

ENGINEERING EXHIBIT

Application for Modification of Digital Television Station Construction Permit

prepared for

Gray Television Licensee, LLC

KWWT(DT) Odessa, TX

Facility ID 84410

Ch. 30 500 kW 204 m

Gray Television Licensee, LLC (“*Gray*”) is the licensee of digital television station KWWT(DT), Channel 30, Facility ID 84410, Odessa TX. KWWT is licensed (file# BLCDDT-20090612AJT) to operate with 50 kW effective radiated power (“ERP”) with a directional antenna at 147 meters height above average terrain (“HAAT”). A Construction Permit (“CP” file# 0000036063) authorizes KWWT to increase power to 500 kW ERP with the existing directional antenna. *Gray* is requesting a modification of the CP by proposing herein to relocate KWWT 33.6 km from the licensed site and to operate with 500 kW ERP with a different directional antenna at 204 meters HAAT.

The change in site location would co-locate KWWT with *Gray’s* station KOSA-TV (Facility ID 6865, Ch. 7, Odessa TX). The KWWT antenna will be side-mounted on the KOSA-TV tower structure, which is owned by *Gray*. The subject tower structure is associated with FCC Antenna Structure Registration (“ASR”) number 1233693 and no change to the overall structure height will result.

The proposed antenna is an elliptically polarized directional ERI model ATW24H2-ESWC-30H (30 percent vertical polarization). The maximum horizontally polarized ERP is 500 kW and the maximum vertically polarized ERP is 60 kW. The vertically polarized component will not exceed the horizontally polarized component at any azimuth. The directional antenna’s azimuthal patterns are depicted in Figures 1 and 1A for horizontal and vertical polarization, respectively. The antenna’s elevation patterns are depicted in Figures 2 and 2A for horizontal polarization and in Figures 2B and 2C for vertical polarization.

Figure 3 supplies a map that demonstrates compliance with §73.625(a)(1) regarding coverage of the entire principal community. The proposed facility's predicted population exceeds 95 percent of the baseline facility's population as described in the *Incentive Auction Closing and Channel Reassignment Public Notice* ("CCRPN", DA 17-317, released April 13, 2017).

The proposed facility expands the KWWT service contour beyond that established by the CCRPN. Interference study per FCC OET Bulletin 69¹ shows that the proposal complies with the 0.5 percent limit of new interference caused to pertinent nearby full service and Class A television stations as required by §73.616. The interference study output report is provided as Table 1.

Owing to the 33.6 km site relocation, there will be some areas of noise limited service contour (NLSC) gain and loss. Figure 4 provides a comparison of the KWWT licensed and proposed NLSC. The proposed KWWT facility's NLSC encompasses 316,041 persons which is an increase of 22,760 persons beyond the 293,281 persons within the licensed KWWT NLSC (2010 Census). The relocation will create a small loss area of KWWT's NLSC having a population of 1,445 persons which is 0.46 percent of the total population within the proposed KWWT-TV NLSC.

The NLSC of nearby licensed stations which overlap the loss area are provided on Figure 4 to demonstrate the availability of other services. All of the entire NLSC loss area is considered "well served" since at least five other licensed television facilities provide NLSC overlap. There are at least six other NLSC services available in all of the loss area, and most all of the loss area has eight other services available.

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

¹FCC 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 1.0 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.

considering 10 percent antenna relative field in downward elevations (pattern data shows less than 10 percent relative field at angles 15 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 $5.4 \mu\text{W}/\text{cm}^2$, which is 1.4 percent of the general population/uncontrolled maximum permitted exposure limit. This is well 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, 1A	Antenna Azimuthal Pattern
Figure 2, 2A, 2B, 2C	Antenna Elevation Pattern
Figure 3	Proposed Coverage Contours
Figure 4	Loss Area Alternate Services
Table 1	TVStudy Analysis of Proposal
Form 2100	Saved Version of Engineering Sections from FCC Form at Time of Upload

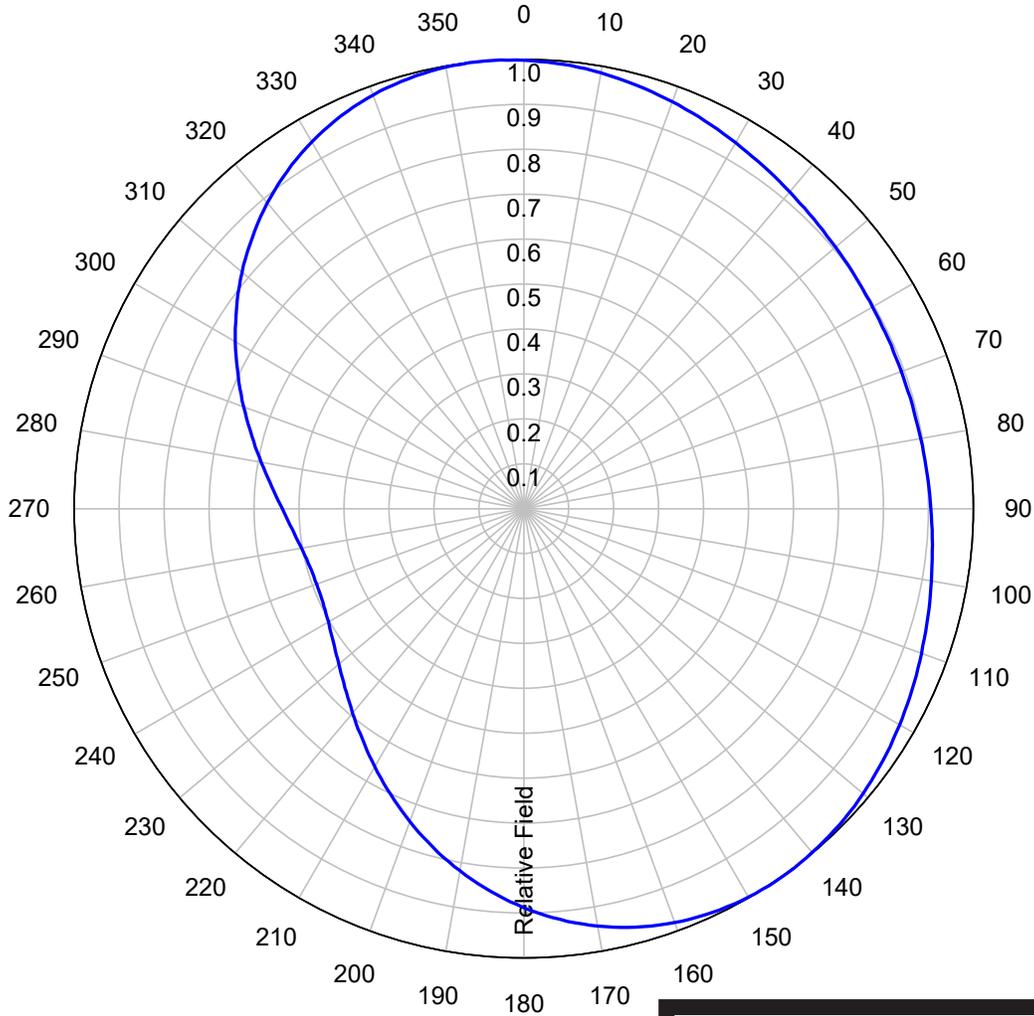
Chesapeake RF Consultants, LLC

Joseph M. Davis, P.E. November 26, 2020
207 Old Dominion Road Yorktown, VA 23692 703-650-9600

AZIMUTH PATTERN

Type: ATW-WC
 Directivity: Numeric 1.40 dBd 1.46
 Peak(s) at: _____

Channel: 30
 Location: Odessa TX
 Polarization: Horizontal
 Note: Pattern shape and directivity may vary with channel and mouting configuration.



Preliminary, subject to final design

ELECTRONICS RESEARCH, INC. ERI

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 Radiofrequency Consulting Engineers
 Digital Television and Radio

Figure 1
Antenna Azimuthal Pattern
Horizontal Polarization
KWWT(DT) Odessa, TX
Facility ID 84410
Ch. 30 500 kW 204 m

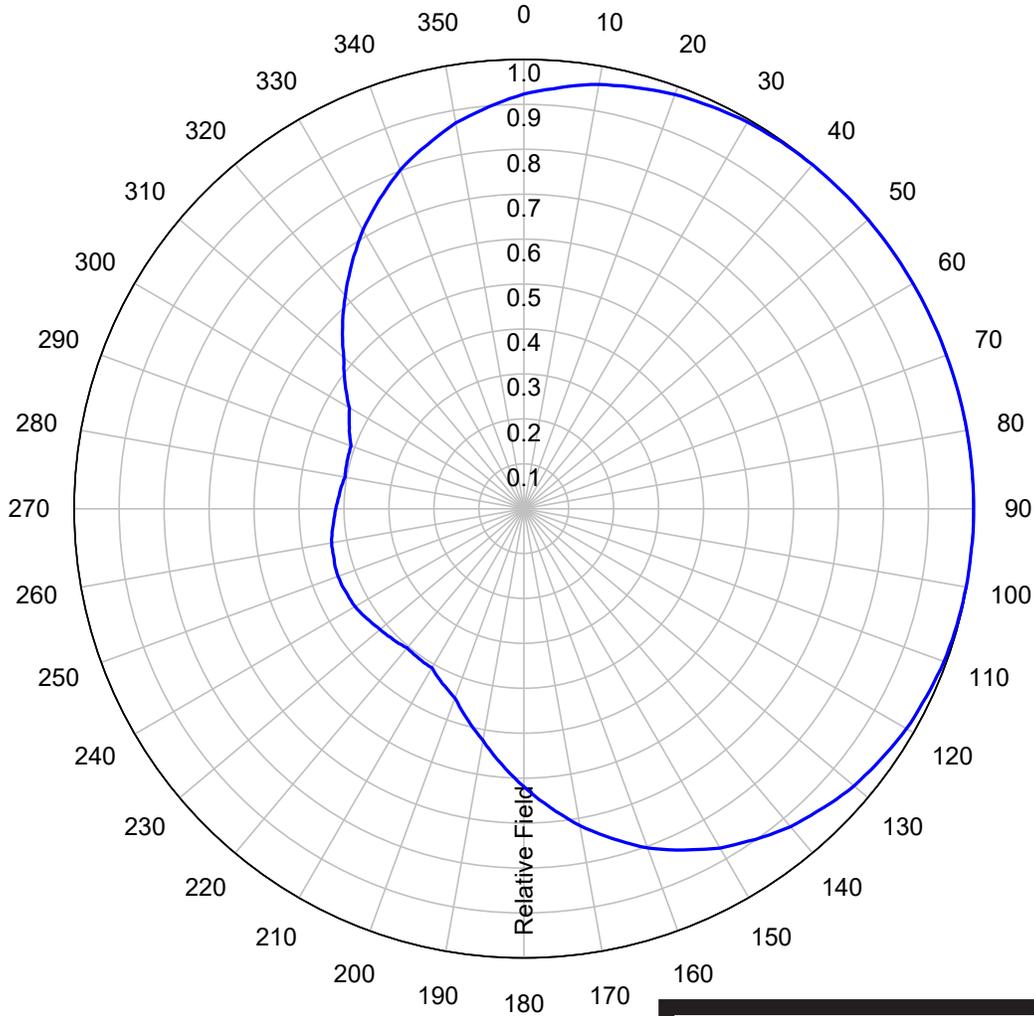
prepared for
Gray Television Licensee, LLC

November, 2020

AZIMUTH PATTERN

Type: ATW-V3
 Directivity: Numeric 1.67 dBd 2.23
 Peak(s) at: _____

Channel: 30
 Location: Odessa TX
 Polarization: Vertical
 Note: Pattern shape and directivity may vary with channel and mouting configuration.



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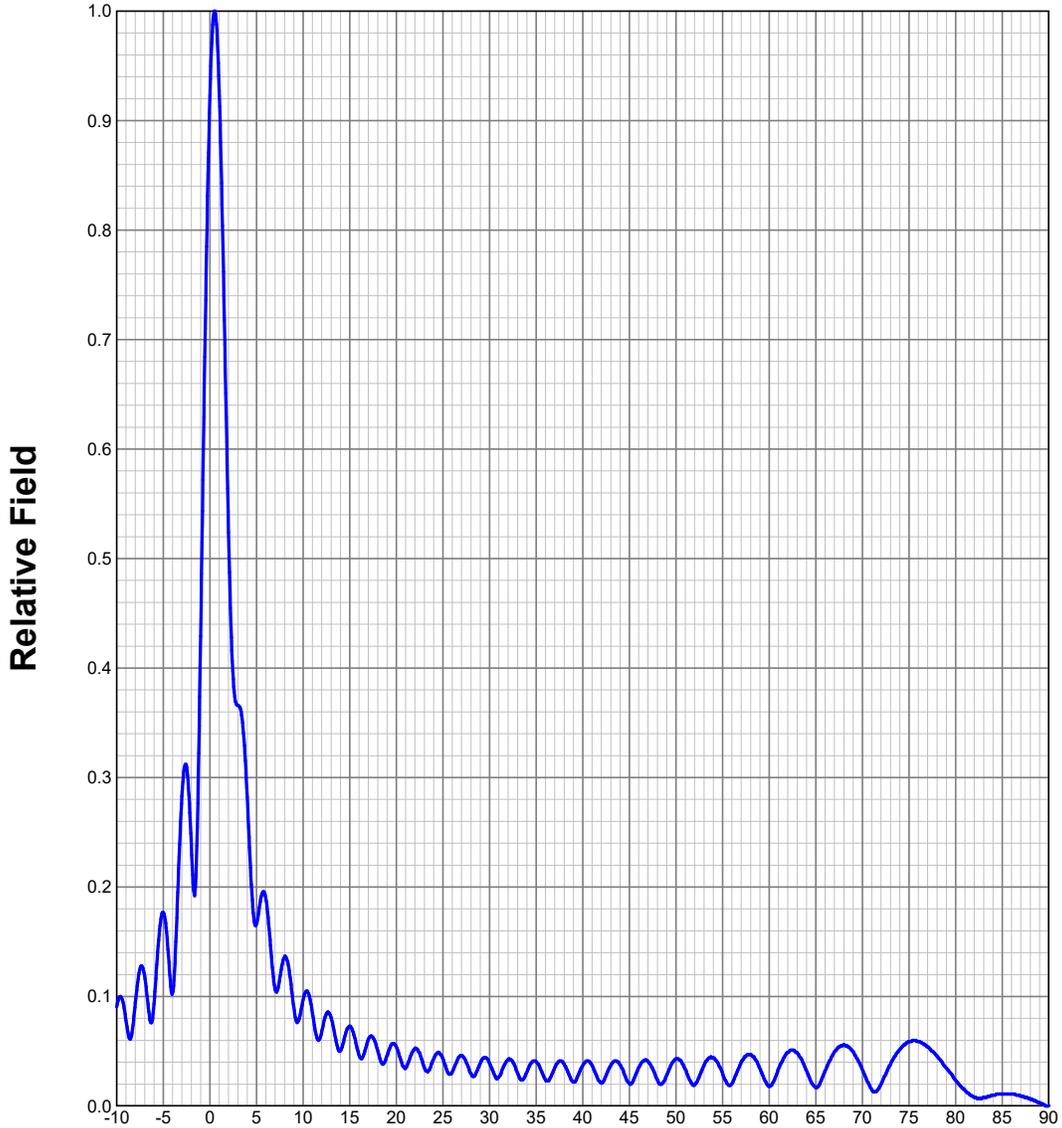
Figure 1A
Antenna Azimuthal Pattern
Vertical Polarization (Ref 30%)
KWWT(DT) Odessa, TX
Facility ID 84410
Ch. 30 500 kW 204 m

prepared for
Gray Television Licensee, LLC

November, 2020

ELEVATION PATTERN

Type:	ATW24H2H		Channel:	30
Directivity:	Numeric	dBd	Location:	Odessa TX
Main Lobe:	24.00	13.80	Beam Tilt:	0.50
Horizontal:	20.42	13.10	Polarization:	Horizontal



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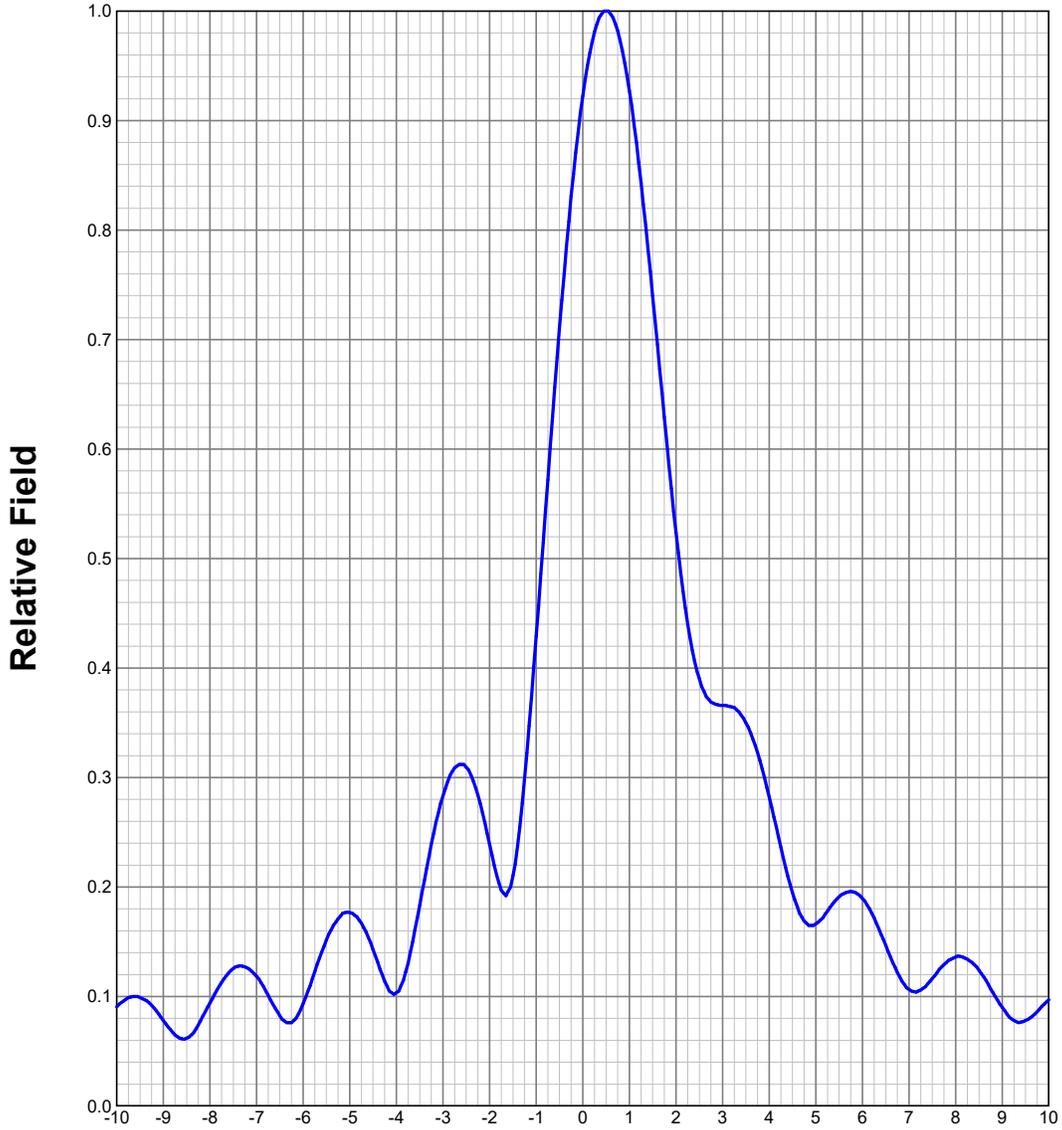
Figure 2
Antenna Elevation Pattern
Horizontal Polarization
KWWT(DT) Odessa, TX
Facility ID 84410
Ch. 30 500 kW 204 m

prepared for
Gray Television Licensee, LLC

November, 2020

ELEVATION PATTERN

Type:	ATW24H2H		Channel:	30
Directivity:	Numeric	dBd	Location:	Odessa TX
Main Lobe:	24.00	13.80	Beam Tilt:	0.50
Horizontal:	20.42	13.10	Polarization:	Horizontal



Preliminary, subject to final design

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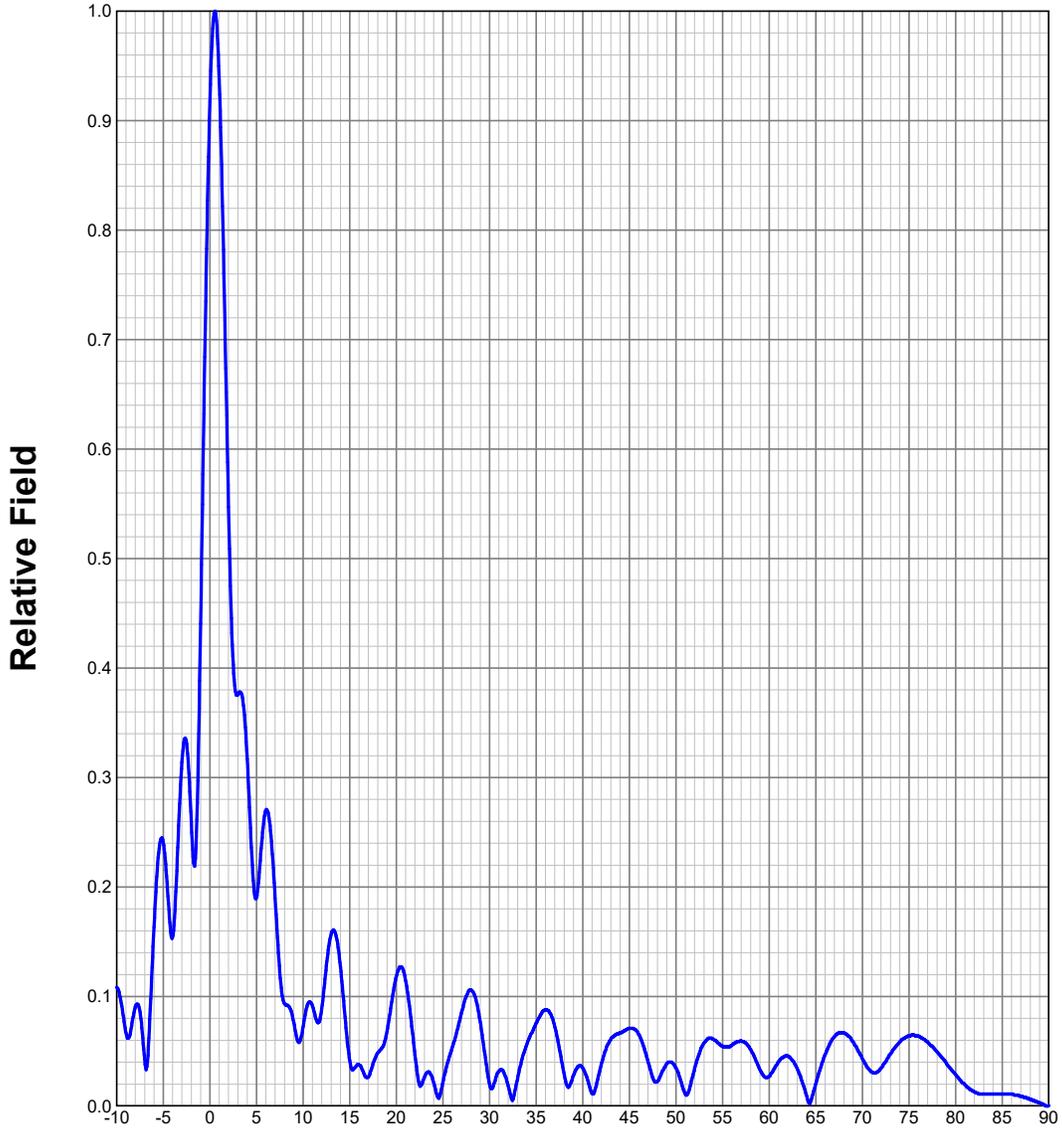
**Figure 2A - Detail
Antenna Elevation Pattern
Horizontal Polarization
KWWT(DT) Odessa, TX
Facility ID 84410
Ch. 30 500 kW 204 m**

prepared for
Gray Television Licensee, LLC

November, 2020

ELEVATION PATTERN

Type:	ATW21H2V		Channel:	30
Directivity:	Numeric	dBd	Location:	Odessa TX
Main Lobe:	21.00	13.22	Beam Tilt:	0.50
Horizontal:	17.68	12.47	Polarization:	Vertical



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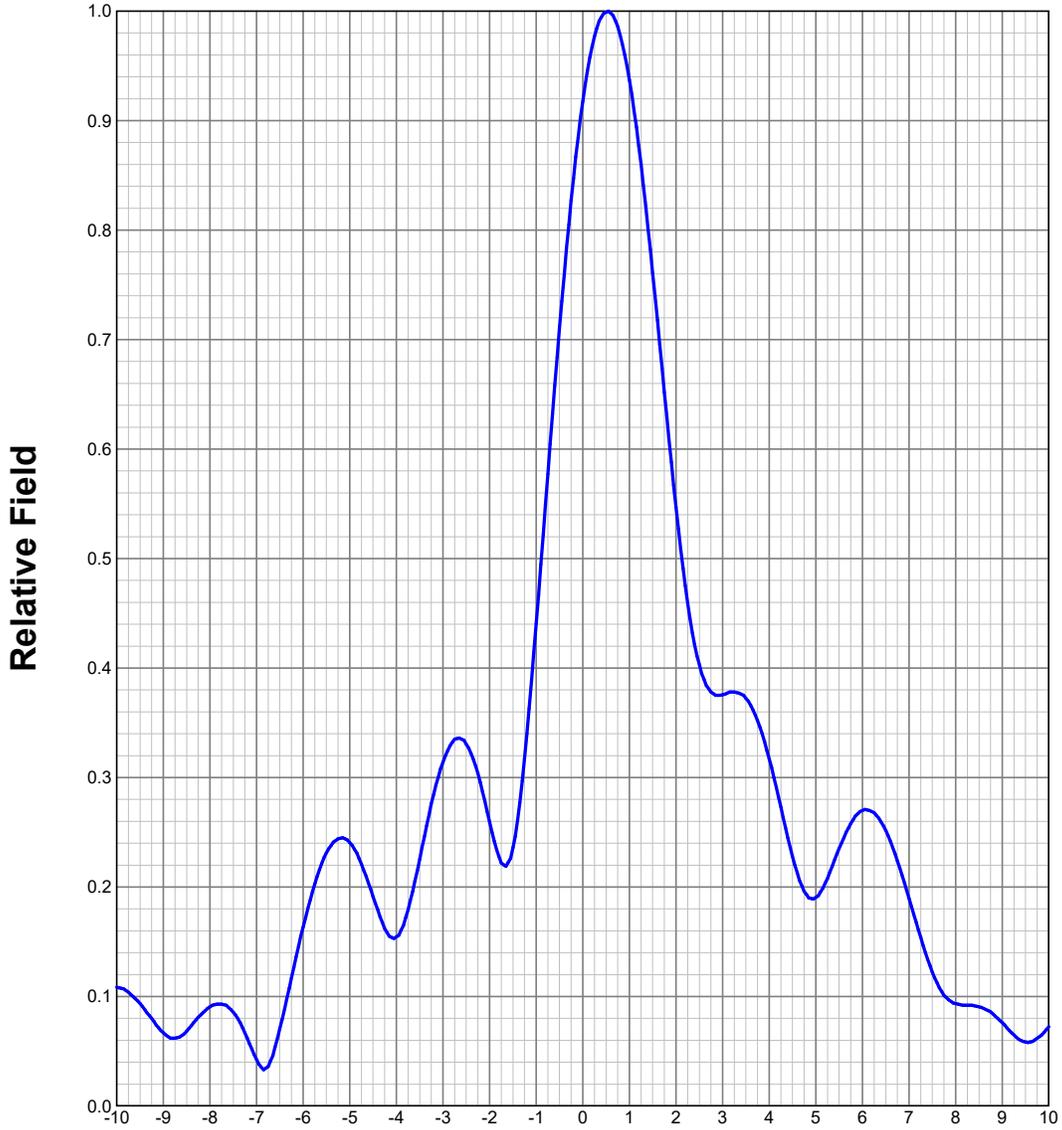
Figure 2B
Antenna Elevation Pattern
Vertical Polarization
KWWT(DT) Odessa, TX
Facility ID 84410
Ch. 30 500 kW 204 m

prepared for
Gray Television Licensee, LLC

November, 2020

ELEVATION PATTERN

Type:	ATW21H2V		Channel:	30
Directivity:	Numeric	dBd	Location:	Odessa TX
Main Lobe:	21.00	13.22	Beam Tilt:	0.50
Horizontal:	17.68	12.47	Polarization:	Vertical



Preliminary, subject to final design

ELECTRONICS RESEARCH, INC. ERI



**Figure 2C - Detail
Antenna Elevation Pattern
Vertical Polarization
KWWT(DT) Odessa, TX
Facility ID 84410
Ch. 30 500 kW 204 m**

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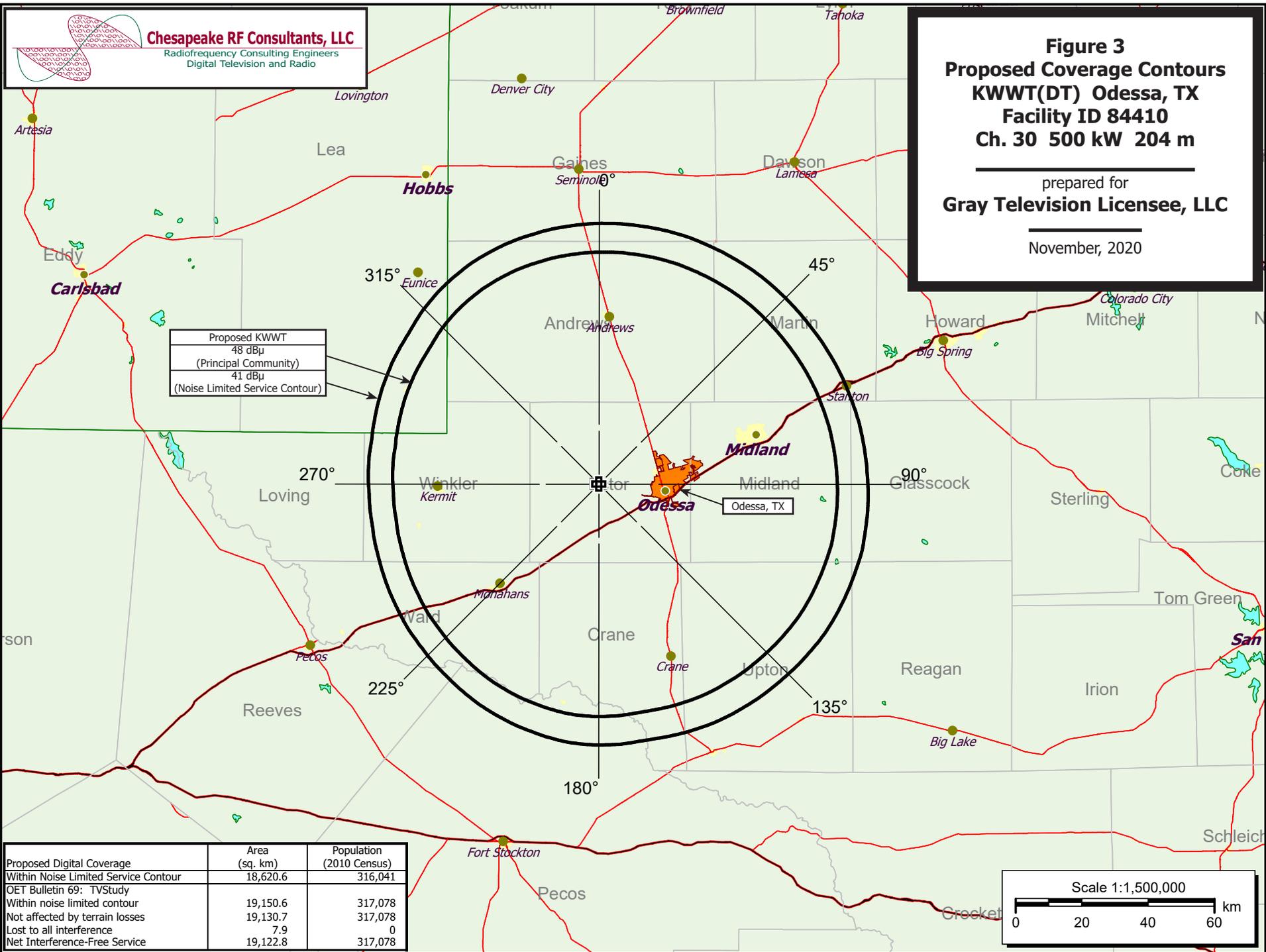
November, 2020

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Figure 3
Proposed Coverage Contours
KWWT(DT) Odessa, TX
Facility ID 84410
Ch. 30 500 kW 204 m

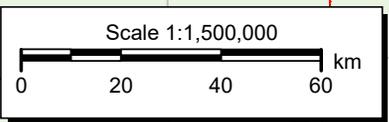
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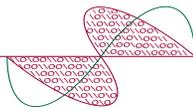
November, 2020



Proposed KWWT	48 dBμ
(Principal Community)	
(Noise Limited Service Contour)	41 dBμ

Proposed Digital Coverage	Area (sq. km)	Population (2010 Census)
Within Noise Limited Service Contour	18,620.6	316,041
OET Bulletin 69: TVStudy		
Within noise limited contour	19,150.6	317,078
Not affected by terrain losses	19,130.7	317,078
Lost to all interference	7.9	0
Net Interference-Free Service	19,122.8	317,078



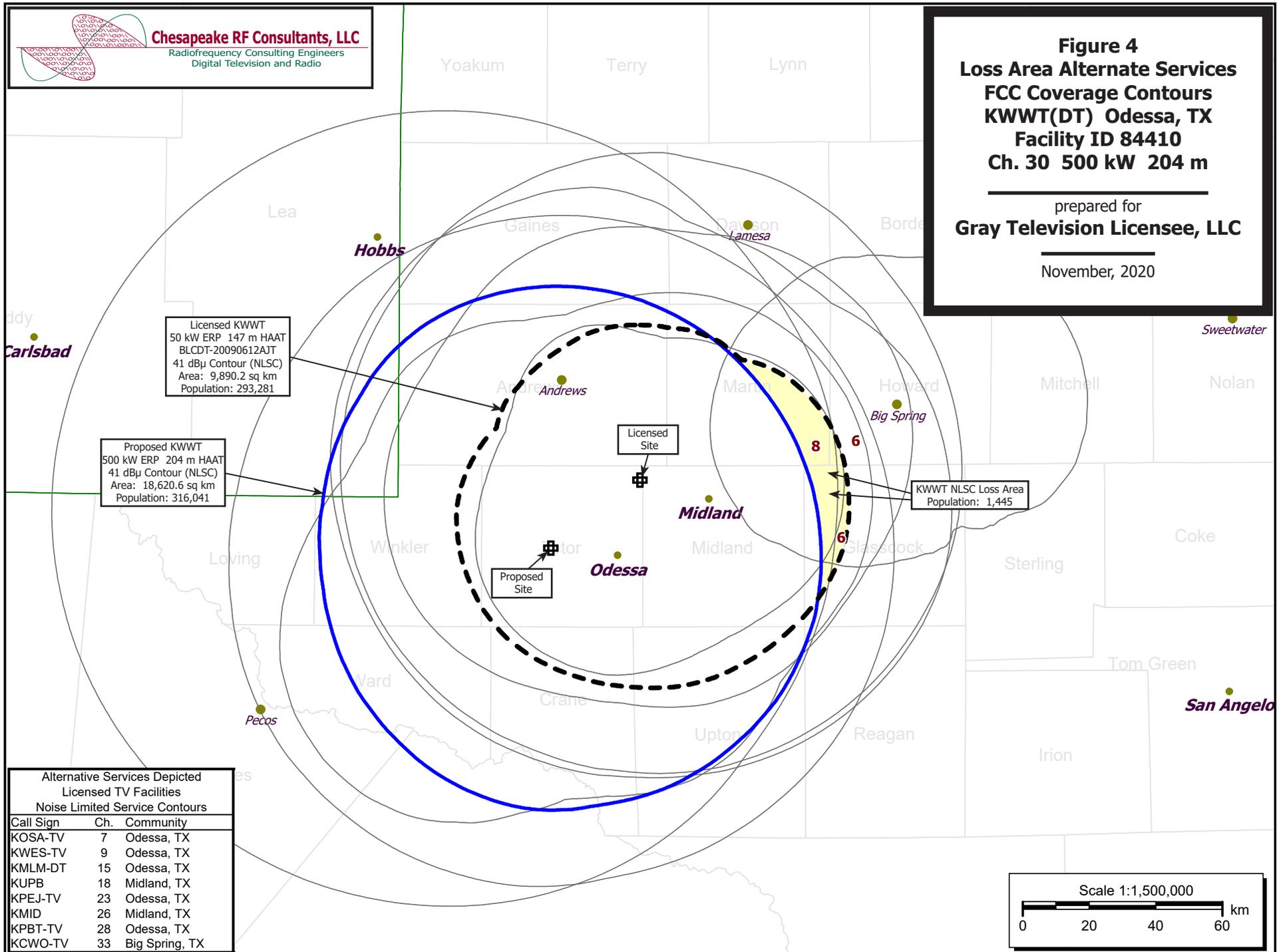


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 Digital Television and Radio

Figure 4
Loss Area Alternate Services
FCC Coverage Contours
KWWT(DT) Odessa, TX
Facility ID 84410
Ch. 30 500 kW 204 m

prepared for
Gray Television Licensee, LLC

November, 2020



Licensed KWWT
 50 kW ERP 147 m HAAT
 BLCDT-20090612AJT
 41 dBu Contour (NLSC)
 Area: 9,890.2 sq km
 Population: 293,281

Proposed KWWT
 500 kW ERP 204 m HAAT
 41 dBu Contour (NLSC)
 Area: 18,620.6 sq km
 Population: 316,041

Licensed Site

Proposed Site

KWWT NLSC Loss Area
 Population: 1,445

Alternative Services Depicted		
Licensed TV Facilities		
Noise Limited Service Contours		
Call Sign	Ch.	Community
KOSA-TV	7	Odessa, TX
KWES-TV	9	Odessa, TX
KMLM-DT	15	Odessa, TX
KUPB	18	Midland, TX
KPEJ-TV	23	Odessa, TX
KMID	26	Midland, TX
KPBT-TV	28	Odessa, TX
KCWO-TV	33	Big Spring, TX

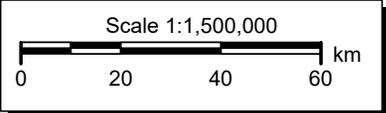


Table 1 KWWT TVStudy Analysis of Proposal
(page 1 of 3)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: KWWT prop WC, Model: Longley-Rice
Start: 2020.11.26 11:29:12

Study created: 2020.11.26 11:29:11

Study build station data: LMS TV 2020-11-26

Proposal: KWWT D30 DT APP ODESSA, TX
File number: KWWT prop WC
Facility ID: 84410
Station data: User record
Record ID: 3351
Country: U.S.
Zone: II

Search options:
Baseline record excluded if station has CP

Stations potentially affected by proposal:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	KUPT	D29	DT	LIC	HOBBS, NM	BLCDT20081125ADR	107.3 km
Yes	KTAB-TV	D30	DT	CP	ABILENE, TX	BLANK0000029890	284.5
No	KLBK-TV	D31	DT	LIC	LUBBOCK, TX	BLANK0000078650	196.3

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D30
Latitude: 31 51 50.80 N (NAD83)
Longitude: 102 34 42.50 W
Height AMSL: 1143.1 m
HAAT: 204.1 m
Peak ERP: 500 kW
Antenna: ERI ATW-WC 70.0 deg
Elev Pattn: Generic
Elec Tilt: 0.50

40.3 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	498 kW	196.1 m	79.7 km
45.0	416	219.6	80.4
90.0	410	238.8	81.8
135.0	492	222.1	81.6
180.0	394	214.0	79.7
225.0	160	207.4	74.3
270.0	144	164.9	70.6
315.0	364	170.3	75.9

Distance to Canadian border: 1904.5 km

**Proposal is within coordination distance of Mexican border
Distance to Mexican border: 222.0 km

Conditions at FCC monitoring station: Kingsville TX
Bearing: 136.1 degrees Distance: 668.6 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 346.2 degrees Distance: 947.7 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 KWWT TVStudy Analysis of Proposal
(page 2 of 3)



Interference to BLANK0000029890 CP scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KTAB-TV	D30	DT	CP	ABILENE, TX	BLANK0000029890	
Undesireds:	KWWT	D30	DT	BL	ODESSA, TX	DTVBL84410	255.1 km
	KWWT	D30	DT	APP	ODESSA, TX	KWWT prop WC	284.5
	KMPX	D30	DT	LIC	DECATUR, TX	BLCDT20060317AGE	249.1
	KPLE-CD	D30	DC	LIC	KILLEEN, TX	BLDTL20090416ASY	220.0
	KABB	D30	DT	LIC	SAN ANTONIO, TX	BLANK0000127068	355.2
	Service area		Terrain-limited		IX-free, before	IX-free, after	Percent New IX
29095.4	274,707	28818.3	274,536	28407.7	271,493	28331.0 271,373	0.27 0.04
Undesired			Total IX		Unique IX, before	Unique IX, after	
KWWT D30 DT BL		12.1	7	12.1	7		
KWWT D30 DT APP		96.7	134			88.8 127	
KMPX D30 DT LIC		378.7	3,027	366.6	3,007	366.6 3,007	
KPLE-CD D30 DC LIC		16.1	20	4.0	0	4.0 0	
KABB D30 DT LIC		23.8	9	15.8	9	7.9 2	

Interference to BLANK0000029890 CP scenario 2

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KTAB-TV	D30	DT	CP	ABILENE, TX	BLANK0000029890	
Undesireds:	KWWT	D30	DT	BL	ODESSA, TX	DTVBL84410	255.1 km
	KWWT	D30	DT	APP	ODESSA, TX	KWWT prop WC	284.5
	KMPX	D30	DT	LIC	DECATUR, TX	BLCDT20060317AGE	249.1
	KPLE-CD	D30	DC	CP	KILLEEN, TX	BPDTA20130211ACF	220.0
	KABB	D30	DT	LIC	SAN ANTONIO, TX	BLANK0000127068	355.2
	Service area		Terrain-limited		IX-free, before	IX-free, after	Percent New IX
29095.4	274,707	28818.3	274,536	28407.7	271,493	28331.0 271,373	0.27 0.04
Undesired			Total IX		Unique IX, before	Unique IX, after	
KWWT D30 DT BL		12.1	7	12.1	7		
KWWT D30 DT APP		96.7	134			88.8 127	
KMPX D30 DT LIC		378.7	3,027	362.6	3,007	362.6 3,007	
KPLE-CD D30 DC CP		20.1	20	4.0	0	4.0 0	
KABB D30 DT LIC		23.8	9	15.8	9	7.9 2	

Interference to BLANK0000029890 CP scenario 3

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KTAB-TV	D30	DT	CP	ABILENE, TX	BLANK0000029890	
Undesireds:	KWWT	D30	DT	BL	ODESSA, TX	DTVBL84410	255.1 km
	KWWT	D30	DT	APP	ODESSA, TX	KWWT prop WC	284.5
	KMPX	D30	DT	LIC	DECATUR, TX	BLCDT20060317AGE	249.1
	KPLE-CD	D30	DC	LIC	KILLEEN, TX	BLDTL20090416ASY	220.0
	KABB	D30	DT	LIC	SAN ANTONIO, TX	BLCDT20100527AFI	355.2
	Service area		Terrain-limited		IX-free, before	IX-free, after	Percent New IX
29095.4	274,707	28818.3	274,536	28407.7	271,493	28331.0 271,373	0.27 0.04
Undesired			Total IX		Unique IX, before	Unique IX, after	
KWWT D30 DT BL		12.1	7	12.1	7		
KWWT D30 DT APP		96.7	134			88.8 127	
KMPX D30 DT LIC		378.7	3,027	366.6	3,007	366.6 3,007	
KPLE-CD D30 DC LIC		16.1	20	4.0	0	4.0 0	
KABB D30 DT LIC		23.8	9	15.8	9	7.9 2	

Interference to BLANK0000029890 CP scenario 4

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KTAB-TV	D30	DT	CP	ABILENE, TX	BLANK0000029890	

Table 1 KWWT TVStudy Analysis of Proposal
(page 3 of 3)



Undesireds:	KWWT	D30	DT	BL	ODESSA, TX	DTVBL84410	255.1 km
	KWWT	D30	DT	APP	ODESSA, TX	KWWT prop WC	284.5
	KMPX	D30	DT	LIC	DECATUR, TX	BLCDT20060317AGE	249.1
	KPLE-CD	D30	DC	CP	KILLEEN, TX	BPDTA20130211ACF	220.0
	KABB	D30	DT	LIC	SAN ANTONIO, TX	BLCDT20100527AFI	355.2
	Service area		Terrain-limited		IX-free, before	IX-free, after	Percent New IX
	29095.4	274,707	28818.3	274,536	28407.7	271,493	28331.0 271,373 0.27 0.04
Undesired			Total IX		Unique IX, before		Unique IX, after
KWWT D30 DT BL		12.1	7	12.1	7		
KWWT D30 DT APP		96.7	134			88.8	127
KMPX D30 DT LIC		378.7	3,027	362.6	3,007	362.6	3,007
KPLE-CD D30 DC CP		20.1	20	4.0	0	4.0	0
KABB D30 DT LIC		23.8	9	15.8	9	7.9	2

Interference to proposal scenario 1

Desired:	Call	Chan	Svc	Status	City, State	File Number	Distance
	KWWT	D30	DT	APP	ODESSA, TX	KWWT prop WC	
Undesireds:	KTAB-TV	D30	DT	CP	ABILENE, TX	BLANK0000029890	284.5 km
	Service area		Terrain-limited		IX-free		Percent IX
	19150.6	317,078	19130.7	317,078	19122.8	317,078	0.04 0.00
Undesired			Total IX		Unique IX		Prcnt Unique IX
KTAB-TV D30 DT CP		7.9	0	7.9	0	0.04	0.00

Channel and Facility Information

Section	Question	Response
Proposed Community of License	Facility ID	84410
	State	Texas
	City	ODESSA
	DTV Channel	30
	Designated Market Area	ODESSA-MIDLAND
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?	Yes
	ASR Number	1233693
Coordinates (NAD83)	Latitude	31° 51' 50.8" N+
	Longitude	102° 34' 42.5" W-
	Structure Type	TOWER-A free standing or guyed struct
	Overall Structure Height	222.5 meters
	Support Structure Height	198.3 meters
	Ground Elevation (AMSL)	955.6 meters
Antenna Data	Height of Radiation Center Above Ground Level	187.5 meters
	Height of Radiation Center Above Average Terrain	204.1 meters
	Height of Radiation Center Above Mean Sea Level	1143.1 meters
	Effective Radiated Power	500 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:	ERI
	Model	ATW24H2-ESWC-30H
	Rotation	70 degrees
	Electrical Beam Tilt	0.5
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Elliptical
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	Value	Degree	Value	Degree	Value	Degree	Value
0	0.893	90	0.980	180	0.490	270	0.980
10	0.896	100	0.943	190	0.502	280	0.998
20	0.905	110	0.888	200	0.537	290	0.998
30	0.920	120	0.818	210	0.593	300	0.985
40	0.941	130	0.741	220	0.663	310	0.964
50	0.964	140	0.663	230	0.741	320	0.941
60	0.985	150	0.593	240	0.818	330	0.920
70	0.998	160	0.537	250	0.888	340	0.905
80	0.998	170	0.502	260	0.943	350	0.896

Additional Azimuths

Degree	V _A
75	1.000
285	1.000

**Construction
Permit
Certifications**

Section	Question	Response
<p>Post-Incentive Auction Expedited Processing</p>	<p>It will operate on the DTV channel for this station as established in the post-incentive auction channel reassignment public notice.</p>	<p>Yes</p>
	<p>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.</p>	<p>No</p>
	<p>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.</p>	<p>Yes</p>
	<p>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.</p>	<p>Yes</p>
<p>Environmental Effect</p>	<p>Would a Commission grant of Authorization for this location be an action which may have a significant environmental effect? (See 47 C.F.R. Section 1.1306)</p>	<p>No</p>
<p>Broadcast Facility</p>	<p>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.</p>	<p>Yes</p>