Anchorage-Fairbanks Transmission Intertie

ELECTRICAL ENVIRONMENTAL EFFECTS REPORT INCLUDING

RADIO AND TELEVISION PRECONSTRUCTION MEASUREMENTS AND COMMUNICATIONS TOWER SURVEY

ENGINEERING REPORT R-2394
June 1982

ALASKA POWER AUTHORITY

Gilbert/Commonwealth engineers/consultants/architects

COMMONWEALTH ASSOCIATES INC., 209 E. Washington Avenue, Jackson, MI 49201/Tel. 517 788-3000

June 25, 1982

Mr. David R. Eberle
Project Manager
Alasks Power Authority
334 West 5th Avenue
Anchorage, AK 99501

Dear Mr. Eberle:

Subject: ANCHORAGE/FAIRBANKS INTERTIE
ELECTRICAL ENVIRONMENTAL EFFECTS REPORT

Enclosed are 22 copies of "Electrical Environmental Report" (R-2394). The 22 copies supplied are in accordance with Mr. David Wozniak's letter of December 22, 1981, Item 1, and are for your distribution.

The report as submitted is final and includes sections entitled, "Electrical Environmental Effects Report;" Appendix A, "Results of Preconstruction Measurements of Radio and TV Signal Strengths and Radio Frequency Noise;" and Appendix B, "Communication Tower Survey". These three sections of the report were orginally submitted in the first draft as individual reports but are submitted together in the final report for convenience.

Yours very truly,

Lytle G. Miller, P.E.
Project Manager

LGM/dl

Enclosures

ALASKA POWER AUTHORITY

ANCHORAGE - FAIRBANKS TRANSMISSION INTERTIE

ELECTRICAL ENVIRONMENTAL EFFECTS REPORT

INCLUDING

RADIO AND TELEVISION PRECONSTRUCTION MEASUREMENTS
APPENDIX A

AND

COMMUNICATIONS TOWER SURVEY
APPENDIX B

Engineering Report R-2394

Prepared by:
J. F. Torri, P.E.
J. T. Hancock, P.E.
at the offices of
Commonwealth Associates Inc.
209 East Washington Avenue
Jackson, Michigan 49201
June 4, 1982

Approved by:

F. A. Denbrock, P.E.
Vice President

ELECTRICAL ENVIRONMENTAL EFFECTS REPORT

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SCOPE

This report discusses the electrical environmental effects of three 345 KV transmission lines associated with the Alaska Power Authority's intertie between Willow and Healy, Alaska. This report presents the results of calculations, preconstruction field measurements and a communication tower survey. The following subjects are discussed:

- Ozone generated by transmission line corona
- Audible noise generated by transmission line corona
- Broadcast and citizen band (CB) radio interference
- Television interference
- Electric and Magnetic Field Strength
- Induced Currents and Safety Aspects
- Biological Effects and Electrical Safety

The report is based on an analysis of three single circuit 345 kV lines on a common 400 foot wide right-of-way as described in a following section of this report. To estimate the effects of the transmission lines, an operating voltage of 362.5 kV was used.

Preconstruction measurements taken in the study area between Willow and Healy determined the radio and television signal strengths and ambient radio frequency noise levels. The results of these measurements document the preconstruction conditions and are presented in Appendix A.

A survey of radio communications towers licensed to business and governmental agencies in the study area was conducted to identify locations where the metallic structures of the intertie may interfere with communication signals. The results of this survey are presented in Appendix B.

CONCLUSIONS

The conclusions below are based on studies conducted for operation of the intertie at 362.5 kV. Initially, the intertie will be operated at a lower voltage of 138 kV. During the period of operation at 138 kV, all electrical environmental effects will have much lower levels and will be, for practical purposes, negligible.

No measurable levels of ozone will be generated by the intertie transmission lines.

The low levels of audible noise produced by the intertie will not result in significant noise problems.

No interference to FM radio reception caused by rf noise from the intertie is expected.

No interference to AM radio reception from the intertie is expected at distances greater than 1000 feet from the centerline of the right-of-way.

No interference to TV reception is expected from the intertie in locations where present TV reception is good.

Electric and magnetic field strengths produced by the intertie at ground level will be harmless.

The minimum phase-to-ground clearance of 30 feet is sufficient to satisfy the 8 kV/meter design criterion for maximum electric field strength on the right-of-way.

The 30 foot phase-to-ground clearance is sufficient to satisfy the National Electrical Safety Code five milliampere induced current criterion for large vehicles (13.5' H, 8.5' W, 70' L) on highways and major roads crossing perpendicularly beneath the intertie.

No shock hazards from induced currents from the intertie are expected.

RECOMMENDATIONS

As a result of this analysis, the following recommendations are made.

- In areas where use of large (tall) equipment is operated under the lines, adequate clearance should be maintained by the operators of the equipment to insure that minimum NESC clearances are attained.

- Metallic fences and/or large stationary metallic objects permanently located inside the right-of-way should be grounded to prevent possible nuisance shocks.

- Between Willow and Curry, a minimum separation of 1000 feet is recommended between the centerline of the intertie right-of-way and long parallels to the Parks Highway and to residences to preserve the existing quality of AM radio reception. Between Curry and Garner (south of Healy), the one AM radio signal able to be measured has a Grade D quality of reception.

- The recommended minimum separation between the edge of the right-of-way and the commercial and governmental communications towers in the study area are presented in Table B-3 of Appendix B.

TRANSMISSION LINE CONFIGURATION

The analysis is based on three single-circuit 345 kV transmission lines on a common 400 foot wide right-of-way. One structure is located on the centerline of the right-of-way, and the other two structures are separated from the center structure by a distance of 115 feet. The structure is a guyed steel pole X. The minimum phase conductor height is 30 feet and the average conductor height is 44.3 feet based on a suspension height of 73 feet and a sag of 43 feet. A bundle of two 1.165 inch diameter wires comprise each phase conductor which are spaced 33 feet apart. The shield wires are 3/8 inch extra high strength steel and have a minimum height of 76.7 feet. The two shield wires on each structure are spaced 52 feet apart.

INTERTIE OPERATING VOLTAGES

The nominal voltage of the intertie is 345 kV. The operating voltages are expected to range from a minimum of 310.5 kV to a maximum of 362.5 kV [1]. Calculations of the electrical environmental effects were made for the maximum operating voltage.

HEAVY RAIN AND WET CONDUCTOR CONDITIONS DEFINED

In calculating and evaluating audible noise and radio frequency noise from the transmission lines, it is necessary to define the terms "wet conductor" and "heavy rain." The wet conductor (also called "after rain") condition represents a natural condition of very light rain, drizzle or dense fog. The conductor is saturated with pendant water drops and the concentration of moisture in the air is just sufficient to maintain an equilibrium between the loss and replacement of water drops [2].

The audible noise level during wet conductor conditions represents the maximum noise in fog, the noise in light rain and the noise immediately after rain [2]. For radio noise the wet conductor condition represents the average (50 percent point) radio noise level for the total foul-weather period. Foul-weather includes all periods of rain, wet snow, and "wetting fog" [2].

For audible noise purposes, heavy rain is defined as a laboratory condition of artificial rain of intensity ranging from 0.7 to 3.5 inches per hour which gives reproducible results and simulates a special situation which occurs in nature for short periods of time [2]. For radio noise purposes, heavy rain is defined as a rainfall rate of 0.47 inch per hour or greater. For 99 percent of the total foul-weather period, the radio noise generated by corona can be expected to be below the heavy rain value [2]. In a general context, heavy rain may be considered as a rainfall rate of 0.5 inches per hour or greater.

LEVELS OF OZONE CONCENTRATION AND THE QUALITY OF AIR

Field measurements, laboratory studies, and analytical predictions [3, 4, 5], show that existing high voltage transmission lines, including 345 kV lines, produce no significant levels of ozone.

Actual field measurements, have shown that commercial transmission lines, including 345 kV, 500 kV and 765 kV lines, do not generate ozone levels which are measurable above the ambient levels. The results of these studies clearly demonstrate that ozone levels produced by transmission lines are significantly below the maximum concentration level (0.12 parts per million) recommended by the Environmental Protection Agency [6].

It is concluded that the line design used will produce no significant levels of ozone.

AUDIBLE NOISE

Corona generated audible noise from ac transmission lines is greatest during heavy rain when corona activity is greatest. During these periods, the background audible noise level also increases and public activity generally decreases. These two factors tend to offset the effect of increased noise during heavy rain.

When the conductor is wet following a heavy rain or during light rain, fog or snow, lower levels of audible noise are produced by transmission line corona. However, since background audible noise levels are also lower during light rain, fog, or snow and public activity is more nearly normal, the "wet conductor" condition is generally used as the audible noise design condition for ac transmission lines.

Audible noise during fair weather is highly variable and is dependent on the conductor surface condition and the number of dust particles or insects on the conductors. The audible noise from the Anchorage-Fairbanks Transmission Intertie during fair weather will probably be inaudible to a person with normal hearing standing under or near the line. Sometimes a faint "crackling" noise may be heard if one listens for this noise. Many factors will determine whether a particular person will be aware of this noise. If a light wind is blowing, air turbulence around the ears in usually more than loud enough to obscure fair weather audible noise. Natural noise sources would also tend to mask the fair weather noise from the lines. A person having his attention focused on some activity or engaged in conversation would probably not be aware of fair weather audible noise from the lines unless he would specifically listen for it.

Audible noise levels for the intertie have been calculated using methods developed at Project UHV [2]. The calculated maximum audible noise level and the calculated noise level at the edge of right-of-way (EROW) are given in Table 1 for heavy rain and wet conductor conditions. Estimated fair weather levels (inaudible) are also given.

Bonneville Power Administration developed a general guideline [7] based upon public response to ac transmission line audible noise. The guideline indicates that numerous complaints can be expected if the line noise exceeds approximately 58.5 dBA and that few complaints should be expected if audible noise is less than 52.5 dBA. The calculated noise levels for the subject line indicate that few complaints should result from transmission line audible noise and then only if conditions of heavy rain and maximum system voltage occur simultaneously.

The EPA Levels Document [8] discusses the effects of various day-night average sound levels (L_{dn}) in terms of interference with speech communication, community reaction, annoyance and attitude toward the area. A summary of the expected effects of an outdoor day-night average sound level of 55 dB, as developed by the Committee on Hearing, Bioacoustics and Biomechanics (CHABA) [9], is shown in Table 2 together with the defining equation for L_{dn}. Effects for L_{dn} levels below 55 dB have not been developed.

For purposes of comparison, the 44 dBA wet conductor audible noise level (at the edge of the right-of-way; see Table 1), excluding background noise, may be converted to an equivalent L_{dn}. To do this, it must be assumed that the conductors will remain wet (producing a 44 dBA noise level) for a 24 hour period. This is a very conservative assumption. The resulting equivalent day-night average sound level (L_{dn}) is 50.4 dB. Since this level is well below 55 dB, the effects of transmission line noise will be much smaller than those given in Table 2.

A comparison of transmission line audible noise levels can be made with other common noise sources given in Table 3 [10]. Such a comparison illustrates that the intertie will not significantly increase the noise level to which people are normally exposed. Therefore, no problems are expected as a result of the low levels of audible noise produced by the intertie.

RADIO INTERFERENCE

Radio interference from ac transmission lines may result from corona generated radio frequency (rf) noise. The severity of this interference depends on the strength of the desired radio signal and the intensity of the transmission line rf noise. This assumes that the transmission line rf noise exceeds the ambient rf noise. The magnitude of corona generated rf noise decreases with increasing frequency and is very low at frequencies above 10 MHz. Interference is generally noticed on AM broadcast-band radios located near a transmission line such as in an automobile passing under a line. FM radios generally do not experience interference from corona generated radio noise for two reasons: the magnitude of radio noise is quite small in the FM broadcast band (88-108 MHz) and the interference rejection properties inherent in FM radio systems make them virtually immune to static type disturbances. No interference to FM radio reception caused by rf noise from the intertie is expected.

The degree of interference to AM broadcast reception caused by corona generated radio noise is characterized in terms of the signal-to-noise ratio (SNR). The SNR is more generally expressed in terms of the difference (in decibels) between the radio station signal strength and the radio frequency noise, both expressed in decibels based on a one microvolt per meter reference level (dBu). The quality of radio reception expressed in terms of SNR is defined in Appendix A, page A-5.

Signal strengths of AM broadcast stations and ambient rf noise levels have been measured at eleven sites in the study area between Willow and Healy (Appendix A). The rf noise levels for the Anchorage-Fairbanks transmission intertie have been calculated.

RADIO FREQUENCY NOISE CALCULATIONS

Corona generated rf noise levels for the three 345 kV transmission lines have been calculated for heavy rain and wet conductor conditions using methods developed at Project UHV [2]. Radio noise levels for average fair weather can be estimated using averages of measured differences between radio noise during heavy rain and during fair weather. For 345 kV lines this difference in noise levels is about 20 dBu [2].

The calculated levels of rf noise from the intertie operating at 362.5 kV are given in Table 4 for three weather conditions; heavy rain, wet conductor and fair weather. The radio noise levels are calculated for a frequency of one megahertz which is representative of the middle of the AM broadcast band. The radio noise level at the low frequency end of the broadcast band (550 kHz) is 4.5 dB greater than at one megahertz and at the high frequency end (1600 kHz) it is 5 dB lower.

HARDWARE RADIO FREQUENCY NOISE

Radio frequency noise from transmission lines may also be generated by loose or damaged hardware where sparking can occur. This problem is not unique to transmission lines but also occurs on lower voltage distribution lines. No methods are available for calculating the intensity of this type of radio frequency noise. If this type of noise causes interference, techniques exist [11] for locating and correcting these sources of rf noise.

RADIO STATION SIGNAL STRENGTH MEASUREMENTS

The signal strengths of AM broadcast stations were measured at eleven sites. At these sites, all thirteen radio stations measured had very low signal levels and all signals were below the level required by the Federal Communications Commission for primary service in small towns and northern rural areas. These measurements are discussed in Appendix A. The results of these measurements are summarized in Table 5 in terms of the number of stations observed to provide various grades of reception quality.

ESTIMATED RADIO RECEPTION QUALITY

The width of the zone of influence depends on the levels of rf noise from the intertie for three different weather conditions. The width of this zone during fair weather is expected to be 800 feet, extending past the edge of the right-of-way a distance of 200 feet. For wet conductor conditions, this zone of influence is 1000 feet wide and extends past the edge of the right-of-way a distance of 300 feet. For heavy rain conditions (expected to occur less than 3 percent of the time) the zone of influence is 1600 feet wide and extends past the edge of the right-of-way a distance of 600 feet.

Table 6 tabulates the maximum extent of the zones of influence of corona generated rf noise from three transmission lines operating at 362.5 kV. The width of these zones for the different weather conditions will diminish when less than three lines are energized and when the lines are operated at voltages lower than 362.5 kV.

Based on the results of the radio noise calculations and the results of measurements of AM radio station signal strengths in the study area between Willow and Curry (Appendix A), it is recommended that the minimum separation between the centerline of the right-of-way and residences and long parallels with the Parks Highway be 1000 feet. This provides an adequate buffer zone and is expected to preserve the existing quality of AM radio reception near the line route.

Between Curry and Garner, AM radio reception is almost non-existant. Only one radio signal was measured at Deneki Lake and that had a Grade D quality of reception.

The radio reception analysis pertains only to AM radio reception in the commercial AM broadcast band for daylight propagation condtions. During nighttime hours, the radio propagation characteristics change dramatically and good AM reception might be available only from a few high power clear channel AM stations. Also during thunderstorms, high levels of atmospheric static preclude noise-free AM radio reception.

Should radio interference occur near the intertie, it is theoretically possible to restore AM reception quality to preconstruction conditions. However, there are practical problems and limitations in implementing mitigative procedures. The basic requirement to restore the existing quality of radio reception is to reestablish the preconstruction signal-to-noise ratio. Any method which decreases the radio frequency noise without affecting the signal strength, or which increases the signal strength but not the rf noise, will be suitable. This will generally require locating an outside antenna beyond the influence of radio noise from the intertie and using a shielded lead-in to connect the antenna to the radio. However, many radios manufactured in recent years do not have provision for an external antenna. The use of an external antenna may require modification of the radio to permit connection of an external antenna. In some cases it may be possible to use the directional characteristics of an internal loop antenna by orienting the radio to minimize the radio noise.

CB RADIO INTERFERENCE

Interference to a 27 MHz citizen band (CB) radio near the intertie is theoretically possible in two ways: a) a "static" type noise from corona while receiving and b) a signal blocking effect by steel structures on both receiving and transmitting. The severity of the static-like interference will depend on the signal-to-noise ratio (SNR) and hence the strength of the received signal.

As previously mentioned, the intensity of radio noise from transmission line corona decreases with increasing distance from the line and decreases at high radio frequencies. Corona generated radio frequency noise will be about 48 dB (250 times) lower at CB frequencies of 27 MHz than at a frequency of one MHz.

Assuming typical CB signal strengths, it is estimated that good CB communications (SNR = 16) can be obtained outside the transmission line right-of-way during fair weather conditions. During rain a separation of 100 feet will be required for good CB communications. During thunderstorm activity, atmospheric static will mask intertie rf noise in the CB band.

Radio noise from loose or damaged transmission or distribution line hardware could cause interference to CB radio reception. If such noise sources cause problems, they can be located and repaired [11].

TELEVISION INTERFERENCE

Interference to TV reception, when present, is a visible interference in the received picture. The audio portion of a TV signal is an FM radio system which is not subject to static types of interference as was discussed in the section on Radio Interference.

Of the thirteen different television signals measured in the study area (Appendix A), nine of these signals were from television translators. A television translator is a low power facility (normally 10 watts) which receives a weak signal from a primary television station and rebroadcasts the video and audio on a different channel. A TV translator is licensed to provide service to a small geographical area. A TV translator is therefore located near more densly populated areas such as Talkeetna and Healy, which are areas receiving relatively weak TV signals from Anchorage and Fairbanks respectively. Measurements show that these signals can be detected up to about 20-30 miles from the translator tower with diminishing quality of reception as the distance from the translator tower increases (Appendix A).

In the service area of a TV translator, the rebroadcasted signal from the translator is stronger than the weak signal of the primary television station and is therefore less susceptible to interference from the intertie.

Television interference from transmission lines is possible from three sources: a) corona generated interference, b) interference from spark discharges associated with loose or damaged hardware, and c) "ghost" images resulting from TV signal reflections from large metallic structures.

Corona generated rf noise is quite small in the very high frequency (VHF) range used for television transmission. Generally, if the AM radio reception associated with a particular transmission line is acceptable, then TV interference from corona will not be a problem.

Spark discharges associated with loose or damaged hardware can cause TV interference. This problem is not unique to transmission lines but also occurs on lower voltage distribution lines. Loose or damaged hardware can be located and repaired to eliminate this source of interference [11].

Reception of TV signals reflected from large structures can cause delayed or "ghost" images in the TV picture. The tubular steel structures used for the intertie are not expected to reflect sufficient TV signals to cause ghost images. Modification of or addition to the receiving TV antenna system is the most effective means of alleviating ghost images and must be considered on a case by case basis.

No TV reception problems are expected to result from the intertie in locations where present TV reception is good.

ELECTRIC FIELDS

The maximum calculated electric field strength in the intertie right-of-way is 6.9 kV/meter. At the edge of right-of-way, the maximum field strength is 1.6 kV/meter. Other levels of electric field strength for the proposed lines are given in Table 7. These values are for a minimum conductor height of 30 feet, a 33 foot phase-to-phase spacing and an operating voltage of 362.5 kV.

These field strengths are directly proportional to line voltage and can be determined for any line voltage (V_1 in kV) by multiplying the given field strengths by $V_1/362.5$. All field strength values are calculated for a standard height of one meter above ground.

INDUCED CURRENTS

The electric field will induce electric charges on metallic objects (such as vehicles) near the line. This induced charge results in an electric current (induced current) flowing between a vehicle and ground. The largest vehicle allowed on Alaskan state highways without a special permit [12] is 13.5 feet high, 8.5 feet wide and 70 feet long. For this vehicle the maximum induced current will be approximately 4.5 milliamperes based on a perpendicular crossing of a major road or highway, a conductor height of 30 feet and a line operating voltage of 362.5 kV.

Induced currents on vehicles under and parallel to the intertie will be greater than for the perpendicular vehicle orientation. Calculations show that a large vehicle (13.5 feet high and 8.5 feet wide) longer than 45 feet and parallel to the intertie will have an induced current greater than 5 milliamperes if it is positioned in the maximum electric field produced by the intertie. However, vehicles this large are not expected under and parallel to the intertie. Smaller vehicles parallel to the intertie will satisfy the 5 milliampere criterion.

Measurements show that people touching a large vehicle (i.e., bus or large truck) receive a current of 10 percent or less [13] of the induced current about 90 percent of the time. For an induced current of 4.5 milliamperes, the current through the person touching the vehicle would be about 0.5 milliamperes or less. A current of 0.5 milliamperes can be perceived by approximately 1.0 percent or less of adult males [13]. The remaining 10 percent of the time, the current through a person touching a vehicle ranges between 10 percent and about 80 percent of the induced current [13]. Even though such currents may become perceptable, they will be safe since the NESC criterion of 5 milliamperes is satisfied. No shock hazard due to induced currents from vehicles will result.

Existing metal fences and large stationary metallic objects permanently located inside the right-of-way will be grounded as an additional precaution.

MAGNETIC FIELDS

The maximum magnetic field strength under heavily loaded 345 kV transmission lines is typically 0.2 Gauss or less at a height of one meter above ground. Such a field strength is between 10 and 100 times smaller than magnetic fields from common household tools and appliances [14] and is considered harmless.

BIOLOGICAL EFFECTS

A comprehensive review of world literature covering several hundred publications has been compiled in the book Biological Effects of Electric and Magnetic Fields of Extremely low Frequency (ELF) [15] by A. R. Sheppard and M. Eisenbud. The authors conclude "...there is no evidence that the public health or ecological systems have been jeopardized in the slightest by artificial electromagnetic (transmission line ELF) fields..." and "...neither is there a basis for alarm concerning exposure (ELF) to the public."

A tutorial review of the biological influences of power frequency electric fields by Bridges, [16] concludes "In the interim, based on the above (Bridges') review, it does not appear likely that power-frequency electric fields from existing transmission lines can cause any important biological effects on humans at ground level. However, the possibility of some subtle and yet undetected effect cannot be excluded."

Although there is abundant evidence suggesting that no short-term harmful biological effects of transmission line fields exist, the electric utility industry continues to sponsor additional research. The Electric Power Research Institute (EPRI) in Palo Alto, California and the U. S. Department of Energy (DOE) have funded research studies totaling several millions of dollars. These and continuing studies are examining the nature of long-term biological effects of continuous exposure to transmission line fields especially as they regard the health and safety of the public.

ELECTRICAL SAFETY

Two aspects of electrical safety relative to normal proximity to the proposed 345 kV transmission lines are considered below.

PHYSICAL CONTACT

Physical contact with energized transmission line conductors or objects which touch them is hazardous and may result in injury or death. The same, however, applies to lower voltage distribution lines of all sizes.

The likelihood of direct contact with the energized conductors by a person is reduced by using a minimum conductor to ground clearance which satisfies the National Electrical Safety Code. The greatest hazard comes from a person raising a long conductive object, such as a metallic irrigation pipe into the conductors. This hazard is obvious and only careful handling of such objects will prevent accidents.

VEHICLES

Since it is very difficult to visually judge distance from overhead conductors, anyone operating equipment in close proximity to a transmission line should know the height of his equipment (including fully extended overhead apparatus) and should limit the height of the equipment to a safe height.

The same precautions should be applied to lower voltage distribution lines of all sizes which generally have lower clearances.

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TABLE 1

CALCULATED AUDIBLE NOISE LEVELS

(Three Transmission Lines Operating at 362.5 kV)

	Location	
Weather Conditions	Maximum Level (dBA)	Level at the Edge of Right-of-Way* (dBA)
Heavy Rain	57	54
Wet Conductor	48	44
Fair Weather	inaudible**	inaudible**

*200 feet from centerline

**Estimated

TABLE 2

SUMMARY OF HUMAN EFFECTS FOR OUTDOOR DAY-NIGHT AVERAGE SOUND LEVEL OF 55 DECIBELS

Type of Effects	Magnitude of Effect
Speech - Indoors	No disturbance of speech: 100% sentence intelligibility (average) with a 5 dB margin of safety
- Outdoors	Slight disturbance of speech with: 100% sentence intelligibility (average) at 0.35 meter or 99% sentence intelligibility (average) at 1.0 meter or 95% sentence intelligibility (average) at 3.5 meters
Average Community Reaction	None; 7 dB below level of significant "complaints and threats of legal action" and at least 16 dB below "vigorous action" (attitudes and other non-acoustical factors may modify this effect)
High Annoyance	Depending on attitude and other non-acoustical factors, approx. 5% of the population will be highly annoyed.
Attitudes Towards Area	Noise essentially the least important of various factors

WET CONDUCTOR EQUIVALENT DAY-NIGHT AVERAGE SOUND LEVEL WITH OTHER NOISE SOURCES EXCLUDED

Wet Conductor	Day-Night Average (L_{dn})
44 dBA	50.4 dB

$$L_{dn} = 10 \log \frac{1}{24} \left(15 \left[10^{Ld/10}\right] + 9 \left[10^{(Ln + 10)/10}\right]\right)$$

Where Ld = 44 dBA (assumed)
Ln = 44 dBA (assumed)

TABLE 3

NOISE LEVELS OF TYPICAL NOISE SOURCES

Noise Source	Operator* (dBA)	Community** (dBA)
Air Conditioners	70-96	52-77
Power Lawn Equipment	80-95	59-85
Chain Saws	103-115	64-86
Automobiles	55-87	77-87
Snowmobiles	100-116	78-88
Motorcycles		
Less than 240 cc	90-105	70-90
Greater than 240 cc	95-115	78-95
Trucks	70-100	70-95

*Operator: Noise levels measured at the position of the operator of the noise source

**Community: Noise levels measured at locations 50 feet from the center line of the path of the source or 50 feet from the source.

TABLE 4

CALCULATED TRANSMISSION LINE RF NOISE LEVELS
(Three Transmission Lines Operating at 362.5 kV)
1 MHz

Lateral Separation From Edge of Right-of-Way	Weather Conditions		
	Heavy Rain (dBu)	Wet Conductor (dBu)	Fair Weather (dBu)
0'	69	57	49
100'	50	38	30
200'	40	28	20*
300'	34	22*	14*
400'	29	19*	9*
500'	25	15*	5*
600'	22*	12*	2*
700'	20*	10*	0*
800'	18*	8*	-2*

Note: Average value of measured ambient rf noise level is 25 dBu.

*No impact of corona generated transmission line rf noise is expected on the existing quality of radio reception.

TABLE 5

Existing Quality of Reception for AM Radio Stations
(Based on Field Measurements of Radio Station
Signal Strengths July 9-15, 1981)

Site Number	Location	Number of Radio Stations Judged to have the following Quality of Radio Reception				
		A	B	C	D	E
10	Willow	-	-	3	3	-
20	Trapper Creek	-	-	2	2	3
30	Chase	-	-	-	1	4
40	Lane Creek	-	-	1	1	4
50A	Curry	-	-	-	-	1
60	Cantwell	-	-	-	-	1
70	Carlo Creek	-	-	-	-	1
80	Deneki Lake	-	-	-	1	3
90	McKinley Village	-	-	-	-	-
100	McKinley Park	-	-	-	-	-
110A	Healy	-	-	-	1	1

LEGEND:

A - Entirely Satisfactory
B - Very Good, Background Unobtrusive
C - Fairly Satisfactory, Background Plainly Evident
D - Background Very Evident, Speech Understandable With Concentrating
E - Speech Unintelligible

TABLE 6

ZONES OF INFLUENCE OF TRANSMISSION LINE
RADIO FREQUENCY NOISE

Weather Condition	Width of Zone (Feet)	Distance Away From Edge of Right-of-Way (Feet)*
Fair Weather	800	200
Wet Conductor	1000	300
Heavy Rain**	1600	600

*At greater distances from the edge of the right-of-way, no impact on the quality of radio reception from the operation of the intertie is foreseen for the weather conditions cited.

**Condition of the highest levels of radio noise from the intertie.

TABLE 7

CALCULATED TRANSMISSION LINE ELECTRIC FIELD STRENGTHS
(Three Transmission Lines Operating at 362.5 kV)

Lateral Separation from Centerline of Right-of-Way	Calculated Electric Field Strengths kV/m
0	5.14
50	3.78
100	3.90
150	6.90*
200	1.61**
300	0.22
400	0.07

*The maximum value of electric field strength occurs near the outside phase conductors.

**Value of electric field strength at the edge of the right-of-way.

APPENDIX A

APPENDIX A

RESULTS OF PRECONSTRUCTION MEASUREMENTS OF RADIO AND TV SIGNAL STRENGTHS AND RADIO FREQUENCY NOISE

ALASKA POWER AUTHORITY

JULY 9, 1981 - JULY 15, 1981

Measurements by:

D. A. Reynolds - CAI
J F. Torri - CAI

APPENDIX A

TABLE OF CONTENTS

RESULTS OF PRECONSTRUCTION MEASUREMENTS OF RADIO AND TV SIGNAL STRENGTHS AND RADIO FREQUENCY NOISE

SCOPE

This appendix covers the pre-construction measurements of AM radio signal strengths, background radio noise, television signal strengths and television background noise in the study area between Willow and Healy, Alaska. These measurements are intended to serve as a record of the preconstruction signal strengths and noise levels at 11 sites near the intertie corridor.

SUMMARY

Based on Federal Communication Commission (FCC) criteria, all AM radio stations received at the 11 sites offer intermittent service in the study area. According to the FCC, these radio signals are subject to fading and interference from atmospheric and man-made noise.

The quality of AM radio reception was judged by the observers while making measurements of the AM signal strengths. Five grades, A through E, were used to evaluate the quality of radio reception. No radio signal received had a Grade A or Grade B quality of reception. Seven different AM radio stations measured had a Grade C or Grade D quality of reception. At Willow six of these stations were received, at Trapper Creek four of these stations were received, and at Lane Creek two of these stations were received. Between Lane Creek and Curry, these last two stations faded out. Between Lane Creek and McKinley Park, only one radio station having a Grade D quality of reception was received.

To preserve the existing quality of reception of the very weak radio station signals measured between Willow and Curry, it is necessary to recommend a minimum separation between parallel route segments and the Parks Highway and between the line route and residences. Between Willow and Curry the minimum recommended separation is given in the engineering report.

TV signals, especially those from the TV translators, are much stronger on a relative basis than the measured AM radio signal strengths due to the proximity of TV translator antennae. In areas of strong signal strengths, no interference from the 345 kV intertie is anticipated, provided that the minimum recommended separation from the line route to the residences (between Willow and Curry) is satisfied.

During these measurements, signal strengths from 13 television stations and translators were measured at the 11 sites. Five grades, A through E, were used to evaluate the quality of audio reception of television signals. Four television stations from Anchorage were received at Willow, and each had a Grade A or Grade B quality of audio reception. One television station from Anchorage was received at Trapper Creek, and one television station from Fairbanks was received at Healy. Both had a Grade B quality of audio reception. No other signals from television stations having a Grade A, B or C quality of audio reception were received.

All other TV signals which had Grade A, B or C quality of audio reception were from TV translators. Signals from seven such translators were measured between Trapper Creek and Healy.

FIELD SURVEY

This survey was conducted at 11 sites in the study area between Willow and Healy, Alaska as shown as Figure A.1. The measurements were made during the period July 9, 1981, to July 15, 1981.

A description of each measurement site and weather conditions at the time of measurement are contained in the "Site Location and Weather Data" exhibits.

INSTRUMENTATION AND DATA

The instrumentation used in making the measurements is described below. A brief discussion of the results of the measurements is also included.

RADIO SIGNAL STRENGTH AND NOISE EQUIPMENT

The radio signal strengths and background radio frequency noise levels in the AM broadcast band (540-1600 kHz) were measured using an Ailtech NM-17/27A electromagnetic interference field intensity meter (Leasemetric serial number 0514-81146), an Ailtech vertical rod antenna (Model 92197-5), an Ailtech rod antenna coupler (Model Number 94592-1) and ground plane (Model 92199-3). The rod antenna was mounted on the antenna coupler that was attached to a ground plane normally placed on the ground and remote from the meter. (At Site 20, Trapper Creek, a tripod was used to elevate the ground plane approximately 4 feet above ground.) The antenna coupler was connected to the meter by a 100 foot long radio frequency coaxial cable. The bandwidth of the NM-17/27A was approximately 5 kHz. The calibration of the meter was periodically checked using an internal calibrator. The

NM-17/27A was factory calibrated on June 29, 1981, and the vertical rod antenna, rod antenna coupler and ground plane were calibrated on June 5, 1981.

RADIO SIGNALS AND NOISE DATA

Signal strengths from 13 different standard broadcast (AM) radio stations were measured at the 11 sites. A summary of these stations are tabulated in "AM Radio Stations Received." These stations are listed by frequency with the station call letters, transmitter location, power, antenna and operating information.

Only Class II and Class III stations were received. Class II stations are licensed by the Federal Communication Commission (FCC) to operate on a clear channel and render primary service over wide areas. Class III stations are licensed by the FCC to operate on a regional channel and render primary service to large cities (municipalities) and surrounding areas. The primary service area is the area in which the radio signal is not subject to objectionable interference or fading. In northern rural areas, the FCC requires a minimum signal strength of 40 dBu for primary service. Since the maximum signal strength measured at the 11 sites is only 37 dBu, no stations offer primary service in the study area.

The FCC defines an intermittent service area as an area receiving service from a ground wave signal beyond the primary service area. The intermittent service area is subject to fading and some interference (from atmospheric and man-made noise). Therefore, all 13 radio stations provide intermittent service to the study area.

Measured radio frequency noise and AM radio signal strengths are tabulated in summary form in "RF Signal Strength and Ambient Noise Survey" for each of the 11 sites.

Background radio frequency noise measurements were made at five station-free frequencies distributed throughout the AM broadcast band. The quasi-peak (QP) detector mode was used for these measurements. The results are given in decibels based on a one microvolt per meter reference level, i.e., dBu.

The signal strength of the radio stations was measured using the field intensity (FI) detector mode. These results are also given in dBu.

The quality of reception of each radio station, based on the subjective evaluation of the observers, is given. The letter classification is based on the reception quality definitions as follows:

Reception Quality	Definition
A	Entirely satisfactory.
B	Very good, background unobtrusive.
C	Fairly satisfactory, background plainly evident.
D	Background very evident, but speech easily understood.
E	Speech unintelligible.

Those AM radio signals having a Grade E quality of reception should be disregarded.

Very few AM radio stations were received between Willow and Healy, and those that were received had a low signal strength. Reception quality was no better than fairly satisfactory, Grade C.

At all 11 sites only three radio stations were received with a Grade C quality of reception and only four were received with a Grade D quality of reception. The station having the strongest signal (37 dBu) was measured at Willow. All other signal strengths measured at the 11 sites were below this level. A summary of the observed quality of reception at each of the 11 sites is tabulated in "Existing Quality of Reception for AM Radio Stations."

Graphs of the "Measured Radio Signal Strength (dBu)," showing the ambient noise level and the signal strengths required for primary service in small towns and northern rural areas, have been prepared for each of the 11 sites. These graphs illustrate that radio signal strengths are very low.

TELEVISION SIGNAL STRENGTH AND NOISE EQUIPMENT

An Ailtech NM-37/57 electromagnetic interference/field intensity meter (Model Number 0389-06293) was used to make the signal strength and background radio frequency noise measurements in the VHF and UHF frequency spectrum allocated for commercial television. Two antennae were used. A biconical antenna, Model 94455-1, was used for frequencies in the range from 20 MHz to 200 MHz. A conical logarithmic spiral antenna, Model 93490-1, was used over the frequency range from 200 MHz to 800 MHz. Each antenna was normally mounted at a height of approximately 29 feet above ground and was connected to the NM-37/57 by a 100-foot long radio frequency coaxial cable. At Sites 30, 40 and 50A, each antenna was mounted at a height of approximately 24 feet above ground. At Sites 90, 100 and 110A, each antenna was mounted on a tripod at a height of approximately 8 feet due to wind conditions.

Each antenna was rotated in the horizontal plane to obtain maximum video signal strength on each channel received. The antenna was left in this position for the noise measurement. The bandwidth of the NM-37/57 was 1.0 MHz. The calibration of the meter was checked prior to each measurement using an internal calibrator. The NM-37/57 was calibrated on March 20, 1981.

A 2-4 dB correction factor was used to correct for signal attenuation in the 100-foot coaxial cable.

TELEVISION SIGNAL AND NOISE DATA

Signal strengths from 13 different television stations and TV translators were measured at the 11 sites. A summary of these stations and translators is tabulated in "TV Stations Received." These stations and translators are listed by channel with the call letters, location, transmitter power and broadcast antenna height.

A summary of the measured video signal strengths and background radio frequency noise is tabulated in "TV Signal Strength and Ambient Noise Survey" for each of the 11 sites.

The signal strength of the television video signal was measured using the quasi-peak (QP) detector mode. The background radio frequency noise was measured at a clear frequency slightly below the video carrier frequency. The quasi-peak (QP) detector mode was also used for this measurement. The results of these measurements are given in dBu.

The TV signal strength readings contained in this report do not necessarily indicate any particular reception quality. Television signals too weak to provide good video reception can be detected and measured by the NM-37/57 measurement system.

The quality of audio reception of each television signal, based on the subjective evaluation of the observers, is given in "TV Signal Strength and Ambient Noise Survey." Five grades, A through E, the same used for the evaluation of the quality of radio reception, were also used in the evaluation of the quality of audio reception of the television signals. Those TV signals having a Grade E quality of audio reception, "speech unintelligible," should be disregarded. A summary of the observed quality of audio reception for television signals at each of the 11 sites is tabulated in "Existing Quality of Television Reception (Audio)."

At all sites other than Willow, the television signals judged to have a Grade A or Grade B quality of audio reception were from nearby TV translators.

At six sites, at least one television signal was judged to have a Grade A quality of audio reception. At the remaining five sites, no television signals were judged to have better than Grade D quality of audio reception.

Based on the results of this subjective evaluation of the quality of audio reception for television signals, no additional recommendations for locating the transmission line route, over and above these recommendations offered for preserving the quality of radio reception, are required.

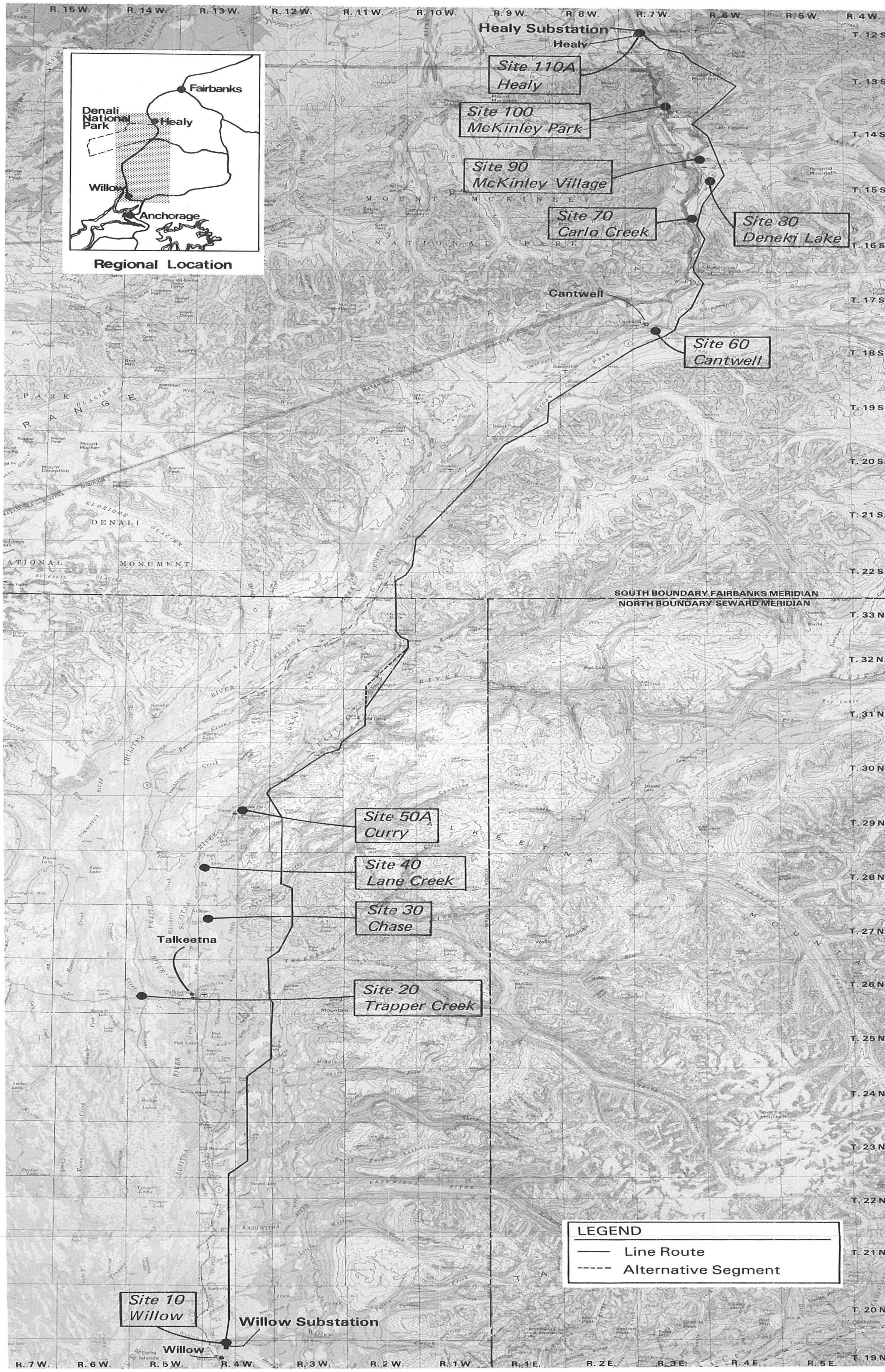


FIGURE A-1

Alaska Power Authority

ANCHORAGE FAIRBANKS TRANSMISSION INTERTIE

Location of Measurement Sites

Gilbert/Commonwealth

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Date: 07-09-81 Site: 10 Willow

Time: Start 13:00

Finish 18:50

Temperature: Wet 56°F

Dry 58°F

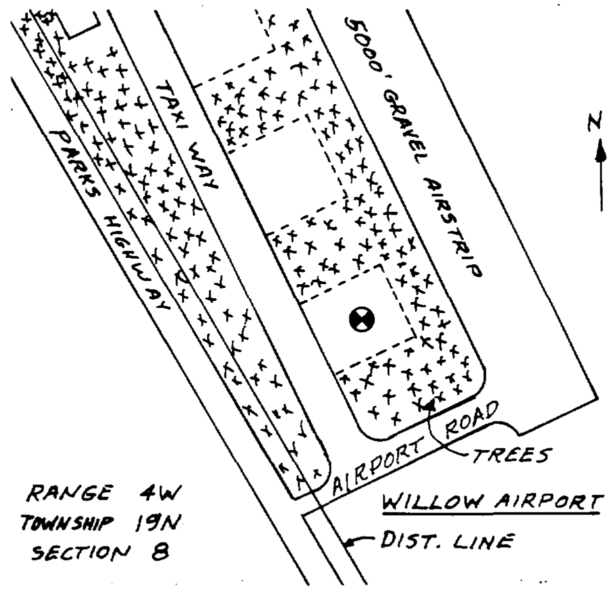
Relative Humidity 88%

Barometric Pressure 28.1"

Wind: Speed (mph) <5

Direction S

Sketch of Location



Weather Description: Overcast, Light Drizzle

Site Description: Willow Airport, located at southern most clearing off Taxiway. Site surrounded on 3 sides by 40 feet tall deciduous trees.

Closest Residence: None visible

Topography: Flat

Shielding Terrain or Structures: None visible

Sources of Radio Noise: Ambient. Distribution line located 250' west of site was very quiet.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

Comments:

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri
P. Robinson*

Date: 07-11-81 Site: 20
Trapper Creek

Time: Start 09:25

Finish 12:15

Temperature: Wet 56°F

Dry 56°F

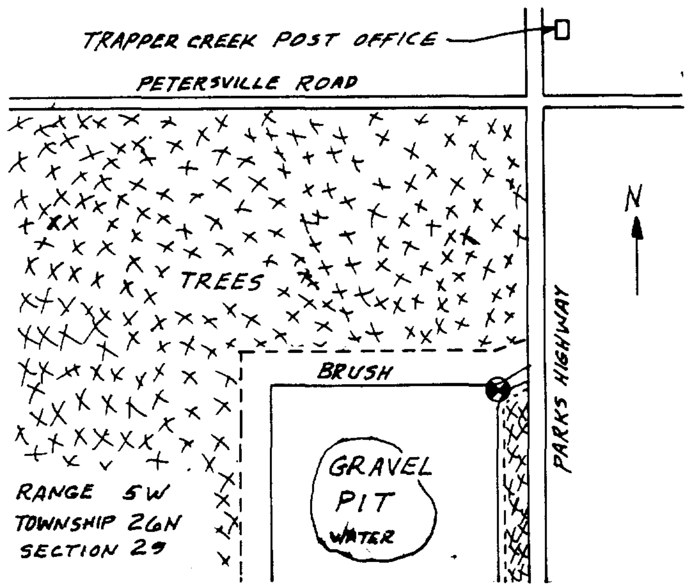
Relative Humidity 100%

Barometric Pressure 28.05"

Wind: Speed (mph) <5

Direction S

Sketch of Location



Weather Description: Overcast and raining

Site Description: Gravel pit west of Parks Highway. First pit south of Petersville Road. Gravel pit surrounded by brush about 3 feet tall. Brush surrounded by tall deciduous trees.

Closest Residence: None visible

Topography: Rolling terrain. Gravel pit was filled with water.

Shielding Terrain or Structures: None visible

Sources of Radio Noise: Ambient.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

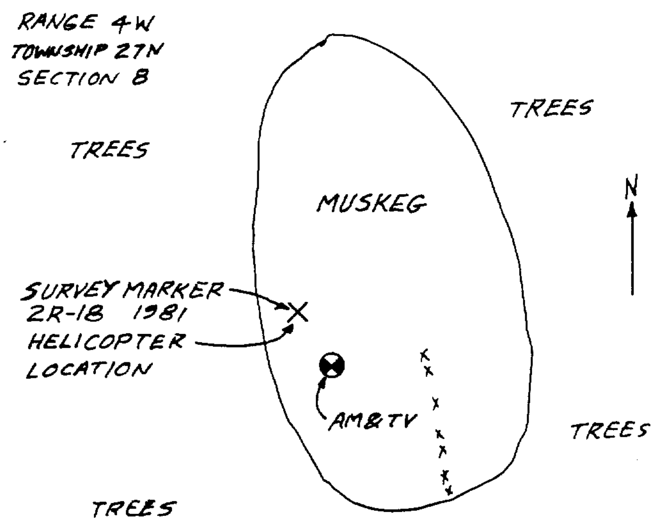
*Comments: The calibrated rod antenna (including base plate and antenna coupler) was mounted 4 feet above ground on a tripod. Pete Robinson, a resident of Trapper Creek, observed these measurements.

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Sketch of Location



Date: 07-12-81 Site: 30
Chase

Time: Start 13:40

Finish 14:25

Temperature: Wet 55°F

Dry 59°F

Relative Humidity 78%

Barometric Pressure

Wind: Speed (mph) <5

Direction S

Weather Description: Overcast

Site Description: Alaskan muskeg surrounded by short black spruce and then by taller coniferous and deciduous trees. Panel Point 2R-18 was positively identified.

Closest Residence: None visible

Topography: Flat muskeg in hilly terrain.

Shielding Terrain or Structures: None visible

Sources of Radio Noise: Ambient.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

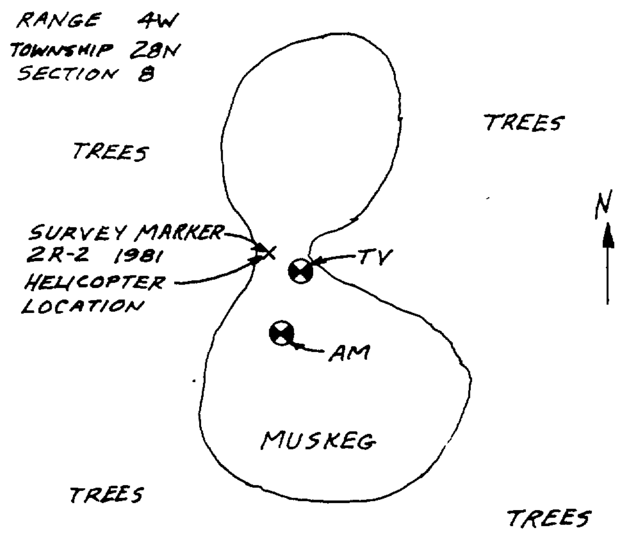
Comments: Helicopter access. TV mast was about 23'-4" tall.

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Sketch of Location



Date: 07-12-81 Site: 40
Lane Creek

Time: Start 10:15

Finish 12:35

Temperature: Wet 53°F

Dry 56°F

Relative Humidity 82%

Barometric Pressure

Wind: Speed (mph) <5

Direction S

Weather Description: Overcast

Site Description: Alaskan muskeg surrounded by black spruce and then by taller coniferous and deciduous trees. Panel Point 2R-2 was positively identified. Mountain visible to northwest.

Closest Residence: None visible

Topography: Flat muskeg in gently rolling terrain.

Shielding Terrain or Structures: Trees, mountain to northwest.

Sources of Radio Noise: Ambient.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

Comments: Helicopter access. TV mast was about 23'-4" tall.

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Date: 07-12-81 Site: 50A
Curry

Time: Start: 15:15

Finish 16:15*

Temperature: Wet 55°F

Dry 58°F

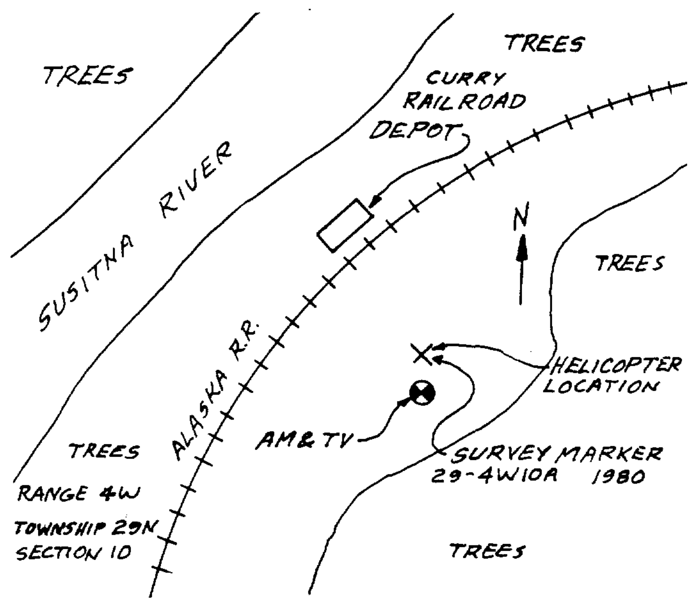
Relative Humidity 83%

Barometric Pressure

Wind: Speed (mph) <5

Direction S

Sketch of Location



Weather Description: Overcast with drizzle.

Site Description: Clearing within 500 feet of the Curry Depot. Survey marker 29-4W/OA/1980 (R&M consultants) was positively identified.

Closest Residence: Curry Train Station 500 feet west.

Topography: In Susitna River Valley with mountains to the east and west.

Shielding Terrain or Structures: Mountains to the east and west.

Sources of Radio Noise: Ambient. Distribution line 700 feet northwest of the site was very quiet.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

Comments: Helicopter access. TV mast was about 23'4" tall. The original site selected at Curry was on a gravel bar in the Susitna River. Due to the heavy rainfall during the previous two days, the gravel bar was under water.

*Estimated

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Date: 07-11-81 Site: 60
Cantwell

Time: Start 17:15

Finish 18:30

Temperature: Wet 49°F

Dry 51°F

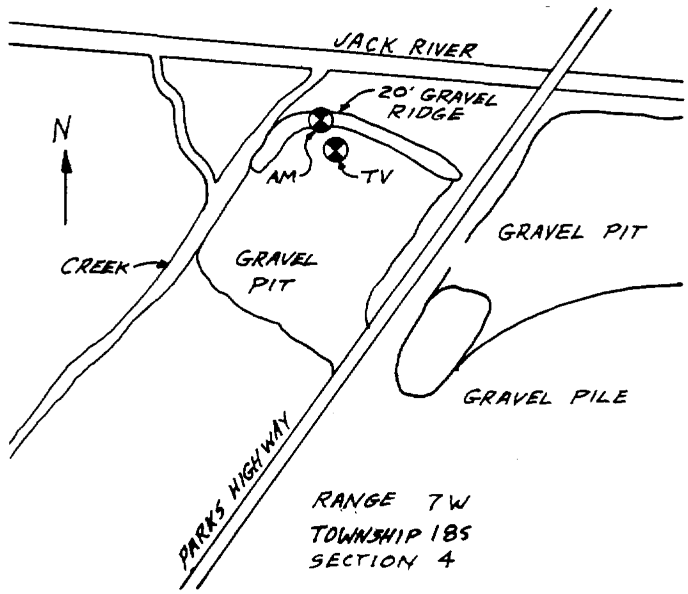
Relative Humidity 87%

Barometric Pressure 27.4"

Wind: Speed (mph) 9-17

Direction S

Sketch of Location



Weather Description: Heavy overcast, showers

Site Description: Gravel pit west of Parks Highway and south of the Jack River. Located about 3/4 mile south of Cantwell.

Closest Residence: None visible

Topography: Gently rolling terrain around gravel pit. Mountains northeast and west of gravel pit.

Shielding Terrain or Structures: Mountains

Sources of Radio Noise: Ambient.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

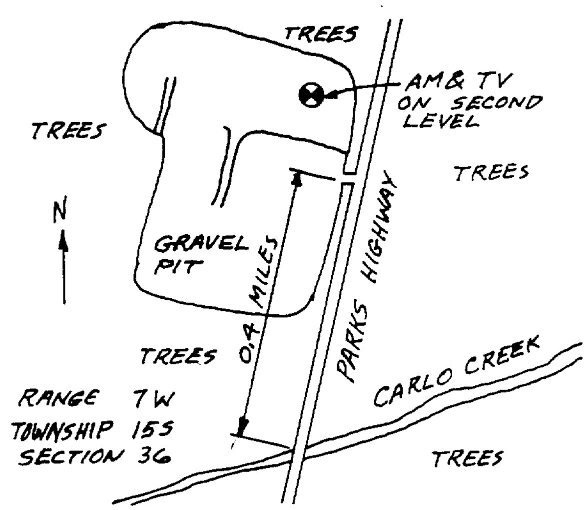
Comments: Located AM antenna coupler on top of 20' tall gravel ridge due to very weak signal.

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Sketch of Location



Date: 07-15-81 Site: 70
Carlo Creek

Time: Start 10:45

Finish 12:20

Temperature: Wet 52°F

Dry 53°F

Relative Humidity 94%

Barometric Pressure 26.80"

Wind: Speed (mph) 6-12

Direction 290° Magnetic

Weather Description: Cloudy, very low ceiling, light misty rain.

Site Description: Second level of gravel pit 0.4 miles north of Carlo Creek along Parks Highway.

Closest Residence: 3 residences about 1/4 mile away on east side of Parks Highway

Topography: Mountainous terrain

Shielding Terrain or Structures: Rim around northwest and southwest of gravel pit about 40 feet above site.

Sources of Radio Noise: Ambient.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

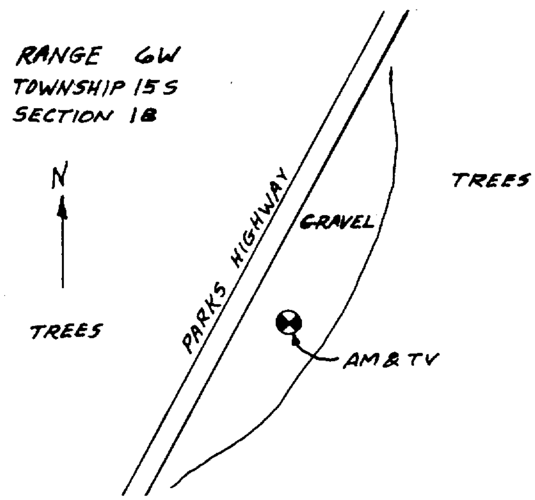
Comments:

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Sketch of Location



Date: 07-15-81 Site: 80
Deneki Lake

Time: Start 12:50

Finish 15:45*

Temperature: Wet 53°F

Dry 57°F

Relative Humidity 77%

Barometric Pressure 26.8"

Wind: Speed (mph) <5-14

Direction S

Weather Description: Hazy, low ceiling, broken clouds

Site Description: Gravel pit approximately 2 miles north of Carlo Creek along east side of Parks Highway.

Closest Residence: None visible

Topography: Mountainous terrain. Site is at a crest of a rise where highway goes down hill in both directions.

Shielding Terrain or Structures: None at crest of small hill.

Sources of Radio Noise: None visible

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

Comments:

*Estimated

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Date: 07-14-81 Site: 90
McKinley Village

Time: Start 14:30

Finish 16:30

Temperature: Wet 51°F

Dry 59°F

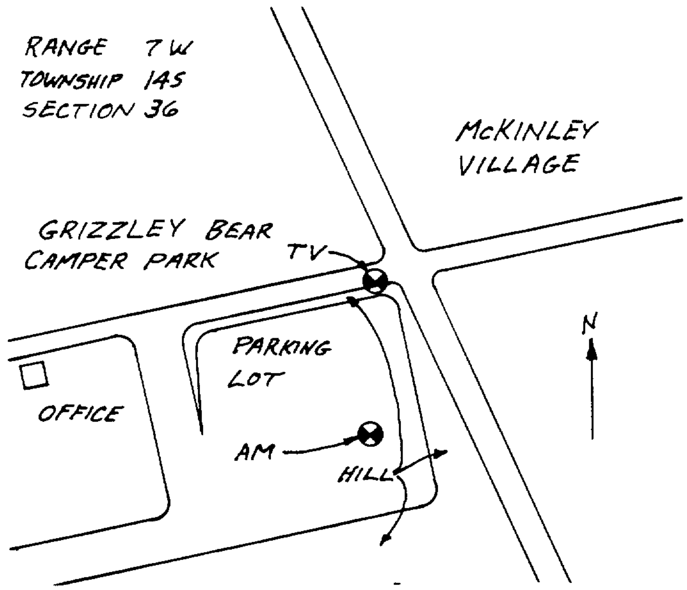
Relative Humidity 57%

Barometric Pressure 27.45

Wind: Speed (mph)

Direction

Sketch of Location



Weather Description: Overcast.

Site Description: West of McKinley Village at entrance to the Grizzley Bear Camper Park.

Closest Residence: Camper park office within 300 feet of site. McKinley Village is across Parks Highway.

Topography: Rolling terrain surrounded by mountains.

Shielding Terrain or Structures: Nearby mountains

Sources of Radio Noise: Ambient.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

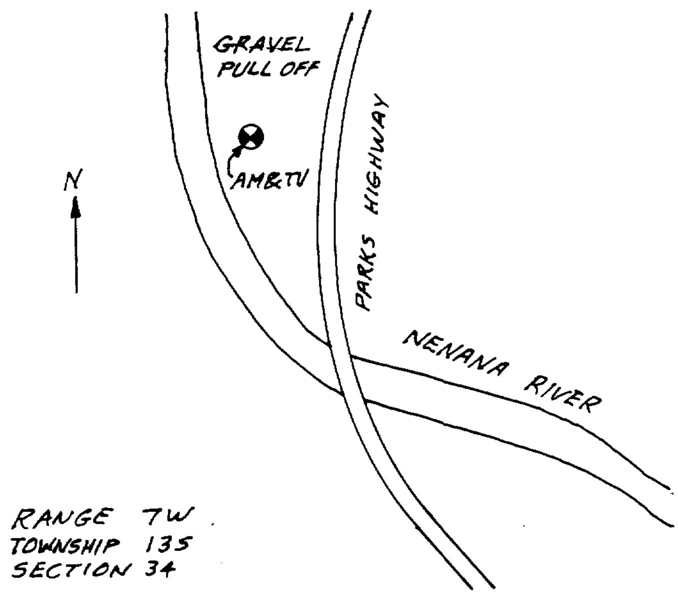
Comments: TV mast was not used due to swirling winds in parking lot. Used tripod for TV measurements located at entrance road and Parks Highway. Elevation of TV antenna appeared to be the same as visible TV antennas located in McKinley Village.

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Sketch of Location



Date: 07-14-81 Site: 100
McKinley Park

Time: Start 11:45

Finish 13:00*

Temperature: Wet 51°F

Dry 59°F

Relative Humidity 57%

Barometric Pressure

Wind: Speed (mph) 15-27

Direction S

Weather Description: Overcast.

Site Description: Gravel pit northwest of bridge where the Parks Highway crosses the Nenana River.

Closest Residence: 1/2 mile north.

Topography: Mountainous.

Shielding Terrain or Structures: Nearby mountains

Sources of Radio Noise: Ambient.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

Comments: Tripod used for TV antenna due to strong winds.

*Estimated

SITE LOCATION - WEATHER DATA

ALASKA POWER AUTHORITY

Observers: D. Reynolds
J. Torri

Date: 07-13-81 Site: 110A
Healy

Time: Start 16:10

Finish 17:50*

Temperature: Wet 53°F

Dry 63°F

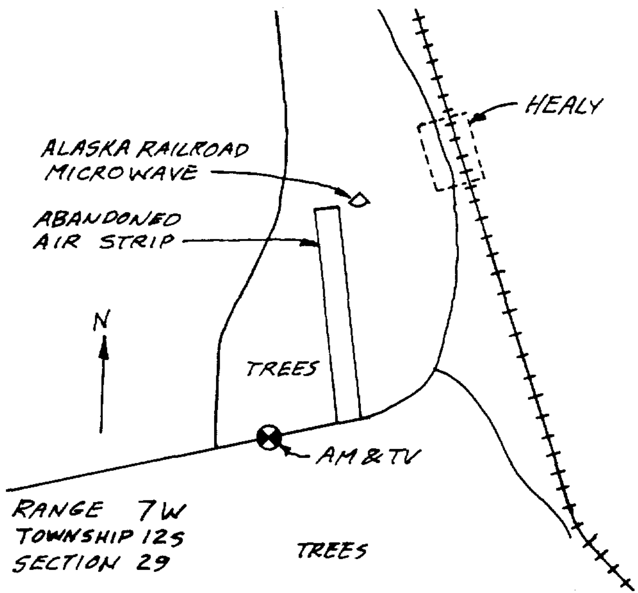
Relative Humidity 50%

Barometric Pressure

Wind: Speed (mph)

Direction

Sketch of Location



Weather Description: Broken clouds.

Site Description: Located on Alaska Railroad property along gravel road at a hilltop between the abandoned gravel air strip and the Parks Highway.

Closest Residence: None visible

Topography: Flat hilltop, surrounded by distant rugged mountains.

Shielding Terrain or Structures: Distant mountains

Sources of Radio Noise: Ambient. The 138 kV transmission line 1/2 mile east was very quiet at this site.

Direction of Site Location Photographs: 1-N, 2-E, 3-S, 4-W

Comments: The original site at the parking lot at the Healy Depot of the Alaska Railroad was full of cars and trucks. The depot agent suggested a site near the abandoned air strip. Tripod was used for TV antenna due to strong wind gusts.

*Estimated

AM RADIO STATIONS RECEIVED
ALASKA POWER AUTHORITY

Freq. kHz	Station Call	Location	Power kW	Antenna Limitation	Station Class *
550	KENI	Anchorage	5	-	III
560	KVOK	Kodiak	1	-	III
580	KYUK	Bethel	5	-	III
590	KHAR	Anchorage	5	-	III
650	KYAK	Anchorage	50	DA-2	II
660	KFAR	Fairbanks	10	-	II
700	KBYR	Anchorage	LS-1, N-.5	-	II
750	KFQD	Anchorage	LS-50, N-10	-	II
900	KFRB	Fairbanks	10	-	II
970	KIAK	Fairbanks	5	-	III
1080	KANC	Anchorage	10	-	II
1150	KABN	Long Island (Big Lake)	5	-	III
1170	KJNP	North Pole	50	DA-N	II

Key:

DA-2 - Directional Antenna, different patterns day and night
DA-N - Directional Antenna during night only
LS - Local Sunset
N - Night
* - See Text, Page A-4

RF SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 10
WILLOW

DATE: 7/9/81

START: 15:00

FINISH: 16:30

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
540	NOISE	27.0(QP)	-40	39.0	26.0	
800	NOISE	27.0(QP)	-40	37.0	24.0	
1000	NOISE	26.5(QP)	-40	37.0	23.5	
1300	NOISE	24.5(QP)	-40	37.5	22.0	
1600	NOISE	25.0(QP)	-40	38.0	23.0	
550	KENI	27.0	-40	39.0	26.0	D
580	KYUK	29.5	-40	38.0	27.5	D
650	KYAK*	35.0	-40	37.0	32.0	C
750	KFQD	40.0	-40	37.0	37.0	C
1080	KANC	28.0	-40	37.0	25.0	D
1150	KABN	37.0	-40	37.5	34.5	C

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NOT IDENTIFIED

SIGNAL IS FIELD INTENSITY(FI)
NOISE IS QUASI-PEAK(QP)

?F SIGNAL STRENGTH AND

AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 20
TRAPPER CREEK

DATE: '11/81

START :25

FINIS⊦ 9:59

OBSERVERS: D. REYNOLDS
J. TORRI
P. ROBINSON

FREQUENCY	LE S	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	27.5(QP)	-40	39.0	26.5	
800	NOISE	26.5(QP)	-40	37.0	23.5	
1000	NOISE	26.5(QP)	-40	37.0	23.5	
1300	NOISE	24.5(QP)	-40	37.5	22.0	
1600	NOISE	25.0(QP)	-40	38.0	23.0	
550	KENI	23.5	-40	39.0	22.5	E
590	KHAR	26.5	-40	38.0	24.5	E
650	KYAK	32.5	-40	37.0	29.5	C
700	KBYR	21.0	-40	37.0	18.0	E
750	KFQD	37.0	-40	37.0	34.0	C
1080	KANC	27.0	-40	37.0	24.0	D
1150	KABN	28.0	-40	37.5	25.5	D

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NO' ENTIFIED

SIGNAL IS ' D INTENSITY(FI)
NOISE IS Q -PEAK(QP)

RF SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 30
CHASE

DATE: 7/12/81

START: 12:50

FINISH: 13:35

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	26.5(QP)	-40	39.0	25.5	
800	NOISE	26.0(QP)	-40	37.0	23.0	
1000	NOISE	26.5(QP)	-40	37.0	23.5	
1300	NOISE	29.5(QP)	-40	37.5	27.0	
1600	NOISE	25.0(QP)	-40	38.0	23.0	
590	KHAR	20.5	-40	38.0	18.5	E
650	KYAK	22.5	-40	37.0	19.5	E
750	KFQD	24.0	-40	37.0	21.0	D
1080	KANC	20.0	-40	37.0	17.0	E
1150	KABN	19.0	-40	37.5	16.5	E

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NOT IDENTIFIED

\# SIGNAL IS FIELD INTENSITY(FI)
NOISE IS QUASI-PEAK(QP)

RF SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 40
LANE CREEK

DATE: 7/12/81

START: 10:30

FINISH: 11:05

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	27.0(QP)	-40	39.0	26.0	
800	NOISE	26.5(QP)	-40	37.0	23.5	
1000	NOISE	26.5(QP)	-40	37.0	23.5	
1300	NOISE	24.5(QP)	-40	37.5	22.0	
1600	NOISE	25.0(QP)	-40	38.0	23.0	
560	KVOK	20.5	-40	38.5	19.0	E
590	KHAR	22.0	-40	38.0	20.0	E
650	KYAK	25.0	-40	37.0	22.0	E
750	KFQD	31.0	-40	37.0	28.0	C
1080	KANC	21.5	-40	37.0	18.5	D
1150	KABN	22.0	-40	37.5	19.5	E

* STA CALL VERIFIED

() COC HEL OR ADJACENT CHANNEL INTERFERENCE

? STAT NOT IDENTIFIED

SIGN IS FIELD INTENSITY(FI)
NOIS S QUASI-PEAK(QP)

RF SIGNAL STRENGTH AND

AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 50A
CURRY

DATE: 7/12/81

START: 15:10

FINISH: 15:30

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	27.0(QP)	-40	39.0	26.0	
800	NOISE	26.0(QP)	-40	37.0	23.0	
1000	NOISE	26.5(QP)	-40	37.0	23.5	
1300	NOISE	24.5(QP)	-40	37.5	22.0	
1600	NOISE	25.0(QP)	-40	38.0	23.0	
650	KYAK	20.0	-40	37.0	17.0	E

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NOT IDENTIFIED

SIGNAL IS FIELD INTENSITY(FI)
NOISE IS QUASI-PEAK(QP)

RF SIGNAL STRENGTH AND

AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 60
CANTWELL

DATE: 7/11/81

START: 17:58

FINISH: 18:11

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	27.0(QP)	-40	39.0	26.0	
800	NOISE	26.0(QP)	-40	37.0	23.0	
1000	NOISE	27.0(QP)	-40	37.0	24.0	
1300	NOISE	24.0(QP)	-40	37.5	21.5	
1600	NOISE	25.0(QP)	-40	38.0	23.0	
1170	KJNP	19.5	-40	37.5	17.0	E

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NOT IDENTIFIED

SIGNAL IS FIELD INTENSITY(FI)
NOISE IS QUASI-PEAK(QP)

RF SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 70
CARLO CREEK

DATE: 7/15/81

START: 11:00

FINISH: 11:15

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	27.0(QP)	-40	39.0	26.0	
800	NOISE	26.0(QP)	-40	37.0	23.0	
1000	NOISE	26.0(QP)	-40	37.0	23.0	
1300	NOISE	24.5(QP)	-40	37.5	22.0	
1600	NOISE	25.0(QP)	-40	38.0	23.0	
1170	KJNP	23.5	-40	37.5	21.0	E

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NOT IDENTIFIED

SIGNAL IS FIELD INTENSITY(FI)
NOISE IS QUASI-PEAK(QP)

RF SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 80
DENEKI LAKE

DATE: 7/15/81

START: 13:05

FINISH: 13:30

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	26.5(QP)	-40	39.0	25.5	
800	NOISE	25.5(QP)	-40	37.0	22.5	
1000	NOISE	25.5(QP)	-40	37.0	22.5	
1300	NOISE	24.5(QP)	-40	37.5	22.0	
1600	NOISE	25.0(QP)	-40	38.0	23.0	
660	KFAR	20.0	-40	37.0	17.0	E
900	KFRB	19.0	-40	37.0	16.0	E
970	KIAK	19.0	-40	37.0	16.0	E
1170	KJNP	27.5	-40	37.5	25.0	D

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NOT IDENTIFIED

SIGNAL IS FIELD INTENSITY(FI)
NOISE IS QUASI-PEAK(QP)

RF SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 90
MCKINLEY VILLAGE

DATE: 7/14/81

START: 14:40

FINISH: 14:55

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	27.5(QP)	-40	39.0	26.5	
800	NOISE	26.0(QP)	-40	37.0	23.0	
1000	NOISE	26.5(QP)	-40	37.0	23.5	
1300	NOISE	24.5(QP)	-40	37.5	22.0	
1600	NOISE	25.0(QP)	-40	38.0	23.0	

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NOT IDENTIFIED

SIGNAL IS FIELD INTENSITY(FI)
NOISE IS QUASI-PEAK(QP)

RF SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 100
MCKINLEY PARK

DATE: 7/14/81

START: 12:10

FINISH: 12:22

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	26.5(QP)	-40	39.0	25.5	
800	NOISE	26.0(QP)	-40	37.0	23.0	
1000	NOISE	26.5(QP)	-40	37.0	23.5	
1300	NOISE	24.5(QP)	-40	37.5	22.0	
1600	NOISE	25.0(QP)	-40	38.0	23.0	

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NOT IDENTIFIED

SIGNAL IS FIELD INTENSITY(FI)
NOISE IS QUASI-PEAK(QP)

RF SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 110A
HEALY

DATE: 7/13/81

START: 16:15

FINISH: 16:27

OBSERVERS: D. REYNOLDS
J. TORRI

FREQUENCY	CALL LETTERS	METER READING	ATTENUATOR SETTING	ANTENNA FACTOR	SIGNAL STRENGTH	OBSERVED RECEPTION QUALITY
kHz		dB#	dB	dB	dB:1uV/M	
530	NOISE	27.0(QP)	-40	39.0	26.0	
800	NOISE	26.0(QP)	-40	37.0	23.0	
1000	NOISE	26.5(QP)	-40	37.0	23.5	
1300	NOISE	24.5(QP)	-40	37.5	22.0	
1600	NOISE	25.5(QP)	-40	38.0	23.5	
660	KFAR	20.5	-40	37.0	17.5	E
1170	KJNP	28.5	-40	37.5	26.0	D

* STATION CALL VERIFIED

() COCHANNEL OR ADJACENT CHANNEL INTERFERENCE

? STATION NOT IDENTIFIED

SIGNAL IS FIELD INTENSITY(FI)
NOISE IS QUASI-PEAK(QP)

ALASKA POWER AUTHORITY

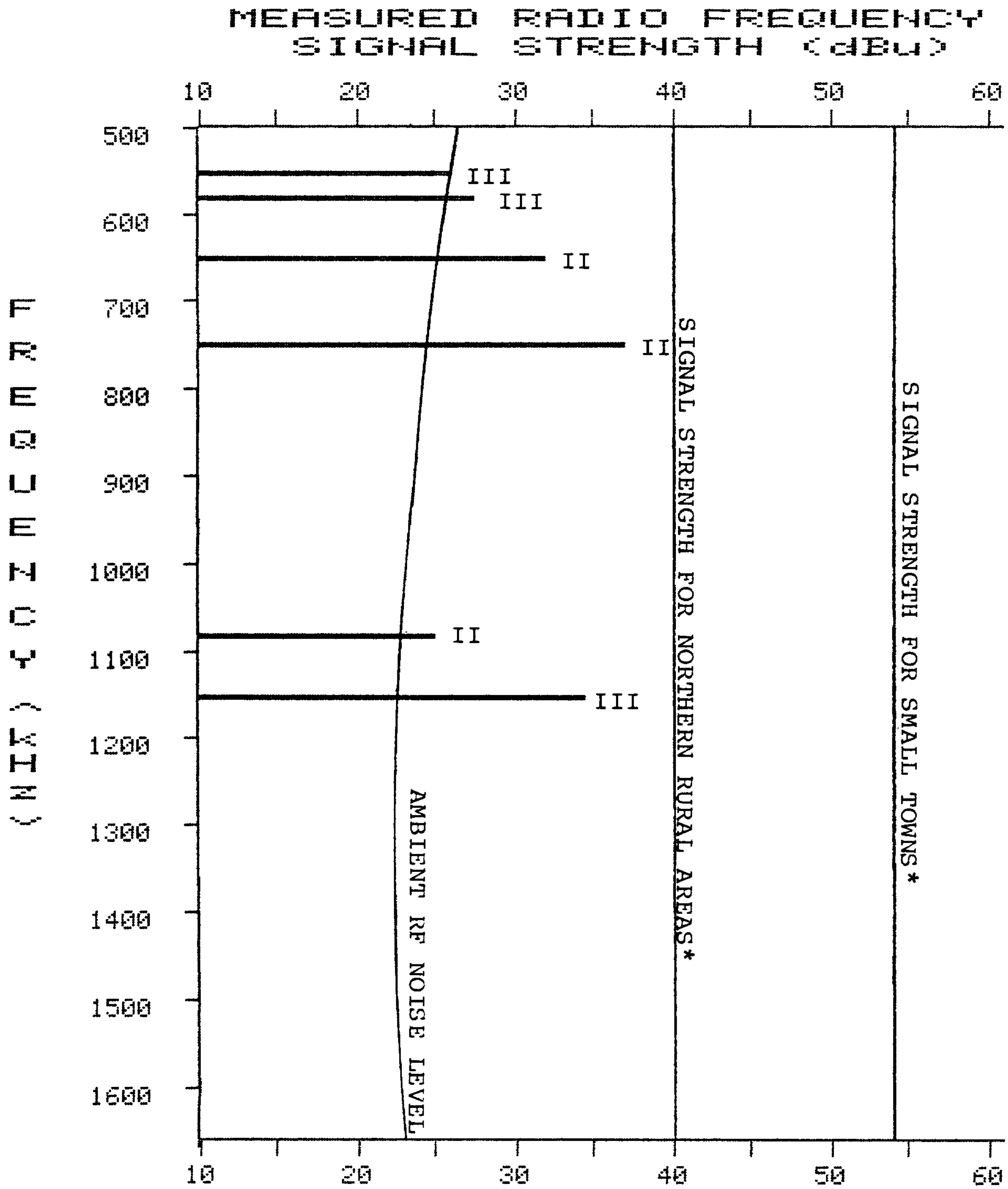
Existing Quality of Reception for AM Radio Stations (Based on Field Measurements of Radio Station Signal Strengths July 9-15, 1981)

Site Number	Location	Number of Radio Stations Judged to have the following Quality of Radio Reception				
		A	B	C	D	E
10	Willow	-	-	3	3	-
20	Trapper Creek	-	-	2	2	3
30	Chase	-	-	-	1	4
40	Lane Creek	-	-	1	1	4
50A	Curry	-	-	-	-	1
60	Cantwell	-	-	-	-	1
70	Carlo Creek	-	-	-	-	1
80	Deneki Lake	-	-	-	1	3
90	McKinley Village	-	-	-	-	-
100	McKinley Park	-	-	-	-	-
110A	Healy	-	-	-	1	1

LEGEND:

A - Entirely Satisfactory
B - Very Good, Background Unobtrusive
C - Fairly Satisfactory, Background Plainly Evident
D - Background Very Evident, Speech Understandable With Concentrating
E - Speech Unintelligible

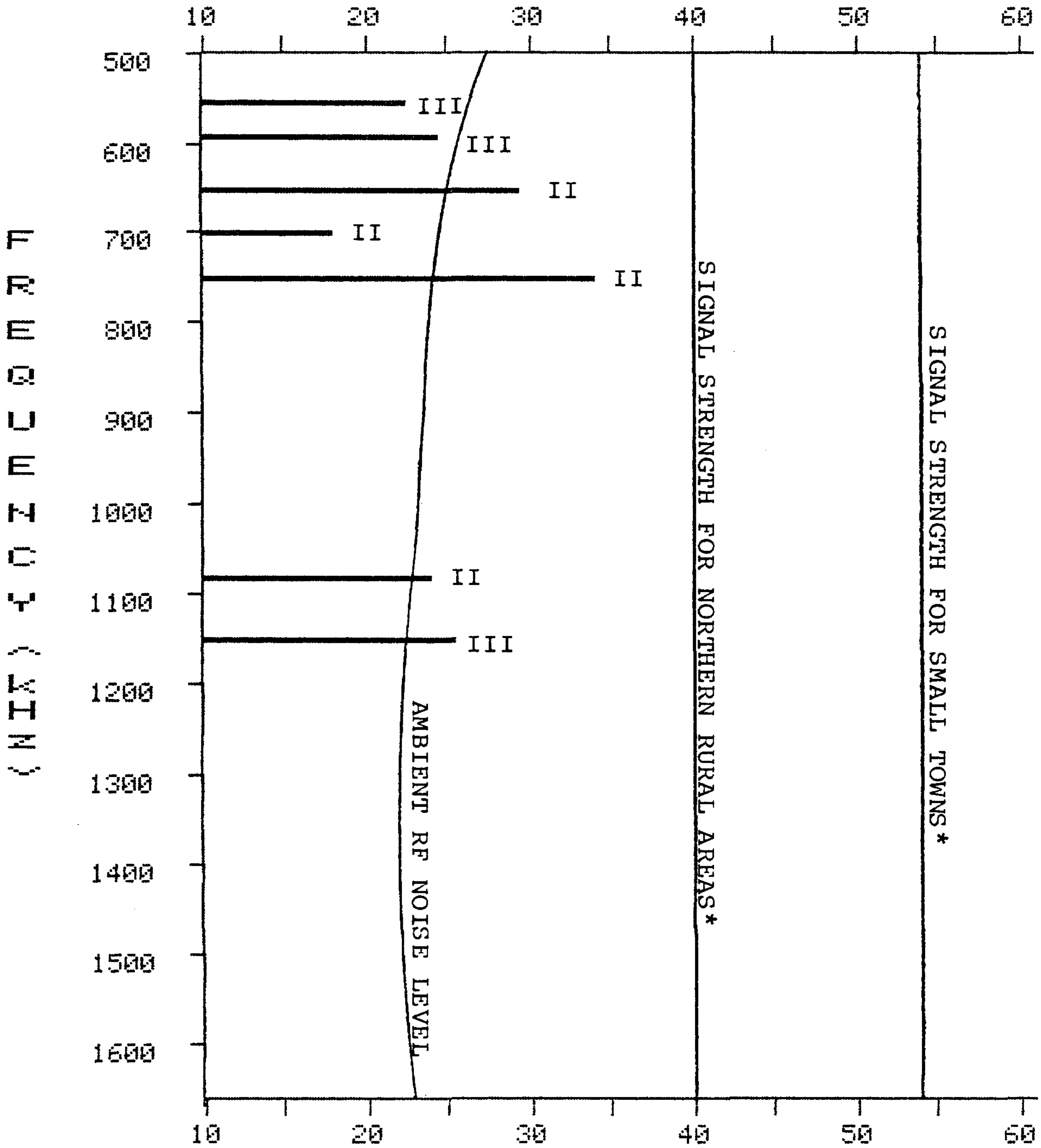
SITE 10 WILLOW



II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

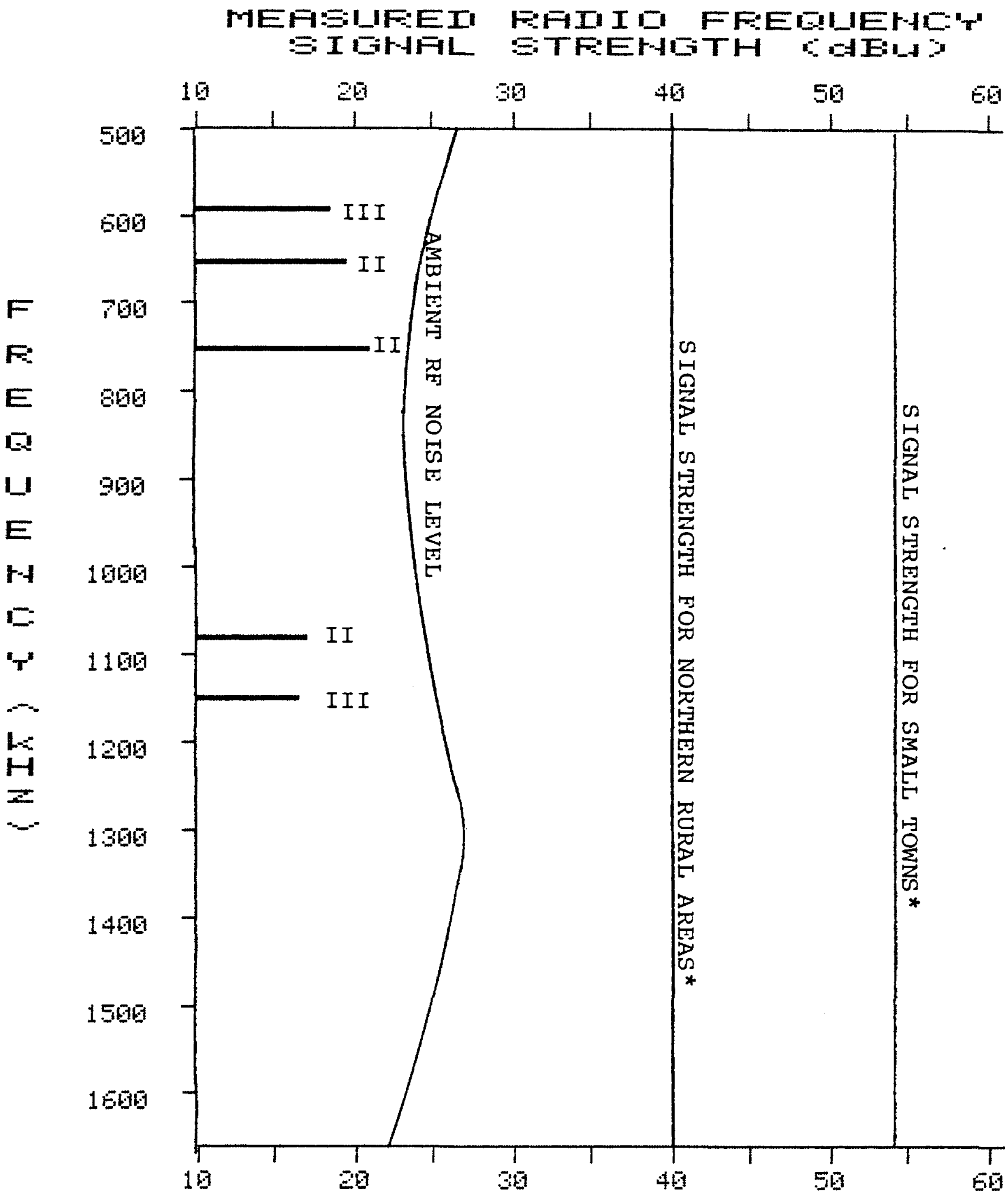
SITE 20 TRAPPER CREEK

MEASURED RADIO FREQUENCY
SIGNAL STRENGTH (dBu)



II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

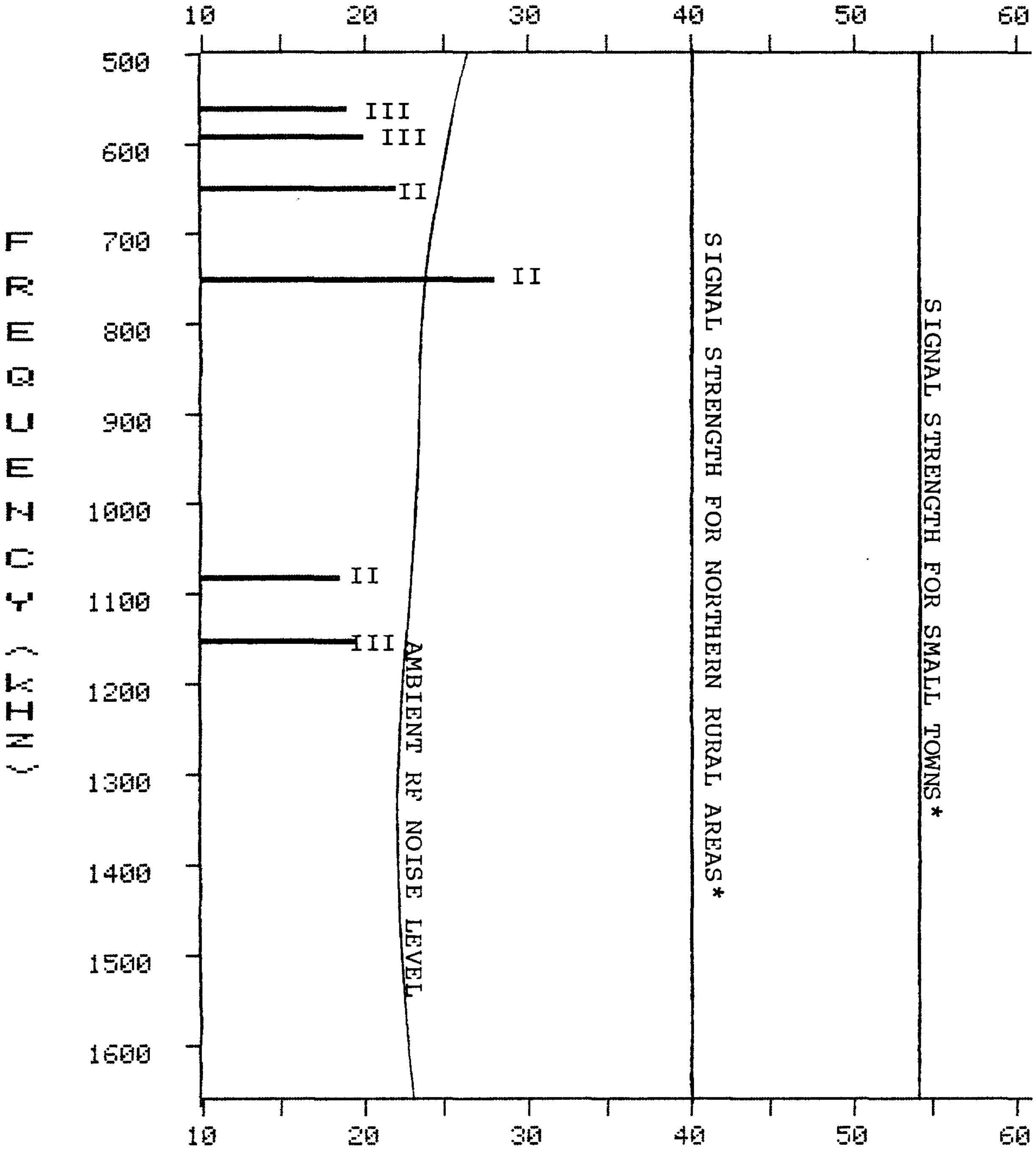
SITE 30 CHASE



II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

SITE 40 LANE CREEK

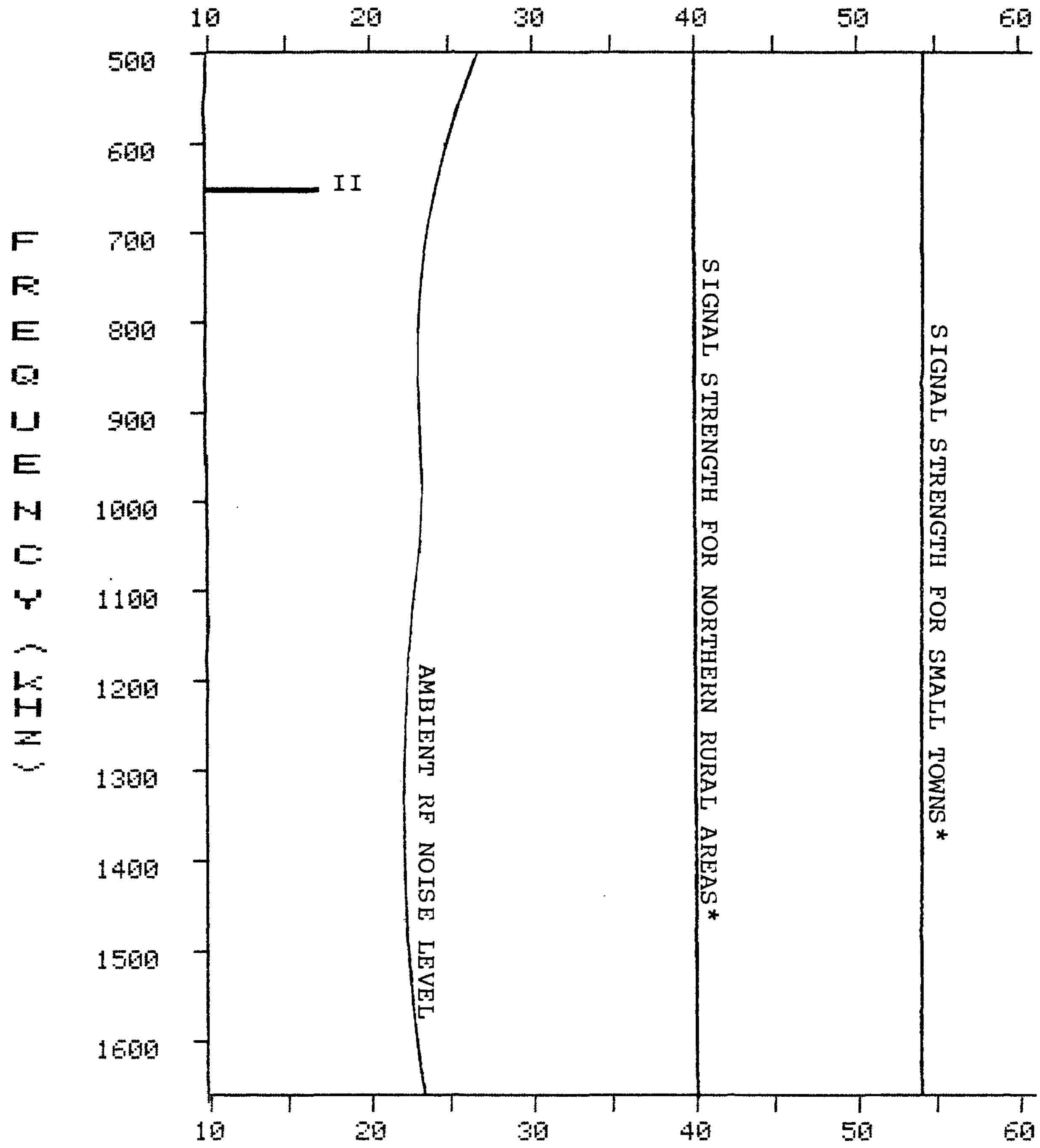
MEASURED RADIO FREQUENCY
SIGNAL STRENGTH (dBu)



II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

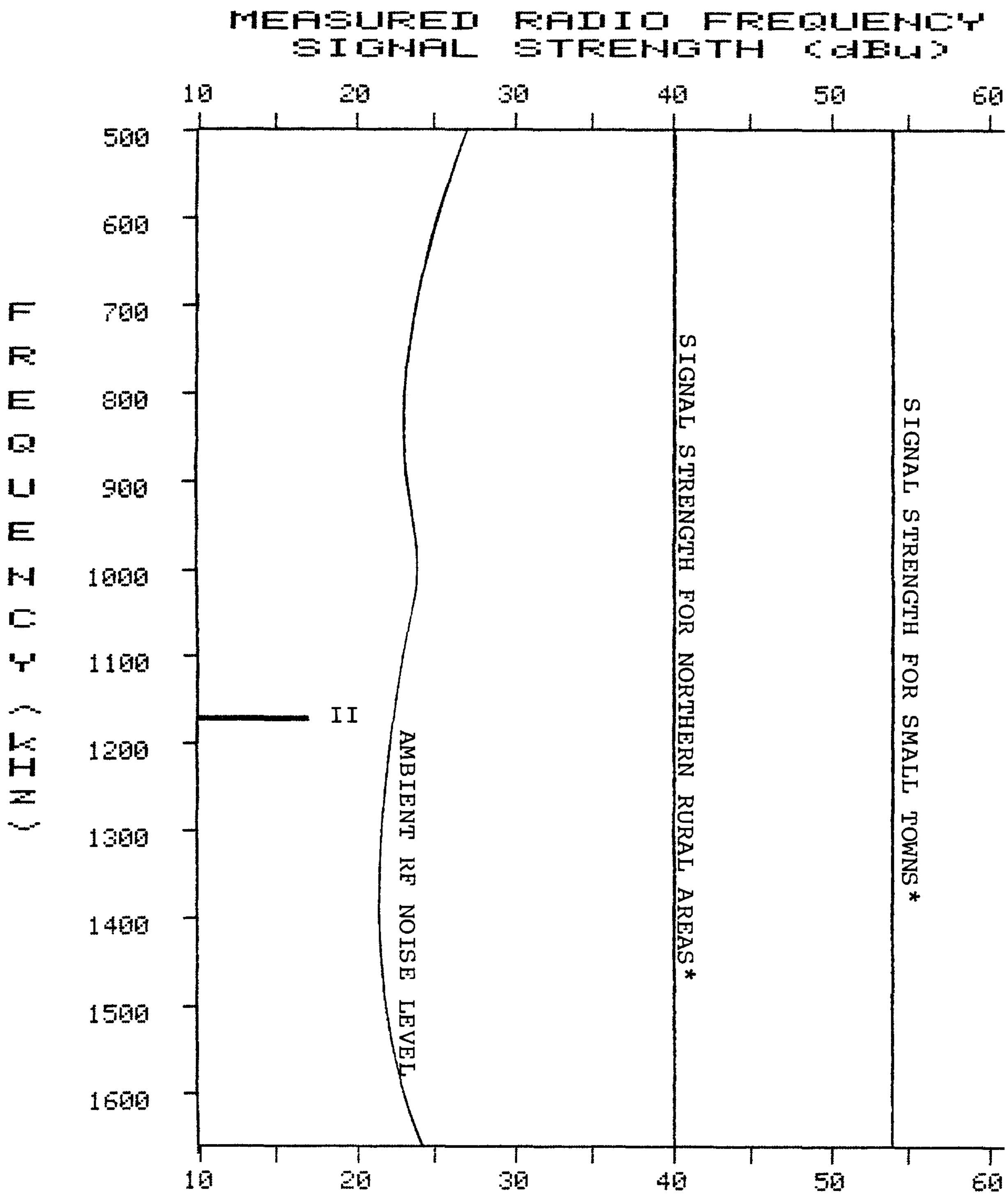
SITE 50A CURRY

MEASURED RADIO FREQUENCY SIGNAL STRENGTH (dBu)



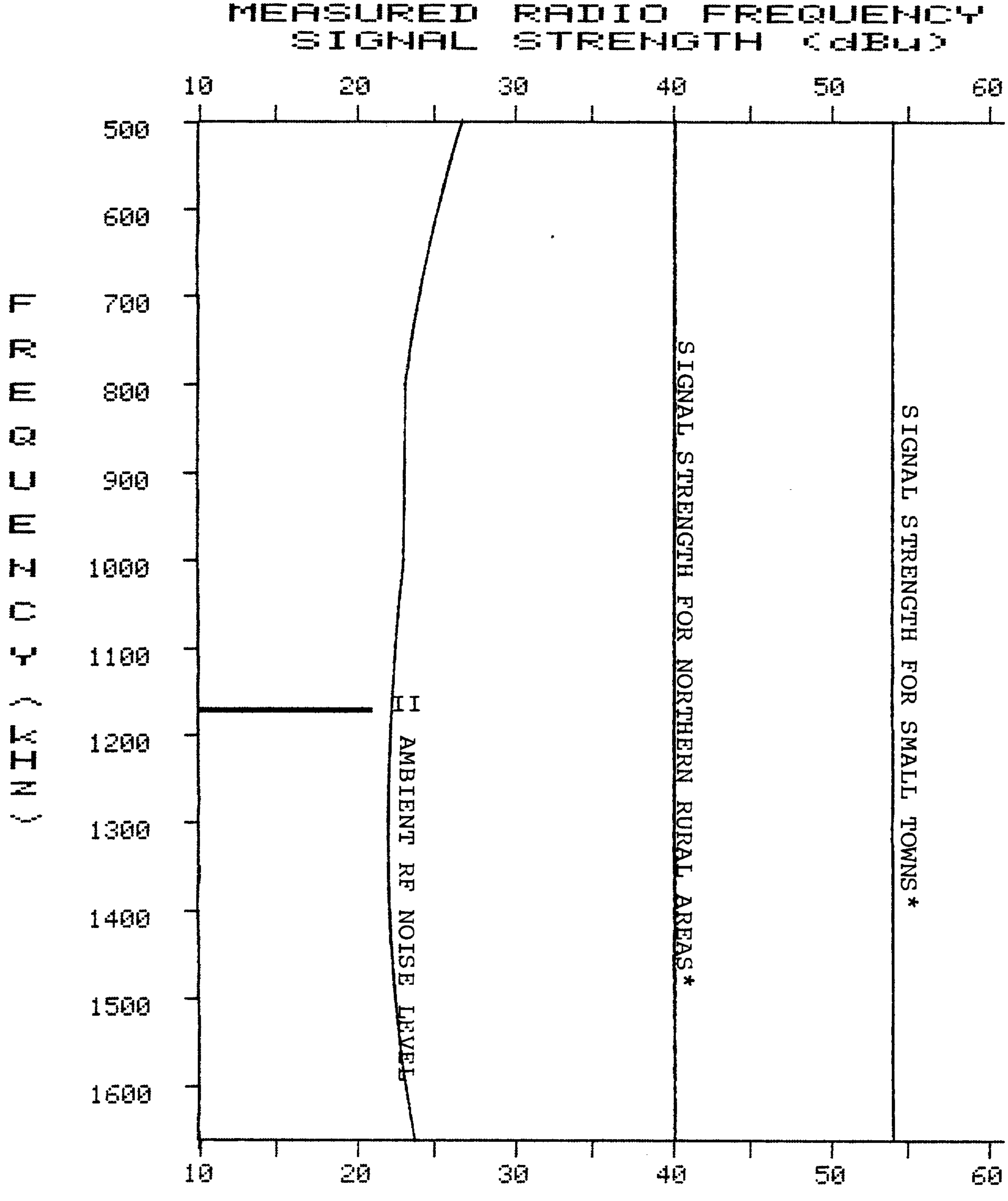
II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

SITE 60 CANTWELL



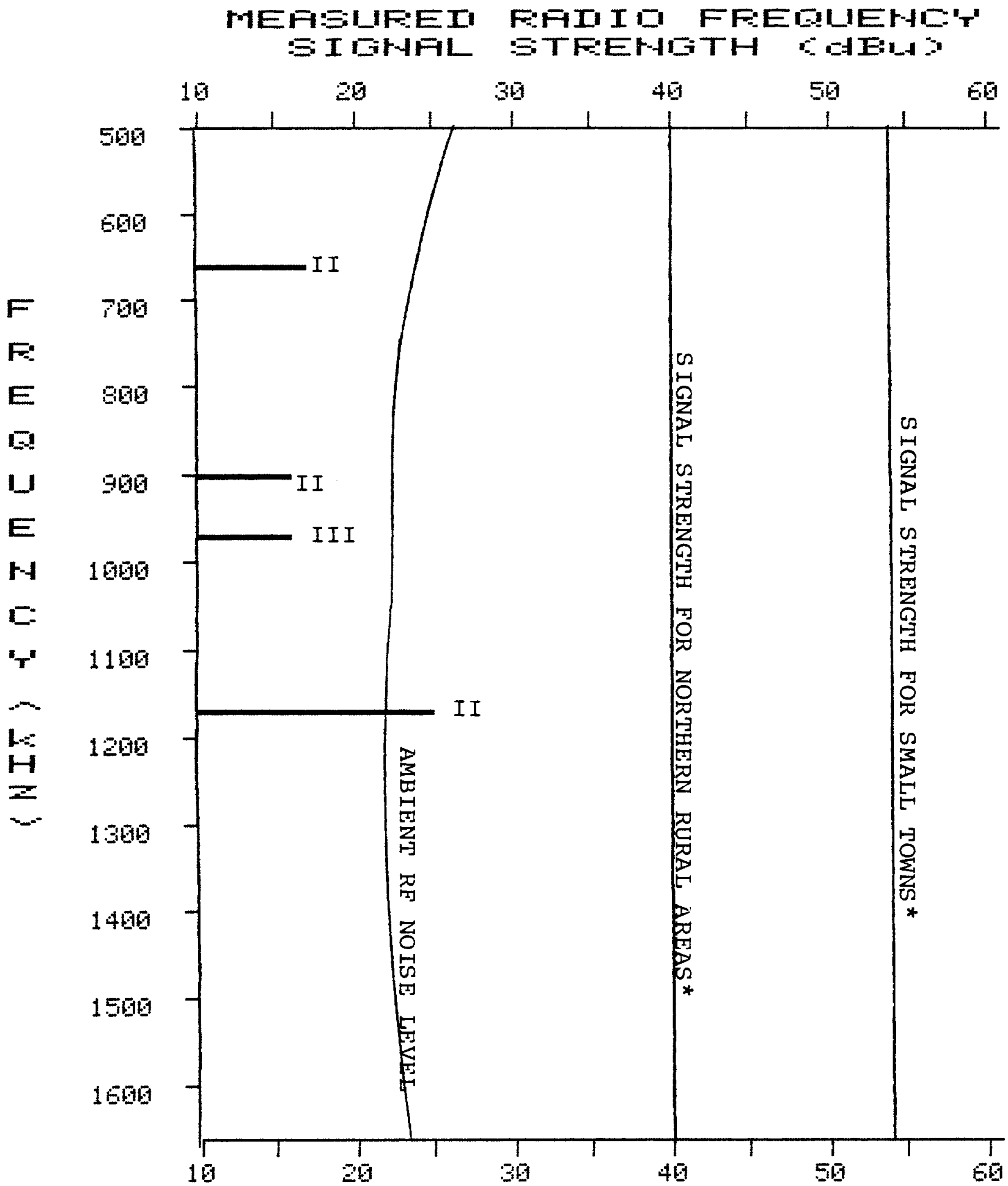
II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

SITE 70 CARLO CREEK



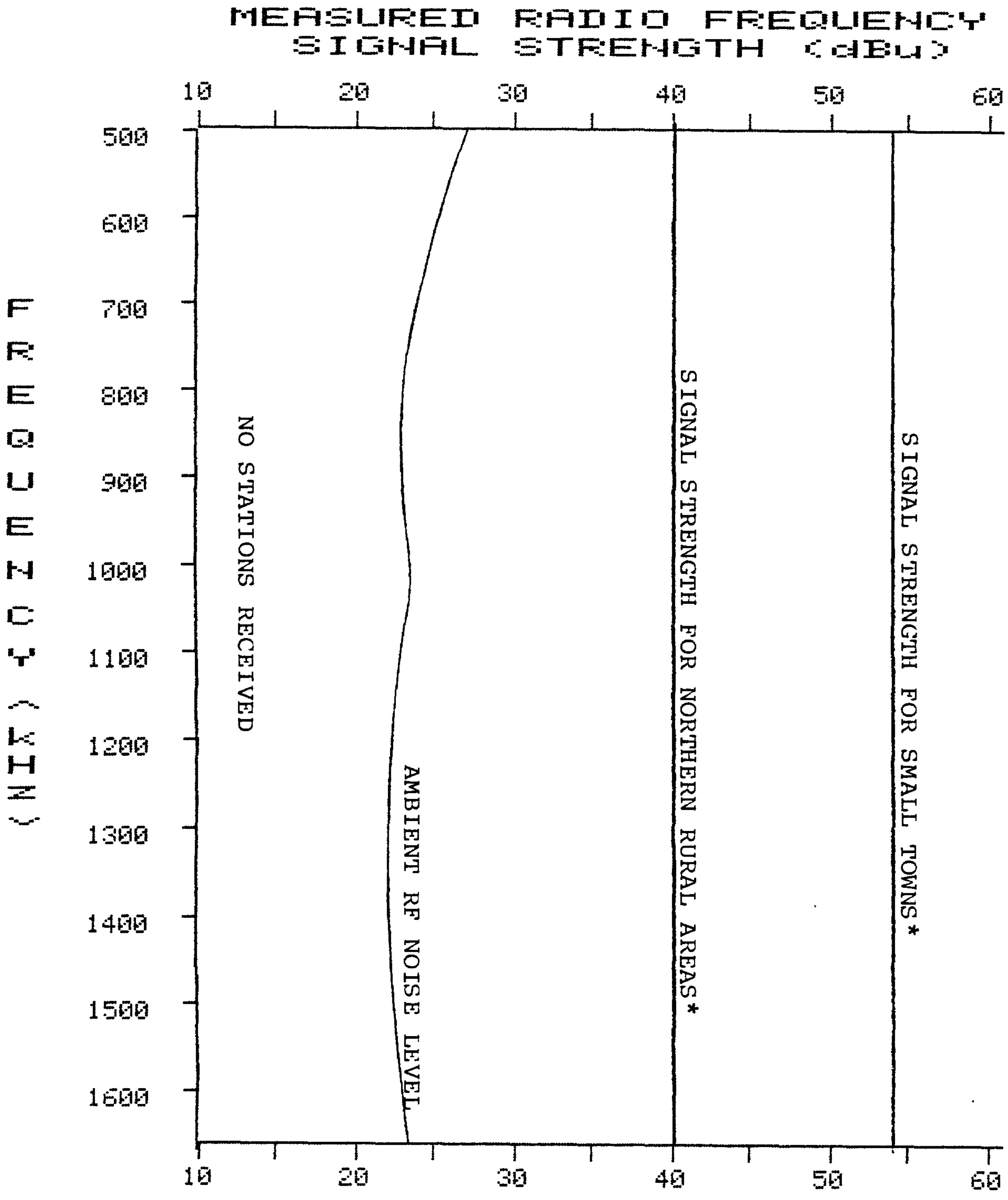
II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

SITE 80 DENEKI LAKE



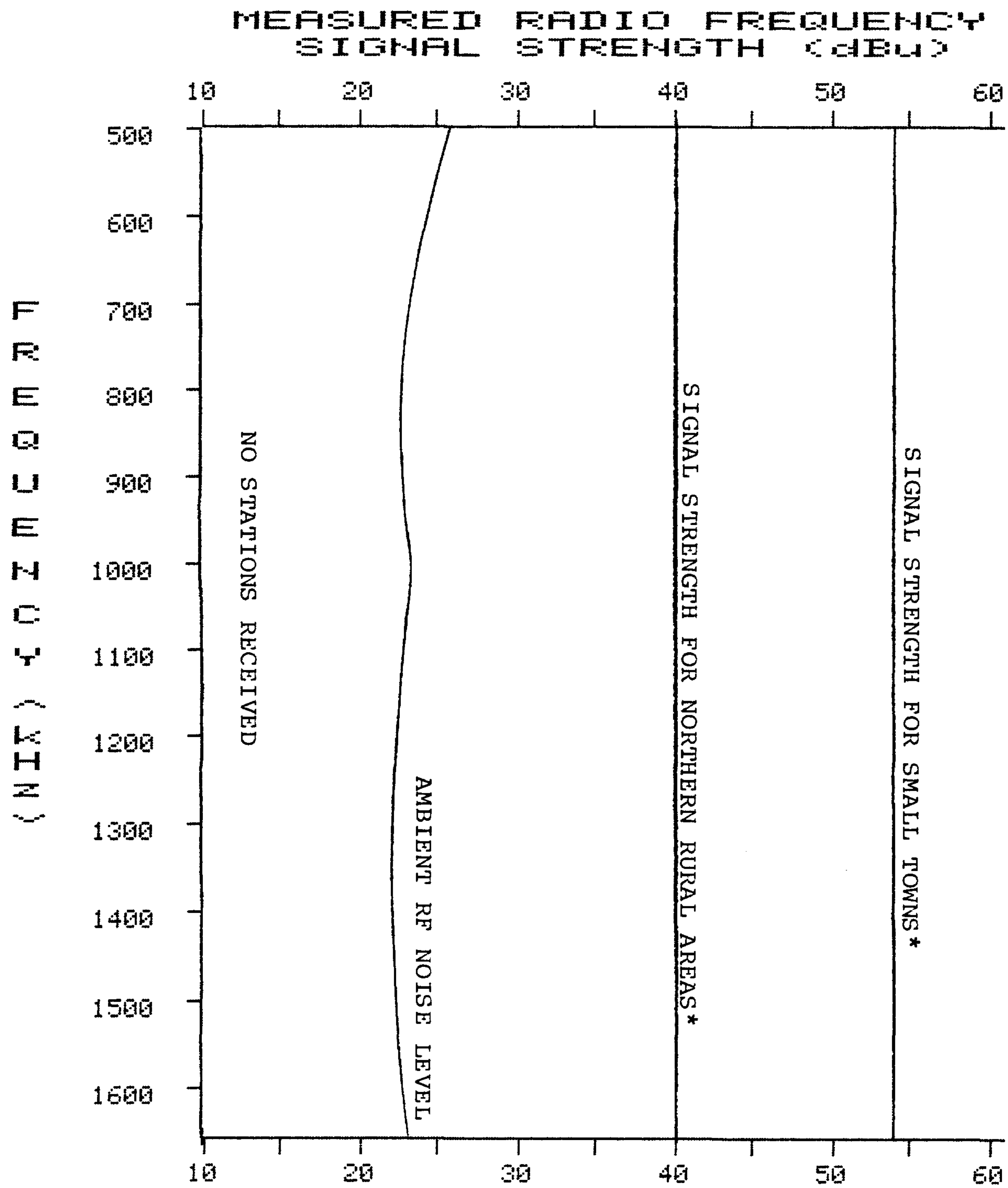
II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

SITE 90 MCKINLEY VILLAGE



II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

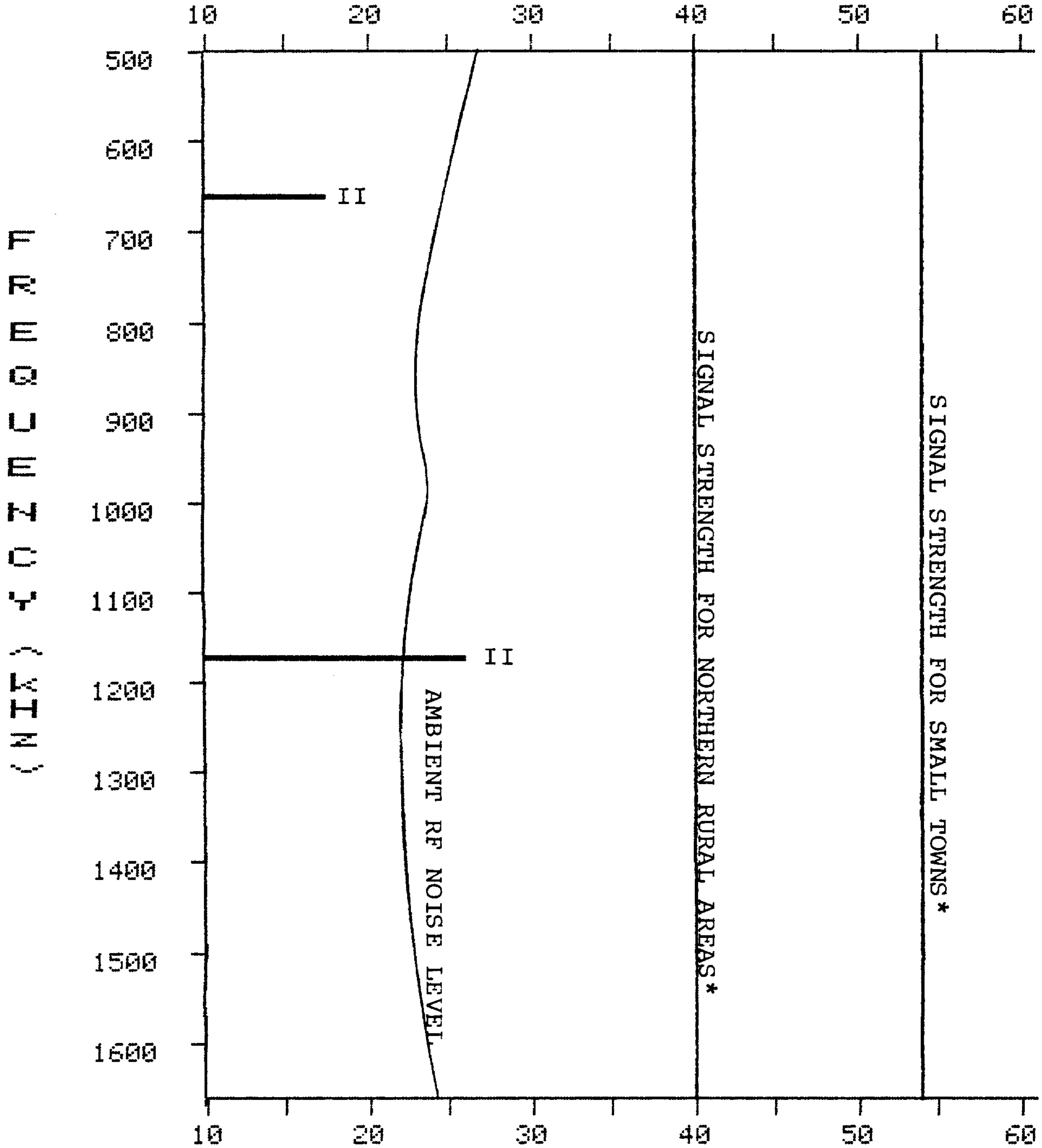
SITE 100 MCKINLEY PARK



II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

SITE 110A HEALY

MEASURED RADIO FREQUENCY SIGNAL STRENGTH (dBu)



II - CLASS II STATION
III - CLASS III STATION
* - SET BY FCC FOR PRIMARY SERVICE

TV STATIONS RECEIVED

ALASKA POWER AUTHORITY

Ch.	Call	Location	Operating Power-kW Visual/Aural	Antenna Height-Feet AT/AG
2	KENI	Anchorage	26.9/2.69	70/173
2	KFAR	Fairbanks	5.37/.676	45/200
2		Cantwell Translator at Earth Station Operated by Alaska Department of Highways		
4	K04CO	Healy Translator (Primary Ch. 11 KTVF Fairbanks)		
4	K04DO	Talkeetna Translator (Primary Ch. 11 Anchorage)		
6	K06KG	Talkeetna Translator (Primary Ch. 13 Anchorage)		
*7	KAKM	Anchorage	105/20.90	143/250
7	K07ND	Healy Translator (Primary Ch. 9 Fairbanks)		
9	KUAC	Fairbanks	46.7/1.16	200/255
9	K09OO	Talkeetna Translator (Primary Ch. 2 Anchorage)		
11	KTVA	Anchorage	26.3/5.35	300/391
13	KIMO	Anchorage	30/6.17	90/347
13		Healy Translator		

AT - Above average terrain

AG - Above ground

* - Non-commercial educational station

TV SIGNAL STRENGTH AND AMBIENT NOISE SURVEY FOR ALASKA POWER AUTHORITY

SITE 10
WILLOW

DATE: 7/9/81

START: 16:40

FINISH: 18:30

OBSERVERS: J. TORRI
D. REYNOLDS

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
2	KENI	53.0	-20	8.5	3.0	44.5	-	A
		26.0	-20	8.5	3.0	-	17.5	
6	K06KG	29.0	-20	7.0	3.0	19.0	-	E
		27.0	-20	7.0	3.0	-	17.0	
7	KAKM	53.5	-20	14.0	4.0	51.5	-	A
		26.0	-20	14.0	4.0	-	24.0	
11	KTVA	43.0	-20	15.5	5.0	43.5	-	A
		29.0	-20	15.5	5.0	-	29.5	
13	KIMO	47.0	-20	19.5	8.0	54.5	-	B
		29.0	-20	19.5	8.0	-	36.5	

* Decibels (dBu) Quasi Peak (QP)

TV SIGNAL STRENGTH AND

AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 20
TRAPPER CREEK

DATE: 7/11/81

START: 11:06

FINISH: 12:01

OBSERVERS: J. TORRI
D. REYNOLDS
P. ROBINSON

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
2	KENI	37.0	-20	8.5	3.0	28.5	-	B
		26.0	-20	8.5	3.0	-	17.5	
4	K04DO	31.0	-20	5.0	3.0	19.0	-	D
		28.0	-20	5.0	3.0	-	16.0	
6	K06KG	44.0	-20	7.0	3.0	34.0	-	C
		28.0	-20	7.0	3.0	-	18.0	
7	KAKM	28.0	-20	14.0	4.0	26.0	-	E
		26.0	-20	14.0	4.0	-	24.0	
9	K09OO	39.5	-20	12.5	4.0	36.0	-	A
		26.0	-20	12.5	4.0	-	22.5	
11	KTVA	32.0	-20	15.5	5.0	32.5	-	E
		29.0	-20	15.5	5.0	-	29.5	

* Decibels (dBu) Quasi Peak (QP)

TV SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 30
CHASE

DATE: 7/12/81

START: 13:40

FINISH: 14:20

OBSERVERS: J. TORRI
D. REYNOLDS

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
2	KFAR	34.0	-20	8.5	3.0	25.5	-	D
		26.0	-20	8.5	3.0	-	17.5	
4	K04DO	47.0	-20	5.0	3.0	35.0	-	B
		28.0	-20	5.0	3.0	-	16.0	
6	K06KG	38.5	0	7.0	3.0	48.5	-	A
		27.0	-20	7.0	3.0	-	17.0	
7	KAKM	32.0	-20	14.0	4.0	30.0	-	D
		26.0	-20	14.0	4.0	-	24.0	
9	K09OO	38.5	-20	12.5	4.0	35.0	-	A
		26.0	-20	12.5	4.0	-	22.5	
11	KTVA	32.0	-20	15.5	5.0	32.5	-	D
		29.0	-20	15.5	5.0	-	29.5	
13	KIMO	33.0	-20	19.5	8.0	40.5	-	E
		29.0	-20	19.5	8.0	-	36.5	

* Decibels (dBu) Quasi Peak (QP)

TV SIGNAL STRENGTH AND

AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 40
LANE CREEK

DATE: 7/12/81

START: 11:25

FINISH: 12:19

OBSERVERS: J. TORRI
D. REYNOLDS

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
2	KFAR	38.5	-20	8.5	3.0	30.0	-	D
		26.5	-20	8.5	3.0	-	18.0	
4	K04DO	37.0	-20	5.0	3.0	25.0	-	D
		28.0	-20	5.0	3.0	-	16.0	
6	K06KG	52.0	-20	7.0	3.0	42.0	-	A
		27.0	-20	7.0	3.0	-	17.0	
7	KAKM	31.0	-20	14.0	4.0	29.0	-	D
		26.0	-20	14.0	4.0	-	24.0	
9	K09OO	39.0	-20	12.5	4.0	35.5	-	A
		26.0	-20	12.5	4.0	-	22.5	

* Decibels (dBu) Quasi Peak (QP)

TV SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 50A
CURRY

DATE: 7/12/81

START: 15:40

FINISH: 15:55

OBSERVERS: J. TORRI
D. REYNOLDS

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
6	K06KG	29.0	-20	7.0	3.0	19.0	-	E
		27.0	-20	7.0	3.0	-	17.0	

* Decibels (dBu) Quasi Peak (QP)

TV SIGNAL STRENGTH AND

AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 60
CANTWELL

DATE: 7/11/81

START: 17:23

OBSERVERS: J. TORRI
D. REYNOLDS

FINISH: 17:53

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
2	?	50.0	0	8.5	3.0	61.5	–	A
		21.0	-20	8.5	3.0	–	12.5	
7	KAKM	28.0	-20	14.0	4.0	26.0	–	E
		26.0	-20	14.0	4.0	–	24.0	
9	KUAC	32.0	-20	12.5	4.0	28.5	–	D
		26.0	-20	12.5	4.0	–	22.5	

* Decibels (dBu) Quasi Peak (QP)

? Station Call Letters Unknown.

TV SIGNAL STRENGTH AND

AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 70
CARLO CREEK

DATE: 7/15/81

START: 11:47

FINISH: 12:01

OBSERVERS: J. TORRI
D. REYNOLDS

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
2	KFAR	25.0	-20	8.5	3.0	16.5	-	D
		17.0	-20	8.5	3.0	-	8.5	

* Decibels (dBu) Quasi Peak (QP)

TV SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 80
DENEKI LAKE

DATE: 7/15/81

START: 13:40

OBSERVERS: J.TORRI
D. REYNOLDS

FINISH: 14:30

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
2	?	24.0	-20	8.5	3.0	15.5	-	E
		17.5	-20	8.5	3.0	-	9.0	
4	?	21.0	-20	5.0	3.0	9.0	-	E
		19.0	-20	5.0	3.0	-	7.0	

* Decibels (dBu) Quasi Peak (QP)

? Station Call Letters Unknown.

TV SIGNAL STRENGTH AND
AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 90
MCKINLEY VILLAGE

DATE: 7/14/81

START: 15:00

FINISH: 15:51

OBSERVERS: J. TORRI
D. REYNOLDS

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
9	KUAC	20.0	-20	12.5	4.0	16.5	-	E
		16.5	-20	12.5	4.0	-	13.0	

* Decibels (dBu) Quasi Peak (QP)

TV SIGNAL STRENGTH AND

AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 100
MCKINLEY PARK

DATE: 7/14/81

START: 12:35

FINISH: 12:41

OBSERVERS: J. TORRI
D. REYNOLDS

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY

NO STATIONS RECEIVED

* Decibels (dBu) Quasi Peak (QP)

TV SIGNAL STRENGTH AND

AMBIENT NOISE SURVEY
FOR
ALASKA POWER AUTHORITY

SITE 110A
HEALY

DATE: 7/13/81

START: 16:33

FINISH: 17:10

OBSERVERS: J. TORRI
D. REYNOLDS

CHANNEL	CALL LETTERS	METER* READING	ATTEN. SETTING	ANTENNA CORR.	CABLE CORR.	SIGNAL* STRENGTH	AMBIENT NOISE*	AUDIO QUALITY
4	K04CO	47.0	-20	5.0	3.0	35.0	-	A
		28.0	-20	5.0	3.0	-	16.0	
7	K07ND	48.0	-20	14.0	4.0	46.0	-	A
		26.0	-20	14.0	4.0	-	24.0	
9	KUAC	33.0	-20	12.5	4.0	29.5	-	B
		26.0	-20	12.5	4.0	-	22.5	
13	?	40.0	-20	19.5	8.0	47.5	-	C
		29.0	-20	19.5	8.0	-	36.5	

* Decibels (dBu) Quasi Peak (QP)

? Station Call Letters Unknown.

ALASKA POWER AUTHORITY

Existing Quality of Television Reception (Audio)
(Based on Field Measurements of Radio Station
Signal Strengths July 9-15, 1981)

Site Number	Location	Number of TV Signals Judged to have the following Quality of Audio Reception				
		A	B	C	D	E
10	Willow	3	1	-	-	1
20	Trapper Creek	1	1	1	1	2
30	Chase	2	1	-	3	1
40	Lane Creek	2	-	-	3	-
50A	Curry	-	-	-	-	1
60	Cantwell	1	-	-	1	1
70	Carlo Creek	-	-	-	1	-
80	Deneki Lake	-	-	-	-	2
90	McKinley Village	-	-	-	-	1
100	McKinley Park	-	-	-	-	-
110A	Healy	2	1	1	-	-

A - Entirely Satisfactory
B - Very Good, Background Unobtrusive
C - Fairly Satisfactory, Background Plainly Evident
D - Background Very Evident, Speech Understandable With Concentrating
E - Speech Unintelligible

APPENDIX B

APPENDIX B

COMMUNICATION TOWER SURVEY

ALASKA POWER AUTHORITY

APPENDIX B

TABLE OF CONTENTS

COMMUNICATION TOWER SURVEY
ALASKA POWER AUTHORITY

SCOPE

The results of an investigation of radio communications towers licensed to business and governmental agencies in the study area between Willow and Healy, Alaska are presented in this Appendix. A total of 50 towers have been identified including microwave relay facilities, TV translators, FM translators, earth stations and air navigational aides. Also presented are the minimum recommended separations between the 345 kV intertie and these towers.

RECOMMENDATIONS

It is recommended that the minimum separation distances summarized in Table B-3 be observed between the communication towers identified in this appendix and the edge of the right-of-way of the intertie. Actual locations of the communication towers near the final line route will be verified using aerial photographs of the route at the time the transmission line centerline is established.

INTRODUCTION

In the past, EHV transmission lines have been reported to cause interference to certain types of communication facilities. This interference is not limited to electromagnetic interference resulting from conductor corona. Rather such interference has been caused by the physical presence of tall metallic transmission line structures, shield wires and, in some cases, phase conductors. Such interference occurred even when transmission lines were deenergized. Both clearance criteria and mitigative techniques have been developed to successfully resolve most of these types of interference.

In routing the intertie, it then becomes desirable to identify those situations where a proposed route may cause such interference. Necessary corrective measures can be implemented prior to the construction of the intertie thereby minimizing the impact on communication facilities.

APA authorized CAI to perform a study of the commercial radio communication facilities near the proposed 345 kV intertie. The radio communication facilities identified in this study are:

- FM Translators
- TV Translators
- Earth Stations
- Air Navigational Aids
- Point-to-Point Microwave

The primary sources of technical data on these communication facilities include various bureaus of the Federal Communication Commission (FCC), the Federal Aviation Administration, Alascom, Inc. the Alaska Railroad, the Golden Valley Electric Association and the Matanuska Telephone Association. These sources were supplemented by Federal Aviation Administration Aeronautical Charts and United States Geological Service Maps and field surveys by both Dryden & LaRue and Commonwealth.

These sources of technical data are the best available. However, it is Commonwealth's experience that the actual location of the communication towers may be slightly different from that shown in the technical data. For example, the smallest unit of longitude shown in the technical data is normally integer seconds. A deviation of 0.5 seconds (longitude) between an actual tower location and the technical data can result in a difference of about 50 feet. Commonwealth will verify the actual locations of the communication towers near the final line route using aerial photographs of the route at the time the transmission line centerline is established.

COMMUNICATION FACILITIES

The following types of communications facilities were identified in this study:

1. FM Translators
2. TV Translators
3. Earth Stations
4. Air NAVAIDS Not Located at Airports
   a. Nondirectional Radio Beacons
   b. Remote Center Air Ground Facilities
   c. Single Frequency Outlets
   d. Simultaneous Single Frequency Outlets
5. Air NAVAIDS Located at Airports
   a. VOR Stations
   b. Unicoms
   c. Remote Communications Outlets
   d. Flight Service Stations
   e. Airport Advisory Services
   f. Airport Landing Alert Systems
6. Common Carrier and Point-to-Point Microwave

The following types of communication facilities were excluded in this study:

1. Police and Sheriff 2-Way Radio
2. Private 2-Way Radio
3. Amateur Radio and Citizens Band
4. Classified Government Frequency Assignments
5. Telephone, Telegraph and Other Wire Facilities

CLEARANCE CRITERIA

A summary of the clearance criteria for the different communication towers identified in the study area is tabulated in Table B-1.

FM TRANSLATOR FACILITIES

FM translator facilities are licensed by the FCC to receive an FM station and to rebroadcast the FM program on a different FM frequency. To date, EHV tower and conductor impacts on FM transmitting antennas have not been reported.

The minimum spacing between FM transmitting antennas and the EHV right-of-way is recommended to be the FM antenna structure height plus 200 feet. If the FM antenna were to topple, it would topple so that neither the antenna nor guy wires would be expected to fall on the right-of-way. Also sufficient clearance would be provided for established maintenance practices on the guying anchors for the broadcast tower.

TELEVISION TRANSLATOR FACILITIES

TV translator facilities are licensed by the FCC to receive a TV signal and to rebroadcast the TV program on a different TV channel. No effects of EHV lines on television transmitting antennas have been reported. Again, the clearance criteria is the antenna structure height plus 200 feet.

There may be an impact of the EHV towers on television reception due to reflections from the EHV towers which can cause ghost images (multiple images) to appear on the television screen. Modification or improvement of the receiving TV antenna system is the preferred method of correcting ghosting problems. Such problems must be considered on a case by case basis.

EARTH STATIONS

Earth Stations are licensed by the FCC to provide communication service from a geostationary satellite. Operating at frequencies in the 1 GHz or 6 GHz band, earth stations are normally unaffected by 345 kV lines. Located at approximately 61° N latitude, earth stations in Alaska have low zeniths, approximately 19° above the horizon. For proper operation it is necessary that the line of sight link between the earth station antenna and the satellite does not pass through or near the transmission line structures. Therefore the minimum separation between the line route and the earth station is recommended to be 1000 feet (approximately 10 tower heights).

AIR NAVIGATIONAL AIDS

Air Navigational Aids (NAVAIDS) are radio facilities used by government, commercial and private airplane pilots for communication, data logging, positioning and other information exchange. Many types of Air Navigational Aids are in use in the study area.

NAVAIDS (Enroute)

In selected cases NAVAIDS are not located at airports. Such NAVAIDS are located throughout the countryside to provide a blanket of electronic aids to pilots and controllers.

Nondirectional Radio Beacons (NDB)

These omnibeacons are used by pilots for navigation fixes or homing points. The nondirectional signal has a frequency range of 200-400 kHz in 3 power ranges: MH - less than 50 watts, H - 50 to 2000 watts, and HH - more than 2000 watts. The airborne equipment generally consists of a radio direction finder, a loop antenna and a sense antenna. The FAA recommends a minimum clearance of 1000 feet to tall metallic structures such as transmission towers.

Remote Center Air Ground (RCAG) Facilities

The RCAG Facilities extend the communications coverage of Air Route Traffic Control Centers. The voice signal from the Controller is generally carried over telephone lines to a RCAG site where it is transmitted (AM) in the range of 123.6-128.8 MHz or 132.05-135.95 MHz at 10 or 50 watts. When telephone lines are not used for the ground link, an FM link (between 162 MHz and 174 MHz) or an alternate FM UHF link (between 406 MHz and 420 MHz) is used. These directional signals normally have a transmitted power of up to 50 watts.

Effects from EHV lines have not been reported by the FAA. The FAA recommended clearance is 1000 feet to tall metallic structures such as transmission towers.

Single Frequency Outlets (SFO)

At or near airports with no control towers, the FAA can authorize an SFO air-to-ground facility to tie in with a remote Air Traffic Control Tower communications. SFO operates on a frequency between 118-136 MHz and has a non-directional AM signal using a normal transmitter power of 10 watts. For an SFO not located at an airport the FAA recommends a minimum 1000 foot separation to tall metallic structures such as transmission towers.

The ground link used for a SFO is identical with the ground link for a Remote Communications Outlet (see RCO).

Simultaneous Single Frequency Outlets (SSFO)

A SSFO is a low-powered battery-operated Single Frequency Outlet (unique to Alaska). Refer to the section on SFOs for characteristics of this system.

NAVAIDS (At Airports)

The air NAVAIDS located at airports in the study area include the facilities listed under Airport NAVAIDS in Table B-1. For most applications the minimum spacing criteria for EHV lines (from airports) requires a maximum slope of 1.5° from the airport to the top of the EHV tower. This criteria generally will provide sufficient separation resulting in insignificant impact on NAVAIDS located at airports.

VOR Stations

The VOR station is the standard Very High Frequency Omni Range electronic direction finder in common use today. The VOR system consists of a 200 watt ground transmitter and airborne receiving equipment. Two signals are transmitted on a 110-118 mHz carrier: 1) a frequency modulating reference phase 30 Hz signal and 2) a space amplitude modulating variable phase 30 Hz signal. With proper phasing of the reference and variable signals, the airborne equipment can determine the azimuth from the plane to the transmitting site.

Unicoms

A Unicom is a nongovernment air-to-ground radio communications facility providing private air-to-ground communications and, at certain airports, airport advisory services. Unicoms are licensed by the Aviation Marine Branch of the Federal Communications Commission. At airports with no control towers, one of three frequencies (122.7 MHz, 122.8 MHz or 123.0 MHz) is used. At airports with control towers a frequency of 122.95 MHz is normally used. The nondirectional vertically polarized signals are amplitude modulated. The broadcast power is normally 10 watts.

Remote Communications Outlets (RCO)

At airports with no control towers, a Remote Communications Outlet may be authorized by the FAA to provide local Flight Service Station (FSS) service from a remote location. These nondirectional signals have a frequency range between 118-136 MHz, are amplitude modulated and normally have a transmitted power level of 10 watts.

Voice channels between an RCO and an FSS may be over telephone lines or a directional VHF link. This link has a frequency range of 162-174 MHz and is frequency modulated.

Flight Service Stations (FSS)

At airports with control towers, air-to-ground communication for a Flight Service Station may be authorized by the FAA. Services of the FSS include change of flight plans and reports of weather conditions along a flight route. A nondirectional signal having a frequency between 122.0-122.6 MHz is amplitude modulated. Normal broadcast power is 10 watts.

Airport Advisory Services (AAS)

Airports, having an FSS, may also be authorized by the FAA to provide an Airport Advisory Service. This air-to-ground communications is used for aircraft landings and takeoffs. The nondirectional AM signal has a frequency of 123.6 MHz from a 10 watt transmitter.

Airport Landing Alert Systems (ALAS)

At airports with no control towers or when the control tower is unmanned, the FAA can authorize an ALAS, an air-to-ground communication link. A pilot can key a frequency between 118-136 MHz, a predetermined number of times to cause the airfield lights to turn on. At the airport only a receiver is used for this communications link.

POINT-TO-POINT MICROWAVE

All tall metallic structures including 345 kV transmission line towers may affect microwave beams. While literature discussing such effects is scarce, it is standard practice for microwave facility suppliers and microwave routing engineers to avoid placing a microwave path through a transmission line tower. The general routing criteria for a microwave beam is to provide a minimum spacing of six-tenths of the radius of the first fresnel zone [Reference B-1] from path to obstacle. Because of the considerations made in microwave routing, it is appropriate that APA make similar considerations in transmission line route selection.

This survey of microwave beams considers a two dimensional model with the understanding that the elevation of the microwave beams may be higher than the transmission line. The licensees of the facilities normally have completed path-profiles for each microwave beam to determine the minimum clearance required between the beam and both the natural topography and existing man-made objects. Using these path-profiles, these licensees should be able to easily determine whether sufficient clearance exists between their microwave beams and the proposed transmission lines.

The minimum horizontal separation recommended between a microwave tower and the 345 kV line is the height of the microwave tower plus 200 feet. This is a distance based on physical parameters rather than microwave beam degradation.

RESULTS

A total of 50 commercial communications towers have been identified in the study area (Figure B-1). A summary of these towers is provided in Table B-2, Sheets 1-8. Included in this summary for each tower is the licensee, site name, licensing agency, location, site elevation, antenna height, the type and call letters (when available), frequency, power and the receiving targets of the facility.

The recommended separations between the commercial communications towers and the edge of the right-of-way of the 345 kV intertie are summarized in Table B-3, Sheets 1-4.

The Federal Aviation Administration and the Licenses of Microwave Facilities and Earth Stations have received copies of this Appendix for review and comments. A record of pertinent correspondence in this matter follows Table B-3.

REFERENCES

B-1 Engineering Considerations for Microwave Communications Systems. GET Lenkurt, San Carlos, California, June, 1970.

B-2 VOR/VORTAC Siting Criteria, 6700.11, Federal Aviation Administration, Department of Transportation, Washington, D.C., August 7, 1968.

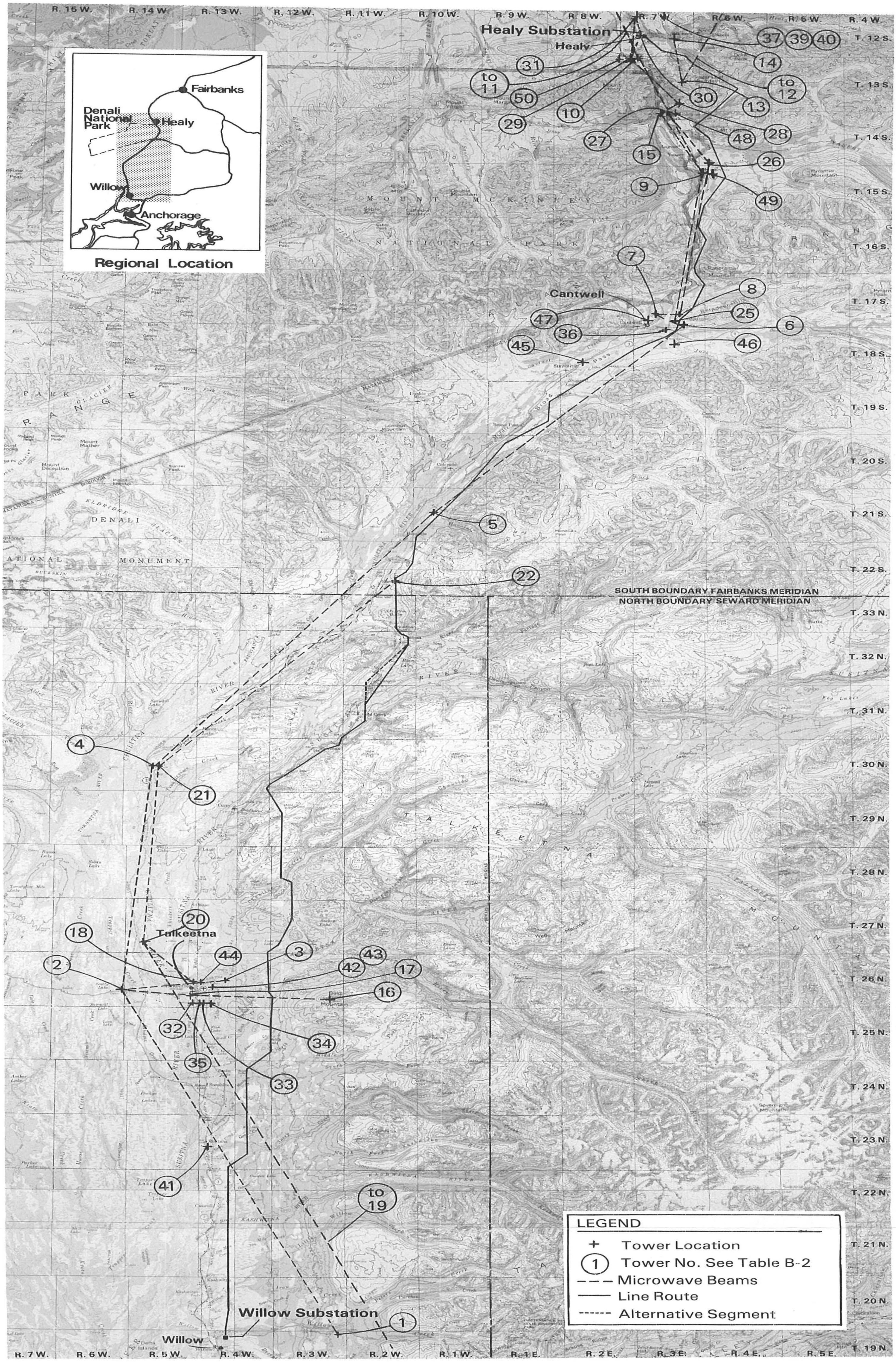


FIGURE B-1

Alaska Power Authority **ANCHORAGE FAIRBANKS TRANSMISSION INTERTIE**

0 10 20 Miles
0 10 20 Kilometers

North

Communication Towers

Gilbert/Commonwealth

TABLE B-1

POSSIBLE EHV LINE EFFECTS ON COMMUNICATIONS FACILITIES
AND RECOMMENDED MINIMUM CLEARANCES

Communication Facility	Reflection	Diffraction	Absorption	Ghosting	No Reported Effects	Recommended Minimum Clearance to EHV Lines	Criterion
FM Translator					X	Antenna Height plus 200 feet	Antenna Toppling Guy Anchor Maintenance
TV Translator	X	X		X		Antenna Height Plus 200 feet	Antenna Toppling Guy Anchor Maintenance
Earth Stations						10 Tower Height	See Text
NAVAIDS (Enroute)							
NDB					X	1000 feet	FAA
RCAG					X	1000 feet	FAA
SFO					X	1000 feet	FAA
SSFO					X	1000 feet	FAA
NAVAIDS (At Airports)						1.5°	DOT/FAA
VOR	X					1.5°	Ref. B-2
Unicom					X		Airport Criterion
RCO					X		Airport Criterion
FSS					X		Airport Criterion
AAS					X		Airport Criterion
ALAS					X		Airport Criterion
Point-to-Point Microwave	X	X	X			Antenna Height Plus 200 feet	Antenna Toppling Guy Anchor Maintenance
						See Text	0.6 First Fresnel Zone

COMMUNICATION TOWER SURVEY
ALASKA POWER AUTHORITY
345 KV INTERTIE

Tower #	Licensee (Site Name) (Bureau)	Latitude N / Near Municipality	Longitude W	Site El. Ft. AMSL	Tower Ht. Feet	Facility (Type)	Frequency (Power)	Target
1	Alascom Inc. (Twelve Mile) (Common Carrier)	61° 46' 20" 14 Miles east of Willow	149° 45' 06"	1450	175	WAD94 (Microwave)		Microwave to Tower 2
2	Alascom Inc. (Scotty Lake) (Common Carrier)	62° 19' 07" Trapper Creek	150° 17' 55"	450	150	WAD95 (Microwave)		Microwave to Tower 17 (MTA only) Microwave to Tower 1 Microwave to Tower 3 Microwave to Tower 4
3	Alascom Inc. (Bartlett Earth Station) (Common Carrier)	62° 19' 57" Talkeetna	150° 01' 57"	480	75	WAD93 (Microwave)		Microwave to Tower 2
4	Alascom Inc. (Byers Creek) (Common Carrier)	62° 41' 20" Byers Lake	150° 13' 50"	1216	130	WQQ87 (Microwave)		Microwave to Tower 2 Microwave to Tower 5
5	Alascom Inc. (Honolulu) (Common Carrier)	63° 05' 41" Honolulu	149° 30' 18"	1910	233	WQQ86 (Microwave)		Microwave to Tower 4 Microwave to Tower 6
6	Alascom Inc. (Reindeer Hill #2) (Common Carrier)	63° 24' 14" Cantwell	148° 50' 31"	3643	45	Reindeer 2PV (Microwave) Passive Reflector		Microwave to Tower 5 Microwave to Tower 7
7	Alascom Inc. (Cantwell) (Common Carrier)	63° 24' 04" Cantwell	148° 56' 16"	2644	61	WQQ80 (Microwave)		Microwave to Tower 6 Microwave to Tower 8

LEGEND: AMSL - Above Mean Sea Level
MTA - Matanuska Telephone Association

COMMUNICATION TOWER SURVEY
ALASKA POWER AUTHORITY
345 KV INTERTIE

Tower #	Licensee (Site Name) (Bureau)	Latitude N	Longitude W	Site El. Ft. AMSL	Tower Ht. Feet	Facility (Type)	Frequency (Power)	Target
		Near Municipality						
8	Alascom Inc. (Reindeer Hill #1) (Common Carrier)	63° 24' 34" Cantwell	148° 50' 58"	3238	45	Reindeer 1PV (Microwave) Passive Reflector		Microwave to Tower 7 Microwave to Tower 9
9	Alascom Inc. (McKinley Village) (Common Carrier)	63° 38' 37" McKinley Village	148° 47' 00"	2162	98	WQQ81 (Microwave		Microwave to Tower 8 Microwave to Tower 10 (Only MTA) Microwave to Tower 15 (Shared with MTA)
10	Alascom Inc. (Healy) (Common Carrier)	63° 50' 16" Healy	148° 58' 41"	1914	205	WQQ82 (Microwave)		Microwave to Tower 9 (Only MTA) Microwave to Tower 11 (Shared with MTA)
11	Alascom Inc. (Birch Creek) (Common Carrier)	64° 10' 14" Birch Creek	149° 17' 43"	983	125	WQQ83 (Microwave)		Microwave to Tower 10 (Shared with MTA)
12	Golden Valley Ele. (Private Radio)	64° 52' 47" Ester Dome	148° 03' 20"	2364	80	WJI92 (Microwave)	956.0 MHz (10 W)	Microwave to Tower 13
13	Golden Valley Ele. (Sugar Loaf) (Private Radio)	63° 47' 25" Sugar Loaf Mountain, Healy	148° 52' 18"	4500	28	WJI93 (Microwave	957.6 MHz (10W) 959.6 MHz (10 W)	Microwave to Tower 12 Microwave to Tower 14
14	Golden Valley Ele. (Healy Power Plant) (Private Radio)	63° 51' 21" Healy	148° 57' 00"	1272	80	WJI94 (Microwave)	954.0 MHz (10 W)	Microwave to Tower 13

LEGEND: AMSL - Above Mean Sea Level
MTA - Matanuska Electric Association

COMMUNICATION TOWER SURVEY
ALASKA POWER AUTHORITY
345 KV INTERTIE

Tower #	Licensee (Site Name) (Bureau)	Latitude N	Longitude W	Site El. Ft. AMSL	Tower Ht. Feet	Facility (Type)	Frequency (Power)	Target
		Near Municipality						
15	Matanuska Telephone Association (McKinley Park) (Common Carrier)	63° 43' 59" McKinley Park	148° 54' 56"	1753	33	WAS480 (Microwave)		Microwave to Tower 9 (Shared with Alascom)
16	Matanuska Telephone Association (Bald Mountain) (Common Carrier)	62° 18' 30" 12 Miles east of Talkeetna	149° 45' 07"	3300	30	(Microwave)	2GHz Digital	Microwave to Tower 17
17	Matanuska Telephone Association (Talkeetna) (Common Carrier)	62° 19' 19" Talkeetna (Central Office)	150° 06' 54"	346	100 90	(Microwave)	2 GHz Digital 2 GHz Digital	Microwave to Tower 16 Microwave to Tower 2
18	Alaska Railroad (Talkeetna) (IRAC)	62° 19' 48" Talkeetna	150° 06' 48"	340	60	(Microwave)	2.202 GHz (3 Watts)	Microwave to Tower 20
19	Alaska Railroad (Summit) (IRAC)	61° 15' 31" Anchorage	149° 31' 37"	3850	30	(Microwave)	1.776 GHz (10 Watts)	Microwave to Tower 20
20	Alaska Railroad (Chalitna Hwy. Camp) (IRAC)	62° 24' 10" Trapper Creek	150° 15' 08"	550	160 100 100	(Microwave)	2.2565 GHz (3 Watts) 1.716 GHz (10 Watts) 1.746 GHz (5 Watts)	Microwave to Tower 18 Microwave to Tower 19 Microwave to Tower 21
21	Alaska Railroad (Byers Lake) (IRAC)	62° 41' 17"	150° 13' 34"	1400	30 30	(Microwave)	1.806 GHz (10 Watts) 1.746 GHz (10 Watts)	Microwave to Tower 20 Microwave to Tower 22

LEGEND: AMSL - Above Mean Sea Level
IRAC - Interdepartment Radio Advisory Committee

COMMUNICATION TOWER SURVEY
ALASKA POWER AUTHORITY
345 KV INTERTIE

Tower #	Licensee (Site Name) (Bureau)	Latitude N / Near Municipality	Longitude W	Site El. Ft. AMSL	Tower Ht. Feet	Facility (Type)	Frequency (Power)	Target
22	Alaska Railroad (Hurricane) (IRAC)	62° 58' 40" Hurricane	149° 38' 47"	1600	100 155	(Microwave)	1.806 GHz (5 Watts) 1.776 GHz (5 Watts)	Microwave to Tower 21 Microwave to Tower 24 Microwave to Tower 23
23	Alaska Railroad (IRAC)	To Gold Creek, south of Hurricane Future Site				(Microwave)		Microwave to Tower 22
24	Alaska Railroad (IRAC)	Future Site				(Microwave)	1.716 GHz (0.1 Watts) 1.776 GHz (0.1 Watts)	Microwave to Tower 22 Microwave to Tower 25
25	Alaska Railroad (Cantwell/Reindeer) (IRAC)	63° 24' 13" Cantwell	148° 50' 23"	3500	40 30	(Microwave)	1.716 GHz (5 Watts) 2.2565 GHz (5 Watts)	Microwave to Tower 24 Microwave to Tower 26
26	Alaska Railroad (Yanert) (IRAC)	63° 39' 17" Yanert	148° 46' 41"	2515	25 25	(Microwave)	2.205 GHz (0.1 Watts) 2.2565 GHz (0.1 Watts)	Microwave to Tower 25 Microwave to Tower 27
27	Alaska Railroad (McKinley Park) (IRAC)	63° 43' 58" McKinley Park	148° 54' 30"	1753	30 30	(Microwave)	2.205 GHz (5 Watts) 1.746 GHz (5 Watts)	Microwave to Tower 26 Microwave to Tower 28
28	Alaska Railroad (Horseshoe Passive) (IRAC)	63° 44' 40" Horseshoe Pass	148° 53' 00"	2050	8 8	(Microwave) Passive Reflector	1.806 GHz 1.746 GHz	Microwave to Tower 27 Microwave to Tower 29

LEGEND: AMSL - Above Mean Sea Level
IRAC - Interdepartment Radio Advisory Committee

COMMUNICATION TOWER SURVEY
ALASKA POWER AUTHORITY
345 KV INTERTIE

Tower #	Licensee (Site Name) (Bureau)	Latitude N	Longitude W	Site El. Ft. AMSL	Tower Ht. Feet	Facility (Type)	Frequency (Power)	Target
		Near Municipality						
29	Alaska Railroad (Garner) (IRAC)	63° 50' 13" Garner	148° 59' 30"	1900	75	(Microwave)	1.806 GHz (5 Watts)	Microwave to Tower 28
					50		2.2565 GHz (0.25 Watts)	Microwave to Tower 30
					90		1.716 GHz (5 Watts)	Microwave to Tower 31
30	Alaska Railroad (Healy) (IRAC)	63° 51' 15"	148° 58' 44"	1459	40	(Microwave)	2.202 GHz (0.25 Watts)	Microwave to Tower 29
31	Alaska Railroad (Browne) (IRAC)	64° 10' 30" Browne	149° 19' 00"	1200	25	(Microwave)	1.776 GHz (0.10 Watts	Microwave to Tower 29
32	(Broadcast)	62° 17' 56" Talkeetna	150° 06' 25"			K0900 (TV Translator)	Primary - Channel 2 Operate - Channel 9	
33	Alaska Public TV (Broadcast)	62° 18' 02" (Application for Construction Permit) Talkeetna	150° 05' 52"			(TV Translator)	Primary - Channel 7 Operate - Channel 47	
34	Northern TV Inc. (Broadcast)	62° 18' 00" Talkeetna	150° 05' 36"		31	K04D0 (TV Translator)	Primary - Channel 11 Operate - Channel 4 (1 Watt)	

LEGEND: AMSL - Above Mean Sea Level
IRAC - Interdepartment Radio Advisory Committee

COMMUNICATION TOWER SURVEY
ALASKA POWER AUTHORITY
345 KV INTERTIE

Tower #	Licensee (Site Name) (Bureau)	Latitude N	Longitude W	Site El. Ft. AMSL	Tower Ht. Feet	Facility (Type)	Frequency (Power)	Target
		Near Municipality						
35	Talkeetna Chamber of Commerce (Broadcast)	62° 18' 00" Talkeetna	150° 06' 12"		15	K06KG (TV Translator)	Primary - Channel 13 Operate - Channel 6	
36	Alaska Dept. of Highways (Broadcast)	63° 23' 14" Cantwell	148° 52' 32"			Rebroadcast Channel 2 (Earth Station)	Channel 2 (10 Watts)	
37	(Broadcast)	63° 52' 30" Healy	148° 51' 00"	2550	40	K269AD (FM Translator)	Primary - Channel 284 (KUAC-FM) Operate - Channel 269	
38	Alaska Public Broadcasting (Broadcast)	63° 50' 13" Application for Construction Permit Healy	148° 58' 38"			(TV Translator)		
39	KUAC-TV (Broadcast)	63° 52' 30" Healy	148° 51' 00"	2550	30	K07ND (TV Translator)	Primary - Channel 9 (KUAC-TV) Operate - Channel 7	
40	Northern TV Inc. (Broadcast)	63° 52' 30" Healy/Suntrana/Usibelli	148° 51' 00"	2550	25	K04CO (TV Translator)	Primary - Channel 11 (KTVF-TV) Operate - Channel 4	

LEGEND: AMSL - Above Mean Sea Level

COMMUNICATION TOWER SURVEY
ALASKA POWER AUTHORITY
345 KV INTERTIE

Tower #	Licensee (Site Name) (Bureau)	Latitude N / Near Municipality	Longitude W	Site El. Ft. AMSL	Tower Ht. Feet	Facility (Type)	Frequency (Power)	Target
41	FAA Montana Creek Airport (IRAC)	62° 04' 18" Montana Creek	150° 04' 00"	250		(Unicom)	122.8 MHz	Talkeetna Airport(FSS)
42	FAA Talkeetna Airport (IRAC)	62° 19' 27" Talkeetna	150° 05' 30"	358		(Unicom) (FSS) (AAS) (ALAS) (RCO)	123.0 MHz 122.2 MHz 123.6 MHz 123.6 MHz(r) 122.2 MHz 121.5 MHz(R) 116.2 MHz(T)	Anchorage FSS
43	FAA VOR Station (IRAC)	62° 18' 00" Talkeetna	150° 06' 12"	358		(VOR)	116.2 MHz	
44	FAA (IRAC)	62° 19' 54" Peters Creek	150° 05' 42"			(NDB)	305 KHz	
45	FAA Summit Airport (IRAC)	63° 19' 54" Summit	149° 07' 30"	2409		(RCO) (NDB)	122.6 MHz 326 kHz	Anchorage FSS
46	FAA Golden North Airport (IRAC)	63° 22' 18" Cantwell	148° 50' 54"	2250		(Unicom)	122.8 MHz	Anchorage FSS
47	FAA Cantwell SSFO (IRAC)	63° 24' 00" Cantwell	148° 56' 18"	2525		(SSFO)	122.5 MHz	Anchorage FSS

LEGEND:
AMSL - Above Mean Sea Level
AAS - Airport Advisory Service
FAA - Federal Aviation Administration
FSS - Flight Service Station
IRAC - Interdepartment Radio Advisory Committee
NDB - Non Directional Radio Beacon (Navigational Aid)
RCO - Remote Communications Outlet
SSFO - Simultaneous Single Frequency Outlet (Air-Ground Communications)
VOR - Very High Frequency Omni Range (Navigational Aid)

COMMUNICATION TOWER SURVEY
345 KV INTERTIE

Tower #	Licensee (Site Name) (Bureau)	Latitude N / Near Municipality	Longitude W	Site El. Ft. AMSL	Tower Ht. Feet	Facility (Type)	Frequency (Power)	Target
48	FAA McKinley Park Airport (IRAC)	63° 44' 00" McKinley Park	148° 54' 30"	1720		(ALAS)	122.8 MHz	
49	FAA McKinley Park SSFO (IRAC)	63° 38' 36" McKinley Park	148° 47' 00"			(SSFO)	122.1 MHz	Anchorage FSS
50	FAA Healy River SFO (IRAC)	63° 50' 00" Healy	149° 00' 00"	1294		(SFO)	122.4 MHz	Fairbanks FSS

LEGEND:
ALAS - Airport Landing Alert Service
AMSL - Above Mean Sea Level
FAA - Federal Aviation Administration
FSS - Flight Service Station
IRAC - Interdepartment Radio Advisory Committee
SFO - Single Frequency Outlet (Air-Ground Communications)
SSFO - Simultaneous Single Frequency Outlet (Air-Ground Communications)

RECOMMENDED SEPARATION BETWEEN 345 KV INTERTIE AND COMMUNICATIONS TOWERS

Tower #	Licensee (Site Name)	Latitude N / Near Municipality	Longitude W	Recommended Separation In Feet
1	Alascom Inc. (Twelve Mile)	61° 46' 20" 14 Miles east of Willow	149° 45' 06"	Out of Study Area
2	Alascom Inc. (Scotty Lake)	62° 19' 07" Trapper Creek	150° 17' 55"	350'
3	Alascom Inc. (Bartlett Earth Station)	62° 19' 57" Talkeetna	150° 01' 57"	1000'
4	Alascom Inc. (Byers Creek)	62° 41' 20" Byers Lake	150° 13' 50"	350'
5	Alascom Inc. (Honolulu)	63° 05' 41" Honolulu	149° 30' 18"	450'
6	Alascom Inc. (Reindeer Hill #2)	63° 24' 14" Cantwell	148° 50' 31"	250'
7	Alascom Inc. (Cantwell)	63° 24' 04" Cantwell	148° 56' 16"	300'
8	Alascom Inc. (Reindeer Hill #1	63° 24' 34" Cantwell	148° 50' 58"	300'
9	Alascom Inc. (McKinley Village)	63° 38' 37" McKinley Village	148° 47' 00"	300'
10	Alascom Inc. (Healy)	63° 50' 16" Healy	148° 58' 41"	400'
11	Alascom Inc. (Birch Creek)	64° 10' 14" Birch Creek	149° 17' 43"	Out of Study Area
12	Golden Valley Ele.	64° 52' 47" Ester Dome	148° 03' 20"	Out of Study Area
13	Golden Valley Ele. (Sugar Loaf)	63° 47' 25" Sugar Loaf Mountain, Healy	148° 52' 18"	250'
14	Golden Valley Ele. (Healy Power Plant)	63° 51' 21" Healy	148° 57' 00"	300'

RECOMMENDED SEPARATION BETWEEN 345 KV INTERTIE AND COMMUNICATIONS TOWERS

Tower #	Licensee (Site Name)	Latitude N / Near Municipality	Longitude W	Recommended Separation In Feet
15	Matanuska Telephone Association (McKinley Park)	63° 43' 59" McKinley Park	148° 54' 56"	250'
16	Matanuska Telephone Association (Bald Mountain)	62° 18' 30" 12 Miles east of Talkeetna	149° 45' 07"	Out of Study Area
17	Matanuska Telephone Association (Talkeetna)	62° 19' 19" Talkeetna (Central Office)	150° 06' 54"	300'
18	Alaska Railroad (Talkeetna)	62° 19' 48" Talkeetna	150° 06' 48"	300'
19	Alaska Railroad (Summit)	61° 15' 31" Anchorage	149° 31' 37"	Out of Study Area
20	Alaska Railroad (Chalitna Hwy. Camp)	62° 24' 10" Trapper Creek	150° 15' 08"	400'
21	Alaska Railroad (Byers Lake)	62° 41' 17"	150° 13' 34"	250'
22	Alaska Railroad (Hurricane)	62° 58' 40" Hurricane	149° 38' 47"	400'
23	Alaska Railroad	To Gold Creek, south of Hurricane - Future Site		-
24	Alaska Railroad	Future Site		-
25	Alaska Railroad (Cantwell/Reindeer)	63° 24' 13" Cantwell	148° 50' 23"	250'
26	Alaska Railroad (Yanert)	63° 39' 17" Yanert	148° 46' 41"	250'
27	Alaska Railroad (McKinley Park)	63° 43' 58" McKinley Park	148° 54' 30"	250'

RECOMMENDED SEPARATION BETWEEN 345 KV INTERTIE
AND COMMUNICATIONS TOWERS

Tower #	Licensee (Site Name)	Latitude N / Near Municipality	Longitude W	Recommended Separation In Feet
28	Alaska Railroad (Horseshoe Passive)	63° 44' 40" Horseshoe Pass	148° 53' 00"	200'
29	Alaska Railroad (Garner)	63° 50' 13" Garner	148° 59' 30"	400'
30	Alaska Railroad (Healy)	63° 51' 15"	148° 58' 44"	250'
31	Alaska Railroad (Browne)	64° 10' 30" Browne	149° 19' 00"	Out of Study Area
32	TV Translator	62° 17' 56" Talkeetna	150° 06' 25"	300'
33	Alaska Public TV	62° 18' 02" (Application for Construction Permit) Talkeetna	150° 05' 52"	300'
34	Northern TV Inc.	62° 18' 00" Talkeetna	150° 05' 36"	250'
35	Talkeetna Chamber of Commerce	62° 18' 00" Talkeetna	150° 06' 12"	250'
36	Alaska Dept. of Highways	63° 23' 14" Cantwell	148° 52' 32"	1000'
37	TV Translator	63° 52' 30" Healy	148° 51' 00"	250'
38	Alaska Public Broadcasting	63° 50' 13" (Application for Construction Permit) Healy	148° 58' 38"	300'

RECOMMENDED SEPARATION BETWEEN 345 KV INTERTIE
AND COMMUNICATIONS TOWERS

Tower #	Licensee (Site Name)	Latitude N / Near Municipality	Longitude W	Recommended Separation In Feet
39	KUAC-TV	63° 52' 30" Healy	148° 51' 00"	250'
40	Northern TV Inc.	63° 52' 30" Healy/Suntrana/Usibelli	148° 51' 00"	250'
41	FAA Montana Creek Airport	62° 04' 18" Montana Creek	150° 04' 00"	3800'
42	FAA Talkeetna Airport	62° 19' 27" Talkeetna	150° 05' 30"	3800'
43	FAA VOR Station	62° 18' 00" Talkeetna	150° 06' 12"	3800'
44	FAA	62° 19' 54" Peters Creek	150° 05' 42"	1000'
45	FAA Summit Airport	63° 19' 54" Summit	149° 07' 30"	3800'
46	FAA Golden North Airport	63° 22' 18" Cantwell	148° 50' 54"	3800'
47	FAA Cantwell SSFO	63° 24' 00" Cantwell	148° 56' 18"	1000'
48	FAA McKinley Park Airport	63° 44' 00" McKinley Park	148° 54' 30"	3800'
49	FAA McKinley Park SSFO	63° 38' 36" McKinley Park	148° 47' 00"	1000'
50	FAA Healy River SFO	63° 50' 00" Healy	149° 00' 00"	1000'

LEGEND: FAA - Federal Aviation Administration
SFO - Single Frequency Outlet (Air-Ground Communications)
SSFO - Simultaneous Single Frequency Outlet (Air-Ground Communications)

TABLE B-4

ADDRESSES OF MICROWAVE LICENSEES

Alascom Inc.
Vancouver, Washington
Vice President: George Roberts
(206)-694-8333

Alaska Railroad
General Office Building
419 1st Avenue
Anchorage, Alaska 99501
Chief Engineer: Francis Weeks
(907)-265-2456

Golden Valley Electric Association
758 Illinois Street
Fairbanks, Alaska 99707
Chief Engineer: Joe Killion
(907)-452-1151

Mantanuska Telephone Association
Palmer, Alaska 99645
Graham Rolstad
(907)-745-3211

Gilbert/Commonwealth engineers/consultants/architects

COMMONWEALTH ASSOCIATES INC., 209 E. Washington Avenue, Jackson, MI 49201/Tel. 517 788-3000

January 12, 1982

Mr. Francis Weeks
Alaska Railroad
General Office Building
419 1st Avenue
Anchorage, Alaska 99501

Dear Mr. Weeks:

The Alaska Power Authority is planning to construct a 345 kV transmission line between Willow and Healy, Alaska in 1984. The recommended line route (shown in Figure B1 of the enclosed Appendix B: Communication Tower Survey) consists of the super-link numbers 1S, 3S, 6S, 7S, 9S, 12S, 13S, 15S and 16S. A profile of a typical transmission structure for the new 345 kV line is shown in Figure 1.

Please review the list of your facilities in Table B-2 in Appendix B for completeness. Also, please review the recommended separations in Table B3 of Appendix B to determine if there would be an impact of the transmission structures on your communication facilities and advise us of the results of your review within two weeks.

Transmission line Plan and Profile Drawings will be made available to you, if requested, when they are completed. Expected completion dates are June to September 1982, depending on locations.

If you require additional information, please contact J. F. Torri at (517) 788-3048.

Sincerely,

Lytle G. Miller, P.E.
Project Manager

JFT/dl

Enclosure

CC: D. D. Wozniak, Alaska Power Authority

DEPARTMENT OF TRANSPORTATION
FEDERAL RAILROAD ADMINISTRATION

THE ALASKA RAILROAD
Pouch 7-2111
Anchorage, Alaska 99510

February 4, 1982

Mr. Lytle G. Miller, P.E.
Project Manager
Commonwealth Associates Inc.
209 E Washington Avenue
Jackson, MI 49201

Dear Mr. Miller:

We appreciate very much receiving the Communication Tower Survey and having an opportunity to comment on it. We have reviewed the list of our facilities shown on Table B-2 and find that it is complete. The operations shown on Table B-3 are acceptable to The Alaska Railroad.

The Alaska Railroad would appreciate receiving the transmission line plan and profile drawings as soon as you have them available. In the design and construction phases of this project, the Alaska Railroad is looking forward to working closely with you on this project

Sincerely,

Francis Weeks

Francis C. Weeks, P.E.
Chief Engineer

Gilbert/Commonwealth engineers/consultants/architects

COMMONWEALTH ASSOCIATES INC., 209 E. Washington Avenue, Jackson, MI 49201/Tel. 517 788-3000

January 12, 1982

Mr. Joe Killion
Golden Valley Electric Association
758 Illinois Street
Fairbanks, AK 99707

Dear Mr. Killion:

Enclosed is a revised copy of the Communications Tower Survey Report. The revision consists of a minor change of the recommendation and pages have been renumbered. The recommended line route (shown in Figure B1 of the enclosed Appendix B: Communication Tower Survey) consists of the superlink numbers 1S, 3S, 6S, 7S, 9S, 13S, 15S and 16S. A profile of a typical transmission structure for the new 345 kV line is shown in Figure 1.

Please review the list of your facilities in Table B-2 in Appendix B for completeness. Also, please review the recommended separations in Table B3 of Appendix B to determine if there would be an impact of the transmission structures on your communication facilities and advise us of the results of your review within two weeks.

Transmission line Plan and Profile Drawings will be made available to you, if requested, when they are completed. Expected completion dates are June to September 1982, depending on locations.

This report is provided also for your information as a member of the Technical Review Committee.

If you require additional information, please contact J. F. Torri at (517) 788-3048.

Sincerely,

Lytle G. Miller, P.E.
Project Manager

JFT/dl

Enclosure

CC: D. D. Wozniak, Alaska Power Authority

GOLDEN VALLEY ELECTRIC ASSOCIATION INC. Box 1249, Fairbanks, Alaska 99707, Phone 907-452-1151

January 21, 1982

Common Wealth Associates Inc.
Attn: Lytle Miller
209 E. Washington
Jackson, Michigan 49201

Re: Communications Tower Survey Report

Dear Lytle,

Per your request, I have reviewed the list of facilities (Table B-2), and have no additions to recommend. I have also reviewed the recommended separations (Table B-3) and they appear to be adequate. I would not expect the powerline to interfere with any of our communication facilities. I am sure that APA would cooperate in helping to promptly resolve any interference created by the new line.

Sincerely,

Joe Killion

Joe Killion,
Chief Engineer

JK:ta

cc: Dave Wozniak,
Alaska Power Authority

Gilbert/Commonwealth engineers/consultants/architects

COMMONWEALTH ASSOCIATES INC., 209 E. Washington Avenue, Jackson, MI 49201/Tel. 517 788-3000

January 12, 1982

Mr. Gerry Markey
Frequency Engineering Branch
AAF-730
Airways Facilities Division
Federal Aviation Administration
800 Independence Avenue
Washington, D.C. 20591

Dear Mr. Markey:

As discussed in your telephone conversation with J. F. Torri on January 6, 1982, the Alaska Power Authority is planning to construct a 345 kV transmission line between Willow and Healy, Alaska in 1984. The recommended line route (shown in Figure B1 of the enclosed Appendix B: Communication Tower Survey) consists of superlink numbers 1S, 3S, 6S, 7S, 9S, 12S, 13S, 15S and 16S.

Please review the list of FAA facilities in Table B2 in Appendix B for completeness. Also, please review the recommended separations, Table B-3 in Appendix B, between the proposed intertie and the communication towers administered by the FAA and advise us of the results of your review within two weeks.

Transmission line Plan and Profile Drawings will be made available to you, if requested, when they are completed. Expected completion dates are June to September 1982, depending on locations.

If you require additional information, please contact Mr. J. F. Torri at (517) 788-3048.

Sincerely,

Lytle G. Miller, P.E.
Project Manager

JFT/dl

Enclosures

CC: D. D. Wozniak, Alaska Power Authority

U.S. Department
of Transportation

Federal Aviation
Administration

800 Independence Ave., S.W.
Washington, D.C. 20591

Mr. Lytle G. Miller, P.E.
Project Manager
Commonwealth Associates, Inc.
209 E. Washington Avenue
Jackson, MI 49201

Dear Mr. Miller:

In response to your letter of January 12, we have reviewed the communications tower survey for the 345 KV intertie proposed by the Alaska Power Authority. The only facility that may have been overlooked is a unicom station on 122.8 MHz operated by the Willow Air Service at the Willow Airport. Its coordinates are 150-03-00N061-45-18W.

In regard to Table-3, the recommended separation distances, we have been advised by our Research and Development Service that large power lines have caused reflection problems to VOR's at distances in excess of one mile. It appears as if the only VOR involved in this study is well beyond this distance so we do not expect any conflicts.

Thank you for giving us the opportunity to review this proposal.

Gerald J. Markey

Gerald J. Markey.

RECEIVED

DEPART...
Commonwealth ...

Gilbert/Commonwealth engineers/consultants/architects

COMMONWEALTH ASSOCIATES INC., 209 E. Washington Avenue, Jackson, MI 49201/Tel. 517 788-3000

March 19, 1982

Mr. Gerald J. Markey
Frequency Engineering
AAF-730
Airways Facilities Division
Federal Aviation Administration
800 Independence Avenue
Washington, D.C. 20591

Dear Mr. Markey:

Subject: UNICOM STATION AT WILLOW ALASKA AIRPORT

Thank you for your letter of February 16, 1982. The unicom station at the Willow Airport was included in our inventory of communication towers between Willow and Healy, Alaska. However, this unicom was not included in our Communication Tower Survey report for two reasons:

1. The unicom station was outside the transmission line study area.

2. The unicom station is located approximately 6500 feet southwest of the existing Douglas 138 kV Substation which is the southern terminus of the proposed intertie. This 6500 foot distance is greater than the minimum FAA required separations for unicoms.

Thank you for reviewing our Communications Tower Survey.

Yours very truly,

Lyle G. Miller, P.E.
Project Manager

JFT/dl

CC: D. D. Wozniak, APA

BCC: SAOtt
RRHoop
JTHancock

Gilbert/Commonwealth engineers/consultants/architects

COMMONWEALTH ASSOCIATES INC., 209 E. Washington Avenue, Jackson, MI 49201/Tel. 517 788-3000

January 12, 1982

Mr. Julian Wakefield
Director of Engineering
Telephone Utilities, Inc.
100 West 11th Street
Plaza Suite
Vancouver, Washington 98810

Dear Mr. Wakefield:

The Alaska Power Authority is planning to construct a 345 kV transmission line between Willow and Healy, Alaska in 1984. The recommended line route (shown in Figure B1 of the enclosed Appendix B: Communication Tower Survey) consists of the super-link numbers 1S, 3S, 6S, 7S, 9S, 12S, 13S, 15S and 16S. A profile of a typical transmission structure for the new 345 kV line is shown in Figure 1.

Please review the list of your facilities in Table B-2 in Appendix B for completeness. Also, please review the recommended separations in Table B3 of Appendix B to determine if there would be an impact of the transmission structures on your communication facilities and advise us of the results of your review within two weeks.

Transmission line Plan and Profile Drawings will be made available to you, if requested, when they are completed. Expected completion dates are June to September 1982, depending on locations.

If you require additional information, please contact J. F. Torri at (517) 788-3048.

Sincerely,

Lytle G. Miller, P.E.
Project Manager

JFT/dl

Enclosure

CC: D. D. Wozniak, Alaska Power Authority

Telephone Utilities, Inc.

100 WEST 11TH, PLAZA SUITE
VANCOUVER, WASHINGTON 98660
AREA CODE (206) 694-8333

2/16/82

February 11, 198.

Lytle G. Miller, P.E.
Commonwealth Associates, Inc.
209 E. Washington Avenue
Jackson, Mi. 49201

Dear Mr. Miller:

REF: Your January 12, 1982, letter and Communication Tower Survey for 345 kV Intertie for the Alaska Power Authority

The list of Alascom sites as outlined in your report is correct. There is one site elevation for the Reindeer #1 passive site that needs to be corrected to 3238 feet (AMSL).

The Alascom systems ~~in the~~ Willow to Healy area are heavy route communications systems and little or no interference can be tolerated that affects the performance criteria. To reduce the potential of interference from the transmission line, every effort should be made to locate the transmission line route as far as possible from the microwave sites, and in no case should the line route be any closer than a 500' radius of any site. Also, no power line or supporting structure should intrude into the 2° (degree) beam width of any existing microwave antenna or to within 150 feet of the microwave beam centerline for the first 2 miles of a microwave path, and no power line supporting structure should intrude into the 150 foot radius area around the microwave beam centerline from the 2 mile path point to the mid-path mile point.

Beam reflections off of power line supporting structures can also cause severe interference problems. The possibility of reflections from the supporting structures will need to be analyzed when the final locations of all structures have been determined.

The above referenced criteria are predicated upon both obstruction to line-of-sight performance and the potential for radio frequency interference problems that may result from transmission line electric and magnetic field intensities, corona discharge, etc. Such criteria might be revised pending detailed analysis of the particulars of this transmission line design. Therefore, Alascom Engineering requests that a detailed radio frequency interference analysis of the proposed power line be provided to assure that no degradation will occur to our VHF, microwave and earth station communications systems by the close proximity of the power line to our sites.

Very truly yours,

Ronald G. Weber

Ronald G. Weber
Manager, Systems Engineering

cc: D.D. Wozniak Roger Funk Julian Wakefield

Gilbert/Commonwealth engineers/consultants/architects
COMMONWEALTH ASSOCIATES INC., 209 E. Washington Avenue, Jackson, MI 49201/Tel. 517 788-3000

February 18, 1982

Mr. Ronald G. Weber
Manager, Systems Engineering
Telephone Utilities Inc.
100 West 11th, Plaza Suite
Vancouver, Washington 98660

Dear Mr. Weber:

Subject: YOUR FEBRUARY 11, 1982 LETTER AND COMMUNICATION TOWER STUDY FOR 345 KV ALASKA INTERTIE

The transmission line Plan and Profile drawings showing the proposed locations of the transmission structures will be completed between June and September 1982 depending on locations. Those drawings pertaining to the locations where the transmission line will pass near Alascom's microwave facilities will be sent to you when available.

A radio frequency interference analysis of the proposed power line has been completed and can be found in the enclosed reports:

- Electrical Environmental Effects Report (R-2394) pages 7-11.

- Results of Preconstruction Measurements of Radio and TV Signal Strengths and Radio Frequency Noise, Preliminary, Appendix A, dated October 15, 1981.

As noted in the R-2394 report, FM radio systems generally do not experience interference from corona generated radio noise for two reasons:

- The magnitude of radio noise is small in the VHF bands.

- The interference rejection properties inherent in FM radio systems makes them virtually immune to static type disturbances.

No interference to FM radio reception caused by radio noise from the proposed transmission line is expected.

Gilbert / Commonwealth
209 E. Washington Avenue, Jackson, MI 49201

Transmission line r^f noise (calculated at 1 MHz) falls off rapidly as the separation from the transmission line increases. From Table 4 of Report R-2394, the greatest level of r^f noise, occurring during heavy rain conditions, is below the measured ambient r^f noise level at separations greater than about 600 feet from the edge of the transmission line's right-of-way.

Transmission line r^f noise also falls off rapidly as the frequency of interest increases. For example, references 1 and 2 below show that the r^f noise levels at 10 MHz are 20-30 dB below the levels for 1 MHz. Also the r^f noise levels at 1 GHz are about 60 dB below the levels for 1 MHz.

1. IEEE Radio Noise and Corona Subcommittee Report, "Review of Technical Considerations on Limits to Interference from Power Lines and Stations," IEEE Transactions on Power Apparatus and Systems, Vol. PAS-99, No. 1, January/February 1980, pages 365-388, (Specifically page 367).

2. Pakala, W. E. and Chartier, V. L., "Radio Noise Measurement on Overhead Power Lines from 2.4 to 800 kV," IEEE Transactions on Power Apparatus and Systems, Vol. PAS-90, May/June 1971, pages 1155-1165.

Therefore, no interference to microwave or earth station communications systems caused by r^f noise from the proposed transmission line is expected.

Radio noise from damaged insulators or loose transmission line hardware could cause interference to communication systems in the same way as from damaged insulators on distribution lines supplying power to these communications systems. Should this occur, they can be located and repaired [Reference 11 of Report R-2394].

If you have additional questions, please contact J. F. Torri at (517) 788-3048.

Sincerely,

Lytle G. Miller, P.E.
Project Manager

JFT/dl

Enclosures

CC: D. D. Wozniak - Alaska Power Authority
Julian Wakefield, Telephone Utilities, Inc.
Roger Funk, Alascom

BCC: RRHoop (for follow-up info)

Gilbert/Commonwealth engineers/consultants/architects

COMMONWEALTH ASSOCIATES INC., 209 E. Washington Avenue, Jackson, MI 49201/Tel. 517 788-3000

January 12, 1982

Mr. Mel Hoversten
Division of Telecommunication
  Systems
5900 East Tudor Road
Anchorage, AK 99507

Dear Mr. Hoversten:

The Alaska Power Authority is planning to construct a 345 kV transmission line between Willow and Healy, Alaska in 1984. The recommended line route (shown in Figure B1 of the enclosed Appendix B: Communication Tower Survey) consists of the super-link numbers 1S, 3S, 6S, 7S, 9S, 12S, 13S, 15S and 16S. A profile of a typical transmission structure for the new 345 kV line is shown in Figure 1. Table B2 in Appendix B gives the communication tower locations.

Please review the recommended separations between the proposed line and the earth station (Tower 36, Table B3 in Appendix B) and determine if there would be an impact of the transmission structure on your facilities. Please advise us of the results of your review within two weeks.

Transmission line Plan and Profile Drawings will be made available to you, if requested, when they are completed. Expected completion dates are June to September 1982, depending on locations.

If you require additional information, please contact J. F. Torri at (517) 788-3048.

Sincerely,

Lytle G. Miller

Lytle G. Miller, P.E.
Project Manager

JFT/dl

Enclosures

CC: D. D. Wozniak, Alaska Power Authority

During a telephone conversation between Mr. Hoversten and J. F. Torri, on January 7, 1982, Mr. Hoversten said the 1000 foot minimum separation between the earth station and the 345 kV intertie is acceptable.

Gilbert/Commonwealth engineers/consultants/architects

COMMONWEALTH ASSOCIATES INC., 209 E. Washington Avenue, Jackson, MI 49201/Tel. 517 788-3000

January 12, 1982

Mr. Graham Rolstad
Matanuska Telephone Association
Palmer, AK 99645

Dear Mr. Rolstad:

The Alaska Power Authority is planning to construct a 345 kV transmission line between Willow and Healy, Alaska in 1984. The recommended line route (shown in Figure B1 of the enclosed Appendix B: Communication Tower Survey) consists of the super-line numbers 1S, 3S, 6S, 7S, 9S, 12S, 13S, 15S and 16S. A profile of a typical transmission structure for the new 345 kV line is shown in Figure 1.

Please review the list of your facilities in Table B-2 in Appendix B for completeness. Also, please review the recommended separations in Table B3 of Appendix B to determine if there would be an impact of the transmission structures on your communication facilities and advise us of the results of your review within two weeks.

Transmission line Plan and Profile Drawings will be made available to you, if requested, when they are completed. Expected completion dates are June to September 1982, depending on locations.

If you require additional information, please contact J. F. Torri at (517) 788-3048.

Sincerely,

Lytle G. Miller, P.E.
Project Manager

JFT/dl

Enclosure

CC: D. D. Wozniak, Alaska Power Authority