

ENGINEERING EXHIBIT

Application for Minor Modification of Digital Low Power Television Station Construction Permit

prepared for

Gray Television Licensee, LLC

W33DH-D Eau Claire, WI

Facility ID 184506

Ch. 33 15 kW Directional

Gray Television Licensee, LLC (“Gray”) is the proposed assignee of unbuilt digital Low Power Television station W33DH-D, Channel 33, Eau Claire WI, Facility ID 184806 (assignment file# 0000139119). W33DH-D is currently authorized to operate pursuant to a Construction Permit (“CP”, file# 0000036215) with 15 kW effective radiated power (“ERP”), directional. *Gray* herein seeks a modification of the CP to specify a different transmitting location and directional antenna.

The proposed facility will employ a new antenna system to be side-mounted on the existing tower structure associated with FCC Antenna Structure Registration number 1033663, located 9.2 km (5.7 miles) from the authorized site. No change to the overall structure height is proposed. The antenna supporting structure is owned by *Gray* and is adjacent to the studio building of *Gray*’s full-service television station WEAU(DT) (Facility ID 7893, Eau Claire WI). The site is located more than 75 miles (121 km) from the reference coordinates of the markets listed in Appendix A of DA 09-1487¹.

The proposed antenna is a Dielectric model TLP-8H/VP having elliptical polarization. The ERP is 15 kW using a “full service” out of channel emission mask. A plot of the directional antenna’s azimuthal pattern is supplied in Figure 1. Figure 2 depicts the 51 dBμ coverage contour of the proposed facility as well as those of the existing W33DH-D authorization (0000036215)

¹“Commencement of Rural, First-come, First-served digital licensing for Low Power Television and TV Translators Beginning August 25, 2009 and Commencement of Nationwide, First-come, First-served Digital Licensing for Low Power Television and TV Translator Services Beginning January 25, 2010,” Public Notice, DA 09-1487, Released June 29, 2009.

and the original CP (file# BNPDTL-20100208ABH) facility, demonstrating compliance with §73.3572 for a minor change.

Interference study per OET Bulletin 69² shows that the proposal complies with the FCC's interference protection requirements toward all digital television, television translator, LPTV, and Class A stations. FCC processing of this proposal is requested using a **1.0 km cell size and 0.2 km terrain profile increment**. 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 25 percent antenna relative field in downward elevations (pattern data shows 25 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 $2.4 \mu\text{W}/\text{cm}^2$, which is 0.6 percent of the general population / uncontrolled maximum permissible 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

²FCC 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 0.2 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.

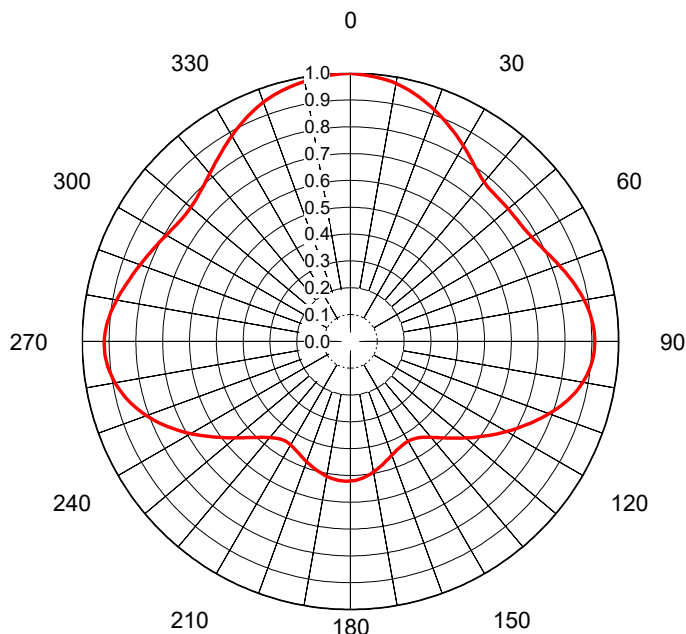
exhibit is limited to the evaluation of exposure to RF electromagnetic field. No increase in structure height is proposed.

List of Attachments

Figure 1	Antenna Azimuthal Pattern
Figure 2	Coverage Contour Comparison
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.	April 13, 2021	
207 Old Dominion Road	Yorktown, VA 23692	703-650-9600



AZIMUTH PATTERN Horizontal Polarization

Proposal No.

Date

Call Letters

W33DH-D

Channel

33

Frequency

587 MHz

Antenna Type

TLP-8H/VP

Gain

1.72 (2.36dB)

Calculated

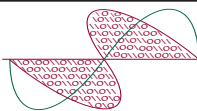
Pattern Number **TLP-H-33 Hpol**

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	1.000	36	0.797	72	0.841	108	0.810	144	0.443	180	0.521	216	0.450	252	0.830	288	0.844
1	0.998	37	0.791	73	0.847	109	0.800	145	0.439	181	0.522	217	0.453	253	0.839	289	0.839
2	0.996	38	0.785	74	0.853	110	0.788	146	0.436	182	0.522	218	0.458	254	0.848	290	0.834
3	0.994	39	0.780	75	0.858	111	0.777	147	0.433	183	0.522	219	0.463	255	0.856	291	0.830
4	0.993	40	0.776	76	0.864	112	0.766	148	0.432	184	0.521	220	0.468	256	0.864	292	0.825
5	0.991	41	0.773	77	0.870	113	0.754	149	0.431	185	0.520	221	0.475	257	0.872	293	0.821
6	0.989	42	0.770	78	0.875	114	0.742	150	0.430	186	0.519	222	0.482	258	0.879	294	0.816
7	0.986	43	0.769	79	0.880	115	0.731	151	0.430	187	0.517	223	0.490	259	0.885	295	0.812
8	0.984	44	0.768	80	0.885	116	0.719	152	0.431	188	0.515	224	0.498	260	0.891	296	0.808
9	0.980	45	0.768	81	0.890	117	0.707	153	0.432	189	0.513	225	0.507	261	0.896	297	0.804
10	0.977	46	0.768	82	0.894	118	0.696	154	0.434	190	0.511	226	0.517	262	0.901	298	0.800
11	0.972	47	0.768	83	0.898	119	0.684	155	0.436	191	0.508	227	0.527	263	0.906	299	0.796
12	0.968	48	0.768	84	0.901	120	0.673	156	0.438	192	0.505	228	0.537	264	0.909	300	0.793
13	0.962	49	0.768	85	0.904	121	0.661	157	0.441	193	0.502	229	0.548	265	0.912	301	0.789
14	0.957	50	0.768	86	0.906	122	0.650	158	0.444	194	0.499	230	0.560	266	0.915	302	0.786
15	0.951	51	0.768	87	0.909	123	0.638	159	0.448	195	0.496	231	0.571	267	0.917	303	0.783
16	0.945	52	0.768	88	0.910	124	0.627	160	0.452	196	0.492	232	0.584	268	0.918	304	0.781
17	0.938	53	0.769	89	0.911	125	0.615	161	0.456	197	0.489	233	0.596	269	0.918	305	0.779
18	0.931	54	0.769	90	0.911	126	0.604	162	0.460	198	0.485	234	0.609	270	0.918	306	0.777
19	0.924	55	0.770	91	0.911	127	0.593	163	0.464	199	0.481	235	0.622	271	0.917	307	0.776
20	0.917	56	0.771	92	0.910	128	0.582	164	0.468	200	0.477	236	0.635	272	0.915	308	0.776
21	0.910	57	0.772	93	0.909	129	0.571	165	0.473	201	0.474	237	0.648	273	0.913	309	0.776
22	0.903	58	0.774	94	0.906	130	0.560	166	0.477	202	0.470	238	0.661	274	0.911	310	0.777
23	0.896	59	0.776	95	0.904	131	0.550	167	0.482	203	0.466	239	0.675	275	0.907	311	0.779
24	0.888	60	0.779	96	0.900	132	0.539	168	0.486	204	0.463	240	0.688	276	0.904	312	0.781
25	0.881	61	0.783	97	0.896	133	0.529	169	0.491	205	0.459	241	0.701	277	0.900	313	0.784
26	0.873	62	0.786	98	0.891	134	0.519	170	0.495	206	0.456	242	0.714	278	0.895	314	0.787
27	0.865	63	0.791	99	0.886	135	0.510	171	0.499	207	0.453	243	0.727	279	0.890	315	0.791
28	0.858	64	0.795	100	0.880	136	0.500	172	0.503	208	0.450	244	0.740	280	0.885	316	0.795
29	0.850	65	0.800	101	0.873	137	0.492	173	0.506	209	0.448	245	0.752	281	0.880	317	0.800
30	0.842	66	0.805	102	0.866	138	0.483	174	0.509	210	0.446	246	0.765	282	0.875	318	0.805
31	0.834	67	0.811	103	0.858	139	0.475	175	0.512	211	0.445	247	0.777	283	0.870	319	0.811
32	0.827	68	0.817	104	0.850	140	0.467	176	0.515	212	0.444	248	0.788	284	0.865	320	0.816
33	0.819	69	0.823	105	0.841	141	0.460	177	0.517	213	0.444	249	0.799	285	0.859	321	0.822
34	0.811	70	0.828	106	0.831	142	0.454	178	0.519	214	0.445	250	0.810	286	0.854	322	0.829
35	0.804	71	0.835	107	0.821	143	0.448	179	0.520	215	0.447	251	0.820	287	0.849	323	0.835

Figure 1
Antenna Azimuthal Pattern
W33DH-D Eau Claire, WI
Facility ID 184506
Ch. 33 15 kW Directional

prepared for
Gray Television Licensee, LLC

April, 2021



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

Figure 2
Coverage Contour Comparison
W33DH-D Eau Claire, WI
Facility ID 184506
Ch. 33 15 kW Directional

prepared for
Gray Television Licensee, LLC

April, 2021

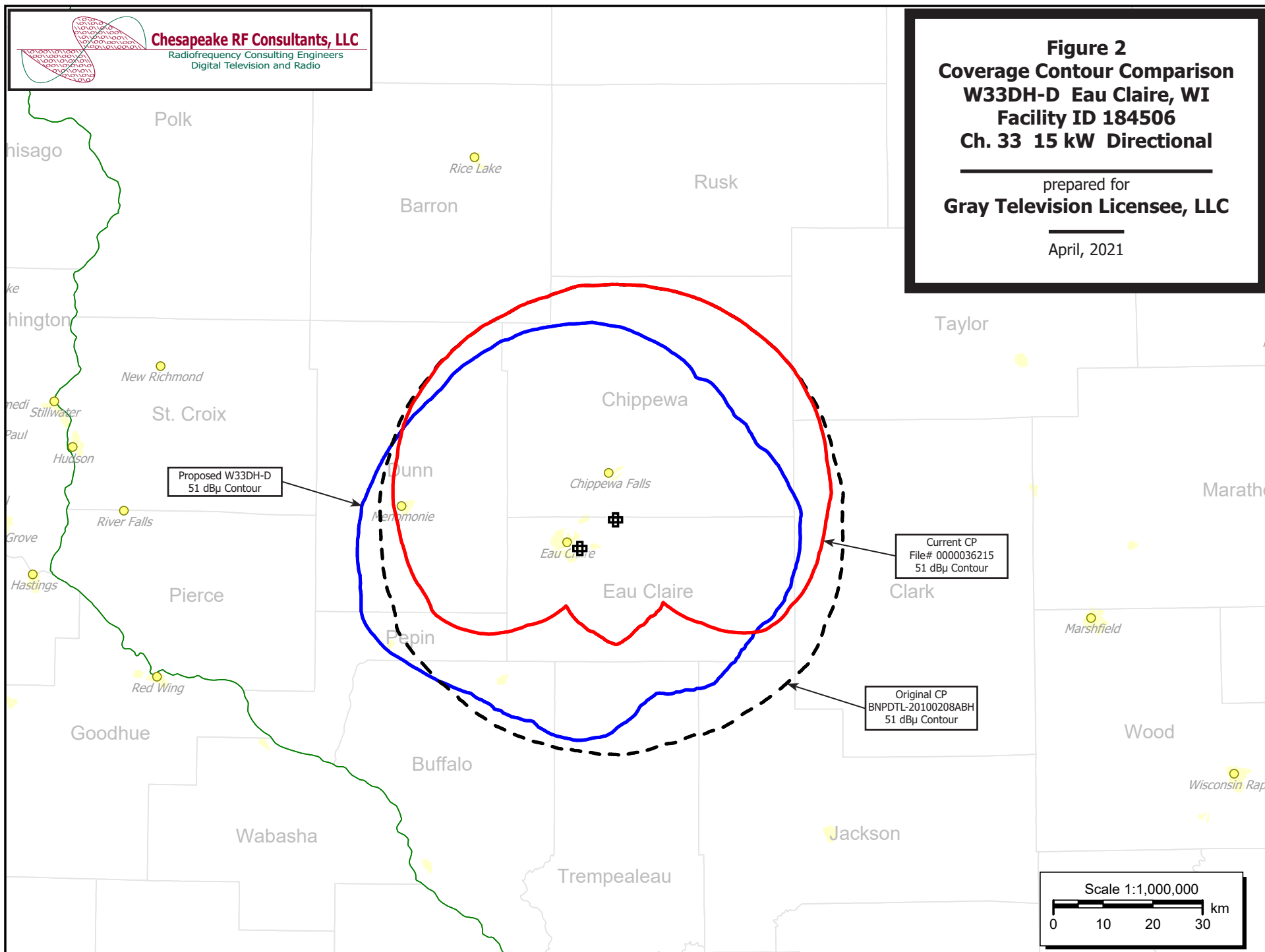


Table 1 W33DH-D TVStudy Analysis of Proposal (page 1 of 3)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: W33DH-D prop TLP-H 1.0-0.2, Model: Longley-Rice
Start: 2021.04.13 15:07:25

Study created: 2021.04.13 15:07:25

Study build station data: LMS TV 2021-04-13

Proposal: W33DH-D D33 LD APP EAU CLAIRE, WI
File number: W33DH-D prop TLP-H
Facility ID: 184506
Station data: User record
Record ID: 3602
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:

IX	Call	Chan	Svc	Status	City, State	File Number	Distance
No	KCRG-TV	D32	DT	APP	CEDAR RAPIDS, IA	BLANK0000127533	277.9 km
No	K32OH-D	D32	LD	CP	DULUTH, MN	BLANK0000072856	226.6
Yes	WCCO-TV	D32	DT	LIC	MINNEAPOLIS, MN	BNPDLT20120907ABQ	134.9
No	W32DW-D	D32	LD	CP	LA CROSSE, WI	BNPDLT20090825CAP	97.6
No	K20KF-D	D33	LD	CP	DAVENPORT, IA	BLANK0000051752	357.1
No	K33PV-D	D33	LD	LIC	ROCK RAPIDS, IA	BLANK0000113997	409.4
No	WMAQ-TV	D33	DT	CP	CHICAGO, IL	BLANK0000080396	448.5
No	K33MH-D	D33	LD	CP	ALBANY, MN	BNPDLT20100505AKI	261.4
No	K50DB-D	D33	LD	LIC	ALEXANDRIA, MN	BLANK0000063273	335.4
No	KAAAL	D33	LD	LIC	AUSTIN, MN	BLCDT20091009AAG	253.4
Yes	KDLH	D33	DT	LIC	DULUTH, MN	BLANK0000007407	226.7
No	K33OS-D	D33	LD	LIC	GRANITE FALLS, MN	BLANK0000063071	324.5
No	K38MJ-D	D33	LD	LIC	MAX, MN	BLANK0000063811	372.2
No	K33LN-D	D33	DC	LIC	MINNEAPOLIS, MN	BLDTA20111219AEB	143.6
No	K33LB-D	D33	LD	LIC	REDWOOD FALLS, MN	BLDTT20120604AAS	278.1
No	K33MW-D	D33	LD	CP	SHERBURN, MN	BNPDLT20100510AJK	298.0
No	K46AC-D	D33	LD	LIC	WILLMAR, MN	BLANK0000060751	284.2
Yes	WLAX	D33	DT	LIC	LA CROSSE, WI	BLANK0000121622	110.9
No	WZAW-LD	D33	LD	LIC	WAUSAU, WI	BLANK0000013771	160.0
No	KTCA-TV	D34	DT	LIC	ST. PAUL, MN	BLDPT20060802AAO	133.6
No	W34FC-D	D34	LD	LIC	LA CROSSE, WI	BLANK0000058890	110.7
No	W34EB-D	D34	LD	CP	LA CROSSE, WI	BNPDLT20090825CAR	97.6
No	W34EO-D	D34	LD	CP	WAUSAU, WI	BLANK0000008337	128.3

No non-directional AM stations found within 0.8 km

No directional AM stations found within 3.2 km

Record parameters as studied:

Channel: D33
Mask: Full Service
Latitude: 44 48 0.00 N (NAD83)
Longitude: 91 27 57.00 W
Height AMSL: 402.0 m
HAAT: 0.0 m
Peak ERP: 15.0 kW
Antenna: DIE TLP-H 0.0 deg
Elev Pattn: Generic
Elec Tilt: 0.50

50.6 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	15.0 kW	127.4 m	45.6 km
45.0	8.94	110.8	41.8
90.0	12.4	124.1	44.5
135.0	3.96	121.0	38.5
180.0	4.07	122.6	38.7
225.0	3.96	122.4	38.6

Table 1 W33DH-D TVStudy Analysis of Proposal
(page 2 of 3)



270.0 12.6 132.4 45.1
315.0 9.52 118.1 42.7

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 122 m

Distance to Canadian border: 360.6 km

Distance to Mexican border: 1884.0 km

Conditions at FCC monitoring station: Allegan MI
Bearing: 116.9 degrees Distance: 505.3 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 250.2 degrees Distance: 1238.5 km

Study cell size: 1.00 km
Profile point spacing: 0.20 km

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

Interference to BMLCDT20120907ABQ LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WCCO-TV	D32	DT	LIC	MINNEAPOLIS, MN	BMLCDT20120907ABQ	
Undesireds:	W33DH-D	D33	LD	APP	EAU CLAIRE, WI	W33DH-D prop TLP-H	134.9 km
	KARE	D31	DT	CP	MINNEAPOLIS, MN	BLANK0000135138	0.0
	KCRG-TV	D32	DT	APP	CEDAR RAPIDS, IA	BLANK0000127533	322.1
	KMEG	D32	DT	LIC	SIOUX CITY, IA	BLANK0000064025	369.8
	K33LN-D	D33	DC	LIC	MINNEAPOLIS, MN	BLDTA20111219AEB	14.2

	Service area	Terrain-limited		IX-free, before		IX-free, after	Percent New IX
	38117.3 3,837,934	37510.4	3,821,878	37372.5	3,818,605	37371.5 3,818,605	0.00 0.00

Undesired			Total IX	Unique IX, before		Unique IX, after	
W33DH-D D33 LD APP			2.0	2		1.0	0
KARE D31 DT CP			2.0	0	2.0	2.0	0
KCRG-TV D32 DT APP			126.8	3,121	115.7	114.7	1,600
KMEG D32 DT LIC			18.1	1,598	7.0	7.0	79
K33LN-D D33 DC LIC			2.0	73	2.0	2.0	73

Interference to BLANK0000007407 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	KDLH	D33	DT	LIC	DULUTH, MN	BLANK0000007407	
Undesireds:	W33DH-D	D33	LD	APP	EAU CLAIRE, WI	W33DH-D prop TLP-H	226.7 km
	K33LN-D	D33	DC	LIC	MINNEAPOLIS, MN	BLDTA20111219AEB	220.5
	WLAX	D33	DT	LIC	LA CROSSE, WI	BLANK0000121622	336.8

	Service area	Terrain-limited		IX-free, before		IX-free, after	Percent New IX
	25225.6 263,648	24757.8	258,479	24729.3	258,333	24729.3 258,333	0.00 0.00

Undesired			Total IX	Unique IX, before		Unique IX, after	
W33DH-D D33 LD APP			9.2	9		0.0	0
K33LN-D D33 DC LIC			17.3	136	8.1	8.1	91
WLAX D33 DT LIC			20.3	55	11.2	7.1	8

Interference to BLANK0000121622 LIC scenario 1

	Call	Chan	Svc	Status	City, State	File Number	Distance
Desired:	WLAX	D33	DT	LIC	LA CROSSE, WI	BLANK0000121622	
Undesireds:	W33DH-D	D33	LD	APP	EAU CLAIRE, WI	W33DH-D prop TLP-H	110.9 km

Table 1 W33DH-D TVStudy Analysis of Proposal
(page 3 of 3)



KCRG-TV	D32	DT	APP	CEDAR RAPIDS, IA	BLANK0000127533	170.0
KDLH	D33	DT	LIC	DULUTH, MN	BLANK0000007407	336.8
K33LN-D	D33	DC	LIC	MINNEAPOLIS, MN	BLDTA20111219AEB	199.3
KTVO	D33	DT	CP	KIRKSVILLE, MO	BLANK0000111691	374.5
Service area	Terrain-limited		IX-free, before		IX-free, after	Percent New IX
25676.3	470,141	24733.9	450,134	24660.6	449,192	24491.2 448,555 0.69 0.14
Undesired	Total IX		Unique IX, before		Unique IX, after	
W33DH-D D33 LD APP	180.4	675			169.4	637
KCRG-TV D32 DT APP	41.2	152	41.2	152	41.2	152
KDLH D33 DT LIC	15.0	57	14.0	57	3.0	19
K33LN-D D33 DC LIC	18.1	733	17.1	733	17.1	733

Interference to proposal scenario 1						
Desired:	Call	Chan	Svc	Status	City, State	File Number Distance
	W33DH-D	D33	LD	APP	EAU CLAIRE, WI	W33DH-D prop TLP-H
Undesireds:	KDLH	D33	DT	LIC	DULUTH, MN	BLANK0000007407 226.7 km
	K33LN-D	D33	DC	LIC	MINNEAPOLIS, MN	BLDTA20111219AEB 143.6
	WLAX	D33	DT	LIC	LA CROSSE, WI	BLANK0000121622 110.9
Service area	Terrain-limited		IX-free		Percent IX	
5502.8	199,182	5237.5	192,491	5000.6	190,149	4.52 1.22
Undesired	Total IX		Unique IX		Prcnt Unique IX	
KDLH D33 DT LIC	14.0	181	9.0	85	0.17	0.04
K33LN-D D33 DC LIC	1.0	0	0.0	0	0.00	0.00
WLAX D33 DT LIC	227.9	2,257	221.9	2,161	4.24	1.12

Channel and Facility Information

Section	Question	Response
Facility ID	184506	
State	Wisconsin	
City	EAU CLAIRE	
LPD Channel	33	

Antenna Location Data

Section	Question	Response
Antenna Structure Registration	Do you have an FCC Antenna Structure Registration (ASR) Number?	Yes
	ASR Number	1033663
Coordinates (NAD83)	Latitude	44° 48' 00.0" N+
	Longitude	091° 27' 57.0" W-
	Structure Type	TOWER-A free standing or guyed struct
	Overall Structure Height	293.0 meters
	Support Structure Height	270.7 meters
	Ground Elevation (AMSL)	270.9 meters
Antenna Data	Height of Radiation Center Above Ground Level	131.1 meters
	Height of Radiation Center Above Mean Sea Level	402.0 meters
	Effective Radiated Power	15 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:	Dielectric
	Model	TLP-8H/VP
	Rotation	0 degrees
	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

Directional Antenna Relative Field Values (Pre-rotated Pattern)

Degree	Value	Degree	Value	Degree	Value	Degree	Value
0	1.000	90	0.911	180	0.521	270	0.918
10	0.977	100	0.880	190	0.511	280	0.885
20	0.917	110	0.788	200	0.477	290	0.834
30	0.842	120	0.673	210	0.446	300	0.793
40	0.776	130	0.560	220	0.468	310	0.777
50	0.768	140	0.467	230	0.560	320	0.816
60	0.779	150	0.430	240	0.688	330	0.885
70	0.828	160	0.452	250	0.810	340	0.949
80	0.885	170	0.495	260	0.891	350	0.984

Additional Azimuths

Degree	V _A
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