

ENGINEERING EXHIBIT

Digital Television Station Application for Minor Modification of Licensed Facility

prepared for

WWAY-TV, LLC
WWAY(DT) Wilmington NC
Facility ID 12033
Ch. 24 700 kW 592 m

WWAY-TV, LLC (“*WWAY-TV*”) is the licensee of digital television station WWAY(DT), Channel 24, Facility ID 12033, Wilmington NC. WWAY is licensed (file# 0000100423) to operate at 652 kW effective radiated power (“ERP”) with a directional antenna at 590 meters height above average terrain (“HAAT”). *WWAY-TV* proposes herein to utilize a replacement antenna and operate WWAY at increased ERP of 700 kW at 592 meters HAAT.

The existing WWAY broadband panel directional antenna has become deficient and will be replaced with a new antenna of the same style. WWAY shares the antenna with stations WECT Channel 23 and WSFX-TV Channel 29, both Wilmington NC. The replacement antenna, supplied by an alternate manufacturer, has a similar but not exact directional azimuthal pattern as compared to the licensed facility. Manufacturing differences also place the resulting proposed antenna radiation center height above ground level at 588.2 meters, an increase of 1.2 meters above the licensed value. The proposed replacement antenna will be top-mounted in lieu of the existing antenna on the WWAY tower structure corresponding to FCC Antenna Structure Registration number 1008242.

The proposed antenna is a horizontally polarized ERI model ETU14U4-HTP4Ox-24/23/29. *WWAY-TV* proposes to operate WWAY with an ERP of 700 kW at 592 meters antenna HAAT. The directional antenna’s azimuthal pattern is depicted in Figure 1 and the elevation pattern is supplied in Figure 2.

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 WWAY noise limited service contour ("NLSC") 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.

The proposed WWAY NLSC encompasses and expands beyond nearly all of the licensed facility's NLSC. Minor NLSC loss areas are created due to the directional pattern variations of the replacement antenna. The NLSC of nearby licensed television stations² which overlap the loss areas are provided on Figure 4 to demonstrate the availability of other services. All of the NLSC loss areas are considered "well served" since at least five other licensed television facilities provide NLSC overlap. There are at least seven other NLSC services available throughout all of the loss areas.

The proposed 700 kW ERP exceeds the maximum permitted by §73.622(f)(8) for the proposed antenna HAAT of 592 meters. Section 73.622(f)(5) permits the maximum ERP to be exceeded in order to provide the same geographic coverage area as the largest station within the same market. As demonstrated in Figure 4, the total area within the proposed WWAY NLSC is 37,605 square kilometers, which does not exceed the NLSC area of the licensed WWAY facility (37,628 sq. km). Thus, the 700 kW ERP specified herein complies with §73.622(f)(5).

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.

²The NLSCs for WECT and WSFX-TV as depicted on Figure 4 correspond to their Construction Permit facilities that authorize use of the subject replacement shared antenna with WWAY.

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 $1.5 \mu\text{W}/\text{cm}^2$, which is 0.4 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.

List of Attachments

Figure 1	Antenna Azimuthal Pattern
Figure 2	Antenna Elevation Pattern
Figure 3	Proposed Coverage Contours
Figure 4	Coverage Contour Comparison Alternate DTV Services Maximum ERP per §73.622(f)
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.	July 7, 2023	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600

Azimuth Pattern

Type:	ETUP4Ox-H	Polarization:	Horizontal
Directivity:	1.93 numeric (2.86 dB)	Frequency:	24 (ATSC)
Peak(s) at:		Location:	Wilmington, NC
		NOTE: Pattern shape and directivity may vary with channel and mounting configuration.	

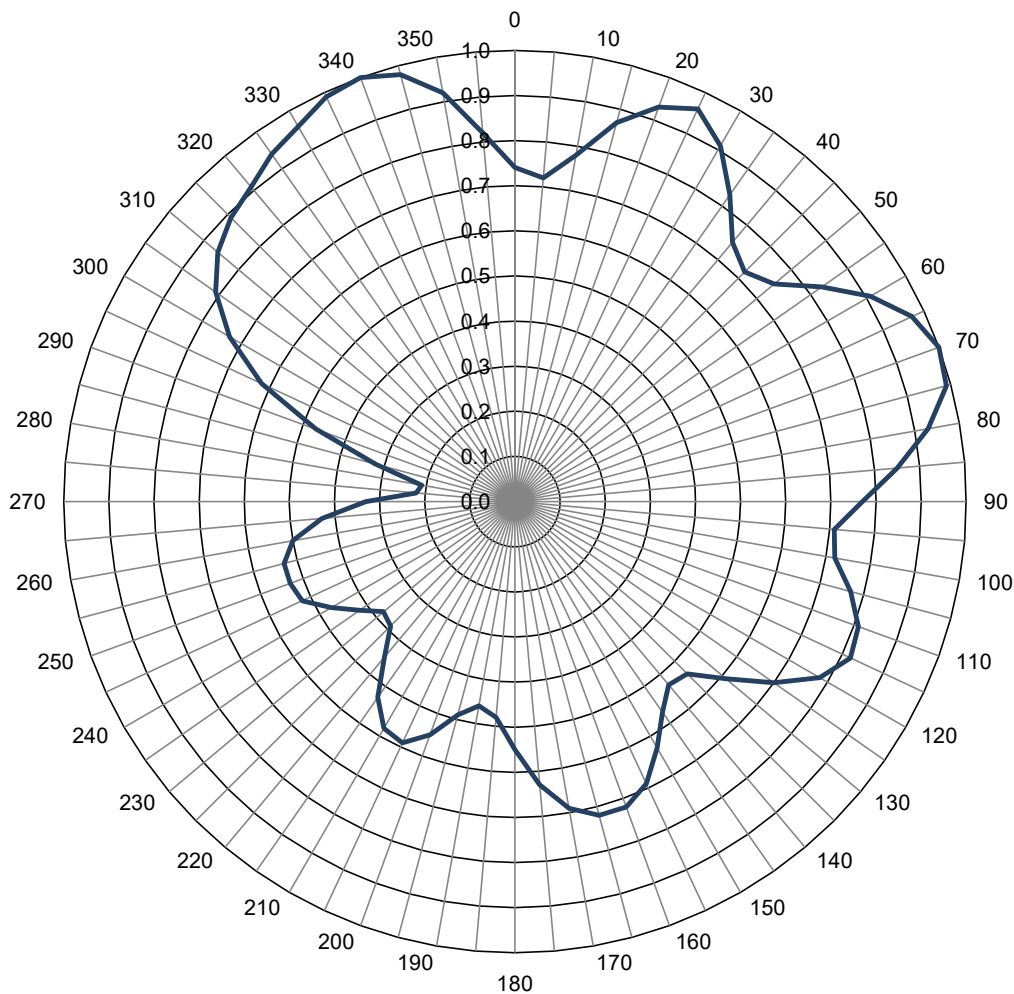
Relative Field

Figure 1
Antenna Azimuthal Pattern
WWAY(DT) Wilmington NC
Facility ID 12033
Ch. 24 700 kW 592 m

prepared for
WWAY-TV, LLC

July, 2023



Elevation Pattern

Type:	ETU-14U4-H	Polarization:	Horizontal
Directivity:		Frequency:	24 (ATSC)
Main Lobe:	31.53 numeric (14.99 dB)	Location:	Wilmington, NC
Horizontal:	15.01 numeric (11.76 dB)	Beam Tilt:	1.00 degrees

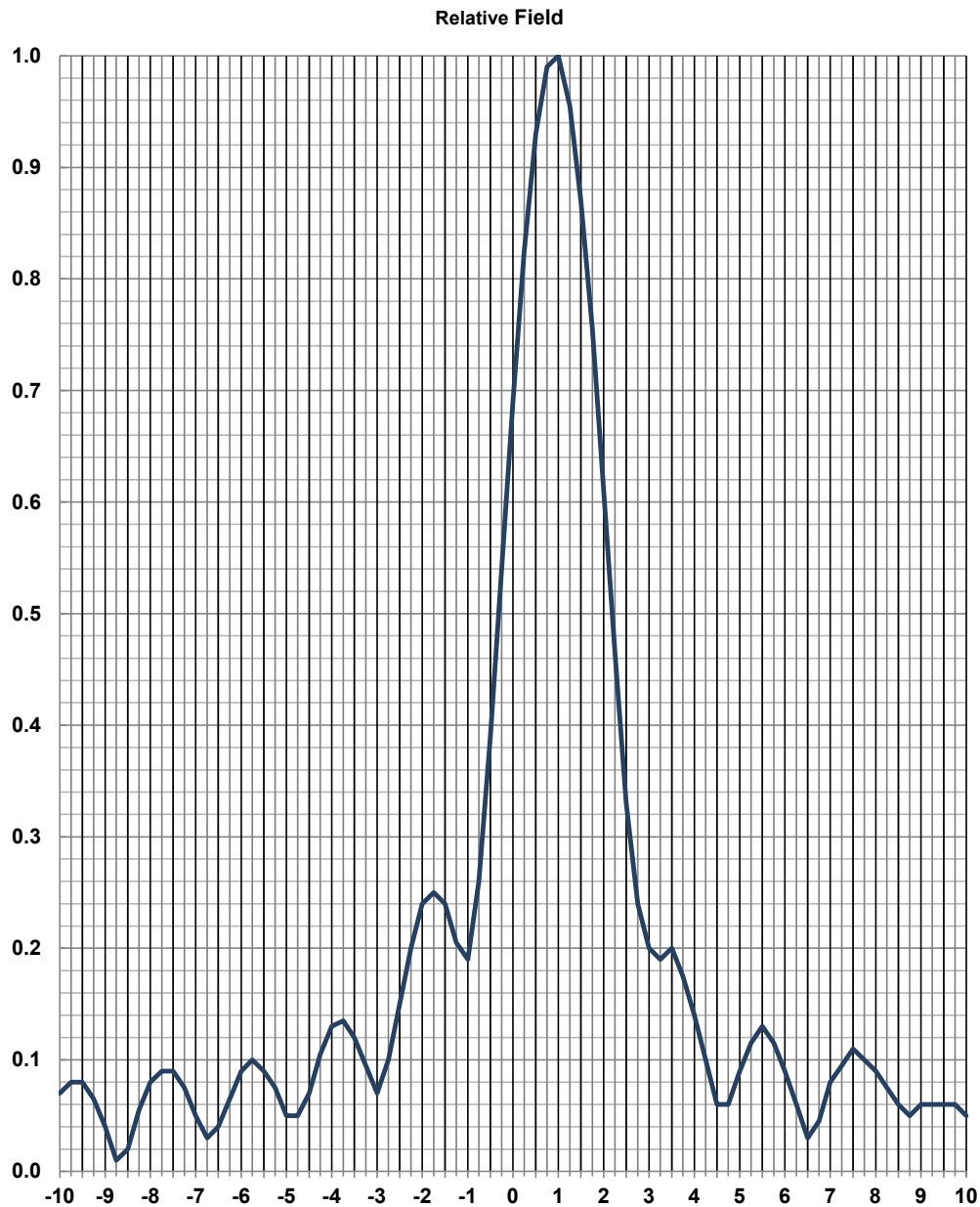
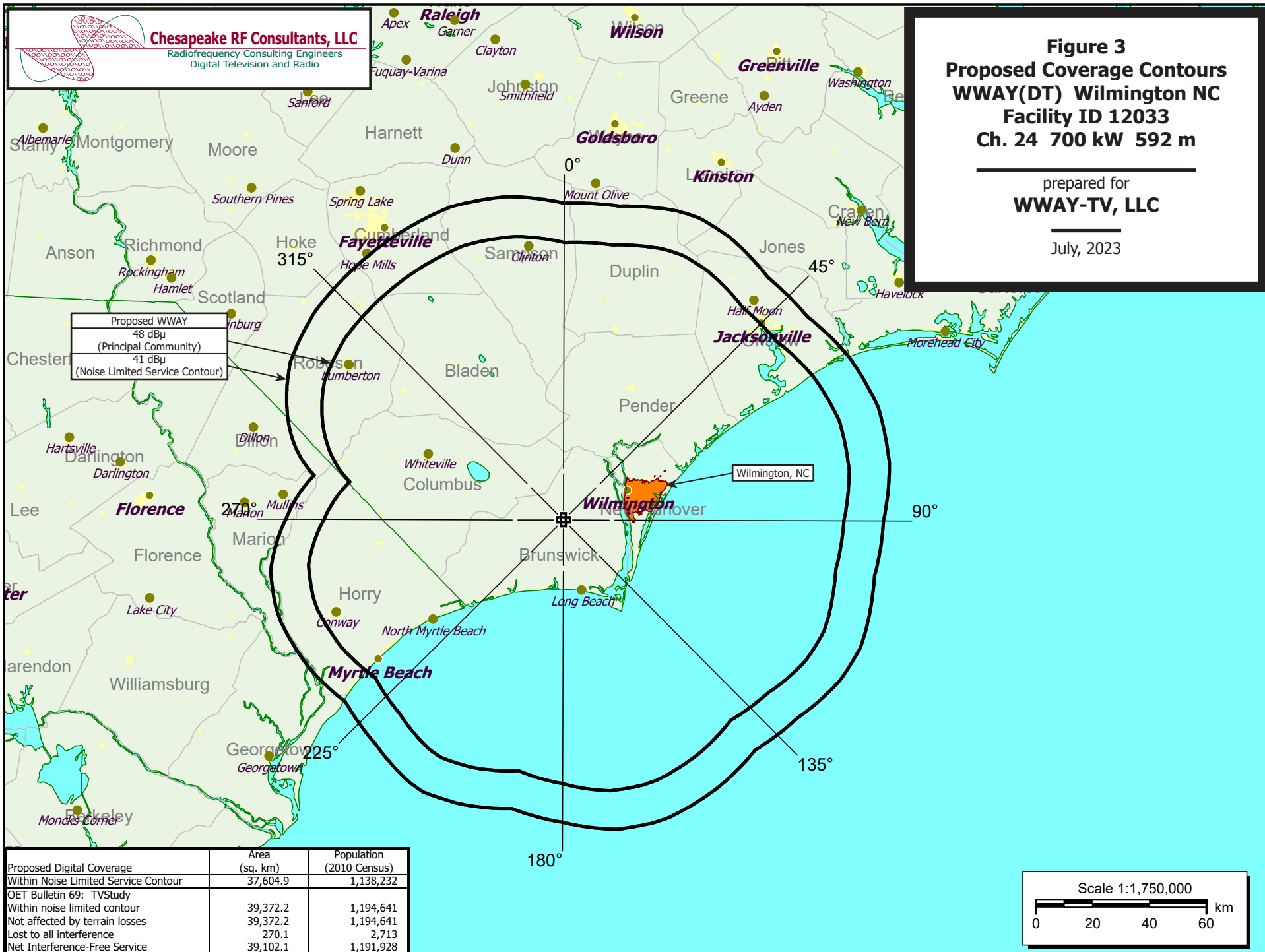


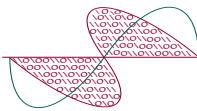
Figure 2
Antenna Elevation Pattern
WWAY(DT) Wilmington NC
Facility ID 12033
Ch. 24 700 kW 592 m

prepared for
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July, 2023







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

Figure 4
Coverage Contour Comparison
Alternate DTV Services
Maximum ERP per §73.622(f)
WWAY(DT) Wilmington NC
Facility ID 12033
Ch. 24 700 kW 592 m

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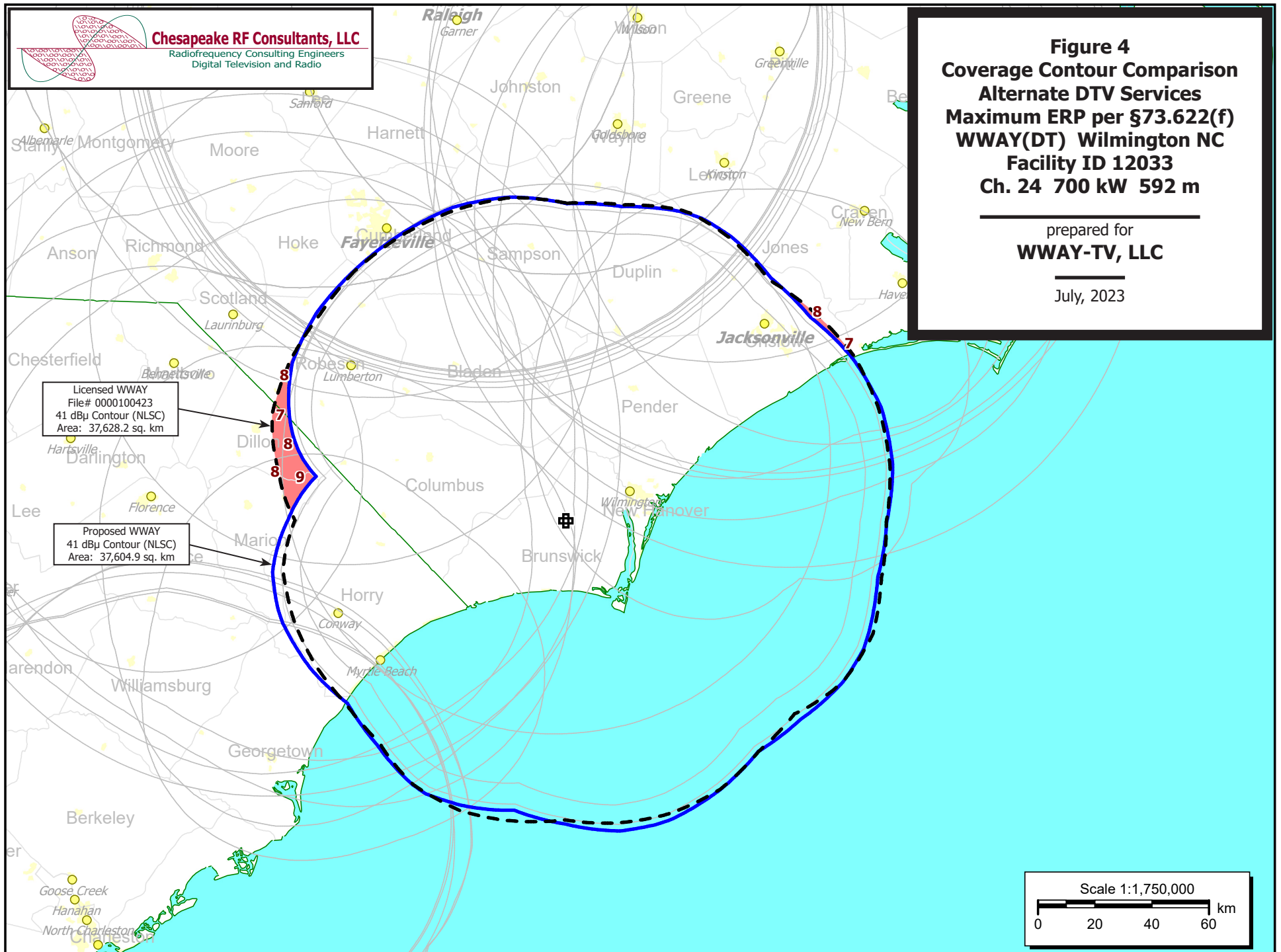


Table 1 WWAY TVStudy Analysis of Proposal
(page 1 of 3)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: WWAY ERI 700kW, Model: Longley-Rice
Start: 2023.07.06 13:29:53

Study created: 2023.07.06 13:29:53

Study build station data: LMS TV 2023-07-06

Proposal: WWAY D24 DT APP WILMINGTON, NC
File number: WWAY ERI 700kW
Facility ID: 12033
Station data: User record
Record ID: 30
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	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	174.6 km
No	WECT	D23	DT	LIC	WILMINGTON, NC	BLANK0000111584	0.0
No	WECT	D23	DT	CP	WILMINGTON, NC	BLANK0000207207	0.0
Yes	WCNC-TV	D24	DT	LIC	CHARLOTTE, NC	BLANK0000147158	304.1
Yes	WUBX-CD	D24	DC	LIC	DURHAM, ETC., NC	BLANK0000108883	213.0
No	WITV	D24	DT	LIC	CHARLESTON, SC	BLANK0000118279	193.9
Yes	WRLH-TV	D24	DT	LIC	RICHMOND, VA	BLANK0000186907	379.5
Yes	WUNK-TV	D25	DT	LIC	GREENVILLE, NC	BLANK0000143143	166.8
No	WCIV	D25	DT	LIC	CHARLESTON, SC	BLANK0000184940	192.5
No	WZRB	D25	DT	LIC	COLUMBIA, SC	BLANK0000081456	258.8

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D24
Latitude: 34 7 54.00 N (NAD83)
Longitude: 78 11 16.00 W
Height AMSL: 607.4 m
HAAT: 592.2 m
Peak ERP: 700 kW
Antenna: Ch24 ETU14U4 AZpat 20210304-390-1r1 0.0 deg
Elev Pattn: Generic
Elec Tilt: 1.00

39.8 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	382 kW	590.9 m	113.8 km
45.0	390	591.3	114.0
90.0	412	599.7	114.9
135.0	220	592.6	108.9
180.0	209	596.6	108.7
225.0	120	590.2	103.6
270.0	77.6	588.5	99.8
315.0	549	588.0	116.9

ERP exceeds maximum

ERP: 700 kW ERP maximum: 336 kW

Distance to Canadian border: 916.0 km

Distance to Mexican border: 2013.2 km

Conditions at FCC monitoring station: Laurel MD
Bearing: 11.9 degrees Distance: 572.6 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:

Table 1 WWAY TVStudy Analysis of Proposal
(page 2 of 3)



Bearing: 293.5 degrees Distance: 2476.0 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%

Interference to BLANK0000147158 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WCNC-TV	D24	DT	LIC	CHARLOTTE, NC	BLANK0000147158	
Undesireds:	WWAY	D24	DT	BL	WILMINGTON, NC	DTVBL12033	304.1 km
	WWAY	D24	DT	APP	WILMINGTON, NC	WWAY ERI 700kW	304.1
	WBTW	D23	DT	LIC	CHARLOTTE, NC	BLANK0000147971	2.4
	WGTA	D24	DT	LIC	TOCCOA, GA	BLANK0000001315	216.5
	WUBX-CD	D24	DC	LIC	DURHAM, ETC., NC	BLANK0000108883	223.9
	WITV	D24	DT	LIC	CHARLESTON, SC	BLANK0000118279	301.3
	WETP-TV	D24	DT	LIC	SNEEDVILLE, TN	BLANK0000120200	214.4
	WRLH-TV	D24	DT	LIC	RICHMOND, VA	BLANK0000186907	399.7
	WJZY	D25	DT	LIC	BELMONT, NC	BLANK0000146872	2.2
	WZRB	D25	DT	LIC	COLUMBIA, SC	BLANK0000081456	145.7

	Service area	Terrain-limited		IX-free, before		IX-free, after	Percent New IX
	40222.5	3,883,049	38674.9	3,809,706	37207.1	3,737,482	37266.6 3,738,621 -0.16 -0.03

Undesired			Total IX		Unique IX, before		Unique IX, after
WWAY D24 DT BL			408.0	14,064	328.1	10,144	
WWAY D24 DT APP			324.6	12,665			268.6 9,005
WBTW D23 DT LIC			460.5	34,412	255.7	22,772	255.7 22,772
WGTA D24 DT LIC			31.9	1,239	23.9	1,235	23.9 1,235
WUBX-CD D24 DC LIC			24.1	1,068	4.0	44	4.0 44
WITV D24 DT LIC			183.3	2,674	99.6	1,315	123.5 1,575
WETP-TV D24 DT LIC			59.9	2,279	39.9	1,766	39.9 1,766
WRLH-TV D24 DT LIC			20.1	2,466	4.0	30	4.0 30
WJZY D25 DT LIC			596.6	30,498	391.8	18,858	391.8 18,858
WZRB D25 DT LIC			20.0	483	0.0	0	0.0 0

Interference to BLANK0000108883 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WUBX-CD	D24	DC	LIC	DURHAM, ETC., NC	BLANK0000108883	
Undesireds:	WWAY	D24	DT	BL	WILMINGTON, NC	DTVBL12033	213.0 km
	WWAY	D24	DT	APP	WILMINGTON, NC	WWAY ERI 700kW	213.0
	WNGT-CD	D23	DC	LIC	RALEIGH, NC	BLANK0000143970	42.0
	WCNC-TV	D24	DT	LIC	CHARLOTTE, NC	BLANK0000147158	223.9
	WRLH-TV	D24	DT	LIC	RICHMOND, VA	BLANK0000186907	202.0

	Service area	Terrain-limited		IX-free, before		IX-free, after	Percent New IX
	5902.2	1,391,159	5866.0	1,385,773	5625.3	1,366,858	5621.3 1,366,752 0.07 0.01

Undesired			Total IX		Unique IX, before		Unique IX, after
WWAY D24 DT BL			112.2	6,637	52.1	5,104	
WWAY D24 DT APP			116.3	8,761			56.1 5,210
WNGT-CD D23 DC LIC			8.1	1,364	4.0	1,193	4.0 1,193
WCNC-TV D24 DT LIC			104.3	6,277	44.1	3,322	44.1 3,322
WRLH-TV D24 DT LIC			136.5	9,254	44.3	5,594	44.2 3,576

Interference to BLANK0000186907 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WRLH-TV	D24	DT	LIC	RICHMOND, VA	BLANK0000186907	
Undesireds:	WWAY	D24	DT	BL	WILMINGTON, NC	DTVBL12033	379.5 km
	WWAY	D24	DT	APP	WILMINGTON, NC	WWAY ERI 700kW	379.5
	WDPB	D24	DT	LIC	SEAFORD, DE	BLANK0000080899	215.5

Table 1 WWAY TV Study Analysis of Proposal
(page 3 of 3)



	WUBX-CD	D24	DC	LIC	DURHAM, ETC., NC	BLANK0000108883		202.0				
	WTAJ-TV	D24	DT	LIC	ALTOONA, PA	BLANK0000079898		347.1				
	WDCO-CD	D24	DC	LIC	WOODSTOCK, VA	BLANK0000138193		165.0				
Service area		Terrain-limited			IX-free, before		IX-free, after		Percent New IX			
32784.4	2,017,508	32293.0	1,959,111		31791.5	1,930,709		31791.5	1,930,709	0.00	0.00	
Undesired				Total IX	Unique IX, before		Unique IX, after					
WWAY	D24	DT	BL	4.0	0	4.0	0					
WWAY	D24	DT	APP	4.0	0		4.0	0				
WDPB	D24	DT	LIC	11.9	0	0.0	0	0.0	0			
WUBX-CD	D24	DC	LIC	4.0	99	4.0	99	4.0	99			
WTAJ-TV	D24	DT	LIC	68.3	580	32.1	246	32.1	246			
WDCO-CD	D24	DC	LIC	461.4	28,057	421.3	27,723	421.3	27,723			

Interference to BLANK0000143143 LIC scenario 1												
Desired:	Call	Chan	Svc	Status	City, State	File Number		Distance				
	WUNK-TV	D25	DT	LIC	GREENVILLE, NC	BLANK0000143143						
Undesireds:	WWAY	D24	DT	BL	WILMINGTON, NC	DTVBL12033		166.8 km				
	WWAY	D24	DT	APP	WILMINGTON, NC	WWAY ERI 700kW		166.8				
	WUBX-CD	D24	DC	LIC	DURHAM, ETC., NC	BLANK0000108883		119.3				
	WJZY	D25	DT	LIC	BELMONT, NC	BLANK0000146872		322.4				
	WCIV	D25	DT	LIC	CHARLESTON, SC	BLANK0000184940		348.3				
	WLFB	D25	DT	LIC	BLUEFIELD, WV	BLANK0000123625		375.8				

Service area		Terrain-limited			IX-free, before		IX-free, after		Percent New IX			
33937.5	1,991,039	33905.4	1,985,696		33487.0	1,968,868		33475.1	1,969,086		0.04	-0.01
Undesired				Total IX	Unique IX, before		Unique IX, after					
WWAY	D24	DT	BL	329.8	3,926	317.9	3,710					
WWAY	D24	DT	APP	341.7	3,708		329.8	3,492				
WUBX-CD	D24	DC	LIC	4.0	973	0.0	0	0.0	0			
WJZY	D25	DT	LIC	96.5	12,145	72.5	11,324	72.5	11,324			
WCIV	D25	DT	LIC	23.9	821	0.0	0	0.0	0			
WLFB	D25	DT	LIC	4.0	973	0.0	0	0.0	0			

Interference to proposal scenario 1												
Desired:	Call	Chan	Svc	Status	City, State	File Number		Distance				
	WWAY	D24	DT	APP	WILMINGTON, NC	WWAY ERI 700kW						
Undesireds:	WECT	D23	DT	LIC	WILMINGTON, NC	BLANK0000111584		0.0 km				
	WITV	D24	DT	LIC	CHARLESTON, SC	BLANK0000118279		193.9				
	WUNK-TV	D25	DT	LIC	GREENVILLE, NC	BLANK0000143143		166.8				

Service area		Terrain-limited			IX-free		Percent IX					
39372.2	1,194,641	39372.2	1,194,641		39102.1	1,191,928		0.69	0.23			
Undesired				Total IX	Unique IX		Prcnt Unique IX					
WITV	D24	DT	LIC	143.6	0	143.6	0	0.36	0.00			
WUNK-TV	D25	DT	LIC	126.6	2,713	126.6	2,713	0.32	0.23			

**Channel and
Facility
Information**

Section	Question	Response
Proposed Community of License	Facility ID	12033
	State	North Carolina
	City	WILMINGTON
	DTV Channel	24
	Designated Market Area	Wilmington
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	1008242
Coordinates (NAD83)	Latitude	34° 07' 54.0" N+
	Longitude	078° 11' 16.0" W-
	Structure Type	GTOWER-Guyed Structure Used for Communication Purposes
	Overall Structure Height	595.6 meters
	Support Structure Height	548.0 meters
	Ground Elevation (AMSL)	19.2 meters
Antenna Data	Height of Radiation Center Above Ground Level	588.2 meters
	Height of Radiation Center Above Average Terrain	592.2 meters
	Height of Radiation Center Above Mean Sea Level	607.4 meters
	Effective Radiated Power	700 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	ETU14U4-HTP4Ox-24/23/29
	Rotation	0 degrees
	Electrical Beam Tilt	1
	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	Value	Degree	Value	Degree	Value	Degree	Value
0	0.739	90	0.767	180	0.546	270	0.333
10	0.768	100	0.714	190	0.450	280	0.200
20	0.927	110	0.803	200	0.546	290	0.465
30	0.906	120	0.772	210	0.573	300	0.728
40	0.746	130	0.600	220	0.449	310	0.860
50	0.747	140	0.521	230	0.378	320	0.911
60	0.908	150	0.631	240	0.473	330	0.961
70	0.999	160	0.715	250	0.535	340	1.000
80	0.937	170	0.687	260	0.502	350	0.918

Additional Azimuths

Degree	V _A
253	0.536
24	0.956
207	0.590
163	0.717
113	0.822