

ENGINEERING EXHIBIT

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

prepared for

Gray Television Licensee, LLC

W31EV-D Wausau, WI

Facility ID 184339

Ch. 31 15 kW Nondirectional

Gray Television Licensee, LLC (“Gray”) is the proposed assignee of unbuilt digital Low Power Television station W31EV-D, Channel 31, Wausau WI, Facility ID 184339 (assignment file# 0000139122). W31EV-D is currently authorized to operate pursuant to a Construction Permit (“CP”, file# 0000071942) with 15 kW effective radiated power (“ERP”), nondirectional. The current CP was obtained as a displacement of the original authorization on Channel 38 (file# BNPDTL-20100202AAJ as callsign W38EX-D). *Gray* herein seeks a modification of the current CP to specify a different transmitting location for the Channel 31 facility.

The proposed facility will employ an existing antenna system that is top-mounted on the tower structure associated with FCC Antenna Structure Registration number 1066073, located 9.8 km (6.1 miles) from the current and original CP sites. No change to the overall structure height is proposed. The antenna supporting structure is partly owned by *Gray* and is utilized by *Gray’s* full-service television station WSAW-TV (Facility ID 6867, Wausau 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 TFU-20GTH-R O4 having horizontal polarization. The ERP is 15 kW nondirectional using a “full service” out of channel emission mask. Figure 1 depicts the 51 dBμ coverage contour of the proposed facility as well as those of

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.

the existing W31EV-D authorization (0000071942) and the original CP (file# BNPDTL-20100202AAJ) 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. 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 15 percent antenna relative field in downward elevations (pattern data shows 15 percent or less relative field at angles 20 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 $0.3 \mu\text{W}/\text{cm}^2$, which is 0.1 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 exhibit is limited to the evaluation of exposure to RF electromagnetic field. No increase in structure height is proposed.

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 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.

Engineering Exhibit
Gray Television Licensee, LLC (W31EV-D)
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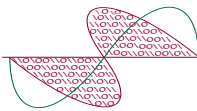
List of Attachments

Figure 1 Coverage Contour Comparison
Table 1 TVStudy Analysis of Proposal

Chesapeake RF Consultants, LLC

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

Figure 1
Coverage Contour Comparison
W31EV-D Wausau, WI
Facility ID 184339
Ch. 31 15 kW Nondirectional

prepared for
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April, 2021

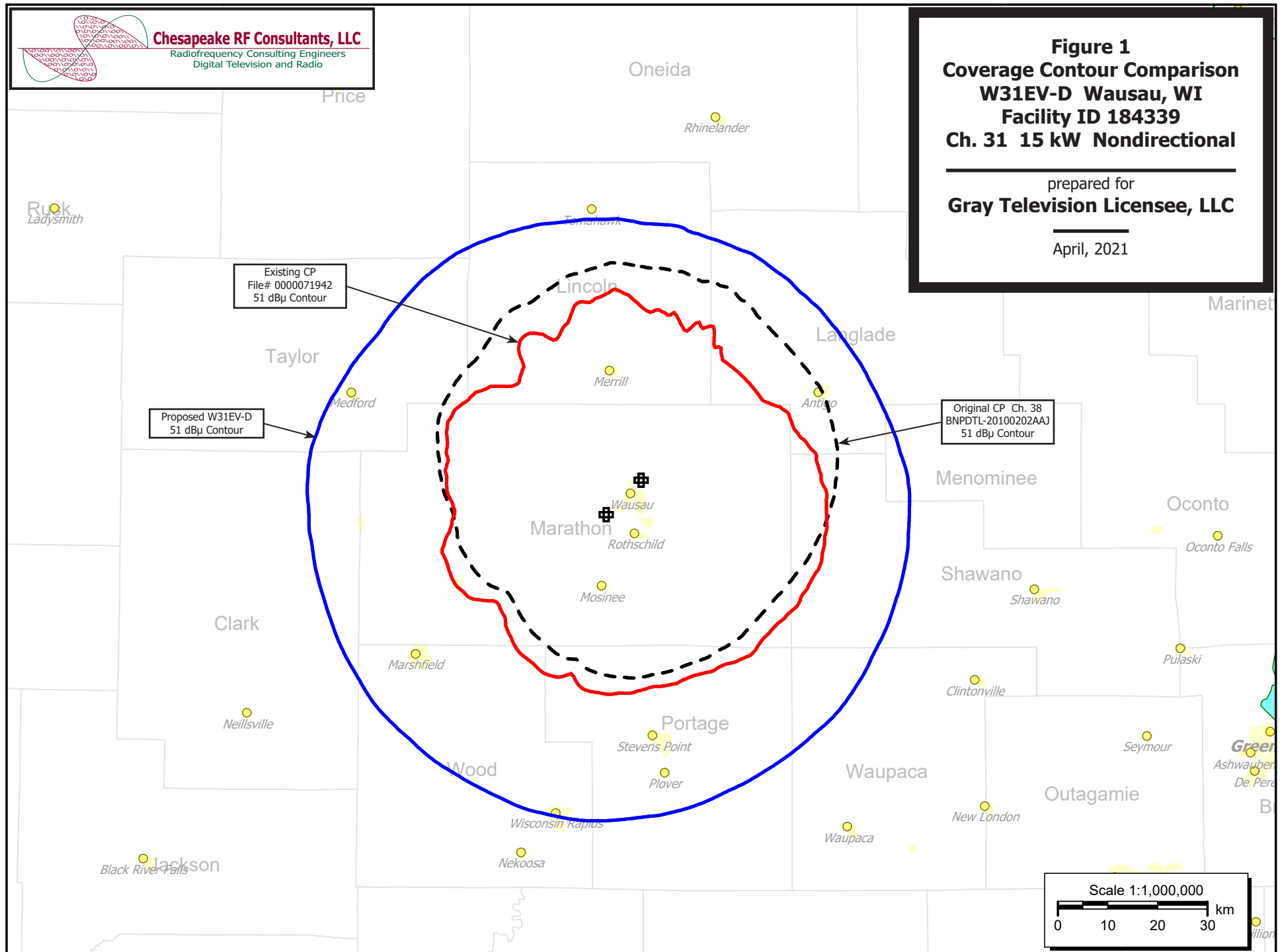


Table 1 W31EV-D TVStudy Analysis of Proposal (page 1 of 3)



tvstudy v2.2.5 (4uoc83)
Database: localhost, Study: W31EV-D prop, Model: Longley-Rice
Start: 2021.04.22 11:41:37

Study created: 2021.04.22 11:41:37

Study build station data: LMS TV 2021-04-21

Proposal: W31EV-D D31 LD APP WAUSAU, WI
File number: W31EV-D prop
Facility ID: 184339
Station data: User record
Record ID: 3612
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 | KSTC-TV | D30 | DT | LIC | MINNEAPOLIS, MN | BLANK0000080959 | 271.5 km |
| No | WEAU | D30 | LD | LIC | EAU CLAIRE, WI | BLANK00000124038 | 182.3 |
| No | W30EN-D | D30 | LD | CP | EAU CLAIRE, WI | BLANK0000071871 | 138.6 |
| No | W30DZ-D | D30 | LD | LIC | FENCE, WI | BLANK0000060424 | 134.0 |
| No | W30BU | D30+ | LD | CP | GREEN BAY, WI | BLANK0000072177 | 148.6 |
| No | W30BU | N30+ | TX | LIC | GREEN BAY, WI | BLTTL20030923AAD | 148.7 |
| No | WPXE-TV | D30 | DT | LIC | KENOSHA, WI | BLANK0000087614 | 248.9 |
| No | K31NJ-D | D31 | LD | LIC | LANSING, IA | BLANK0000093973 | 213.0 |
| No | WFLD | D31 | DT | LIC | CHICAGO, IL | BLANK0000055195 | 376.6 |
| No | W31EZ-D | D31 | LD | LIC | CHICAGO, IL | BLANK00000124951 | 375.1 |
| No | WESV-LD | D31 | LD | LIC | CHICAGO, IL | BLANK00000125079 | 375.1 |
| No | WQAD-TV | D31 | DT | LIC | MOLINE, IL | BLANK00000120809 | 404.9 |
| No | W31DT-D | D31 | LD | CP | STERLING - DIXON, IL | BDCCDTL20110726AJF | 336.1 |
| No | WNIT | D31 | DT | LIC | SOUTH BEND, IN | BLANK0000087078 | 464.1 |
| No | W38FO-D | D31 | LD | APP | ELMHURST, MI | BLANK00000143601 | 370.6 |
| No | WMKG-CD | D31 | DC | LIC | MUSKEGON, MI | BLANK00000107817 | 338.9 |
| No | K31EF-D | D31 | LD | LIC | FROST, MN | BLDTT20090730ACQ | 368.5 |
| No | WRPT | D31 | DT | LIC | HIBBING, MN | BLDTT20090603AAY | 371.3 |
| No | WDMI-LD | D31 | LD | LIC | MINNEAPOLIS, MN | BLDTL20100809CIU | 274.4 |
| Yes | KARE | D31 | DT | CP | MINNEAPOLIS, MN | BLANK00000135138 | 271.5 |
| No | K31LN-D | D31 | LD | CP | ROCHESTER, MN | BNPDTL20100309AAW | 239.9 |
| No | K31KX-D | D31 | LD | CP | ST CHARLES, MN | BNPDTL20090825BXU | 211.1 |
| Yes | W31DN-D | D31 | LD | CP | EAU CLAIRE, WI | BNPDTL20090825AYR | 138.6 |
| Yes | K31GH-D | D31- | LD | LIC | HAYWARD, WI | BLANK0000016624 | 179.4 |
| No | K31GH-D | N31- | TX | LIC | HAYWARD, WI | BLTTL20020729AAS | 179.3 |
| Yes | WITI | D31 | DT | LIC | MILWAUKEE, WI | BLANK0000086971 | 248.9 |
| No | WJMN-TV | D32 | DT | LIC | ESCANABA, MI | BLANK0000063727 | 252.6 |
| No | W32CV-D | D32+ | LD | LIC | IRONWOOD, MI | BLANK0000016623 | 173.4 |
| No | W32CV-D | N32+ | TX | LIC | IRONWOOD, MI | BLTT20040217ACE | 173.4 |
| No | WCCO-TV | D32 | DT | LIC | MINNEAPOLIS, MN | BMLCDT20120907ABQ | 271.5 |
| No | W32DW-D | D32 | LD | CP | LA CROSSE, WI | BNPDTL20090825CAP | 175.2 |
| No | WTMJ-TV | D32 | DT | LIC | MILWAUKEE, WI | BLANK0000086939 | 248.6 |
| No | K18NQ-D | N32- | TX | LIC | RHINELANDER, WI | BLTT20050929AGL | 101.1 |

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: 44 55 14.20 N (NAD83)
Longitude: 89 41 28.70 W
Height AMSL: 769.1 m
HAAT: 0.0 m
Peak ERP: 15.0 kW
Antenna: Omnidirectional
Elev Pattn: Generic

Table 1 W31EV-D TV Study Analysis of Proposal
(page 2 of 3)



Elec Tilt: 0.50

50.4 dBu contour:

| Azimuth | ERP | HAAT | Distance |
|---------|---------|---------|----------|
| 0.0 deg | 15.0 kW | 369.4 m | 59.7 km |
| 45.0 | 15.0 | 372.8 | 59.8 |
| 90.0 | 15.0 | 401.3 | 61.2 |
| 135.0 | 15.0 | 398.6 | 61.1 |
| 180.0 | 15.0 | 413.3 | 61.9 |
| 225.0 | 15.0 | 382.7 | 60.3 |
| 270.0 | 15.0 | 377.8 | 60.1 |
| 315.0 | 15.0 | 365.7 | 59.5 |

Database HAAT does not agree with computed HAAT
Database HAAT: 0 m Computed HAAT: 385 m

Distance to Canadian border: 340.5 km

Distance to Mexican border: 1971.7 km

Conditions at FCC monitoring station: Allegan MI
Bearing: 129.3 degrees Distance: 395.1 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 252.8 degrees Distance: 1375.4 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 BLANK0000135138 CP scenario 1

| Desired: | Call | Chan | Svc | Status | City, State | File Number | Distance |
|--------------------|---------|-----------------|-----|-------------------|-----------------|------------------|----------------|
| | KARE | D31 | DT | CP | MINNEAPOLIS, MN | BLANK0000135138 | |
| Undesireds: | W31EV-D | D31 | LD | APP | WAUSAU, WI | W31EV-D prop | 271.5 km |
| | KSTC-TV | D30 | DT | LIC | MINNEAPOLIS, MN | BLANK0000080959 | 0.0 |
| | WRPT | D31 | DT | LIC | HIBBING, MN | BLEDT20090603AAY | 258.2 |
| Service area | | Terrain-limited | | IX-free, before | | IX-free, after | Percent New IX |
| 39730.0 | | 3,865,802 | | 39133.1 | | 3,855,504 | 0.08 0.00 |
| Undesired | | Total IX | | Unique IX, before | | Unique IX, after | |
| W31EV-D D31 LD APP | | 31.3 | | 141 | | 31.3 141 | |
| KSTC-TV D30 DT LIC | | 2.0 | | 14 | | 2.0 14 | |
| WRPT D31 DT LIC | | 15.1 | | 642 | | 15.1 642 | |

Interference to BNPDTL20090825AYR CP scenario 1

| Desired: | Call | Chan | Svc | Status | City, State | File Number | Distance |
|--------------------|---------|-----------------|-----|-------------------|-----------------|-------------------|----------------|
| | W31DN-D | D31 | LD | CP | EAU CLAIRE, WI | BNPDTL20090825AYR | |
| Undesireds: | W31EV-D | D31 | LD | APP | WAUSAU, WI | W31EV-D prop | 138.6 km |
| | KARE | D31 | DT | CP | MINNEAPOLIS, MN | BLANK0000135138 | 138.2 |
| | K31GH-D | D31- | LD | LIC | HAYWARD, WI | BLANK0000016624 | 137.3 |
| Service area | | Terrain-limited | | IX-free, before | | IX-free, after | Percent New IX |
| 1721.6 | | 130,655 | | 1687.4 | | 124,417 | 0.00 0.00 |
| Undesired | | Total IX | | Unique IX, before | | Unique IX, after | |
| W31EV-D D31 LD APP | | 2.0 | | 17 | | 0.0 0 | |
| KARE D31 DT CP | | 204.6 | | 5,695 | | 202.6 5,678 | |

Interference to BLANK0000016624 LIC scenario 1

Table 1 W31EV-D TV Study Analysis of Proposal
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| | | | | | | | | | | |
|--------------|---------|-----------------|-----|-----------------|-------------------|-----------------|------------------|--------|-------|------|
| | Call | Chan | Svc | Status | City, State | File Number | Distance | | | |
| Desired: | K31GH-D | D31- | LD | LIC | HAYWARD, WI | BLANK0000016624 | | | | |
| Undesireds: | W31EV-D | D31 | LD | APP | WAUSAU, WI | W31EV-D prop | 179.4 km | | | |
| | KARE | D31 | DT | CP | MINNEAPOLIS, MN | BLANK0000135138 | 170.5 | | | |
| | W32CV-D | D32+ | LD | LIC | IRONWOOD, MI | BLANK0000016623 | 105.5 | | | |
| Service area | | Terrain-limited | | IX-free, before | | IX-free, after | Percent New IX | | | |
| 5083.3 | 29,466 | 5021.0 | | 29,131 | 4776.5 | 27,101 | 4776.5 | 27,101 | 0.00 | 0.00 |
| Undesired | | | | Total IX | Unique IX, before | | Unique IX, after | | | |
| W31EV-D | D31 | LD | APP | 1.0 | 0 | 0.0 | | 0 | | |
| KARE | D31 | DT | CP | 244.5 | 2,030 | 244.5 | 2,030 | 243.5 | 2,030 | |

Interference to BLANK0000086971 LIC scenario 1

| | | | | | | | | | |
|--------------|-----------|-----------------|-----------|-----------------|-------------------|-----------------|------------------|----------------|--------|
| | Call | Chan | Svc | Status | City, State | File Number | Distance | | |
| Desired: | WITI | D31 | DT | LIC | MILWAUKEE, WI | BLANK0000086971 | | | |
| Undesireds: | W31EV-D | D31 | LD | APP | WAUSAU, WI | W31EV-D prop | 248.9 km | | |
| | WQAD-TV | D31 | DT | LIC | MOLINE, IL | BLANK0000120809 | 284.3 | | |
| | WNIT | D31 | DT | LIC | SOUTH BEND, IN | BLANK0000087078 | 215.9 | | |
| | WMKG-CD | D31 | DC | LIC | MUSKEGON, MI | BLANK0000107817 | 137.0 | | |
| | WLPD-CD | D32 | DC | LIC | PLANO, IL | BLANK0000113895 | 140.0 | | |
| | WTMJ-TV | D32 | DT | LIC | MILWAUKEE, WI | BLANK0000086939 | 0.4 | | |
| Service area | | Terrain-limited | | IX-free, before | | IX-free, after | | Percent New IX | |
| 26841.9 | 3,111,623 | 26616.3 | 3,096,558 | 26204.9 | 3,072,868 | 26162.3 | 3,062,021 | 0.16 | 0.35 |
| Undesired | | | | Total IX | Unique IX, before | | Unique IX, after | | |
| W31EV-D | D31 | LD | APP | 50.7 | 10,887 | 42.5 | 10,847 | | |
| WQAD-TV | D31 | DT | LIC | 393.3 | 23,330 | 375.2 | 22,997 | 371.1 | 22,988 |
| WNIT | D31 | DT | LIC | 13.1 | 243 | 3.0 | 134 | 1.0 | 118 |
| WMKG-CD | D31 | DC | LIC | 8.1 | 94 | 1.0 | 1 | 1.0 | 1 |
| WTMJ-TV | D32 | DT | LIC | 20.1 | 448 | 13.1 | 210 | 13.1 | 210 |

Interference to proposal scenario 1

| | | | | | | | |
|--------------|-----------------|-----------------|-----------|---------------|---------------------------|-----------------------------|-----------|
| Desired: | Call W31EV-D | Chan D31 | Svc LD | Status APP | City, State WAUSAU, WI | File Number W31EV-D prop | Distance |
| Undesireds: | W30BU | D30+ | LD | CP | GREEN BAY, WI | BLANK0000072177 | 148.6 km |
| | KARE | D31 | DT | CP | MINNEAPOLIS, MN | BLANK0000135138 | 271.5 |
| | K31GH-D | D31- | LD | LIC | HAYWARD, WI | BLANK0000016624 | 179.4 |
| | WITI | D31 | DT | LIC | MILWAUKEE, WI | BLANK0000086971 | 248.9 |
| Service area | | Terrain-limited | | | IX-free | Percent IX | |
| 11493.3 | 314,024 | 11481.2 | 313,846 | | 11473.2 | 313,748 | 0.07 0.03 |
| Undesired | | | | Total IX | Unique IX | Prcnt Unique IX | |
| KARE | D31 | DT | CP | 2.0 0 | 2.0 0 | 0.02 0.00 | |
| WITI | D31 | DT | LIC | 6.0 98 | 6.0 98 | 0.05 0.03 | |