TECHNICAL STATEMENT
TRUSTEES OF INDIANA UNIVERSITY
WTIU 384 KW-DA 219 M HAAT CH. 33
BLOOMINGTON, INDIANA

The Trustees of Indiana University, the licensee of digital television station WTIU, Facility ID No. 66536, proposes construction of the WTIU post-auction facility on Channel 33. Reassignment from Channel 14 to Channel 33 was specified in the *Channel Reassignment Public Notice* ("CRPN"), DA 17-314, released on April 13, 2017. The licensee seeks authority to operate WTIU on the reassigned channel using a new directional antenna. Although the proposed antenna pattern will be similar to the licensed pattern, an increase in the maximum effective radiated power (ERP) specified in the CRPN, from 345 kW to 384 kW, is requested to minimize coverage area loss. The replacement antenna will be installed at a radiation center height of 436.7 meters above mean sea level (AMSL) and the height above average terrain (HAAT) will be 219 meters as determined by the *TVStudy* analysis software.

As indicated above, the licensee proposes to replace the antenna that WTIU currently employs in order to accommodate the channel reassignment. The new antenna will be an elliptically polarized directional Dielectric Model TFU-18GTH/VP-R 6S250. This new antenna will be designed to operate such that the horizontally polarized ERP will be 384 kW and the vertically polarized ERP will be 111 kW. The licensee was unable to match the relative field values associated with the present antenna pattern due to the change in frequency, thus a similar pattern is proposed. The vertically polarized component will not exceed the horizontally polarized component in any direction. The horizontal and vertical azimuth patterns for the new directional antenna are depicted in Figures 1 and 1A.

The aforementioned antenna height of 436.7 meters AMSL was determined based on the site elevation of the registered antenna-supporting structure and the proposed height of the new antenna radiation center of 191.0 meters above ground level (AGL).[1] Because there is no significant variance from the permissible contour coverage area as defined by the technical parameters specified in the CRPN, the proposed interference-free service population and area will closely match the baseline by +95 percent.[2] The *TVStudy* summary report provided in Figure 2 demonstrates that no interference beyond 0.5 percent will be caused to the technical

[1] Antenna Structure Registration No. 1234684 specifies a site elevation of 245.7 meters AMSL.

[2] The technical parameters specified in the CRPN result in an interference-free coverage area of 1,118,341 people and 16,915.6 sq.km. The proposed interference-free coverage area amounts to 1,070,568 people and 16,702.4 sq.km.

parameters of any other station as specified in the CRPN and the permissible coverage area will not be extended by more than one percent in any direction.

The construction permit application specifies an existing FCC registered tower that was constructed after March 16, 2001.[3] Given that the specified antenna replacement does not result in a substantial increase in the size of the existing antenna-supporting structure,[4] the criteria outlined in 47 CFR § 1.1307(a) for certain types of facilities that may significantly affect the environment do not apply. With regard to the rules for limiting human exposure to radio-frequency (RF) energy in 47 CFR § 1.1307(b), this application seeks authority to operate a television broadcast antenna in full compliance with those guidelines as described in greater detail below. The following technical specifications are proposed:

Frequency :	584 - 590 MHz (UHF Channel 33)
Effective Radiated Power:	384 kW(H); 111.4 kW(V)
Antenna Type:	DIE TFU-18GTH/VP-R 6S250
Antenna Polarization:	Elliptical
Antenna Height:	191.0 meters AGL
Location coordinates:	39-08-31.0 N, 86-29-42.9 W (NAD83)
Site elevation:	245.7 meters AMSL
Overall tower height:	196.9 meters AGL
FCC ASRN:	1234684; Replacement tower constructed 12/28/2015

[3] 47 CFR Part 1, App. B, § IV.A. *"An antenna may be mounted on an existing tower constructed after March 16, 2001 without such collocation being reviewed through the Section 106 process set forth in the NPA, unless: 1. The Section 106 review process for the existing tower set forth in 36 CFR part 800 (including any applicable program alternative approved by the Council pursuant to 36 CFR 800.14) and any associated environmental reviews required by the FCC have not been completed; or, 2. The mounting of the new antenna will result in a substantial increase in the size of the tower as defined in Stipulation I.E, above; or, 3. The tower as built or proposed has been determined by the FCC to have an adverse effect on one or more historic properties, where such effect has not been avoided or mitigated through a conditional no adverse effect determination, a Memorandum of Agreement, a Programmatic Agreement, or otherwise in compliance with Section 106 and the NPA; or, 4. The collocation licensee or the owner of the tower has received written or electronic notification that the FCC is in receipt of a complaint from a member of the public, an Indian Tribe, a SHPO or the Council, that the collocation has an adverse effect on one or more historic properties. Any such complaint must be in writing and supported by substantial evidence describing how the effect from the collocation is adverse to the attributes that qualify any affected historic property for eligibility or potential eligibility for the National Register."*

[4] 47 CFR Part 1, App. B, § I.C. A substantial increase in size means: "*(1) The mounting of the proposed antenna on the tower would increase the existing height of the tower by more than 10%, or by the height of one additional antenna array with separation from the nearest existing antenna not to exceed twenty feet, whichever is greater, except that the mounting of the proposed antenna may exceed the size limits set forth in this paragraph if necessary to avoid interference with existing antennas; or (2) The mounting of the proposed antenna would involve the installation of more than the standard number of new equipment cabinets for the technology involved, not to exceed four, or more than one new equipment shelter; or (3) The mounting of the proposed antenna would involve adding an appurtenance to the body of the tower that would protrude from the edge of the tower more than twenty feet, or more than the width of the tower structure at the level of the appurtenance, whichever is greater, except that the mounting of the proposed antenna may exceed the size limits set forth in this paragraph if necessary to shelter the antenna from inclement weather or to connect the antenna to the tower via cable; or (4) The mounting of the proposed antenna would involve excavation outside the current tower site, defined as the current boundaries of the leased or owned property surrounding the tower and any access or utility easements currently related to the site."*

Using the methodology for predicting power density levels for television broadcast antennas outlined in *FCC OET Bulletin No. 65, Edition 97-01,* (OET-65), the proposed facility is calculated to produce a maximum power density of 4.63 μW/cm² at points 2 meters above ground (approximate human head height). This exposure level was determined using 10 percent antenna relative field, which is generally considered to be a typical value for UHF antennas. The maximum exposure limits applicable to Channel 33, as determined in accordance with 47 CFR § 1.1310 for uncontrolled and controlled situations, are 389 μW/cm² and 1,947 μW/cm² respectively. Because the worst-case exposure level determined for the proposed facility is not more than 5% of those guidelines and considering that the base of the tower is fenced and suitable warning signs are posted, no further showing of compliance is necessary. Accordingly, this application complies with the RF exposure limits and is categorically excluded from environmental processing by 47 CFR § 1.1306.

Steps to limit exposure to persons authorized to access the transmitter site will be consistent with the appropriate recommendations in OET-65. All maintenance and other related work to be performed at elevations higher than 2 meters above ground will be coordinated to prevent exposure to RF fields in excess of the controlled limit. Such preventative steps shall include reducing power or shutting down the facility.

Respectfully submitted,

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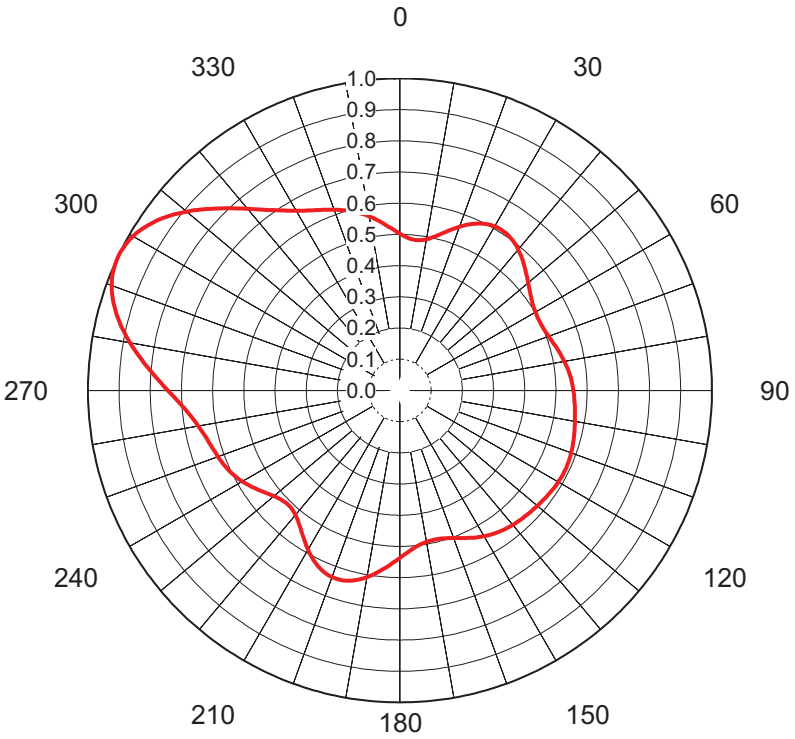
July 11, 2017

Dielectric®

FIGURE 1

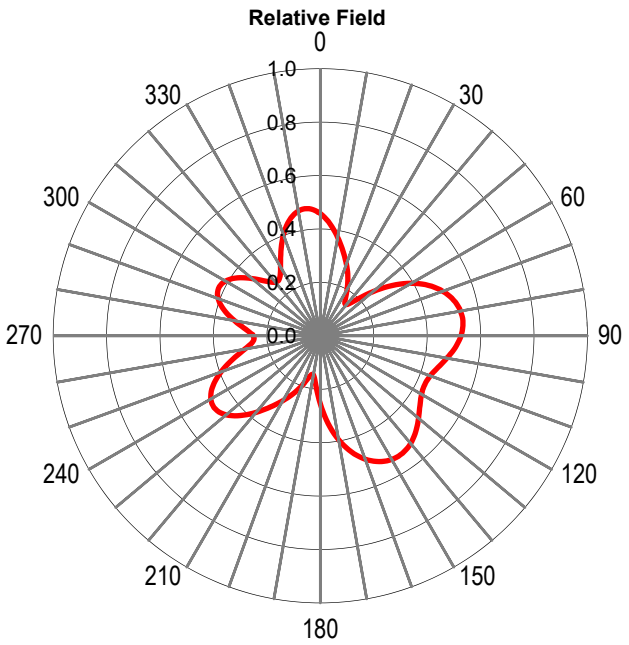


AZIMUTH PATTERN
Horizontal Polarization

Proposal No.	**C-70404-1**
Date	**19-Jun-17**
Call Letters	**WTIU**
Channel	**33**
Frequency	**587 MHz**
Antenna Type	**TFU-18GTH/VP-R 6S250**
Gain	**2.52 (4.02dB)**
	Calculated

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.502	36	0.604	72	0.512	108	0.582	144	0.555	180	0.537	216	0.543	252	0.626	288	0.968	324	0.715
1	0.497	37	0.601	73	0.515	109	0.583	145	0.553	181	0.544	217	0.537	253	0.629	289	0.976	325	0.705
2	0.493	38	0.598	74	0.518	110	0.584	146	0.551	182	0.551	218	0.531	254	0.632	290	0.983	326	0.696
3	0.490	39	0.594	75	0.521	111	0.585	147	0.548	183	0.558	219	0.525	255	0.635	291	0.989	327	0.688
4	0.487	40	0.590	76	0.524	112	0.586	148	0.545	184	0.566	220	0.521	256	0.638	292	0.993	328	0.680
5	0.485	41	0.585	77	0.527	113	0.587	149	0.542	185	0.573	221	0.517	257	0.642	293	0.997	329	0.672
6	0.485	42	0.580	78	0.530	114	0.587	150	0.539	186	0.580	222	0.515	258	0.646	294	0.999	330	0.665
7	0.485	43	0.575	79	0.533	115	0.588	151	0.536	187	0.588	223	0.513	259	0.651	295	1.000	331	0.659
8	0.486	44	0.570	80	0.535	116	0.588	152	0.532	188	0.595	224	0.512	260	0.656	296	1.000	332	0.653
9	0.489	45	0.564	81	0.538	117	0.588	153	0.530	189	0.601	225	0.512	261	0.662	297	0.999	333	0.648
10	0.492	46	0.559	82	0.541	118	0.588	154	0.525	190	0.608	226	0.514	262	0.668	298	0.996	334	0.642
11	0.496	47	0.553	83	0.543	119	0.587	155	0.521	191	0.614	227	0.516	263	0.675	299	0.993	335	0.638
12	0.502	48	0.547	84	0.545	120	0.586	156	0.518	192	0.619	228	0.519	264	0.683	300	0.988	336	0.633
13	0.507	49	0.542	85	0.547	121	0.586	157	0.514	193	0.624	229	0.523	265	0.691	301	0.982	337	0.629
14	0.514	50	0.537	86	0.549	122	0.585	158	0.510	194	0.628	230	0.527	266	0.701	302	0.976	338	0.625
15	0.521	51	0.532	87	0.551	123	0.584	159	0.507	195	0.631	231	0.532	267	0.710	303	0.968	339	0.621
16	0.528	52	0.527	88	0.553	124	0.583	160	0.504	196	0.634	232	0.537	268	0.721	304	0.959	340	0.617
17	0.535	53	0.522	89	0.555	125	0.581	161	0.501	197	0.636	233	0.543	269	0.732	305	0.950	341	0.613
18	0.543	54	0.518	90	0.556	126	0.580	162	0.498	198	0.637	234	0.549	270	0.744	306	0.940	342	0.608
19	0.551	55	0.514	91	0.557	127	0.579	163	0.496	199	0.637	235	0.555	271	0.756	307	0.929	343	0.604
20	0.558	56	0.511	92	0.559	128	0.578	164	0.494	200	0.637	236	0.561	272	0.769	308	0.917	344	0.599
21	0.565	57	0.508	93	0.560	129	0.576	165	0.492	201	0.635	237	0.567	273	0.782	309	0.905	345	0.595
22	0.572	58	0.505	94	0.561	130	0.575	166	0.491	202	0.633	238	0.573	274	0.795	310	0.892	346	0.590
23	0.579	59	0.503	95	0.563	131	0.574	167	0.491	203	0.630	239	0.578	275	0.809	311	0.879	347	0.584
24	0.585	60	0.501	96	0.564	132	0.573	168	0.491	204	0.626	240	0.583	276	0.823	312	0.866	348	0.579
25	0.590	61	0.500	97	0.565	133	0.571	169	0.491	205	0.621	241	0.588	277	0.837	313	0.852	349	0.573
26	0.595	62	0.499	98	0.567	134	0.570	170	0.492	206	0.616	242	0.593	278	0.851	314	0.839	350	0.567
27	0.599	63	0.499	99	0.568	135	0.569	171	0.494	207	0.610	243	0.598	279	0.864	315	0.825	351	0.560
28	0.603	64	0.499	100	0.569	136	0.568	172	0.497	208	0.604	244	0.602	280	0.878	316	0.812	352	0.554
29	0.605	65	0.500	101	0.571	137	0.567	173	0.500	209	0.597	245	0.606	281	0.891	317	0.798	353	0.547
30	0.607	66	0.500	102	0.572	138	0.565	174	0.504	210	0.589	246	0.609	282	0.904	318	0.785	354	0.540
31	0.609	67	0.502	103	0.574	139	0.564	175	0.508	211	0.582	247	0.612	283	0.917	319	0.772	355	0.533
32	0.609	68	0.503	104	0.576	140	0.563	176	0.513	212	0.574	248	0.615	284	0.928	320	0.760	356	0.526
33	0.609	69	0.505	105	0.577	141	0.561	177	0.518	213	0.566	249	0.618	285	0.940	321	0.748	357	0.520
34	0.608	70	0.507	106	0.579	142	0.559	178	0.524	214	0.558	250	0.621	286	0.950	322	0.737	358	0.514
35	0.606	71	0.510	107	0.580	143	0.557	179	0.530	215	0.551	251	0.623	287	0.960	323	0.726	359	0.508

FIGURE 1A



AZIMUTH PATTERN
Vertical Polarization

Proposal No.	**C-70404-1**
Date	**19-Jun-17**
Call Letters	**WTIU**
Channel	**33**
Frequency	**587 MHz**
Antenna Type	**TFU-18GTH/VP-R 6S250**
Gain	**1.89 (2.77dB)**

Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value	Deg	Value
0	0.384	36	0.157	72	0.501	108	0.448	144	0.535	180	0.254	216	0.335	252	0.373	288	0.396	324	0.262
1	0.374	37	0.153	73	0.506	109	0.444	145	0.537	181	0.241	217	0.344	253	0.362	289	0.401	325	0.265
2	0.365	38	0.151	74	0.512	110	0.441	146	0.537	182	0.226	218	0.354	254	0.350	290	0.407	326	0.269
3	0.355	39	0.150	75	0.516	111	0.438	147	0.538	183	0.212	219	0.364	255	0.339	291	0.411	327	0.275
4	0.346	40	0.153	76	0.521	112	0.436	148	0.537	184	0.199	220	0.374	256	0.328	292	0.415	328	0.282
5	0.337	41	0.156	77	0.525	113	0.434	149	0.536	185	0.188	221	0.384	257	0.317	293	0.418	329	0.289
6	0.328	42	0.163	78	0.528	114	0.433	150	0.534	186	0.176	222	0.394	258	0.306	294	0.419	330	0.298
7	0.319	43	0.170	79	0.531	115	0.432	151	0.533	187	0.167	223	0.404	259	0.296	295	0.420	331	0.307
8	0.311	44	0.180	80	0.533	116	0.432	152	0.530	188	0.158	224	0.413	260	0.287	296	0.420	332	0.317
9	0.302	45	0.190	81	0.534	117	0.432	153	0.527	189	0.153	225	0.422	261	0.278	297	0.419	333	0.328
10	0.294	46	0.202	82	0.536	118	0.433	154	0.524	190	0.149	226	0.431	262	0.271	298	0.417	334	0.337
11	0.286	47	0.215	83	0.537	119	0.433	155	0.520	191	0.147	227	0.439	263	0.263	299	0.414	335	0.349
12	0.277	48	0.229	84	0.537	120	0.436	156	0.515	192	0.148	228	0.447	264	0.258	300	0.410	336	0.360
13	0.269	49	0.243	85	0.536	121	0.438	157	0.510	193	0.149	229	0.454	265	0.254	301	0.405	337	0.371
14	0.261	50	0.257	86	0.535	122	0.441	158	0.504	194	0.153	230	0.460	266	0.250	302	0.399	338	0.382
15	0.253	51	0.272	87	0.534	123	0.443	159	0.498	195	0.158	231	0.465	267	0.249	303	0.393	339	0.392
16	0.244	52	0.286	88	0.532	124	0.447	160	0.492	196	0.165	232	0.470	268	0.248	304	0.386	340	0.403
17	0.236	53	0.300	89	0.529	125	0.451	161	0.484	197	0.172	233	0.474	269	0.250	305	0.378	341	0.413
18	0.227	54	0.314	90	0.527	126	0.456	162	0.476	198	0.180	234	0.477	270	0.251	306	0.370	342	0.423
19	0.218	55	0.328	91	0.524	127	0.460	163	0.468	199	0.188	235	0.479	271	0.253	307	0.361	343	0.432
20	0.209	56	0.342	92	0.520	128	0.465	164	0.460	200	0.196	236	0.480	272	0.260	308	0.352	344	0.440
21	0.201	57	0.355	93	0.515	129	0.470	165	0.450	201	0.205	237	0.479	273	0.266	309	0.343	345	0.447
22	0.192	58	0.369	94	0.511	130	0.474	166	0.440	202	0.213	238	0.479	274	0.273	310	0.333	346	0.455
23	0.184	59	0.381	95	0.507	131	0.480	167	0.429	203	0.222	239	0.476	275	0.280	311	0.324	347	0.460
24	0.176	60	0.393	96	0.502	132	0.485	168	0.419	204	0.231	240	0.474	276	0.289	312	0.315	348	0.466
25	0.168	61	0.405	97	0.497	133	0.491	169	0.407	205	0.239	241	0.469	277	0.297	313	0.306	349	0.470
26	0.162	62	0.416	98	0.492	134	0.496	170	0.395	206	0.247	242	0.464	278	0.307	314	0.297	350	0.474
27	0.157	63	0.427	99	0.487	135	0.501	171	0.383	207	0.255	243	0.458	279	0.317	315	0.290	351	0.477
28	0.153	64	0.438	100	0.481	136	0.506	172	0.369	208	0.263	244	0.451	280	0.326	316	0.282	352	0.479
29	0.151	65	0.447	101	0.476	137	0.511	173	0.356	209	0.272	245	0.443	281	0.336	317	0.276	353	0.479
30	0.150	66	0.456	102	0.471	138	0.515	174	0.342	210	0.281	246	0.435	282	0.346	318	0.270	354	0.479
31	0.153	67	0.465	103	0.466	139	0.519	175	0.328	211	0.289	247	0.426	283	0.355	319	0.265	355	0.478
32	0.156	68	0.473	104	0.461	140	0.523	176	0.314	212	0.298	248	0.416	284	0.364	320	0.262	356	0.475
33	0.163	69	0.481	105	0.456	141	0.526	177	0.299	213	0.307	249	0.406	285	0.373	321	0.260	357	0.472
34	0.170	70	0.488	106	0.452	142	0.529	178	0.284	214	0.316	250	0.396	286	0.381	322	0.259	358	0.468
35	0.180	71	0.495	107	0.448	143	0.532	179	0.269	215	0.325	251	0.385	287	0.388	323	0.259	359	0.463

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FIGURE 2
Analysis Summary
TVSTUDY, VERSION 2.2.2.

Study created: 2017.07.08 16:02:29

Study build station data: LMS TV 2017-06-25 (3)

Proposal: WTIU D33 DT APP BLOOMINGTON, IN
Facility ID: 66536
Station data: User record
Record ID: 139
Country: U.S.

Non-U.S. records included

All records on or after 2017-04-13 excluded

Stations potentially affected:

Call	Chan	Svc	Status	City, State	File Number	Distance
WICD	D32	DT	BL	CHAMPAIGN, IL	DTVBL25684	159.3 km
WANE-TV	D32	DT	BL	FORT WAYNE, IN	DTVBL39270	244.1
WDRB	D32	DT	BL	LOUISVILLE, KY	DTVBL28476	104.3
WMAQ-TV	D33	DT	BL	CHICAGO, IL	DTVBL47905	319.1
WAOE	D33	DT	BL	PEORIA, IL	DTVBL52280	308.4
WKHA	D33	DT	BL	HAZARD, KY	DTVBL34196	361.1
WKAR-TV	D33	DT	BL	EAST LANSING, MI	DTVBL6104	432.6
WOKZ-CD	D33	DC	BL	KALAMAZOO, MI	DTVBL36841	357.9
KTVI	D33	DT	BL	ST. LOUIS, MO	DTVBL35693	342.4
WHIO-TV	D33	DT	BL	DAYTON, OH	DTVBL41458	203.8
WPGD-TV	D33	DT	LIC	HENDERSONVILLE, TN	BMLCDT20131125BGF	320.5
WCIA	D34	DT	BL	CHAMPAIGN, IL	DTVBL42124	198.7
WISE-TV	D34	DT	BL	FORT WAYNE, IN	DTVBL13960	244.7
WKMJ-TV	D34	DT	BL	LOUISVILLE, KY	DTVBL34195	103.6
WKEF	D34	DT	BL	DAYTON, OH	DTVBL73155	202.9

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
Latitude: 39 8 31.00 N (NAD83)

Longitude: 86 29 42.90 W
Height AMSL: 436.7 m
HAAT: 219.0 m
Peak ERP: 384 kW
Antenna: DIE TFU-18GTH/VP-R 6S250 0.0 deg

40.6 dBu contour:

Azimuth	ERP	HAAT	Distance
0.0 deg	96.8 kW	224.8 m	72.7 km
45.0	122	205.0	72.5
90.0	119	239.9	74.9
135.0	124	242.4	75.3
180.0	111	231.3	73.9
225.0	105	216.5	72.6
270.0	213	191.1	74.3
315.0	262	199.0	76.0

Proposal service area is within baseline plus 1.0%
Proposal service area population is more than 95.0% of baseline

Distance to Canadian border: 418.7 km

Distance to Mexican border: 1710.3 km

Conditions at FCC monitoring station: Allegan MI
Bearing: 6.5 degrees Distance: 387.6 km

Proposal is not within the West Virginia quiet zone area

Conditions at Table Mountain receiving zone:
Bearing: 280.0 degrees Distance: 1603.9 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%

Proposal receives 0.97% interference from scenario 1
No IX check failures found.