ENGINEERING EXHIBIT

Displacement Application for Modification of Digital Television Translator Station

prepared for

Gray Television Licensee, LLC
W42DH-D Sayner / Vilas County, WI
Facility ID 167156
Ch. 21 (digital) 15 kW

Gray Television Licensee, LLC ("Gray") is the licensee of digital television translator station W42DH-D, Channel 42, Sayner / Vilas County WI, Facility ID 167156. W42DH-D has received a 120 day notice from a 600 MHz licensee that the wireless licensee intends to commence operations and W42DH-D is predicted to cause interference to the wireless operations. Pursuant to the procedures described in DA 17-584,[1] *Gray* herein seeks a displacement channel for W42DH-D.

The 120 day notice, attached separately, states that wireless operations will commence on February 4, 2018, in advance of the Special Displacement Window. Therefore, *Gray* requests a waiver of the Displacement Freeze.[2] A request for Special Temporary Authority is being submitted contemporaneously to operate on the proposed displacement channel pending the final outcome of the Special Displacement Window.

As proposed herein, W42DH-D will operate at its existing antenna location on Channel 21 in lieu of the licensed Channel 42. The existing tower structure is associated with FCC Antenna Structure Registration number 1034107. The proposed W42DH-D facility will employ a replacement side-mounted antenna system and no change to the overall structure height is proposed.

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[1] *"Incentive Auction Task Force and Media Bureau Set Forth Tools Available to LPTV/Translator Stations Displaced Prior to the Special Displacement Window,"* Public Notice, DA 17-584, released June 13, 2017.

[2] *"Freeze on the Filing of Applications for Digital Replacement Translator Stations and Displacement Applications,"* Public Notice, DA 14-808, released June 11, 2014.

The existing W42DH-D facility is licensed to operate at 15 kW effective radiated power ("ERP") with a directional antenna. As proposed herein, the Channel 21 W42DH-D facility will operate at 15 kW ERP with nondirectional antenna and a "full service" out of channel emission mask. Since the Channel 21 antenna has a greater length, the antenna's radiation center height above ground will be reduced slightly. Figure 2 depicts the 51 dBµ coverage contour of the licensed and proposed facilities, demonstrating compliance with §73.3572 for a minor change.

Interference study per OET Bulletin 69[3] shows that the proposal complies with the FCC's interference protection requirements toward all digital television, television translator, LPTV, and Class A stations (existing and post-auction). 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.

The site is located 217 km from the U.S. – Canadian border. For Canada referral purposes, the 24.4 dBµ F(50,10) contour is relevant for digital LPTV/translator operations on Channel 21. The 24.4 dBµ F(50,10) contour is depicted in Figure 2 and does not reach Canada. Thus, international coordination is not required.

The nearest FCC monitoring station is 476 km distant at Allegan, MI. 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). There are no authorized AM stations within 3 km 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),

[3]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.

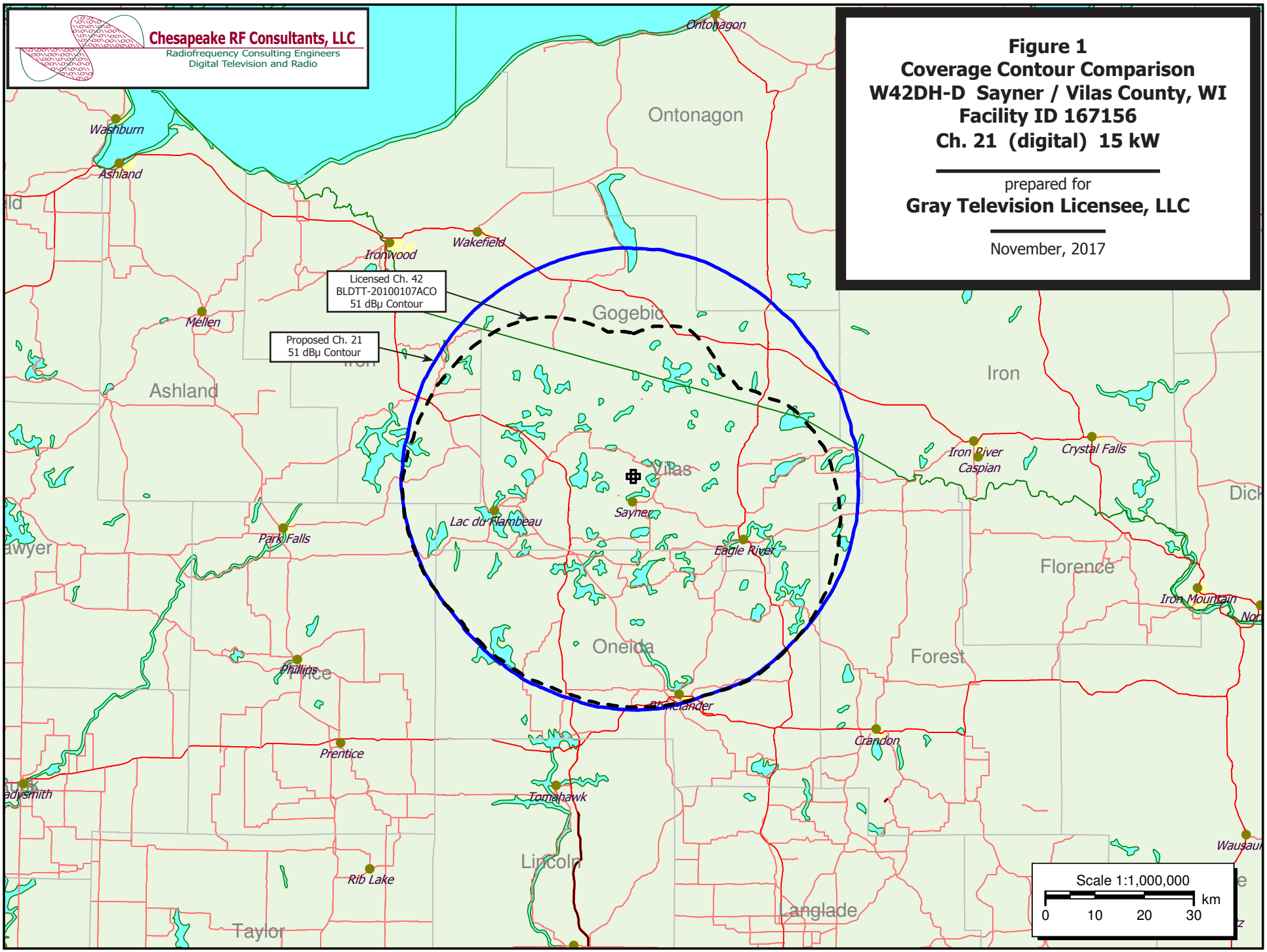
and considering 25 percent antenna relative field in downward elevations (pattern data shows less than 25 percent relative field at angles 15 to 90 degrees below the antenna), the calculated signal density near the tower at two meters above ground level attributable to the proposed facility is 3.7 $\mu W/cm^2$, which is 1.1 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	Coverage Contour Comparison
Figure 2	Interfering Contour Towards Canada
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. November 28, 2017
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
W42DH-D Sayner / Vilas County, WI
Facility ID 167156
Ch. 21 (digital) 15 kW
prepared for
Gray Television Licensee, LLC
November, 2017
Licensed Ch. 42
BLDTT-20100107ACO
51 dBµ Contour
Proposed Ch. 21
51 dBµ Contour
Ontonagon
Washburn
Ashland
Wakefield
Ironwood
Mellen
Gogebic
Iron
Ashland
Vilas
Iron River
Caspian
Crystal Falls
Sayner
Lac du Flambeau
Park Falls
Eagle River
Florence
Iron Mountain
Oneida
Forest
Phillips
Price
Rhinelander
Crandon
Prentice
Tomahawk
Rib Lake
Lincoln
Langlade
Taylor
Scale 1:1,000,000
km
0
10
20
30

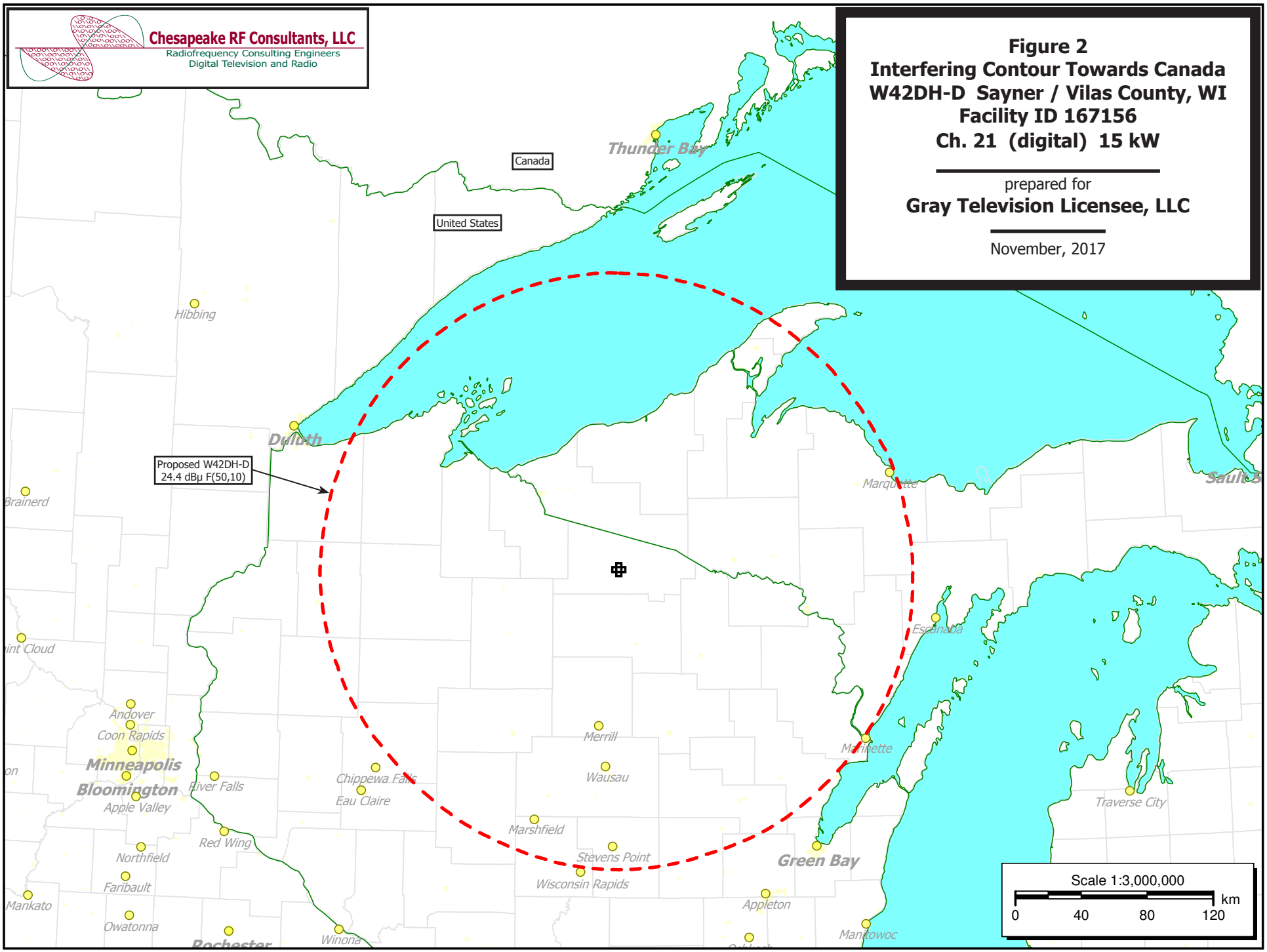

Chesapeake RF Consultants, LLC
Radiofrequency Consulting Engineers
Digital Television and Radio
Figure 2
Interfering Contour Towards Canada
W42DH-D Sayner / Vilas County, WI
Facility ID 167156
Ch. 21 (digital) 15 kW
prepared for
Gray Television Licensee, LLC
November, 2017
Canada
United States
Thunder Bay
Hibbing
Duluth
Proposed W42DH-D
24.4 dBµ F(50,10)
Brainerd
Marquette
Escanaba
Menominee
Merrill
Wausau
Chippewa Falls
Eau Claire
River Falls
Minneapolis
Bloomington
Apple Valley
Andover
Coon Rapids
Red Wing
Northfield
Faribault
Mankato
Owatonna
Rochester
Winona
Marshfield
Stevens Point
Wisconsin Rapids
Green Bay
Appleton
Manitowoc
Traverse City
Scale 1:3,000,000
0 40 80 120 km

Table 1 W42DH-D OET Bulletin 69 Interference Study
(page 1 of 3)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tvstudy v2.2.4 (Z2Qqz3)
Database: localhost,  Study: W42DH-D Prop_Ch-21,  Model: Longley-Rice
Start: 2017.11.28 09:18:34

Study created: 2017.11.28 09:18:34

Study build station data: LMS TV 2017-11-28 LMSTV

    Proposal: W42DH-D D21 LD APP SAYNER/VILAS COUNTY, WI
 File number: W42DH-D Prop_Ch-21
 Facility ID: 167156
Station data: User record
   Record ID: 1550
     Country: U.S.
        Zone: II

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

Stations potentially affected by proposal:

IX   Call      Chan       Svc Status  City, State              File Number             Distance
Yes  W20DN-D   D20        LD  CP      TOMAHAWK, WI             BNPDTL20100510AFG        60.1 km
No   WCMW      D21        DT  LIC     MANISTEE, MI             BLEDT20090612ABH        332.8
No   WFUP      D21        DT  CP      VANDERBILT, MI           BLANK0000028572         383.7
No   WFUP      D21        DT  APP     VANDERBILT, MI           BLANK0000034794         383.7
No   K21KY-D   D21        LD  LIC     BIGFORK/MARCELL, MN      BLDTT20111107ALH        362.7
No   K21KZ-D   D21        LD  CP      DULUTH, MN               BNPDTL20090902AAE       212.5
No   K21KR-D   D21        LD  CP      DULUTH, MN               BNPDTL20090825AQR       215.3
Yes  WEUX      D21        DT  APP     CHIPPEWA FALLS, WI       BLANK0000034736         205.0
No   W21DH-D   D21        LD  CP      EAU CLAIRE, WI           BNPDTL20100507ACR       194.7
No   W21DC-D   D21        LD  CP      GALESVILLE, WI           BNPDTL20090825CAZ       245.0
No   WIFS      D21        DT  CP      JANESVILLE, WI           BLANK0000026425         331.4
No   WIFS      D21        DT  APP     JANESVILLE, WI           BLANK0000034588         330.8
No   WMKE-CD   D21        DC  LIC     MILWAUKEE, WI            BLDTA20150126AAQ        350.8
No   WCWF      D21        DT  LIC     SURING, WI               BLCDT20091015ABT        224.4
No   WFRV-TV   D22        DT  CP      GREEN BAY, WI            BLANK0000027552         224.4
No   WFRV-TV   D22        DT  APP     GREEN BAY, WI            BLANK0000034729         224.4

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

    Channel: D21
       Mask: Simple
   Latitude:  46  1 55.00 N (NAD83)
  Longitude:  89 31 49.00 W
Height AMSL: 650.5 m
       HAAT: 0.0 m
   Peak ERP: 15.0 kW
    Antenna: Omnidirectional
Elev Pattrn: Generic
  Elec Tilt: 0.50

49.5 dBu contour:
Azimuth      ERP       HAAT   Distance
  0.0 deg   15.0 kW   140.1 m   47.8 km
 45.0       15.0      120.0     46.4
 90.0       15.0      128.4     47.0
135.0       15.0      145.5     48.2
180.0       15.0      155.1     48.9
225.0       15.0      138.8     47.7
270.0       15.0      152.4     48.7
315.0       15.0      146.3     48.3

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m   Computed HAAT: 141 m

Proposal 24.46 dBu contour does not cross Canadian border
Distance to Canadian border: 216.3 km
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Distance to Mexican border: 2080.5 km

Conditions at FCC monitoring station: Allegan MI
Bearing: 142.0 degrees Distance: 475.1 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 248.4 degrees Distance: 1428.3 km

No land mobile station failures found

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 BNPDTL20100510AFG CP scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	W20DN-D	D20	LD	CP	TOMAHAWK, WI	BNPDTL20100510AFG	
Undesireds:	W42DH-D	D21	LD	APP	SAYNER/VILAS COUNTY, WI	W42DH-D Prop_Ch-21	60.1 km
	WTPX-TV	D19	DT	CP	ANTIGO, WI	BLANK0000027030	53.9

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
1600.9	29,211	1600.9	29,211	1600.9	29,211	1568.9	28,923	2.00	0.99

Undesired	Total IX		Unique IX, before		Unique IX, after	
W42DH-D D21 LD APP	32.0	288			32.0	288

Interference to BNPDTL20100510AFG CP scenario 2

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	W20DN-D	D20	LD	CP	TOMAHAWK, WI	BNPDTL20100510AFG	
Undesireds:	W42DH-D	D21	LD	APP	SAYNER/VILAS COUNTY, WI	W42DH-D Prop_Ch-21	60.1 km
	WTPX-TV	D19	DT	APP	ANTIGO, WI	BLANK0000034927	53.9

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
1600.9	29,211	1600.9	29,211	1593.8	29,211	1561.8	28,923	2.01	0.99

Undesired	Total IX		Unique IX, before		Unique IX, after	
W42DH-D D21 LD APP	32.0	288			32.0	288
WTPX-TV D19 DT APP	7.0	0	7.0	0	7.0	0

Interference to BLANK0000034736 APP scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WEUX	D21	DT	APP	CHIPPEWA FALLS, WI	BLANK0000034736	
Undesireds:	W42DH-D	D21	LD	APP	SAYNER/VILAS COUNTY, WI	W42DH-D Prop_Ch-21	205.0 km
	KSMQ-TV	D20	DT	LIC	AUSTIN, MN	BLEDT20081223AAK	161.2
	WIFS	D21	DT	CP	JANESVILLE, WI	BLANK0000026425	274.3
	WUCW	D22	DT	LIC	MINNEAPOLIS, MN	BLCDT20060405AAI	116.2

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
22080.2	404,847	21593.9	399,398	20939.6	375,868	20928.6	375,839	0.05	0.01

Undesired	Total IX		Unique IX, before		Unique IX, after	
W42DH-D D21 LD APP	13.0	51			11.0	29
KSMQ-TV D20 DT LIC	3.0	0	1.0	0	1.0	0
WIFS D21 DT CP	60.2	748	58.2	748	57.2	748
WUCW D22 DT LIC	593.1	22,782	593.1	22,782	592.0	22,760

Interference to BLANK0000034736 APP scenario 2

Table 1 W42DH-D OET Bulletin 69 Interference Study
(page 3 of 3)

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

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WEUX	D21	DT	APP	CHIPPEWA FALLS, WI	BLANK0000034736	
Undesireds:	W42DH-D	D21	LD	APP	SAYNER/VILAS COUNTY, WI	W42DH-D Prop_Ch-21	205.0 km
	KSMQ-TV	D20	DT	LIC	AUSTIN, MN	BLEDT20081223AAK	161.2
	WIFS	D21	DT	APP	JANESVILLE, WI	BLANK0000034588	271.5
	WUCW	D22	DT	LIC	MINNEAPOLIS, MN	BLCDT20060405AAI	116.2

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
22080.2	404,847	21593.9	399,398	20893.5	375,288	20882.5	375,259	0.05	0.01

Undesired	Total IX		Unique IX, before		Unique IX, after	
W42DH-D D21 LD APP	13.0	51			11.0	29
KSMQ-TV D20 DT LIC	3.0	0	1.0	0	1.0	0
WIFS D21 DT APP	106.3	1,328	104.3	1,328	103.3	1,328
WUCW D22 DT LIC	593.1	22,782	593.1	22,782	592.0	22,760

Interference to BLANK0000034736 APP scenario 3

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WEUX	D21	DT	APP	CHIPPEWA FALLS, WI	BLANK0000034736	
Undesireds:	W42DH-D	D21	LD	APP	SAYNER/VILAS COUNTY, WI	W42DH-D Prop_Ch-21	205.0 km
	KSMQ-TV	D20	DT	LIC	AUSTIN, MN	BLEDT20081223AAK	161.2
	WIFS	D21	DT	BL	JANESVILLE, WI	DTVBL26025	274.3
	WUCW	D22	DT	LIC	MINNEAPOLIS, MN	BLCDT20060405AAI	116.2

Service area		Terrain-limited		IX-free, before		IX-free, after		Percent New IX	
22080.2	404,847	21593.9	399,398	20939.6	375,858	20928.6	375,829	0.05	0.01

Undesired	Total IX		Unique IX, before		Unique IX, after	
W42DH-D D21 LD APP	13.0	51			11.0	29
KSMQ-TV D20 DT LIC	3.0	0	1.0	0	1.0	0
WIFS D21 DT BL	60.2	758	58.2	758	57.2	758
WUCW D22 DT LIC	593.1	22,782	593.1	22,782	592.0	22,760

Interference to proposal scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	W42DH-D	D21	LD	APP	SAYNER/VILAS COUNTY, WI	W42DH-D Prop_Ch-21	
Undesireds:	W20DN-D	D20	LD	CP	TOMAHAWK, WI	BNPDTL20100510AFG	60.1 km
	WEUX	D21	DT	APP	CHIPPEWA FALLS, WI	BLANK0000034736	205.0
	WIFS	D21	DT	CP	JANESVILLE, WI	BLANK0000026425	331.4

Service area		Terrain-limited		IX-free		Percent IX	
7193.3	57,254	7103.4	57,253	7036.8	56,910	0.94	0.60

Undesired	Total IX		Unique IX		Prcnt Unique IX	
W20DN-D D20 LD CP	26.1	313	24.1	313	0.34	0.55
WEUX D21 DT APP	42.5	30	40.5	30	0.57	0.05

Channel and Facility Information

Section	Question	Response
Proposed Community of License	Facility ID	167156
	State	Wisconsin
	City	SAYNER/VILAS COUNTY
	LPT Channel	21

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1034107
Coordinates (NAD83)	Latitude	46° 01' 55.0" N+
	Longitude	089° 31' 49.0" W-
	Structure Type	TOWER-A free standing or guyed struct
	Overall Structure Height	150.9 meters
	Support Structure Height	143.3 meters
	Ground Elevation (AMSL)	519.7 meters
Antenna Data	Height of Radiation Center Above Ground Level	130.8 meters
	Height of Radiation Center Above Mean Sea Level	650.5 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:	ERI
	Model	ALP16L2-CSO-21
	Rotation	0 degrees
	Electrical Beam Tilt	0.5
	Mechanical Beam Tilt	Not Applicable
	toward azimuth	
	Polarization	Circular
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