**Table 1 KLCW-TV OET Bulletin 69 Interference Study**  
(page 1 of 2)



**Chesapeake RF Consultants, LLC**

Radiofrequency Consulting Engineers  
Digital Television and Radio

tvstudy v2.2.2

Database: localhost, Study: KLCW-TV RFS 127KW PROP, Model: Longley-Rice  
Start: 2017.07.06 17:42:06

Study created: 2017.07.06 17:41:59

Study build station data: LMS TV 2017-07-05 LMSTV

Proposal: KLCW-TV D23 DT APP WOLFFORTH, TX  
File number: KLCW-TV RFS 127KW  
Facility ID: 77719  
Station data: User record  
Record ID: 764  
Country: U.S.  
Zone: II

Stations potentially affected:

| Call    | Chan | Svc | Status | City, State | File Number      | Distance |
|---------|------|-----|--------|-------------|------------------|----------|
| KPEJ-TV | D23  | DT  | LIC    | ODESSA, TX  | BLCDT20060629AGO | 160.9 km |
| KXTQ-CD | D24  | DC  | BL     | LUBBOCK, TX | DTVBL55055       | 0.0      |

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D23  
Latitude: 33 30 8.30 N (NAD83)  
Longitude: 101 52 21.30 W  
Height AMSL: 1263.7 m  
HAAT: 282.1 m  
Peak ERP: 127 kW  
Antenna: RFS PHPR64U3313 Ch-23 20170705 0.0 deg

39.7 dBu contour:

| Azimuth | ERP    | HAAT    | Distance |
|---------|--------|---------|----------|
| 0.0 deg | 119 kW | 282.3 m | 79.6 km  |
| 45.0    | 124    | 295.1   | 81.2     |
| 90.0    | 118    | 300.8   | 81.5     |
| 135.0   | 62.7   | 298.4   | 77.3     |
| 180.0   | 22.9   | 283.8   | 70.6     |
| 225.0   | 59.4   | 268.6   | 74.5     |
| 270.0   | 117    | 261.9   | 77.6     |
| 315.0   | 121    | 265.8   | 78.1     |

Proposal service area is within baseline plus 1.0%  
Proposal service area population is more than 95.0% of baseline

Distance to Canadian border: 1722.5 km

Distance to Mexican border: 404.8 km

Conditions at FCC monitoring station: Douglas AZ  
Bearing: 255.2 degrees Distance: 762.4 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:  
Bearing: 338.9 degrees Distance: 793.4 km

Study cell size: 2.00 km  
Profile point spacing: 1.00 km

Maximum new IX to full-service and Class A: 0.50%  
Maximum new IX to LPTV: 2.00%

**Table 1 KLCW-TV OET Bulletin 69 Interference Study**  
(page 2 of 2)



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Interference to BLCDT20060629AGO LIC, scenario 1

|                    | Call    | Chan            | Svc | Status            | City, State   | File Number       | Distance       |
|--------------------|---------|-----------------|-----|-------------------|---------------|-------------------|----------------|
| Desired:           | KPEJ-TV | D23             | DT  | LIC               | ODESSA, TX    | BLCDT20060629AGO  |                |
| Undesireds:        | KLCW-TV | D23             | DT  | BL                | WOLFFORTH, TX | DTVBL77719        | 160.9 km       |
|                    | KLCW-TV | D23             | DT  | APP               | WOLFFORTH, TX | KLCW-TV RFS 127KW | 160.9          |
|                    | KXTQ-CD | D24             | DC  | BL                | LUBBOCK, TX   | DTVBL55055        | 160.9          |
| Service area       |         | Terrain-limited |     | IX-free, before   |               | IX-free, after    | Percent New IX |
| 26771.9 368,212    |         | 26660.2 368,208 |     | 26232.1 366,435   |               | 26479.6 368,183   | -0.94 -0.48    |
| Undesired          |         | Total IX        |     | Unique IX, before |               | Unique IX, after  |                |
| KLCW-TV D23 DT BL  |         | 428.1 1,773     |     | 428.1 1,773       |               |                   |                |
| KLCW-TV D23 DT APP |         | 180.6 25        |     |                   |               | 180.6 25          |                |

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Interference to DTVBL55055 BL, scenario 1

|                    | Call    | Chan            | Svc | Status            | City, State       | File Number       | Distance       |
|--------------------|---------|-----------------|-----|-------------------|-------------------|-------------------|----------------|
| Desired:           | KXTQ-CD | D24             | DC  | BL                | LUBBOCK, TX       | DTVBL55055        |                |
| Undesireds:        | KLCW-TV | D23             | DT  | BL                | WOLFFORTH, TX     | DTVBL77719        | 0.0 km         |
|                    | KLCW-TV | D23             | DT  | APP               | WOLFFORTH, TX     | KLCW-TV RFS 127KW | 0.0            |
|                    | K24HH-D | D24             | DC  | LIC               | WICHITA FALLS, TX | BLDTL20101026ABY  | 309.5          |
|                    | KTTZ-TV | D25             | DT  | BL                | LUBBOCK, TX       | DTVBL65355        | 9.0            |
| Service area       |         | Terrain-limited |     | IX-free, before   |                   | IX-free, after    | Percent New IX |
| 8057.0 313,632     |         | 8025.2 313,632  |     | 8005.1 313,339    |                   | 8005.1 313,339    | 0.00 0.00      |
| Undesired          |         | Total IX        |     | Unique IX, before |                   | Unique IX, after  |                |
| KLCW-TV D23 DT BL  |         | 4.0 0           |     | 4.0 0             |                   |                   |                |
| KLCW-TV D23 DT APP |         | 4.0 0           |     |                   |                   | 4.0 0             |                |
| KTTZ-TV D25 DT BL  |         | 16.1 293        |     | 16.1 293          |                   | 16.1 293          |                |

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Interference to proposal, scenario 1

|                    | Call    | Chan            | Svc | Status          | City, State   | File Number       | Distance |
|--------------------|---------|-----------------|-----|-----------------|---------------|-------------------|----------|
| Desired:           | KLCW-TV | D23             | DT  | APP             | WOLFFORTH, TX | KLCW-TV RFS 127KW |          |
| Undesireds:        | KPEJ-TV | D23             | DT  | LIC             | ODESSA, TX    | BLCDT20060629AGO  | 160.9 km |
|                    | KXTQ-CD | D24             | DC  | BL              | LUBBOCK, TX   | DTVBL55055        | 0.0      |
| Service area       |         | Terrain-limited |     | IX-free         |               | Percent IX        |          |
| 18402.1 368,342    |         | 18326.2 368,335 |     | 18122.0 368,068 |               | 1.11 0.07         |          |
| Undesired          |         | Total IX        |     | Unique IX       |               | Prcnt Unique IX   |          |
| KPEJ-TV D23 DT LIC |         | 204.2 267       |     | 204.2 267       |               | 1.11 0.07         |          |

Channel and Facility Information

| Section                       | Question      | Response   |
|-------------------------------|---------------|------------|
| Proposed Community of License | Facility ID   | 77719      |
|                               | State         | Texas      |
|                               | City          | WOLFFORTH  |
|                               | DTV Channel   | 23         |
| Facility Type                 | Facility Type | Commercial |
|                               | Station Type  | Main       |
| Zone                          | Zone          | 2          |

Antenna Location Data

| Section                        | Question  | Response                              |
|--------------------------------|---|---------------------------------------|
| Antenna Structure Registration | Do you have an FCC Antenna Structure Registration (ASR) Number? | No                                    |
|                                | ASR Number  |                                       |
| Coordinates (NAD83)            | Latitude  | 33° 30' 08.3" N+                      |
|                                | Longitude   | 101° 52' 21.3" W-                     |
|                                | Structure Type  | TOWER-A free standing or guyed struct |
|                                | Overall Structure Height  | 297.2 meters                          |
|                                | Support Structure Height  | 276.9 meters                          |
|                                | Ground Elevation (AMSL)   | 977.5 meters                          |
| Antenna Data                   | Height of Radiation Center Above Ground Level                   | 286.2 meters                          |
|                                | Height of Radiation Center Above Average Terrain                | 282.1 meters                          |
|                                | Height of Radiation Center Above Mean Sea Level                 | 1263.7 meters                         |
|                                | Effective Radiated Power  | 127 kW                                |

Antenna  
Technical Data

| Section                        | Question  | Response           |
|--------------------------------|---|--------------------|
| Antenna Type                   | Antenna Type  | Directional Custom |
|                                | Do you have an Antenna ID?  | No                 |
|                                | Antenna ID  |                    |
| Antenna Manufacturer and Model | Manufacturer:   | RFS                |
|                                | Model   | PHPR64U3313        |
|                                | Rotation  | 0 degrees          |
|                                | Electrical Beam Tilt  | 0.7                |
|                                | Mechanical Beam Tilt  | Not Applicable     |
|                                | toward azimuth  |                    |
|                                | Polarization  | Horizontal         |
| DTV and DTS: Elevation Pattern | Does the proposed antenna propose elevation radiation patterns that vary with azimuth for reasons other than the use of mechanical beam tilt? | No                 |
|                                | Uploaded file for elevation antenna (or radiation) pattern data   |                    |

Directional Antenna Relative Field Values (Pre-rotated Pattern)

| Degree | V <sub>A</sub> (Authorized Value) | Degree | V <sub>A</sub> (Authorized Value) | Degree | V <sub>A</sub> (Authorized Value) | Degree | V <sub>A</sub> (Authorized Value) |
|--------|-----------------------------------|--------|-----------------------------------|--------|-----------------------------------|--------|-----------------------------------|
| 0      | 0.967                             | 90     | 0.963                             | 180    | 0.425                             | 270    | 0.961                             |
| 10     | 0.841                             | 100    | 0.896                             | 190    | 0.418                             | 280    | 0.832                             |
| 20     | 0.676                             | 110    | 0.716                             | 200    | 0.525                             | 290    | 0.709                             |
| 30     | 0.767                             | 120    | 0.605                             | 210    | 0.679                             | 300    | 0.828                             |
| 40     | 0.956                             | 130    | 0.664                             | 220    | 0.714                             | 310    | 0.977                             |
| 50     | 0.968                             | 140    | 0.733                             | 230    | 0.654                             | 320    | 0.935                             |
| 60     | 0.797                             | 150    | 0.651                             | 240    | 0.624                             | 330    | 0.739                             |
| 70     | 0.727                             | 160    | 0.500                             | 250    | 0.773                             | 340    | 0.719                             |
| 80     | 0.876                             | 170    | 0.427                             | 260    | 0.939                             | 350    | 0.898                             |

Additional Azimuths

| Degree | V <sub>A</sub> |
|--------|----------------|
| 45     | 0.990          |
| 312    | 1.000          |
| 218    | 0.730          |
| 139    | 0.734          |

Construction  
Permit  
Certifications

| Section  | Question   | Response |
|--|--|----------|
| Post-Incentive Auction<br>Expedited Processing | It will operate on the DTV channel for this station as established in the post-incentive auction channel reassignment public notice.   | Yes      |
|  | It will operate post-incentive auction facilities that do not expand the noise-limited service contour in any direction beyond that established by the post-incentive auction channel reassignment public notice.  | No       |
|  | It will operate post-incentive auction facilities that match or reduce by no more than five percent with respect to predicted population from those defined in the post-incentive auction channel reassignment public notice.  | Yes      |
|  | The antenna structure to be used by this facility has been registered by the Commission and will not require re-registration to support the proposed antenna, OR the FAA has previously determined that the proposed structure will not adversely affect safety in air navigation and this structure qualifies for later registration under the Commission's phased registration plan, OR the proposed installation on this structure does not require notification to the FAA pursuant to 47 C.F.R. Section 17.7. | No       |
| Environmental Effect                           | Would a Commission grant of Authorization for this location be an action which may have a significant environmental effect? (See Section 1.1306 of 47 C.F.R.)  | No       |
| Broadcast Facility                             | The proposed facility complies with the applicable engineering standards and assignment requirements of 47 C. F.R. Sections 73.616, 73.622(i), 73.623(e), 73.625, 73.1030, and 73.1125.  | Yes      |