SUPPLEMENT B - STATIONS STUDIED

37	3	WGCI	CHICAGO	IL	1390	41	44	13	87	42	0	B	C	5.153	5	5	DA-2
38	3	WVON	CICERO	IL	1450	41	49	57	87	42	20	C	C	25	1	1	ND-U
39	101	WOWO	FORT WAYNE	IN	1190	40	59	47	85	21	6	A	E	2	50	50	DA-N
40	37	WTLC	INDIANAPOLIS	IN	1310	39	43	8	86	10	33	B	E	5.562	5	1	DA-N
41	89	KNSS	WICHITA	KS	1240	37	43	6	97	19	5	C	C	25	0.6	0.63	ND-U
42	108	WVLK	LEXINGTON	KY	590	38	6	42	84	34	36	B	E	14.9	5	1	DA-2
43	129	KWKH	SHREVEPORT	LA	1130	32	42	18	93	52	55	A	C	2	50	50	DA-N
44	39	WBOK	NEW ORLEANS	LA	1230	29	59	18	90	2	45	C	C	25	1	1	ND-U
45	129	KRMD	SHREVEPORT	LA	1340	32	29	36	93	45	55	C	C	25	1	1	ND-U
46	10	WEEI	BOSTON	MA	850	42	16	41	71	16	2	B	E	3.793	50	50	DA-2
47	19	WCBM	BALTIMORE	MD	680	39	24	30	76	46	34	B	E	12.13	10	5	DA-2
48	201	WFMD	FREDERICK	MD	930	39	24	55	77	27	41	B	E	13.37	5	2.5	DA-2
49	19	WITH	BALTIMORE	MD	1230	39	18	58	76	36	3	C	E	25	1	1	ND-U
50	162	WPOR	PORTLAND	ME	1490	43	39	48	70	16	16	C	E	25	1	1	ND-U
51	7	WDFN	DETROIT	MI	1130	42	6	39	83	11	52	B	E	7.6	50	10	DA-2
52	14	KSTP	ST. PAUL	MN	1500	45	1	32	93	2	38	A	C	2	50	50	DA-N
53	18	KTRS	ST. LOUIS	MO	550	38	39	12	90	7	44	B	C	3.94	5	5	DA-N
54	26	WDAF	KANSAS CITY	MO	610	38	59	3	94	37	40	B	C	3.451	5	5	ND-U
55	118	WKXI	JACKSON	MS	1400	32	19	12	90	11	25	C	C	25	1	1	ND-U
56	242	KGHL	BILLINGS	MT	790	45	43	34	108	36	35	B	M	2.8	5	5	DA-N
57	264	KXGF	GREAT FALLS	MT	1400	47	27	56	111	20	22	C	M	25	1	1	ND-U
58	36	WBT	CHARLOTTE	NC	1110	35	7	56	80	53	23	A	E	2	50	50	DA-N
59	259	KFYR	BISMARCK	ND	550	46	51	12	100	32	37	B	C	2.869	5	5	DA-N
60	72	KOSR	OMAHA	NE	1490	41	14	6	95	57	57	C	C	25	1	1	ND-U
61	268	WHWH	PRINCETON	NJ	1350	40	22	0	74	44	38	B	E	25.54	5	5	DA-2
62	70	KDEF	ALBUQUERQUE	NM	1150	35	12	6	106	35	54	B	M	12.31	5	0.5	DA-N
63	70	KRZY	ALBUQUERQUE	NM	1450	35	7	56	106	37	18	C	M	25	1	1	ND-U
64	43	KDWN	LAS VEGAS	NV	720	36	4	22	114	58	20	B	P	4.4	50	50	DA-N
65	43	KLAV	LAS VEGAS	NV	1230	36	11	20	115	8	40	C	P	25	1	1	ND-U
66	130	KPTT	RENO	NV	1450	39	33	26	119	47	47	C	P	25	1	1	ND-U
67	1	WABC	NEW YORK	NY	770	40	52	50	74	4	12	A	E	2	50	50	ND-U
68	57	WGY	SCHENECTADY	NY	810	42	47	37	74	0	36	A	E	2	50	50	ND-U
69	1	WCBS	NEW YORK	NY	880	40	51	35	73	47	9	A	E	2	50	50	ND-U
70	149	WTLB	UTICA	NY	1310	43	3	24	75	16	42	B	E	9.66	5	0.5	DA-2
71	47	WXXI	ROCHESTER	NY	1370	43	6	1	77	34	23	B	E	6.047	5	5	DA-N
72	25	WLW	CINCINNATI	OH	700	39	21	11	84	19	30	A	E	2	50	50	ND-U
73	76	WSPD	TOLEDO	OH	1370	41	36	3	83	32	11	B	E	7.723	5	5	DA-N
74	53	KOMA	OKLAHOMA CITY	OK	1520	35	20	0	97	30	16	A	C	2	50	50	DA-N
75	144	KUGN	EUGENE	OR	590	44	5	48	123	4	18	B	P	10.98	5	1	DA-N

SUPPLEMENT B - STATIONS STUDIED

76	144	KKXO	EUGENE	OR	1450	44	4	54	123	6	34	C	P	25	1	1	ND-U
77	73	WHP	HARRISBURG	PA	580	40	18	11	76	57	7	B	E	4.725	5	5	DA-N
78	20	KDKA	PITTSBURGH	PA	1020	40	33	33	79	57	11	A	E	2	50	50	ND-U
79	5	KYW	PHILADELPHIA	PA	1060	40	6	12	75	14	56	A	E	2	50	50	DA-1
80	5	WHAT	PHILADELPHIA	PA	1340	40	0	6	75	12	35	C	E	25	1	1	ND-U
81	90	WVOC	COLUMBIA	SC	560	34	2	0	81	8	32	B	E	6.043	5	5	DA-N
82	269	WNAX	YANKTON	SD	570	42	54	47	97	18	58	B	C	2.661	5	5	DA-N
83	44	WSM	NASHVILLE	TN	650	35	59	50	86	47	32	A	C	2	50	50	ND-U
84	241	KCMC	TEXARKANA	TX	740	33	26	17	94	8	33	B	C	11.7	1	1	DA-1
85	6	WBAP	FORT WORTH	TX	820	32	36	38	97	10	0	A	C	2	50	50	ND-U
86	33	WOAI	SAN ANTONIO	TX	1200	29	30	5	98	7	9	A	C	2	50	50	ND-U
87	9	KQUE	HOUSTON	TX	1230	29	45	26	95	20	18	C	C	25	1	1	ND-U
88	6	KAHZ	FORT WORTH	TX	1360	32	46	21	97	24	48	B	C	7.406	5	1	DA-N
89	35	KWLW	NORTH SALT LAK	UT	700	40	53	29	111	56	28	B	M	4.533	50	1	DA-2
90	35	KSL	SALT LAKE CITY	UT	1160	40	46	46	112	5	56	A	M	2	50	50	ND-U
91	56	WRVA	RICHMOND	VA	1140	37	24	13	77	18	59	A	E	2	50	50	DA-1
92	13	KVI	SEATTLE	WA	570	47	25	19	122	25	44	B	P	3.928	5	5	ND-U
93	13	KIRO	SEATTLE	WA	710	47	23	55	122	26	1	A	P	2	50	50	DA-N
94	87	KJRB	SPOKANE	WA	790	47	36	16	117	23	11	B	P	7.1	5	5	DA-N
95	87	KSBN	SPOKANE	WA	1230	47	39	30	117	25	8	C	P	25	1	1	ND-U
96	87	KGA	SPOKANE	WA	1510	47	35	44	117	22	15	A	P	2	50	50	DA-N
97	30	WJYI	MILWAUKEE	WI	1340	43	2	49	87	58	52	C	C	25	1	1	ND-U
98	218	WWVA	WHEELING	WV	1170	40	6	7	80	52	2	A	E	2	50	50	DA-N
99	220	WLTP	PARKERSBURG	WV	1450	39	17	23	81	31	36	C	E	25	1	1	ND-U
100	267	KTWO	CASPER	WY	1030	42	50	34	106	13	7	B	M	6.823	50	50	DA-N
101	265	KFBC	CHEYENNE	WY	1240	41	7	17	104	50	22	C	M	25	0.7	0.7	ND-U

FIGURE B-1 - Presumed, Composite Receiver Response

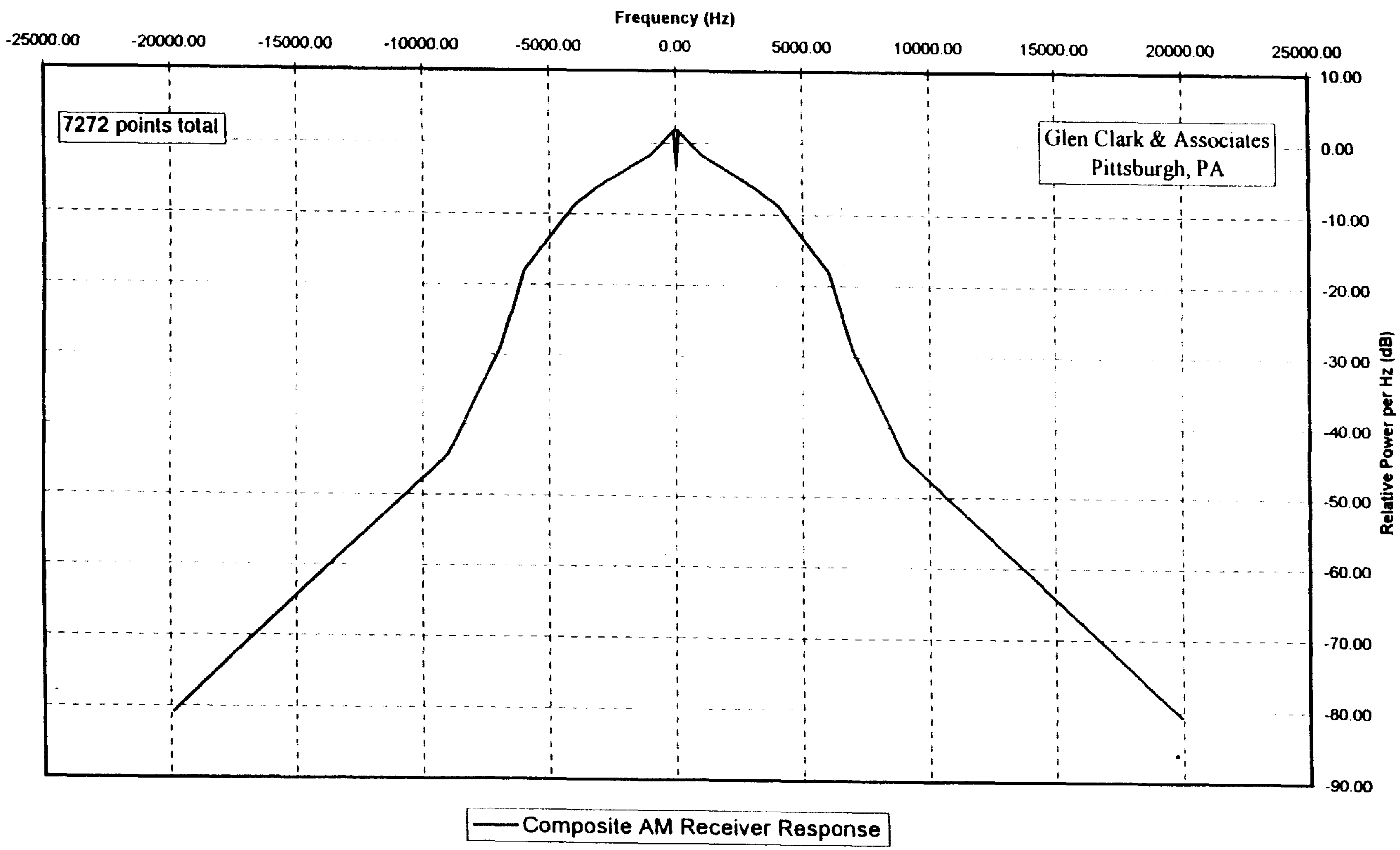


FIGURE B-2 - Presumed, Present Transmitted Analog System (10 kHz)

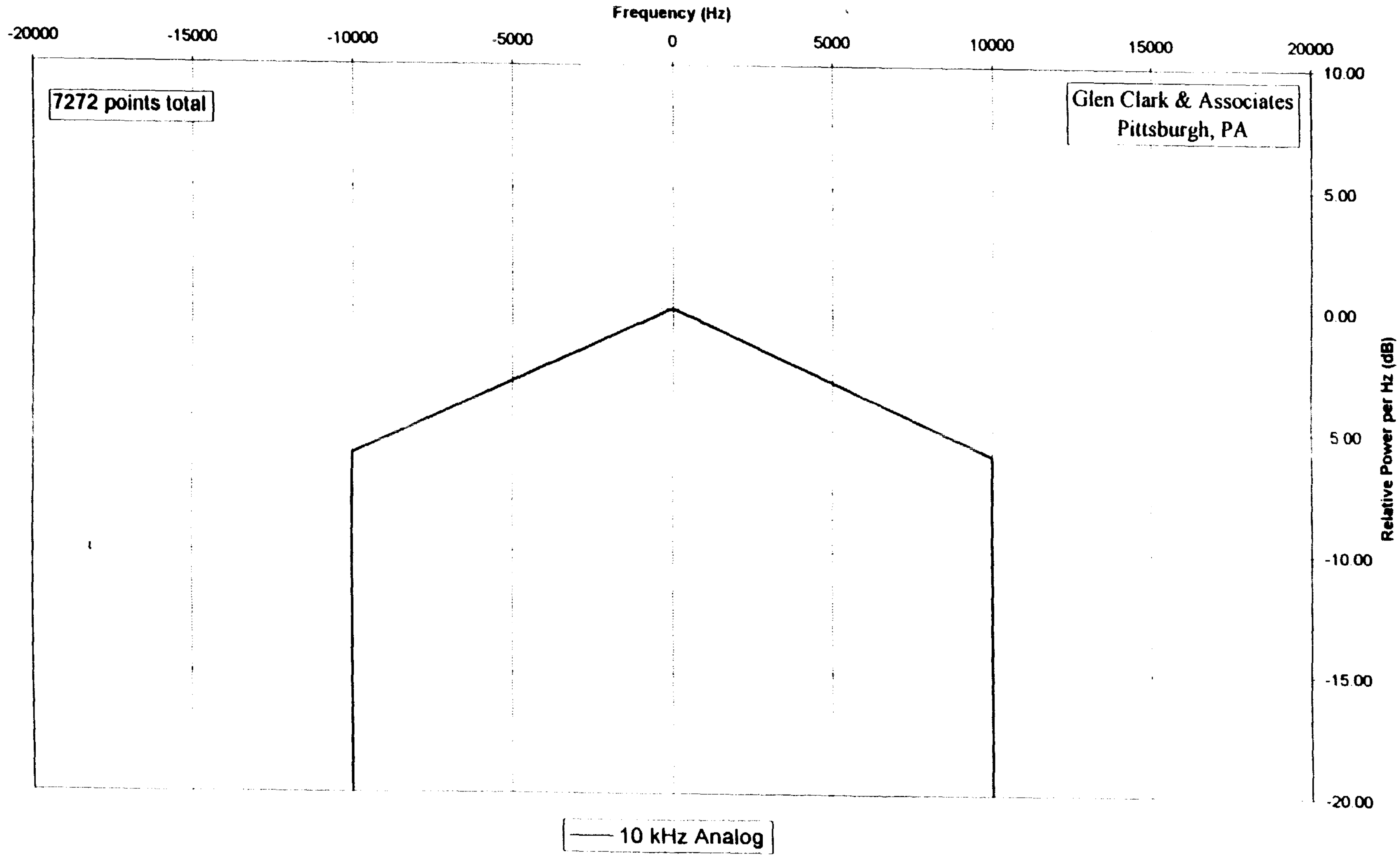


FIGURE B-3 - Histogram Comparing Differential Change in Day SNR with 20 kHz IBOC

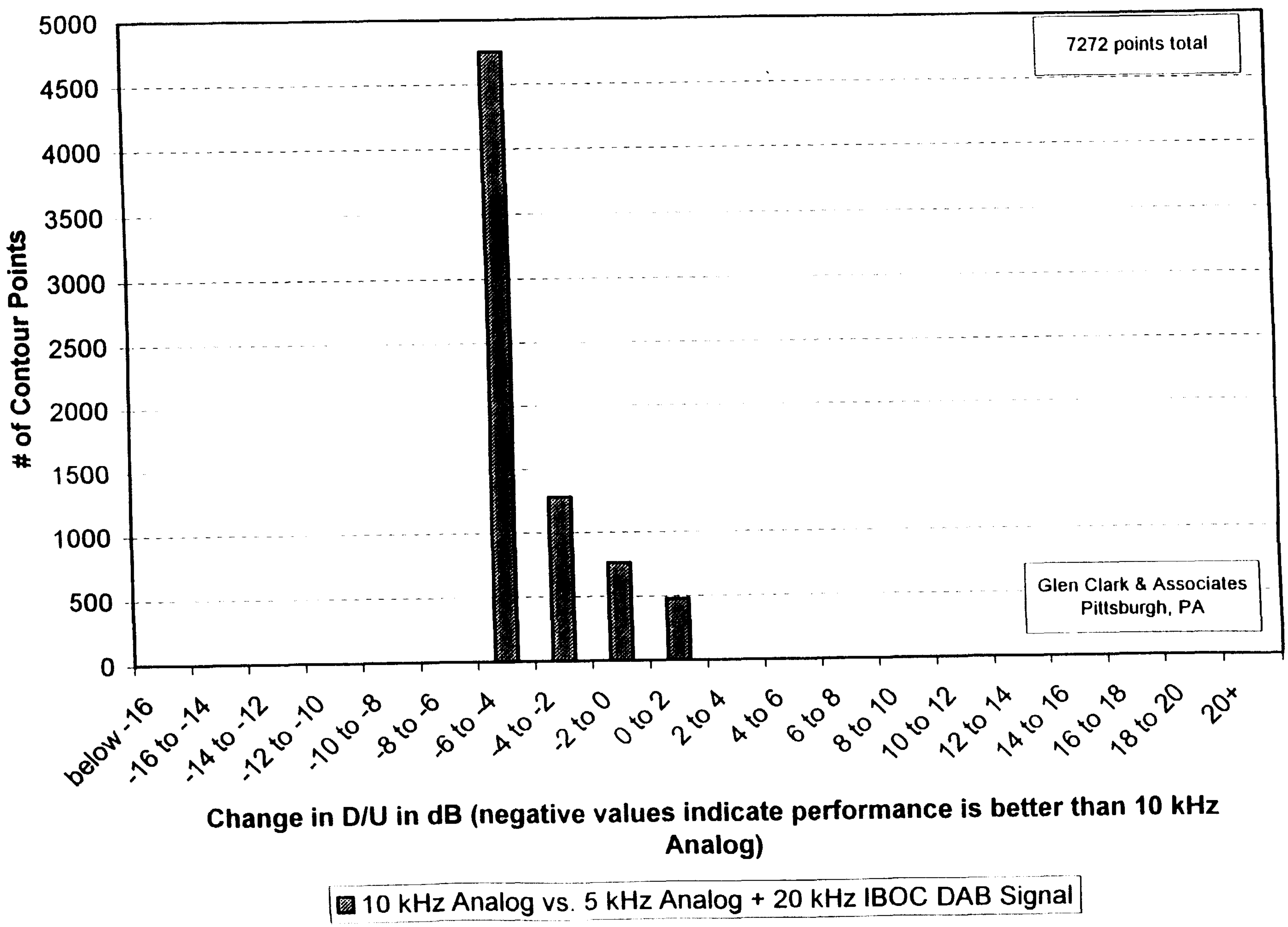
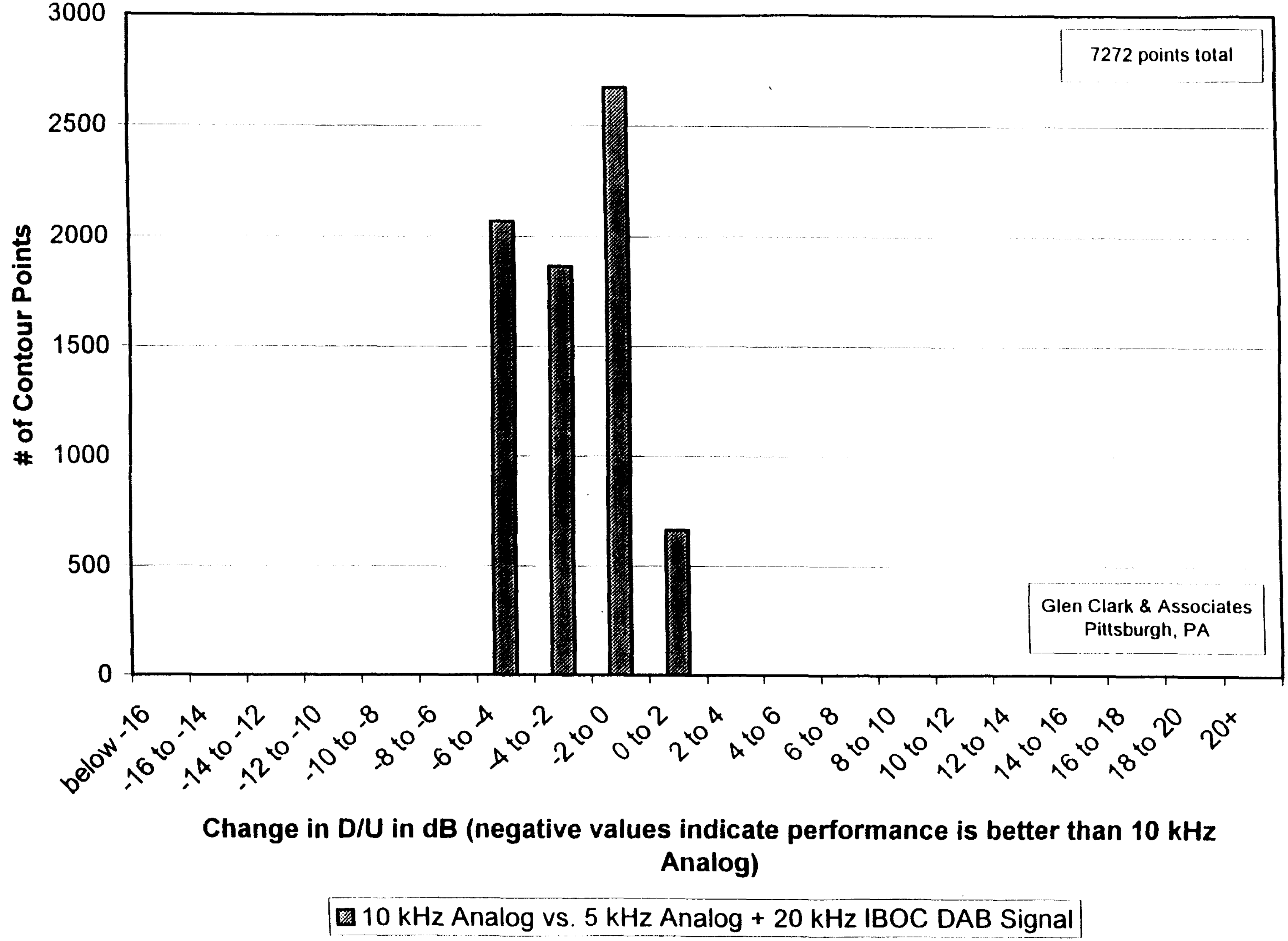


FIGURE B-4 - Histogram Comparing Differential Change in Night SNR with 20 kHz IBOC



SUPPLEMENT C

DETAILED ANALYSIS OF INTERFERENCE RECEIVED AT TEN SELECTED CONTOURS

Statistical analysis provides the researcher with the trend contained in a large body of data. And a significant amount of statistical analysis was performed. However, some critical understandings are often lost in the act of statistical data reduction. To fully appreciate the implications of the data, it is often useful to investigate, in detail, several anecdotal members of the total population.

We have selected ten contours (five day and five night) from the total of 202 contours and explored the "distant" signals arriving at each of the 72 points around the peripheries of those ten contours. The presentation chosen below allows the reader to determine both the strength of the interference and its geographic location.

READING THE "NECKLACE CHARTS

We have chosen to call Figures C-1A through C-10A "necklace charts," because each data string resembles a pearl necklace. Figure C-1A shows the incoming daytime signals for KGA(AM), Spokane, Washington which, because of its geographic isolation from other stations, is quite quiet. The KGA plot is therefore simpler than most and is an excellent example on which to explain the features of the necklace chart The Y-axis represents increasing signal strength and is plotted as a logarithmic scale. The X-axis is measured in degrees of azimuth, from 0 degrees (north), clockwise through 355 degrees. A legend at the bottom of the frame identifies the 6 data strings plotted, although only 4 data strings are visible for KGA. (Because the allocation is comparatively quiet, the two remaining data strings are off the bottom of the graph.)

KGA's 2 mV/m daytime signal on 1510 kHz (the "home" station) plots as a straight, horizontal blue line near the top of the frame. The second line from the top (red squares) shows the power-sum composite of all signals arriving on the lower, second-adjacent channel (1490 kHz). The third line from the top (yellow triangles) shows the power-sum composite of all signals arriving on the lower, first-adjacent channel (1500 kHz). The remaining data strings are identified in the legend at the bottom of the figure.

One can see that there are two "humps" in the data chain for the lower, second-adjacent channel (red squares). The first, near 205 degrees of azimuth, is primarily the contribution of KTEL(AM), Walla Walla, Washington. The second hump, near 275 degrees of azimuth, is primarily the contribution of KEYG(AM), Grand Coulee, Washington.

At its strongest, the lower second-adjacent signal is at 20 dB below the desired KGA signal. The incoming signals on all other channels are down a remarkable 60 dB or more.

Each of the necklace charts in Figures C-1A through C-10A has a companion map which shows the geographic location of the contour being studied. Figure C-1B shows the contour for the necklace chart in Figure C-1A, etc.

<u>EXAMINING THE REMAINING DAYTIME "NECKLACE CHARTS"</u>

Figure C-2A shows the incoming daytime signals for KBOI(AM), Boise, Idaho. A pronounced hump is noticeable on the upper second-adjacent at approximately 80 degrees True. This is primarily the contribution of KECN(AM), Blackfoot, Idaho. Like KGA, the KBOI allocation is extremely quiet. At its strongest, the upper second adjacent signal is 20 dB below the desired KBOI signal.

Compare Figure C-3A with the two previous figures, which represented "quiet" daytime allocations. WCBM (Baltimore) operates on 680 kHz and (based on FCC Figure M-3 conductivities) has a very strong incoming signal on the upper second-adjacent channel (700 kHz). The strength of the interfering signal exceeds WCBM's 2 mV/m contour over the arc from 220 through 340 degrees True. At its strongest, the interfering signal exceeds the desired signal by more than 20 dB.

Figure C-4A introduces the concept of shoreline truncation. Figures C-1A through C-3A showed the desired contour as a straight, horizontal line at 2 mV/m. Spokane, Boise and Baltimore were inland markets. KNBR, shown in Figure C-4A, is licensed to San Francisco and the calculated KNBR contour extends many miles over the ocean. What happens many miles offshore is of far less interest than are the conditions where the contour reaches the ocean. Accordingly, all contours in this report which extend over the ocean have been manually truncated at or near the shoreline. The KNBR contour has been so adjusted over the arc from 160 through 320 degrees True. Because the study points within this arc have been moved closer to the transmitter, the fields at these points exceed 2 mV/m. Notice how the data string representing the KNBR service contour is moved upward over the arc described. [Similar effects are observable later in this report for KFMB, San Diego (Figure 9A) and WABC, New York City (Figure C-8A).

Figure C-3A showed an example where there was one significant interferer. Figure 6A shows that KNBR has two significant interferers. At 165 degrees True, both the upper and lower second-adjacent signals rise to the same strength as the desired signal (0 dB).

Figure C-5A shows a situation where the desired station is significantly affected by three interfering stations. At 200 degrees True, KSQR (1240 kHz) has a desired-to-undesired ratio of 0 dB on 1220, 1230 and 1260 kHz.

EXAMINING THE NIGHTTIME "NECKLACE CHARTS"

Figures C-1A through C-5A displayed daytime conditions. Figures C-6A through C-10A show nighttime conditions. KDEF was chosen for study in Figure C-6A because it is a comparatively quiet channel. All interfering signals are at least 18 dB below the desired signal. Later figures will show that this is not a universal condition.

Notice in Figure C-6A that there is usually far less change in the field with azimuth (delta field/delta theta) in night examinations than there is for daytime examinations. This is because the nighttime interfering signals are usually coming from a greater distance than are the day signals. The three largest interferers in Figure C-6A are distant Class A stations which deliver skywave interference (KVOO, KSL and KWKH).

Figure C-7A shows the incoming nighttime interference for KFMB, San Diego. While not as pristine an allocation as the previous figure, this is still a reasonably clean allocation. No distant signal exceeds the desired signal (excepting a small overage at 310 degrees True). The incoming signal from lower, second-adjacent channel station KCBS is the only interferer which comes within 6 dB of the desired signal. Recall that the KCBS contribution consists of both the skywave <u>and</u> groundwave components.

Figure C-8A is significant because it shows an unusual situation. The night signal of WAEB (Allentown, Pennsylvania) exceed the desired signal of WABC (New York City) over a very narrow arc. While this kind of graph represents a rare phenomenon, if the affected area is highly populated, it can be troublesome.

Figure C-9A shows the night situation for WWVA (Wheeling, West Virginia). In contrast with earlier night figures, this shows that the incoming interference on <u>two</u> channels exceeds the strength of the desired signal <u>over 360 degrees of the compass</u>. [All skywave signals are computed using the FCC's 10% skywave interference algorithm. See Supplement A.] The incoming signal from WHAM (Rochester, New York) exceeds the desired signal by between 6 and 10 dB. The incoming signal from WOWO (Fort Wayne, Indiana) exceeds the desired signal by between as much as 12dB. [Note that WOWO has a Construction Permit to decrease night power, which will change these figures. However, all calculations in this report are based on licensed facilities.]

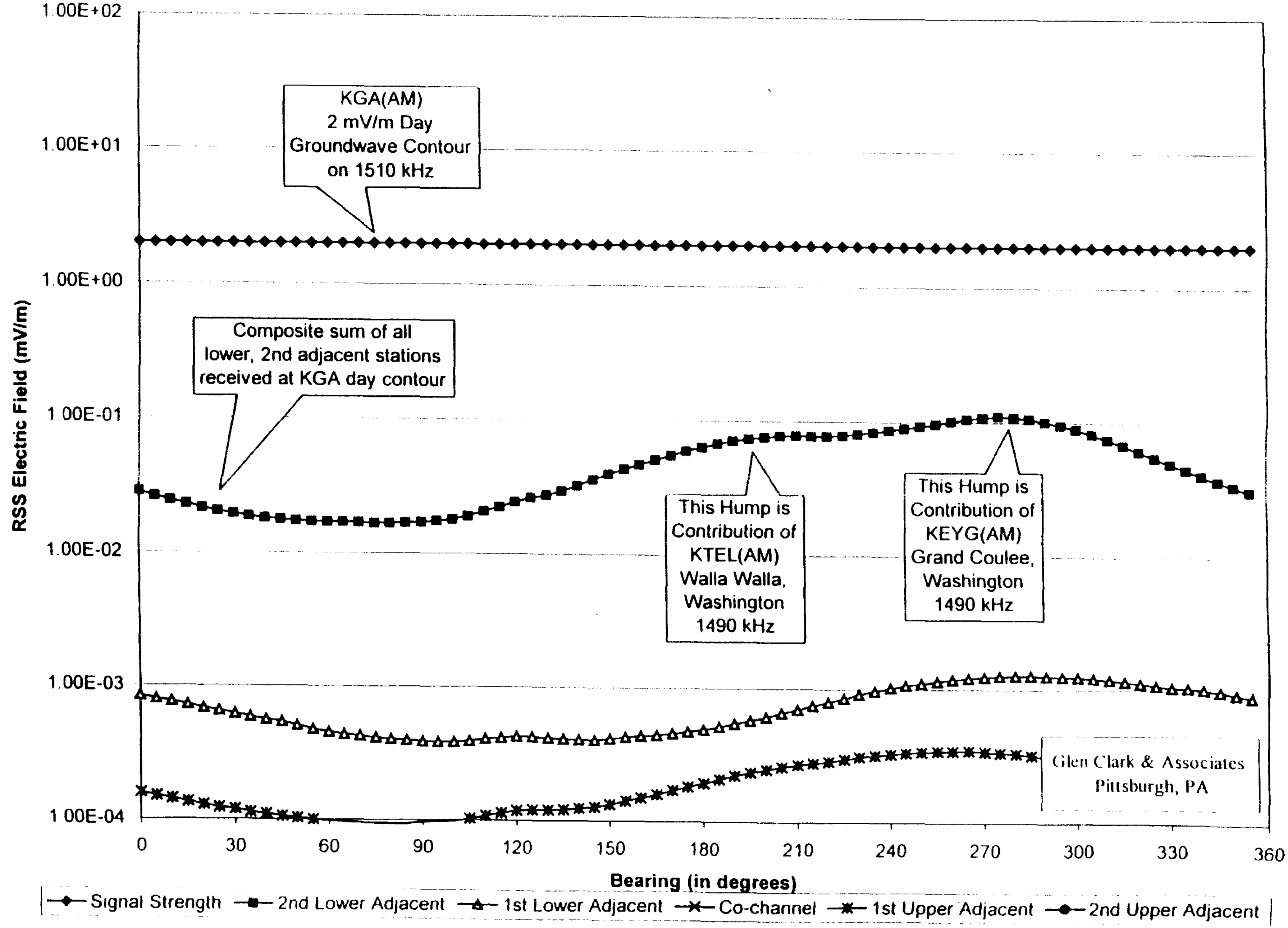
Figure C-10A shows that KDKA (Pittsburgh, PA) receives significant interference over some azimuths from three distant stations. Over the arc from 345 degrees, clockwise through 60 degrees True, the desired KDKA signal is exceeded by the skywave contributions of WMVP (Chicago), CFRB (Toronto) and WBZ (Boston).

INTERPRETATION OF THE NECKLACE CHART DATA

Figures C-1A through C-10A clearly show that there is a great variability in the allocation environments experienced by the stations in the study. When considering the design of the digital protocol, it is apparent that no one structure will be optimal for all stations. The data leads us to believe that the best overall results will be obtained from an IBOC protocol which is adaptive to the RF conditions found.

* * * *

FIGURE C-1A - Incoming Daytime Interference to KGA(AM), Spokane, Washington (1510 kHz)



ALL CONTOURS BASED ON FCC FIGURE M3 CONDUCTIVITIES

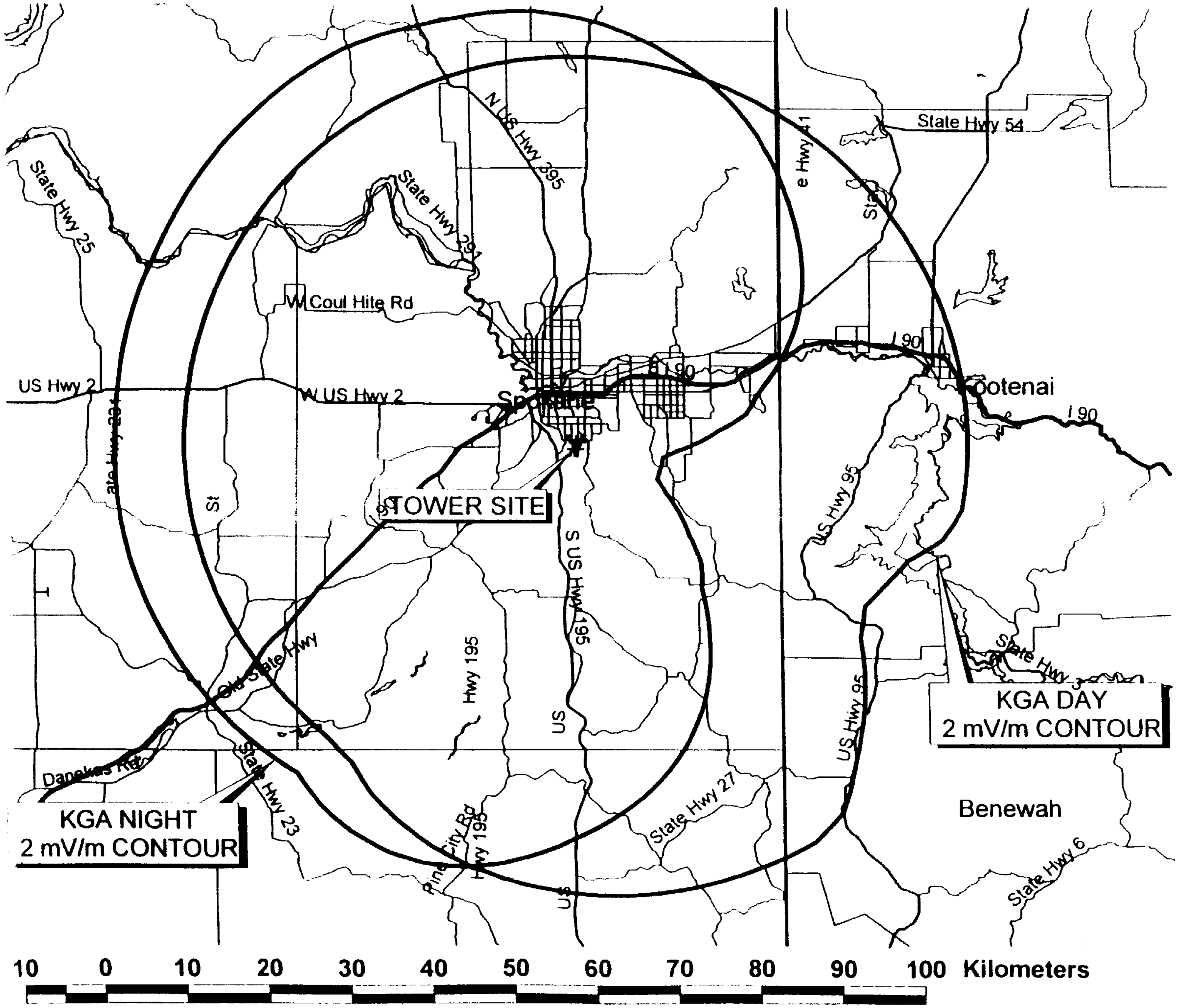


FIGURE C-1B

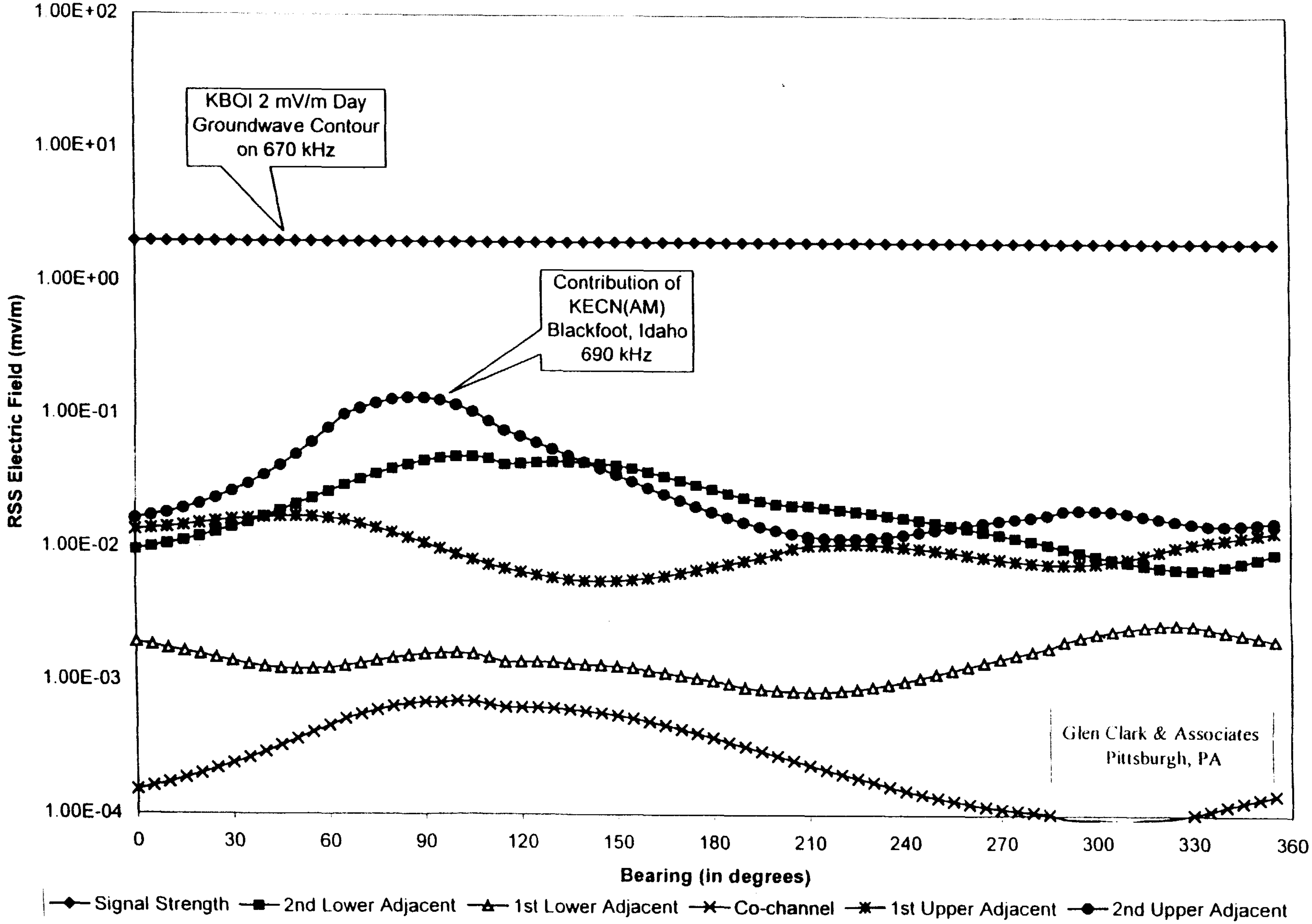
STATION #96
KGA

SPOKANE, WA
MARKET #87

1510 kHz, 50 kW, DA-N
CLASS A
47-35-44 North
117-22-15 West

Glen Clark & Associates
Pittsburgh, PA

FIGURE C-2A - Incoming Daytime Interference to KBOI(AM), Boise, Idaho (670 kHz)



ALL CONTOURS BASED ON FCC FIGURE M3 CONDUCTIVITIES.

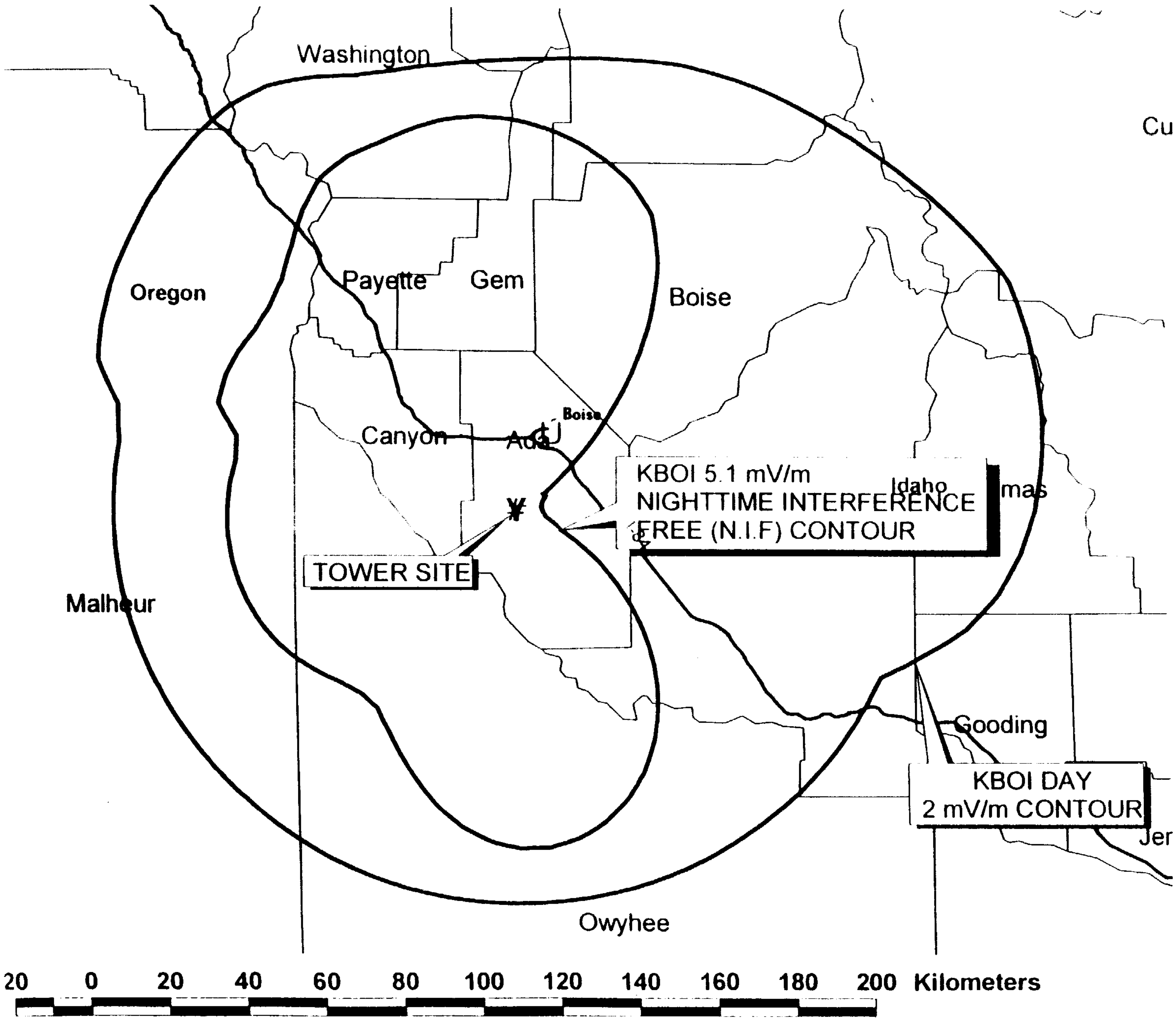


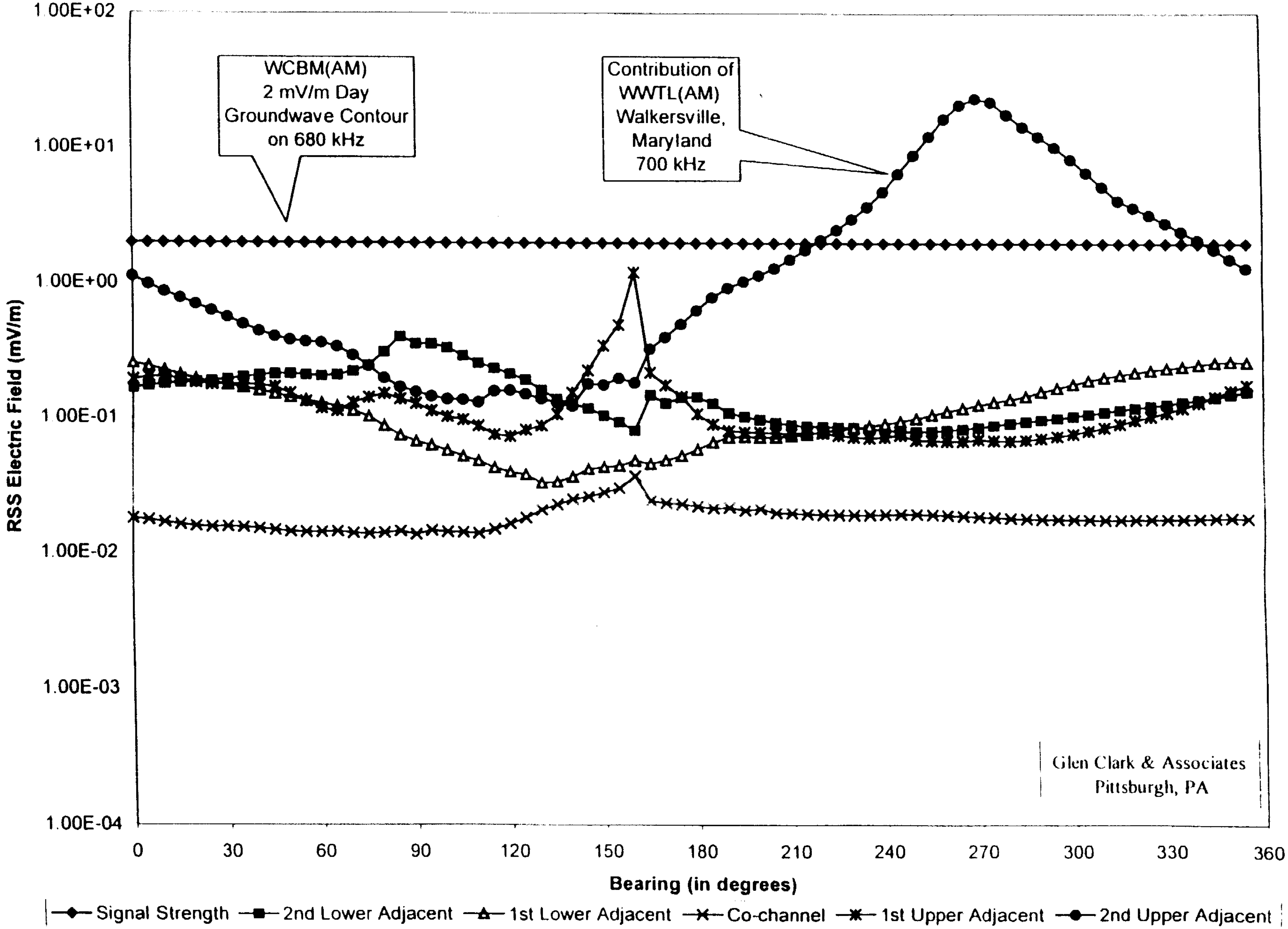
FIGURE C-2B

STATION #33
KBOI
BOISE, ID
MARKET #126

670 kHz, 50 kW, DA-N
CLASS B
43-25-44 North
116-19-43 West

Glen Clark & Associates
Pittsburgh, PA

FIGURE C-3A - Incoming Daytime Interference to WCBM(AM), Baltimore, Maryland (680 kHz)



ALL CONTOURS BASED ON FCC FIGURE M3 CONDUCTIVITIES

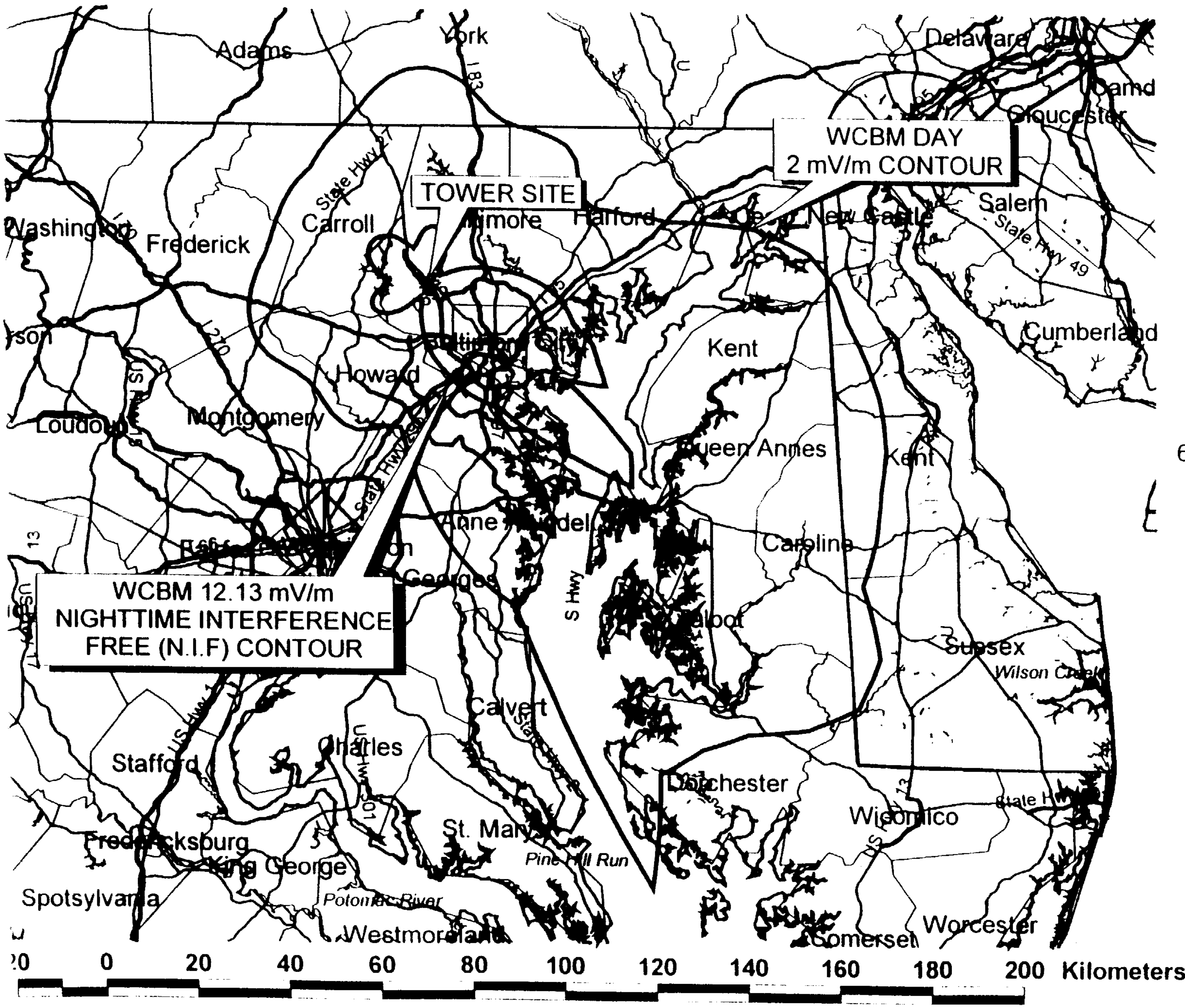


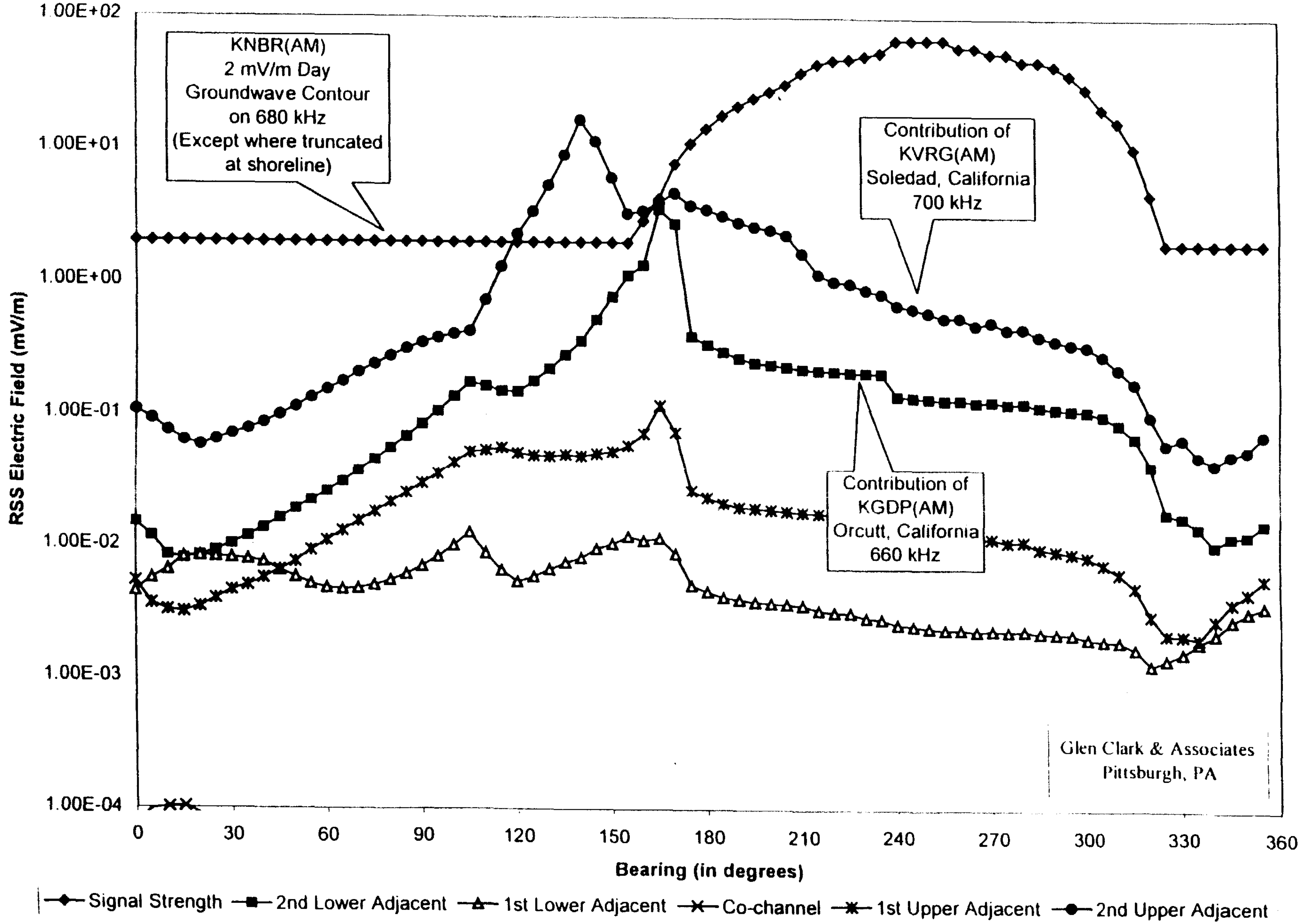
FIGURE C-3B

STATION #47
WCBM
BALTIMORE, MD
MARKET #19

680 kHz, 10/5 kW, DA-2
CLASS B
39-24-30 North
76-46-34 West

Glen Clark & Associates
Pittsburgh, PA

FIGURE C-4A - Incoming Daytime Interference to KNBR(AM), San Francisco, California (680 kHz)



ALL CONTOURS BASED ON FCC FIGURE M3 CONDUCTIVITIES.

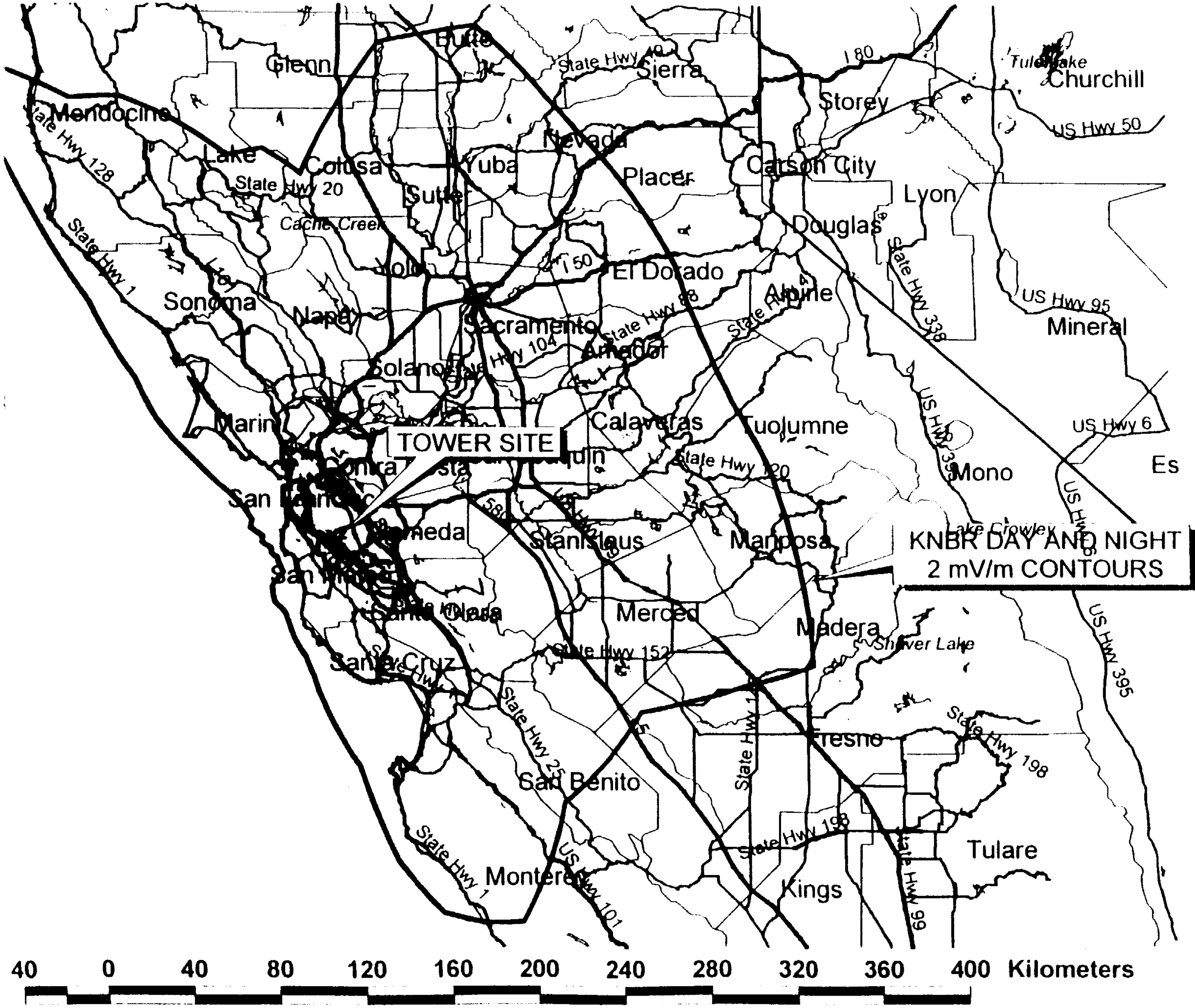


FIGURE C-4B

STATION #7

KNBR

SAN FRANCISCO, CA

MARKET #4

680 kHz, 50 kW, ND-U

CLASS A

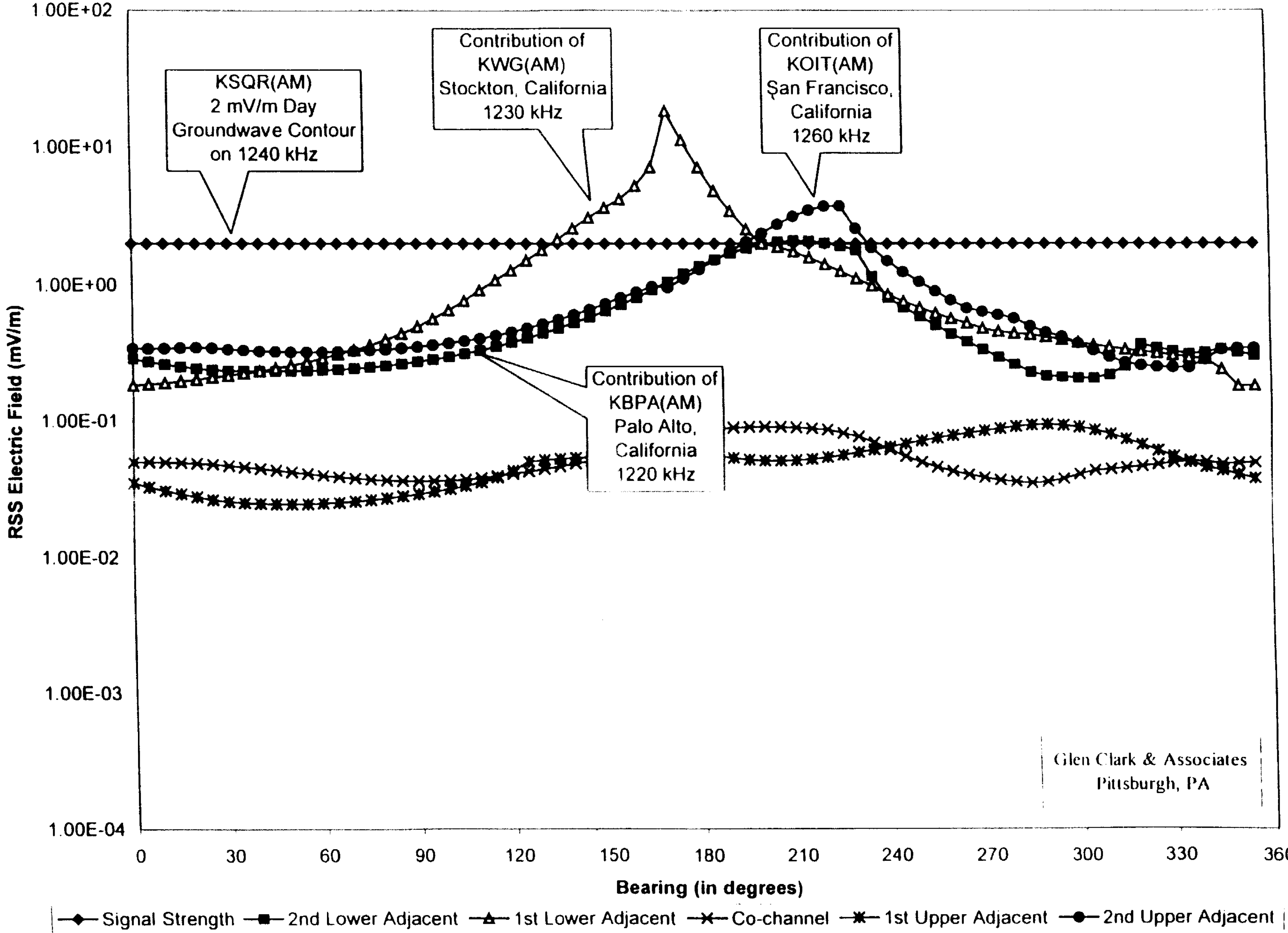
37-32-50 North

122-14-0 West

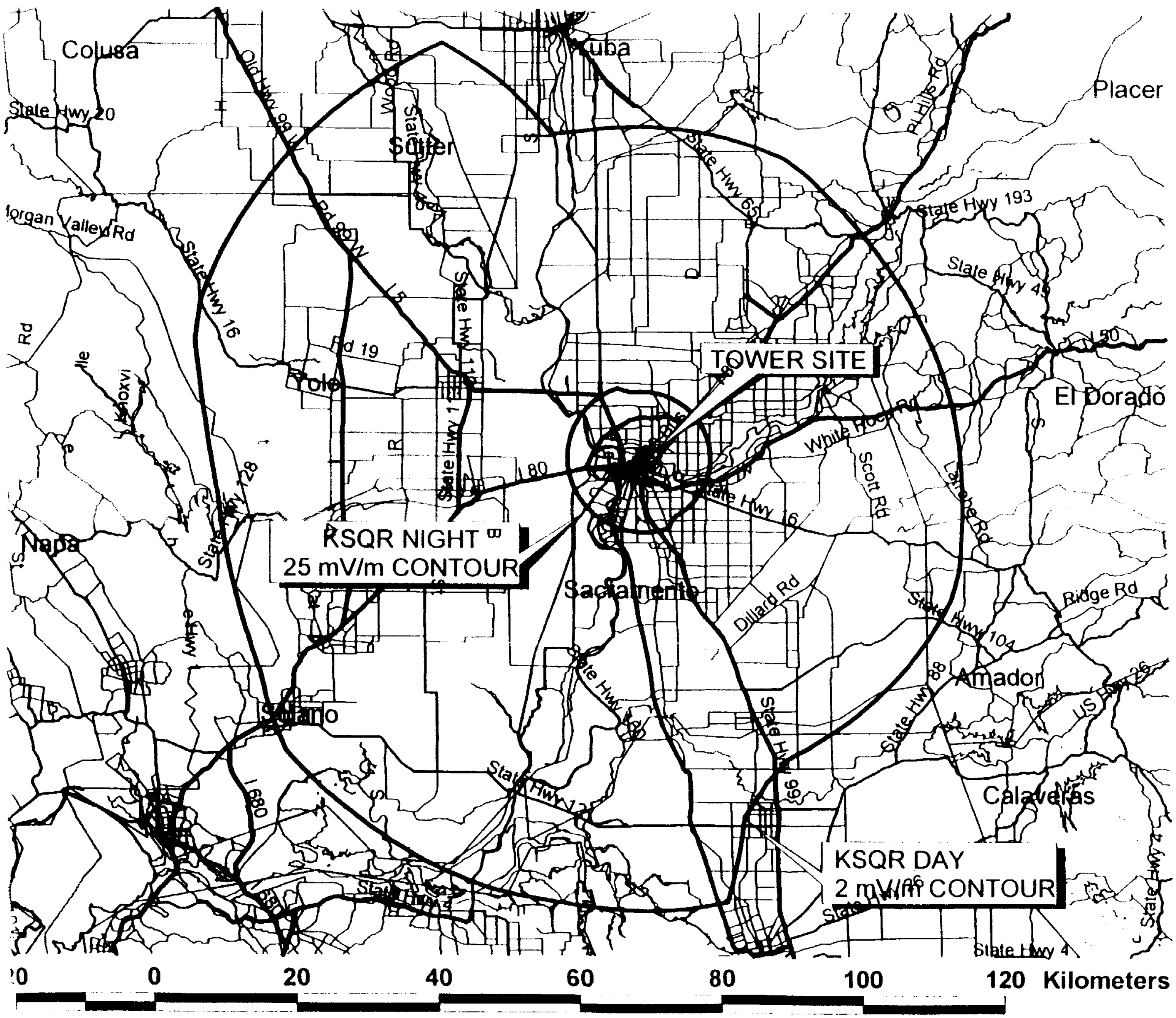
Glen Clark & Associates

Pittsburgh, PA

FIGURE C-5A - Incoming Daytime Interference to KSQR(AM), Sacramento, California (1240 kHz)



ALL CONTOURS BASED ON FCC FIGURE M3 CONDUCTIVITIES



N

FIGURE C-5B

STATION #13

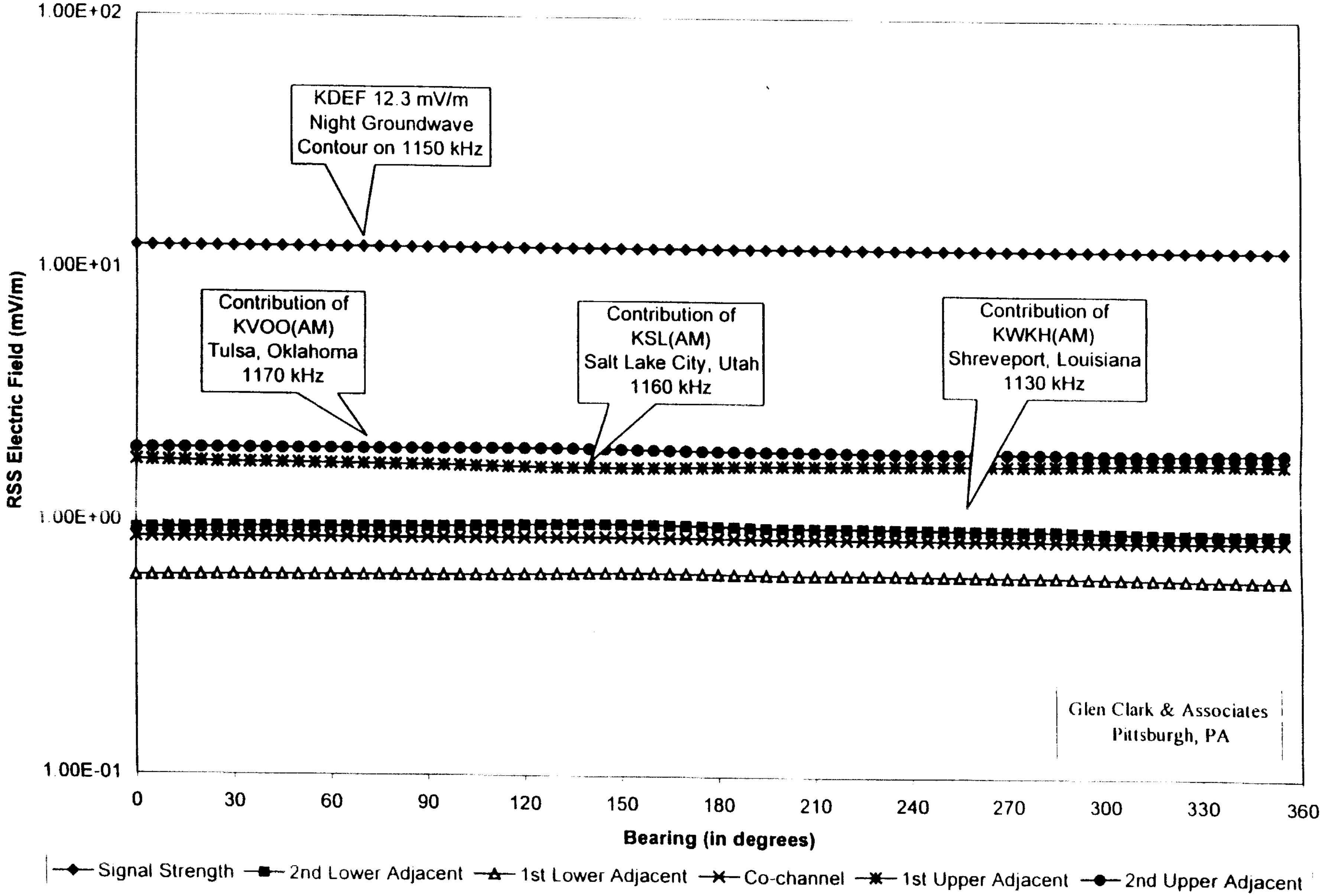
KSQR

SACRAMENTO, CA
MARKET #27

1240 kHz, 1 kW, ND-U
CLASS C
38-35-17 North
121-28-5 West

Glen Clark & Associates
Pittsburgh, PA

FIGURE C-6A - Incoming Nighttime Interference to KDEF(AM), Albuquerque, New Mexico (1150 kHz)



ALL CONTOURS BASED ON FCC FIGURE M3 CONDUCTIVITIES.

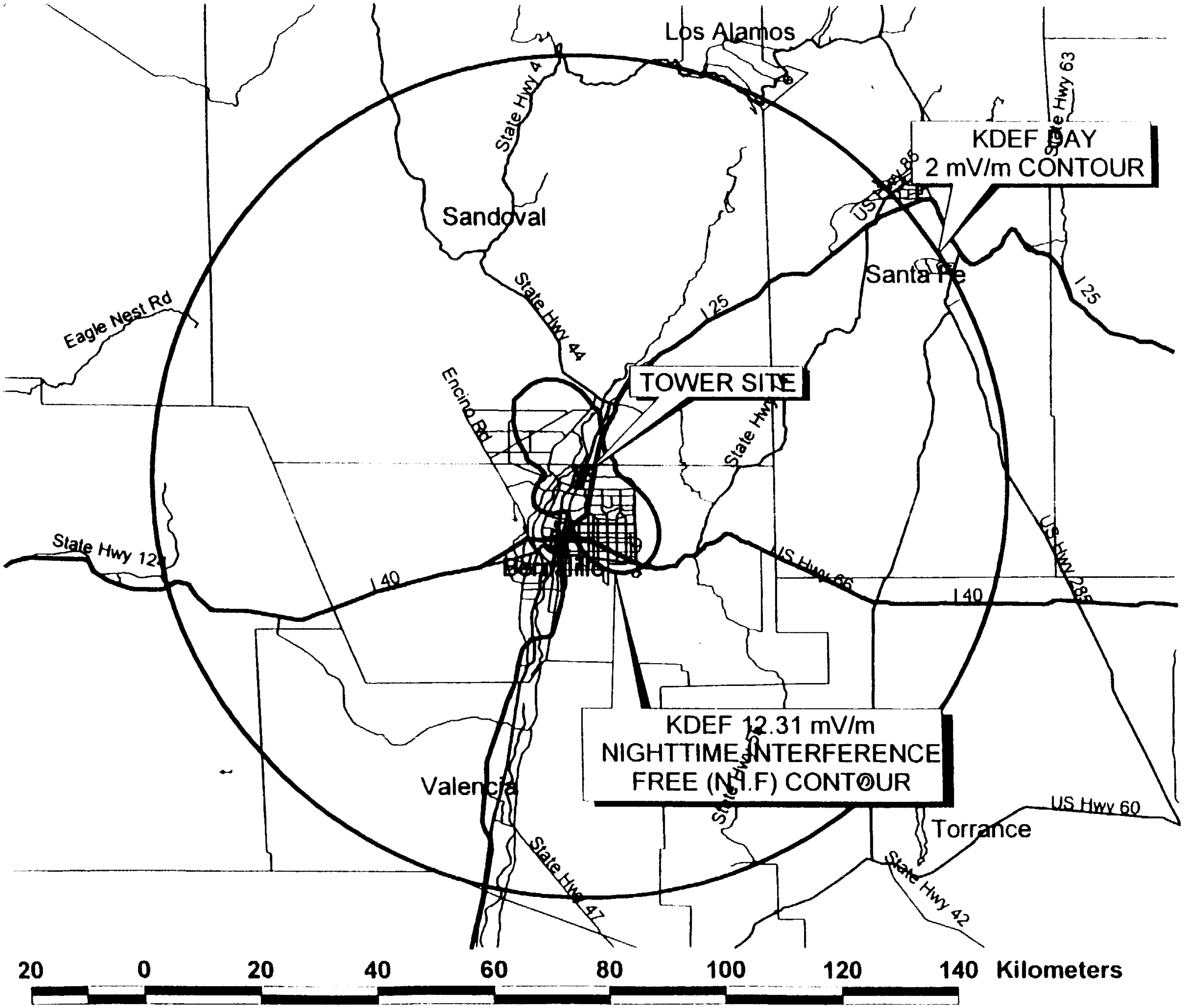


FIGURE C-6B

STATION #62

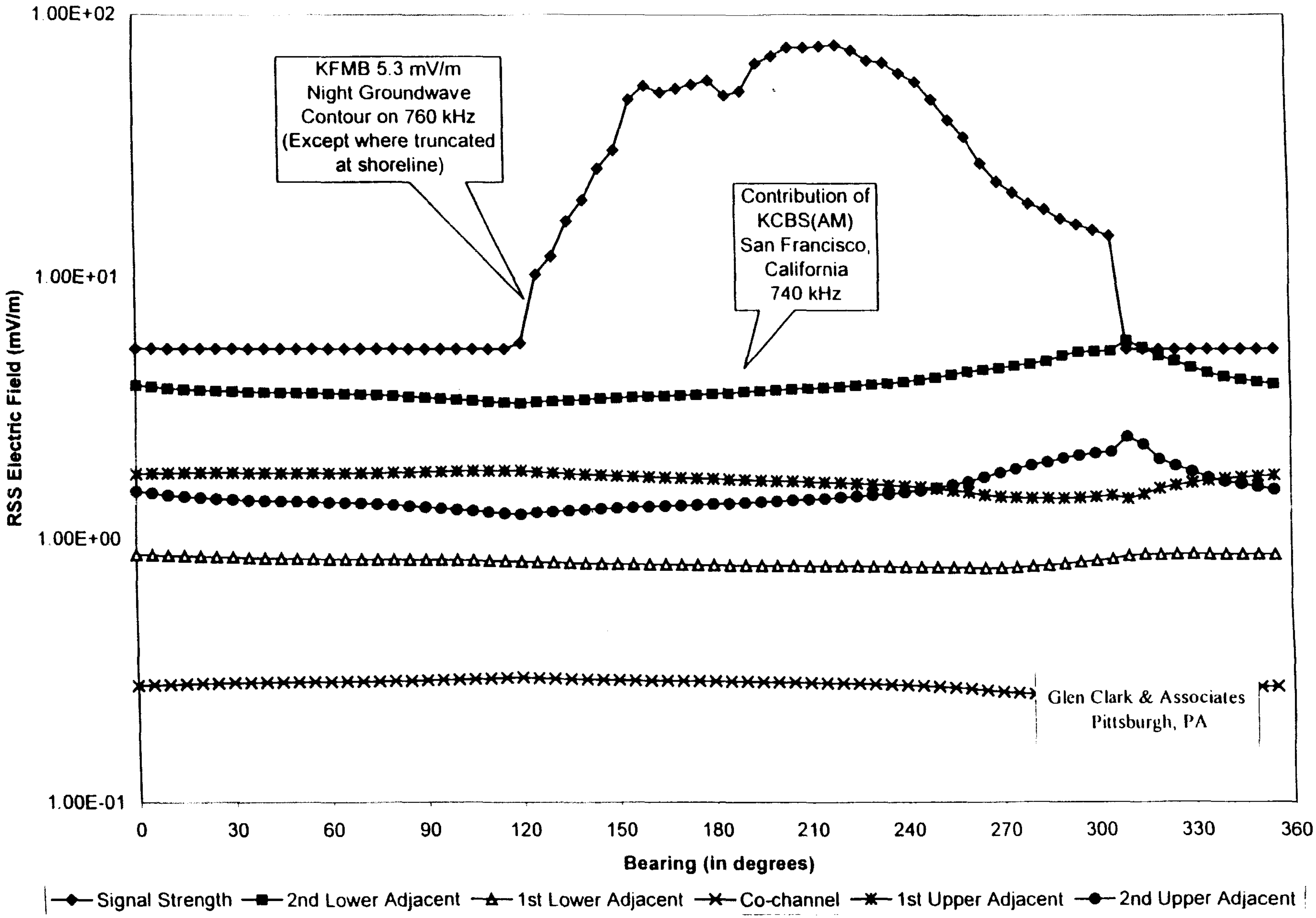
KDEF

ALBUQUERQUE, NM
MARKET #70

1150 kHz, 5/0.5 kW, DA-N
CLASS B
35-12-6 North
106-35-54 West

Glen Clark & Associates
Pittsburgh, PA

FIGURE C-7A - Incoming Nighttime Interference to KFMB(AM), San Diego, California (760 kHz)



ALL CONTOURS BASED ON FCC FIGURE M3 CONDUCTIVITIES.

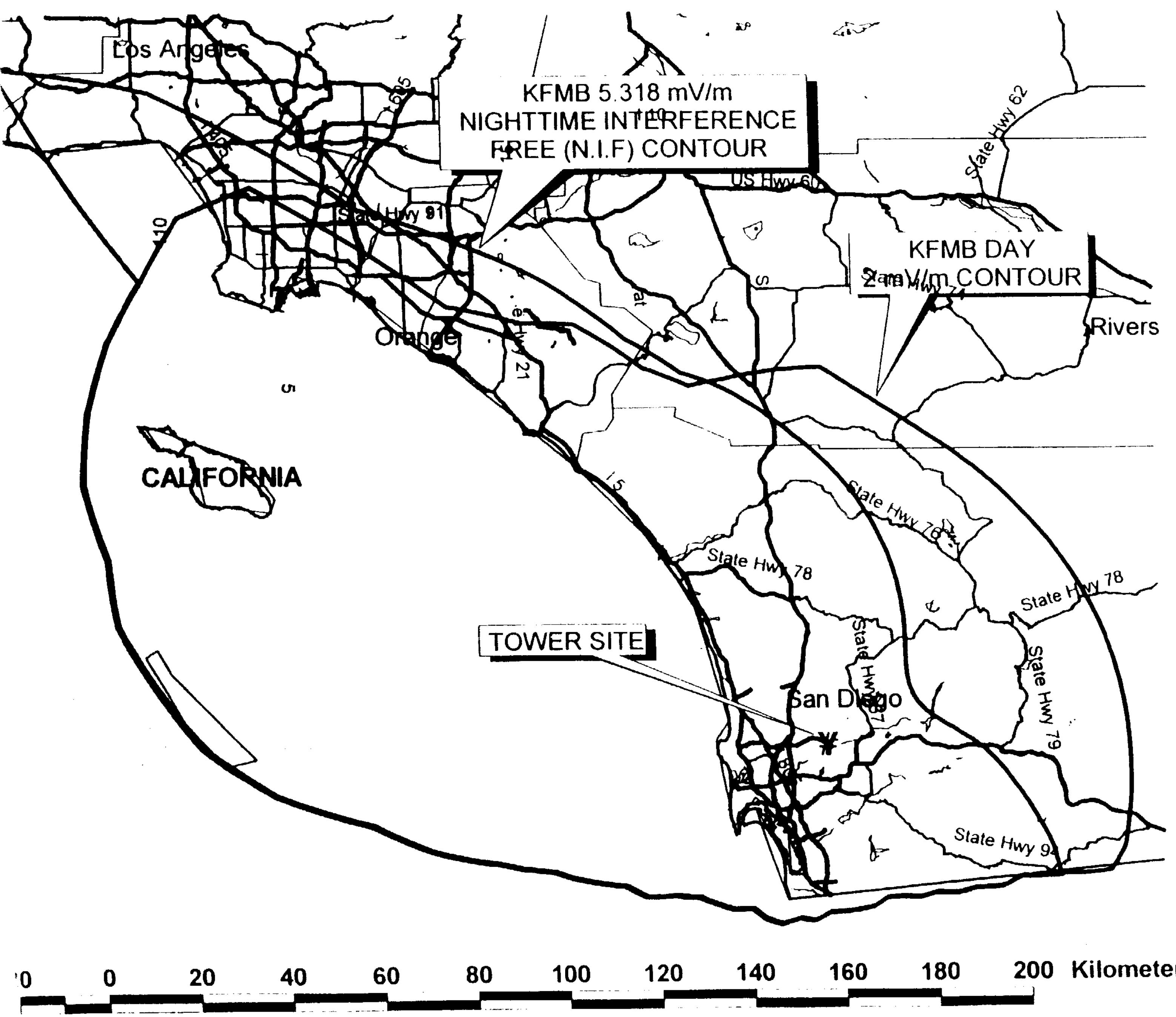


FIGURE C-7B

STATION #8

KFMB

SAN DIEGO, CA
MARKET #15

760 kHz, 5/50 kW, DA-N
CLASS B
32-50-33 North
117-1-30 West

Glen Clark & Associates
Pittsburgh, PA