ENGINEERING EXHIBIT

Digital Low Power Television Station
Application for Minor Modification of Licensed Facility

prepared for

Gray Television Licensee, LLC
WTWL-LD Wilmington, NC
Facility ID 185718
Ch. 31 15 kW Nondirectional

Gray Television Licensee, LLC ("Gray") is the licensee of digital Low Power Television station WTWL-LD, Channel 31, Facility ID 185718, Wilmington NC. WTWL-LD is licensed to operate at 0.2 kW effective radiated power ("ERP") with a directional antenna (file# 0000179362). *Gray* herein seeks a minor modification Construction Permit to relocate WTWL-LD and to utilize a nondirectional antenna at increased ERP and antenna height.

The proposed facility will employ a new antenna to be side-mounted on the tower structure associated with FCC Antenna Structure Registration number 1006714, located 23.6 km (14.7 miles) from the licensed site. No change to the overall structure height is proposed. The proposed site is at the studio location for WTWL-LD and *Gray's* full power television station WECT (Facility ID 48666, Wilmington, NC).

The proposed antenna is a Dielectric model TLP-12A/VP-R having elliptical polarization. The proposed ERP is 15 kW horizontally polarized and 4.5 kW vertically polarized using a "full service" out of channel emission mask.

Figure 1 depicts the 51 dBµ coverage contour of the proposed and licensed facilities, demonstrating compliance with §73.3572 for a minor change. Since the proposed 51 dBµ contour encompasses that of the licensed facility, no service loss area will be created. Considerable service improvement will result as the population within the 51 dBµ contour increases to 309,956 persons (2010 census), which is a 258-fold increase beyond the 1,203 persons within the licensed WTWL-LD facility's 51 dBµ contour.

Interference study per OET Bulletin 69[1] shows that the proposal complies with the FCC's interference protection requirements toward all digital television, television translator, LPTV, and Class A stations. The results, summarized in Table 1, show that any new interference does not exceed the FCC's interference limits (0.5 percent to full power and Class A stations, and 2.0 percent to secondary stations) to any facility.

Human Exposure to Radiofrequency Electromagnetic Field (Environmental)

The proposed facility 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 20 percent antenna relative field in downward elevations (pattern data shows 20 percent or less relative field at angles 10 to 90 degrees below the antenna), the calculated power density attributable to the proposed facility at locations near the transmitter site at a height of two meters above ground level is 4.9 $\mu W/cm^2$, which is 1.3 percent of the general population / uncontrolled maximum permissible 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.

[1]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, 1 km cell size, and 1 km terrain increment. Comparisons of various results of this computer program (run on a Mac processor) to the FCCs implementation of TVStudy show excellent correlation.

List of Attachments

Figure 1	Coverage Contour Comparison
Table 1	TVStudy Analysis of Proposal
Form 2100	Saved Version of Engineering Sections of FCC Form at Time of Upload

Chesapeake RF Consultants, LLC
Joseph M. Davis, P.E. August 23, 2022
207 Old Dominion Road Yorktown, VA 23692 703-650-9600

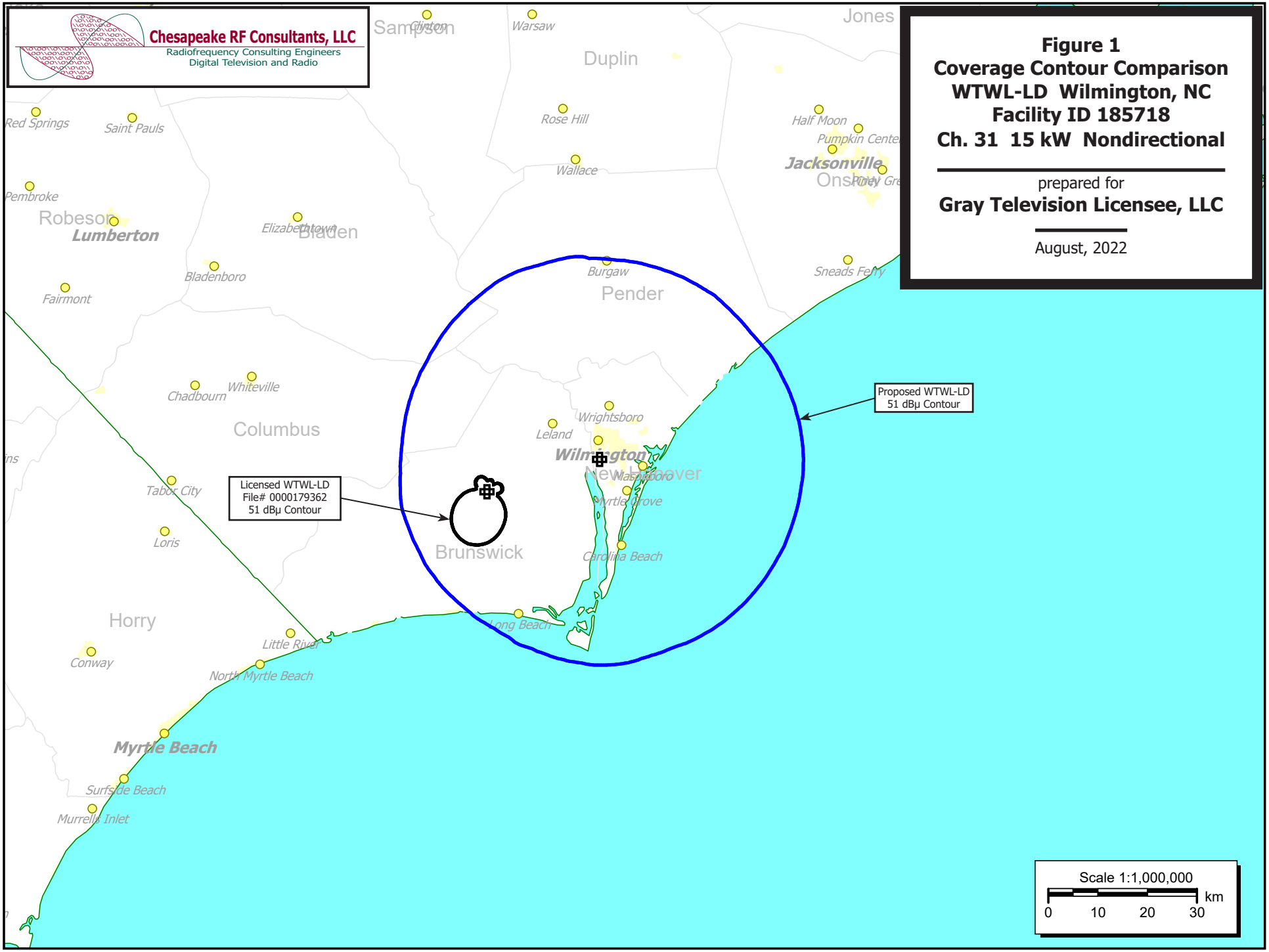
Chesapeake RF Consultants, LLC
Radiofrequency Consulting Engineers
Digital Television and Radio
Figure 1
Coverage Contour Comparison
WTWL-LD Wilmington, NC
Facility ID 185718
Ch. 31 15 kW Nondirectional
prepared for
Gray Television Licensee, LLC
August, 2022
Proposed WTWL-LD
51 dBµ Contour
Licensed WTWL-LD
File# 0000179362
51 dBµ Contour
Scale 1:1,000,000
km
0 10 20 30
Sampson
Clinton
Warsaw
Duplin
Jones
Red Springs
Saint Pauls
Rose Hill
Half Moon
Pumpkin Center
Jacksonville
Onslow
Wallace
Pembroke
Robeson
Lumberton
Elizabethtown
Bladen
Bladenboro
Fairmont
Burgaw
Pender
Sneads Ferry
Chadbourn
Whiteville
Columbus
Wrightsboro
Leland
Wilmington
Masonboro
Myrtle Grove
Tabor City
Loris
Brunswick
Carolina Beach
Horry
Little River
Conway
North Myrtle Beach
Myrtle Beach
Surfside Beach
Murrells Inlet

Table 1 WTWL-LD TVStudy Analysis of Proposal


```
tvstudy v2.2.5 (4uoc83)
Database: localhost,  Study: WTWL-LD 1006714,  Model: Longley-Rice
Start: 2022.08.23 15:01:06

Study created: 2022.08.23 15:01:06

Study build station data: LMS TV 2022-08-22

    Proposal: WTWL-LD D31 LD APP WILMINGTON, NC
 File number: WTWL-LD 1006714
 Facility ID: 185718
Station data: User record
   Record ID: 4598
     Country: U.S.

Build options:
Protect pre-transition records not on baseline channel

Search options:
Baseline record excluded if station has CP

Stations potentially affected by proposal:
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IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	WUNU	D30	DT	LIC	LUMBERTON, NC	BLANK0000114990	121.4 km
No	WHIG-CD	D30	DC	CP	ROCKY MOUNT, NC	BLANK0000186196	190.7
Yes	W30ER-D	D30	LD	CP	WILMINGTON, NC	BNPDTL20090825BVJ	30.0
Yes	WGHP	D31	DT	LIC	HIGH POINT, NC	BLANK0000158670	249.8
No	W31FD-D	D31	LD	LIC	BEAUFORT, SC	BLANK0000157739	347.0
No	W31FD-D	D31	LD	CP	BEAUFORT, SC	BLANK0000157869	327.3
No	WFDY-LD	D31	LD	LIC	MYRTLE BEACH, SC	BLANK0000163451	121.5
No	WJNI-LD	D31	LD	LIC	NORTH CHARLESTON, SC	BLDTL20100916ADG	244.4
No	WKTC	D31	DT	LIC	SUMTER, SC	BLANK0000093003	259.7
No	WAHU-LD	D31	LD	LIC	CROZET, VA	BLANK0000177047	424.4
No	WHRO-TV	D31	DT	LIC	HAMPTON-NORFOLK, VA	BLANK0000120642	318.8
No	WDRN-LD	D32	LD	LIC	FAYETTEVILLE, NC	BLANK0000141011	132.9
No	WTMQ-LD	D32	LD	CP	JACKSONVILLE, NC	BLANK0000029998	74.9
No	WRPX-TV	D32	DT	LIC	ROCKY MOUNT, NC	BLANK0000081831	183.3
No	WMBF-TV	D32	DT	LIC	MYRTLE BEACH, SC	BLCDT20091105AAP	116.3

```
No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

    Channel: D31
       Mask: Full Service
   Latitude:  34 11 27.30 N (NAD83)
  Longitude:  77 56 31.20 W
Height AMSL: 88.1 m
       HAAT: 0.0 m
   Peak ERP: 15.0 kW
    Antenna: Omnidirectional
Elev Pattrn: Generic
  Elec Tilt: 0.50

50.4 dBu contour:
Azimuth      ERP       HAAT   Distance
  0.0 deg   15.0 kW    80.8 m   40.9 km
 45.0       15.0       76.6     40.3
 90.0       15.0       84.5     41.4
135.0       15.0       84.9     41.5
180.0       15.0       87.5     41.8
225.0       15.0       81.0     40.9
270.0       15.0       78.0     40.5
315.0       15.0       81.9     41.0

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m   Computed HAAT: 82 m

Distance to Canadian border: 918.8 km
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Distance to Mexican border: 2036.6 km

Conditions at FCC monitoring station: Laurel MD
Bearing: 9.9 degrees Distance: 561.8 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 293.3 degrees Distance: 2494.1 km

Study cell size: 1.00 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%

Interference to BNPDTL20090825BVJ CP scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	W30ER-D	D30	LD	CP	WILMINGTON, NC	BNPDTL20090825BVJ	
Undesireds:	WTWL-LD	D31	LD	APP	WILMINGTON, NC	WTWL-LD 1006714	30.0 km
	WSFX-TV	D29	DT	LIC	WILMINGTON, NC	BLANK0000111706	21.4
	WUNU	D30	DT	LIC	LUMBERTON, NC	BLANK0000114990	91.6
	WHIG-CD	D30	DC	LIC	ROCKY MOUNT, NC	BLANK0000180530	180.4
	WLOW-LD	D30	LD	CP	Charleston, SC	BLANK0000157610	229.0

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
2756.9	263,400	2756.9	263,400	2170.7	256,304	2165.6	253,354	0.23	1.15

Undesired	Total IX		Unique IX, before		Unique IX, after	
WTWL-LD D31 LD APP	5.0	2,950			5.0	2,950
WSFX-TV D29 DT LIC	235.5	2,666	4.0	8	4.0	8
WUNU D30 DT LIC	582.2	7,088	350.7	4,430	350.7	4,430

Interference to BLANK0000158670 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WGHP	D31	DT	LIC	HIGH POINT, NC	BLANK0000158670	
Undesireds:	WTWL-LD	D31	LD	APP	WILMINGTON, NC	WTWL-LD 1006714	249.8 km
	WUNU	D30	DT	LIC	LUMBERTON, NC	BLANK0000114990	134.0
	WHIG-CD	D30	DC	LIC	ROCKY MOUNT, NC	BLANK0000180530	185.7
	WDBJ	D30	DT	LIC	ROANOKE, VA	BLANK0000185231	156.2
	WKTC	D31	DT	LIC	SUMTER, SC	BLANK0000093003	206.5
	WHRO-TV	D31	DT	LIC	HAMPTON-NORFOLK, VA	BLANK0000120642	318.8
	WOAY-TV	D31	DT	LIC	OAK HILL, WV	BLANK0000096583	265.3
	WAXN-TV	D32	DT	LIC	KANNAPOLIS, NC	BLANK0000146859	100.9
	WRPX-TV	D32	DT	LIC	ROCKY MOUNT, NC	BLANK0000081831	152.9

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
36117.0	4,172,169	35479.6	4,124,304	33608.8	3,725,607	33606.8	3,725,595	0.01	0.00

Undesired	Total IX		Unique IX, before		Unique IX, after	
WTWL-LD D31 LD APP	14.0	373			2.0	12
WUNU D30 DT LIC	521.5	24,888	449.5	21,996	448.5	21,800
WDBJ D30 DT LIC	142.5	10,508	138.5	10,202	138.5	10,202
WKTC D31 DT LIC	318.8	55,952	132.1	6,845	130.1	6,811
WHRO-TV D31 DT LIC	217.2	49,654	97.6	10,225	97.6	10,225
WOAY-TV D31 DT LIC	6.0	57	1.0	0	1.0	0
WAXN-TV D32 DT LIC	673.0	238,865	568.2	193,143	568.2	193,143
WRPX-TV D32 DT LIC	293.2	106,731	191.5	68,527	191.5	68,527

Interference to proposal scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WTWL-LD	D31	LD	APP	WILMINGTON, NC	WTWL-LD 1006714	

Table 1 WTWL-LD TVStudy Analysis of Proposal

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Digital Television and Radio

Undesireds: W30ER-D D30 LD CP WILMINGTON, NC BNPDTL20090825BVJ 30.0 km

Service area		Terrain-limited		IX-free		Percent IX	
5290.7	311,380	5290.7	311,380	5289.7	311,364	0.02	0.01

Undesired	Total IX		Unique IX		Prcnt Unique IX	
W30ER-D D30 LD CP	1.0	16	1.0	16	0.02	0.01

Channel and Facility Information

Section	Question	Response
Facility ID	185718	
State	North Carolina	
City	WILMINGTON	
LPD Channel	31	

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1006714
Coordinates (NAD83)	Latitude	34° 11' 27.3" N+
	Longitude	077° 56' 31.2" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	92.6 meters
	Support Structure Height	91.4 meters
	Ground Elevation (AMSL)	13.4 meters
Antenna Data	Height of Radiation Center Above Ground Level	74.7 meters
	Height of Radiation Center Above Mean Sea Level	88.1 meters
	Effective Radiated Power	15 kW

Antenna Technical Data

Section	Question	Response
Antenna Type	Antenna Type	Non-Directional
	Do you have an Antenna ID?	
	Antenna ID	
Antenna Manufacturer and Model	Manufacturer:	Dielectric
	Model	TLP-12A/VP-R
	Rotation	
	Electrical Beam Tilt	0.5
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Elliptical
Elevation Radiation 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	
	Out-of-Channel Emission Mask:	Full Service