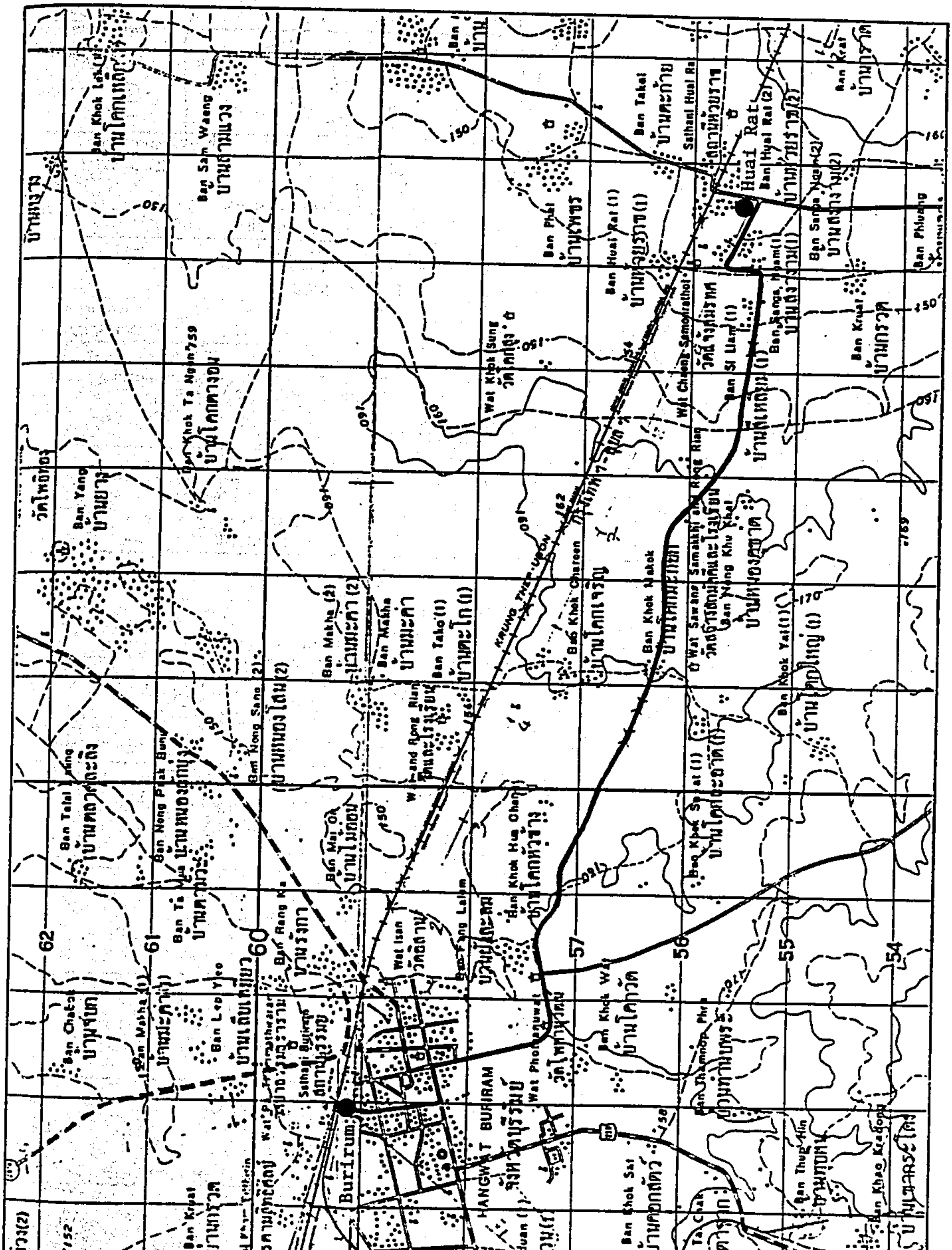
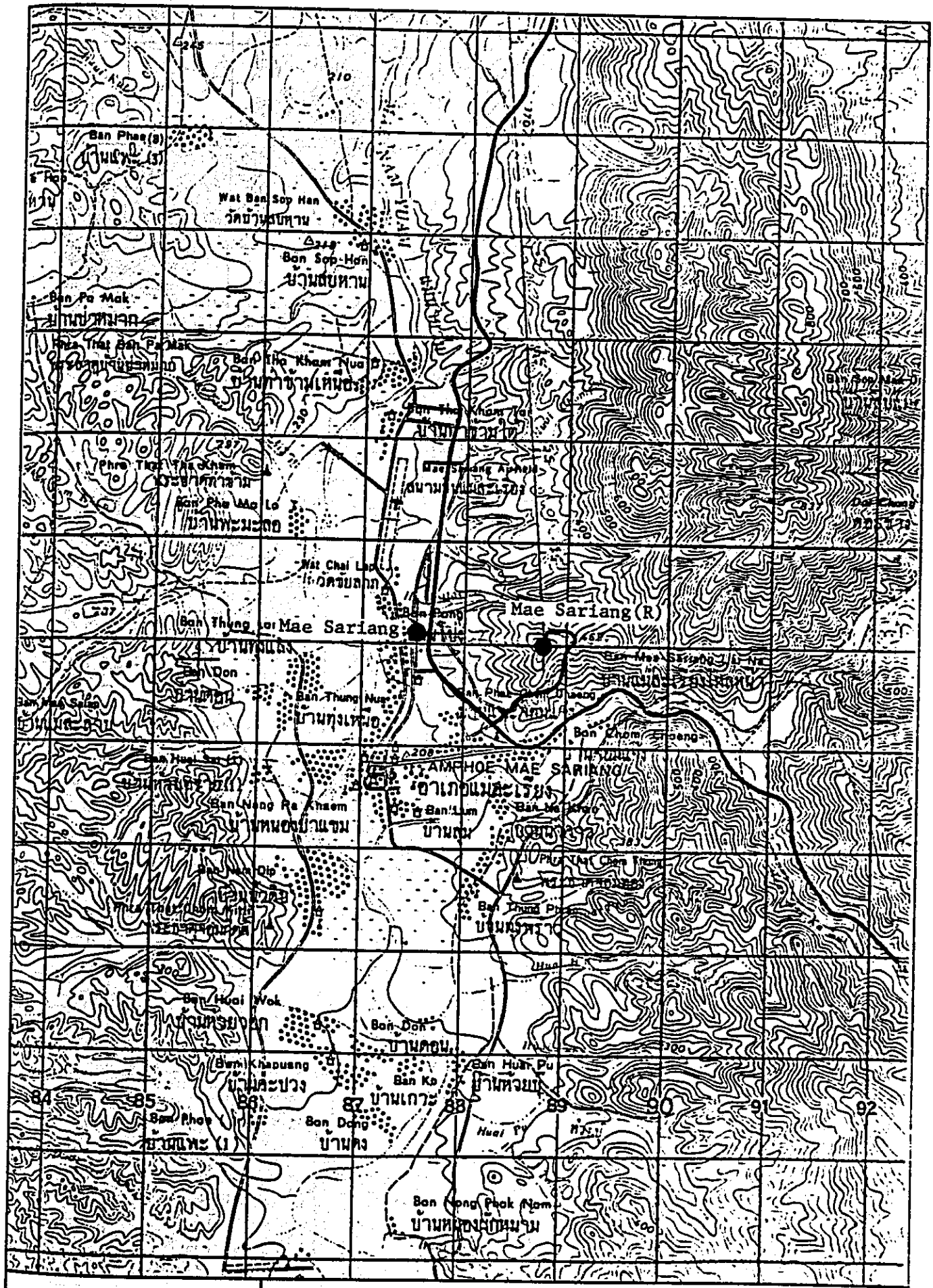
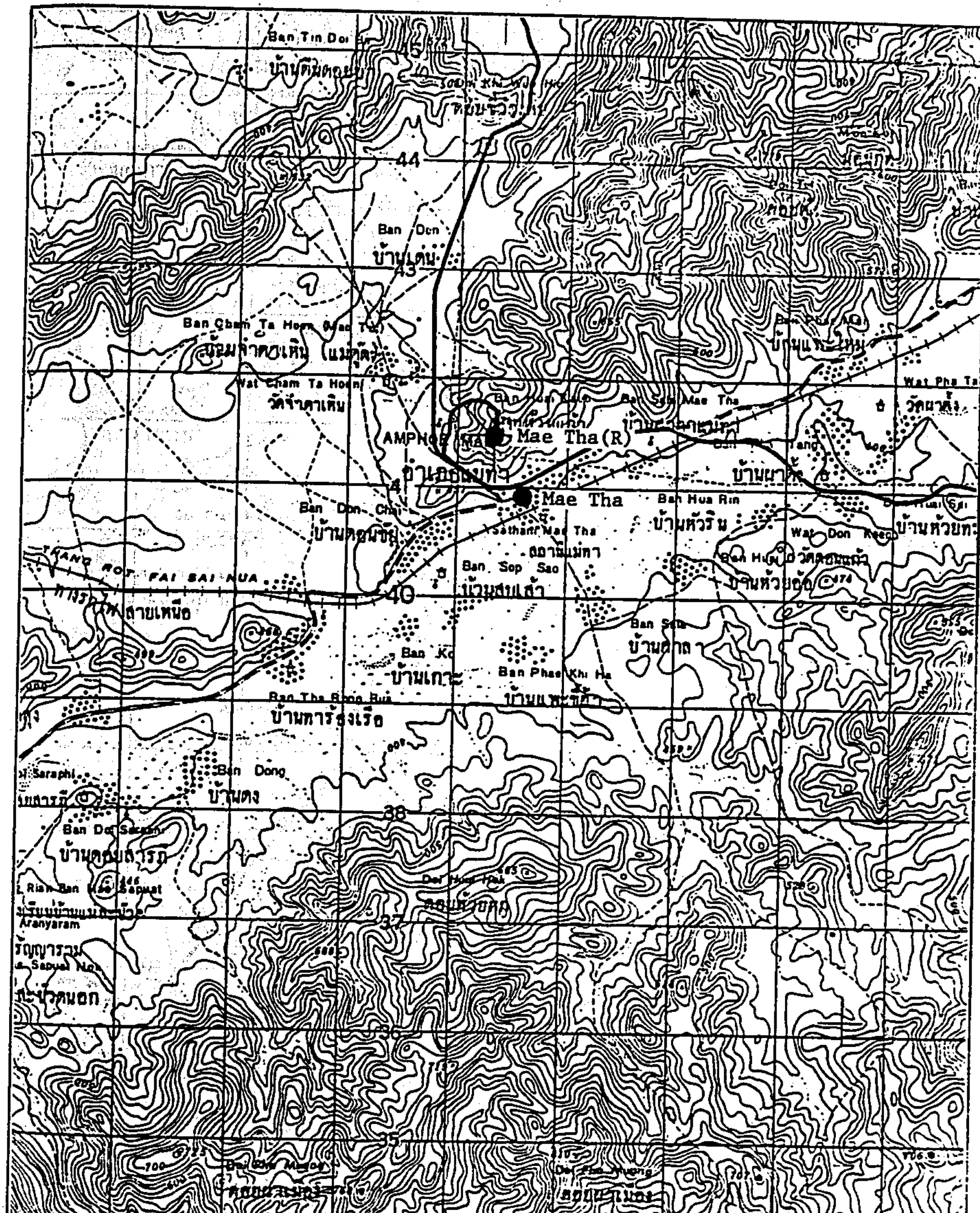


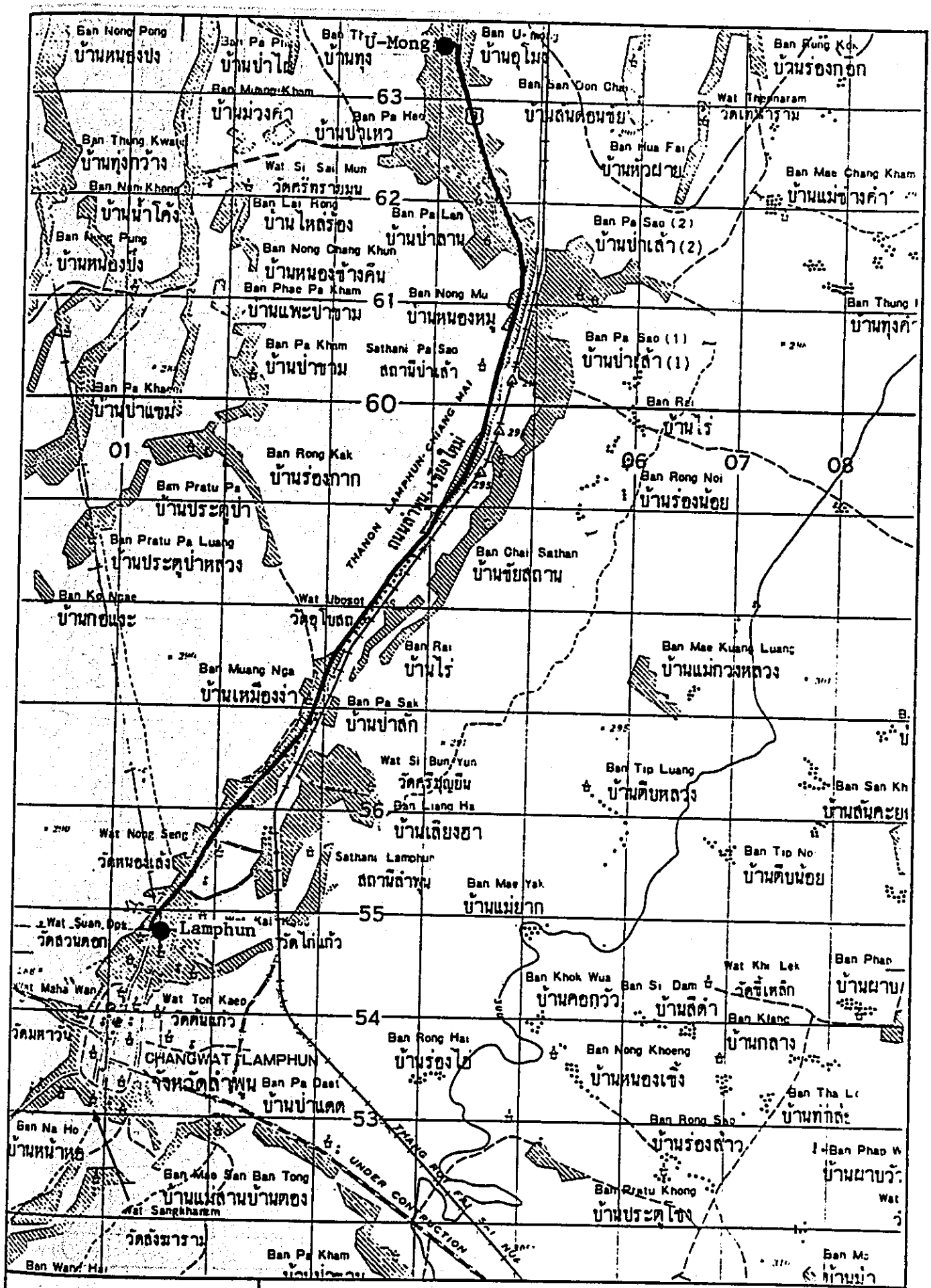
Cable Layout Plan	Huai Rat - Burirum Burirum Area(4412)



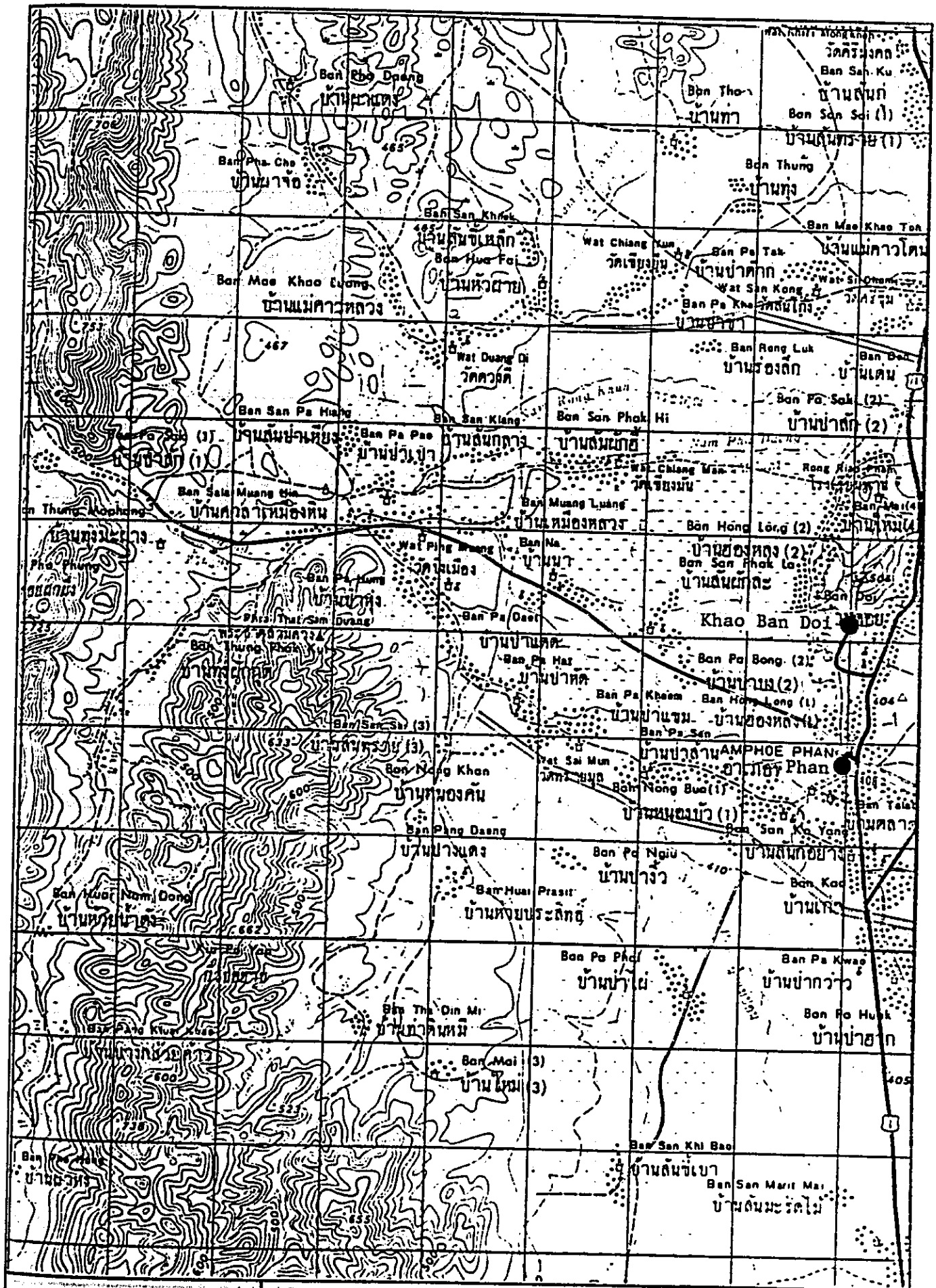
Cable Layout Plan	Mae Sariang - Mae Sariang(R) Mae Hong Son Area(5301)



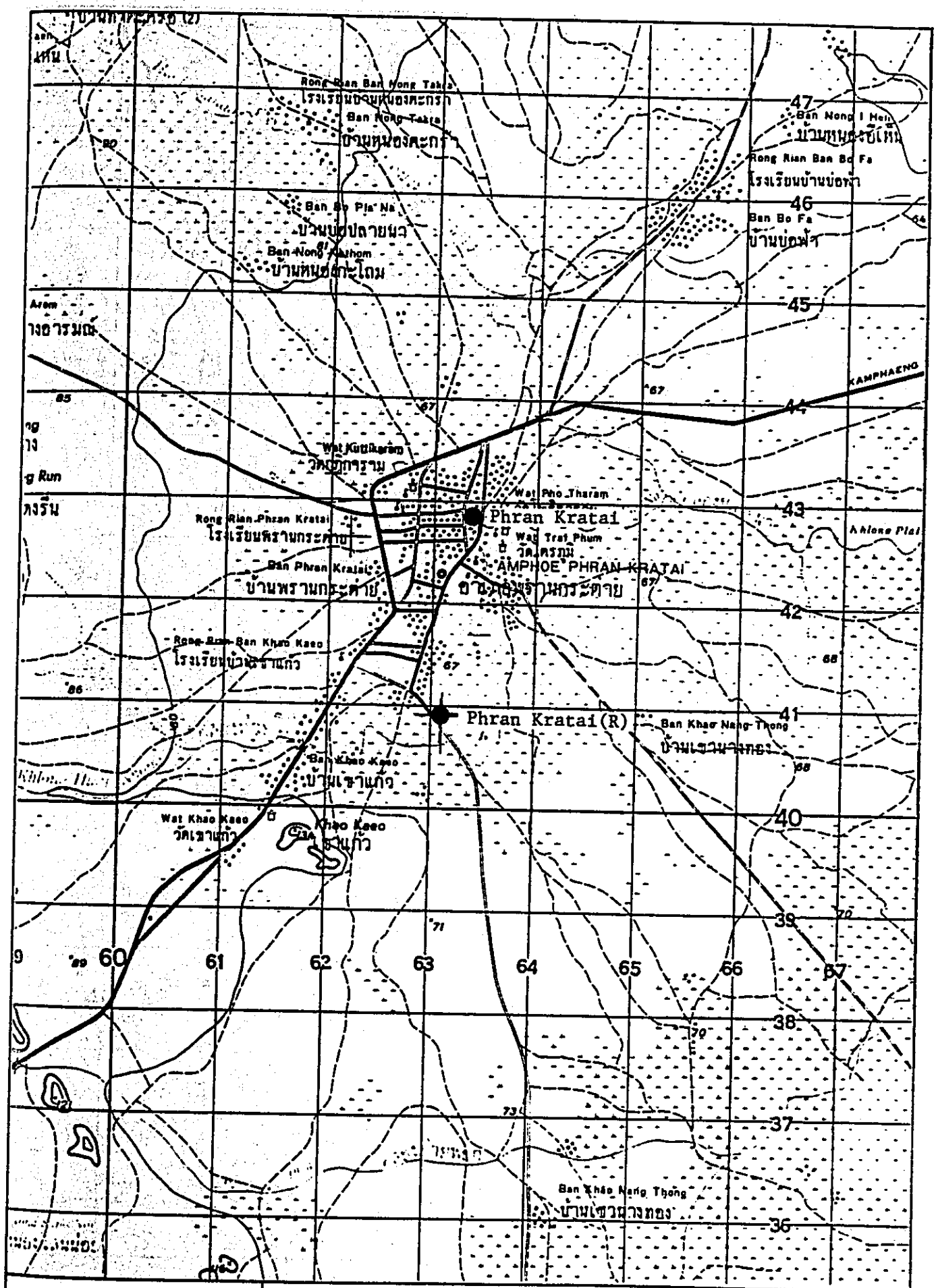
Cable Layout Plan	Mae Tha - Mae Tha(R) Lamphun Area(5322)



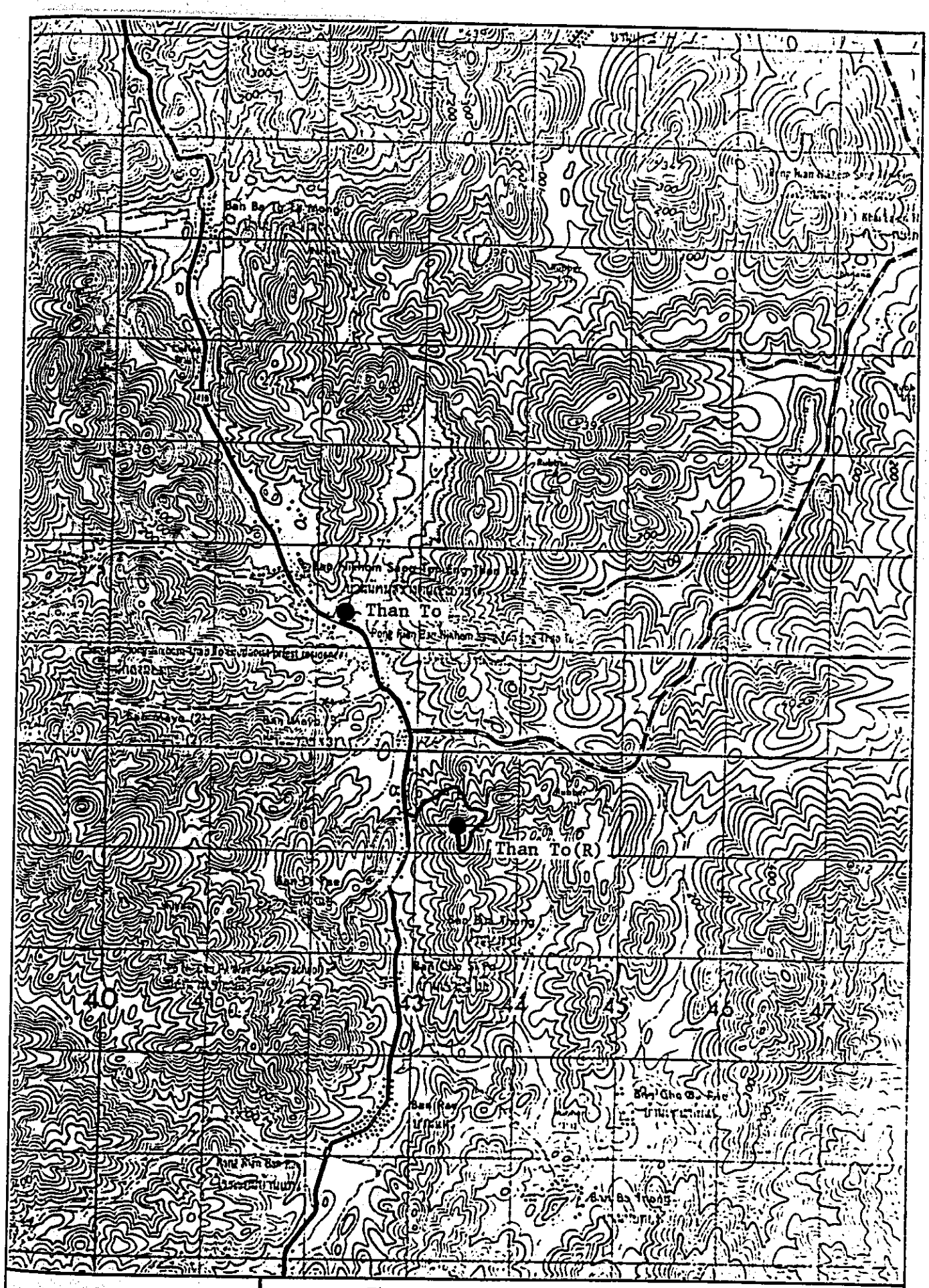
Cable Layout Plan	U-Mong - Lamphun Lamphun Area(5322)



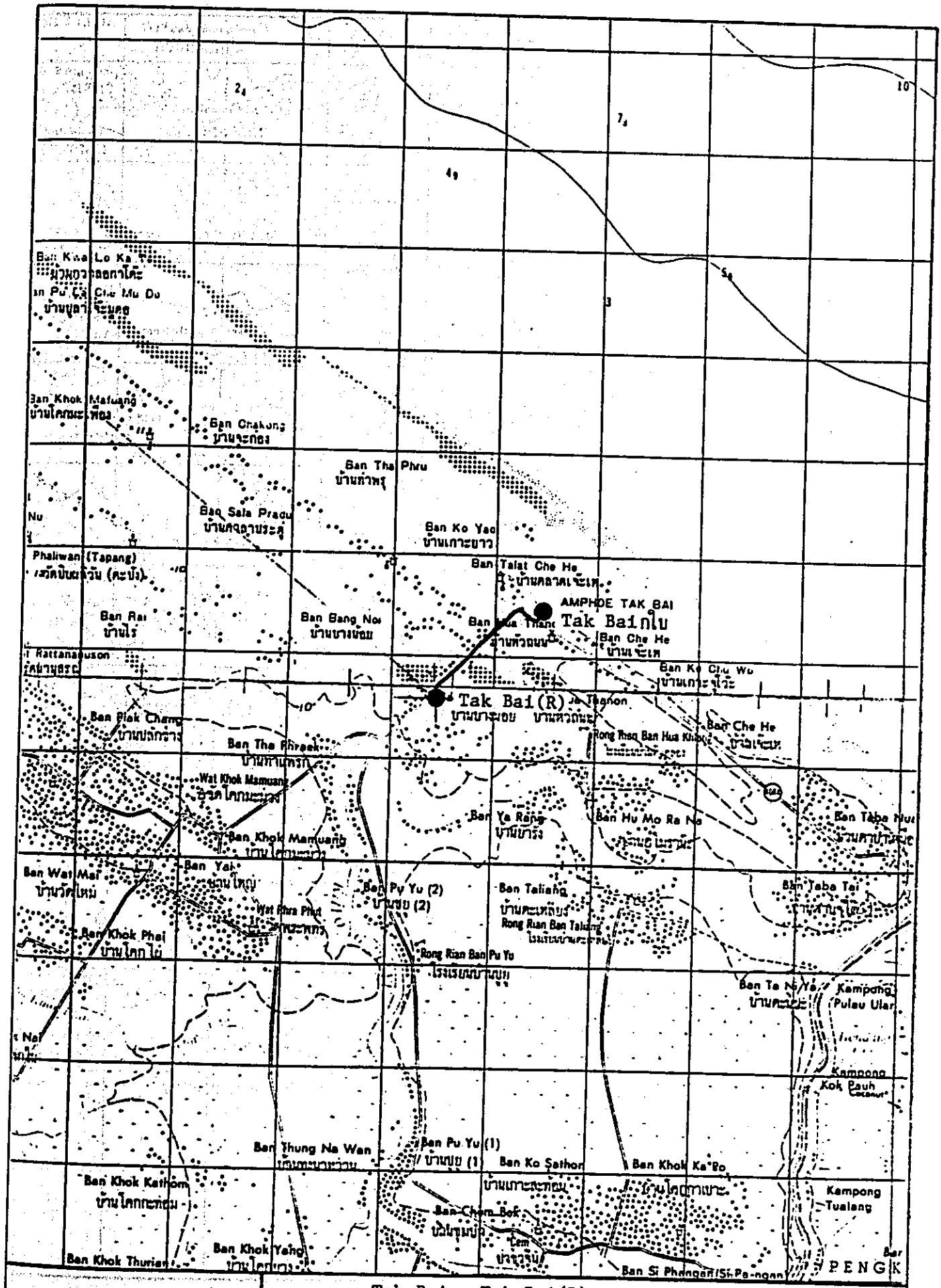
Cable Layout Plan	Phan - Khao Ban Doi Chiangrai Area(5401)



Cable Layout Plan	Phran Kratai - Phran Kratai(R) Khamphaeng Phet Area(5523)



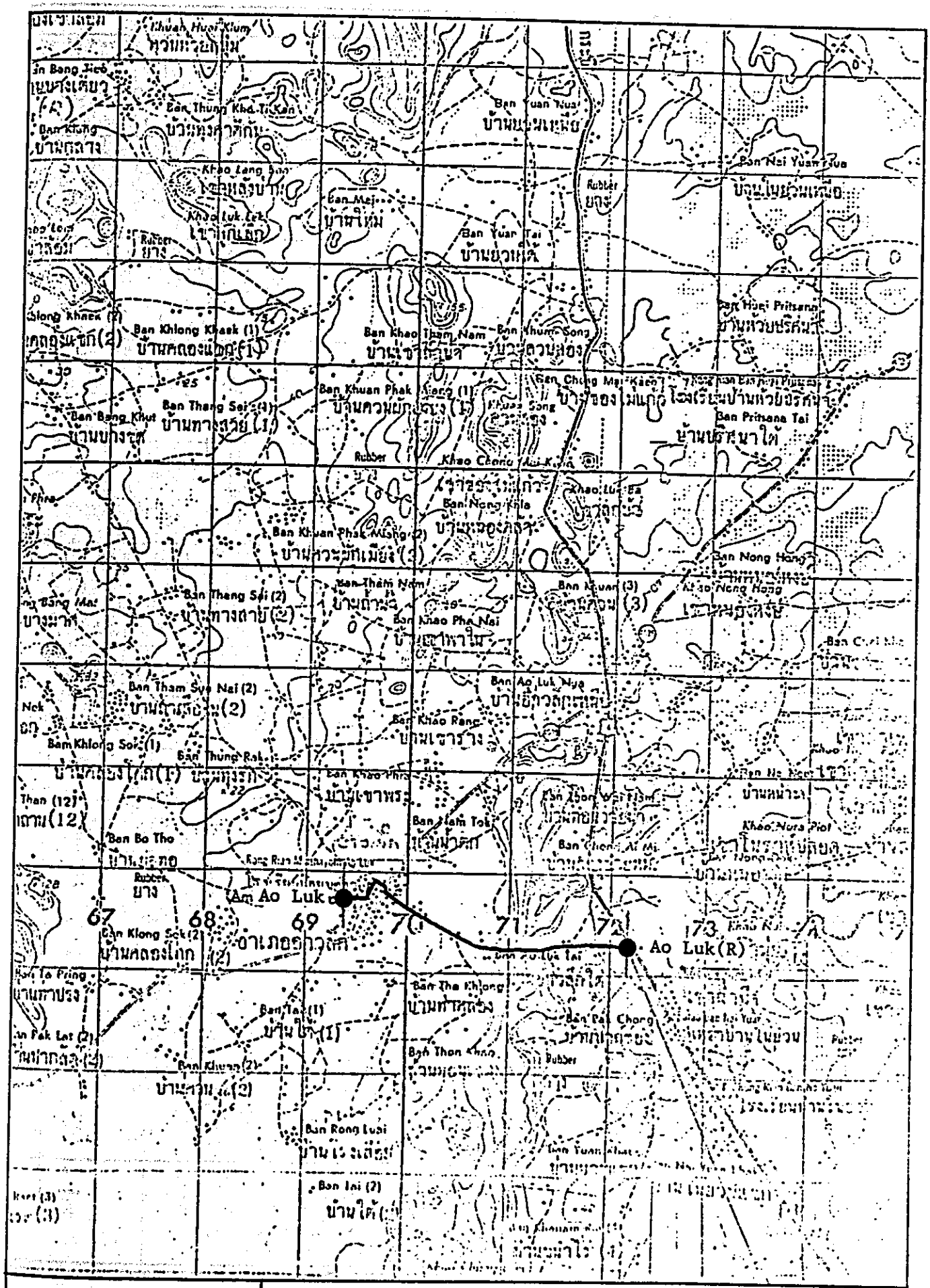
Cable Layout Plan	Than To - Than To(R) Yala Area(7301)



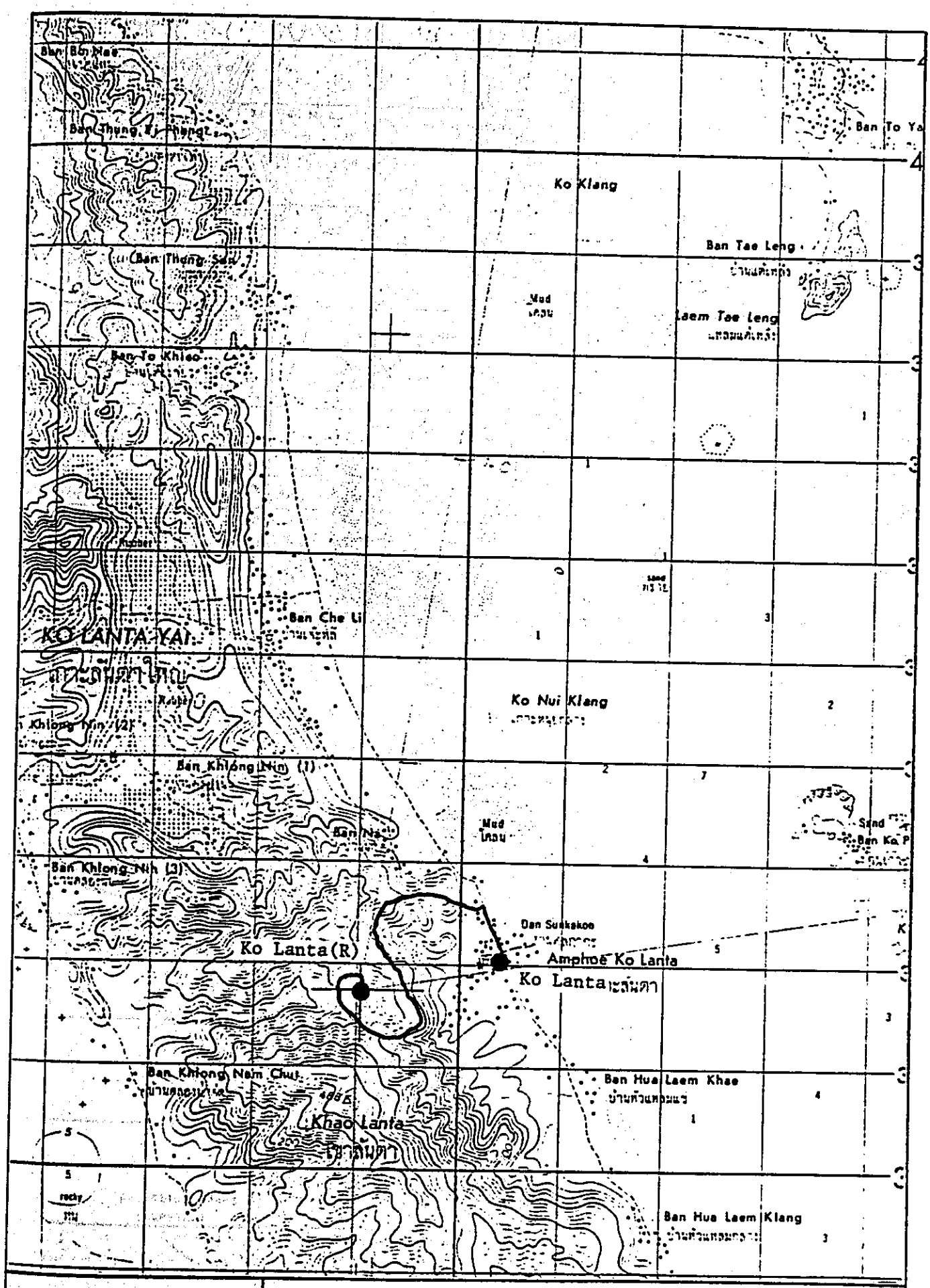
Cable Layout Plan

Tak Bai - Tak Bai(R)

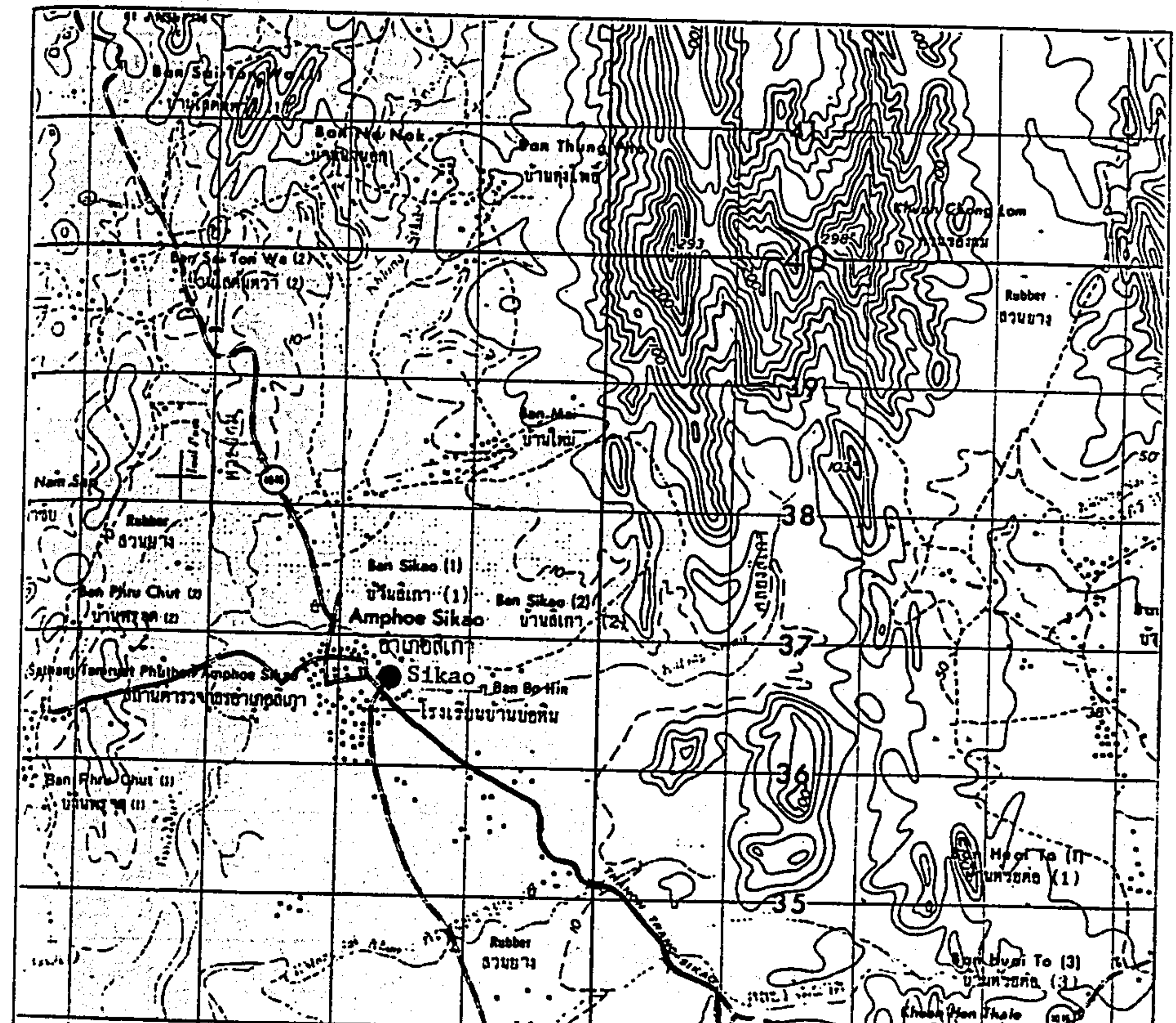
Narathiwat Area(7314)



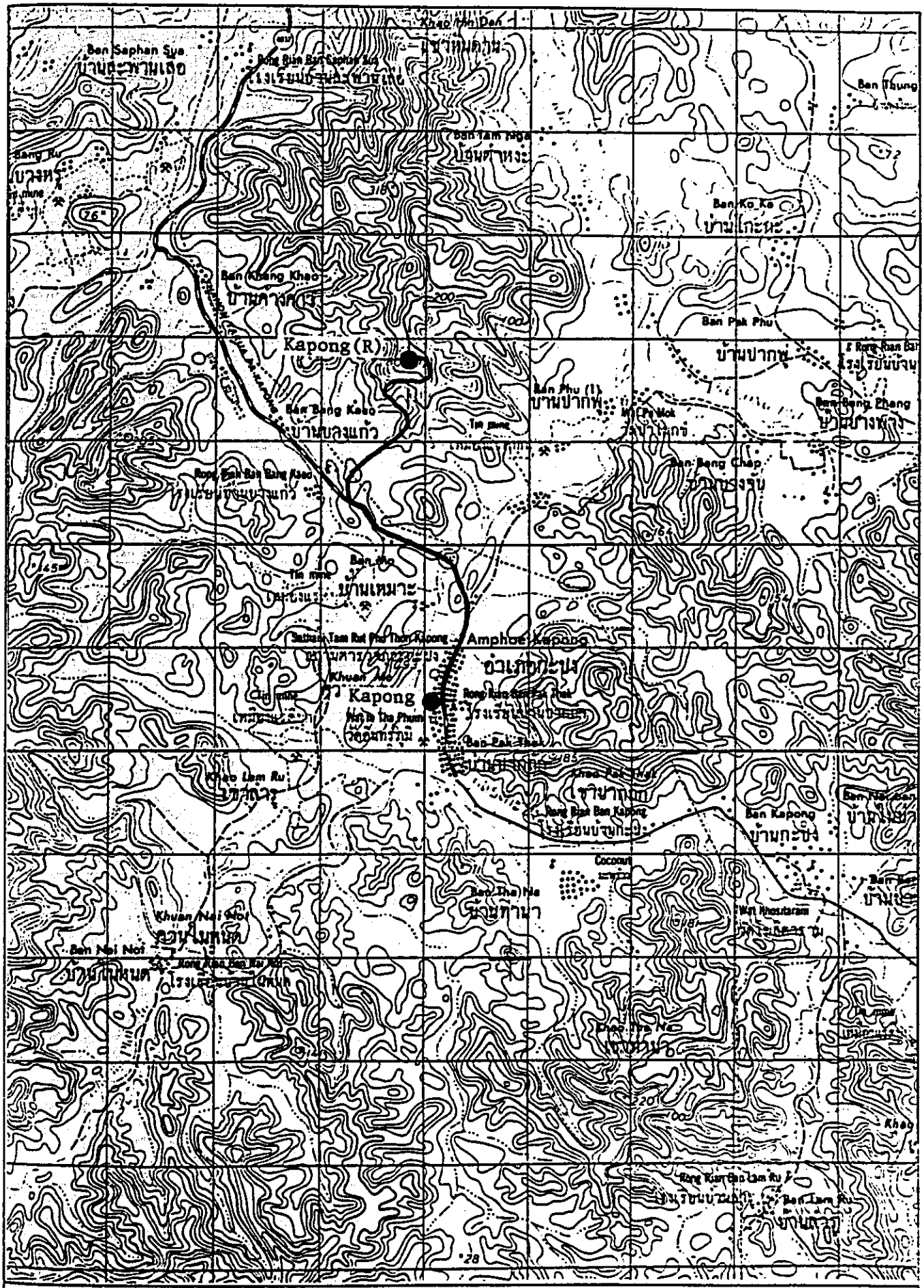
Cable Layout Plan	Ao Luk - Ao Luk(R) Krabi Area(7501)



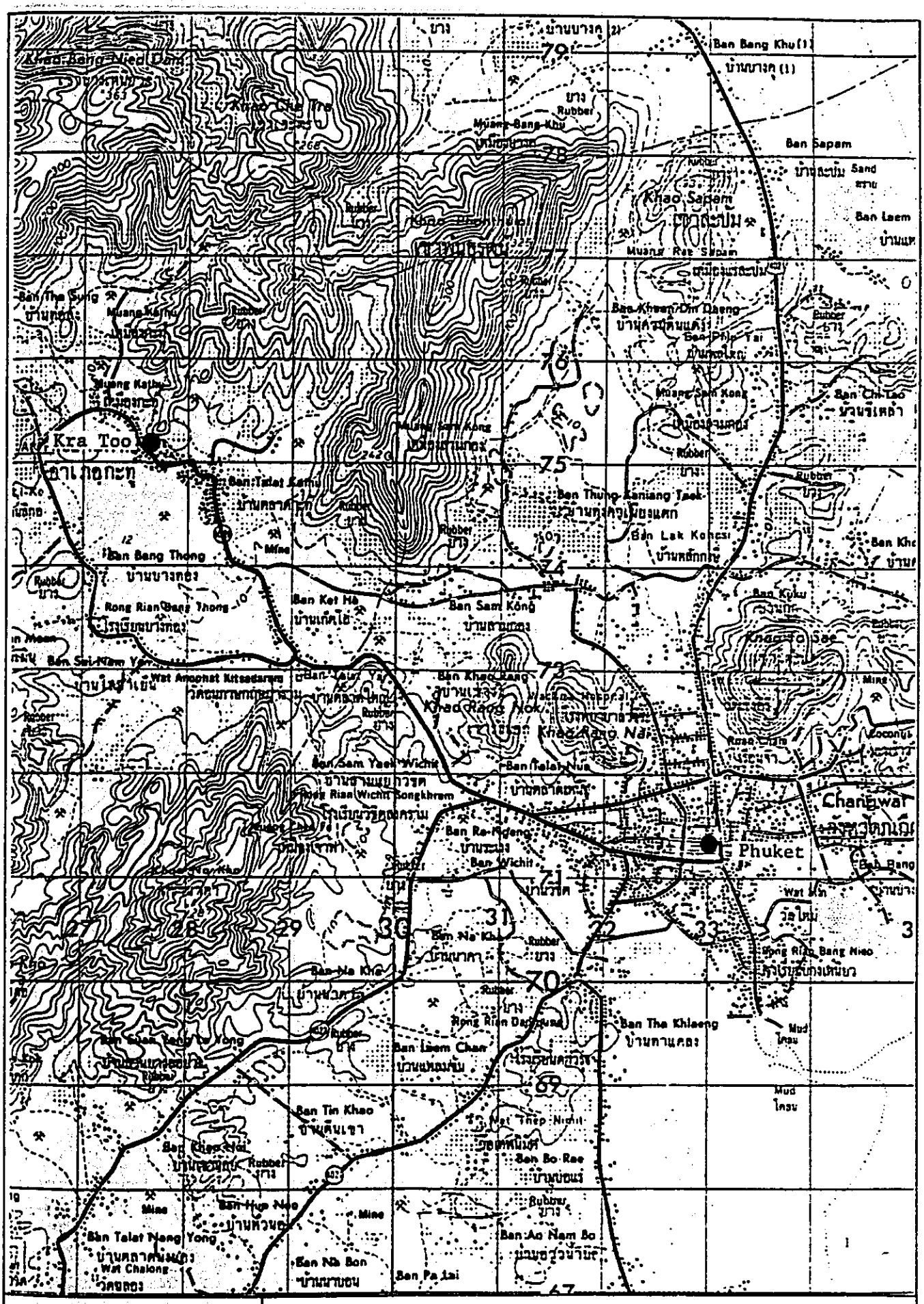
Cable Layout Plan	Ko Lanta - Ko Lanta(R) Krabi Area(7501)



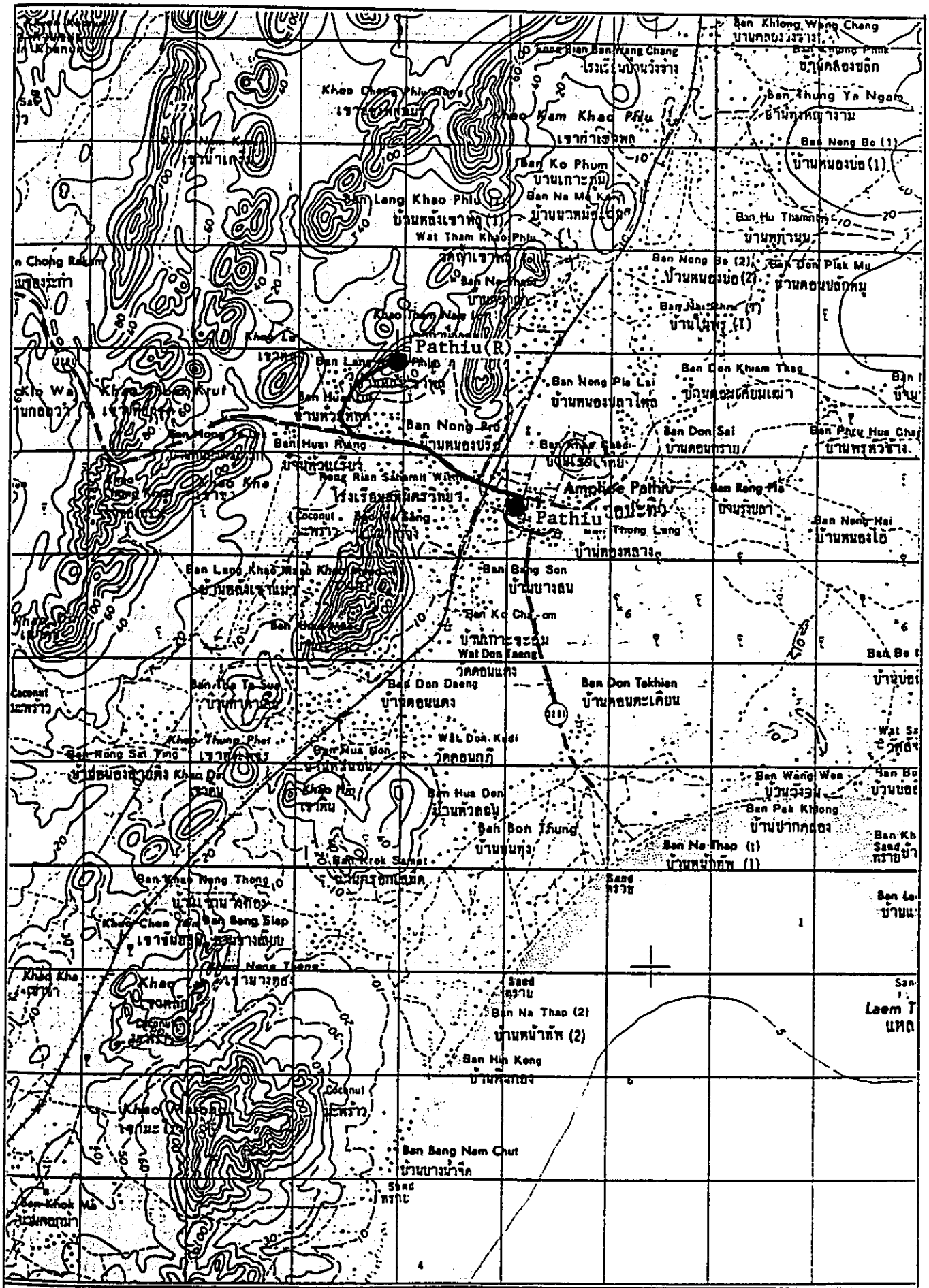
Cable Layout Plan	Sikao - Ban Mai Fat Trang Area(7523)



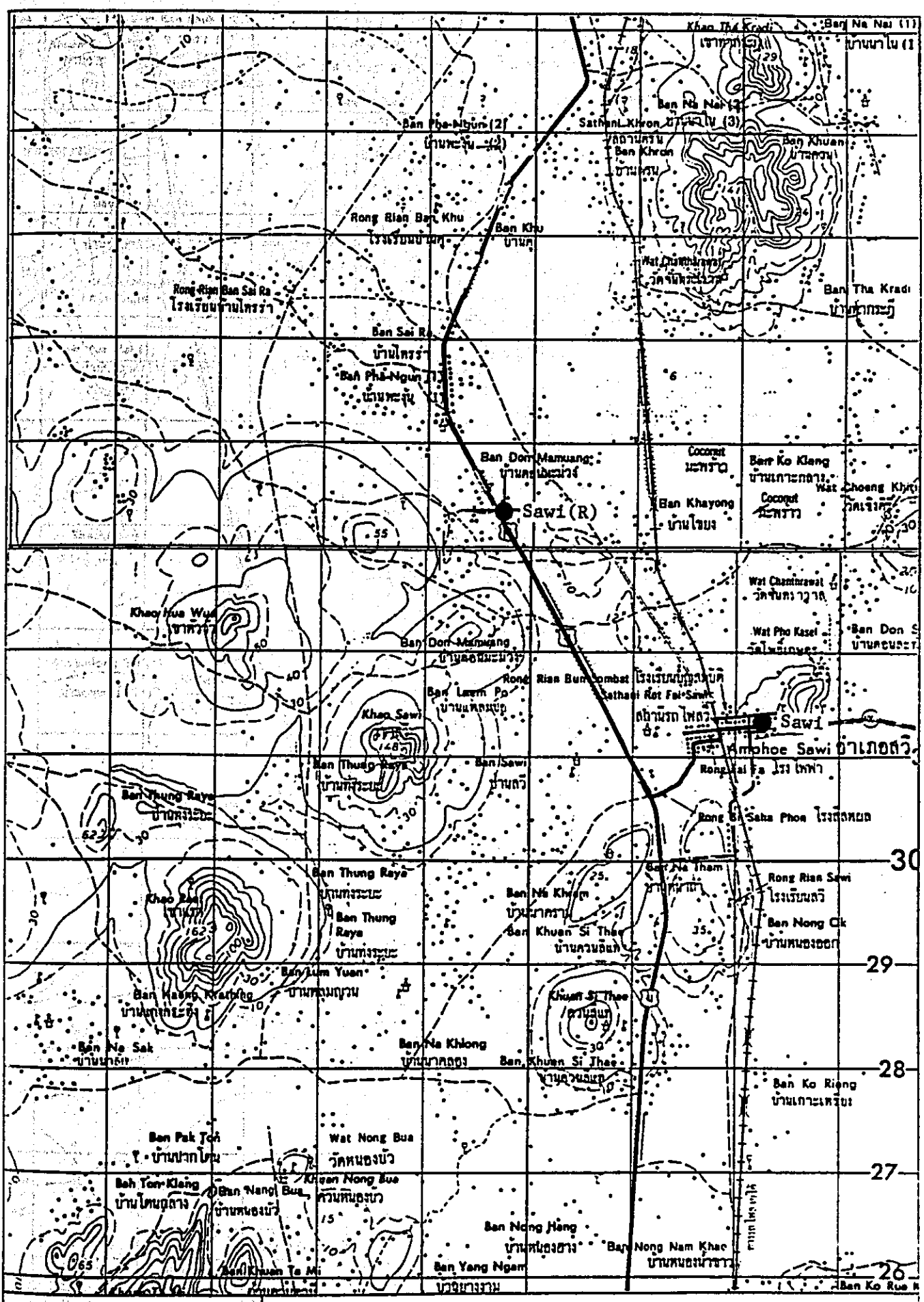
Cable Layout Plan	Kapong - Kapong(R) Phang Nga Area(7601)



Cable Layout Plan	Kra Too - Phuket Phuket Area(7609)



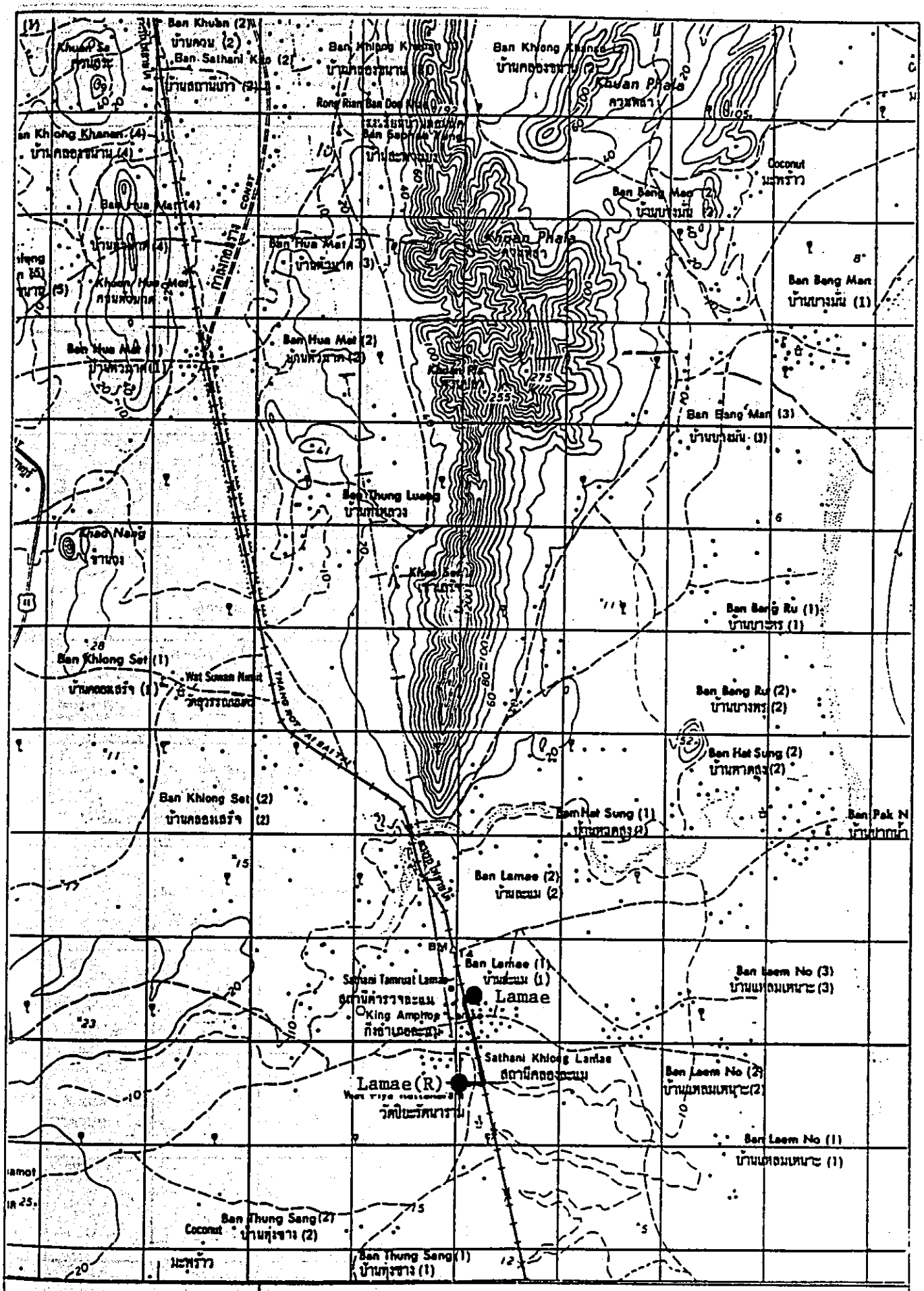
Cable Layout Plan	Pathiu - Pathiu(R) Chum Phon Area(7701)



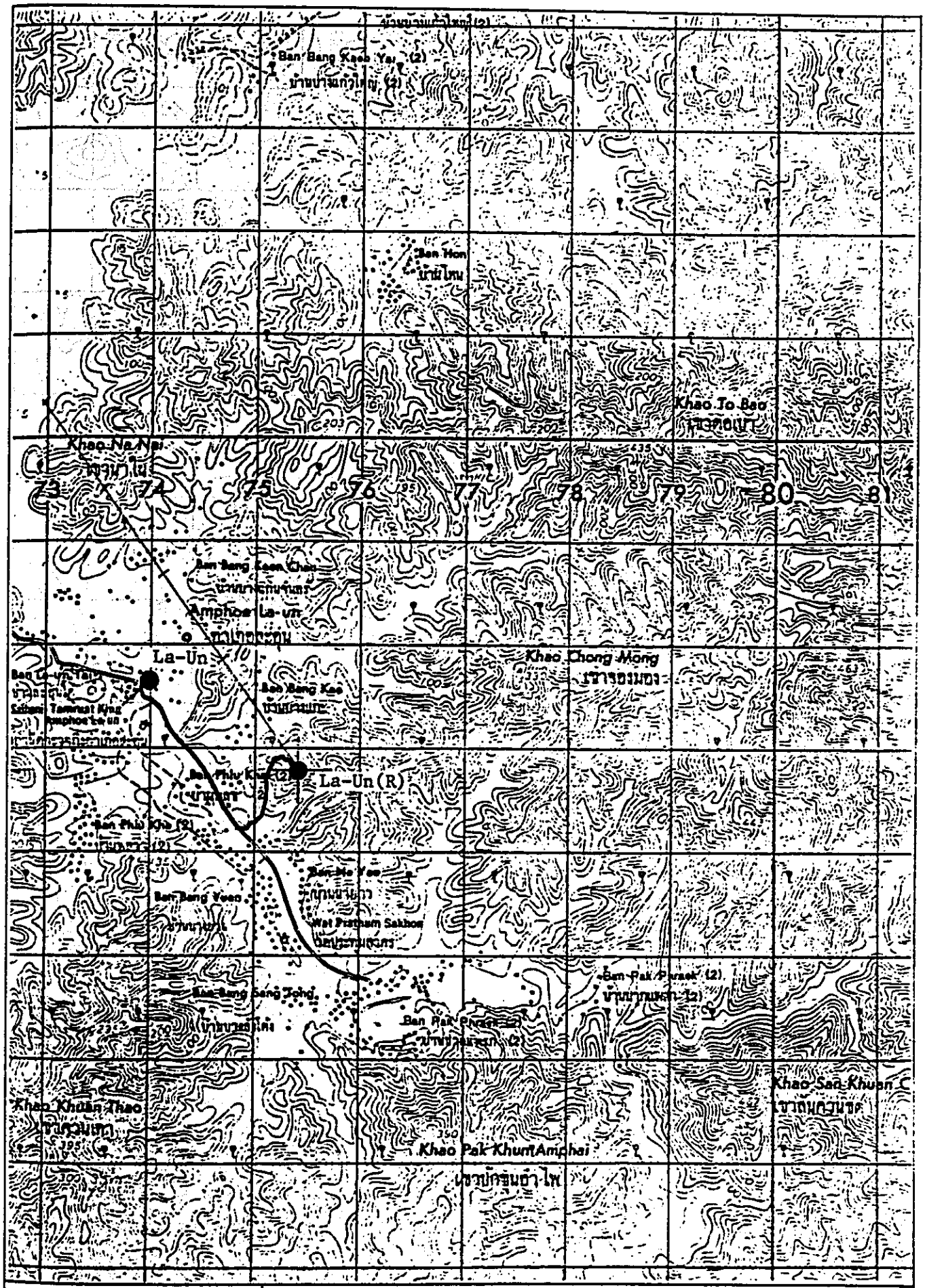
Cable Layout Plan

Sawi - Sawi(R)

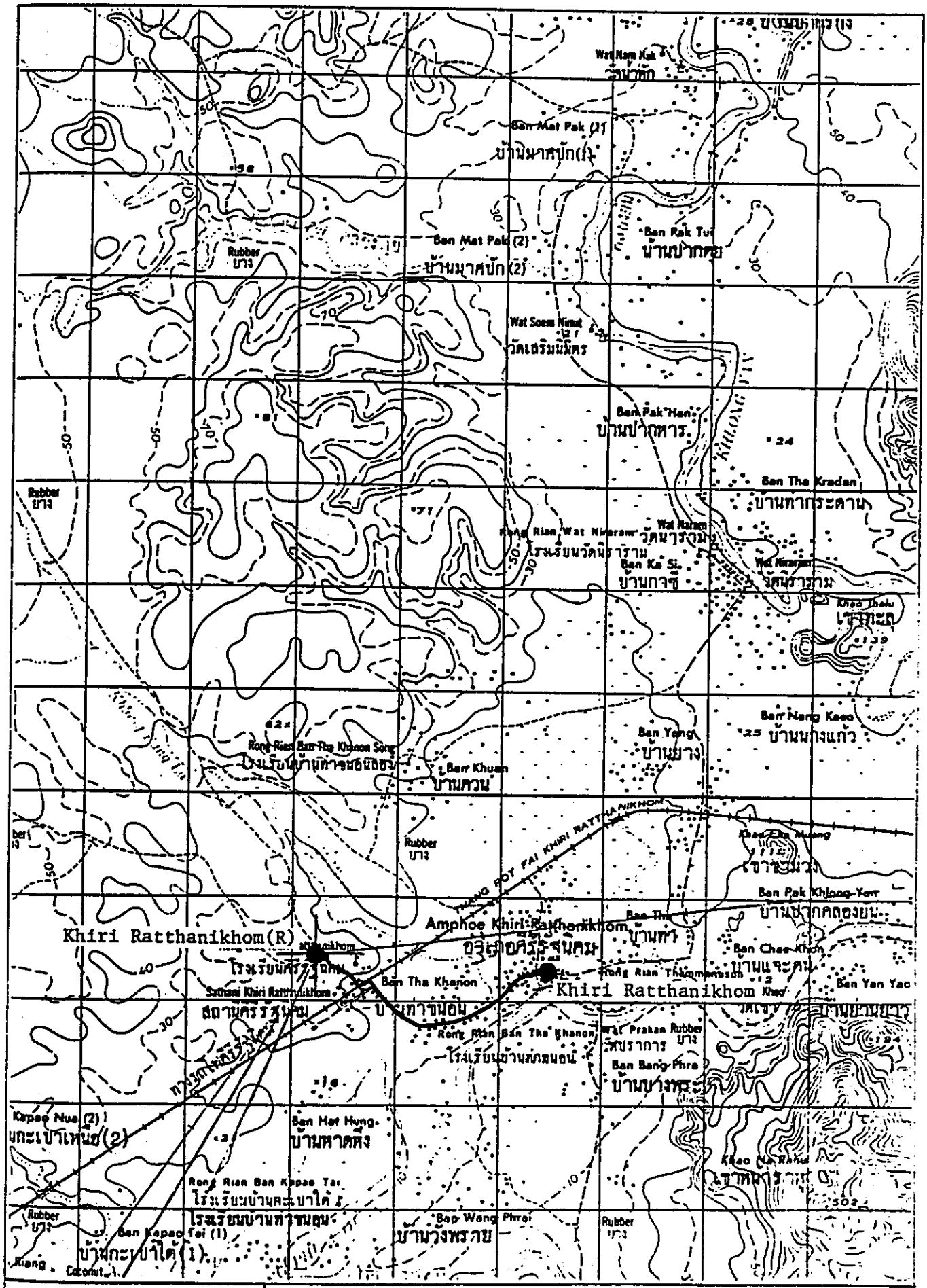
Chum Phon Area(7701)



Cable Layout Plan	Lamae - Lamae(R) Chum Phon Area(7701)



Cable Layout Plan	La-Un - La-Un(R) Ranong Area(7707)



Cable Layout Plan	Khiri Ratthanikhom - Khiri Ratthanikhom(R) Phun Phin Area(7711)

16. Radio Interference Study

16. Radio Interference Study

This report describes the results of interference study of satellite communication system and also provides the basic data required for the adequate site selection to reduce the interference noise. The report consists of six sub-reports: Report A through Report F. For denotations of marks and symbols, etc., of Report A through C, see Figures 1 through 4.

(1) Report A: Basic data with respect to earth station-satellite section.

This report presents the basic elements of radiowave propagation between the two satellites(operational and spare) and the scheduled 423 earth stations. These basic elements, Besides being used as preliminary data for interference study, are complied to be useful for the satellite communication system design and its installation including orientation of each station building and antenna tower foundation.
Each scheduled earth station is enclosed with * . One page coveres four earth stations.

(2) Report B: Basic with respect to terrestrial sections.

This report presents a list of propagation elements of each existing terrestrial station toward each neighbor station. The listed elements have been selected so that they can be used not only as preliminary data for interference study but also for planning to reduce interference noise.
The report consists of 70 pages covering all 70 terrestrial stations.

(3) Report C: Radio interference by earth stations.

This report assumes prime importance in this interference study. It contains 17 propagation elements useful for interference study. Those 17 propagation elements have been computed and selected for each scheduled earth station in regard to the combination of existing terrestrial station likely to suffer radio interference and each of its neighbor stations. D/U is evaluated in four steps, i.e., by 0 to 3 codes as shown below :

$D/U \geq 99$ (dB)	(0)
$99 > D/U \geq 89$ (dB)	(1)
$89 > D/U \geq 79$ (dB)	(2)
$79 > D/U$ (dB)	(3)

The report consists of 603 pages covering all 423 earth stations.

(4) Report D: Radio interference to be suffered by terrestrial stations.

This report presents a list of D/U and its evaluation codes used in Report C, arranged this time according to the combinations of each existing terrestrial station as key station and its opposite scheduled earth station, as well as its neighbor stations.

The report consists of 45 pages covering all 70 terrestrial stations.

(5) Report E: List of D/U

This report presents the cumulative total of D/U of up to 99 dB selected out of D/U of all conceivable paths and arranged at intervals of 2 dB. At the same time, the minimum D/U, the total number of path combinations where D/U was computed (inclusive of path combinations where D/U > 99 dB), and the number of similar combinations of each scheduled earth station and its opposite existing terrestrial station are also presented for the purpose of reference.

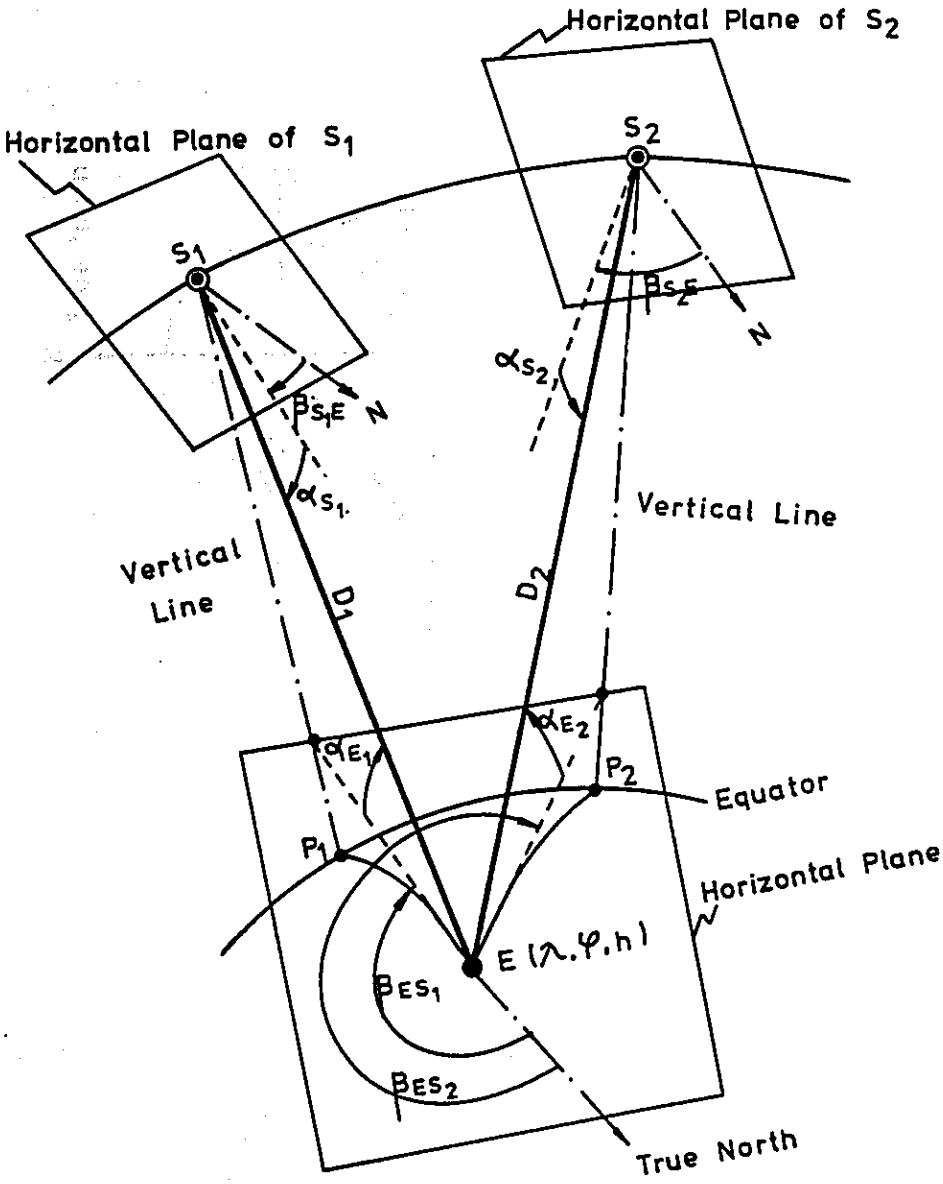
The report consists of one page.

(6) Report F: List of radio stations.

This report presents a complete list of the existing 6 GHz system terrestrial stations totaling 70 and the scheduled satellite communication earth stations totaling 423. Each 25 stations are covered in one page.

The report consists of 20 pages.

(7) Computer print-out of interference study is voluminous, covering as many as 945 pages. One copy of the original has been submitted to TOT. Here, only the typical examples corresponding to Report A through Report F are introduced.



E : Earth Station

S_1 : Satellite (Operational)

S_2 : Satellite (Spare)

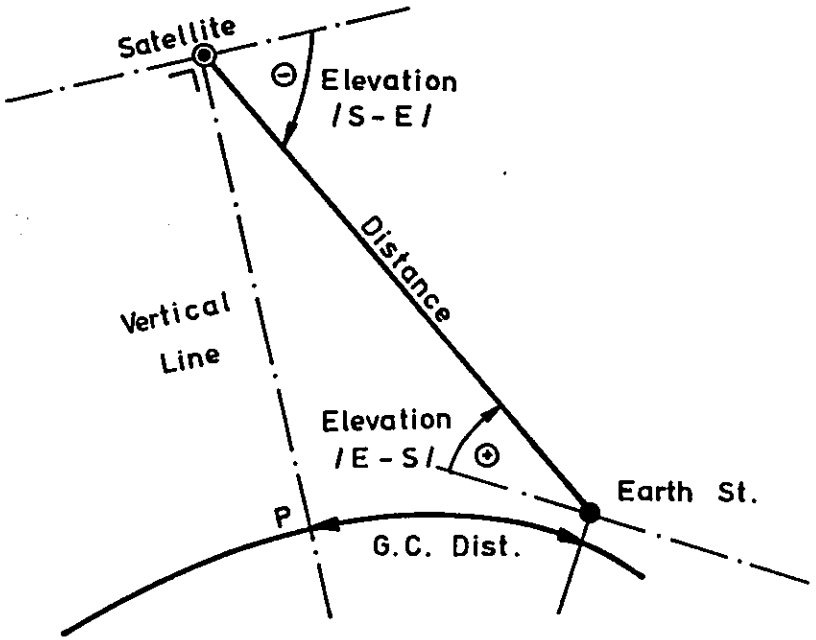
P_1, P_2 : Satellite Position, P_1 ··· E 83° P_2 ··· E 77°

α : Elevation Angle, β : Azimuth, λ : Longitude,

φ : Latitude, h : Elevation above Sea Level

P-S: Satellite Altitude (35,860 Km.)

Figure 1 Geographic Elements of Earth Station and Satellite



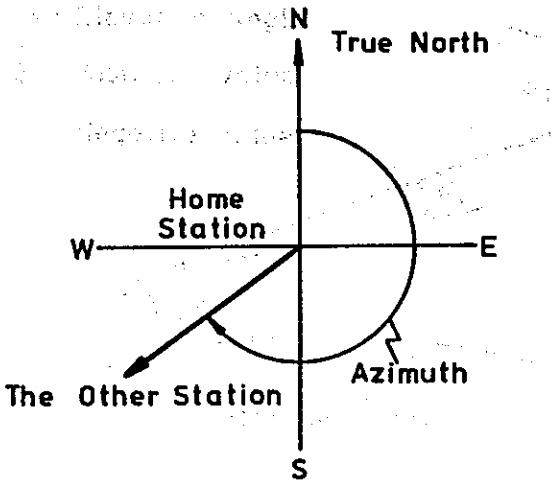
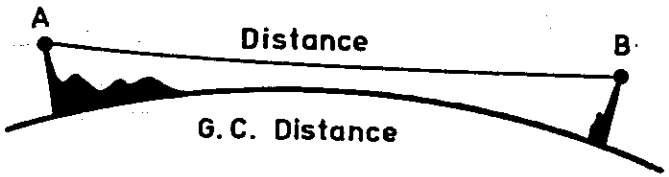


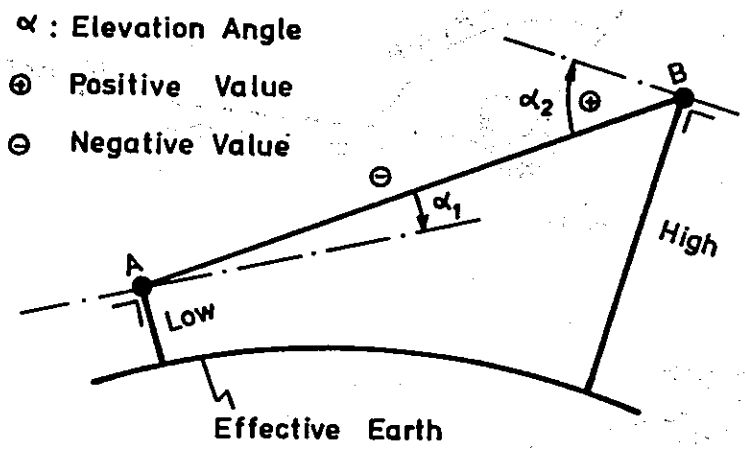
Figure 2 Explanatory Illustration of Report A



Distance = Path Length ÷ G.C. Distance

A, B : Earth Station or Terrestrial Station

G.C. : Great Circle



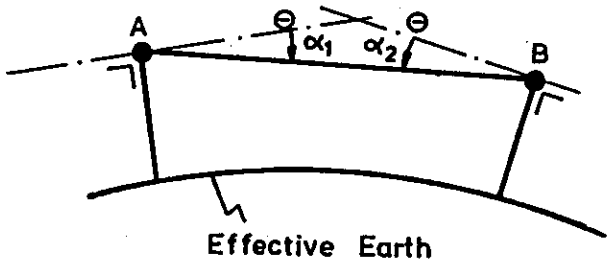
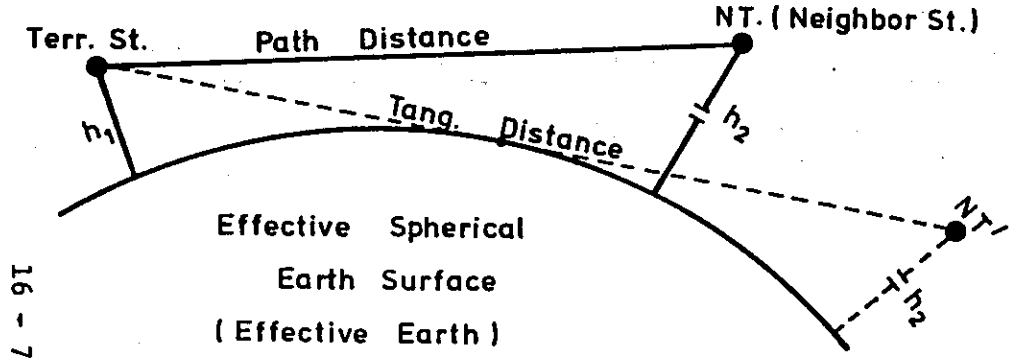
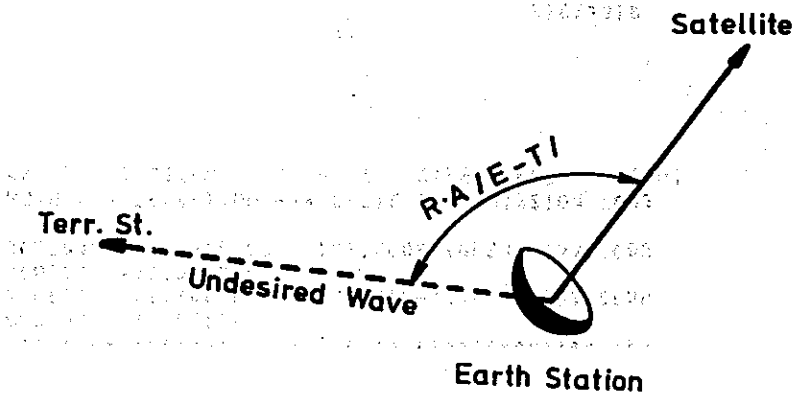
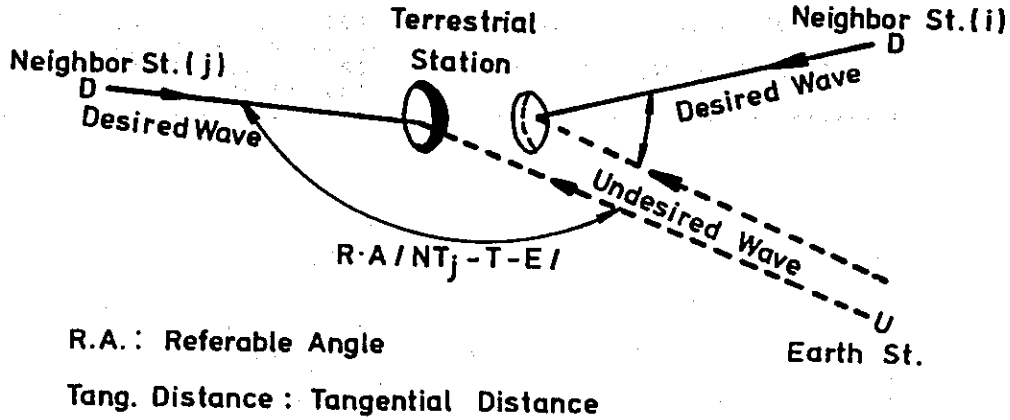


Figure 3 Explanatory Illustration of Report B







R.A.: Referable Angle

Tang. Distance : Tangential Distance

Figure 4 Explanatory Illustration of Report C

** BASIC DATA OF THE EARTH (SATELLITE COMM.) STATION **

ID.NO.(1) ST.NO.(0101) ST.NAME(N.YA PLONG) LONG.(E)= 99 42 3 LATI.(N)= 13 9 3 SITE ELEV.= 65(M)

		DISTANCE	G.C.DIST.	TRAV. TIME	AZIMUTH	ELEVATION	BASIC TRANSMISSION LOSS	
SATELLITE 1	/E-S/	36360(KM)	2347(KM)	121(MSEC)	233.00(DEG)	65.39(DEG)	195.7(DB/4GHZ)	199.5(DB/6GHZ)
	/S-E/				51.08(DEG)	-86.58(DEG)		
SATELLITE 2	/E-S/	36613(KM)	2896(KM)	122(MSEC)	241.61(DEG)	59.70(DEG)	195.8(DB/4GHZ)	199.5(DB/6GHZ)
	/S-E/				58.98(DEG)	-85.82(DEG)		

ID.NO.(2) ST.NO.(0102) ST.NAME(BAN LAT) LONG.(E)= 99 55 5 LATI.(N)= 13 3 4 SITE ELEV.= 4(M)

		DISTANCE	G.C.DIST.	TRAV. TIME	AZIMUTH	ELEVATION	BASIC TRANSMISSION LOSS	
SATELLITE 1	/E-S/	36365(KM)	2360(KM)	121(MSEC)	233.58(DEG)	65.26(DEG)	195.7(DB/4GHZ)	199.5(DB/6GHZ)
	/S-E/				51.65(DEG)	-86.56(DEG)		
SATELLITE 2	/E-S/	36621(KM)	2912(KM)	122(MSEC)	242.04(DEG)	59.54(DEG)	195.8(DB/4GHZ)	199.5(DB/6GHZ)
	/S-E/				59.41(DEG)	-85.80(DEG)		

ID.NO.(3) ST.NO.(0103) ST.NAME(KHAO YOI) LONG.(E)= 99 49 52 LATI.(N)= 13 14 1 SITE ELEV.= 6(M)

		DISTANCE	G.C.DIST.	TRAV. TIME	AZIMUTH	ELEVATION	BASIC TRANSMISSION LOSS	
SATELLITE 1	/E-S/	36367(KM)	2364(KM)	121(MSEC)	233.06(DEG)	65.22(DEG)	195.7(DB/4GHZ)	199.5(DB/6GHZ)
	/S-E/				51.11(DEG)	-86.56(DEG)		
SATELLITE 2	/E-S/	36622(KM)	2913(KM)	122(MSEC)	241.62(DEG)	59.53(DEG)	195.8(DB/4GHZ)	199.5(DB/6GHZ)
	/S-E/				58.95(DEG)	-85.80(DEG)		

ID.NO.(4) ST.NO.(0104) ST.NAME(BAN LAEM) LONG.(E)= 99 59 10 LATI.(N)= 13 12 8 SITE ELEV.= 3(M)

		DISTANCE	G.C.DIST.	TRAV. TIME	AZIMUTH	ELEVATION	BASIC TRANSMISSION LOSS	
SATELLITE 1	/E-S/	36371(KM)	2376(KM)	121(MSEC)	233.39(DEG)	65.10(DEG)	195.7(DB/4GHZ)	199.5(DB/6GHZ)
	/S-E/				51.42(DEG)	-86.54(DEG)		
SATELLITE 2	/E-S/	36629(KM)	2926(KM)	122(MSEC)	241.85(DEG)	59.39(DEG)	195.8(DB/4GHZ)	199.5(DB/6GHZ)
	/S-E/				59.18(DEG)	-85.78(DEG)		

** BASIC DATA OF THE TERRESTRIAL STATION **

* ID.NO. (1)

* ST.NAME BANGKOK

LONGITUDE	(E 100 30 58)
LATITUDE	(N 13 45 26)
SITE /S.L.	3.0(M)
ANTENNA /G.L.	80.0(M)

* RECEIVING CONDITIONS IN FREE-SPACE (NEIGHBOR ST. 6GHZ RADIATED) *

ITEM / NEIGHBOR ST.		NO.(34)	NO.(2)	NO.(60)	NO.(0)	NO.(0)
DISTANCE	(KM)	50.2	42.5	60.7	0.0	0.0
AZIMUTH /T-N/	(DEG)	277.06	15.55	98.15	0.0	0.0
/N-T/	(DEG)	96.95	195.57	278.28	0.0	0.0
ELEV.ANG./T-N/	(DEG)	-0.01	-0.13	-0.20	0.0	0.0
/N-T/	(DEG)	-0.33	-0.16	-0.21	0.0	0.0
B.T.L	(DB)	142.3	140.8	143.9	0.0	0.0
E.I.R.P	(DBM)	82.3	82.3	82.3	0.0	0.0
REC.ANT.GAIN	(DB)	42.3	42.3	42.3	0.0	0.0
REC.ANT.INPUT	(DBM)	-17.7	-16.2	-19.3	0.0	0.0

** ESTIMATION OF INTERFERENCE LEVEL FROM
THE EARTH-STATION TO THE TERRESTRIAL-STATION **

* EARTH-STATION *
ID.NO.(1)
ST.NO.(0101)
STATION NAME N.YA PLONG

LONGITUDE (E 99 42 3)
LATITUDE (N 13 9 3)
SITE.S.L. 65.0 (M)

ANTENNA-G.L. 4.5 (M)
ANTENNA-GAIN 46.5 (DB)
ANTENNA-DIA. 4.5 (M)

RADIATED POWER 30.0 (DBM)
/SATELLITE-1 E 083 (DEG)/
/SATELLITE-2 E 077 (DEG)/

* RESULT *

INTERFERING ITEM	**	-TERRESTRIAL STATION- ID.NO.(NEIGHBOR ID.NO.) 34(1)	34(35)	35(34)	35(36)	36(35)	36(37)	37(36)	37(38)	0(0)	0(0)
PATH DISTANCE /E-T/	(KM)	82.7	82.7	43.4	43.4	25.8	25.8	69.8	69.8	0.0	0.0
TANG.DISTANCE	(KM)	96.5	96.5	63.2	63.2	80.5	80.5	86.9	86.9	0.0	0.0
AZIMUTH /E-T/	(DEG)	27.64	27.64	15.99	15.99	102.05	102.05	158.03	158.03	0.0	0.0
AZIMUTH /T-E/	(DEG)	207.73	207.73	196.02	196.02	282.10	282.10	338.09	338.09	0.0	0.0
ELEVATION /E-T/	(DEG)	-0.17	-0.17	-0.17	-0.17	0.04	0.04	-0.16	-0.16	0.0	0.0
ELEVATION /T-E/	(DEG)	-0.39	-0.39	-0.12	-0.12	-0.21	-0.21	-0.31	-0.31	0.0	0.0
REFER.ANGLE1 /S1-E-T/	(DEG)	112.3	112.3	109.6	109.6	105.8	105.8	83.9	83.9	0.0	0.0
REFER.ANGLE2 /S2-E-T/	(DEG)	114.9	114.9	110.8	110.8	112.5	112.5	86.9	86.9	0.0	0.0
REFER.ANGLE /NT-T-E/	(DEG)	110.4	12.3	156.1	51.5	62.4	103.1	20.9	150.0	0.0	0.0
E.I.ANT.GAIN1 /E-T/	(DB)	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	0.0	0.0
E.I.ANT.GAIN2 /E-T/	(DB)	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	-10.0	0.0	0.0
E.I.ANT.GAIN /T-E/	(DB)	-8.9	12.7	-16.7	0.3	0.3	-2.3	6.7	-16.7	0.0	0.0
DESIRED INPUT / T /	(DBM)	-17.7	-16.0	-16.0	-17.4	-17.4	-19.1	-19.1	-18.6	0.0	0.0
UNDESIRED INPUT1 /E-T/	(DBM)	-135.5	-113.9	-137.7	-120.7	-116.2	-118.8	-118.5	-141.8	0.0	0.0
UNDESIRED INPUT2 /E-T/	(DBM)	-135.5	-113.9	-137.7	-120.7	-116.2	-118.8	-118.5	-141.8	0.0	0.0
D/U 1 (DB) (ESTIMATION CODE)		117.8(0)	97.9(1)	121.7(0)	103.3(0)	98.7(1)	99.7(0)	99.3(0)	123.2(0)	0.0(0)	0.0(0)
D/U 2 (DB) (ESTIMATION CODE)		117.8(0)	97.9(1)	121.7(0)	103.3(0)	98.7(1)	99.7(0)	99.3(0)	123.2(0)	0.0(0)	0.0(0)

- NOTE - 1 : OPERATIONAL, 2 : SPARE, E : EARTH-STATION, T : TERRESTRIAL-STATION(NT:NEIGHBOR), S : SATELLITE
ESTIMATION CODE (FREE SPACE ASSUMED) : (0) 99 DB OVER, (1) 99 - 89 DB, (2) 89 - 79 DB, (3) LESS THAN 79 DB

- PROJECT NAME -
RURAL LONG DISTANCE
PUBLIC TELEPHONE SERVICE
IN THAILAND
(INTERFERENCE STUDY)

- REPORT D -

NTC/1978

** ANALYZED INTERFERING PATH COMBINATION AND D/U VALUE **

** TERRESTRIAL STATION **

* ID.NO. (1)
* ST.NAME (BANGKOK)

* SATELLITE EARTH STATION ID.NO. *	7	12	24	25	26	29	30	41	42	63
* TERRESTRIAL NEIGHBOR STATION ID.NO. *	34	34	2	2	2	2	2	2	2	60
* D/U RATIO 1 (DB)(OPERATIONAL) *	95.1	96.6	92.0	98.7	97.7	76.9	96.2	80.2	94.4	97.6
* D/U ESTIMATION CODE 1(OPERATIONAL) *	1	1	1	1	1	3	1	2	1	1
* D/U RATIO 2 (DB)(SPARE) *	95.1	96.6	92.0	98.7	97.7	76.9	96.2	80.2	94.4	97.6
* D/U ESTIMATION CODE 2(SPARE) *	1	1	1	1	1	3	1	2	1	1

* SATELLITE EARTH STATION ID.NO. *	66	67	269	0	0	0	0	0	0	0
* TERRESTRIAL NEIGHBOR STATION ID.NO. *	60	60	34	0	0	0	0	0	0	0
* D/U RATIO 1 (DB)(OPERATIONAL) *	95.0	87.0	95.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
* D/U ESTIMATION CODE 1(OPERATIONAL) *	1	2	1	0	0	0	0	0	0	0
* D/U RATIO 2 (DB)(SPARE) *	95.0	87.0	95.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
* D/U ESTIMATION CODE 2(SPARE) *	1	2	1	0	0	0	0	0	0	0

- PROJECT NAME -
RURAL LONG DISTANCE
PUBLIC TELEPHONE SERVICE
IN THAILAND
(INTERFERENCE STUDY)

- REPORT E -

******** SUMMARY RESULTANT (ANNEX REPORT) ********

NTC/1978

** ANALYTICAL CONDITION **

* EARTH-STATION TO TERRESTRIAL-STATION
* PATH IN FREE SPACE (FREQUENCY 6GHZ)
* UP-LINK RADIATION POWER 30.0(DBM)
* UP-LINK ANTENNA GAIN 46.5 (DB)
* WITHIN 100 KM RADIUS RANGE OR LINE-OF-SIGHT RANGE (SPHERICAL EARTH SURFACE ASSUMED AND 100 KM OVER)

** ACCUMULATIVE NUMBER OF SPECIFIC D/U VALUE **

D/U (DB)	OPERATIONAL-SATELLITE	SPARE-SATELLITE
LESS THAN		
99	586	586
97	492	492
95	404	404
93	339	339
91	296	296
89	248	248
87	221	221
85	184	184
83	153	153
81	127	127
79	106	106

* D/U MINIMUM-1 52 (DB) MINIMUM-2 52 (DB)
* ANALYZED E-T PATH TOTAL(EACH SATELLITE) 1986
* ANALYZED E-T-NT PATH TOTAL(EACH SATELLITE) 4026

- PROJECT NAME -
RURAL LONG DISTANCE
PUBLIC TELEPHONE SERVICE
IN THAILAND
(INTERFERENCE STUDY)

- REPORT F -

NTC/1978

******* LIST OF THE RADIO STATIONS (ANNEX REPORT) *******

- PART 1 - * TERRESTRIAL STATION (6GHZ) *

(ID.NO.)	(ST.NO.)	STATION NAME	LONGITUDE-E (D M S)	LATITUDE-N (D M S)	SITE/S.L. (M)	ANT./G.L. (M)	*	NEIGHBOR STATIONS (ID.NO.)			
(1)	( )	BANGKOK	100 30 58	13 45 26	3.0	80.0	*	(34)	(2)	(60)	(0)
(2)	( )	BANG KHAI	100 37 16	14 7 32	2.0	90.0	*	(1)	(3)	(0)	(0)
(3)	( )	SARABURI	100 55 2	14 31 4	16.0	90.0	*	(2)	(4)	(17)	(0)
(4)	( )	LOP BURI	100 37 58	14 47 53	12.0	50.0	*	(3)	(5)	(0)	(0)
(5)	( )	TAKLI	100 20 16	15 14 27	190.0	15.0	*	(4)	(6)	(0)	(0)
(6)	( )	NAKHON SAWAN	100 6 48	15 42 37	122.0	15.0	*	(5)	(7)	(0)	(0)
(7)	( )	BANG MUN NAK	100 23 37	16 1 46	30.0	70.0	*	(6)	(8)	(0)	(0)
(8)	( )	PHICHIT	100 19 26	16 26 49	35.0	70.0	*	(7)	(9)	(0)	(0)
(9)	( )	PITSANULOK	100 16 43	16 48 37	46.0	80.0	*	(8)	(10)	(0)	(0)
(10)	( )	BAN KHUN	100 5 43	17 12 48	47.0	80.0	*	(9)	(11)	(0)	(0)
(11)	( )	UTTARADIT	100 5 51	17 37 36	62.0	80.0	*	(10)	(12)	(0)	(0)
(12)	( )	DEN CHAI	100 0 14	17 55 52	710.0	15.0	*	(11)	(13)	(0)	(0)
(13)	( )	PANG PUAI	99 51 11	18 17 8	658.0	15.0	*	(12)	(14)	(0)	(0)
(14)	( )	LAMPANG	99 33 59	18 14 31	563.0	15.0	*	(13)	(15)	(0)	(0)
(15)	( )	D.K.T.NOI	99 13 7	18 26 4	790.0	70.0	*	(14)	(16)	(0)	(0)
(16)	( )	CHIANG MAI	99 58 15	18 48 15	315.0	45.0	*	(15)	(0)	(0)	(0)
(17)	( )	K.PHAENG MA	101 9 24	14 39 2	540.0	20.0	*	(3)	(18)	(0)	(0)
(18)	( )	K.YAI THIANG	101 33 9	14 47 9	720.0	50.0	*	(17)	(19)	(0)	(0)
(19)	( )	N.RATCHASIMA	102 6 12	14 58 10	192.0	60.0	*	(18)	(20)	(63)	(0)
(20)	( )	NIKHONPHINAI	102 33 15	15 9 17	218.0	130.0	*	(19)	(28)	(21)	(0)
(21)	( )	BURI RAM	103 6 44	15 0 4	152.0	90.0	*	(20)	(22)	(0)	(0)
(22)	( )	SURIN	103 29 44	14 53 13	142.0	85.0	*	(21)	(23)	(0)	(0)
(23)	( )	SI KHORAPHUM	103 47 38	14 56 39	137.0	85.0	*	(22)	(24)	(0)	(0)
(24)	( )	U.PHISAI	104 10 53	15 7 17	140.0	40.0	*	(23)	(25)	(0)	(0)
(25)	( )	SI SA KET R	104 20 7	15 6 42	125.0	25.0	*	(24)	(26)	(0)	(0)