

Translators and LPFM

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Keep to
Right

*Personally I think conservatives
and liberals should move towards
the middle of the road. Makes it
easier to run 'em over.*



OBI-WAN ★ ★ ★ ★ ★ ★ ★ ★
KENOBE  **2012**
★ ★ ★ ★ OUR ONLY HOPE



DAFUQ - this is **FAILKING.COM**



Speed Limit

π

(3.1416 MPH)

Translators and LPFM

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Translators and LPFM

- Definition of Services.
- History of Services.
- Technical Stuff.
- Pitfalls.
- Jeremy's Crystal Ball.
- Conclusion, Questions, and Discussion.

Service Definitions

- An FM translator is a station in the broadcasting service operated for the purpose of retransmitting the signals of an AM or FM radio broadcast station or another FM broadcast translator station without significantly altering any characteristics of the incoming signal other than its frequency and amplitude, in order to provide radio broadcast service to the general public. (47 CFR 74.1201)

Service Definitions

- FM translators come in several flavors:
- Non-Commercial FM translator.
- Commercial FM translator.
- Fill-in translator.
- A translator *cannot* be non-commercial and commercial simultaneously.
- A commercial translator is not necessarily a fill-in translator.
- **ALL** AM translators are fill-in translators.

Service Definitions

- An LPFM station is quite simply a low power non-commercial FM broadcast station.
- Many of the rules applicable to full-power FM stations apply to LPFM facilities.
- Conceptually, they are somewhat similar to the old Class D NCE FM stations.
- LPFM facilities can originate material, while in general translators cannot.

History of FM Translators

- 1970 – Translator service first created.
- 1990 – Major revision to translator rules.
- 1997 – Changes to US/Canada agreement.
- 2003 - ~13,000 translator applications filed.
- 2009 – AM translators authorized.
- 2013 – 3,000+ apps from 2003 dismissed.
- 2013 – Final cleanup of 2003 window.

History of LPFM Facilities

- 1948 – Class D stations first authorized.
- 1978 – Class D phase out begins.
- 1987 – LPFM movement “starts” in Illinois.
- 1993 – Radio Free Berkeley.
- 1998 – LPFM movement gathers steam.
- 1999 – FCC proposes new LPFM service.
- 2000 – FCC creates LPFM service.
- 2001 – First LPFM filing window.
- 2010 – Local Community Radio Act.
- 2013 – Second LPFM filing window.

Translator Technical Parameters

- Absolute maximum ERP of 250 Watts.
- No specified height limit for fill-in translators.
- 47 CFR 74.1235(b) for non fill-in translators.
- East of MS River 4.5 mile 60 dBu radius.
- Zone I-A 4.5 mile 60 dBu radius.
- All other areas ~8.3 mile 60 dBu radius.
- Convoluted HAAT determination.
- Other limits by treaty or interference apply.

Translator Technical Parameters

- Translator service contour function of primary.
- 60 dBu (1 mV/m) for non fill-in translators.
- 60 dBu for fill-in of class A, C3, C2, C1, C0, and C.
- 57 dBu (0.7 mV/m) for fill-in of class B1.
- 54 dBu (0.5 mV/m) for fill-in of class B.
- 60 dBu for AM translators.
- 60 dBu of AM translator must be contained within both the 2 mV/m daytime contour and 25 mile radius centered on AM site.

LPFM Technical Parameters

- LP10 maximum ERP 10 Watts at 30 m HAAT.
- Maximum HAAT of 100 meters (1 W ERP).
- Minimum ERP of 1 Watt at any height.
- No minimum contour distance.
- LP100 maximum ERP of 100 W at 30 m HAAT.
- Maximum HAAT of 450 meters (1 W ERP).
- Minimum contour distance 4.7 km (2.9 mi).
- Maximum contour distance 5.6 km (3.5 mi).
- No LP10 stations exist.

LPFM Technical Parameters

- LP250 facilities proposed for rural areas.
- LP250 facilities not implemented at this time.
- FCC appears open to further consideration.
- LP10 class deleted.
- Only LP100 stations are authorized.
- Only LP100 stations will be authorized.

Signal Delivery

- LPFM facilities generally originate programming.
- Translators generally do not originate.
- Off-air feed of translators.
- Terrestrial feed of translators.
- Satellite feed of translators.
- LPFM feed of translator.
- Prohibitions on translator feed methods.

Protections

- First come first served.
- Translators secondary authorization.
- LPFM protect 3rd adjacent translator input.
- Essentially no outgoing interference permitted.
- Limited LPFM interference permitted.
- Complaints are driving force for interference.

Facility Allocation – Part I

- LPFM facilities generally follow spacing table.
- No spacing requirements for translators.
- IF spacing debatable at last word from Staff.
- Translators generally follow contour protection.
- 2nd adjacent waiver possible for LPFM.
- Section 74.1204(d) usable for translators.
- 3rd adjacent applies to translators.
- 3rd adjacent applies in limited cases to LPFM.

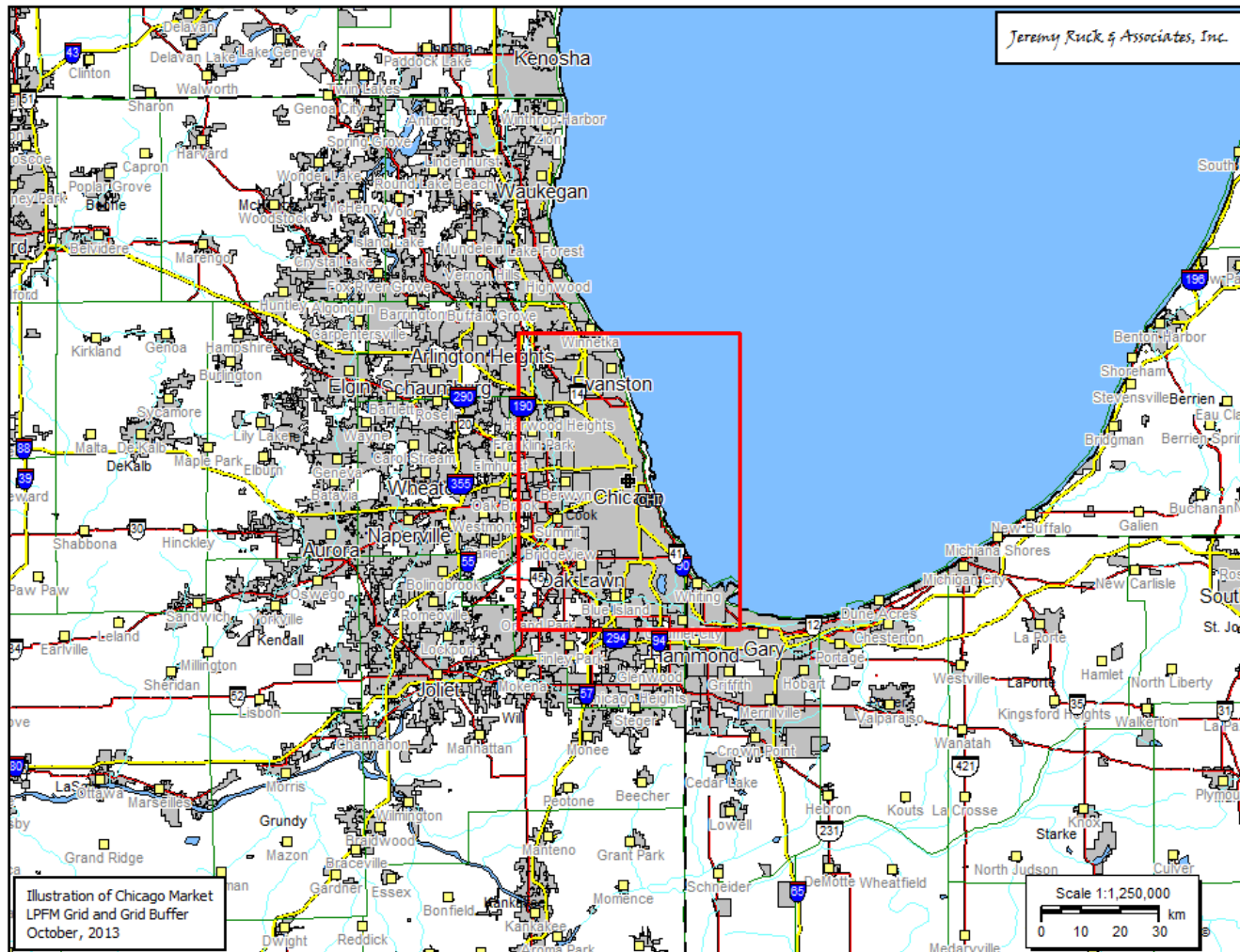
Spectrum Competition

- Filing windows are similar to a dam bursting.
- FCC underestimated translator demand in 2003.
- FCC did not expect spectrum warehousing.
- Auction 83 produced a conundrum.
- Thousands of applications frozen for a decade.
- Applications were short-form in 2003 so no mechanism for clean up.
- Congress mandated spectrum availability for broadcast, translator, and LPFM.

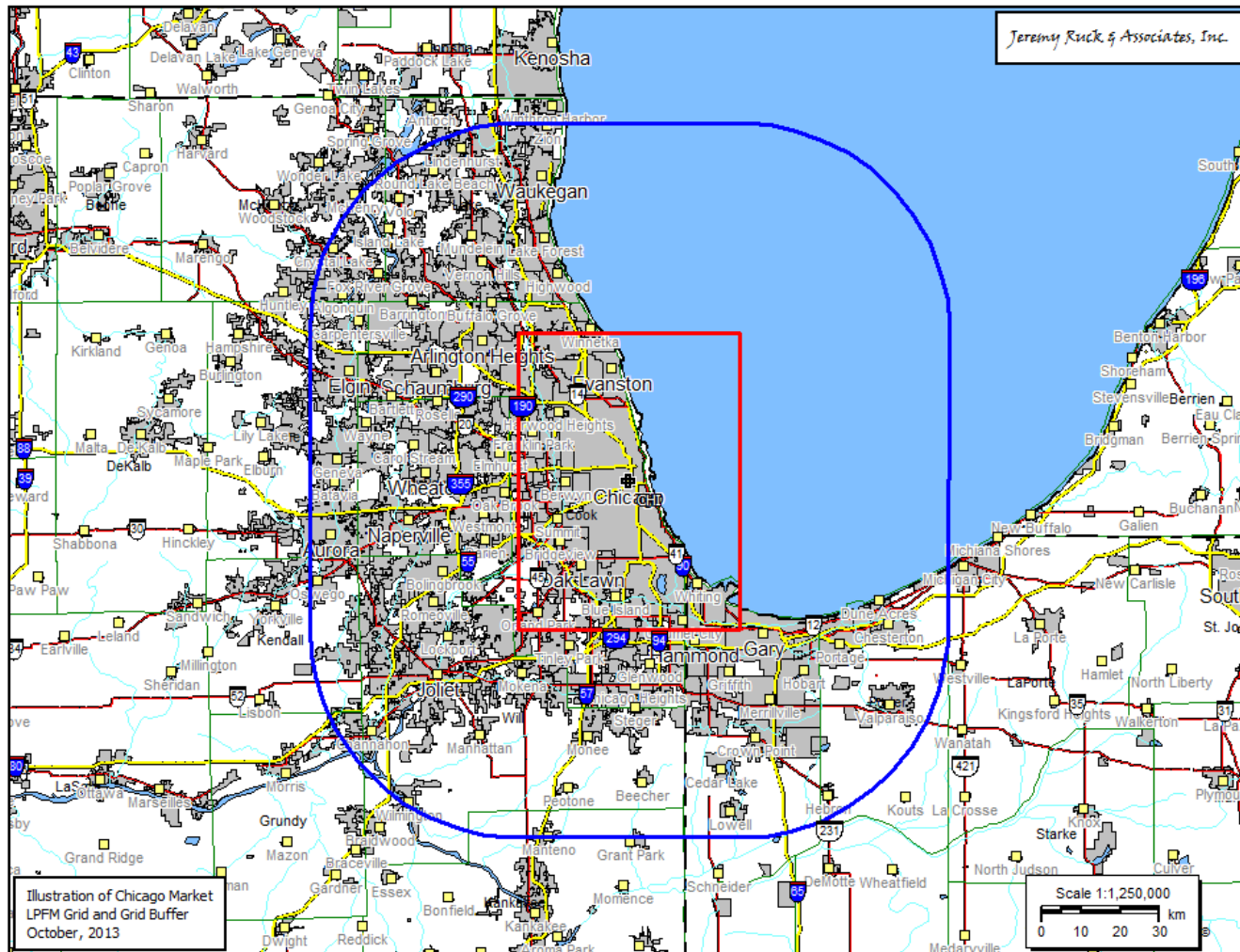
Spectrum Competition

- Many translator applications required dismissal.
- Established market and national caps.
- FCC established LPFM market grid concept.
- Replaced process/dismiss all concepts.
- Top 150 radio markets studied.
- 30x30 or 20x20 minute grid established.
- Classified as spectrum available or limited.
- Translator apps could not impact grid.
- Impact based on spacings.

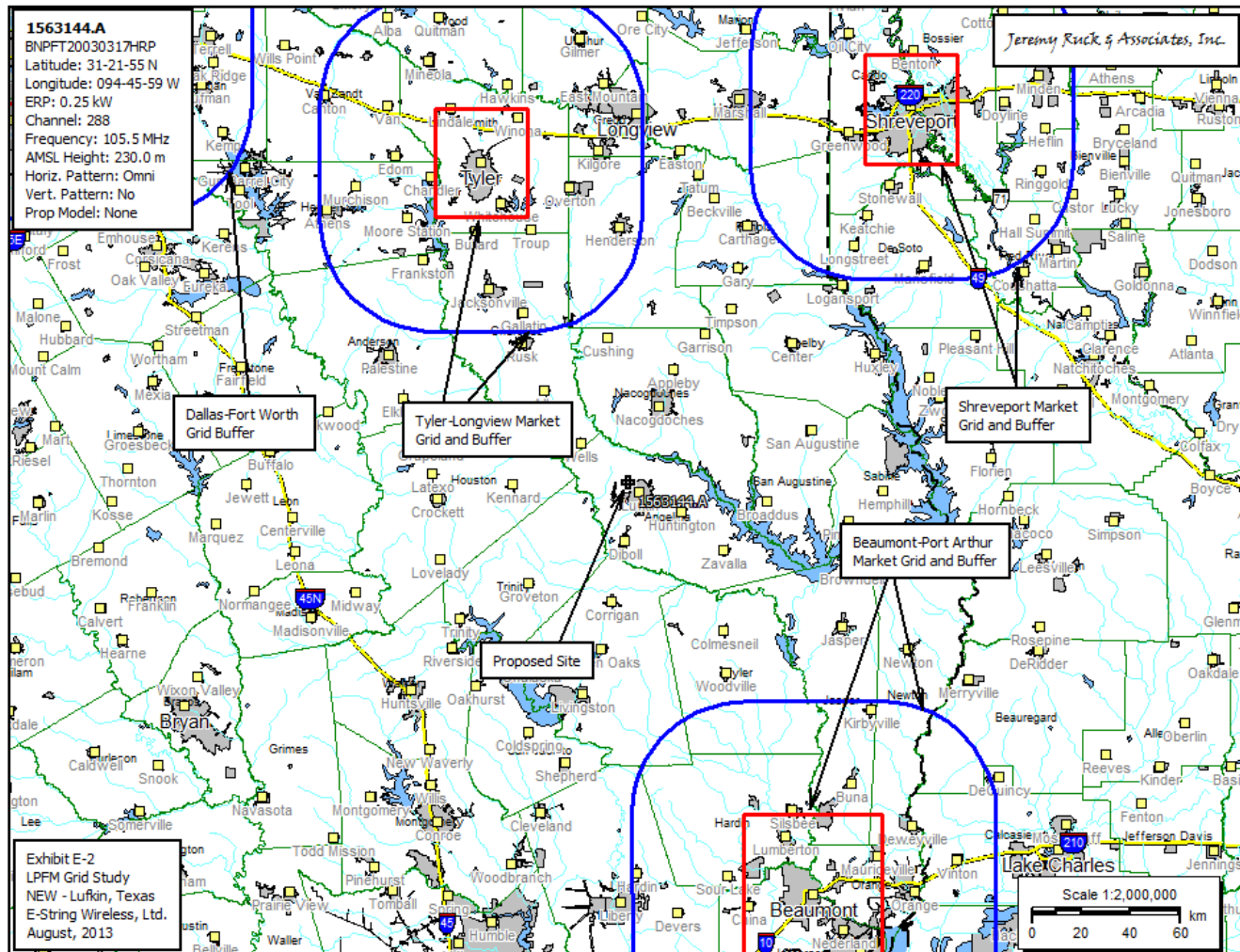
LPFM Grids



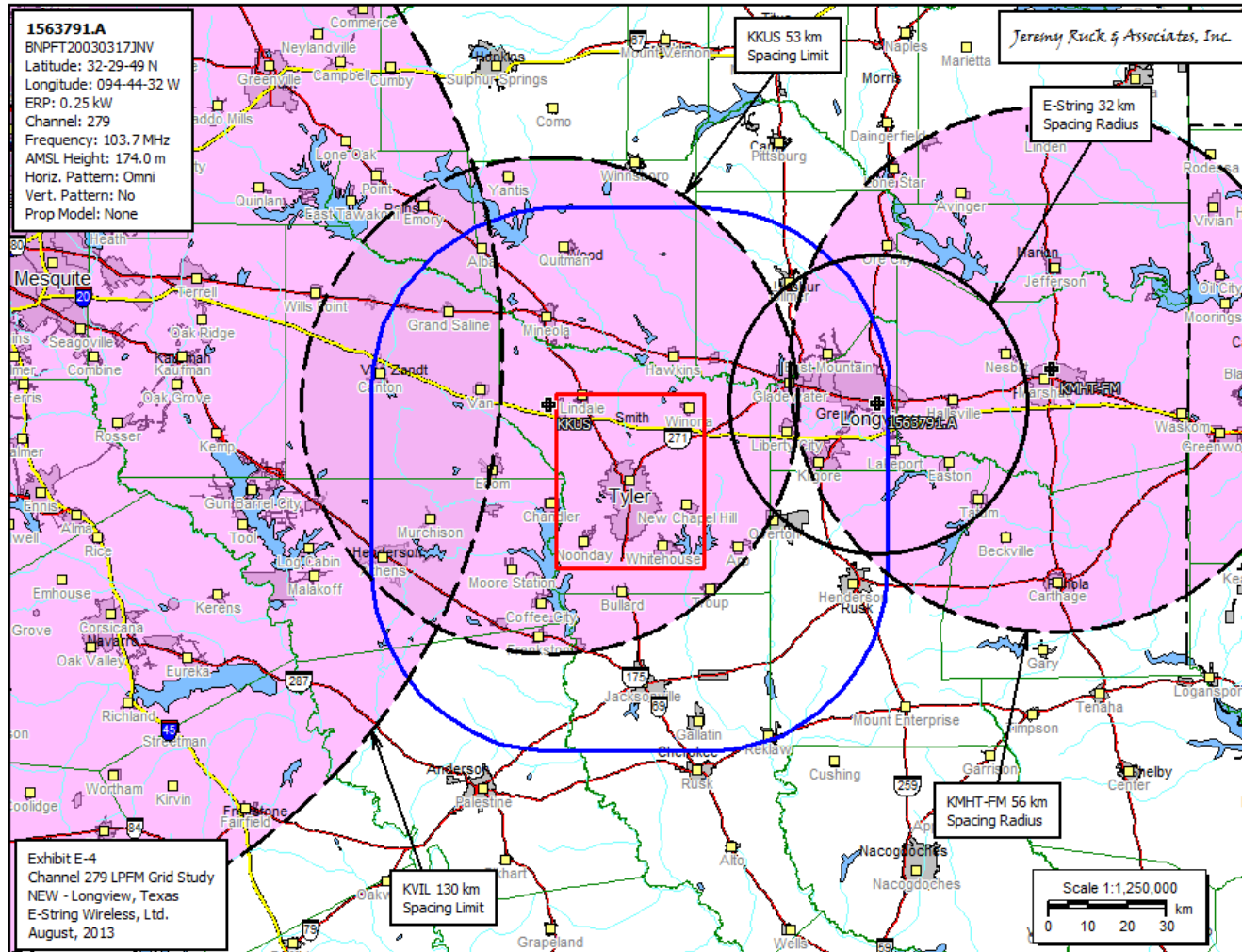
LPFM Grids



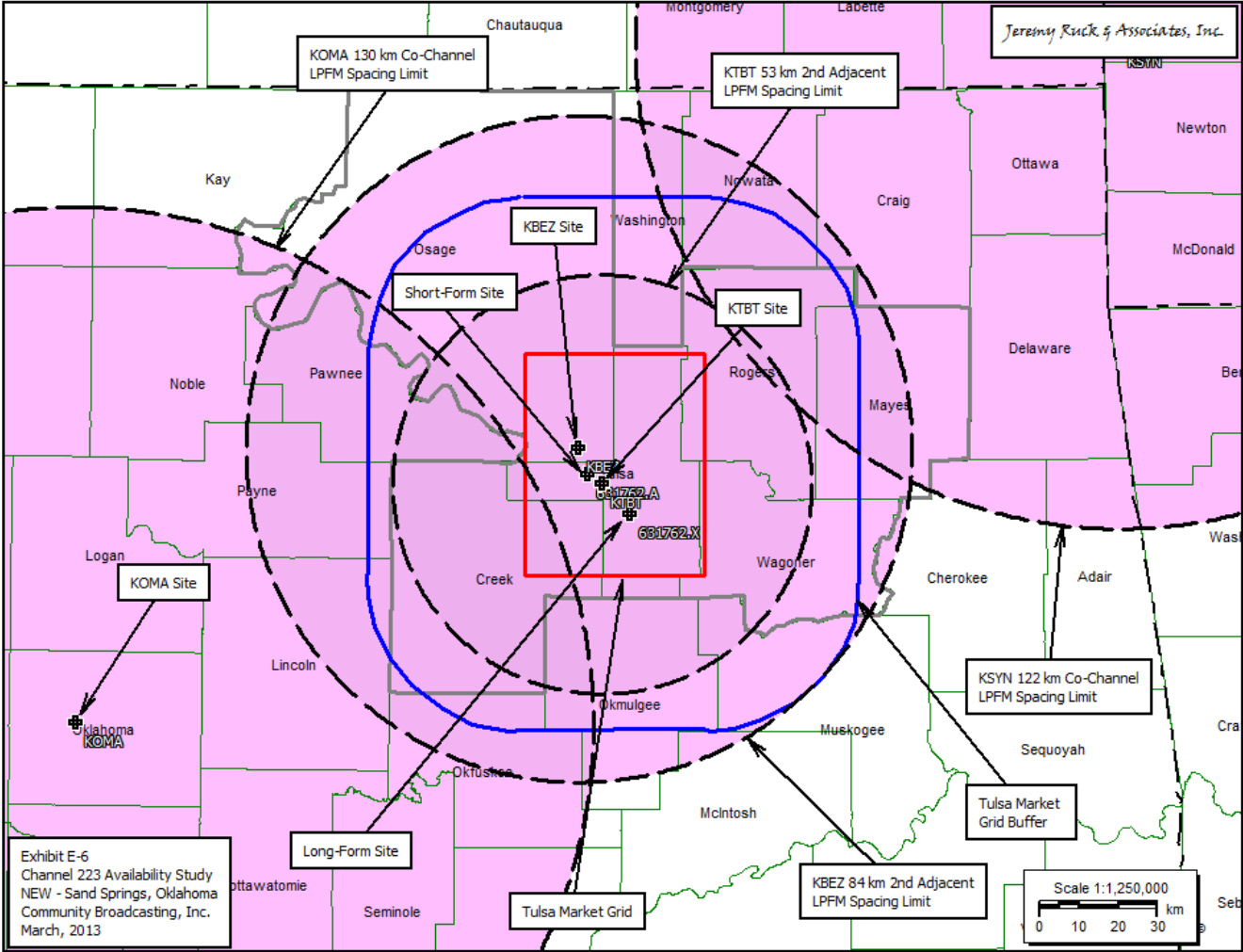
LPFM Grids



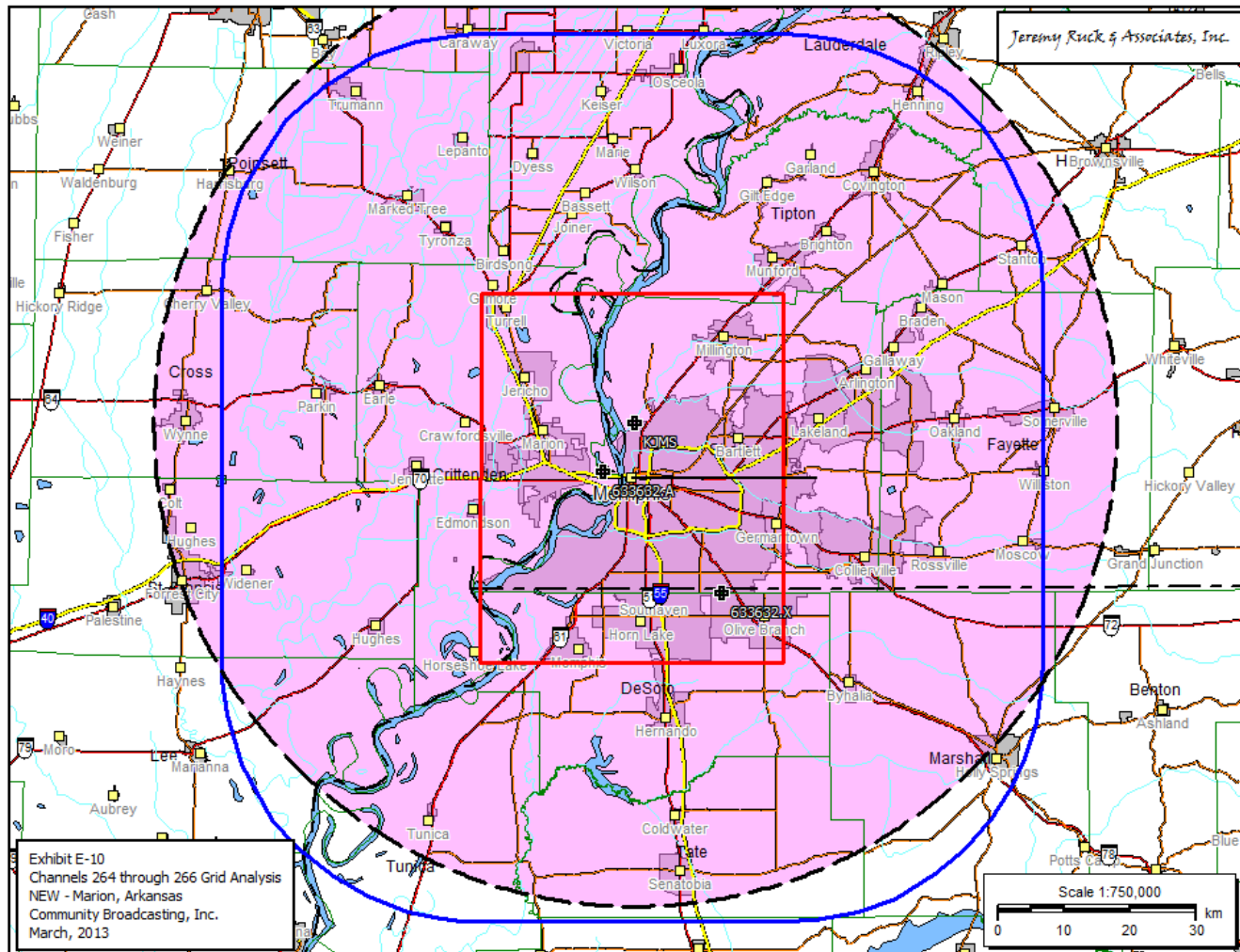
LPFM Grids



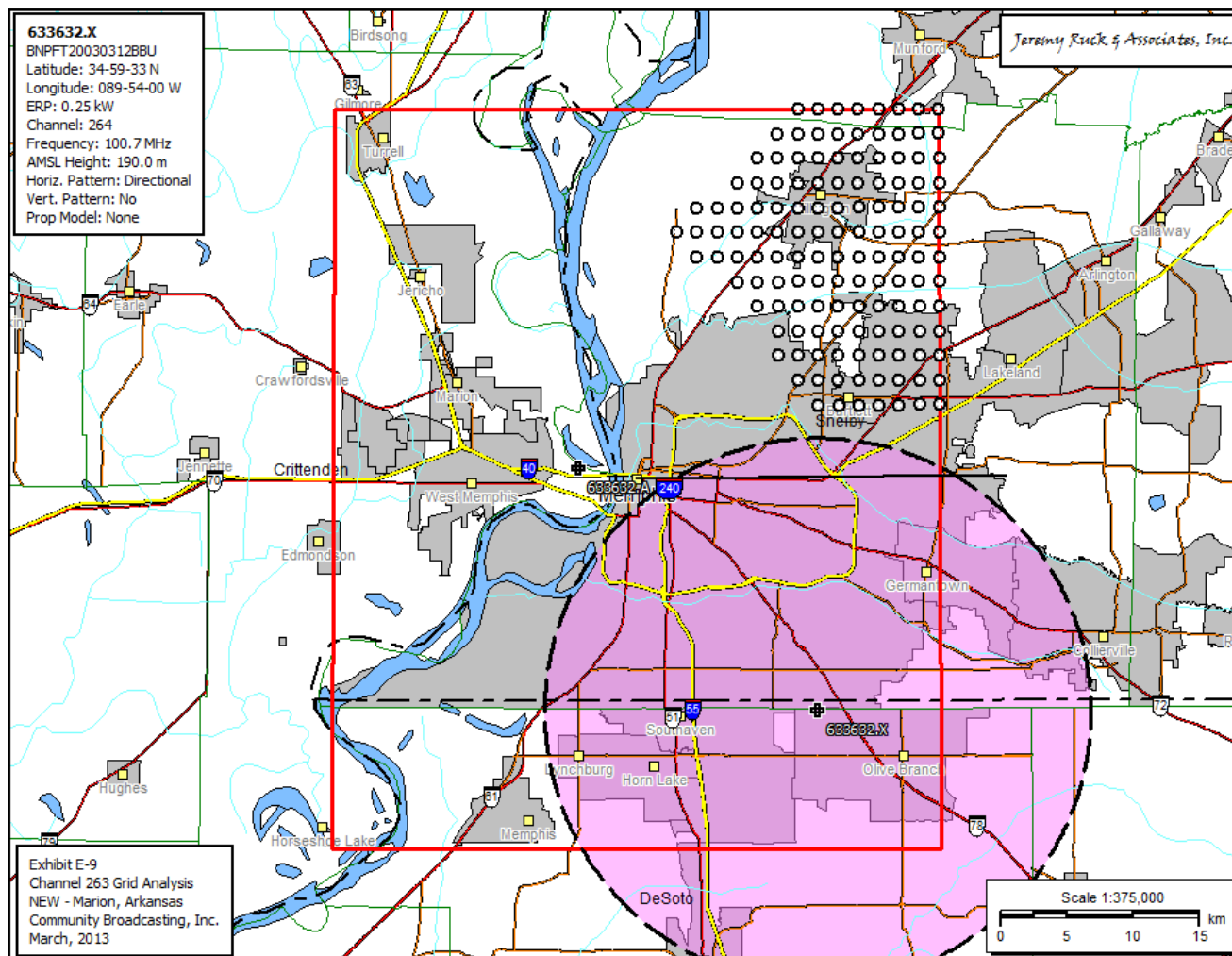
LPFM Grids



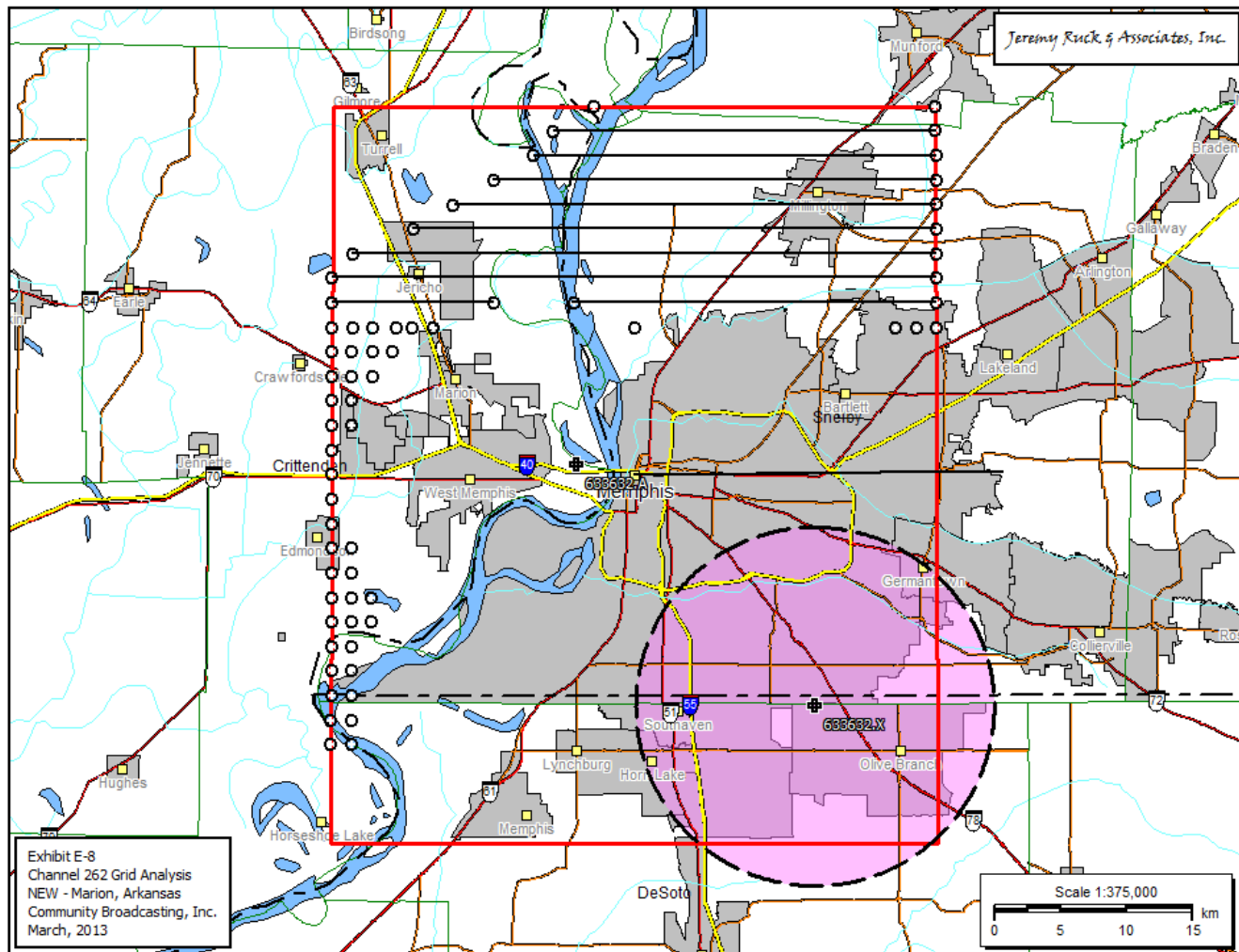
LPFM Grids



LPFM Grids



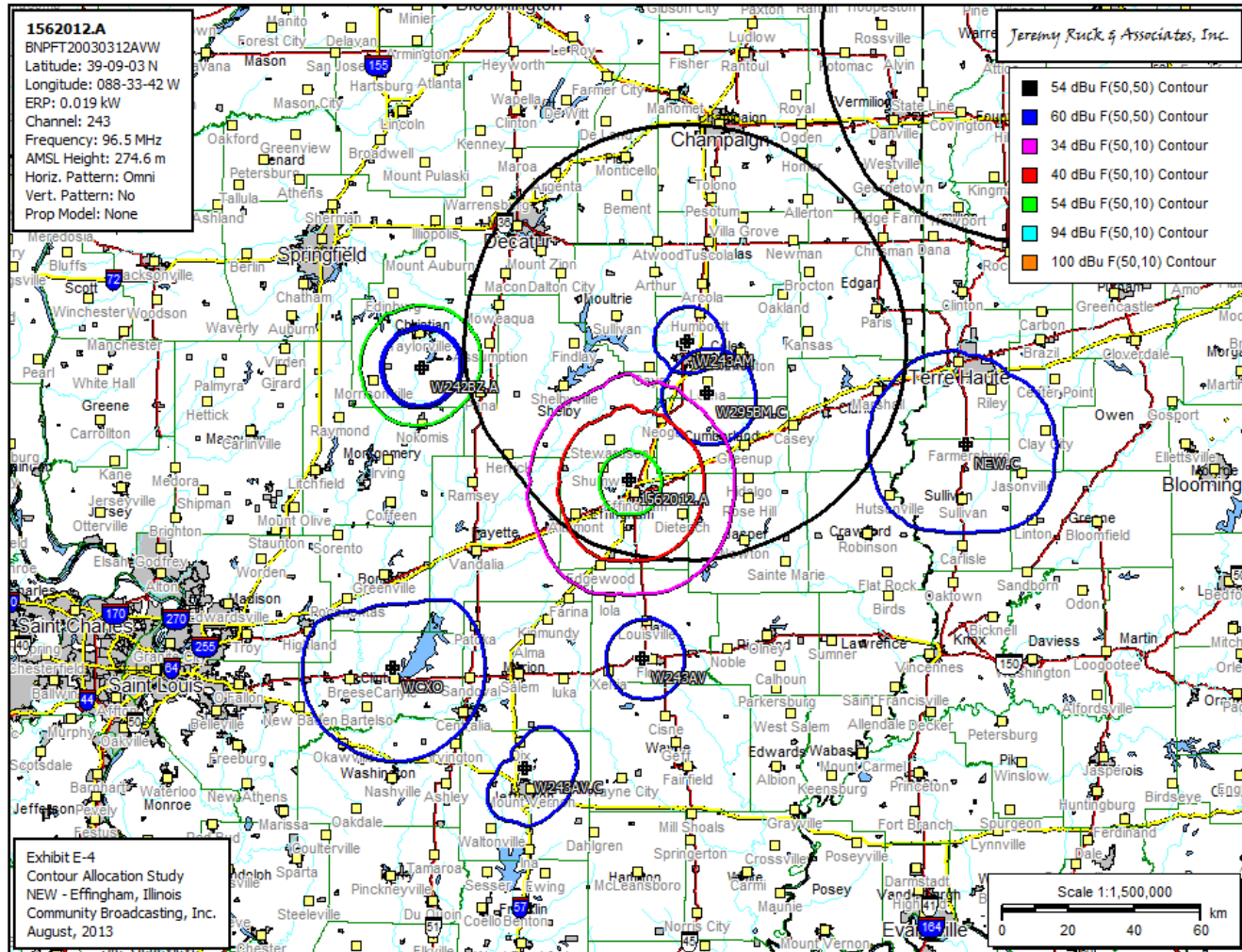
LPFM Grids



Facility Allocation – Part II

- Initial basis for translator allocation is contours.
- Contour protection follows the usual ratios.
- Protected contour based on class.
- Co-channel is -20 dB U/D ratio.
- 1st adjacent is -6 dB U/D ratio.
- 2nd and 3rd adjacent is +40 dB ratio.
- Alternate methods permissible.
- Alternate method usable only on 2nd adjacent for LPFM

Facility Allocation – Part II



Section 74.1204(d)

- The provisions of this section concerning prohibited overlap will not apply where the area of such overlap lies entirely over water. In addition, an application otherwise precluded by this section will be accepted if it can be demonstrated that no actual interference will occur due to intervening terrain, lack of population, or such other factors as may be applicable.

Section 74.1204(d)

- Allows for alternate methods to be used.
- Intervening terrain clause generally will not apply in the Midwest.
- Although accurate, Longley-Rice generally must be augmented with another study.
- A “simple” ratio study works very well for 2nd and 3rd adjacent situations.
- Such study can be used to show zero population is affected by translator (or LPFM).

2nd/3rd Adjacent Studies

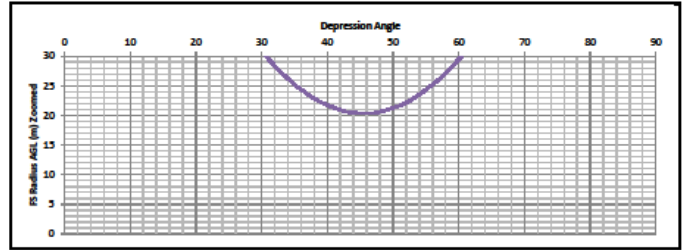
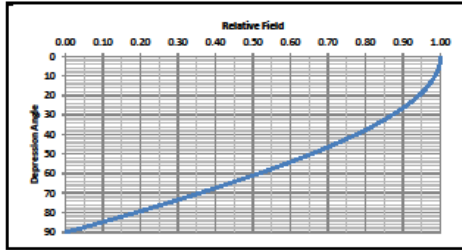
- Antenna radiation varies in vertical plane.
- Study works better when translator or LPFM is closer to the facility under consideration.
- Ideal situation is co-location.
- Method generally does not work when translator or LPFM is at, or close to, protected contour.
- Basis of study is free-space calculations.
- Power density is related to field strength through free space impedance.

2nd/3rd Adjacent Studies

Exhibit E-6
Translator Proximity Interference Analysis
NEW - Effingham, Illinois

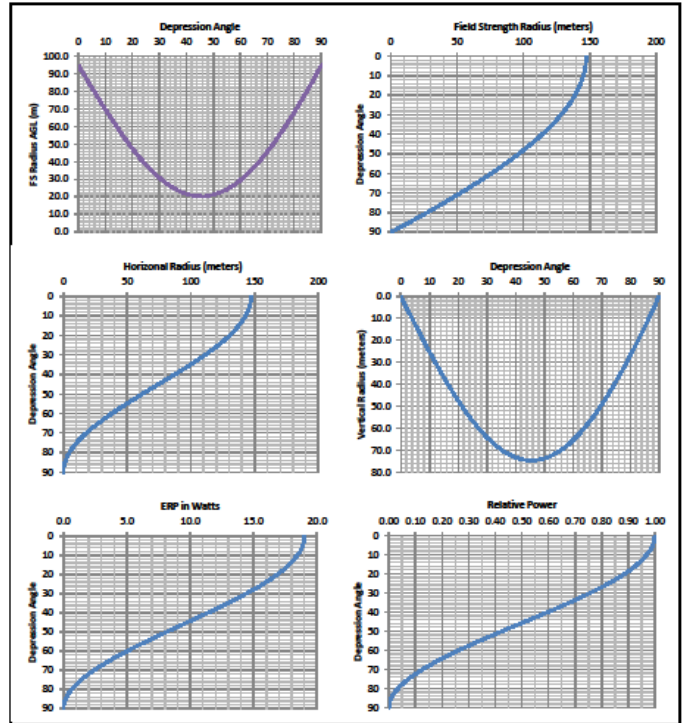
Antenna No: 1
 Manufacturer: Shively
 Model: 6812B-1
 Number of Bays: 1
 Bay Spacing: Lambda

Center of Radiation: 95 m AGL
 Effective Radiated Power: 19 Watts
 FS Contour: 104.2 dBu
 E Field Strength: 0.16218 V/m
 Z0 [Ohms]: 377 Ohms
 Power Density: 0.37684E-05 W/m²



Depression Angle	Relative Field	Relative Power	ERP	Field Strength	Radii in meters		
					Horizontal	Vertical	AGL
0	1.0000	1.0000	18.00	147.21	147.21	0.00	95.00
1	1.0000	1.0000	18.00	147.21	147.19	2.57	92.43
2	0.9990	0.9980	18.96	147.06	146.97	5.13	89.87
3	0.9990	0.9980	18.96	147.06	146.86	7.70	87.30
4	0.9980	0.9960	18.92	146.92	146.56	10.25	84.75
5	0.9960	0.9920	18.85	146.62	146.06	12.78	82.22
6	0.9950	0.9900	18.81	146.48	145.67	15.31	79.69
7	0.9950	0.9860	18.73	146.18	145.09	17.82	77.18
8	0.9910	0.9821	18.66	145.89	144.47	20.30	74.70
9	0.9880	0.9761	18.55	145.45	143.45	22.75	72.25
10	0.9850	0.9702	18.43	145.00	142.80	25.18	69.82
11	0.9820	0.9643	18.32	144.56	141.91	27.58	67.42
12	0.9790	0.9584	18.21	144.12	140.97	29.96	65.04
13	0.9750	0.9526	18.09	143.53	139.85	32.29	62.71
14	0.9710	0.9468	17.97	142.98	138.70	34.58	60.41
15	0.9670	0.9411	17.77	142.35	137.50	36.84	58.16
16	0.9630	0.9354	17.62	141.76	136.27	39.08	55.92
17	0.9580	0.9297	17.44	141.08	134.87	41.23	53.77
18	0.9530	0.9240	17.26	140.29	133.43	43.35	51.65
19	0.9480	0.9187	17.08	139.56	131.95	45.44	49.56
20	0.9420	0.9134	16.86	138.67	130.31	47.43	47.57
21	0.9360	0.9081	16.65	137.79	128.64	49.38	45.62
22	0.9300	0.9028	16.43	136.91	126.94	51.29	43.71
23	0.9240	0.8975	16.22	136.02	125.21	53.15	41.85
24	0.9170	0.8920	15.98	134.99	123.32	54.91	40.09
25	0.9100	0.8861	15.73	133.96	121.41	56.62	38.38
26	0.9030	0.8804	15.49	132.93	119.48	58.27	36.73
27	0.8950	0.8750	15.22	131.75	117.39	59.82	35.18
28	0.8870	0.8698	14.95	130.58	115.29	61.30	33.70
29	0.8790	0.8646	14.68	129.40	113.18	62.73	32.27
30	0.8710	0.8594	14.41	128.23	111.04	64.11	30.89
31	0.8620	0.8540	14.12	126.96	108.77	65.36	29.54
32	0.8540	0.8489	13.86	125.72	106.42	66.62	28.28
33	0.8450	0.8436	13.57	124.39	104.03	67.75	27.03
34	0.8350	0.8387	13.25	122.92	101.59	68.74	25.78
35	0.8260	0.8342	12.96	121.40	99.11	69.75	24.53
36	0.8160	0.8299	12.65	120.12	97.18	70.61	24.39
37	0.8060	0.8256	12.34	118.65	94.76	71.41	23.59
38	0.7960	0.8213	12.04	117.18	92.34	72.14	22.86
39	0.7850	0.8162	11.71	115.56	89.81	72.73	22.27
40	0.7740	0.8113	11.38	113.94	87.28	73.24	21.76
41	0.7630	0.8062	11.06	112.32	84.77	73.69	21.31
42	0.7520	0.8013	10.74	110.70	82.27	74.07	20.93
43	0.7410	0.7961	10.43	109.08	79.78	74.40	20.60
44	0.7290	0.7914	10.10	107.32	77.20	74.55	20.45
45	0.7170	0.7861	9.77	105.55	74.64	74.64	20.38

Depression Angle	Relative Field	Relative Power	ERP	Field Strength	Radii in meters		
					Horizontal	Vertical	AGL
45	0.7170	0.7861	9.77	105.55	74.64	74.64	20.38
46	0.7050	0.4970	9.44	103.78	72.09	74.66	20.34
47	0.6930	0.4802	9.12	102.02	69.58	74.61	20.39
48	0.6800	0.4624	8.79	100.30	66.98	74.39	20.61
49	0.6670	0.4449	8.45	98.19	64.42	74.11	20.89
50	0.6540	0.4277	8.13	96.28	61.89	73.75	21.25
51	0.6410	0.4109	7.81	94.36	59.38	73.33	21.67
52	0.6280	0.3944	7.49	92.45	56.92	72.85	22.15
53	0.6150	0.3770	7.16	90.39	54.40	72.19	22.81
54	0.6000	0.3600	6.84	88.33	51.92	71.46	23.54
55	0.5850	0.3434	6.52	86.27	49.48	70.67	24.33
56	0.5720	0.3272	6.22	84.21	47.09	69.81	25.19
57	0.5590	0.3114	5.92	82.14	44.74	68.89	26.11
58	0.5460	0.2959	5.62	80.08	42.44	67.91	27.09
59	0.5320	0.2798	5.33	77.88	40.11	66.79	28.25
60	0.5190	0.2642	5.02	75.67	37.83	65.53	29.47
61	0.4990	0.2490	4.73	73.46	35.61	64.25	30.75
62	0.4840	0.2343	4.45	71.25	33.45	62.91	32.09
63	0.4690	0.2200	4.18	69.04	31.34	61.52	33.48
64	0.4530	0.2052	3.90	66.69	29.23	59.94	35.06
65	0.4370	0.1910	3.63	64.33	27.19	58.30	36.70
66	0.4220	0.1781	3.38	62.12	25.27	56.75	38.25
67	0.4060	0.1648	3.13	59.77	23.35	55.02	39.98
68	0.3900	0.1521	2.89	57.41	21.51	53.23	41.77
69	0.3730	0.1391	2.64	54.91	19.68	51.26	43.74
70	0.3570	0.1274	2.42	52.55	17.97	49.39	45.61
71	0.3410	0.1163	2.21	50.20	16.34	47.66	47.54
72	0.3240	0.1050	1.99	47.70	14.74	45.36	49.64
73	0.3070	0.0942	1.79	45.19	13.21	43.22	51.78
74	0.2900	0.0841	1.60	42.69	11.77	41.04	53.96
75	0.2730	0.0745	1.43	40.19	10.40	38.82	56.18
76	0.2560	0.0655	1.25	37.69	9.12	36.57	58.43
77	0.2390	0.0571	1.09	35.18	7.91	34.28	60.72
78	0.2210	0.0488	0.93	32.53	6.76	31.82	63.18
79	0.2040	0.0416	0.79	30.03	5.73	29.48	65.52
80	0.1880	0.0346	0.66	27.38	4.75	26.97	68.03
81	0.1680	0.0282	0.54	24.73	3.87	24.43	70.57
82	0.1510	0.0228	0.43	22.23	3.09	22.01	72.89
83	0.1330	0.0177	0.34	19.58	2.39	19.43	75.57
84	0.1140	0.0130	0.25	16.78	1.75	16.69	78.31
85	0.0960	0.0092	0.18	14.13	1.23	14.08	80.92
86	0.0780	0.0061	0.12	11.48	0.80	11.45	83.55
87	0.0590	0.0035	0.07	8.89	0.45	8.67	86.33
88	0.0400	0.0016	0.03	5.89	0.21	5.88	89.12
89	0.0210	0.0004	0.01	3.09	0.05	3.09	91.91
90	0.0000	0.0000	0.00	0.00	0.00	0.00	95.00



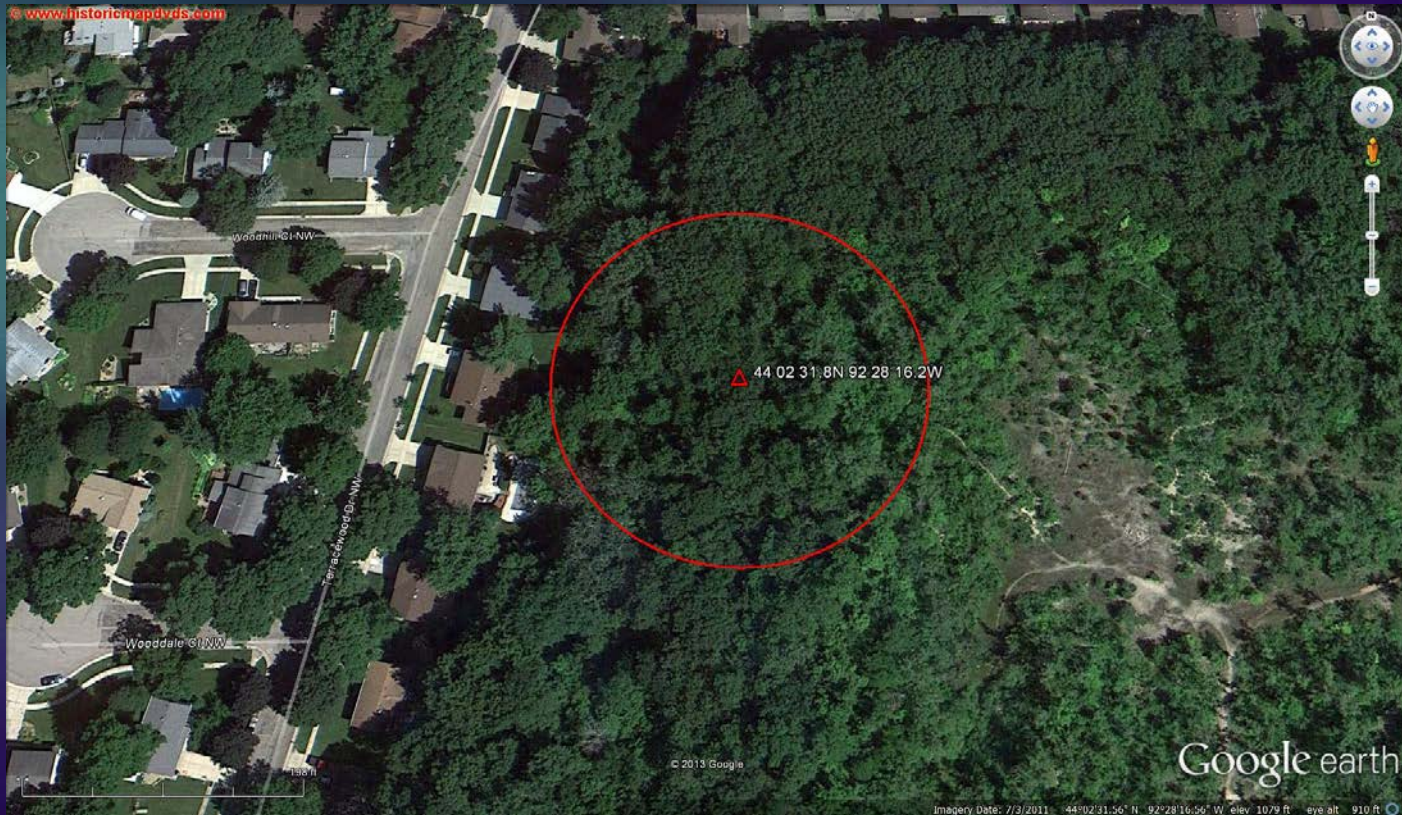
2nd/3rd Adjacent Studies

- Closest ground approach: 20.4 m (67 feet)
- Horizontal distance: 74.6 m (~245 feet)



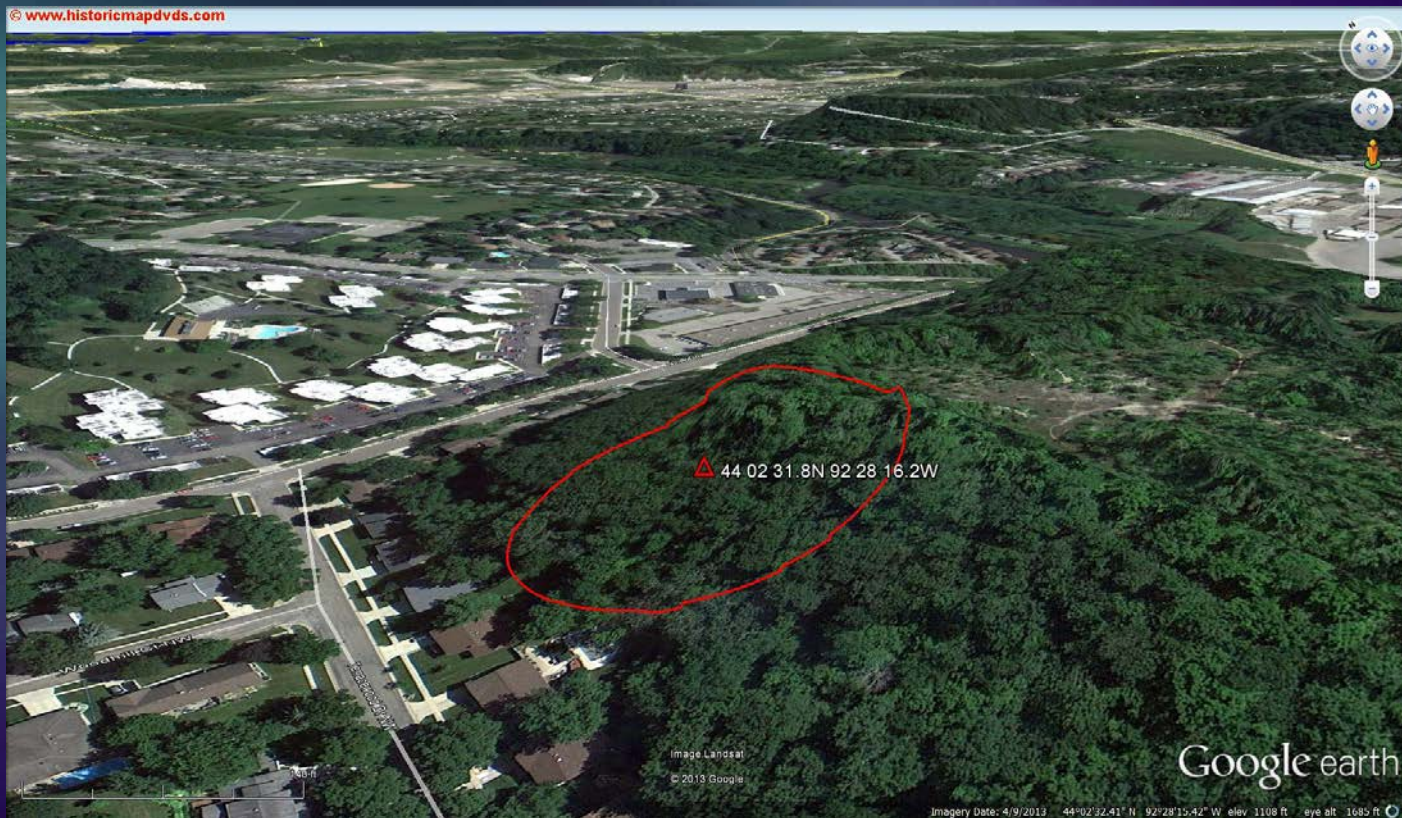
2nd/3rd Adjacent Studies

- Local terrain should be considered.
- Site elevation may vary approaching structures.



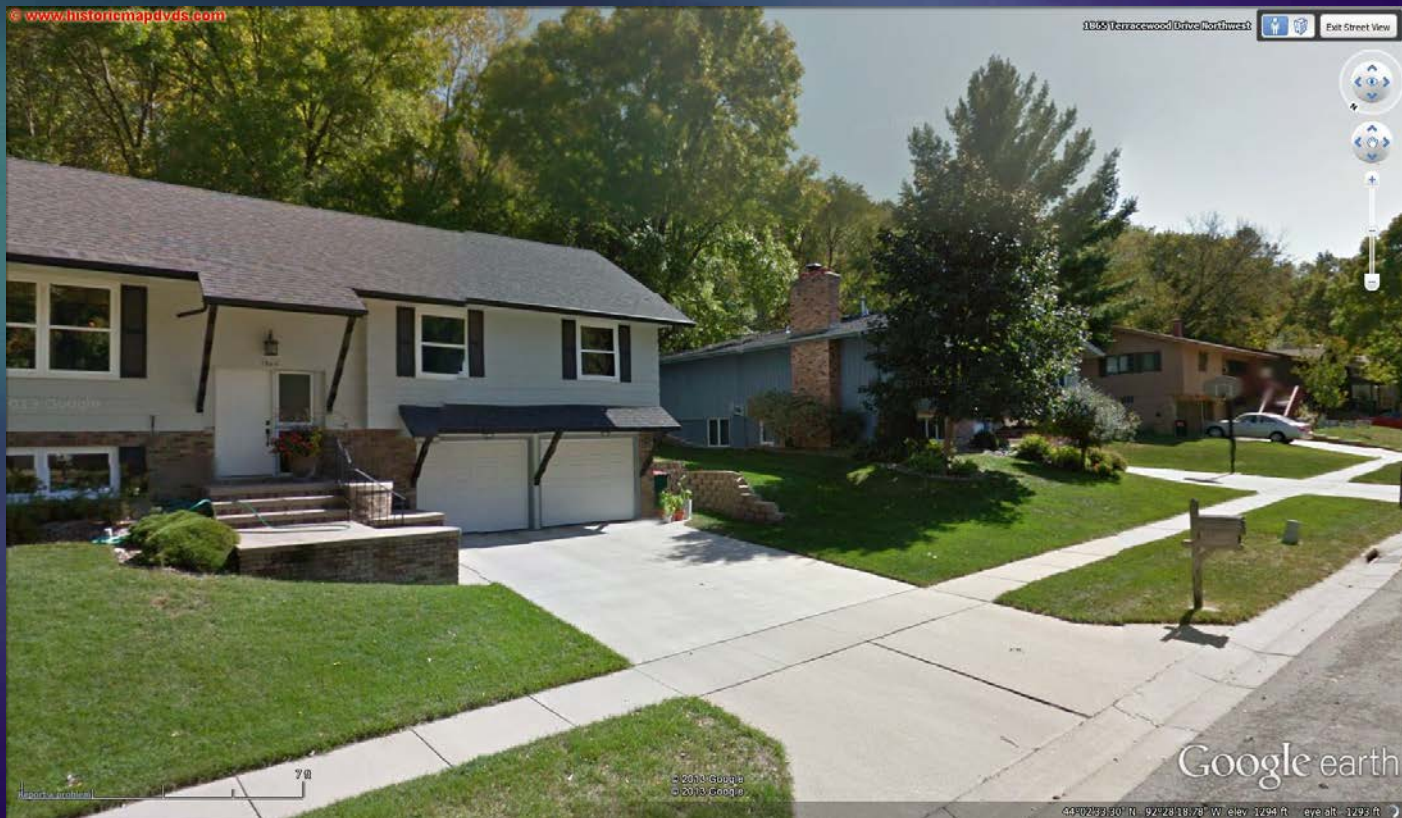
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2nd/3rd Adjacent Studies

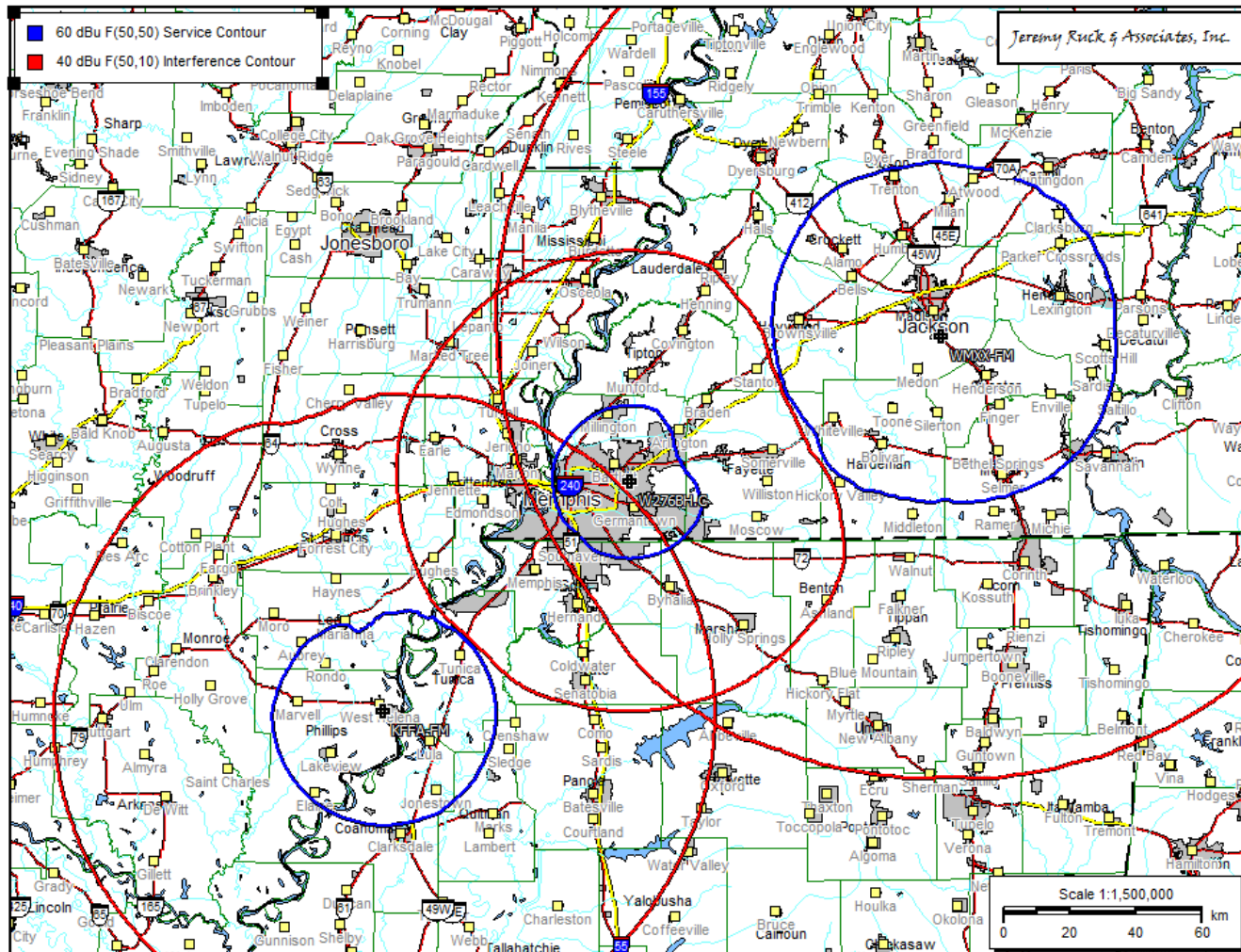
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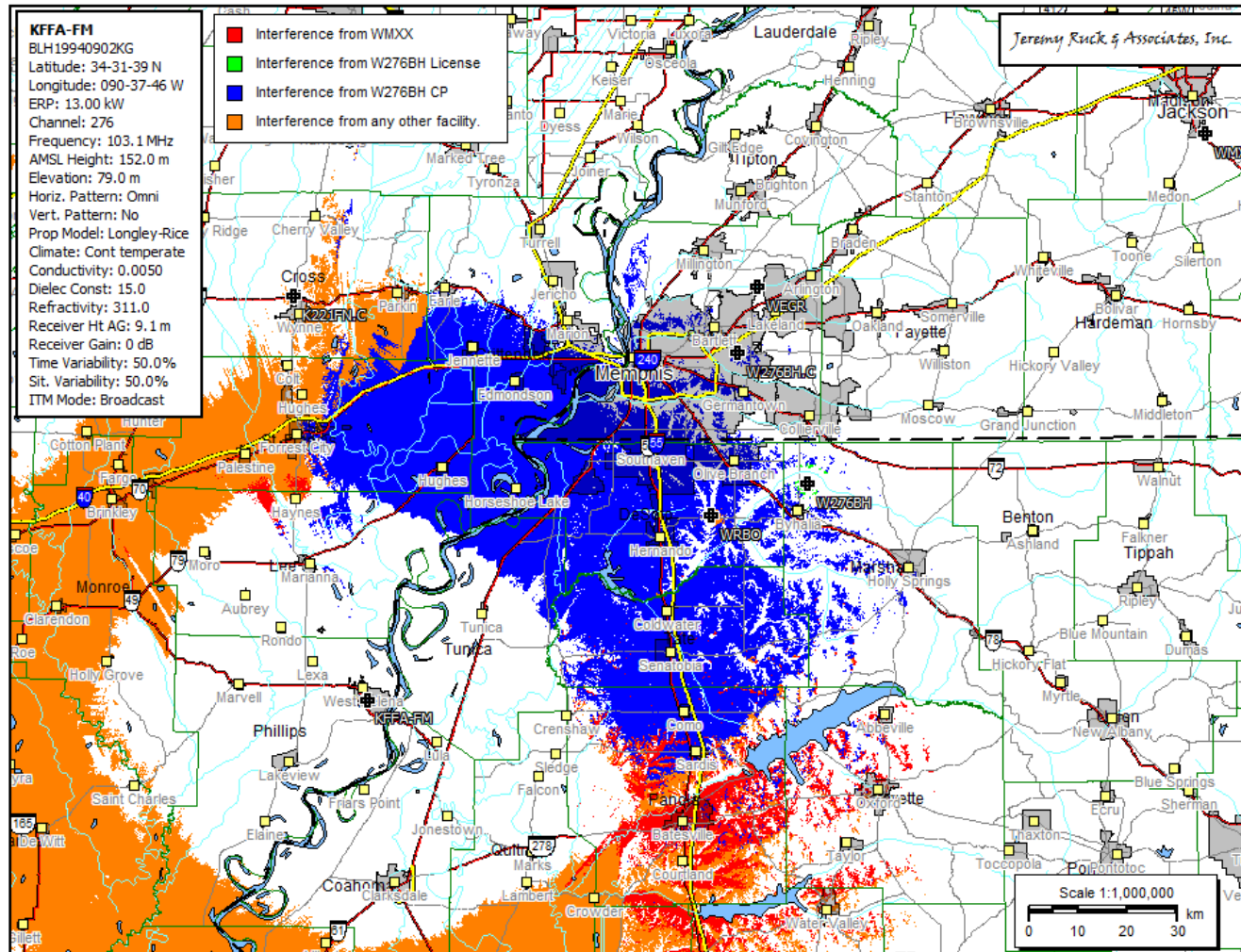
More on interference studies

- Absence of interference does not necessarily follow from lack of contour overlap.
- The converse is also true.
- Contour proximity can be a huge pitfall for translators in co- and 1st adjacent channel situations.
- “Grantability” versus “Survivability”

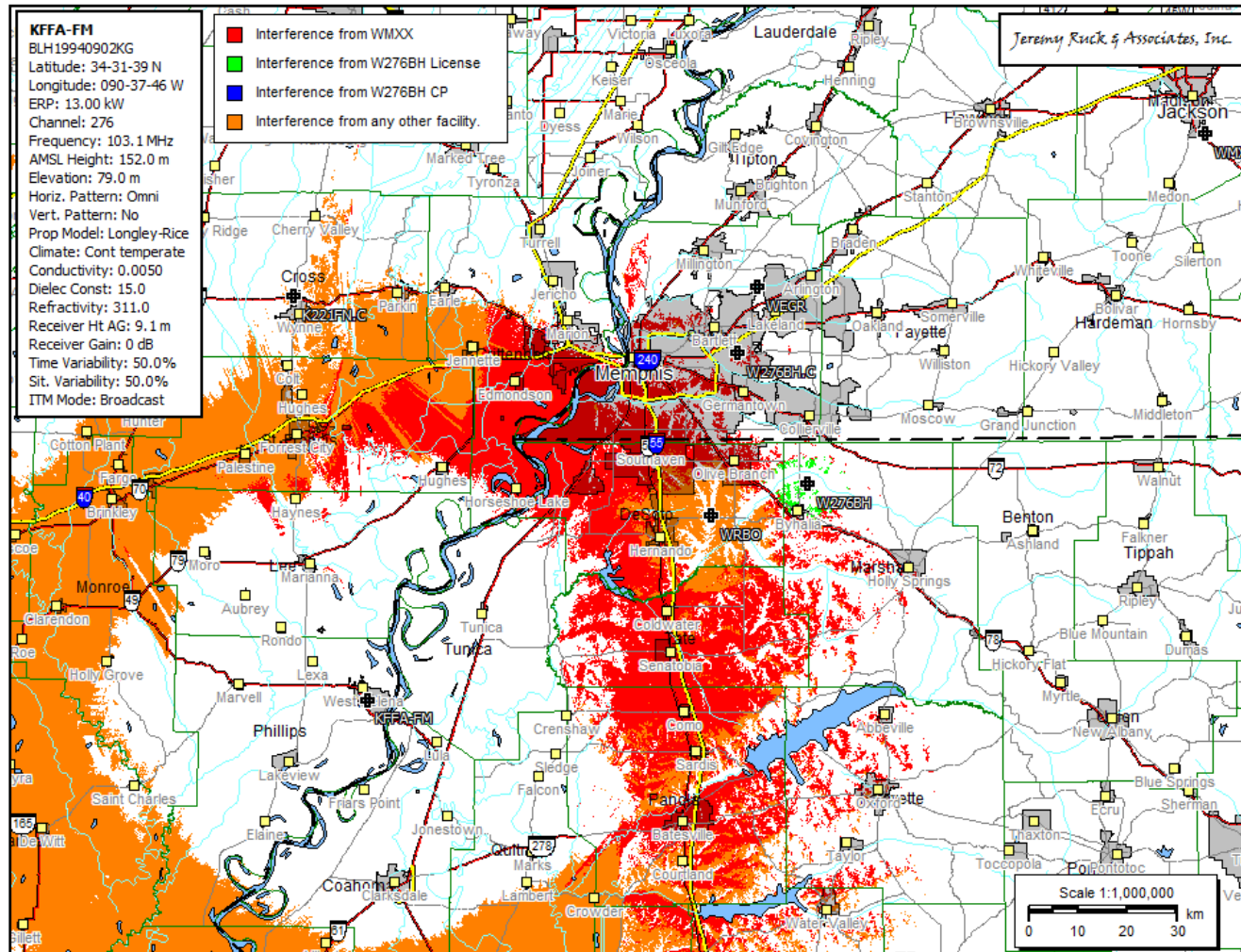
“Grantability” versus “Survivability”



“Grantability” versus “Survivability”



“Grantability” versus “Survivability”



Jeremy's Crystal Ball

- LPFM demand will be robust.
- Expect interference from new LPFM.
- Minimal avenues for mitigation.
- No hammer unless community of license.
- Another translator window possible.
- Likely limited to AM licensees.
- Should mainly impact more rural areas.
- Fewer translator relocation opportunities.

Translators and LPFM

*Questions and
Discussion*

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