CAA Office KC, Mo. Ch. Planning & Control Div. Ext 82 Harrison-6110

Mrs. Watkins.

ENGINEERING STATEMENT OF A. EARL CULLUM, JR., CONSULTING RADIO ENGINEERS, IN CONNECTION WITH THE APPLICATION OF KANSAS BROADCASTING, INC., LICENSEE OF RADIO STATION KANS, WICHITA, KANSAS, FOR CONSTRUCTION PERMIT TO CHANGE FREQUENCY FROM 1240 KILOCYCLES TO 1480 KILOCYCLES, TO INCREASE POWER FROM 250 WATTS TO 5000 WATTS DAYTIME AND 1000 WATTS NIGHTTIME USING A DIRECTIONAL ANTENNA DURING NIGHTTIME HOURS, TO INSTALL A 5000-WATT TRANSMITTER, AND TO CHANGE THE TRANSMITTER SITE FROM THE LASSEN HOTEL TO A LOCATION WEST OF WICHITA, KANSAS.

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I, D. A. PETERSON, AM A RADIO ENGINEER ASSOCIATED WITH THE FIRM OF A. EARL CULLUM, JR., CONSULTING RADIO ENGINEERS, WITH OFFICES LOCATED IN DALLAS, TEXAS. I GRADUATED FROM THE ENGINEERING SCHOOL OF SOUTHERN METHODIST UNIVERSITY IN 1934 WITH A BACHELOR OF SCIENCE DEGREE IN ELECTRICAL ENGINEERING. MY EXPERIENCE INCLUDES ALMOST CONTINUOUS EMPLOYMENT BY BROADCAST STATIONS SINCE 1933. SINCE 1940, I HAVE BEEN ASSOCIATED WITH THE FIRM OF A. EARL CULLUM, JR.

THIS FIRM HAS BEEN EMPLOYED BY KANSAS BROADCASTING, INC., LICENSEE OF STATION KANS, WICHITA, KANSAS, TO PREPARE THE ENGINEERING PORTION OF AN APPLICATION FOR CONSTRUCTION PERMIT TO CHANGE FREQUENCY FROM 1240 KILOCYCLES TO 1480 KILOCYCLES, TO INCREASE POWER FROM 250 WATTS TO 5000 WATTS DAYTIME AND 1000 WATTS NIGHTTIME USING A DIRECTIONAL ANTENNA DURING NIGHTTIME HOURS, TO INSTALL A 5000-WATT TRANSMITTER, AND TO CHANGE THE TRANSMITTER SITE FROM THE LASSEN HOTEL TO A LOCATION WEST OF WICHITA, KANSAS.

EXISTING OPERATING CONDITIONS

STATION KANS IS NOW LICENSED TO OPERATE WITH 250 WATTS OF POWER UNLIMITED TIME ON THE 1240-KILOCYCLE CHANNEL IN THE VICINITY OF WICHITA, KANSAS. THE ANTENNA IS LOCATED ON TOP OF THE LASSEN

HOTEL IN THE CITY OF WICHITA, KANSAS. IT HAS BEEN ASSUMED THAT THE EXISTING ANTENNA HAS AN EFFICIENCY SUCH AS TO PRODUCE AN UNATTENUATED FIELD OF 75 MILLIVOLTS PER METER AT ONE MILE FOR A RADIATED POWER OF 250 WATTS. THE GROUND CONDUCTIVITY IN THE VICINITY OF WICHITA, KANSAS, HAS BEEN ASSUMED TO HAVE A VALUE OF 20 TIMES 10 TO THE MINUS 14TH E.M.U. AS SHOWN ON THE GROUND CONDUCTIVITY MAP IN THE STANDARDS OF GOOD ENGINEERING PRACTICE OF THE FEDERAL COMMUNICATIONS COMMISSION. MAPS SHOWING THE EXISTING COVERAGE OF STATION KANS HAVE BEEN PREPARED, BASED ON THESE ASSUMPTIONS.

PROPOSED OPERATING CONDITIONS

AN ALLOCATION STUDY OF THE NIGHTTIME CONDITIONS ON THE 1480-KILOCYCLE CHANNEL HAS BEEN MADE. LIMITATIONS TO STATIONS WERE CALCULATED BY USING THE 10-PERCENT TIME, SECOND-HOUR, SKY-WAVE CURVES OF THE FEDERAL COMMUNICATIONS COMMISSION AND A RATIO OF 20 TO 1 FOR DESIRED TO UNDESIRED SIGNALS. AFTER THE ALLOCATION STUDY HAD BEEN MADE, A DIRECTIONAL ANTENNA WAS DESIGNED TO PROVIDE FOR OPERATION ON THE 1480-KILOCYCLE CHANNEL WITH 1000 WATTS OF POWER DURING NIGHTTIME HOURS FROM THE VICINITY OF WICHITA, KANSAS. COMPLETE SPECIFICATIONS OF THE PROPOSED ANTENNA ARE ATTACHED.

DURING DAYTIME HOURS, STATION KANS PROPOSES TO OPERATE WITH 5000 WATTS OF POWER AND A NONDIRECTIONAL ANTENNA 200 FEET HIGH. IT HAS BEEN ASSUMED THAT THE ANTENNA EFFICIENCY WILL BE SUCH AS TO PRODUCE AN UNATTENUATED FIELD OF 445 MILLIVOLTS PER METER AT ONE MILE FOR A RADIATED POWER OF 5000 WATTS.

IN CALCULATING THE COVERAGE TO BE EXPECTED FROM THE PROPOSED

ANTENNA SYSTEM, USE WAS MADE OF THE GROUND CONDUCTIVITY MAP IN THE STANDARDS OF GOOD ENGINEERING PRACTICE WHICH INDICATES THAT THE GROUND CONDUCTIVITY IN THE VICINITY OF WICHITA, KANSAS, IS 20 TIMES 10 TO THE MINUS 14TH E.M.U.

LIST OF FIGURES ATTACHED

IN CARRYING OUT THE STUDIES, DESIGNING THE DIRECTIONAL ANTENNA, AND DETERMINING THE COVERAGE, THE FOLLOWING FIGURES WERE PREPARED BY ME OR UNDER MY DIRECTION:

1. SPECIFICATIONS OF PROPOSED ANTENNA FOR KANS
2. DIRECTIONAL ANTENNA DESIGN FORMULAE
3. DIRECTIONAL ANTENNA CALCULATIONS
4. ANTENNA AND GROUND SYSTEM SPECIFICATIONS
5. DIRECTIONAL ANTENNA HORIZONTAL RADIATION PATTERN AND TABULATION OF DATA FOR 1480-KILOCYCLE, 1000-WATT OPERATION
6. DIRECTIONAL ANTENNA VERTICAL RADIATION PATTERNS AND TABULATIONS OF DATA FOR 1480-KILOCYCLE, 1000 WATT OPERATION
7. ALLOCATION STUDY OF THE EXISTING AND PROPOSED CONDITIONS ON THE 1480-KILOCYCLE CHANNEL
8. MAPS SHOWING THE 500-, 250-, 25-, 5.0-, 2.0-, AND 0.5-MILLIVOLT-PER-METER CONTOURS FROM THE PROPOSED NON-DIRECTIONAL ANTENNA USING 5000 WATTS OF POWER ON 1480 KILOCYCLES
9. MAPS SHOWING THE 500-, 250-, 25-, 6.4-, 5.0-, AND 4.0-MILLIVOLT-PER-METER CONTOURS FROM THE PROPOSED DIRECTIONAL ANTENNA USING 1000 WATTS OF POWER ON

1480 KILOCYCLES

10. MAPS SHOWING THE 500-, 250-, 25-, 5.0-, 4.0-, 2.0-, AND 0.5-MILLIVOLT-PER-METER CONTOURS FROM THE EXISTING NONDIRECTIONAL ANTENNA USING 250 WATTS OF POWER ON 1240 KILOCYCLES
11. MAP SHOWING THE PROPOSED SITE AND THE TOPOGRAPHY IN THE VICINITY OF WICHITA, KANSAS
12. MAP SHOWING THE PROPOSED SITE, AIRWAYS, AND AIRPORTS IN THE VICINITY OF WICHITA, KANSAS. OTHER STATIONS SERVING WICHITA ARE SHOWN ON THIS MAP
13. PHOTOGRAPHS FROM THE PROPOSED SITE IN THE EIGHT DIRECTIONS INDICATED.

POPULATION AND AREA ANALYSES OF COVERAGE MAPS

A POPULATION ANALYSIS HAS BEEN PREPARED BASED ON THE ABOVE COVERAGE MAPS BY USING THE 1940 UNITED STATES CENSUS FIGURES AND THE STANDARDS OF GOOD ENGINEERING PRACTICE OF THE FEDERAL COMMUNICATIONS COMMISSION CONCERNING COVERAGE. THE POPULATION FIGURES WERE DETERMINED BY AN ANALYSIS OF THE POPULATION DISTRIBUTION USING MINOR CIVIL DIVISION MAPS SUPPLEMENTED BY HIGHWAY PLANNING SURVEY MAPS. A DETAILED STUDY OF THE POPULATION WITHIN THE EXISTING BLANKET AREA IN WICHITA HAS BEEN MADE BY A CHECK ON HOTELS, APARTMENT HOUSES, APARTMENT HOTELS, AND PRIVATE HOMES WITHIN THE BLANKET AREA AS REFLECTED IN THE RECORDS OF THE COUNTY TAX ASSESSOR. THE AREAS WERE DETERMINED BY USING A POLAR PLANIMETER AND THE ORIGINAL MAPS. THE FOLLOWING IS A TABULATION OF THE COVERAGE FIGURES FROM EACH STUDY:

EXISTING OPERATION 1240 KC 250 WATTS ND

CONTOUR	POPULATION	AREA - SQ. MI.
WITHIN THE 500-MV/M CONTOUR	1,400	
WITHIN THE 250-MV/M CONTOUR	5,700	
WITHIN THE 25-MV/M CONTOUR	104,215	
WITHIN THE 5.0-MV/M CONTOUR	131,668	
WITHIN THE 4.0-MV/M CONTOUR	133,741	491
WITHIN THE 2.0-MV/M CONTOUR	151,422	
WITHIN THE 0.5-MV/M CONTOUR	223,398	5,810

PROPOSED DAYTIME OPERATION 1480 KC 5 KW ND

CONTOUR	POPULATION	AREA - SQ. MI.
WITHIN THE 500-MV/M CONTOUR	76	
WITHIN THE 250-MV/M CONTOUR	824	
WITHIN THE 25- MV/M CONTOUR	131,428	
WITHIN THE 5.0-MV/M CONTOUR	179,913	
WITHIN THE 2.0-MV/M CONTOUR	279,093	
WITHIN THE 0.5-MV/M CONTOUR	431,303	17,000

PROPOSED NIGHTTIME OPERATION 1480 KC 1 KW DA

CONTOUR	POPULATION	AREA - SQ. MI.
WITHIN THE 500-MV/M CONTOUR	27	
WITHIN THE 250-MV/M CONTOUR	72	
WITHIN THE 25-MV/M CONTOUR	102,327	
WITHIN THE 6.4-MV/M CONTOUR	135,776	1,222
WITHIN THE 5.0-MV/M CONTOUR	140,858	
WITHIN THE 4.0-MV/M CONTOUR	145,527	707

THE 25-MILLIVOLT-PER-METER CONTOUR FROM THE PROPOSED 5000-WATT DAYTIME OPERATION WILL COMPLETELY COVER THE CITY OF WICHITA, KANSAS. THE 25-MILLIVOLT-PER-METER CONTOUR FROM THE PROPOSED 1000-WATT NIGHTTIME OPERATION WILL COVER THE MAIN BUSINESS AND INDUSTRIAL AREA, AND THE 6.4-MILLIVOLT-PER-METER CONTOUR WILL COVER ALL OF THE CITY OF WICHITA, KANSAS. THE 250-MILLIVOLT-PER-METER CONTOURS FOR BOTH DAYTIME AND NIGHTTIME PROPOSED

OPERATION WILL INCLUDE LESS THAN ONE PERCENT OF THE POPULATION OF WICHITA, KANSAS.

A. EARL CULLUM, JR.
CONSULTING RADIO ENGINEERS

D. A. PETERSON

AUGUST 10, 1946

STATE OF TEXAS)
) SS:
COUNTY OF DALLAS)

D. A. PETERSON, BEING DULY SWORN, UPON HIS OATH DEPOSES AND SAYS THAT THE FACTS STATED IN THE FOREGOING, TOGETHER WITH ALL EXHIBITS ATTACHED HERETO, ARE TRUE OF HIS OWN KNOWLEDGE, EXCEPT AS TO SUCH STATEMENTS AS THEREIN STATED TO BE ON INFORMATION AND BELIEF, AND AS TO SUCH STATEMENTS HE BELIEVES THEM TO BE TRUE.

D. A. Peterson

D. A. PETERSON

SUBSCRIBED AND SWORN TO BEFORE ME THIS 10TH DAY OF AUGUST, 1946.

Ethelene Jackson

NOTARY PUBLIC IN AND FOR
DALLAS COUNTY, TEXAS

MY COMMISSION EXPIRES JUNE 1, 1947

SPECIFICATIONS OF PROPOSED ANTENNA FOR STATION KANS

FREQUENCY	1480 KILOCYCLES
RATED POWER DAYTIME	5000 WATTS NONDIRECTIONAL
RATED POWER NIGHTTIME	1000 WATTS DIRECTIONAL
NUMBER OF TOWERS DAYTIME	1 TOWER
NUMBER OF TOWERS NIGHTTIME	2 TOWERS
TYPE OF TOWERS	TRIANGULAR TAPERED SELF-SUPPORTING
TOWER BASE WIDTH	5% OF TOWER HEIGHT
TYPE OF FEED	SERIES FEED
TOWER HEIGHT ABOVE INSULATOR	198 FEET
TOWER HEIGHT ABOVE GROUND	200 FEET
TOWER HEIGHT ABOVE SEA LEVEL	1519 FEET
LINE OF TOWERS	SEE FIGURE 4
TOWER SPACING	SEE FIGURE 4
GROUND SYSTEM	SEE FIGURE 4
TOWER FIELD RATIO	SEE FIGURE 3
TOWER FIELD PHASE	SEE FIGURE 3
TRANSMISSION LINES	CONCENTRIC
ANTENNA AMMETERS	THERMAL AND REMOTE THERMAL
CURRENT RATIO MEASUREMENTS	CURRENT MONITOR FROM SAMPLING LOOPS
CURRENT PHASE MEASUREMENTS	PHASE MONITOR FROM SAMPLING LOOPS

LOCATION — NEW 1.7 MILES WEST OF CITY LIMITS OF WICHITA ON CONTINUATION OF 13TH STREET

N. LAT. 37° 42' 47"
W. LONG. 97° 25' 23"

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FIGURE 1

DIRECTIONAL ANTENNA DESIGN FORMULAE

$$F(E) = 2 \cos \left[\frac{\Psi}{2} - \frac{KD \cos \Phi \cos \Theta}{2} \right]$$

$$F(\Theta) = \frac{\cos (G \sin \Theta) - \cos G}{\cos \Theta (1 - \cos G)}$$

$$K = (1 - \cos G) \,/\, \sin G$$

$$P = (I_1^2 \times R_1) + (I_2^2 \times R_2)$$

$$E = 37.25 \times I \times K \times F(E) \times F(\Theta)$$

WHERE:

P	IS BASE POWER IN WATTS
E	IS FIELD INTENSITY IN MILLIVOLTS PER METER UNATTENUATED AT ONE MILE
I	IS THEORETICAL UNIT VECTOR CURRENT
I_1	IS CURRENT AT BASE OF ELEMENT 1 OPERATING DIRECTIONAL
I_2	IS CURRENT AT BASE OF ELEMENT 2 OPERATING DIRECTIONAL
R_1	IS RESISTANCE AT BASE OF ELEMENT 1 OPERATING DIRECTIONAL
R_2	IS RESISTANCE AT BASE OF ELEMENT 2 OPERATING DIRECTIONAL
Ψ	IS PHASE DIFFERENCE BETWEEN THE TOWERS
KD	IS DISTANCE BETWEEN THE TOWERS
G	IS HEIGHT OF THE TOWERS
K	IS FORM FACTOR OF THE TOWERS
Φ	IS ANGLE FROM THE LINE OF TOWERS TO RADIATION VECTOR
Θ	IS ANGLE FROM HORIZONTAL TO RADIATION VECTOR

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FIGURE 2

DIRECTIONAL ANTENNA CALCULATIONS

GIVEN:	RATED POWER	1000	WATTS
	KD	225	DEGREES
	Ψ	168	DEGREES
	G	108.2	DEGREES

ASSUMED:	TOTAL EQUIPMENT LOSSES	7.5	PERCENT
	ANTENNA AND GROUND LOSSES	4.0	OHMS PER TOWER
	CURRENT DISTRIBUTION		SINUSOIDAL

EXPECTED RESULTS:

	(1)	(2)	
TOWER NUMBER			
TOWER LOCATION	WEST	EAST	
FIELD RATIO	1.00	1.00	
FIELD PHASE	0.0	+168	DEGREES
BASE CURRENT	2.35	2.35	AMPERES
BASE RESISTANCE	92.3	88.9	OHMS
BASE POWER	509	491	WATTS

FORM FACTOR $K = 1.38$

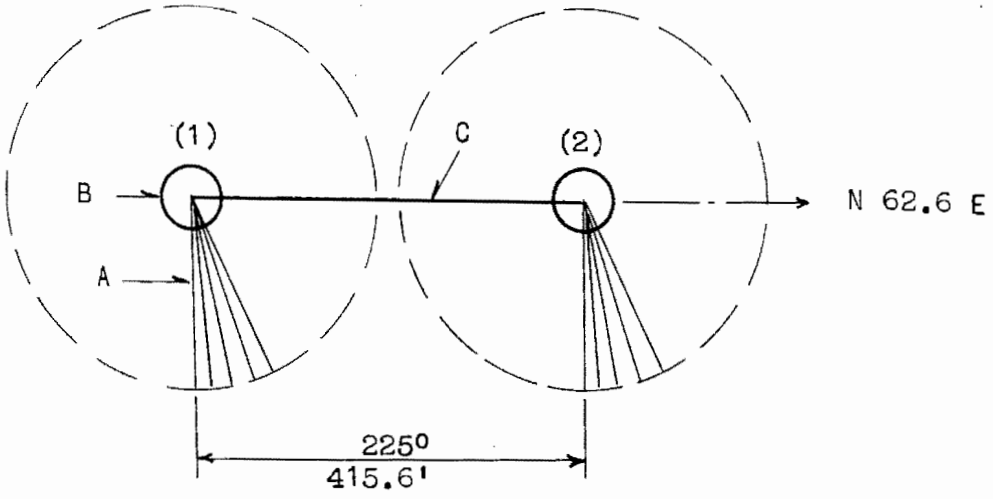
VECTOR CURRENT $I = 2.35$

FIELD INTENSITY AT ONE MILE IN ANY DIRECTION $E = 120.8 \times F(E) \times F(\Theta)$

VARIOUS VALUES WERE THEN ASSIGNED TO Θ AND Φ, AND THE CORRESPONDING VALUES OF $F(E)$, $F(\Theta)$, AND E WERE DETERMINED. THE RESULTS OF THESE CALCULATIONS ARE LISTED ON THE ATTACHED FIGURES.

AFTER THE HORIZONTAL RADIATION PATTERN WAS PLOTTED AND PLANIMETERED, THE R.M.S. VALUE OF THE HORIZONTAL FIELD WAS FOUND TO BE 200 MILLIVOLTS PER METER UNATTENUATED AT ONE MILE FROM THE ANTENNA.

ANTENNA AND GROUND SYSTEM SPECIFICATIONS



GROUND SYSTEM:

A: 240 RADIALS 30 FEET LONG BURIED 2 TO 4 INCHES ABOUT EACH TOWER. 120 RADIALS EXTEND TO 200 FEET BURIED 6 TO 8 INCHES

B: COPPER STRAP ABOUT EACH TOWER AT 30 FEET

C: COPPER STRAP BETWEEN THE TOWERS

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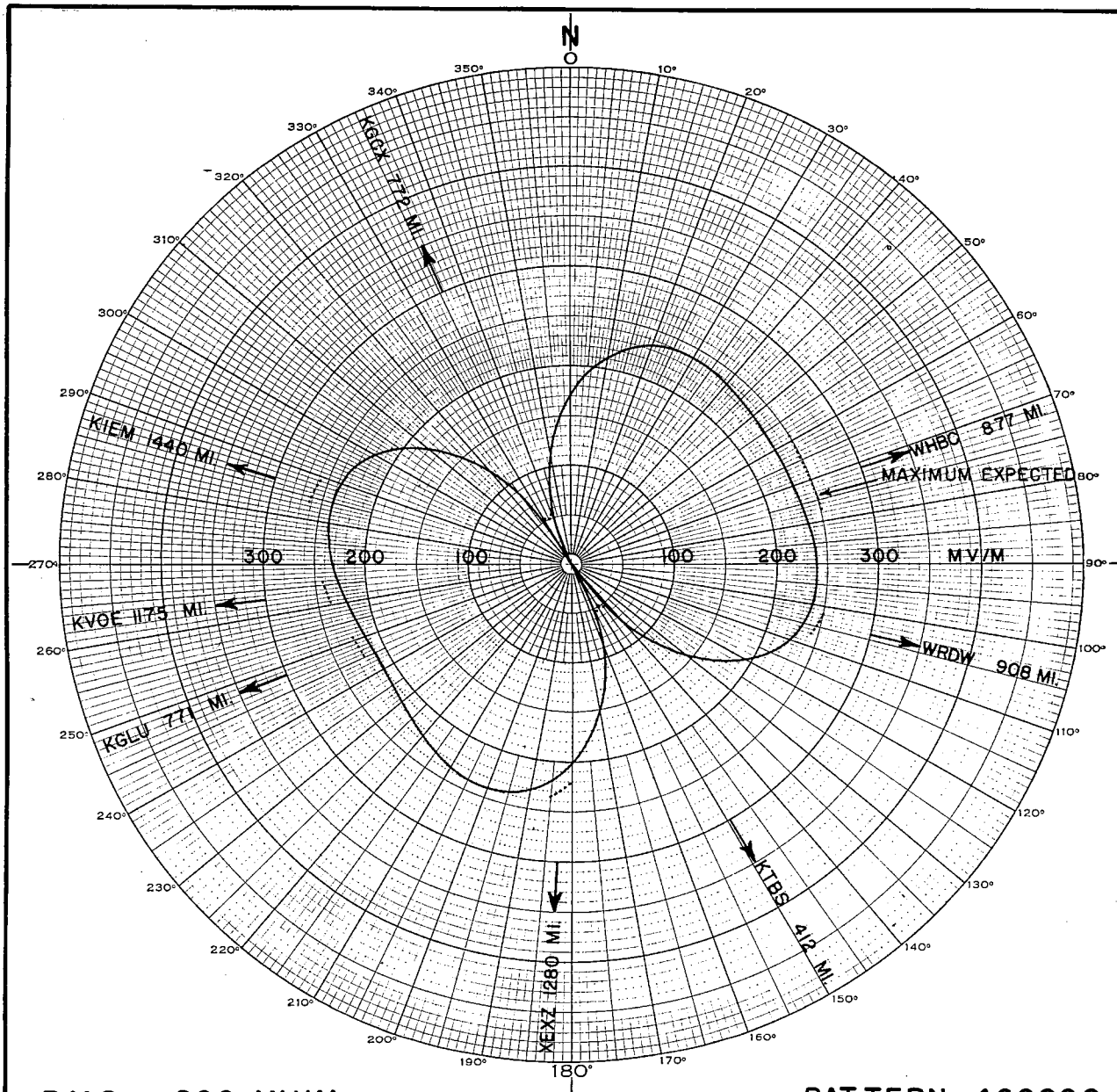
FIGURE 4



R.M.S. = 200 MV/M

PATTERN 460808

(1) ——— 225° ——— (2) → N 62.6° E

G's = 108.2°

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DALLAS TEXAS

Tower	(1)	(2)
Field	1.0	1.0
Phase	0.0°	+168°

RADIO STATION KANS
PROPOSED 1480 KC 1 KW DA-N
FIGURE 5A

RADIO STATION KANS

PROPOSED 1480 KC 1 KW DA-N

HORIZONTAL RADIATION PATTERN

BEARINGS	Φ	F(E)	E(MV/M)
062.6-062.6	00	1.917	230.
052.6-072.6	10	1.933	232.
042.6-082.6	20	1.971	237.
032.6-092.6	30	1.999	240.
022.6-102.6	40	1.971	237.
012.6-112.6	50	1.829	220.
002.6-122.6	60	1.536	184.4
352.6-132.6	70	1.073	128.8
342.6-142.6	80	0.468	56.2
337.6-147.6	85	0.133	16.0
332.6-152.6	90	0.209	25.1
322.6-162.6	100	0.862	103.5
312.6-172.6	110	1.401	168.2
302.6-182.6	120	1.770	212.
292.6-192.6	130	1.959	235.
282.6-202.6	140	1.999	240.
272.6-212.6	150	1.945	234.
262.6-222.6	160	1.858	223.
252.6-232.6	170	1.785	214.
242.6-242.6	180	1.757	211.

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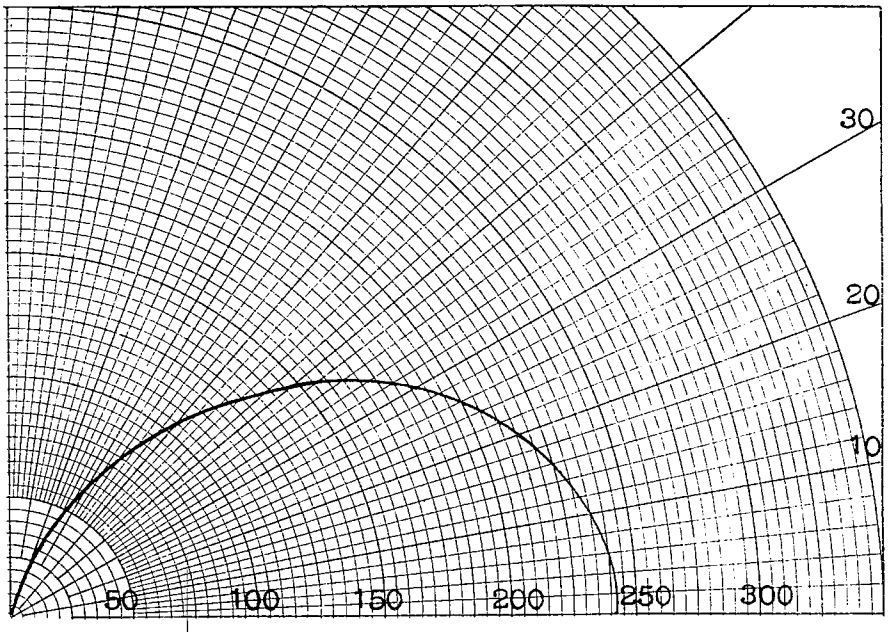
FIGURE 5B

RADIO STATION KANS

PROPOSED 1480 KC 1 KW DA-N

VERTICAL RADIATION PATTERN

IN PLANES THROUGH MAXIMA



AZ: N 31.1 & 94.1 E Φ: ± 31.5

Θ	F(E)	F(Θ)	E(MV/M)
00	2.000	1.000	242.
10	1.999	0.974	235.
20	1.989	0.901	216.
30	1.949	0.791	186.2
40	1.847	0.660	147.3
50	1.651	0.520	103.7
60	1.337	0.382	61.7
70	0.902	0.252	27.5
80	0.370	0.134	6.0
90	-.---	0.000	0.0

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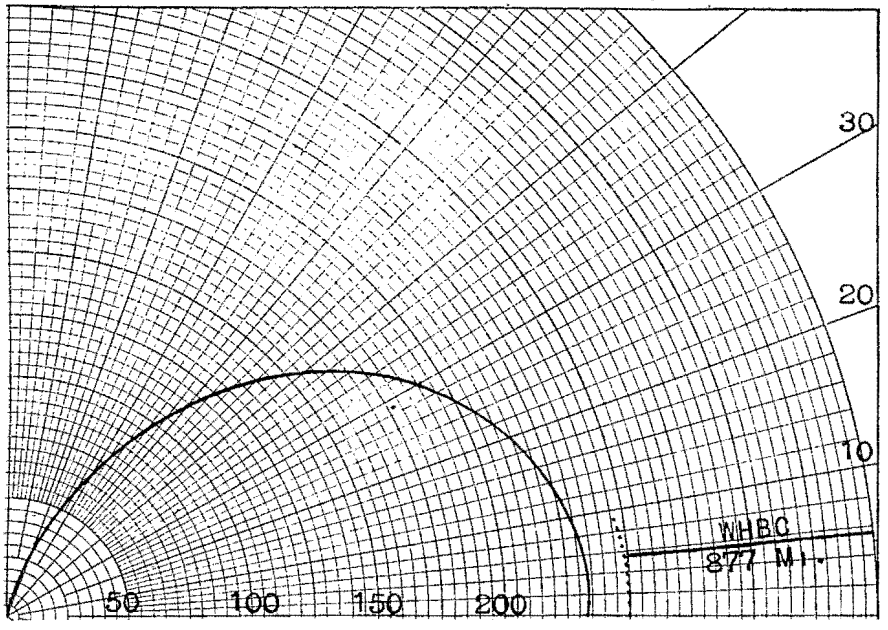
FIGURE 6A

RADIO STATION KANS

PROPOSED 1480 KC 1 KW DA-N

VERTICAL RADIATION PATTERN

IN PLANE THROUGH CANTON, OHIO



AZ: N 71.0 E Φ: 8.4

Θ	F(E)	F(Θ)	E(MV/M)
00	1.929	1.000	233.
10	1.944	0.974	229.
20	1.978	0.901	215.
30	2.000	0.791	191.1
40	1.965	0.660	156.7
50	1.820	0.520	114.3
60	1.524	0.382	70.3
70	1.062	0.252	32.3
80	0.461	0.134	7.5
90	-.---	0.000	0.0

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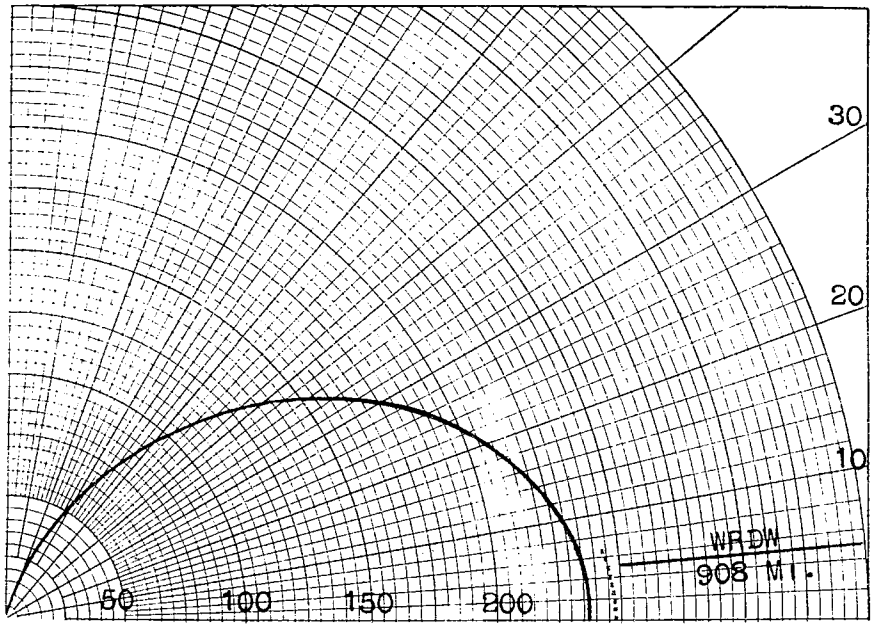
FIGURE 6B

RADIO STATION KANS

PROPOSED 1480 KC 1 KW DA-N

VERTICAL RADIATION PATTERN

IN PLANE THROUGH AUGUSTA, GA.



AZ: N 104.0 E Φ: 41.4

Θ	F(E)	F(Θ)	E(MV/M)
00	1.959	1.000	237.
10	1.950	0.974	229.
20	1.916	0.901	208.
30	1.842	0.791	176.0
40	1.708	0.660	136.2
50	1.492	0.520	93.7
60	1.181	0.382	54.5
70	0.777	0.252	23.7
80	0.301	0.134	4.9
90	-.---	0.000	0.0

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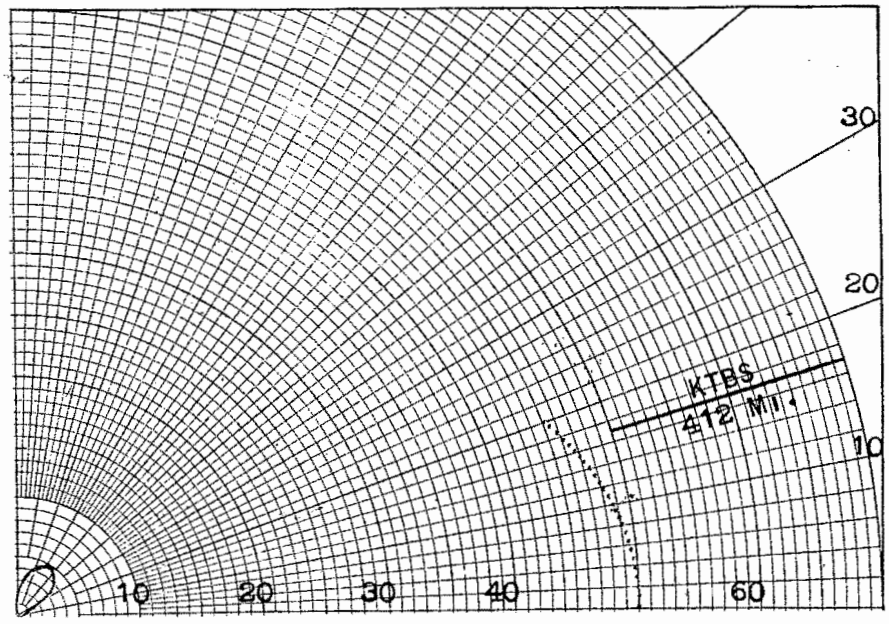
FIGURE 6C

RADIO STATION KANS

PROPOSED 1480 KC 1 KW DA-N

VERTICAL RADIATION PATTERN

IN PLANE THROUGH SHREVEPORT, LA.



AZ: N 149.6 E Φ: 87.0

Θ	F(E)	F(Θ)	E(MV/M)
00	0.004	1.000	0.5
10	0.007	0.974	0.8
20	0.016	0.901	1.7
30	0.031	0.791	3.0
40	0.052	0.660	4.1
50	0.077	0.520	4.8
60	0.107	0.382	4.9
70	0.139	0.252	4.2
80	0.174	0.134	2.8
90	-.---	0.000	0.0

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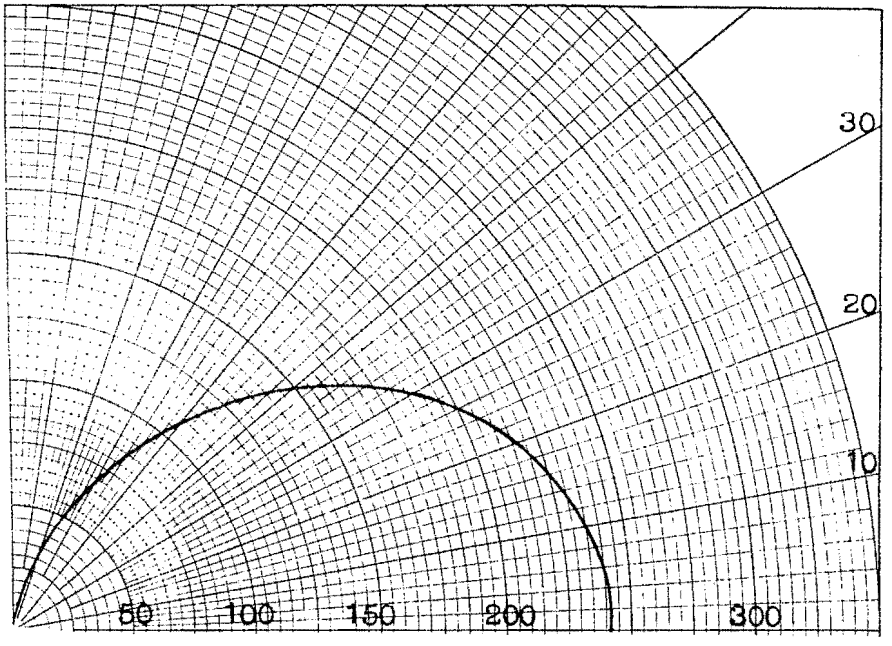
FIGURE 6D

RADIO STATION KANS

PROPOSED 1480 KC 1 KW DA-N

VERTICAL RADIATION PATTERN

IN PLANES THROUGH MAXIMA



AZ: N 200.9 & 284.3 Φ: ± 138.3

Θ	F(E)	F(Θ)	E(MV/M)
00	2.000	1.000	242.
10	1.999	0.974	235.
20	1.992	0.901	217.
30	1.961	0.791	187.4
40	1.883	0.660	150.1
60	1.732	0.520	108.8
60	1.486	0.382	68.6
70	1.139	0.252	34.7
80	0.703	0.134	11.4
90	-.---	0.000	0.0

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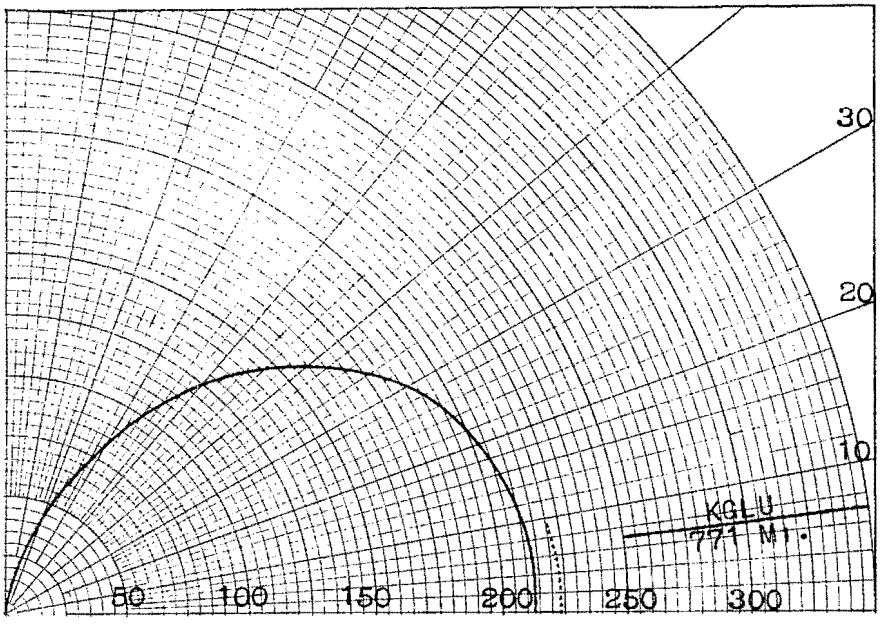
FIGURE 6E

RADIO STATION KANS

PROPOSED 1480 KC 1 KW DA-N

VERTICAL RADIATION PATTERN

IN PLANE THROUGH SAFFORD, ARIZONA



AZ: N 248.2 E Φ: - 174.4

Θ	F(E)	F(Θ)	E(MV/M)
00	1.767	1.000	213.
10	1.794	0.974	211.
20	1.865	0.901	203.
30	1.949	0.791	186.2
40	1.999	0.660	159.4
50	1.956	0.520	122.9
60	1.766	0.382	81.5
70	1.396	0.252	42.5
80	0.841	0.134	13.6
90	-.---	0.000	0.0

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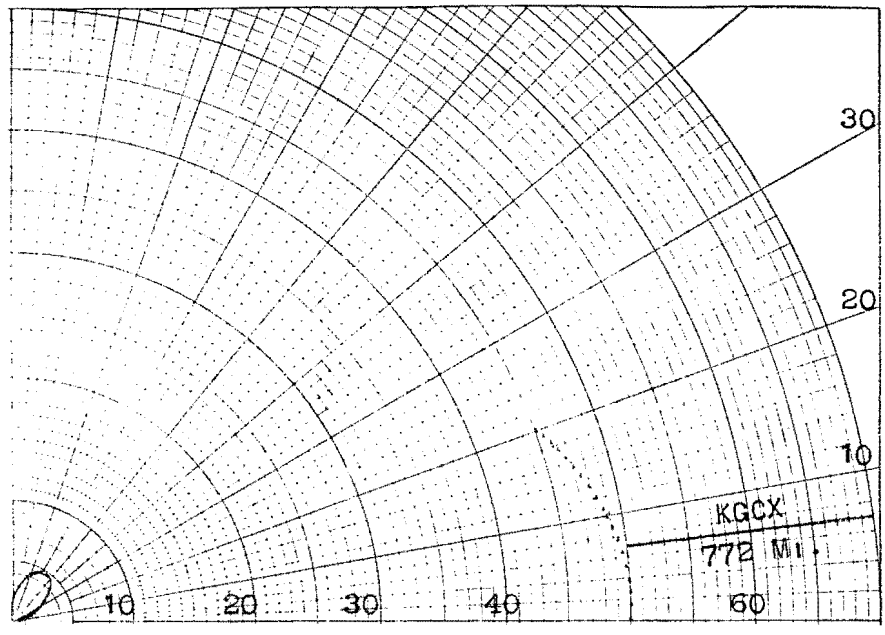
FIGURE 6F

RADIO STATION KANS

PROPOSED 1480 KC 1 KW DA-N

VERTICAL RADIATION PATTERN

IN PLANE THROUGH SIDNEY, MONTANA



AZ: N 335.6 E

Φ: - 87.0

Θ	F(E)	F(Θ)	E(MV/M)
00	0.004	1.000	0.5
10	0.007	0.974	0.8
20	0.016	0.901	1.7
30	0.031	0.791	3.0
40	0.052	0.660	4.1
50	0.077	0.520	4.8
60	0.107	0.382	4.9
70	0.139	0.252	4.2
80	0.174	0.134	2.8
90	-.---	0.000	0.0

460808

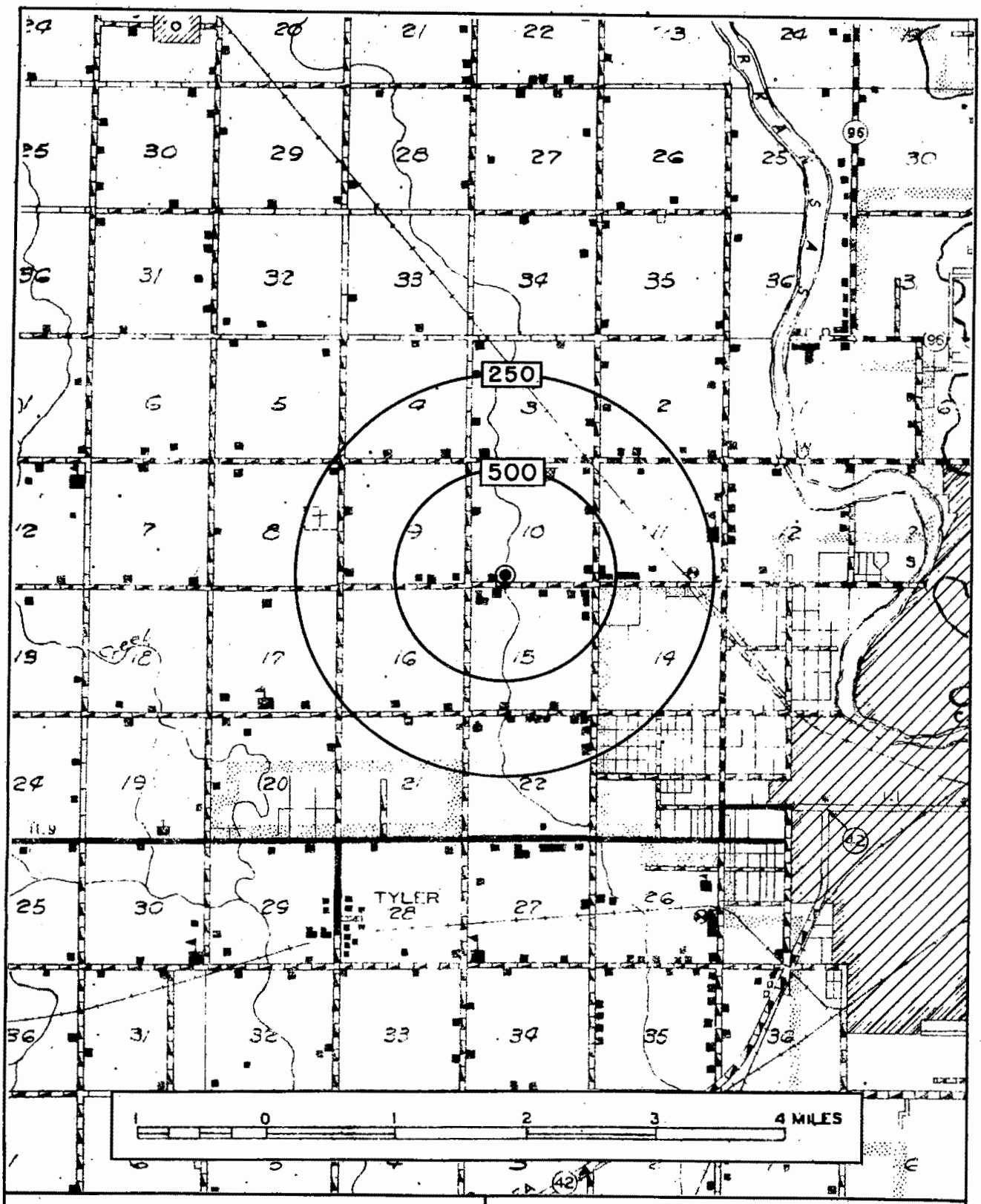
FIGURE 6G

1480 - KILOCYCLE NIGHTTIME ALLOCATION

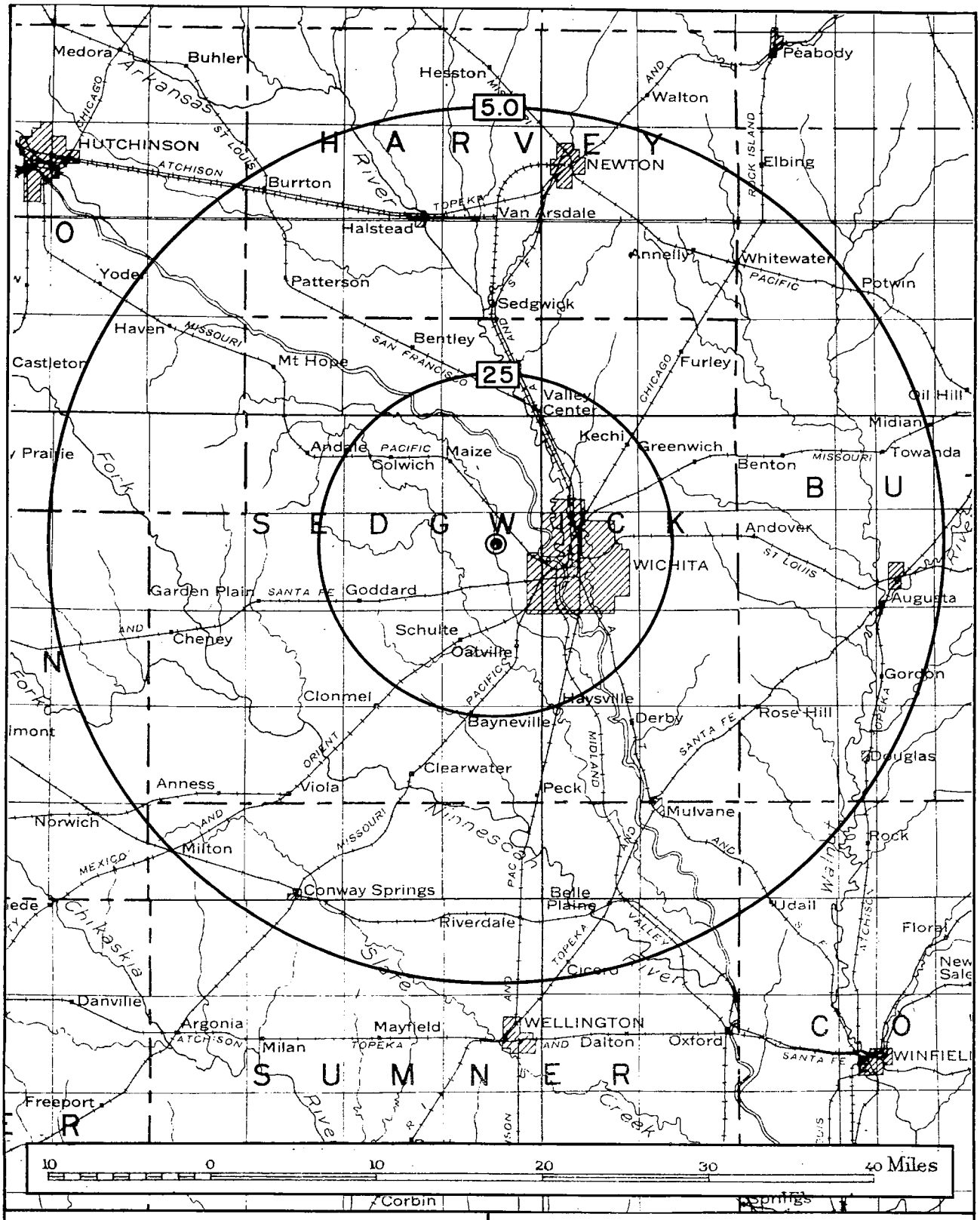
LIMITATION TO	CLASS	EXISTING LIMITATION R.S.S.	EXISTING LIMITATION DOMINANT-FROM	PROPOSED LIMITATION R.S.S.	PROPOSED LIMITATION DOMINANT-FROM	KANS
WHOM	III-B	5.13	5.13 - WSAR	5.13	5.13 - WSAR	0.83
WHBC	III-B	4.85	4.85 - WHOM	4.85	4.85 - WHOM	2.34
WSAR	III-B	4.84	4.84 - WHOM	4.84	4.84 - WHOM	0.61
KTBS	III-A	2.80	2.80 - XEXZ	3.50	2.80 - XEXZ	1.58
WRDW	III-A	4.64	3.54 - WHBC	4.64	3.54 - WHBC	2.10
XEXZ	III-A	1.85	1.34 - KTBS	1.99	1.34 - KTBS	0.72
KGLU	III-B	6.30	6.30 - KCMO	5.18	5.18 - KTBS	2.80
KVOE	III-B	5.78	4.65 - KGLU	6.35	6.35 - KGLU	0.96
KIEM	III-B	2.17	1.77 - KVOE	2.58	1.88 - KGLU	0.60
KGCX	III-A	1.46	1.06 - KVOE	2.00	1.37 - KGLU	0.61
CHGS	IV					0.33
CMHX	IV					0.37
KANS				6.40	6.40 - KTBS	

460808

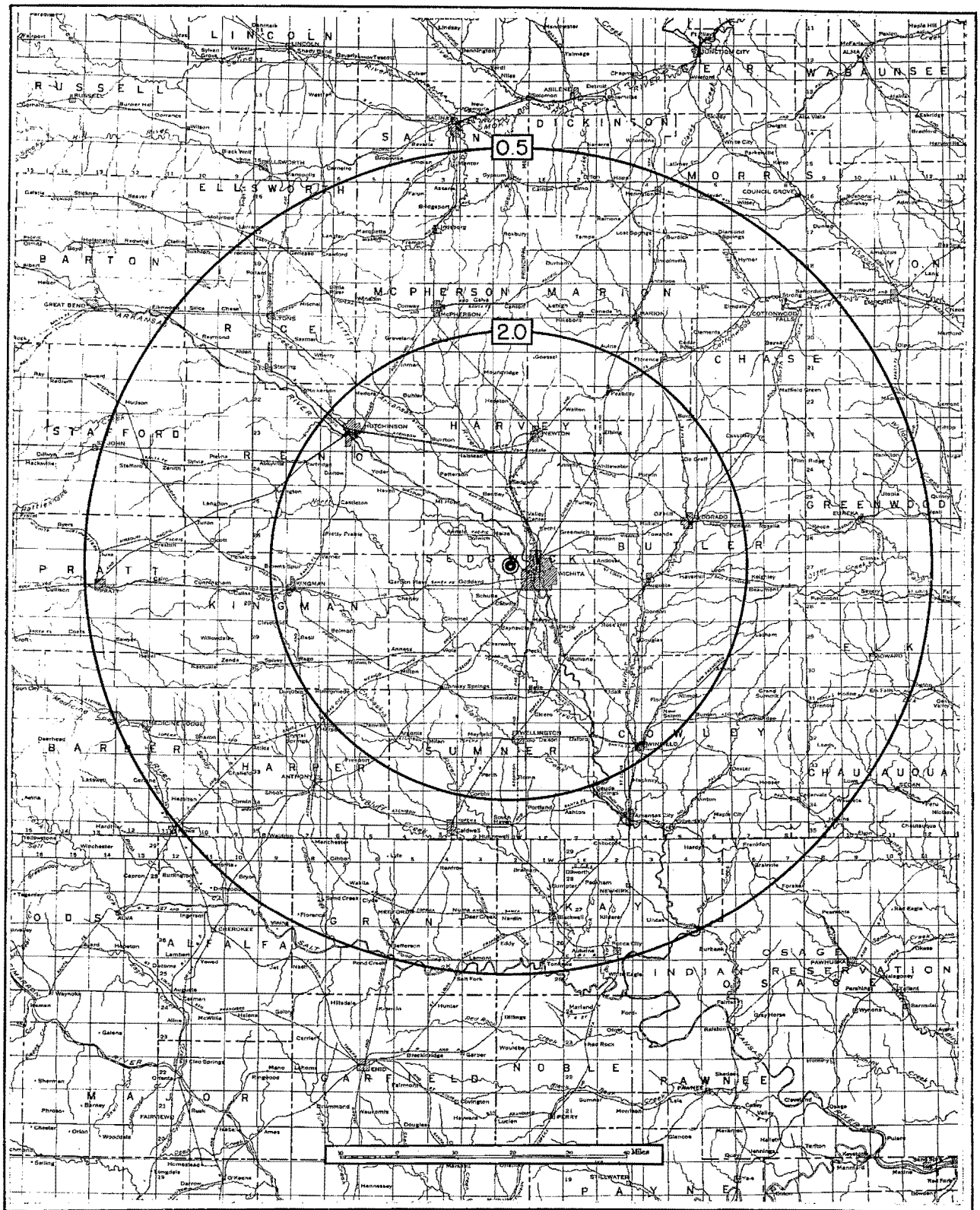
FIGURE 7



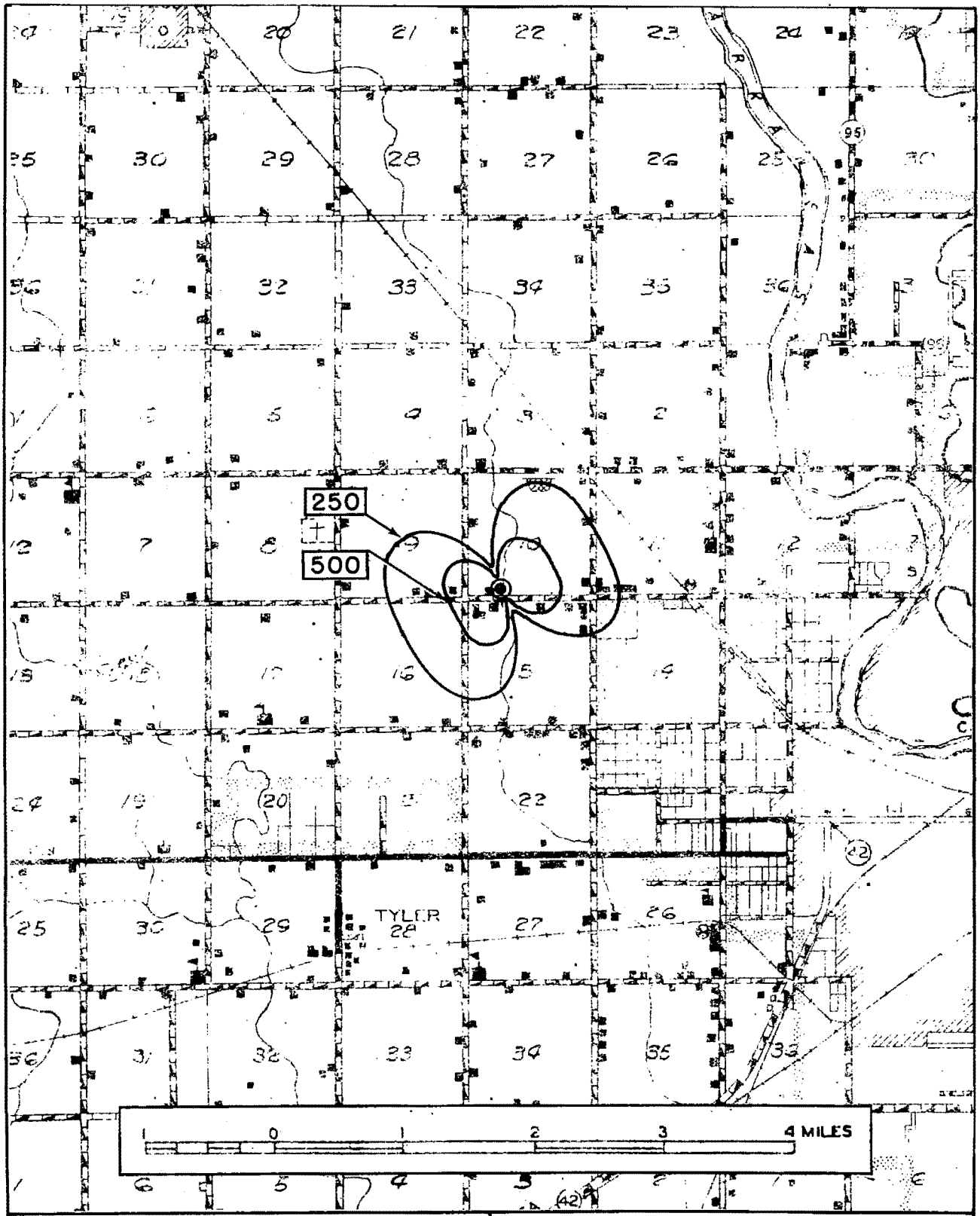
A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS PROPOSED 1480 KC 5 KW ND-D FIGURE 8 A



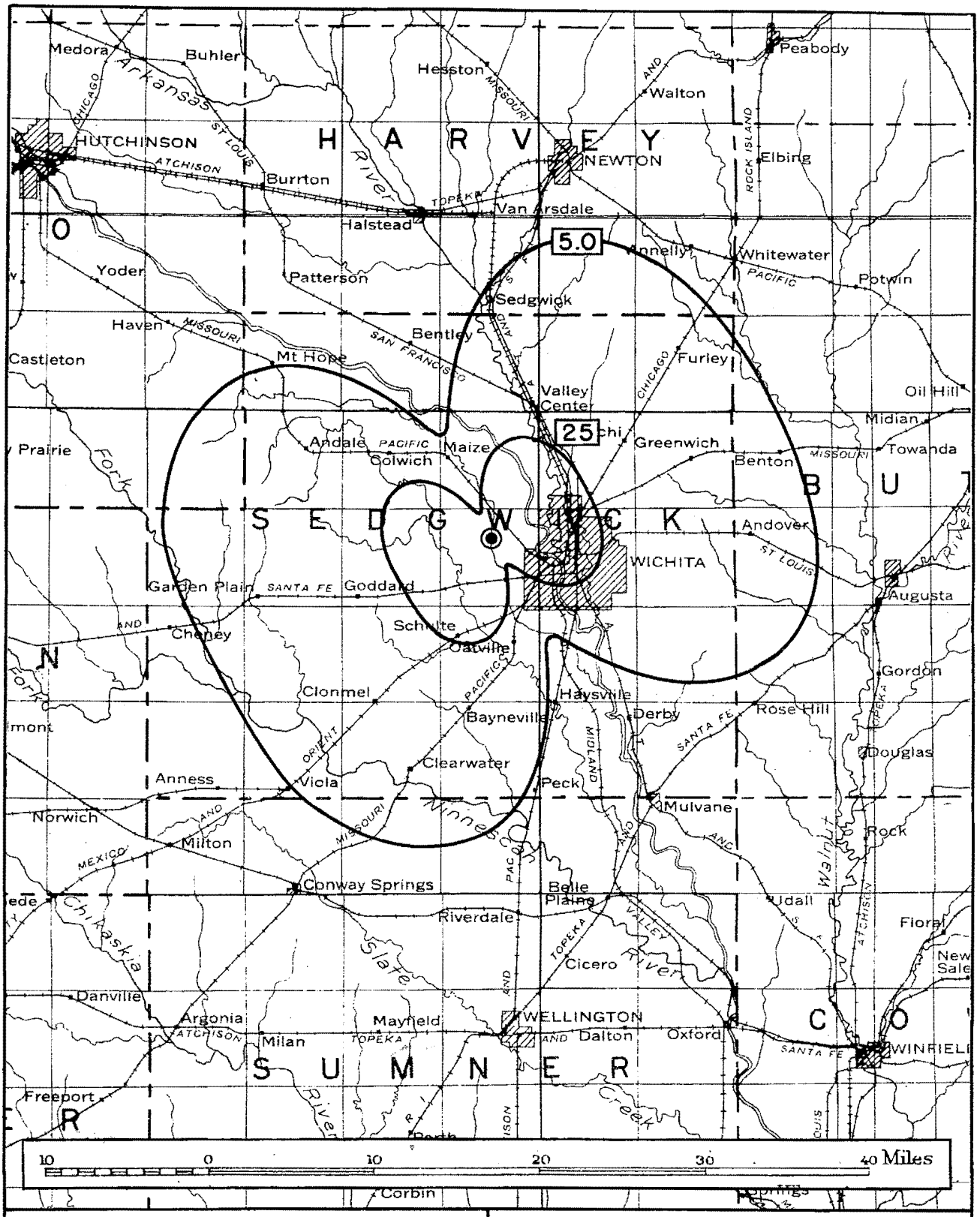
A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS PROPOSED 1480 KC 5 KW ND-D FIGURE 8 B



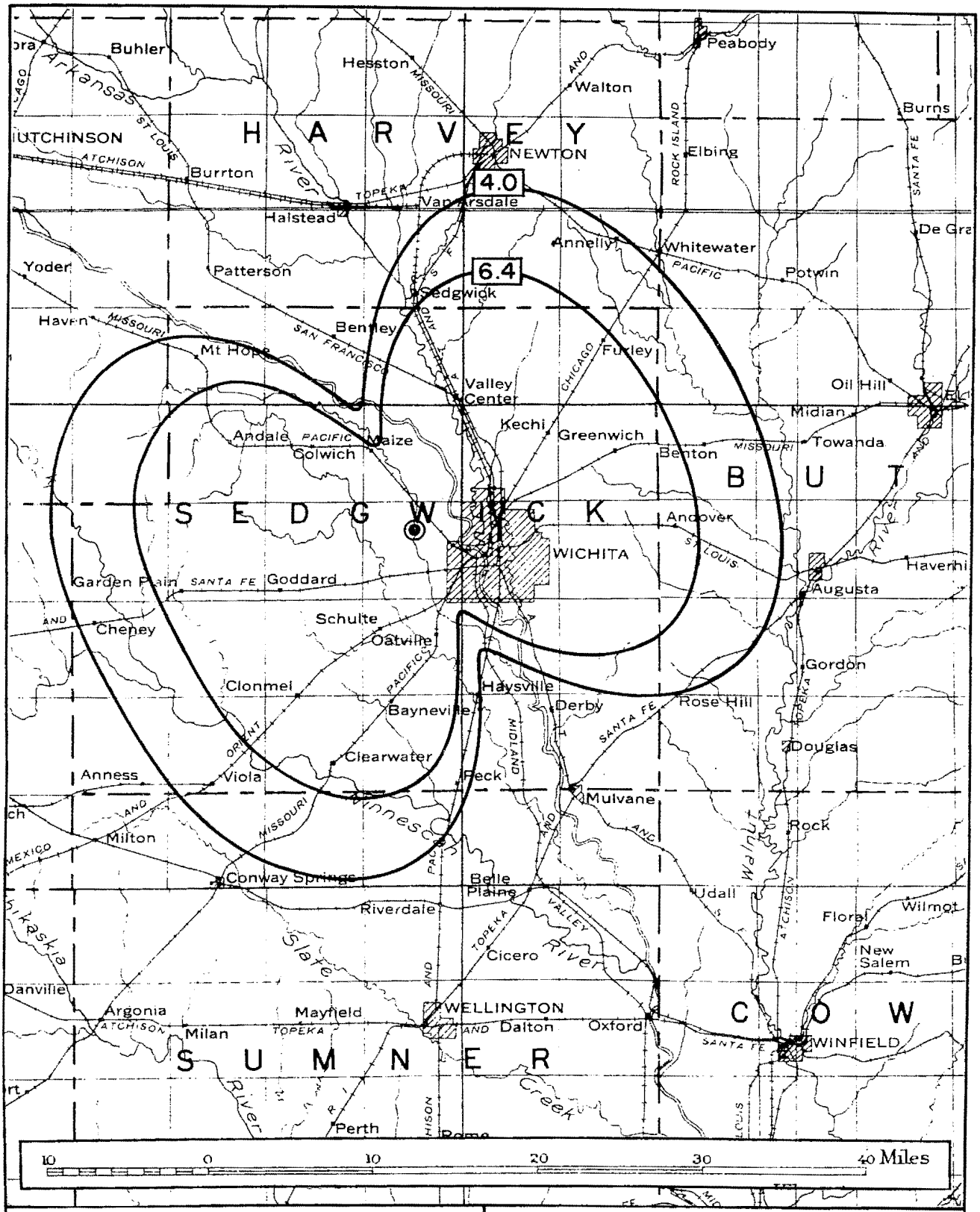
A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS PROPOSED 1480 KC 5 KW ND-D FIGURE 8C



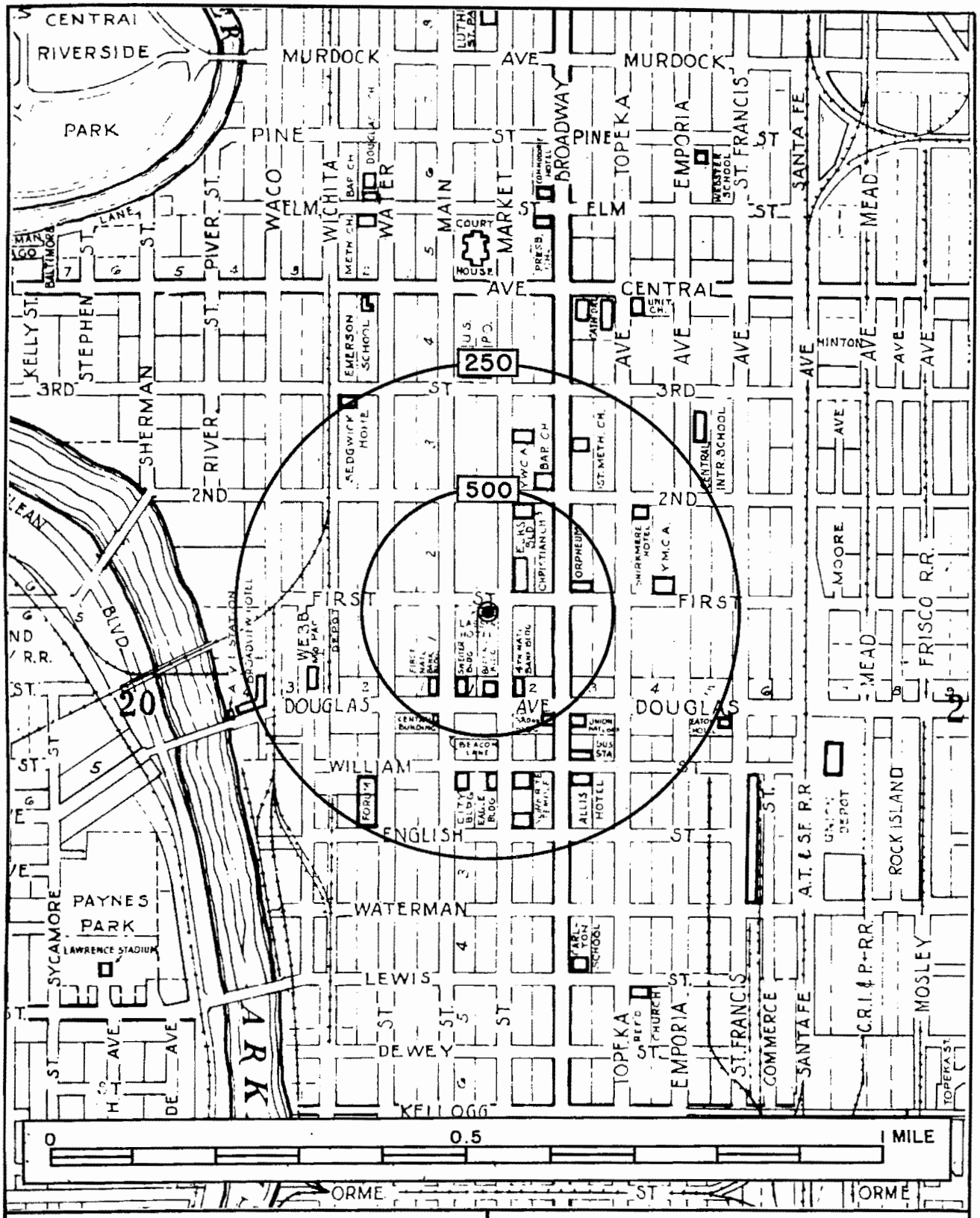
A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS PROPOSED 1480 KC 1 KW DA-N FIGURE 9 A



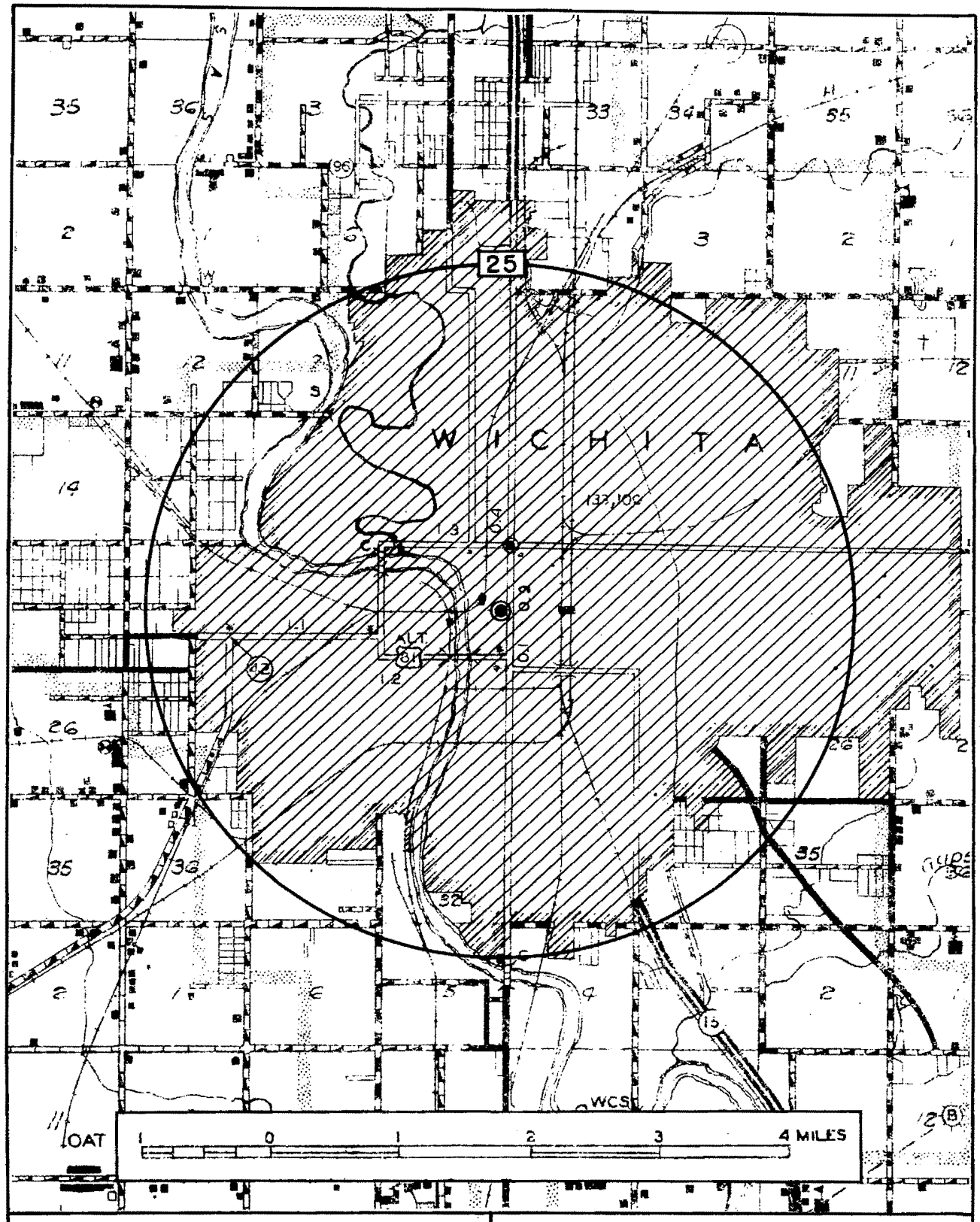
A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS PROPOSED 1480 KC 1 KW DA-N FIGURE 9B



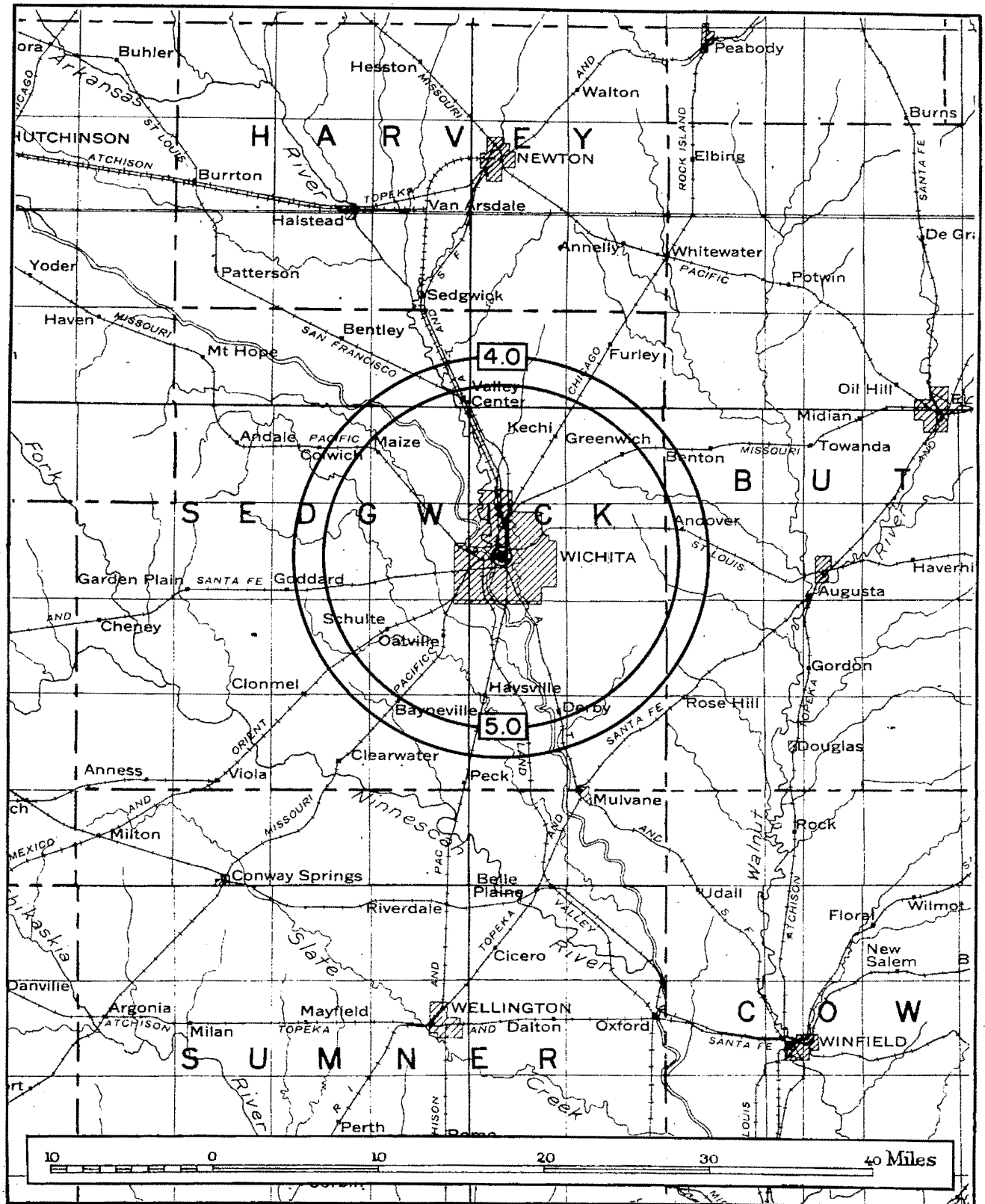
A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS PROPOSED 1480 KC 1 KW DA-N FIGURE 9C



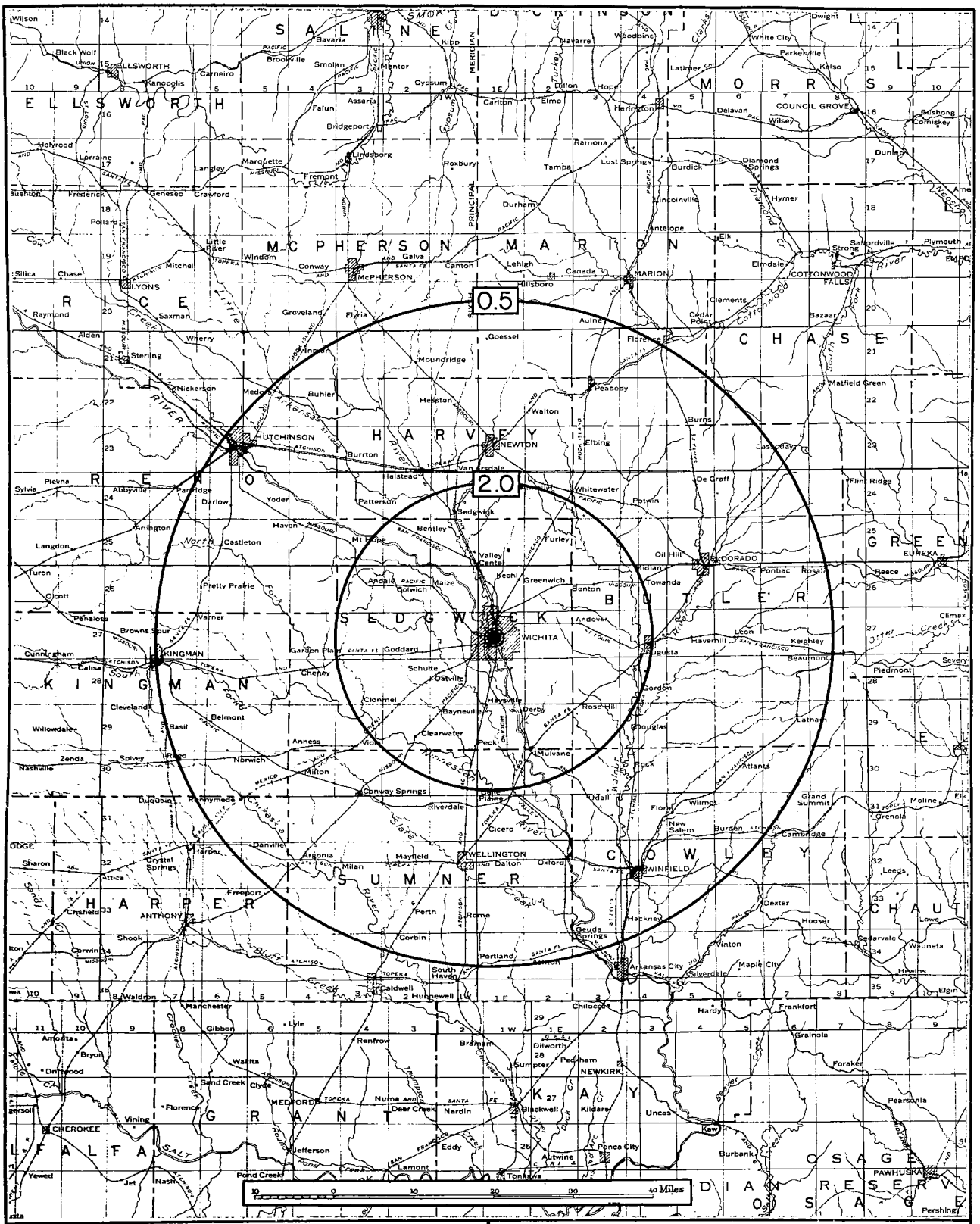
A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS EXISTING 1240 KC 250 WATTS ND FIGURE 10A



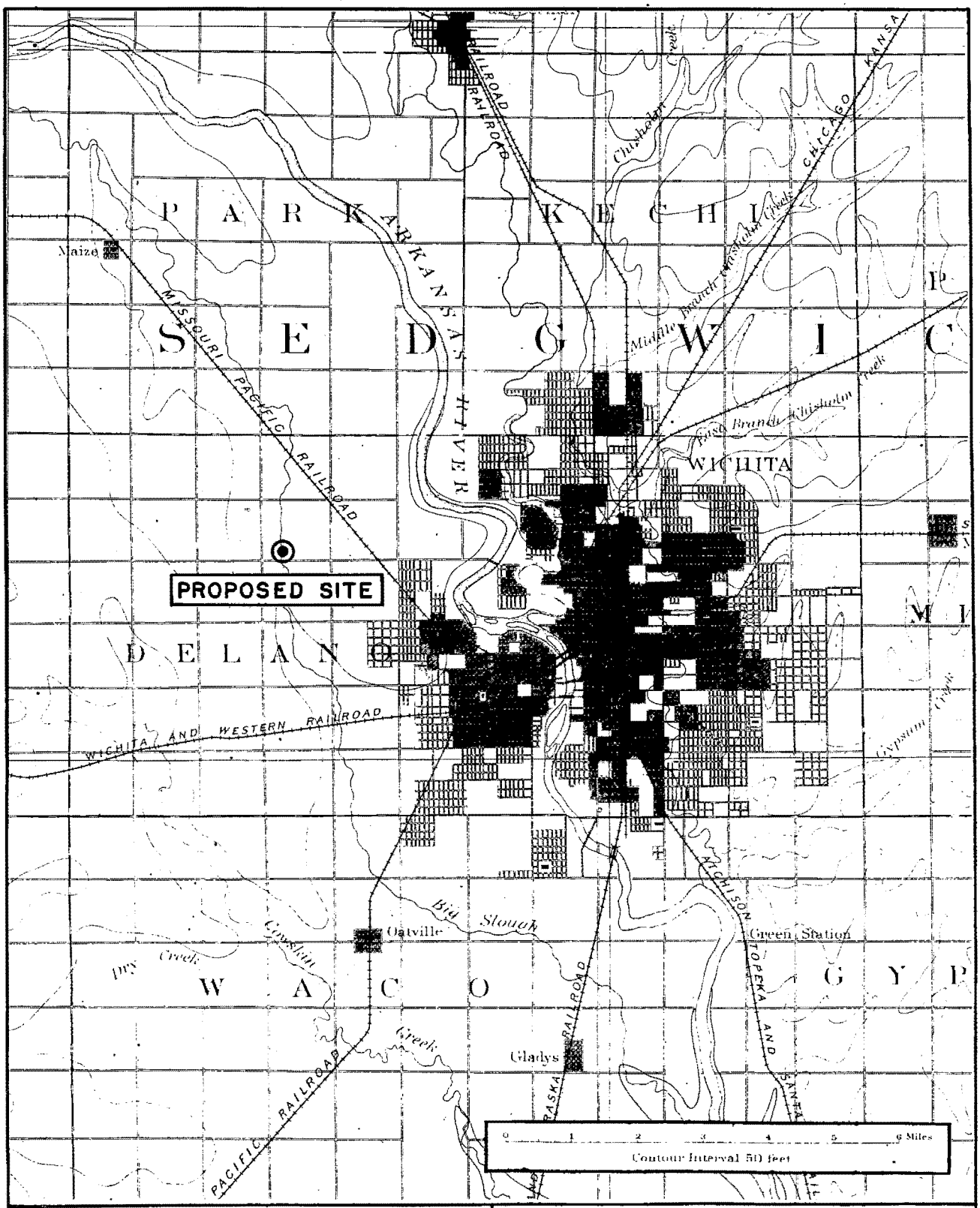
A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS EXISTING 1240 KC 250 WATTS ND FIGURE 10B



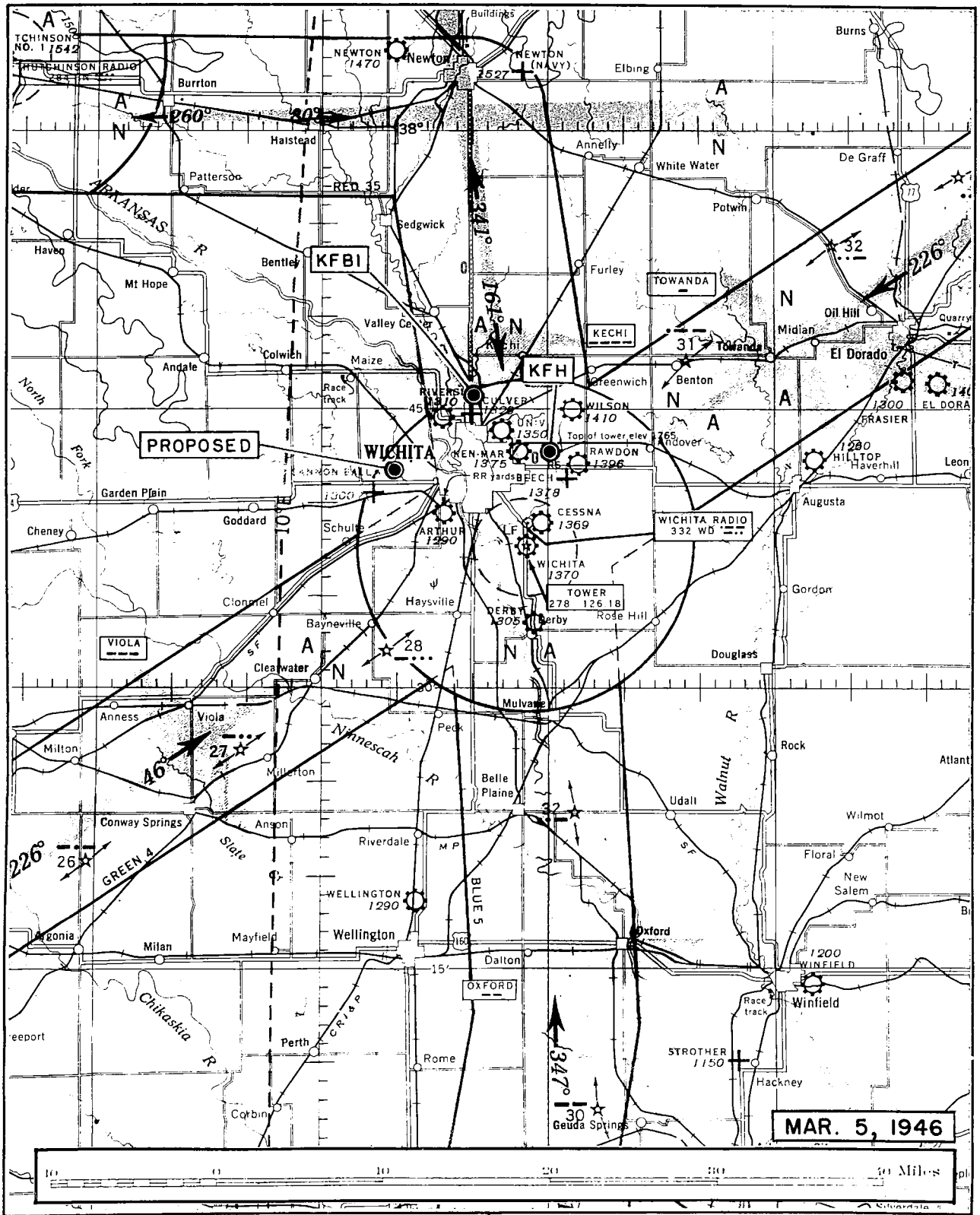
A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS EXISTING 1240 KC 250 WATTS ND FIGURE 10C



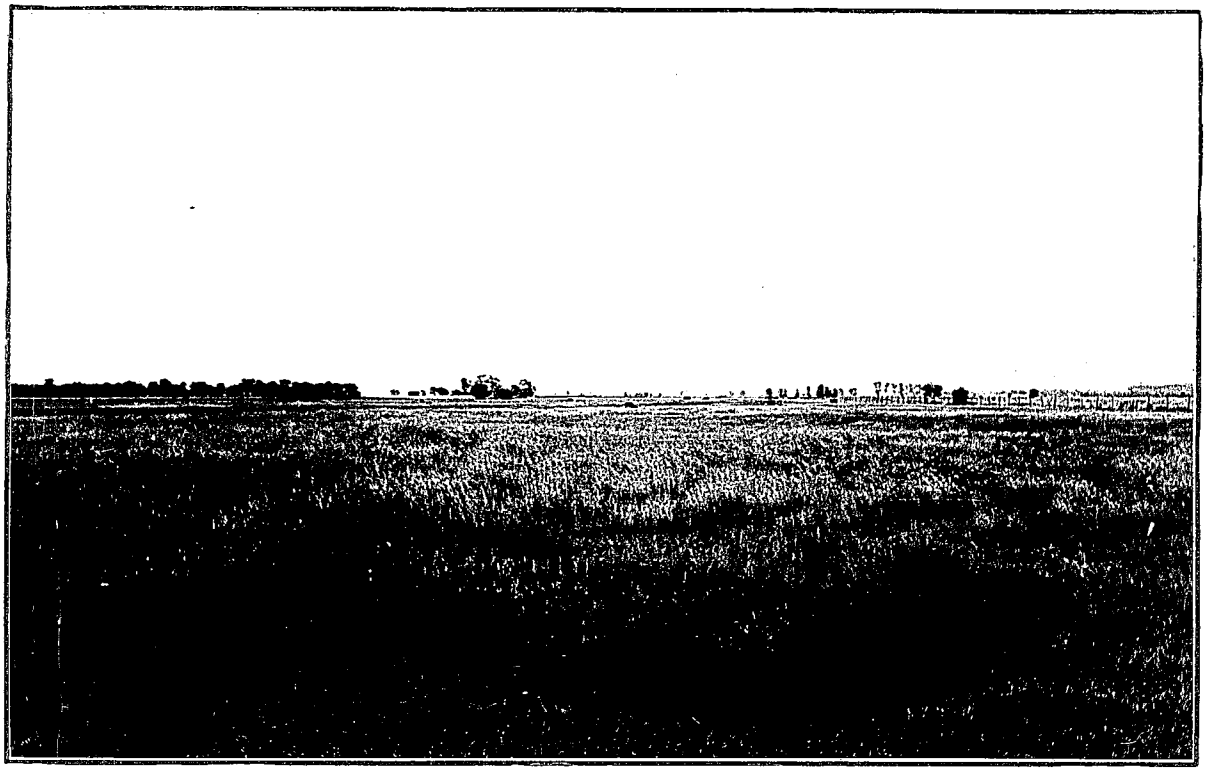
A. EARL CULLUM, JR.	RADIO STATION KANS
CONSULTING RADIO ENGINEERS	EXISTING 1240 KC 250 WATTS ND
DALLAS 460808	FIGURE 10D



A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS PROPOSED 1480 KC .5 KW ND-D FIGURE 11



A. EARL CULLUM, JR. CONSULTING RADIO ENGINEERS DALLAS 460808	RADIO STATION KANS PROPOSED 1480 KC 5 KW ND-D FIGURE 12

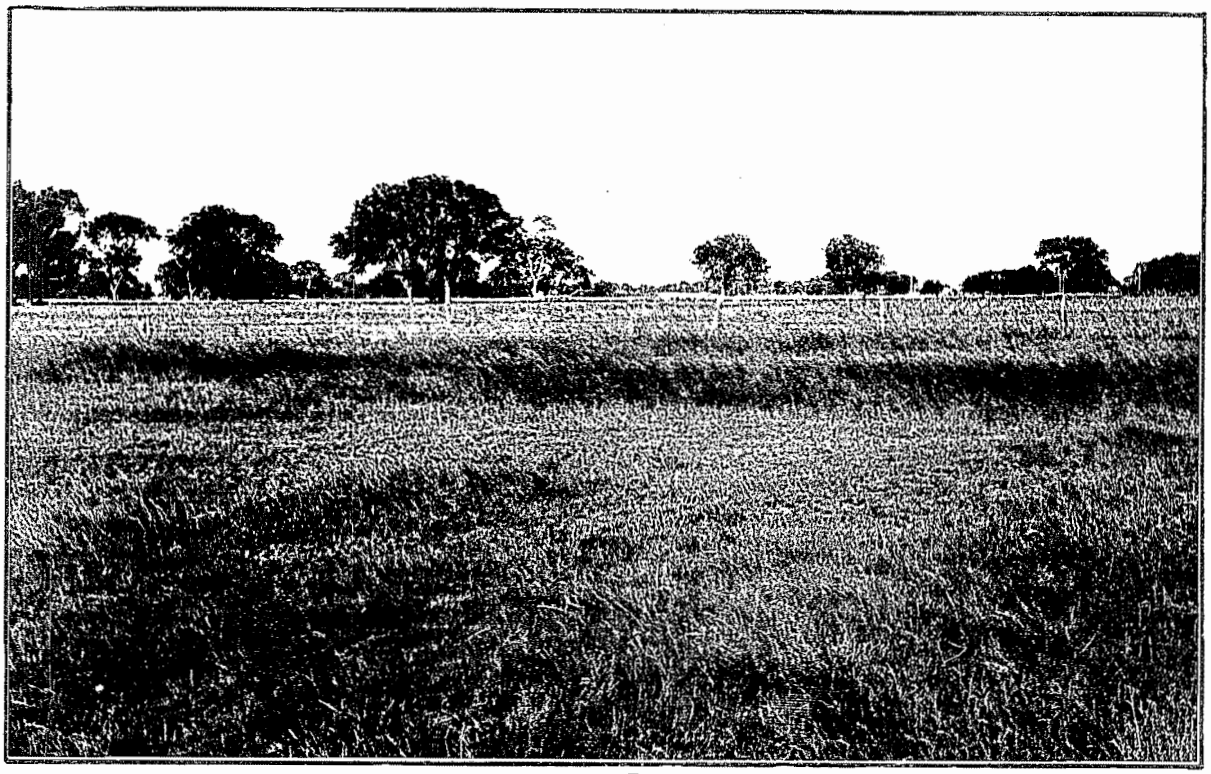


NORTH

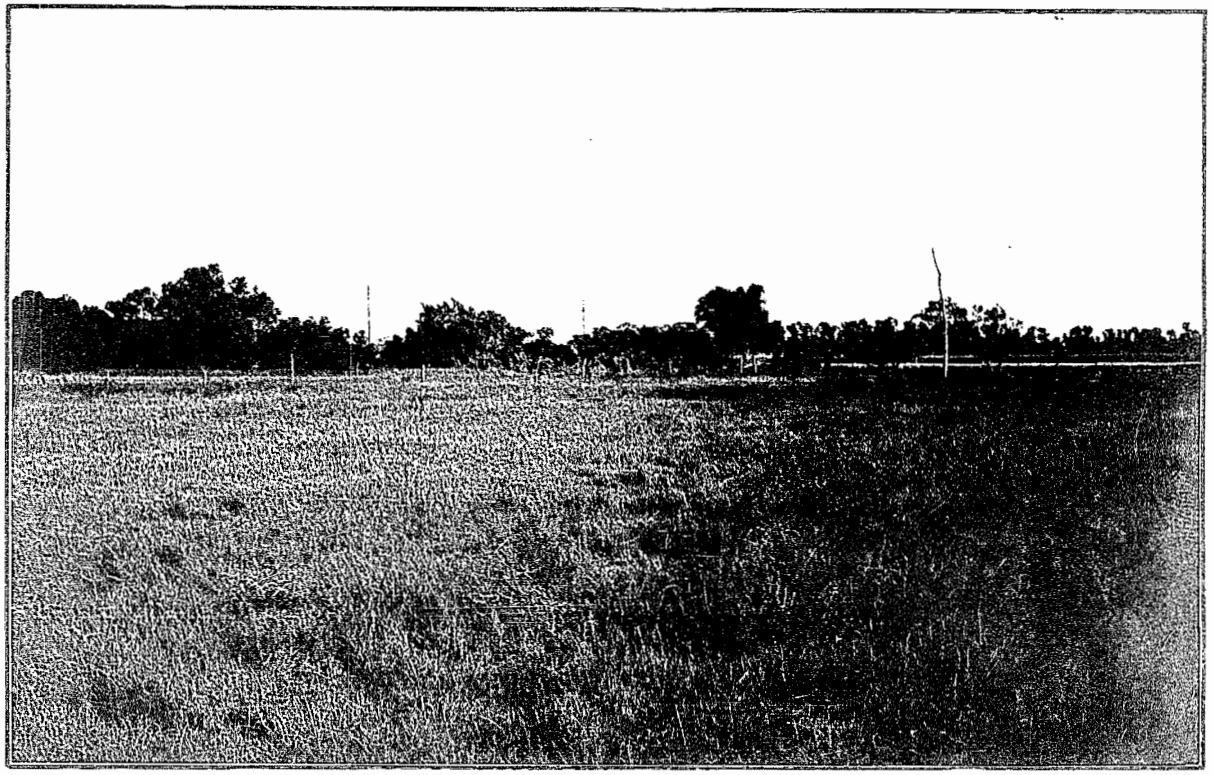
NORTHEAST

460808

FIGURE 13 A



EAST



SOUTHEAST

460808

FIGURE 13 B

SOUTH

SOUTHWEST

460808

FIGURE 13C

WEST

NORTHWEST

460808

FIGURE 13D

4. WHEN THE FIELD ENGINEER HAS DETERMINED THAT THE ADJUSTMENT OF THE ARRAYS IS ESSENTIALLY CORRECT IT WILL BE APPROPRIATE TO SEND A TELEGRAM TO THE SECRETARY OF THE FEDERAL COMMUNICATIONS COMMISSION REQUESTING AUTHORITY TO OPERATE DURING DAYTIME HOURS WITH PROGRAMS UNDER ANY ONE OF THE FOLLOWING CONDITIONS TO FACILITATE ADJUSTMENTS AND PROOF OF PERFORMANCE MEASUREMENTS:

A. 1000 WATTS NONDIRECTIONAL

B. 5000 WATTS USING THE DAYTIME DIRECTIONAL ANTENNA

C. 1000 WATTS USING THE NIGHTTIME DIRECTIONAL ANTENNA

THE TELEGRAM SHOULD ALSO REQUEST AUTHORITY TO CARRY KANS PROGRAMS ON 1420-KC DURING NIGHTTIME HOURS USING 500 WATTS OF POWER AND THE NIGHTTIME DIRECTIONAL ANTENNA ARRAY. THIS TELEGRAM SHOULD STATE THAT KAKE IS UNDERSTOOD TO BE REQUESTING PROGRAM TESTS ON 1240 KC SIMULTANEOUSLY. THE FIELD ENGINEER WILL BE GLAD TO ASSIST IN COMPOSING AN APPROPRIATE TELEGRAM.

5. WHEN TELEGRAPHIC AUTHORITY IS RECEIVED FROM THE FCC, DAYTIME AND NIGHTTIME OPERATION ON 1420-KC MAY BE COMMENCED. THE FIELD ENGINEER WILL PROCEED TO MAKE CLOSE ADJUSTMENTS OF THE DIRECTIONAL ARRAYS DURING THE EXPERIMENTAL PERIOD. NONDIRECTIONAL MEASUREMENTS AND PROOF OF PERFORMANCE MEASUREMENTS MAY BE CARRIED OUT DURING DAYTIME HOURS.

6. IT IS RECOMMENDED THAT FIELD INTENSITY MEASUREMENTS BE MADE ALONG THE FOLLOWING RADIALS:

RADIAL	BEARING	ND	DA-N	DA-D
A	N 8.5° E		X	X
B	N 27.5° E		X	X
C	N 46.0° E		X	
D	N 60.0° E	X	X	X
E	N 74.0° E		X	
F	N 104.0° E		X	X
G	N 130.0° E		X	
H	N 149.0° E	X	X	X
I	N 180.0° E		X	X
J	N 215.0° E		X	X
K	N 248.0° E	X	X	X
L	N 286.5° E		X	X
M	N 335.5° E	X	X	X
RADIALS TOTAL		4	13	10 27

NON-DIRECTIONAL RADIALS HAVE BEEN RECOMMENDED ONLY IN THOSE DIRECTIONS WHERE THE NONDIRECTIONAL MEASUREMENTS WILL BE OF VERY MATERIAL AID IN ANALYZING THE DIRECTIONAL PROOF OF PERFORMANCE MEASUREMENTS.

7. IN ORDER TO MAKE FIELD INTENSITY MEASUREMENTS ALONG THE ABOVE RADIALS IN SUCH A MANNER AS TO COMPLY WITH THE FCC STANDARDS OF GOOD ENGINEERING PRACTICE, IT WILL BE DESIRABLE THAT THE MEASUREMENTS BE MADE ON EACH RADIAL IN ACCORDANCE WITH THE FOLLOWING SCHEDULE INSOFAR AS IS PRACTICABLE:

DISTANCE RANGE	AVERAGE INTERVAL BETWEEN POINTS	NUMBER OF POINTS
NONDIRECTIONAL		
0.2 TO 2 MI.	0.1 MI.	18
2 TO 6 MI.	0.5 MI.	8
6 TO 20 MI.	1.0 MI.	15
	TOTAL	41
DIRECTIONAL		
1.2 TO 2 MI.	0.1 MI.	8
2 TO 6 MI.	0.5 MI.	8
6 TO 20 MI.	1.0 MI.	15
	TOTAL	31

8. IT IS SUGGESTED THAT A SURVEYOR BE RETAINED TO LAY OUT T
MILE POINTS ON THE ABOVE RADIALS WITHIN A RADIUS OF TWO
THE SURVEYOR SHOULD BEGIN WORK ABOUT THE TIME THE FIELD
ARRIVES IN ORDER THAT HE MAY HAVE MOST OF THE RADIALS L
BY THE TIME THE FIELD ENGINEER IS READY TO BEGIN FIELD
MENTS. IT IS SUGGESTED THAT INSTRUCTIONS TO THE SURVE
FOLLOWS:

A. THE BEARINGS LISTED FOR EACH RADIAL IN PARAGRAPH
RESPECT TO TRUE NORTH, NOT MAGNETIC.

B. LAY OFF THE NONDIRECTIONAL RADIALS FIRST.

C. BEGIN ALL MEASUREMENTS AT THE GEOMETRIC MEAN
WHICH IS A POINT MIDWAY BETWEEN TOWERS 2 AND

D. ALONG EACH OF THE BEARINGS (OR AZIMUTHS) LI
TO LAY OFF POINTS AT 0.1 MILE INTERVALS OUT
2 MILES.

ON RADIALS A, B, C, E, F, G, J, AND L, STAKES MARKING THE POINTS NEED BE DRIVEN ONLY FROM 1.2 MILES TO 2.0 MILES.

E. IT WILL BE DESIRABLE TO IMPRESS UPON THE SURVEYOR THAT THE ACCURACY REQUIRED FOR THIS WORK IS NOT NEARLY SO RIGID AS THAT WHICH HE NORMALLY MAINTAINS IN HIS CIVIL ENGINEERING PRACTICE. THE FOLLOWING STANDARDS HAVE BEEN FOUND TO BE ADEQUATE AND WILL SPEED THE SURVEYING IF KEPT IN MIND:

BEARING: $\pm$ 0.5 DEGREES FROM 0.2 TO 2.0 MILES

DISTANCE: 10 FEET AT 0.1 MILES (2%)
200 FEET AT 2.0 MILES (2%)

F. IT HAS BEEN FOUND THAT CONSIDERABLE TIME CAN BE SAVED FOR THE ENGINEER WHO WILL MAKE THE FIELD INTENSITY MEASUREMENTS IF THE SURVEYOR BE REQUIRED TO ESTABLISH EACH STATION BY MEANS OF A LATH OR TALL STAKE SET IN THE GROUND AND MARKED WITH THE STATION NUMBER, USING A RAIN-PROOF PENCIL, AS 1A, 2A, 3A, ETC.

G. IT HAS ALSO BEEN FOUND THAT TIME CAN BE SAVED IF THE SURVEYOR BE REQUIRED TO TIE A STRIP OF WHITE BUNTING NEAR THE TOP OF EACH LATH TO AID THE ENGINEER IN LOCATING THE NEXT LATH IN EACH INSTANCE.

H. IT IS SUGGESTED THAT THE SURVEYING NOT BE COMPLETED MORE THAN A FEW DAYS BEFORE THE FIELD INTENSITY MEASUREMENTS ARE TO BE MADE, SINCE THE LATHS HAVE A TENDENCY TO BE BROKEN OFF BY CATTLE, REMOVED BY PERSONS OR OTHERWISE LOST AFTER A FEW DAYS.

9. IT IS RECOMMENDED THAT TOWER NO. 2 OR NO. 3 BE USED AS A NON-DIRECTIONAL RADIATOR FOR THE TEST MEASUREMENTS IN ORDER TO MINIMIZE THE ERROR IN SURVEYED DISTANCE TO THE NEARBY POINTS. IF THIS IS NOT FEASIBLE, SUCH ERROR IN DISTANCE TO THE NON-DIRECTIONAL POINTS CAN BE ELIMINATED GRAPHICALLY OR MATHEMATICALLY.

10. THE FIELD INTENSITY MEASUREMENTS ALONG THE SURVEYED RADIALS CAN BE MADE ON FOOT IF A HELPER IS AVAILABLE TO THE FIELD ENGINEER.

11. IT IS UNDERSTOOD THAT IT IS DESIRED THAT THE KANS STATION WAGON BE USED IN TAKING THE MEASUREMENTS BETWEEN 2 AND 20 MILES ON EACH RADIAL.

12. IT WILL BE HIGHLY DESIRABLE THAT PHOTOGRAPHS OF THE KANS INSTALLATION BE ATTACHED TO THE APPLICATION FOR LICENSE. THE PHOTOGRAPHS

ARE INTENDED TO FACILITATE THE DETERMINATION BY THE FCC ENGINEERS THAT THE INSTALLATION FULLY COMPLIES WITH THE TERMS OF THE CONSTRUCTION PERMIT AND THE RULES AND REGULATIONS OF THE FEDERAL COMMUNICATIONS COMMISSION. SUCH PHOTOGRAPHS, IF THEY TELL A GOOD STORY, MAY APPRECIABLY EXPEDITE FCC APPROVAL.

THE PHOTOGRAPHS SHOULD NOT BE MADE UNTIL THE INSTALLATION IS ACTUALLY COMPLETE AND UNSIGHTLY DEBRIS HAS BEEN REMOVED. IT IS SUGGESTED THAT THE PHOTOGRAPHS BE MADE AFTER ALL ADJUSTMENTS TO THE ARRAY HAVE BEEN COMPLETED AND FIELD ENGINEER IS MAKING THE FIELD INTENSITY MEASUREMENTS. IN THIS MANNER IT MAY BE POSSIBLE TO SUPPLY US WITH NEGATIVES AND A SET OF CONTACT PRINTS OF EACH OF THE PHOTOGRAPHS BEFORE OUR FIELD ENGINEER ACTUALLY LEAVES THE JOB.

IT IS SUGGESTED THAT AT LEAST THE FOLLOWING VIEWS BE INCLUDED:

A. PHOTOGRAPH SHOWING THE FOUR TOWERS AND IF POSSIBLE INCLUDING THE TRANSMITTER BUILDING.

B. PHOTOGRAPH SHOWING THE EXTERIOR OF THE TRANSMITTER BUILDING.

C. PHOTOGRAPH SHOWING THE AM TRANSMITTER INSTALLATION.

D. PHOTOGRAPH OR PHOTOGRAPHS SHOWING THE AUDIO AND MONITOR PANEL INSTALLATION.

E. PHOTOGRAPH SHOWING EXTERIOR VIEW OF No. 1 TUNING HOUSE AND BASE OF No. 1 TOWER.

F. PHOTOGRAPH SHOWING EXTERIOR VIEW OF No. 2 TUNING HOUSE AND BASE OF No. 2 TOWER.

G. PHOTOGRAPH SHOWING EXTERIOR VIEW OF No. 3 TUNING HOUSE AND BASE OF No. 3 TOWER.

H. PHOTOGRAPH SHOWING EXTERIOR VIEW OF No. 4 TUNING HOUSE AND BASE OF No. 4 TOWER.

I. PHOTOGRAPH SHOWING INTERIOR VIEW OF No. 1 TUNING HOUSE AND COUPLING EQUIPMENT.

J. PHOTOGRAPH SHOWING INTERIOR VIEW OF No. 2 TUNING HOUSE AND COUPLING EQUIPMENT.

K. PHOTOGRAPH SHOWING INTERIOR VIEW OF No. 3 TUNING HOUSE AND COUPLING EQUIPMENT.

NON-DIRECTIONAL RADIALS HAVE BEEN RECOMMENDED ONLY IN THOSE DIRECTIONS WHERE THE NONDIRECTIONAL MEASUREMENTS WILL BE OF VERY MATERIAL AID IN ANALYZING THE DIRECTIONAL PROOF OF PERFORMANCE MEASUREMENTS.

7. IN ORDER TO MAKE FIELD INTENSITY MEASUREMENTS ALONG THE ABOVE RADIALS IN SUCH A MANNER AS TO COMPLY WITH THE FCC STANDARDS OF GOOD ENGINEERING PRACTICE, IT WILL BE DESIRABLE THAT THE MEASUREMENTS BE MADE ON EACH RADIAL IN ACCORDANCE WITH THE FOLLOWING SCHEDULE INSOFAR AS IS PRACTICABLE:

Distance Range	Average Interval Between Points	Number of Points
NONDIRECTIONAL		
0.2 to 2 mi.	0.1 mi.	18
2 to 6 mi.	0.5 mi.	8
6 to 20 mi.	1.0 mi.	15
	Total	41
DIRECTIONAL		
1.2 to 2 mi.	0.1 mi.	8
2 to 6 mi.	0.5 mi.	8
6 to 20 mi.	1.0 mi.	15
	Total	31

8. IT IS SUGGESTED THAT A SURVEYOR BE RETAINED TO LAY OUT THE 0.1-MILE POINTS ON THE ABOVE RADIALS WITHIN A RADIUS OF TWO MILES. THE SURVEYOR SHOULD BEGIN WORK ABOUT THE TIME THE FIELD ENGINEER ARRIVES IN ORDER THAT HE MAY HAVE MOST OF THE RADIALS LAID OUT BY THE TIME THE FIELD ENGINEER IS READY TO BEGIN FIELD MEASUREMENTS. IT IS SUGGESTED THAT INSTRUCTIONS TO THE SURVEYOR BE AS FOLLOWS:

A. THE BEARING LISTED FOR EACH RADIAL IN PARAGRAPH 7 IS WITH RESPECT TO TRUE NORTH, NOT MAGNETIC.

B. LAY OFF THE NONDIRECTIONAL RADIALS FIRST.

C. BEGIN ALL MEASUREMENTS AT THE GEOMETRIC MEAN OF THE ARRAY, WHICH IS A POINT MIDWAY BETWEEN TOWERS 2 AND 3.

D. ALONG EACH OF THE BEARINGS (OR AZIMUTHS) LISTED IN PARAGRA 7, LAY OFF POINTS AT 0.1 MILE INTERVALS OUT TO A DISTANCE 2 MILES.

15. As such time as you have completed Form 302, Section I, and its attachments, and at such time as we have completed Form 302, Section II-A, and its attachments, each of us shall forward our materials to your attorney for combination and filing with the Federal Communications Commission.

16. On forwarding the application for filing, it will be appropriate to send the following telegram to T. J. Slowie, Secretary, Federal Communications Commission, Washington, D. C.:

KANS CONSTRUCTION COMPLETE, ADJUSTMENTS MADE AND PROOF OF PERFORMANCE COMPLETED IN ACCORDANCE WITH TERMS OF CONSTRUCTION PERMIT, FILE BP-6169. FCC FORM 302 AND ATTACHED EXHIBITS FORWARDED TO KANS ATTORNEYS, DOW, LOWNES, AND ALBERTSON FOR FILING. PLEASE CONSIDER THIS AS REQUEST TO COMMENCE PROGRAM TESTS AS SOON AS MATERIAL ACCEPTED. IN ACCORDANCE WITH SLOWIE LETTER DATED *_____, KANS WILL OPERATE ON 1490 KC WITH 500 WATTS, 5000 WATTS LOCAL SUNSET, DA-2 UNTIL PROGRAM TEST AUTHORITY GRANTED. COPY THIS TELEGRAM SENT TO FCC FIELD OFFICE, KANSAS CITY.

17. On receipt of program test authority, KANS may begin operation in accordance with the Construction Permit using 1000 watts, 5000 watts until local sunset, DA-2.

18. Based on the foregoing, the following is an estimate of engineering time to be required previous to the application for license.

For tuning on antenna systems	10 days
For proof of performance	25 days
For office preparation	10 days
	45 days

If you have any comments, suggestions, or questions regarding the above-proposed procedure leading to application for license at KANS, we would be most pleased to have you contact us.

Yours very truly,

A. Earl Cullum, Jr.
Consulting Radio Engineers

Milton Daniell

G. M. Daniell

MLC
cc: Mr. O. L. Taylor
Mr. Archie J. Taylor
Mr. Ted Heitnegner
Mr. John P. Carr

* Fill in date of reply to Archie Taylor's letter to Slowie dated June 14, 1948