

PROPOSED ROUTE NO. IM - 26

Changwat : Surin / Si Sa Ket

B. Non Dang(J.R.2030,2033,2034) - A.Rattana Buri

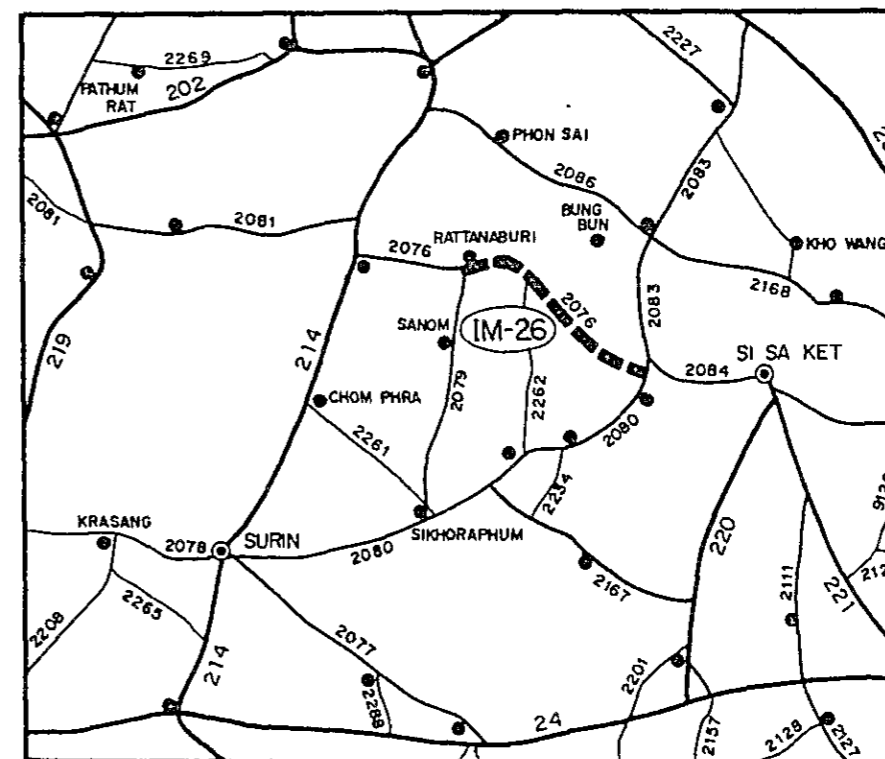
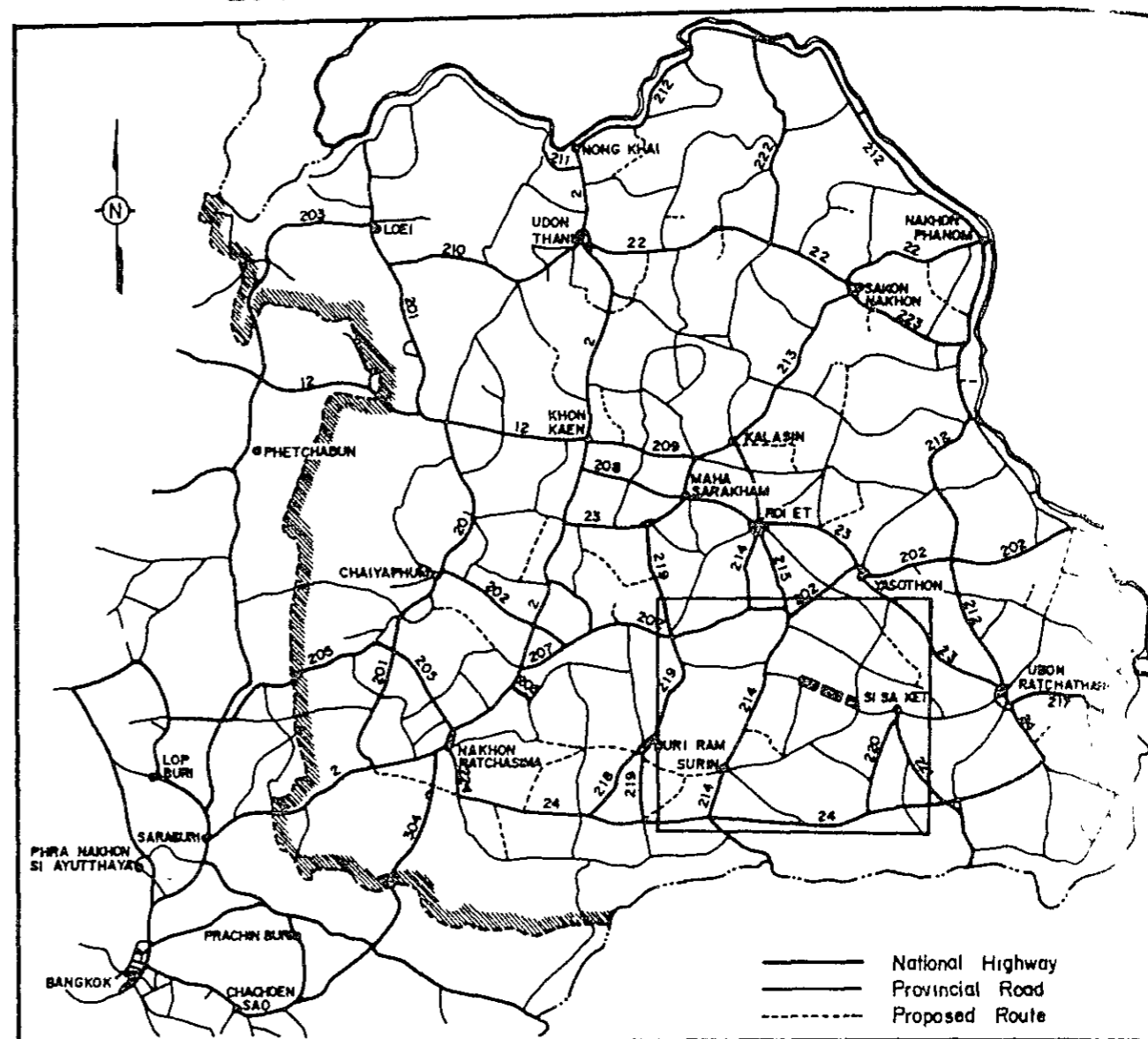
Length · 39.5 KM.

SUMMARY

PROPOSED ROUTE IM-26

Item	Description
Changwat	Surin/Si Sa Ket
Origin	B. Non Dang (J.R.2030, 2033, 2034)
Destination	A. Rattane Buri
Length	
Total	39.5 km
Improvement Section	35.5 km
DOH Road	R.2076 35.5 km
ARD Road	0 km
Others	0 km
New Alignment Section	4.0 km
Surface Type and Condition	Soil Aggregate, Poor
Terrain	Flat and Rolling
Influence Area	
Area	196 km ²
Population (1982)	33,800
Principal Crops	Paddy
Traffic (ADT)	
Existing	154
1993	630
2001	857
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	74,327 . 10 ³ ฿
Economic	67,347 . 10 ³ ฿
IRR	11.8 %
B/C	0.99
Social Impact	High
Recommendation	For immediate implementation

LOCATION OF PROPOSED ROUTE



1. 概要

1.1 計画路線の概要

本路線は、Surin および Si Sa Ket の両県にまたがる。ルートは、Non Dang村の県道2076号線と2079号線が交差する所を起点とし、南東へ走り、Muang Mak 村、E Se村、Dong Ling村を経て、Rathanaburi 郡の県道2080号線と2083号線が交差する所で終わる。その総延長は39.5kmである。(Figure 26.5.2)

沿道の地形は、ほぼ平坦であるが一部に丘陵地が含まれる。影響圏内には、いくつかの村が存在し、その総人口は、33,800人である。

沿道には、医療センターが2ヶ所、病院が1ヶ所あり、教育施設として中学校が1ヶ所ある。

本路線は、農業的に開発の進んだ地域における2つの幹線道路、国道214号線と県道2084号線をつなぐ重要な道路網の形成を目的に計画されたものである。

1.2 現道の状況

計画路線に利用した現道の状況はTable 26.1.1に要約し、その詳細はTable 26.1.2のイベントリー調査の結果に示した。

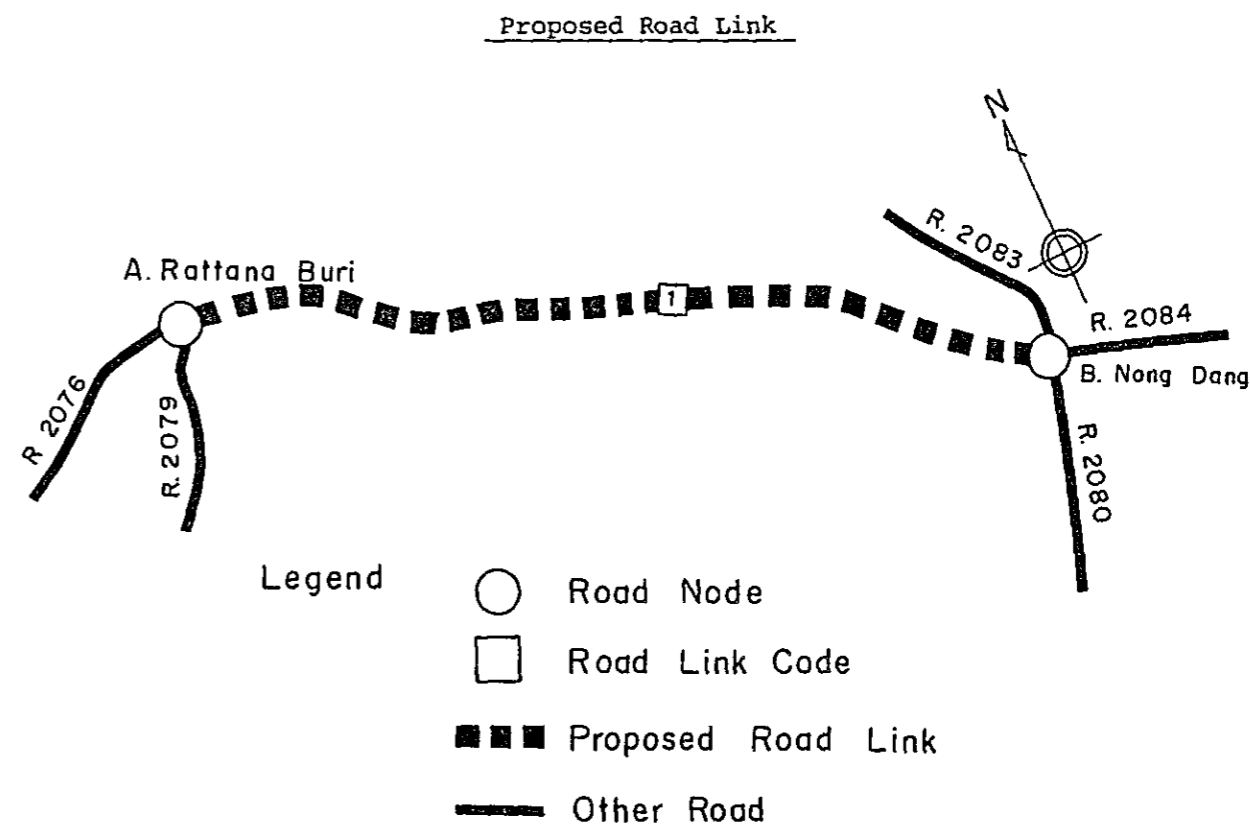
2. 交通

2.1 予測手法

計画対象路線に関し道路改良後の転換交通はほとんど無視し得るので、交通量予測には「伸び率方式」を適用することとした。

2.2 基準年交通量

道路リンク別車種別の基準年交通量は、DOH交通量調査結果を基として次のように推定した。



Traffic Volume in Base Year

Source (base year)	Link No	Vehicle Type									
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T	ADT
DOH (1981)	1 ^{1/}	30	9	27	32	1	2	4	19	30	154

Note : ^{1/} Route 2076 Section 0200 Station Km 0+500

2.3 交通需要

計画路線上の旅客交通需要（トリップ/日）および貨物交通需要（トン/日）は、先に求めた基準年の交通量に路側インタビューによって得られる平均乗車人員もしくは平均貨物積載量をかけることによって推定した。推定結果は以下のとおりである。

PASSENGER MOVEMENT (1982)

PROPOSED ROAD LINK	TRIPS PER DAY
1	1214

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	143	161	304

2.4 交通需要の将来伸び率

1981-1987, 1987-1993, 1993-2001の各期間における旅客および貨物の交通需要の将来伸び率は、メインレポートの7.3.3の1)で述べた予測式に従って求めた。予測の前提および得られた将来伸び率は以下の通りである。

GROWTH RATE OF PASSENGER MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981	1987	1993
	1987	1993	2001
PER CAPITA INCOME	4.2	4.5	4.7
TRANS. PRICE INCREASE	4.5	4.5	4.5
POPULATION	1.5	1.3	1.1
PASSENGER MOVEMENT	5.5	5.7	5.8

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981	1987	1993
	1987	1993	2001
NON-AGRI. AGRICULTURE	7.1	7.3	7.5
AGRICULTURE	0.5	0.3	0.1
FREIGHT	3.6	3.6	3.6

2.5 誘発および開発交通量

メインレポートの7.3.3の3)で述べた方式を基に誘発および開発交通量の通常交通量に対する比率を求めた。

RATE OF INDUCED AND DEVELOPED TRAFFIC

ITEM	YEAR		
	(%)		
	1987	1993	2001
INDUCED	15.0	15.0	15.0
DEVELOPED	0.0	0.5	0.4

2.6 将来交通量

1) 車種構成

計画路線上の旅客・貨物に関する将来交通需要を、以下の車種構成比によって車種別交通量に変換した。

TRAFFIC COMPOSITION

(UNIT : %)

LINK NO.	YEAR	PASSENGER					FREIGHT			
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T
1	1982	30.3	9.1	27.3	32.3	1.0	3.6	7.3	34.5	54.5
	1987	24.3	15.6	25.5	30.5	4.1	7.6	9.9	34.7	47.8
	1993	18.3	22.1	23.7	28.7	7.3	11.7	12.5	34.8	41.0
	2001	10.2	30.8	21.3	26.2	11.5	17.0	16.0	35.0	32.0

2) 将来ADT

計画路線上のリンク加重平均将来交通量は以下に示すとおりであり、またその道路リンク別交通タイプ別の詳細はTable 26.2.1に示す。

AVERAGE FUTURE TRAFFIC ON PROPOSED ROUTE

YEAR	TYPE OF VEHICLE								ADT	M/C	TOTAL
	P/C	L/B	M/B	H/B	P/P&T	4/T	6/T	10/T			
1987	34	36	43	6	28	8	29	40	225	275	500
1993	34	45	54	14	55	15	40	48	305	326	630
2001	28	59	73	32	117	29	64	59	461	396	857

3. 農業開発

3.1. 現況

影響圏の農耕地の90%は、水田であり、畑地の主要な作物は、キャッサバ、ケナフ及び落花生である。圏内の中央部に、限られてはいるが、主に畑地の未開発可耕地が残っている。

圏内の土地利用及び土地適応性の状況はTable 26.3.1とFigure 26.3.1に示し、また、Surin 及びSi Sa Ket 両県の代表的作物暦は、Figure 26.3.2のとおりである。

3.2. 開発予測

影響圏内の将来の農業開発状況を、With ProjectとWithout Projectの双方について予測した。予測した作付面積、単位当り収量及び生産量はTable 26.3.2のとおりである。代表的作物の農家庭先価格と農業生産費とは、各県の資料及び現地調査の結果を参考にし、Table 26.3.3のように見積った。

上記のごとく各作物ごとに予測された生産量と庭先価格により、生産価値を計算し、これから農業生産費及び別途見積られた開墾費を差引き、純生産価値(N.P.V)をTable 26.3.4のよう算出した。

このN.P.V のWith Projectの場合と、Without Project の場合の差が、この道路の開発便益である。

4. 走行費の節減

本報告書、第1巻、第7章で述べた概念と基礎データにもとづき関連する各道路リンクの走行費（以下“VOC”という）をWith ProjectとWithout Project の両ケースについて計算した。

各リンクにおけるVOCのコスト増に影響を与える道路状況は以下に示すとおりである。

Road Condition

Link No.	Terrain	Without Project			With Project			
		Length (Km)	^{/1} Road Class	Nos. of Wooden Bridge	Nos. of Narrow C.Bridge	Length (Km)	^{/1} Road Class	Nos. of Wooden Narrow Bridge
1	Flat & Rolling	39.5	3	0	0	39.5	1 (F4)	0

^{/1} Road 1 : Paved Road

Road 2A : Laterite Road with good surface condition and alignment

Road 2B : Laterite Road with good surface condition but poor alignment

Road 3 : Laterite Road with poor surface condition and alignment

Road 4 : Earth Road

VOC節減は、With Projectの全リンクのVOCとWithout Project の際のVOCとの差で、当道路におけるVOCの節減は次に示すとおりである。

Vehical Operating Cost Saving

(Unit: 1,000 Baht)

Road Class	1987	1993	2001
1 (F4)	8,108	10,600	15,232

5. エンジニアリング

5.1 予備設計

予備設計は、次に示す設計規準を基本に行った。

Design standard : F4 (feasible)

Geometric Design : AASHTO (Rural Highways)

Typical Cross Section : as shown in Figure 26.5.1

Minimum Height of Embankment

Ordinary Section : 1.0m

Approach of Bridge in Flat Area : 2.0m

Flood Section : 0.7m (above flood level)

Pavement Structure

In case of F4 Standard

DBST : 2.5cm

Crushed Stone Base CBR_≥80% : 15.0cm

Soil Aggregate Subbase CBR_≥20% : 15.0cm

Selected Material CBR_≥ 6% : 20.0cm

Pipe Culvert

Standard Size	: $\phi 100\text{cm}$
Standard Interval	
Paddy Area	: 200 m
Others	: 500 m

Box Culvert

Standard Size	: 2.4m x 2.4m
Location	: as required

Bridge

Standard Type (width 7.0m)	
Short Span Bridge	: RC - Slab
Long Span Bridge	: PC - Girder
Location	: as shown in Bridge List in Figure 26.5.2.

ルートの線形は、Figure 26.5.2 示す。

5.2 工事数量および建設費

予備設計による工事数量は建設費は、各工事ごとに単価を付してTable 26.5.1 に示す。

道路規格 F 4 の建設費を財務費用および経済費用に分けて集計すると、下表に示すとおりとなる。

F4 Standard (DBST)	L = 39.5 km
Financial Cost	$74,327 \cdot 10^3 \text{ ¥}$
Economic Cost	$67,347 \cdot 10^3 \text{ ¥}$

6. 経済評価

年次別経済費用と便益及び評価結果はTable 26.6.1 に示す通りである。

このルートは F 4 規格でフィージブルである。

7. 社会インパクト

社会インパクトを示すデータ及び評価結果はTable 26.7.1 に示す通りである。このルートの社会的インパクトはかなり高い。

Table 26.1.1 SUMMARY OF ROAD INVENTORY

Item	Description	
Origin	B. Non Dang (J.R. 2030, 2033, 2034)	
Destination	A. Rattana Buri	
Length		
Total		39.5 km
Improvement Section		35.5 km
DOH Road	R. 2076	35.5 km
ARD Road		0 km
Others		0 km
New Alignment Section		4.0 km
Terrain	Flat and Rolling	
Alignment (Hori./Vert.)	Fair / Fair	
Formation Width	4.0 m - 7.0 m, 5.6 m (Weighted average)	
Embankment Section		
Length		39.5 km
Height	0.5 m - 2.5 m	
Cut Section		
Length		0 km
Depth	m - m	
Surface Type and Condition		
SBST or DBST		0 km
Soil Aggregate	Poor	39.5 km
Earth		0 km
Pipe Culvert	41 each	
Box Culvert	3 each	26.0 m
Bridge		
Permanent Bridge	2 each	170.0 m
Narrow Concrete Bridge	0 each	0 m (4m)
Wooden Bridge	0 each	0 m
Overflow Section	1 place	3.0 km

Table 26.1.2 ROAD INVENTORY (1)

PROPOSED ROUTE NO. IM-26

ROUTE NO. 2076

B. NON DANG (J.R. 2030, 2033, 2034) ~ A. RATTANA BURI

1 = 39.5

SURIN/SI SA KET

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	
VILLAGE																		
- Name																		
- Household (H)																		
- Population (P)																		
TERRAIN																		
CROSS SECTION																		
Formation Width (m)																		
Embankment Height (m)																		
Cutting Depth (m)																		
PAVEMENT																		
Type/Length																		
Condition																		
FLOODING																		
Overflow Length(Km)/Height(m)																		
LAND USE																		
Left																		
Right																		
PIPE CULVERT																		
Total Number																		
BOX CULVERT & BRIDGE																		
Station (Km)																		
Dimension																		
RIGHT OF WAY (m)																		
ALIGNMENT																		
Horizontal																		
Vertical																		
ROUTE NO., AGENCIES																		

ROAD INVENTORY (2)

L = 39.5 Km.

B. NON DANG (J.R. 2030, 2033,2034) ~ A. RATTANA BURI (Cont'd)

SURIN/SI SA KET

PROPOSED ROUTE NO. IM-26

ROUTE NO. 2076

STATION (Km)		30	32	34	36	38	40
VILLAGE							
- Name							
- Household (H)							
- Population (P)				B. SONG H = 300 P = 1500	B. PHAI H = 500 P = 2500		A. RATTANA BURI
TERRAIN				Rolling			
CROSS SECTION	Formation Width (m)			7.00		6.00	
	Embankment Height (m)			0.80	0.40	0.00	
	Cutting Depth (m)						
PAVEMENT	Type/Length			Laterite			
	Condition			Poor			
FLOODING	Overflow Length(Km)/Height(m)						
LAND USE	Left			Paddy			
	Right			Paddy			
PIPE CULVERT	Total Number						
BOX CULVERT & BRIDGE	Station (Km)						39.1
	Dimension						C-Br. 10.0 x 40.0
RIGHT OF WAY (m)							
ALIGNMENT	Horizontal			Fair			
	Vertical			Fair			
ROUTE NO., AGENCIES				DOH 2076			

Table 26.2.1 TRAFFIC VOLUME ON ROUTE IM - 26

YEAR	1987		1993		2001		
	1 AVR.		1 AVR.		1 AVR.		
P/C	N+D	30	30	30	30	25	25
	I	4	4	4	4	4	4
	DV	0	0	0	0	0	0
	TOTAL	34	34	34	34	28	28
L/B	N+D	31	31	39	39	51	51
	I	5	5	6	6	8	8
	DV	0	0	0	0	0	0
	TOTAL	36	36	45	45	59	59
M/B	N+D	37	37	47	47	63	63
	I	6	6	7	7	9	9
	DV	0	0	0	0	0	0
	TOTAL	43	43	54	54	73	73
H/B	N+D	5	5	12	12	28	28
	I	1	1	2	2	4	4
	DV	0	0	0	0	0	0
	TOTAL	6	6	14	14	32	32
P/P&T	N+D	25	25	48	48	101	101
	I	4	4	7	7	15	15
	DV	0	0	0	0	0	0
	TOTAL	28	28	55	55	117	117
4/T	N+D	7	7	13	13	25	25
	I	1	1	2	2	4	4
	DV	0	0	0	0	0	0
	TOTAL	8	8	15	15	29	29
6/T	N+D	25	25	35	35	56	56
	I	4	4	5	5	8	8
	DV	0	0	0	0	0	0
	TOTAL	29	29	40	40	64	64
10/T	N+D	35	35	41	41	51	51
	I	5	5	6	6	8	8
	DV	0	0	0	0	0	0
	TOTAL	40	40	48	48	59	59
ADT	N+D	196	196	264	264	399	399
	I	29	29	40	40	60	60
	DV	0	0	1	1	2	2
	TOTAL	225	225	305	305	461	461
M/C	N+D	252	252	300	300	371	371
	I	22	22	24	24	24	24
	DV	0	0	1	1	1	1
	TOTAL	275	275	326	326	396	396
TOTAL	N+D	448	448	564	564	770	770
	I	52	52	64	64	84	84
	DV	0	0	2	2	2	2
	TOTAL	500	500	630	630	857	857

NOTE

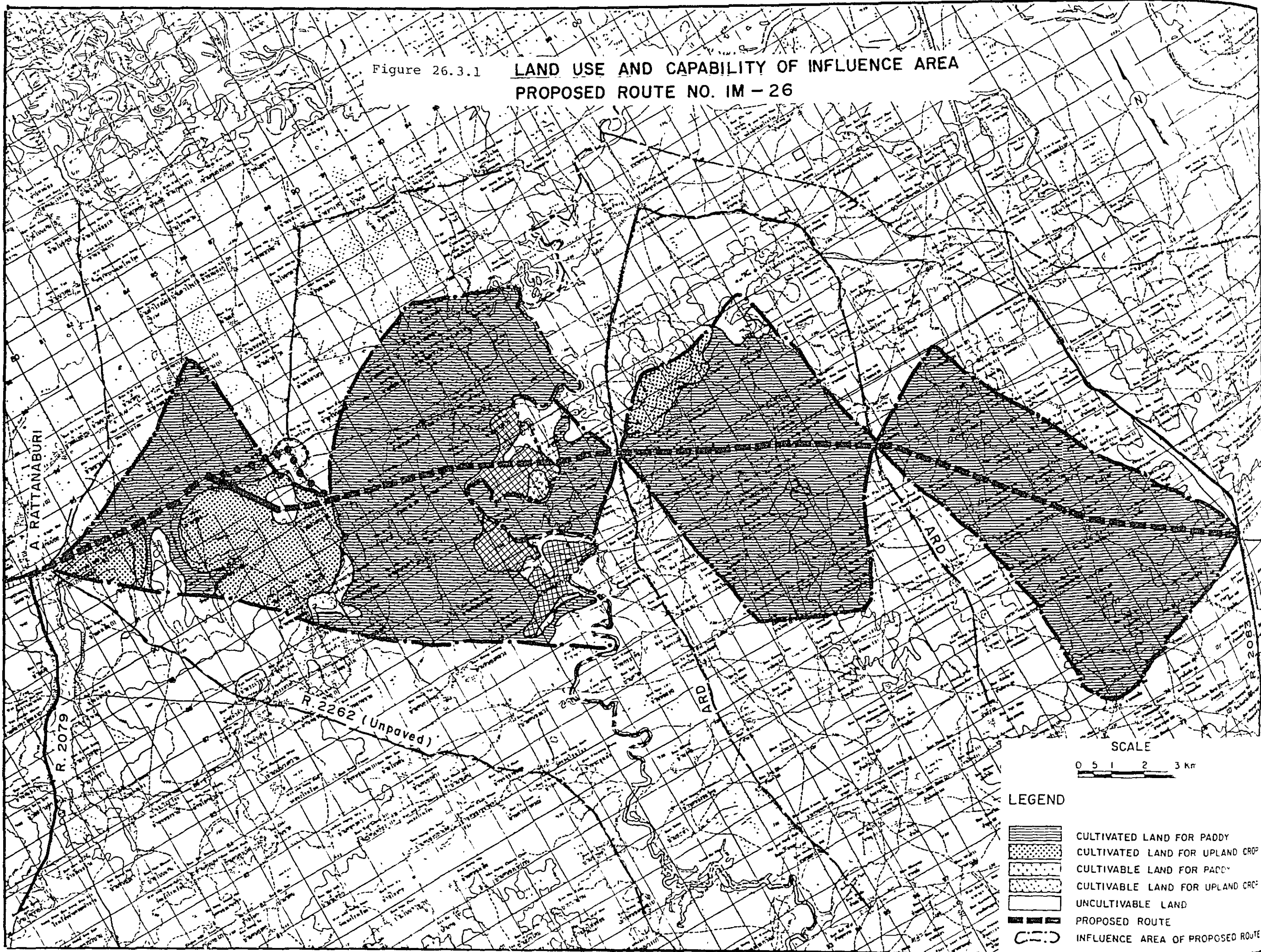
N : NORMAL TRAFFIC

DV : DEVELOPED TRAFFIC

D : DIVERTED TRAFFIC

I : INDUCED TRAFFIC

Figure 26.3.1 LAND USE AND CAPABILITY OF INFLUENCE AREA
PROPOSED ROUTE NO. IM - 26



SCALE
0 5 1 2 3 km

LEGEND

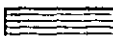




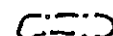

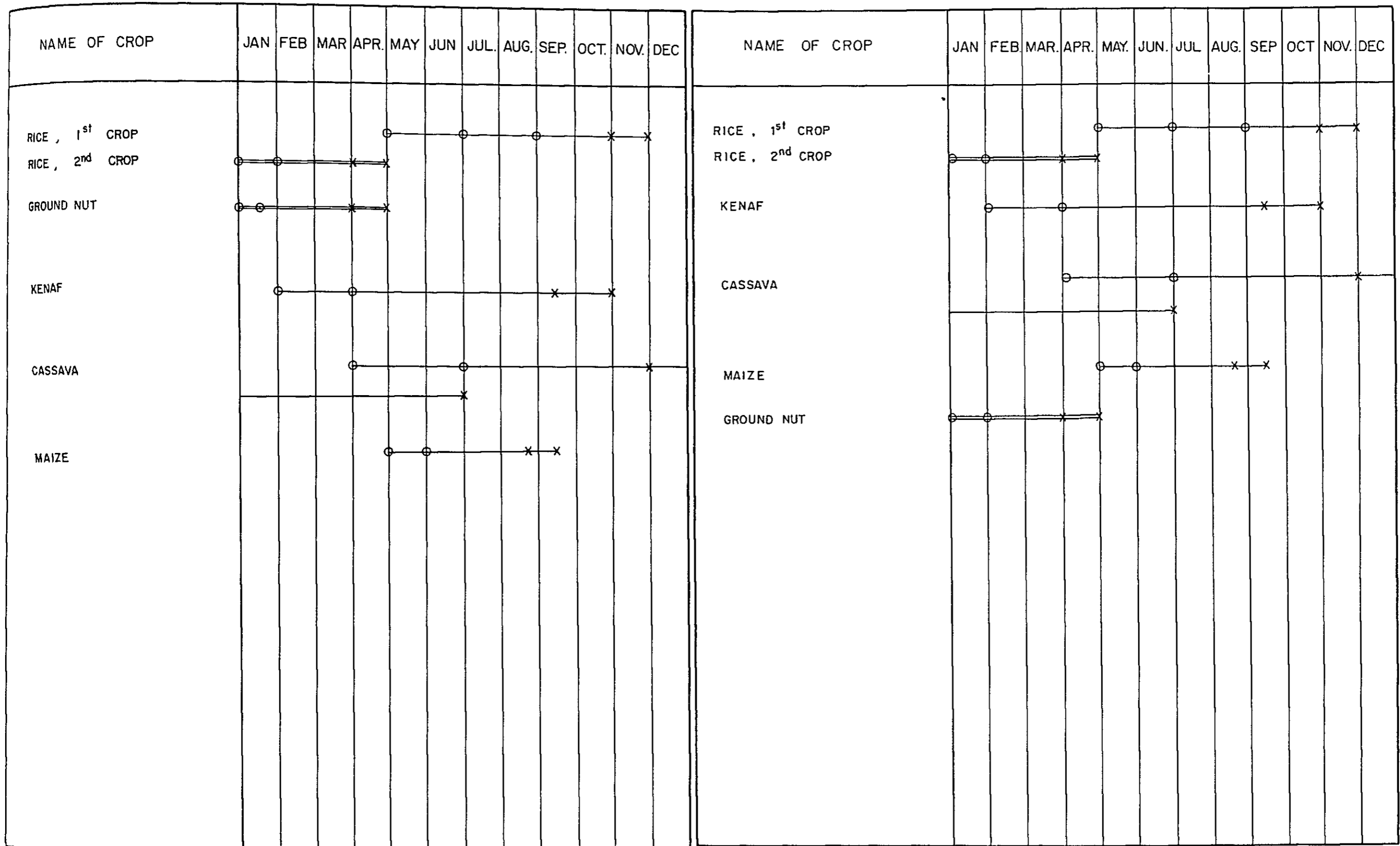
-  CULTIVATED LAND FOR PADDY
-  CULTIVATED LAND FOR UPLAND CROP
-  CULTIVABLE LAND FOR PADDY
-  CULTIVABLE LAND FOR UPLAND CROP
-  UNCULTIVABLE LAND
-  PROPOSED ROUTE
-  INFLUENCE AREA OF PROPOSED ROUTE

Figure 26.3.2 CROPPING CALENDAR (1)

1500 CHANGWAT SURIN

CROPPING CALENDAR (2)

1600 CHANGWAT SI SA KET



Note

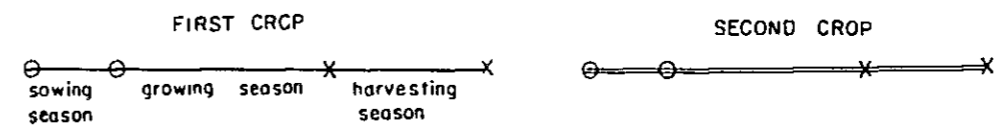


TABLE 26.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[UNIT : 1000 RAI (KM²)]

AMPHOE	AMPHOE	CULTIVATED LAND			UNUSED CULTIVABLE LAND				
		CODE	NAME	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
				100.625 (161.0)	11.875 (19.0)	112.500 (180.0)	0.625 (1.0)	4.375 (7.0)	5.000 (8.0)
1506	RATTANABURI			41.875 (67.0)	10.000 (16.0)	51.875 (83.0)	0.625 (1.0)	4.375 (7.0)	5.000 (8.0)
1605	UTHUMPON PHISAI			58.750 (94.0)	1.875 (3.0)	60.625 (97.0)	-	-	-

TABLE 26.3.2 CROP PRODUCTION

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)										
1981	100.95	-	-	0.15	9.20	-	1.77	-	11.90	112.85
1987	105.90	-	-	0.15	9.25	-	1.78	-	11.99	117.88
1993	WITHOUT PROJECT	-	-	0.15	9.31	-	1.80	-	12.07	119.38
	WITH PROJECT	-	-	0.14	9.96	-	1.76	-	12.65	119.96
2001	WITHOUT PROJECT	-	-	0.15	9.38	-	1.81	-	12.19	119.50
	WITH PROJECT	-	-	0.14	9.95	-	1.76	-	12.65	119.96
CROP YIELD (KG/RAI)										
1981	198.7	-	-	222.3	2600.0	-	160.0	-	-	-
1987	201.1	-	-	222.3	2600.0	-	160.0	-	-	-
1993	WITHOUT PROJECT	-	-	222.3	2600.0	-	160.0	-	-	-
	WITH PROJECT	-	-	223.6	2615.6	-	160.0	-	-	-
2001	WITHOUT PROJECT	-	-	222.3	2600.0	-	160.0	-	-	-
	WITH PROJECT	-	-	225.4	2636.6	-	160.0	-	-	-
CROP PRODUCTION (TON)										
1981	20,055	-	-	32	23,908	-	284	-	24,398	44,453
1987	21,291	-	-	33	24,051	-	285	-	24,549	45,840
1993	WITHOUT PROJECT	-	-	33	24,196	-	287	-	24,701	46,536
	WITH PROJECT	-	-	32	26,059	-	281	-	26,551	48,781
2001	WITHOUT PROJECT	-	-	33	24,390	-	290	-	24,905	47,092
	WITH PROJECT	-	-	32	26,229	-	281	-	26,729	49,863

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 26.3.3 FARMGATE PRICE AND PRODUCTION COST

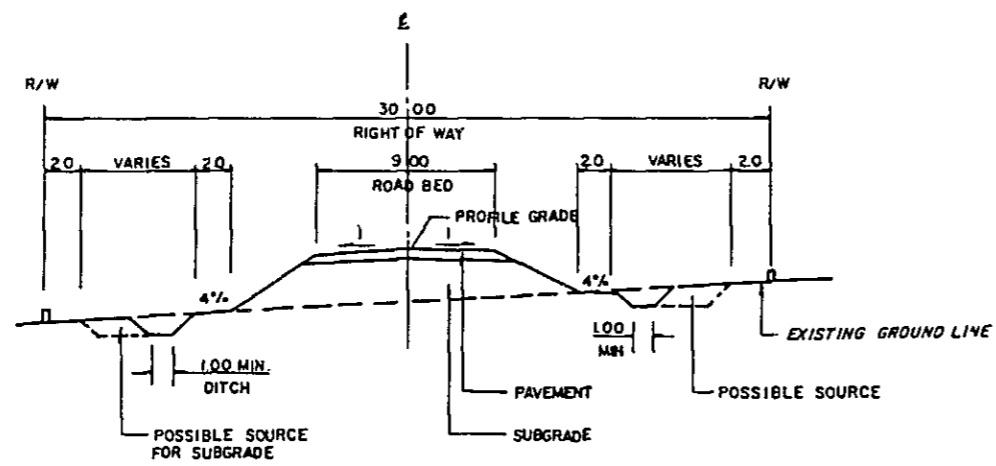
ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	4,017	-	-	6,347	721	-	4,728	-
WITH PROJECT (1987 - 2001)	4,117	-	-	6,347	739	-	4,846	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	526	-	-	1,023	734	-	631	-
WITH PROJECT (1987 - 2001)	546	-	-	1,043	754	-	631	-

TABLE 26.3.4 NET PRODUCTION VALUE

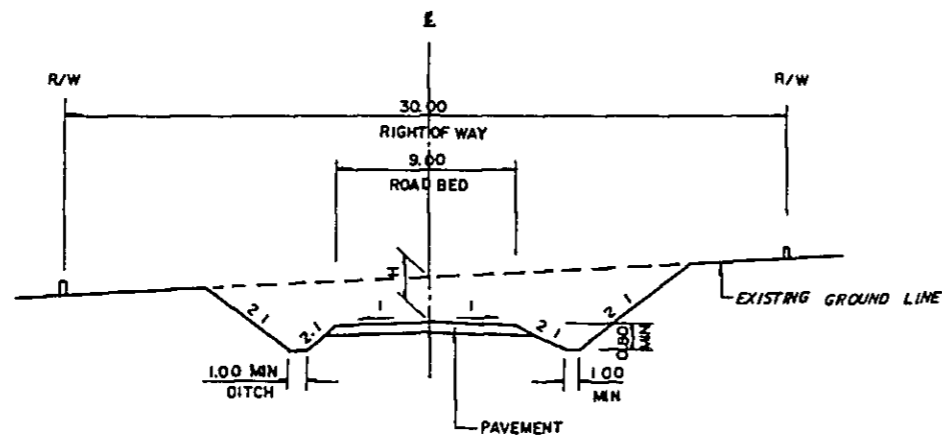
(1000 BAHT)

YEAR	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	29,857	10,824	40,681	29,868	11,100	40,968
1993	31,299	10,891	42,190	32,964	12,050	45,014
2001	32,713	10,980	43,693	36,689	12,196	48,885

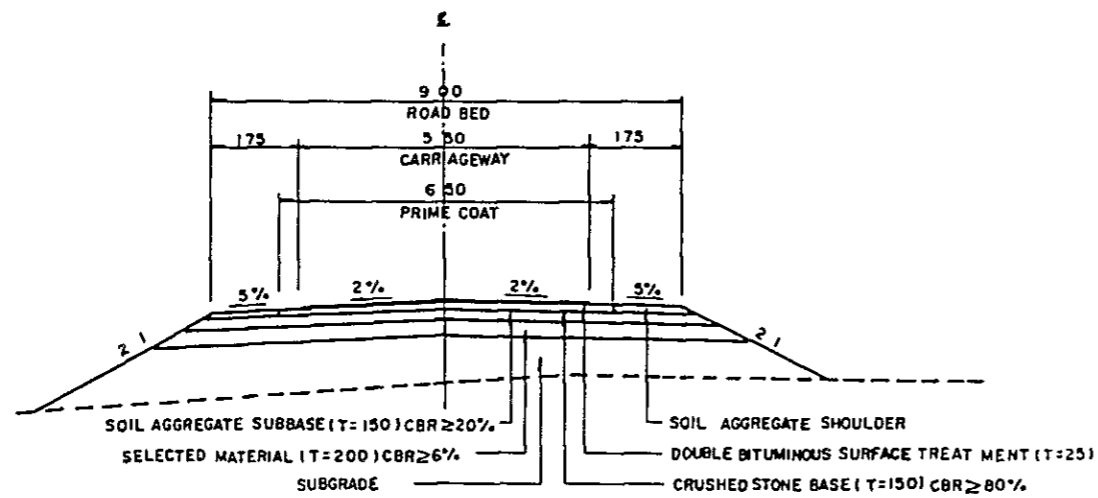
Figure 26.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE



FILL SECTION

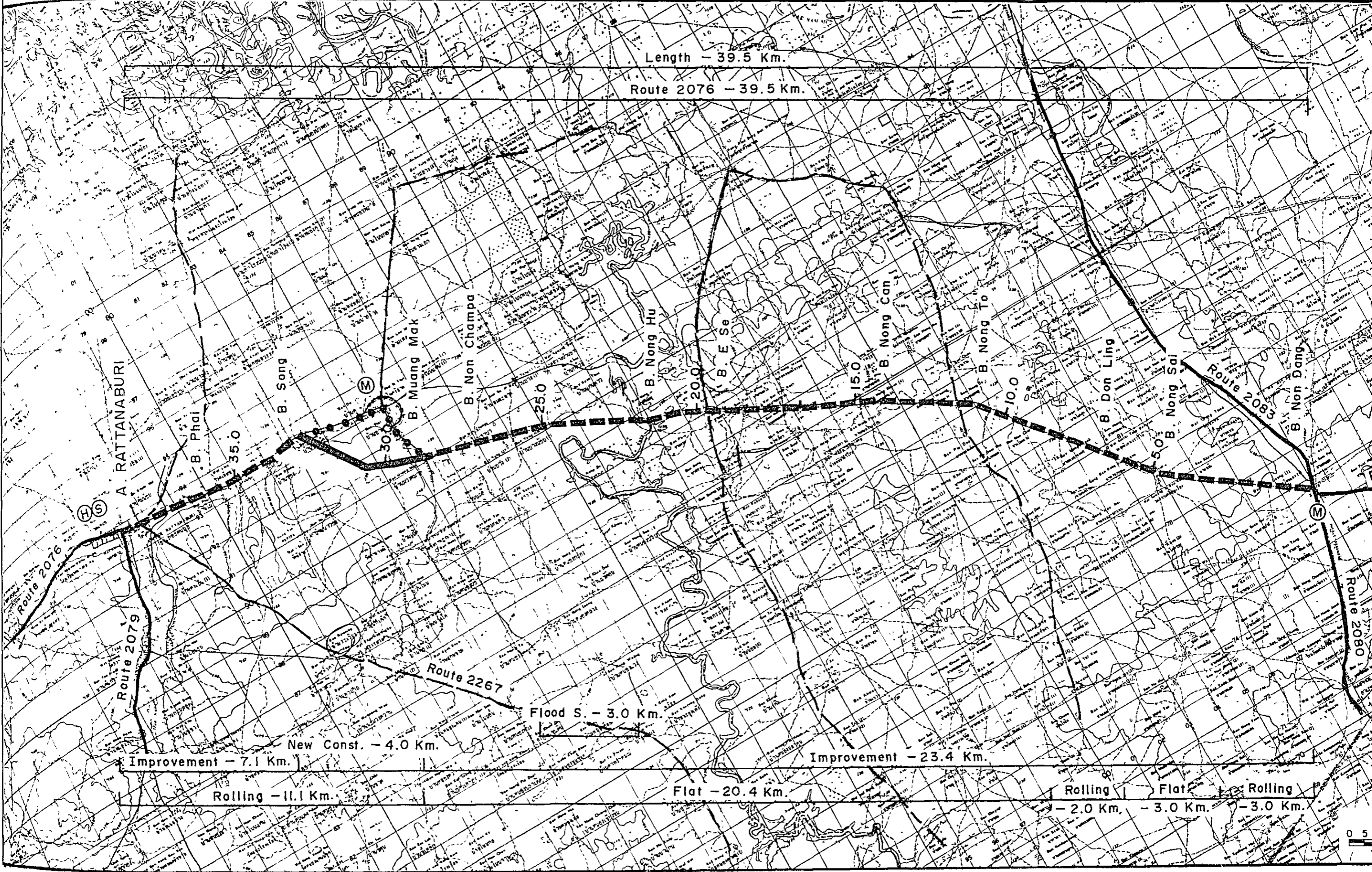


CUT SECTION

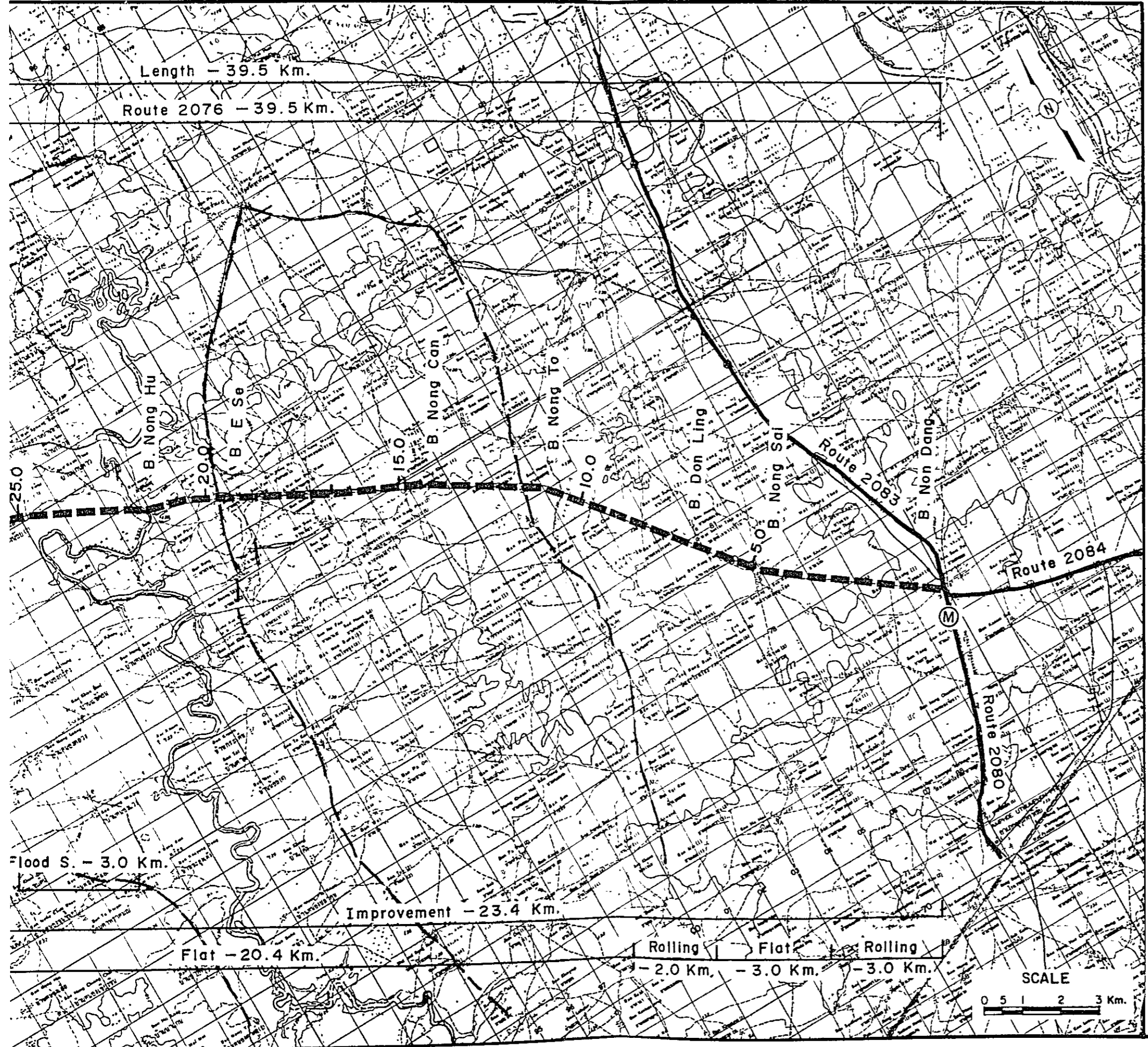


DOUBLE BITUMINOUS SURFACE TREATMENT (DBST) ROAD (Class F4)

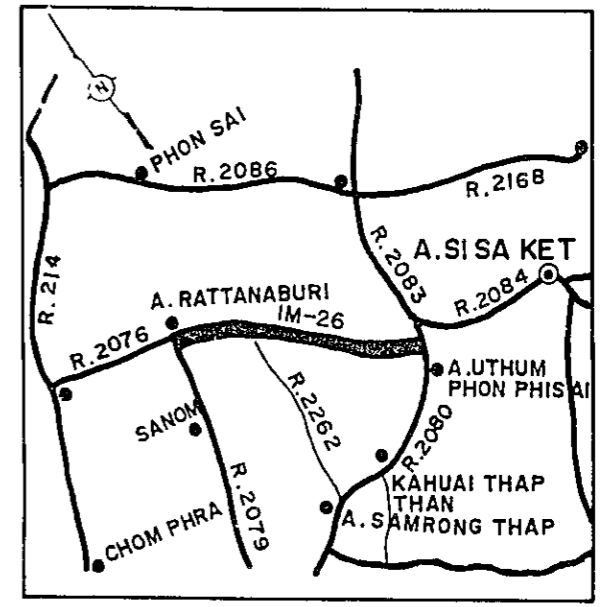
Figure 26.5.2 **PROPOSED ROUTE NO. IM - 26** **C. SURIN** **B. NON DANG (J.R.2080,2083,2084)-A.RATTANA BURI**
SISAKET **ROUTE NO. 2076** **L = 39.5 Km.**



C. SURIN **B. NON DANG (J.R. 2080, 2083, 2084) - A. RATTANA BURI**
SISAKET **ROUTE NO. 2076** **L = 39.5 Km.**



LOCATION MAP



BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	21.6	—	C - 9 50 x 130.00
2	24.0	C - 7.00 x 20.00	—
3	39.1	—	C - 10 0 x 40.00

LEGEND

- PROPOSED ROUTE (IMPROVEMENT)
- PROPOSED ROUTE (NEW CONSTRUCTION)
- PAVED ROUTE
- UNPAVED ROUTE
- INVENTORY SURVEY ROUTE
- HOSPITAL
- MEDICAL CENTER
- SECONDARY SCHOOL

Table 26.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-26 (39.5 km)

Items	Unit of Q'ty	Financial Unit Rate ₪	(DBST)	
			Q'ty	Financial Cost (10 ³ ₪) / Economic Cost (10 ³ ₪)
DIRECT CONSTRUCTION COST				
Clearing and Grubbing	ha	15,000	99	1,485 / 1,351
Excavation - Soil	m ³	20	0	0 / 0
Excavation - Hard Rock	m ³	160	0	0 / 0
Embankment	m ³	45	161,200	7,254 / 6,601
Selected Material	m ³	80	83,700	6,696 / 5,959
Soil Aggregate Surface or Subbase	m ³	105	58,700	6,163 / 5,485
Crushed Stone Base	m ³	370	38,500	14,245 / 13,105
Soil Aggregate Shoulder	m ³	105	16,600	1,743 / 1,551
Prime Coat and DBST	m ²	55	217,300	11,952 / 10,758
Pipe Culvert	m	2,100	1,760	3,696 / 3,400
Box Culvert	m	15,000	68	1,088 / 979
Long Span Bridge	m	80,000	0	0 / 0
Short Span Bridge	m	40,000	20	800 / 712
Sub Total (a)				55,123 / 49,904
Miscellaneous Works (a) x 7%				3,859 / 3,493
Total (b)				58,982 / 53,397
PHYSICAL CONTINGENCY (b) x 15%				8,847 / 8,010
ENGINEERING AND ADMINISTRATION (b) x 10%				5,898 / 5,340
Sub Total				14,745 / 13,350
LAND ACQUISITION				
Highly Developed Land	ha	50,000	12	600 / 600
Less Developed Land	ha	15,000	0	0 / 0
Sub Total				600 / 600
GRAND TOTAL				74,327 / 67,347

Table 26.6.1 COST AND BENEFITS

(F4 STANDARD)

(1000 BAHT)

YEAR	COST		BENEFITS		DISCOUNTED (12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST BENEFIT
1984	13,469	0	0	0	0	18,923 / 0
1985	33,674	0	0	0	0	42,241 / 0
1986	20,204	0	0	0	0	22,628 / 0
1987	0	287	8,108	-79	8,316	0 / 7,425
1988	0	695	8,523	-70	9,148	0 / 7,293
1989	0	1,102	8,939	-61	9,980	0 / 7,104
1990	0	1,510	9,354	-52	10,812	0 / 6,871
1991	0	1,917	9,770	-43	11,644	0 / 6,607
1992	0	2,325	10,185	-34	12,476	0 / 6,321
1993	0	2,733	10,600	-25	13,308	0 / 6,020
1994	19,118	3,040	11,179	-11	14,208	8,648 / 5,738
1995	0	3,347	11,758	2	15,108	0 / 5,448
1996	0	3,655	12,337	15	16,007	0 / 5,154
1997	0	3,962	12,916	28	16,907	0 / 4,860
1998	0	4,270	13,495	41	17,806	0 / 4,570
1999	0	4,577	14,074	54	18,706	0 / 4,287
2000	0	4,885	14,653	67	19,605	0 / 4,012
2001	-31,303	5,192	15,232	81	20,505	-5,719 / 3,746
TOTAL	55,162	43,497	171,126	-86	214,536	86,721 / 85,456
DISCOUNTED ECONOMIC COSTS :					86,721	
DISCOUNTED ECONOMIC BENEFITS :					85,456	
AGRICULTURAL DEVELOPMENT BENEFIT					14,900	
VOC SAVING					70,751	
RMC SAVING					-195	
NET PRESENT VALUE :					-1,265	
BENEFIT COST RATIO :					0.99	
INTERNAL RATE OF RETURN :					11.8 %	

Table 26.7.1 SOCIAL INDICATORS
(Proposed Route IM-26)

Population (1,000)		Education		Health	
1982	: 33.8	Access to Secondary School		Access to Hospital	
1993	: 39.2	Number of Student in 1993 (1,000) ^{2/}	: 7.8	Average distance to Hospital (km) ^{1/}	: 12.0
Average travelling speed, without (kph)	: 48	Average distance to school (km)	: 12.0	Per capita time savings (10 ⁻⁴)	: 0.021
Isolation		Per capita time savings (10 ⁻⁴)	: 0.107	Score	: 49
Access to Amphoe		Score	: 58	Access to Medical Facilities	
Average distance to Amphoe (km) ^{1/}	: 10.1	Teacher Intensity		Average distance to facilities (km) ^{1/}	: 6.9
Per capita time savings (10 ⁻⁴)	: 0.018	Number of teachers ^{3/}		Per capita time savings (10 ⁻⁴)	: 0.012
Score	: 53	University graduate	: -	Score	: 48
Access to Artery Highway		Total	: 9		
Average distance to highway (km) ^{1/}	: 0	Number of Student	: 235		
Per capita time savings (10 ⁻⁴)	: 0	Indicators			
Score	: 0	E1 ^{4/}	: -		
Impassability		E2 ^{5/}	: 38.3		
Impassable week a year	: 12	E ^{6/}	: 38.3		
Impassability per year	: 0.231	Degree of Improvement ^{7/}	: 1.79		
Impassability per capita (10 ⁻⁴)	: 0.059	Score	: 114		
Score	: 492	Disparity			
		G.P.V. in 1993 (Mn B) ^{8/}			
		With project	: 112.7		
		Without project	: 107.1		
		Per capita G.P.V. in 1993 (B)			
		With project (W)	: 2,875		
		Without project (w)	: 2,732		
		Degree of Disparity			
		(A/W) - (A/w) ^{9/}	: 0.05		
		Score	: 89		
		Total Score	: 903		

Note:

- 1/ () shows the length or distance in without project case. Unless otherwise, lengths are same both in with project case and without project case.
- 2/ Number of secondary school student estimated based on the projected population of the areas of influence applying ratios of secondary school students to the total population in the sample area.
- 3/ Numbers of the sample areas
- 4/ (Number of University Graduate Teachers)/(Total Number of Student) x 1,000
- 5/ (Total of Teachers)/(Total Number of Student) x 1,000
- 6/ Sum of 4/ and 5/
- 7/ Ratio of E value of each route to an average value of the same indicator E in case of the sample areas, 33 in number, along paved road near the proposed routes. The average value of E in case of paved roads were calculated at 68.4 from the following data:

Number of university graduate teachers	438
Number of Teachers	1,285
Number of student	25,196
- 8/ Estimated gross value of crop production in the areas of influence
- 9/ "A" indicates an average per capita value of crop production in the Northeastern Region, which is estimated assuming that:
 - GRP per capita of the Northeast is estimated at 11,897 Baht in 1993,
 - Agricultural sector shares 40% of GRP, and
 - Crop production shares 80% of agricultural production.

PROPOSED ROUTE NO. IM - 27

Changwat : Surin / Buri Ram

B.Nong Khao (J.R.2079)-A.Chom Phra (J.R.214)

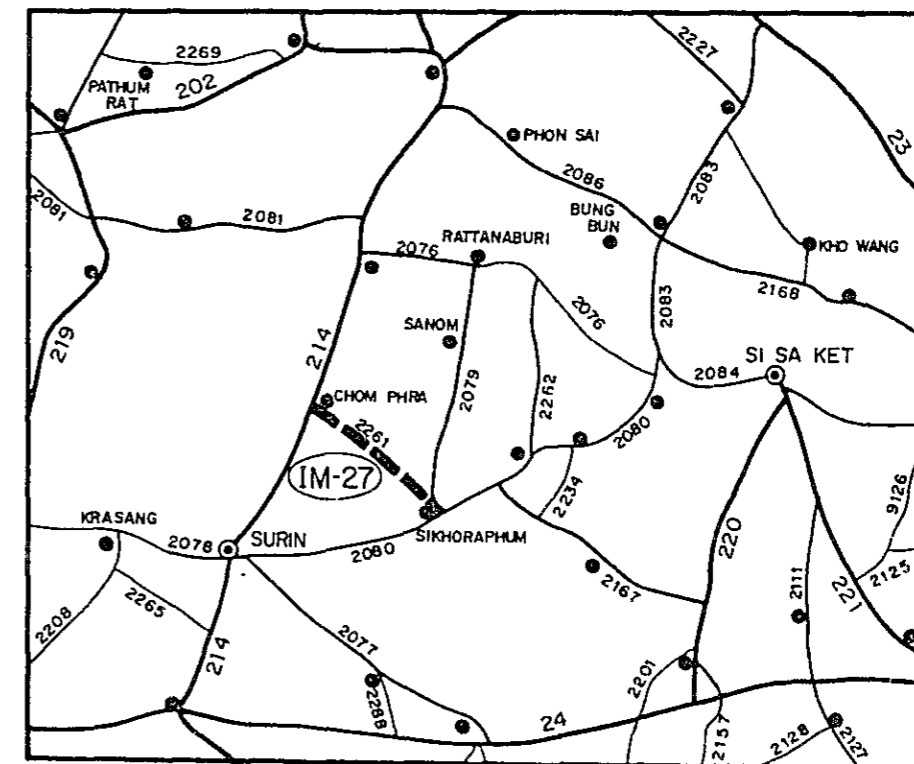
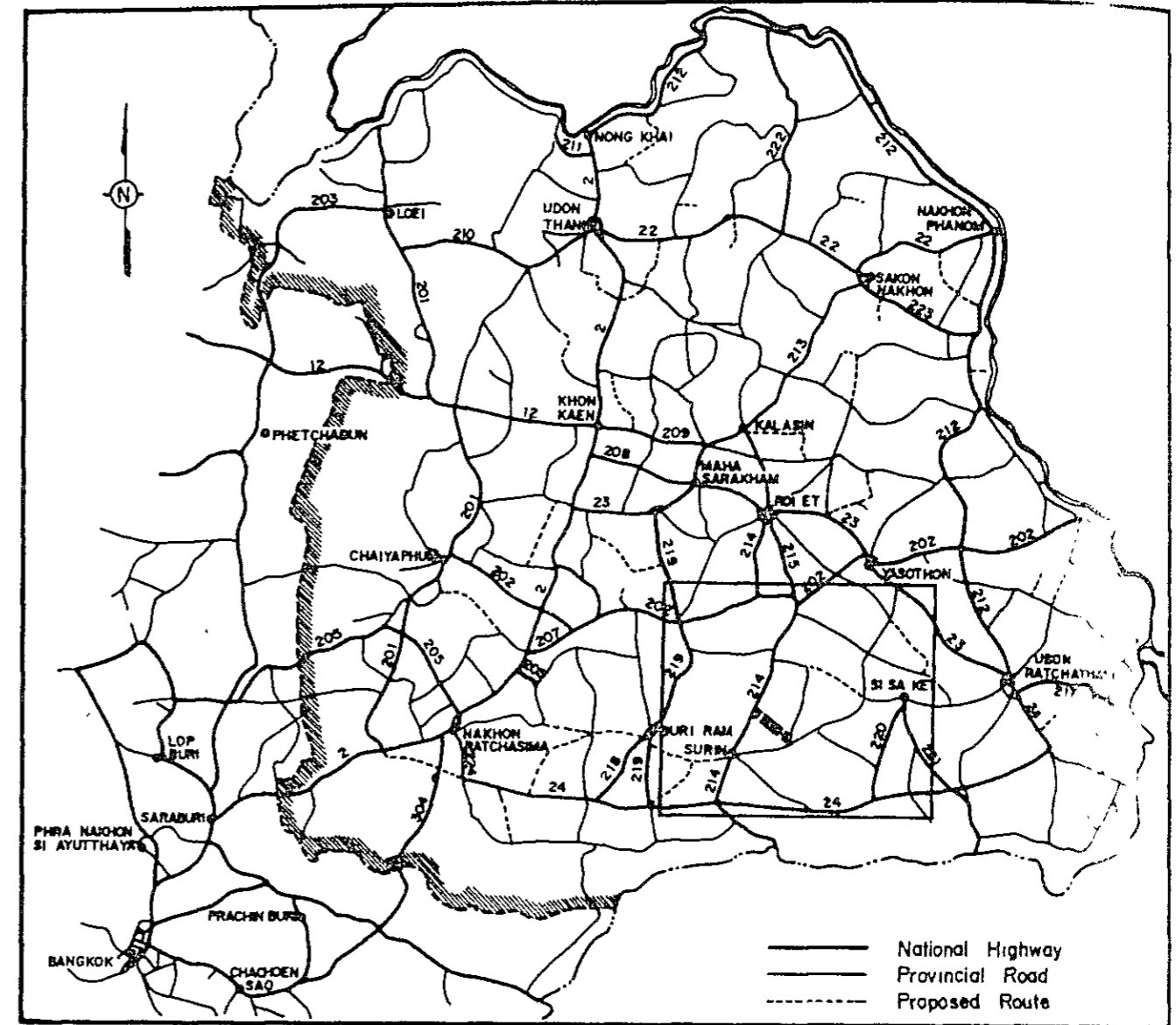
Length : 311 KM.

LOCATION OF PROPOSED ROUTE

SUMMARY

PROPOSED ROUTE IM-27

Item	Description
Changwat	Surin/Buri Ram
Origin	B. Nong Khao (J.R.2079)
Destination	A. Chom Phra (J.R.214)
Length	
Total	31.1 km
Improvement Section	31.1 km
DOH Road	R.2261 31.1 km
ARD Road	0 km
Others	0 km
New Alignment Section	0 km
Surface Type and Condition	Soil Aggregate, Good
Terrain	Flat
Influence Area	
Area	171 km ²
Population (1982)	32,200
Principal Crops	Paddy
Traffic (ADT)	
Existing	234
1993	898
2001	1,246
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	51,994 . 10 ³ ฿
Economic	47,048 . 10 ³ ฿
IRR	11.3 %
B/C	27.0
Recommendation	For further consideration



1. 概要

1.1 計画路線の概要

本路線は、Surin およびBuri Ramの両県にまたがる。ルートは、Nong Khao 村を起点とし、北西に走り、Sam Rong村、Pra Thum村、Kham村を経て、Chin Phra 郡で国道 214号線に交差して終わる。その総延長は、31.1kmである。(Figure 27.5.2 参照)

沿道の地形は、ほとんど平坦である。影響圏内には、いくつかの村があり、その総人口は、32,200人である。沿道には、医療センターが2ヶ所、病院が1ヶ所あり、教育施設として中学校が2ヶ所ある。

本路線は農地的に開発の進んだ地域における2つの幹線道路、国道 214号線と県道2080号線をつなぐ重要な道路網の形成を目的として計画されたものである。

1.2 現道の状況

計画路線に利用した現道の状況はTable 27.1.1に要約し、その詳細はTable 27.1.2のイベントリー調査の結果に示した。

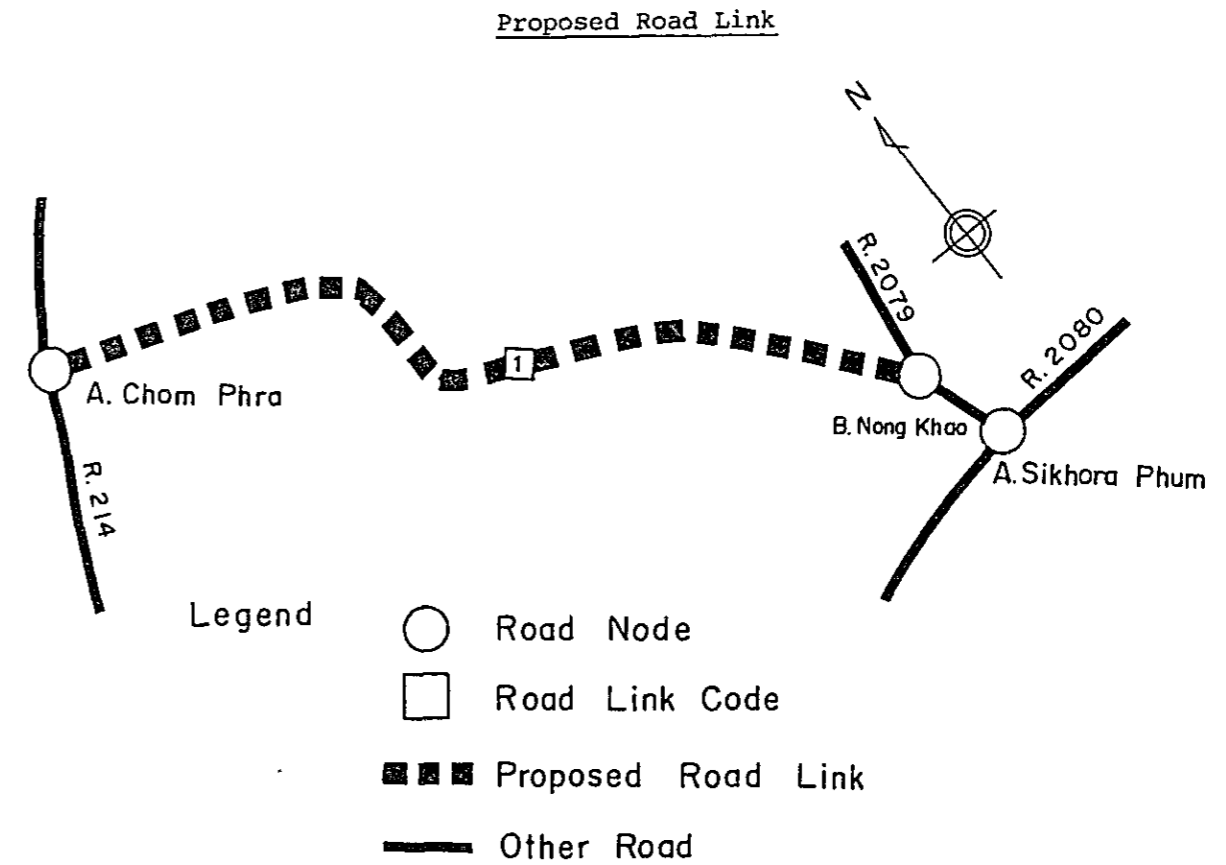
2. 交通

2.1 予測手法

計画対象路線に関し道路改良後の転換交通はほとんど無視し得るので、交通量予測には「伸び率方式」を適用することとした。

2.2 基準年交通量

道路リンク別車種別の基準年交通量は、DOH交通量調査結果を基として次のように推定した。



Traffic Volume in Base Year

Source (base year)	Link No	Vehicle Type									
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T	ADT
DOH (1981)	1 ^{1/}	39	43	13	15	14	7	21	47	35	234

Note : ^{1/} Route 2261 Section 0100

2.3 交通需要

計画路線上の旅客交通需要（トリップ/日）および貨物交通需要（トン/日）は、先に求めた基準年の交通量に路側インタビューによって得られる平均乗車人員もしくは平均貨物積載量をかけることによって推定した。推定結果は以下のとおりである。

Transport Movement

PASSENGER MOVEMENT (1982)

PROPOSED ROAD LINK	TRIPS PER DAY
1	1320

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	299	125	423

2.4 交通需要の将来伸び率

1981-1987, 1987-1993, 1993-2001の各期間における旅客および貨物の交通需要の将来伸び率は、メインレポートの7.3.3の1)で述べた予測式に従って求めた。予測の前提および得られた将来伸び率は以下の通りである。

GROWTH RATE OF PASSENGER MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981-1987	1987-1993	1993-2001
PER CAPITA INCOME	4.2	4.5	4.7
TRANS. PRICE INCREASE	4.5	4.5	4.5
POPULATION	1.2	1.1	1.0
PASSENGER MOVEMENT	5.2	5.5	5.7

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981-1987	1987-1993	1993-2001
NON-AGRI. AGRICULTURE	6.7	7.1	7.3
FREIGHT	5.1	5.4	5.5

2.5 誘発および開発交通量

メインレポートの7.3.3の3)で述べた方式を基に誘発および開発交通量の通常交通量に対する比率を求めた。

RATE OF INDUCED AND DEVELOPED TRAFFIC

ITEM	YEAR (%)		
	1987	1993	2001
INDUCED	15.0	15.0	15.0
DEVELOPED	0.0	1.8	1.8

2.6 将来交通量

1) 車種構成

計画路線上の旅客・貨物に関する将来交通需要を、以下の車種構成比によって車種別交通量に変換した。

TRAFFIC COMPOSITION

(UNIT : %)

LINK NO.	YEAR	PASSENGER					FREIGHT			
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T
1	1982	31.5	34.7	10.5	12.1	11.3	6.4	19.1	42.7	31.8
	1987	27.0	39.2	11.0	13.0	9.9	9.6	18.2	40.4	31.9
	1993	22.5	43.6	11.5	13.9	8.5	12.7	17.2	38.1	31.9
	2001	16.5	49.6	12.2	15.1	6.6	17.0	16.0	35.0	32.0

2) 将来ADT

計画路線上のリンク加重平均将来交通量は以下に示すとおりであり、またその道路リンク別交通タイプ別の詳細はTable 27.2.1に示す。

AVERAGE FUTURE TRAFFIC ON PROPOSED ROUTE

YEAR	TYPE OF VEHICLE								ADT	M/C	TOTAL
	P/C	L/B	M/B	H/B	P/P&T	4/T	6/T	10/T			
1987	51	21	24	19	89	30	66	52	351	339	691
1993	61	31	38	23	148	40	87	73	501	398	898
2001	72	53	66	29	277	57	125	114	793	453	1246

3. 農業開発

3.1. 現況

影響圏の農耕地の殆どが、水田であり、畑地の主要作物は、キャッサバとケナフである。圏内の土地利用及び土地適応性の状況はTable 27.3.1とFigure 27.3.1に示し、また、Buri Ram及びSurin 両県地域の代表的作物歴は、Figure 27.3.2のとおりである。

3.2. 開発予測

影響圏内の将来の農業開発状況を、With ProjectとWithout Projectの双方について予測した。予測した作付面積、単位当り収量及び生産量はTable 27.3.2のとおりである。代表的作物の農家庭先価格と農業生産費とは、各県の資料及び現地調査の結果を参考にし、Table 27.3.3.のように見積った。

上記のごとく各作物ごとに予測された生産量と庭先価格により、生産価値を計算し、これから農業生産費及び別途見積られた開墾費を差引き、純生産価値(N.P.V)をTable 27.3.4.のように算出した。

このN.P.VのWith Projectの場合と、Without Projectの場合の差が、この道路の開発便益である。

4. 走行費の節減

本報告書、第1巻、第7章で述べた概念と基礎データにもとづき関連する各道路リンクの走行費（以下“VOC”という）をWith ProjectとWithout Projectの両ケースについて計算した。

各リンクにおけるVOCのコスト増に影響を与える道路状況は以下に示すとおりである。

Road Condition

Link No.	Terrain	Length (Km)	Without Project			With Project			Nos. of Wooden Narrow Bridge
			^{/1} Road Class	Nos. of Wooden Bridge	Nos. of Narrow C. Bridge	Length (Km)	^{/1} Road Class Case 1	Case 2	
1	Flat	31.1	2B	1	0	31.1	1 (F)	2A(F5)	0

- ^{/1} Road 1 : Paved Road
 Road 2A : Laterite Road with good surface condition and alignment
 Road 2B : Laterite Road with good surface condition but poor alignment
 Road 3 : Laterite Road with poor surface condition and alignment
 Road 4 : Earth Road

VOC節減は、With Projectの全リンクのVOCとWithout Projectの際のVOCとの差で、当道路におけるVOCの節減は次に示すとおりである。

Vehicle Operating Cost Saving

Road Class	1987	1993	2001
1 (FA)	4,359	5,971	9,175
2A (F5)	610	776	1,052

5. エンジニアリング

5.1 予備設計

予備設計は、次に示す設計規準を基本に行った。

- Design Standard : F4 (if not feasible, F5)
 Geometric Design : AASHTO (Rural Highways)
 Typical Cross Section : as shown in Figure 27.5.1.
 Minimum Height of Embankment
 Ordinary Section : 1.0 m
 Approach of Bridge in Flat Area : 2.0 m
 Flood Section : 0.7 m (above flood level)

Pavement Structure

In case of F4 Standard

- DBST : 2.5 cm
 Crushed Stone Base CBR ≥ 80% : 15.0 cm
 Soil Aggregate Subbase CBR ≥ 20% : 15.0 cm
 Selected Material CBR ≥ 6% : 20.0 cm

In case of F5 Standard

- Soil Aggregate Surface CBR ≥ 20% : 15.0 cm
 Selected Material CBR ≥ 6% : 20.0 cm

pipe Culvert

Standard Size : ϕ 100 cm
 Standard Interval
 Paddy Area : 200 m
 Others : 500 m

Box Culvert

Standard Size : 2.4m x 2.4m
 Location : as required

Bridge

Standard Type (width 7.0 m)
 Short Span Bridge : RC - Slab
 Long Span Bridge : PC - Girder
 Location : as shown in Bridge List
 in Figure 27.5.2

ルートの線形は、Figure 27.5.2 示す。

5.2 工事数量および建設費

予備設計による工事数量は建設費は、各工事ごとに単価を付してTable 27.5.1に示す。

道路規格別の建設費を財務費用および経済費用に分けて集計すると、下表に示すとおりとなる。

Financial and Economic Construction Cost

Road Class	Length (km)	Construction Cost (10 ³ ¥)		Remarks
		Financial cost	Economic cost	
F4 (DBST)	31.1	51,994	47,048	
F5(Laterite)	31.1	31,110	28,051	

6. 経済評価

年次別経済費用と便益及び評価結果はTable 27.6.1に示す通りである。

このルートはF4規格でフィージブルである。

7. 社会インパクト

社会インパクトを示すデータ及び評価結果はTable 27.7.1に示す通りである。

Table 27.1.1 SUMMARY OF ROAD INVENTORY

Item	Description	
Origin	B. Nong Khao (J.R. 2079)	
Destination	A. Chom Phra (J.R. 214)	
Length		
Total		31.1 km
Improvement Section		31.1 km
DOH Road	R. 2261	31.1 km
ARD Road		0 km
Others		0 km
New Alignment Section		0 km
Terrain	Flat	
Alignment (Hori./Vert.)	Fair / Fair	
Formation Width		7.0 m
Embankment Section		
Length		31.1 km
Height	0.3 m -	1.0 m
Cut Section		
Length		0 km
Depth	m -	m
Surface Type and Condition		
SBST or DBST		0 km
Soil Aggregate	Good	31.1 km
Earth		0 km
Pipe Culvert	54 each	
Box Culvert	0 each	0 m
Bridge		
Permanent Bridge	0 each	0 m
Narrow Concrete Bridge	0 each	0 m (4m)
Wooden Bridge	1 each	15.6 m
Overflow Section	0 place	0 km

Table 27.1.2 ROAD INVENTORY(1)

PROPOSED ROUTE NO. IM-27

ROUTE NO. 2261

B. NONG KHAO (J.R. 2079) ~ A. CHOM PHRA (J.R. 214)

L = 31.1 Km

SURIN/BURI RAM

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	
VILLAGE																		
- Name																		
- Household (H)																		
- Population (P)																		
TERRAIN		Flat																
CROSS SECTION	Formation Width (m)	7.00																
	Embankment Height (m)	0.50	1.00	0.70	0.30	1.00	0.50	1.00	0.50	1.00	0.80	1.00	0.30	1.00	0.30	1.00	0.50	1.00
	Cutting Depth (m)																	
PAVEMENT	Type/Length	Laterite																
	Condition	Good																
FLOODING	Overflow Length(Km)/Height(m)																	
LAND USE	Left	Paddy																
	Right	Paddy																
PIPE CULVERT	Total Number	54 Pipes																
BOX CULVERT & BRIDGE	Station (Km)	5.9																
	Dimension	W-Br. 4.60 x 15.60																
RIGHT OF WAY (m)																		
ALIGNMENT	Horizontal	Fair																
	Vertical	Fair																
ROUTE NO., AGENCIES		DOH 2261																

B. NONG KHAO (J.R. 2079) ~ A. CHOM PHRA (J.R. 214) (Cont'd)

SURIN/ BURI RAM

PROPOSED ROUTE NO. IM-27

ROUTE NO. 2261

STATION (Km)		30	32	34	36
VILLAGE		A. CHOMPRA			
- Name					
- Household (H)					
- Population (P)					
TERRAIN					
CROSS SECTION	Formation Width (m)	6.00			
	Embankment Height (m)	0.70			
	Cutting Depth (m)				
PAVEMENT	Type/Length	La.			
	Condition	Good			
FLOODING	Overflow Length(Km)/Height(m)				
LAND USE	Left	Paddy			
	Right	Paddy			
PIPE CULVERT	Total Number				
BOX CULVERT & BRIDGE	Station (Km)				
	Dimension				
RIGHT OF WAY (m)					
ALIGNMENT	Horizontal	Fair			
	Vertical	Fair			
ROUTE NO., AGENCIES		DOH 2261			

Table 27.2.1 TRAFFIC VOLUME ON ROUTE IM - 27

YEAR	1987		1993		2001		
LINK	1 AVR.		1 AVR.		1 AVR.		
P/C	N+D	44	44	52	52	62	62
	I	7	7	8	8	9	9
	DV	0	0	1	1	1	1
	TOTAL	51	51	61	61	72	72
L/B	N+D	18	18	27	27	46	46
	I	3	3	4	4	7	7
	DV	0	0	1	1	1	1
	TOTAL	21	21	31	31	53	53
M/B	N+D	21	21	32	32	56	56
	I	3	3	5	5	8	8
	DV	0	0	1	1	1	1
	TOTAL	24	24	38	38	66	66
H/B	N+D	16	16	20	20	25	25
	I	2	2	3	3	4	4
	DV	0	0	0	0	1	1
	TOTAL	19	19	23	23	29	29
P/P&T	N+D	78	78	126	126	237	237
	I	12	12	19	19	35	35
	DV	0	0	3	3	5	5
	TOTAL	89	89	148	148	277	277
4/T	N+D	26	26	34	34	49	49
	I	4	4	5	5	7	7
	DV	0	0	1	1	1	1
	TOTAL	30	30	40	40	57	57
6/T	N+D	57	57	75	75	107	107
	I	9	9	11	11	16	16
	DV	0	0	2	2	2	2
	TOTAL	66	66	87	87	125	125
10/T	N+D	45	45	63	63	98	98
	I	7	7	9	9	15	15
	DV	0	0	1	1	2	2
	TOTAL	52	52	73	73	114	114
ADT	N+D	306	306	428	428	677	677
	I	46	46	64	64	102	102
	DV	0	0	9	9	14	14
	TOTAL	351	351	501	501	793	793
M/C	N+D	316	316	373	373	439	439
	I	23	23	22	22	13	13
	DV	0	0	3	3	1	1
	TOTAL	339	339	398	398	453	453
TOTAL	N+D	622	622	800	800	1116	1116
	I	69	69	86	86	114	114
	DV	0	0	12	12	15	15
	TOTAL	691	691	898	898	1246	1246

NOTE

N : NORMAL TRAFFIC
DV : DEVELOPED TRAFFICD : DIVERTED TRAFFIC
I : INDUCED TRAFFIC

Figure 27.3.1 **LAND USE AND CAPABILITY OF INFLUENCE AREA
PROPOSED ROUTE NO. IM - 27**

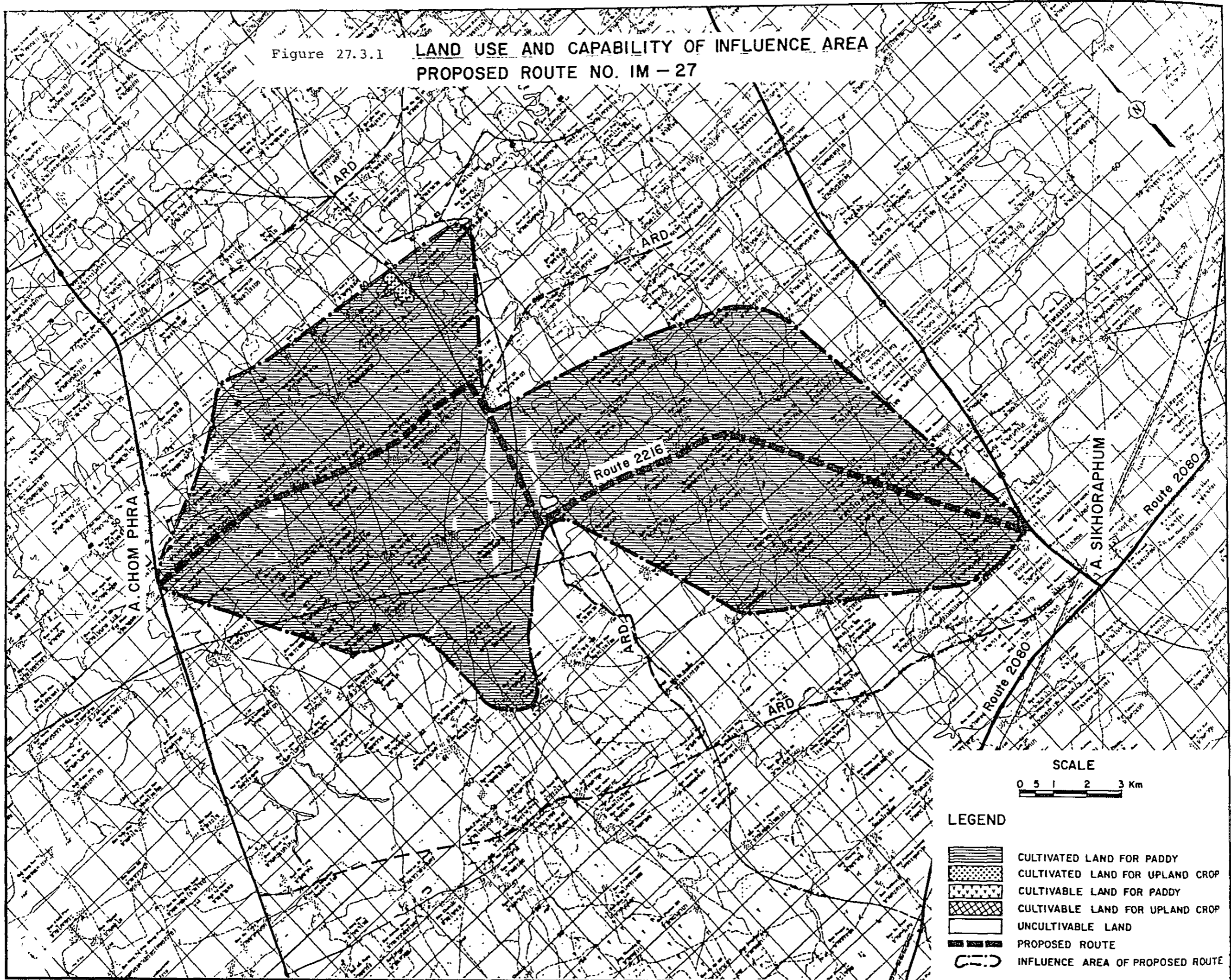


TABLE 27.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[UNIT : 1000 RAI (KM²)]

AMPHOE	AMPHOE	CULTIVATED LAND			UNUSED CULTIVABLE LAND				
		CODE	NAME	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
				106.250 (170.0)	0.313 (0.5)	106.563 (170.5)	-	-	-
1401	M. BURI RAM			8.750 (14.0)	-	8.750 (14.0)	-	-	-
1504	CHOM PHRA			46.250 (74.0)	0.313 (0.5)	46.563 (74.5)	-	-	-
1508	SIKHORAPHUM			51.250 (82.0)	-	51.250 (82.0)	-	-	-

TABLE 27.3.2 CROP PRODUCTION

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)										
1981	79.06	-	-	-	0.19	-	0.09	-	0.31	79.37
1987	84.42	-	-	-	0.19	-	0.09	-	0.31	84.74
1993	WITHOUT PROJECT	90.15	-	-	0.19	-	0.09	-	0.32	90.47
	WITH PROJECT	91.77	-	-	0.21	-	0.10	-	0.34	92.11
2001	WITHOUT PROJECT	98.40	-	-	0.19	-	0.09	-	0.32	98.72
	WITH PROJECT	100.16	-	-	0.21	-	0.10	-	0.34	100.51
CROP YIELD (KG/RAI)										
1981	225.6	-	-	-	2500.0	-	154.0	-	-	-
1987	227.0	-	-	-	2500.0	-	154.0	-	-	-
1993	WITHOUT PROJECT	228.3	-	-	2500.0	-	154.0	-	-	-
	WITH PROJECT	231.1	-	-	2515.0	-	154.0	-	-	-
2001	WITHOUT PROJECT	230.2	-	-	2500.0	-	154.0	-	-	-
	WITH PROJECT	236.7	-	-	2535.2	-	154.0	-	-	-
CROP PRODUCTION (TON)										
1981	17,837	-	-	-	464	-	14	-	495	18,331
1987	19,161	-	-	-	467	-	14	-	498	19,659
1993	WITHOUT PROJECT	20,584	-	-	470	-	14	-	501	21,085
	WITH PROJECT	21,206	-	-	529	-	15	-	561	21,767
2001	WITHOUT PROJECT	22,647	-	-	473	-	14	-	505	23,153
	WITH PROJECT	23,707	-	-	537	-	15	-	570	24,277

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 27.3.3 FARMGATE PRICE AND PRODUCTION COST

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	4,140	-	-	-	721	-	5,232	-
WITH PROJECT (1987 - 2001)	4,244	-	-	-	739	-	5,363	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	592	-	-	-	734	-	731	-
WITH PROJECT (1987 - 2001)	605	-	-	-	754	-	731	-

TABLE 27.3.4 NET PRODUCTION VALUE

YEAR	(1000 BAHT)					
	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	29,347	210	29,557	30,215	214	30,429
1993	31,847	210	32,057	34,446	242	34,688
2001	35,506	212	35,718	39,979	248	40,227

Figure 27.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE

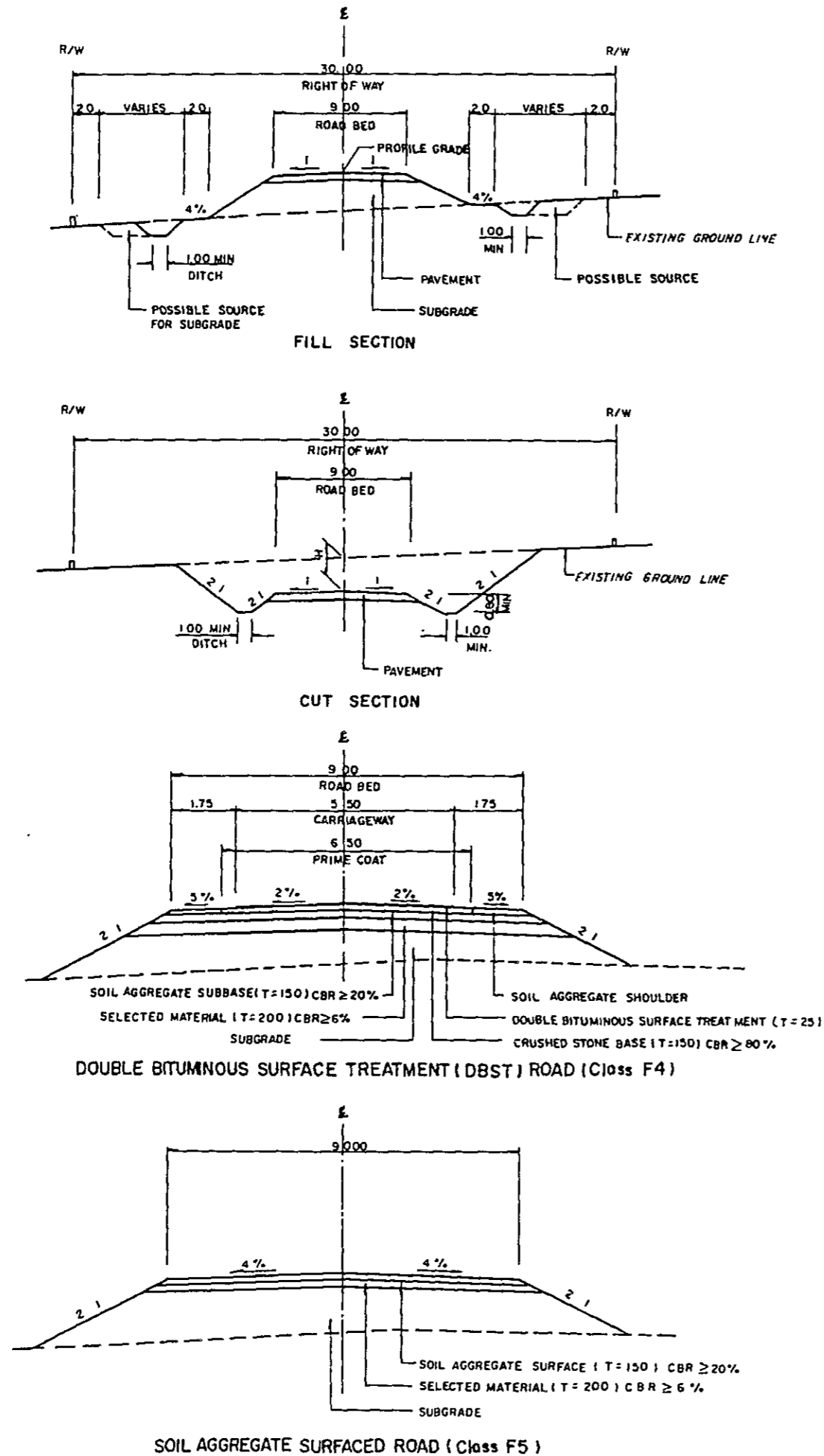
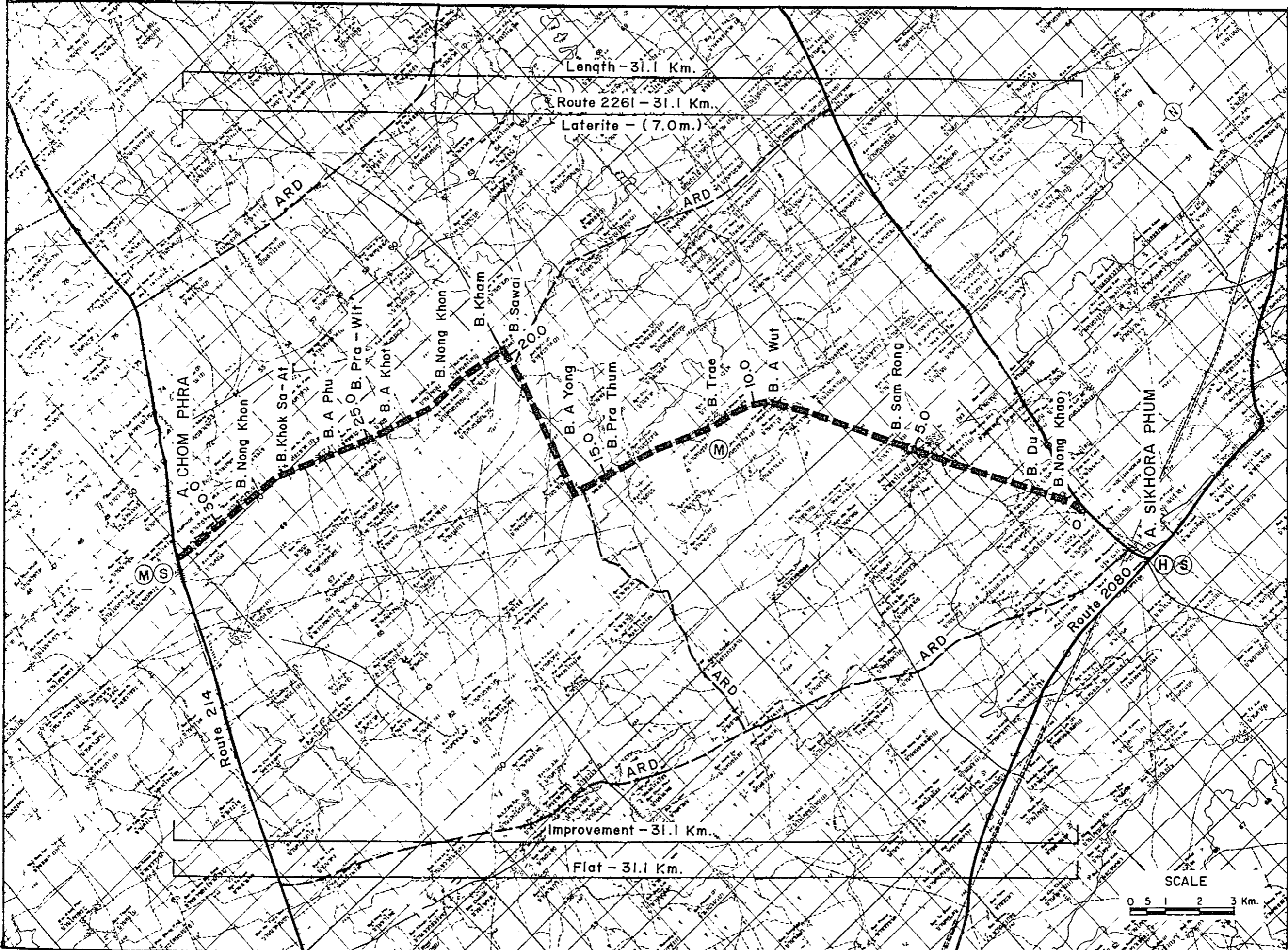


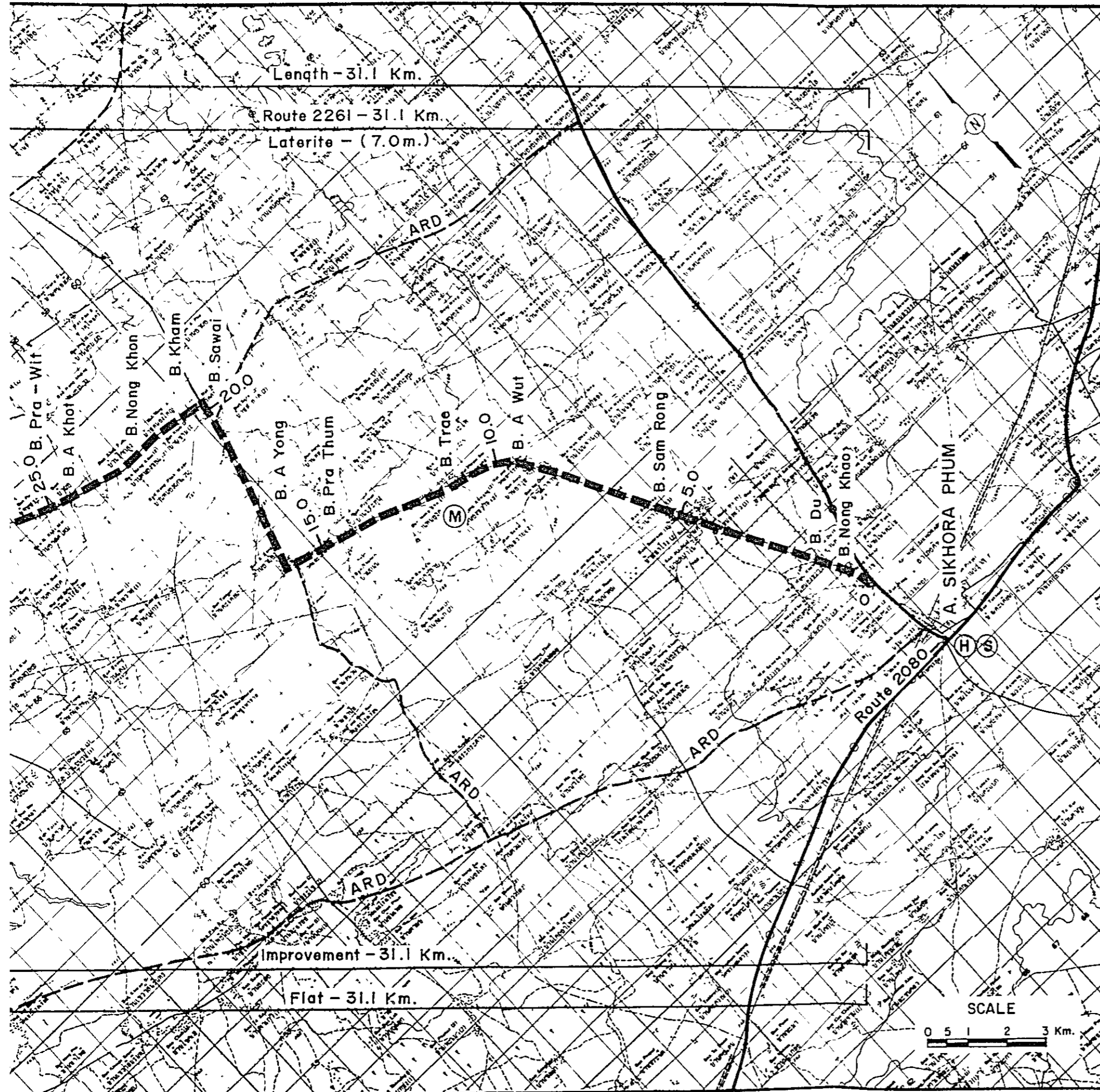
Figure 27.5.2 **PROPOSED ROUTE NO. IM-27** C. SURIN B. NONG KHAO (J.R.2079) - A. CHOM PHRA (J.R.214)
 C. BURI RAM ROUTE NO.2261 L = 31.1 Km.



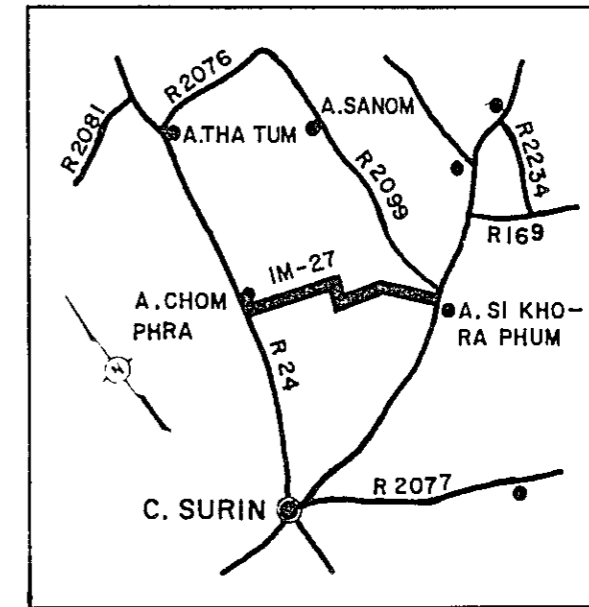
No.	Station Km.
1.	5.9

LEGEND

- (thick dashed line)
- (solid line)
- - - (dashed line)
- (dotted line)
- (H)
- (M)
- (S)



LOCATION MAP



BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	5.9	C-7.00 x 18 00	W-4.60 x 15 60

LEGEND

- PROPOSED ROUTE (IMPROVEMENT)
- PROPOSED ROUTE (NEW CONSTRUCTION)
- PAVED ROUTE
- UNPAVED ROUTE
- INVENTORY SURVEY ROUTE
- HOSPITAL
- MEDICAL CENTER
- SECONDARY SCHOOL

Table 27.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-27 (31.1 km)

Items	Unit of Q'ty	Financial Unit Rate ₪	(DBST)			(Soil Aggregate Surface)		
			Q'ty	Financial Cost (10 ³ ₪)	Economic Cost (10 ³ ₪)	Q'ty	Financial Cost (10 ³ ₪)	Economic Cost (10 ³ ₪)
DIRECT CONSTRUCTION COST								
Clearing and Grubbing	ha	15,000	72	1,080	982	72	1,080	982
Excavation - Soil	m ³	20	0	0	0	0	0	0
Excavation - Hard Rock	m ³	160	0	0	0	0	0	0
Embankment	m ³	45	56,100	2,524	2,297	56,100	2,524	2,297
Selected Material	m ³	80	65,100	5,208	4,635	65,100	5,208	4,634
Soil Aggregate Surface or Subbase	m ³	105	46,200	4,851	4,317	46,200	4,851	4,317
Crushed Stone Base	m ³	370	30,300	11,211	10,314	1,950	722	592
Soil Aggregate Shoulder	m ³	105	13,100	1,375	1,224	840	88	80
Prime Coat and DBST	m ²	55	171,100	9,405	8,465	11,000	405	545
Pipe Culvert	m	2,100	1,190	2,499	2,299	1,190	2,499	2,299
Box Culvert	m	16,000	0	0	0	0	0	0
Long Span Bridge	m	80,000	0	0	0	0	0	0
Short Span Bridge	m	40,000	18	720	640	18	720	640
Sub Total (a)				38,874	35,176		18,297	16,387
Miscellaneous Works (a) x 7%				2,721	2,462		1,281	1,147
Total (b)				41,595	37,638		19,578	17,534
PHYSICAL CONTEGENCY (b) x 15%				6,239	5,646		2,937	2,630
ENGINEERING AND ADMINISTRATION (b) x 10%				4,160	3,764		1,958	1,753
Sub Total				10,399	9,410		4,895	4,383
LAND ACQUISITION								
Highly Developed Land	ha	50,000	0	0	0	0	0	0
Less Developed Land	ha	15,000	0	0	0	0	0	0
Sub Total				0	0		0	0
GRAND TOTAL				51,994	47,048		24,473	21,917

Table 27.6.1 COST AND BENEFITS
(F4 STANDARD)

(1000 BAHT)

YEAR	COST		BENEFITS		TOTAL	DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING		COST	BENEFIT
1984	0	0	0	0	0	0	0
1985	18,819	0	0	0	0	23,607	0
1986	28,229	0	0	0	0	31,616	0
1987	0	872	4,359	2	5,234	0	4,673
1988	0	1,122	4,628	14	5,764	0	4,595
1989	0	1,372	4,897	25	6,293	0	4,480
1990	0	1,621	5,165	36	6,823	0	4,336
1991	0	1,871	5,434	48	7,353	0	4,172
1992	0	2,121	5,703	59	7,883	0	3,994
1993	0	2,371	5,971	71	8,413	0	3,806
1994	15,052	2,636	6,372	87	9,095	6,809	3,673
1995	0	2,901	6,772	104	9,778	0	3,526
1996	0	3,166	7,173	121	10,460	0	3,368
1997	0	3,431	7,573	138	11,142	0	3,203
1998	0	3,696	7,974	155	11,825	0	3,035
1999	0	3,961	8,374	172	12,507	0	2,866
2000	0	4,226	8,775	189	13,189	0	2,699
2001	-21,642	4,491	9,175	205	13,872	-3,954	2,534
TOTAL	40,458	39,860	98,344	1,427	139,631	58,078	54,960

DISCOUNTED ECONOMIC COSTS :	58,078
DISCOUNTED ECONOMIC BENEFITS :	54,960
AGRICULTURAL DEVELOPMENT BENEFIT	14,547
VOC SAVING	39,963
RMC SAVING	450
NET PRESENT VALUE :	-3,118
BENEFIT COST RATIO :	0.95
INTERNAL RATE OF RETURN :	11.3 %

Table 27.7.1 SOCIAL INDICATORS
(Proposed Route IM-27)

Population (1,000)		Education	
1982	: 32.2	Access to Secondary School	
1993	: 36.5	Number of Student in 1993 (1,000) ^{2/}	: 4.7
Average travelling speed, without (kph)		Average distance to school (km)	: 7.8
	: 48	Per capita time savings (10 ⁻⁴)	: 0.115
Isolation		Score	: 62
Access to Amphoe		Teacher Intensity	
Average distance to Amphoe (km) ^{1/}	: 7.8	Number of teachers ^{3/}	
Per capita time savings (10 ⁻⁴)	: 0.015	University graduate	: 3
Score	: 44	Total	: 16
Access to Artery Highway		Number of Student	: 383
Average distance to highway (km) ^{1/}	: 0	Indicators	
Per capita time savings (10 ⁻⁴)	: 0	E1 ^{4/}	: 7.8
Score	: 0	E2 ^{5/}	: 41.8
Impassability		E ^{6/}	: 49.6
Impassable week a year	: 2	Degree of Improvement ^{7/}	: 1.38
Impassability per year	: 0.038	Score	: 88
Impassability per capita (10 ⁻⁴)	: 0.010	Disparity	
Score	: 83	G.P.V. in 1993 (Mn B) ^{8/}	
Health		With project	: 90.5
Access to Hospital		Without project	: 85.7
Average distance to Hospital (km) ^{1/}	: 9.0	Per capita G.P.V. in 1993 (B)	
Per capita time savings (10 ⁻⁴)	: 0.017	With project (W)	: 2,479
Score	: 40	Without project (w)	: 2,348
Access to Medical Facilities		Degree of Disparity	
Average distance to facilities (km) ^{1/}	: 4.5	(A/W) - (A/w) ^{9/}	: 0.06
Per capita time savings (10 ⁻⁴)	: 0.009	Score	: 107
Score	: 36	Total Score	: 460

Note:

- ^{1/} () shows the length or distance in without project case. Unless otherwise, lengths are same both in with project case and without project case.
- ^{2/} Number of secondary school student estimated based on the projected population of the areas of influence applying ratios of secondary school students to the total population in the sample area.
- ^{3/} Numbers of the sample areas
- ^{4/} (Number of University Graduate Teachers)/(Total Number of Student) x 1,000
- ^{5/} (Total of Teachers)/(Total Number of Student) x 1,000
- ^{6/} Sum of ^{4/} and ^{5/}
- ^{7/} Ratio of E value of each route to an average value of the same indicator E in case of the sample areas, 33 in number, along paved road near the proposed routes.
The average value of E in case of paved roads were calculated at 68.4 from the following data:
Number of university graduate teachers 438
Number of Teachers 1,285
Number of student 25,196
- ^{8/} Estimated gross value of crop production in the areas of influence
- ^{9/} "A" indicates an average per capita value of crop production in the Northeastern Region, which is estimated assuming that:
- GRP per capita of the Northeast is estimated at 11,897 Baht in 1993,
- Agricultural sector shares 40% of GRP, and
- Crop production shares 80% of agricultural production.

PROPOSED ROUTE NO. IM - 28

Changwat : Buri Ram

C. Buri Ram - Lam Chi (River) (J.R. 2078)

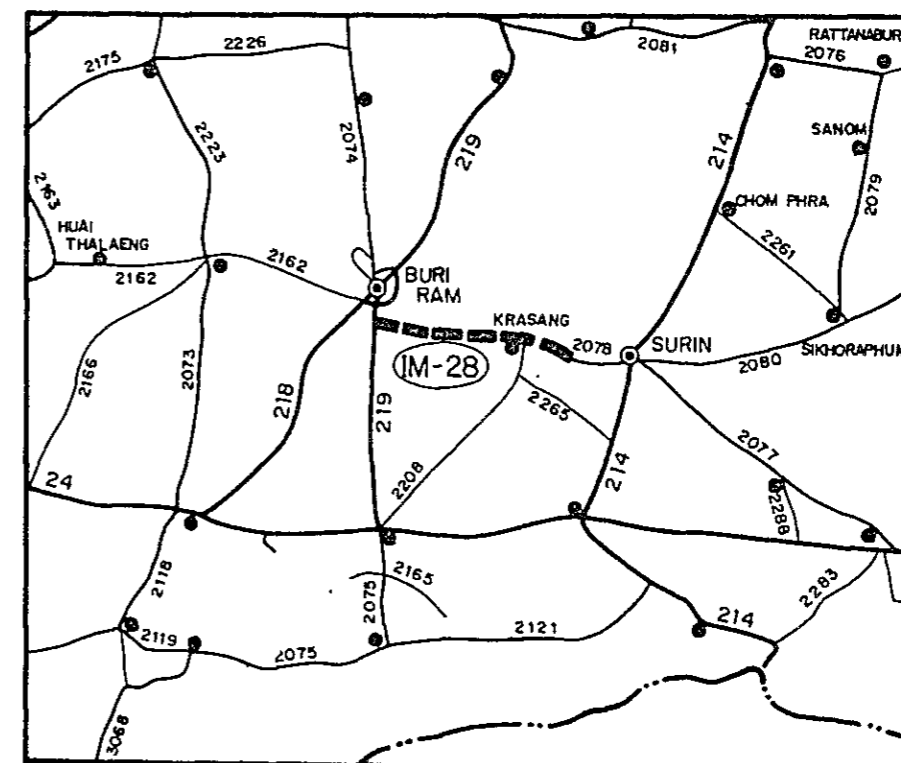
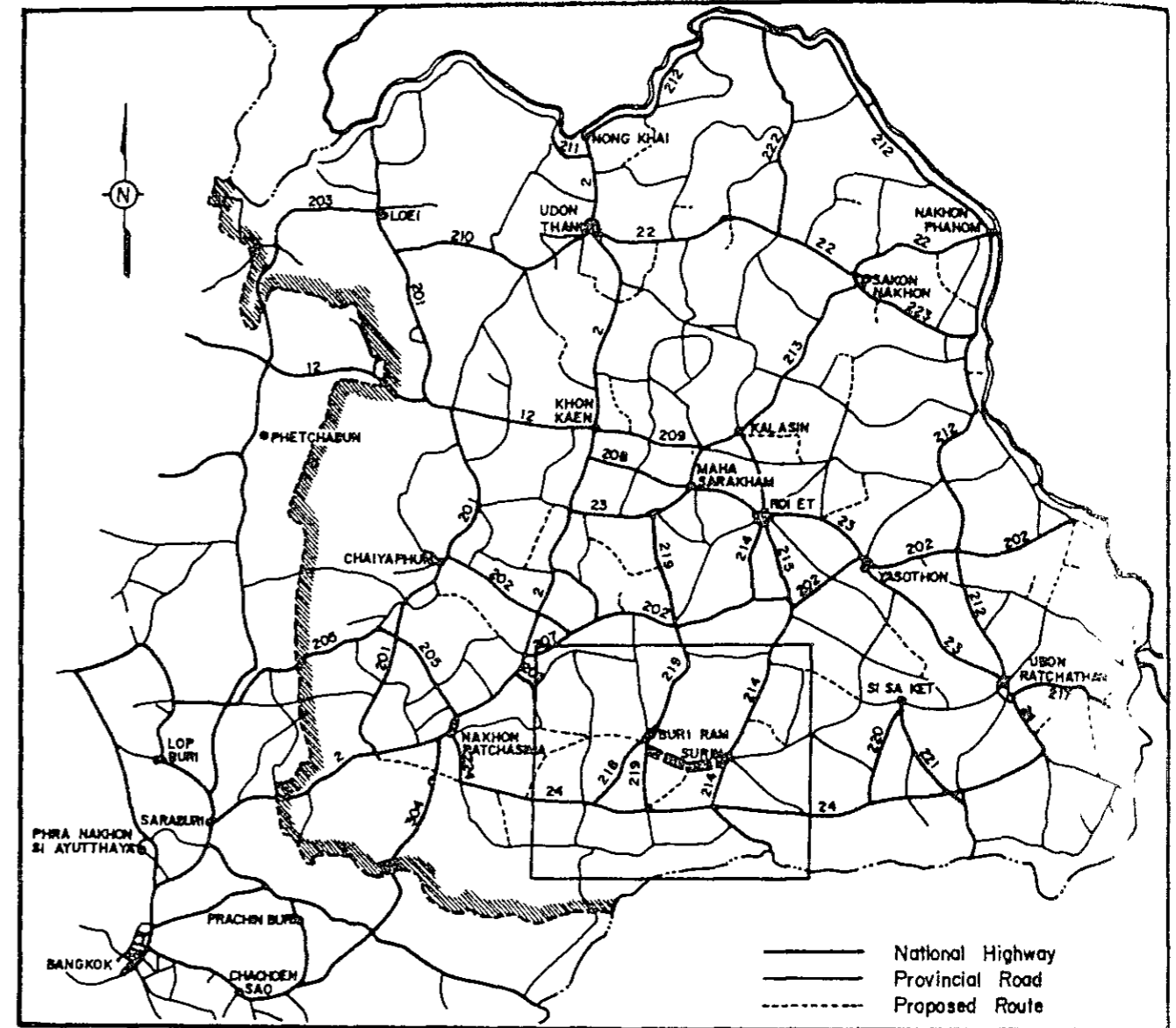
Length : 42.0 KM.

LOCATION OF PROPOSED ROUTE

SUMMARY

PROPOSED ROUTE IM-28

Item	Description
Changwat	Buri Ram
Origin	C. Buri Ram
Destination	Lam Chi (River) (J.R.2078)
Length	
Total	42.0 km
Improvement Section	34.3 km
DOH Road	R.2078 11.1 km
ARD Road	23.2 km
Others	0 km
New Alignment Section	7.7 km
Surface Type and Condition	Soil Aggregate, Good
Terrain	Flat
Influence Area	
Area	261 km ²
Population (1982)	38,600
Principal Crops	Paddy
Traffic (ADT)	
Existing	348
1993	1,722
2001	2,426
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	96,110 . 10 ³ ฿
Economic	89,938 . 10 ³ ฿
IRR	27.0 %
B/C	2.83
Recommendation	For further consideration



1. 概要

1.1 計画路線の概要

本路線は、Buri Ram県の西部に位置する。ルートは、Buri Ram県を起点とし、東に走り Sawa Chick村、Song Chun 村、Wa村を経て、Chi 河を渡った県道2078号線の舗装部分の起点で終る。その総延長は42.0kmである。(Figure 28.5.2 参照)

沿道の地形は、ほぼ平均である。影響圏内には、いくつかの村があり、その総人口は、38,600人である。沿道には、医療センターが3ヶ所あるが病院はない。教育施設としては中学校が2ヶ所ある。

本路線はBuri Ram, Surin という2つの県を結びさらにいくつかの県にまたがってNakhon Ratchasima, Ubon Ratchathaniという2つの大きな県を結ぶ舗装道路網を形成することを目的に計画したものである。

1.2 現道の状況

計画路線の利用した現道の状況はTable 28.1.1 に要約し、その詳細はTable 28.1.2 のインベントリー調査の結果に示した。

2. 交通

2.1 予測手法

本計画路線は道路改良後、交通所要時間の節約により転換交通や誘発交通が大量に期待できるため、交通量予測の手法として「配分方式」を適用することとした。

2.2 ゾーニング

本路線によって交通上変化が予想される地域について、5つの発生ゾーンを設定した。この地域から発生する交通の主要な着ゾーンとしてはMuang Buri Ram, Kra Sang, Muang Surin の3つのAmphoeを設定した。計画路線および関連する周辺道路は、計画路線について5リンク、周辺道路について2リンクの計7リンクに分割して予測を行うこととした。ゾーン界図およびゾーン・道路リンクの特性はFigure 28.2.1 および Table 28.2.1, Table 28.2.2 に示すとおりである。

2.3 交通需要

1) 旅客需要

基準年におけるO/Dペア別の旅客需要(トリップ/日)推定値はメインレポートの7.3.3.1)で述べた算定方式に従って求めた。

推定結果は以下の通りである。

Zone	1	2	3	4	5	11	12
1	0	1595	918	650	417	941	519
2	0	0	294	945	198	639	207
3	0	0	0	594	184	549	196
4	0	0	0	0	463	863	895
5	0	0	0	0	0	724	223
11	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0

Grand Total = 12014

この交通需要を道路リンクに配分することによって得られるリンク別交通需要の推定値は次のとおりである。

PASSENGER MOVEMENT (1982)

PROPOSED ROAD LINK	TRIPS PER DAY
1	3290
2	2919
3	3115
4	2832
5	2427

2) 貨物需要

計画路線上の貨物交通需要 (トン/日) はメインレポートの7.3.3.の1) で述べた方式によって求めた。推定のための基礎データおよび結果は次に示すとおりである。

Ratios of Total/Non-Agricultural Freight Movement

Year	1987	1993	2001
Ratio	1.15	1.10	1.06

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	195	43	238
2	167	37	204
3	182	40	222
4	161	35	196
5	132	29	161

2.4 交通需要の将来伸び率

1981-1987, 1987-1993, 1993-2007の各期間における旅客および貨物の交通需要の将来伸び率は、メインレポートの7.3.3.の1) で述べた予測式に従って求めた。予測の前提および得られた将来伸び率は以下の通りである。

GROWTH RATE OF PASSENGER MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981-1987	1987-1993	1993-2001
PER CAPITA INCOME	4.2	4.5	4.7
TRANS. PRICE INCREASE	4.5	4.5	4.5
POPULATION	1.8	1.6	1.4
PASSENGER MOVEMENT	5.8	6.0	6.0

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981-1987	1987-1993	1993-2001
NON-AGRI. AGRICULTURE	7.5	7.7	7.8
AGRICULTURE	0.1	0.1	0.1
FREIGHT	6.1	6.5	6.9

2.5 誘発および開発交通量

メインレポートの7.3.3.の3) で述べた方式を基に誘発および開発交通量の通常交通量に対する比率を求めた。

RATE OF INDUCED AND DEVELOPED TRAFFIC

(%)

ITEM	YEAR		
	1987	1993	2001
INDUCED	96.7	97.5	98.2
DEVELOPED	0.0	2.4	2.4

2.6 将来交通量

1) 車種構成

計画路線上の旅客・貨物に関する将来交通需要を、以下の車種構成比によって車種別交通量に交換した。

TRAFFIC COMPOSITION

(UNIT : %)

LINK NO.	YEAR	PASSENGER					FREIGHT			
		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T
1-5	1982	3.1	53.1	0.0	43.8	0.0	12.5	18.8	59.3	9.4
	1987	6.0	50.2	4.2	37.4	2.2	13.7	18.1	52.9	15.3
	1993	9.4	46.8	9.2	29.7	4.9	15.1	17.2	45.2	22.5
	2001	14.0	42.2	15.8	19.5	8.5	17.0	16.0	35.0	32.0

2) 将来ADT

計画路線上のリンク加重平均将来交通量は以下に示すとおりであり、またその道路リンク別交通タイプ別の詳細はTable 28.2.3に示す。

AVERAGE FUTURE TRAFFIC ON PROPOSED ROUTE

YEAR	TYPE OF VEHICLE								ADT	M/C	TOTAL
	P/C	L/B	M/B	H/B	P/P&T	4/T	6/T	10/T			
1987	40	28	249	15	365	40	119	34	890	481	1371
1993	90	87	283	47	491	52	137	68	1255	467	1722
2001	210	236	291	127	707	73	160	146	1950	476	2426

3. 農業開発

3.1. 現況

影響圏の農耕地の殆どが、水田でありが、水稻の平均単位当り収量は、水田地帯の一部が塩害を受けているために比較的低い。畑地には、ケナフ、キャッサバ、落花生及び砂糖きびが栽培されている。圏内の一部には、まだ水田及び畑地の未開発可耕地が残っている。

圏内の土地利用及び土地適応性の状況はTable 28.3.1とFigure 28.3.1に示し、また、Buri Ram 県地域の代表的作物暦は、Figure 28.3.2のとおりである。

3.2. 開発予測

影響圏内の将来の農業開発状況を、With ProjectとWithout Projectの双方について予測した。予測した作付面積、単位当り収量及び生産量はTable 28.3.2のとおりである。

代表的作物の農家庭先価格と農業生産費とは、各県の資料及び現地調査の結果を参考にし、Table 28.3.3のように見積った。

上記のごとく各作物ごとに予測された生産量と庭先価格により、生産価値を計算し、これから農業生産費及び別途見積られた開墾費を差引き、純生産価値(N.P.V)をTable 28.3.4のように算出した。

このN.P.VのWith Projectの場合と、Without Projectの場合の差が、この道路の開発便益である。

4. 走行費の節減

本報告書、第1巻、第7章で述べた概念と基礎データにもとづき関連する各道路リンクの走行費（以下“VOC”という）をWith ProjectとWithout Projectの両ケースについて計算した。

各リンクにおけるVOCのコスト増に影響を与える道路状況は以下に示すとおりである。

Link	Road Condition					Length (Km)	With Project	
	Without Project						Length (Km)	Road Class
	No. of Nos. of	Nos. of		Nos. of				
Terrain	Length (Km)	Road Class	Wooden Bridge	Narrow C.Bridge	Road Class	Wooden Narrow Bridge		
1	Flat	11.0	2B	0	0	11.0	1 (F4)	0
2	Flat	10.0	2B	1	0	10.0		0
3	Flat	11.0	2B	0	0	9.0		0
4	Flat	7.0	2B	0	0	3.0		0
5	Flat	14.0	2B	3	0	9.0		0

- /1 Road 1 : Paved Road
 Road 2A : Laterite Road with good surface condition and alignment
 Road 2B : Laterite Road with good surface condition but poor alignment
 Road 3 : Laterite Road with poor surface condition and alignment
 Road 4 : Earth Road

VOC節減は、With Projectの全リンクのVOCとWithout Projectの際のVOCとの差で、当道路におけるVOCの節減は次に示すとおりである。

Vehicle Operating Cost Saving			
(Unit: 1000 Baht)			
Road Class	1987	1993	2001
1 (F4)	27,478	42,867	77,119

5. エンジニアリング

5.1 予備設計

予備設計は、次に示す設計規準を基本に行った。

Design Standard	:	F4 (feasible)
Geometric Design	:	AASHTO (Rural Highways)
Typical Cross Section	:	as shown in Figure 28.5.1
Minimum Height of Embankment		
Ordinary Section	:	1.0m
Approach of Bridge in Flat Area	:	2.0m
Flood Section	:	0.7m (above flood level)
Pavement Structure		
In case of F4 Standard		
DBST	:	2.5cm
Crushed Stone Base	CBR _{>} 80%	: 15.0cm
Soil Aggregate Subbase	CBR _{>} 20%	: 15.0cm
Selected Material	CBR _≥ 6%	: 20.0cm
Pipe Culvert		
Standard Size	:	∅ 100cm
Standard Interval		
Paddy Area	:	200 m
Others	:	500 m
Box Culvert		
Standard Size	:	2.4m x 2.4m
Location	:	as required

Bridge

Standard Type (width 7.0m)

Short Span Bridge : RC - Slab

Long Span Bridge : PC - Girder

Location : as shown in Bridge List in Figure
28.5.2

ルートの線形は、Figure 28.5.2 に示す。

5.2 工事数量および建設費

予備設計による工事数量と建設費は、各工種ごとに単価を付してTable 28.5.1 に示す。

道路規格 F 4 の建設費を財務費用および経済費用に分けて集計すると、下表に示すとおりとなる。

F4 Standard (DBST)	L = 42.0 km
Financial Cost	96,110 . 10 ³ ¥
Economic Cost	89,938 . 10 ³ ¥

6. 経済評価

年次別経済費用と便益及び評価結果はTable 28.6.1 に示す通りである。

このルートは F 4 規格でフィージブルである。

7 社会インパクト

社会インパクトを示すデータ及び評価結果はTable 28.7.1 に示す通りである。

Table 28.1.1 SUMMARY OF ROAD INVENTORY

Item	Description	
Origin	C. Buri Ram	
Destination	Lamchi (River) (J.R. 2078)	
Length		
Total	42.0 km	
Improvement Section	34.3 km	
DOH Road	R. 2078	11.1 km
ARD Road		23.2 km
Others		0 km
New Alignment Section		7.7 km
Terrain	Flat	
Alignment (Hori./Vert.)	Fair / Fair	
Formation Width	5.5 m - 7.0 m, 6.4 m (Weighted average)	
Embankment Section		
Length	42.0 km	
Height	0.3 m - 1.6 m	
Cut Section		
Length	0 km	
Depth	m - m	
Surface Type and Condition		
SBST or DBST	0 km	
Soil Aggregate	Good	42.0 km
Earth		0 km
Pipe Culvert	36 each	
Box Culvert	0 each	0 m
Bridge		
Permanent Bridge	2 each	29.3 m
Narrow Concrete Bridge	0 each	0 m (4m)
Wooden Bridge	1 each	10.5 m
Overflow Section	3 places	3.0 km

Table 28.1.2 ROAD INVENTORY (1)

PROPOSED ROUTE NO. IM-28

ROUTE NO. ARD
2078

C. BURI RAM ~ LAM CHI (RIVER) (J.R. 2078)

L = 42.0 Km

BURI RAM

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
VILLAGE																	
- Name																	
- Household (H)																	
- Population (P)																	
TERRAIN									Flat								
CROSS SECTION	Formation Width (m)	6.00	7.50	7.00	6.50	7.50	5.50	6.00		6.50		6.00		7.00		6.50	
	Embankment Height (m)	0.70	0.50	0.70	1.00	0.70	0.40	0.30	0.50		0.30	0.70		0.50	1.60	0.50	0.50
	Cutting Depth (m)																
PAVEMENT	Type/Length																
	Condition																
FLOODING	Overflow Length(Km)/Height(m)																
LAND USE	Left		Paddy	Forest													
	Right		Paddy	Forest													
PIPE CULVERT	Total Number																
BOX CULVERT & BRIDGE	Station (Km)	0.2			4.5												
	Dimension	C-Br. 9.75 x 11.50			C-Br. 7.00 x 20.00												
RIGHT OF WAY (m)																	
ALIGNMENT	Horizontal																
	Vertical																
ROUTE NO., AGENCIES																	

ROAD INVENTORY (2)

PROPOSED ROUTE NO. IM-28

ROUTE NO. ARD 2078

C. BURI RAM^LAM CHI (RIVER) (J.R. 2078) (Cont'd)

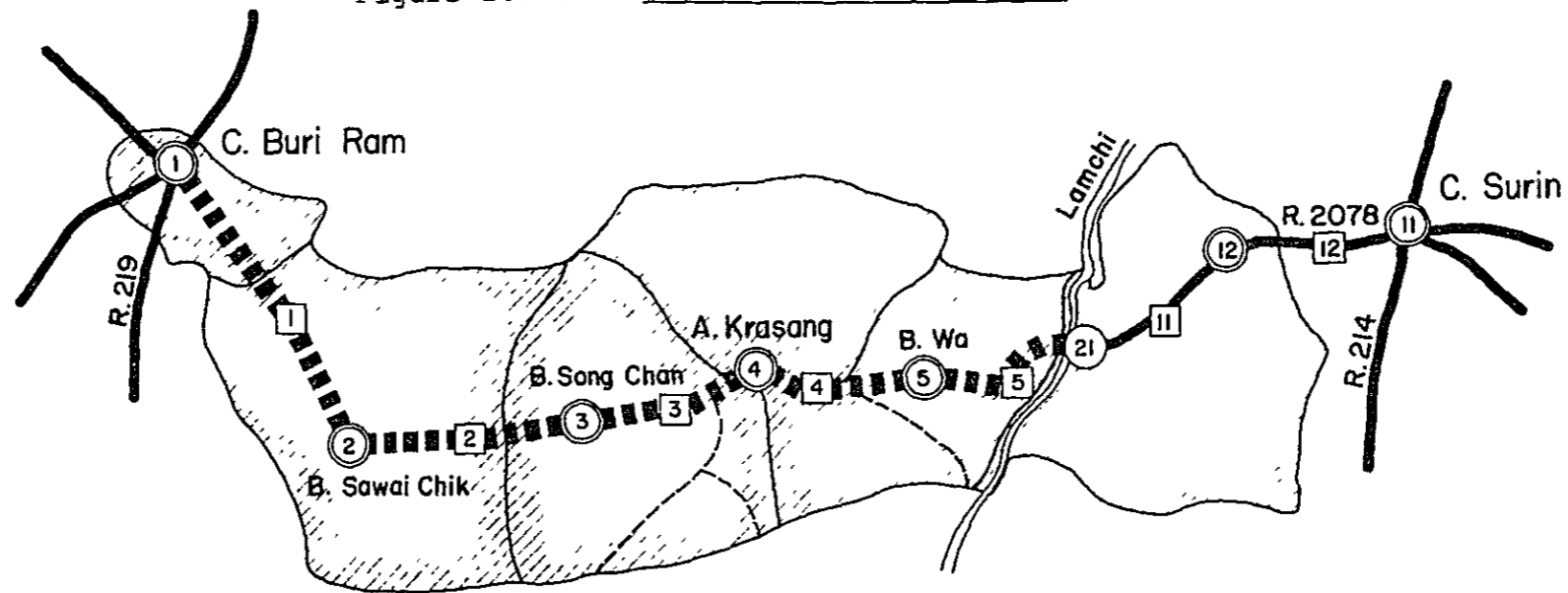
L = 42.0 Km.

BURI RAM

STATION (Km)		30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	
VILLAGE - Name - Household (H) - Population (P)			B. WA H = 250 P = 1250			B. KHOK KHAMIN H = 21 P = 105	B. NON DANG H = 115 P = 375	B. LALUM										
TERRAIN		Flat																
CROSS SECTION	Formation Width (m)	5.50		6.50		6.00												
	Embankment Height (m)	0.30				1.00	0.50	0.60										
	Cutting Depth (m)																	
PAVEMENT	Type/Length	Laterite																
	Condition	Good																
FLOODING	Overflow Length(Km)/Height(m)							L=1.0 H=0.6										
LAND USE	Left	Paddy																
	Right	Paddy																
PIPE CULVERT	Total Number																	
BOX CULVERT & BRIDGE	Station (Km)																	
	Dimension																	
RIGHT OF WAY (m)																		
ALIGNMENT	Horizontal	Fair																
	Vertical	Fair																
ROUTE NO., AGENCIES		DOH 2078																

Figure 28.2.1 ZONING AND ROAD NETWORK

PROPOSED ROUTE NO. IM-28



LEGEND

- ⓪ Traffic Zone
- ⓪ Dummy Node
- ⓪ Road Link Code
- ▬▬▬▬ Proposed Road Link
- ▬▬▬▬ Other Road

Table 28.2.1 ZONE CHARACTERISTICS

Zone	Administrative Division			Population			Zone Attraction
	Changwat	Amphoe	Tambon Code	Tambon	%		
1	Buri Ram	Muang	1	25,719	100	25.7	
			2	16,772	20	3.4	
			Total			29.1	
2	Buri Ram	Muang	3	18,744	10	1.9	
			6	16,465	80	13.2	
			Total			15.1	
3	Buri Ram	Kra Sang	3	6,909	100	6.9	
			4	6,821	20	1.4	
			8	5,888	20	1.2	
Total					9.5		
4	Buri Ram	Kra Sang	1	10,252	100	10.3	67.8
5	Buri Ram	Kra Sang	5	8,264	60	5.0	
			8	5,888	40	2.4	
			Total				
11	Surin	Muang	1	31,467	100	31.5	288.1
12	Surin	Muang	12	14,338	100	14.3	-

Table 28.2.2 LINK CHARACTERISTICS

Link No	Node Pair		Length		Grade		Remark
	Start Node	End Node	W	W	W	W	
1	1. C. Buri Ram	2. B. Saway Chik	11.0	11.0	8	4	ARD
2	2. B. Saway Chik	3. B. Song Chan	10.0	10.0	8	4	ARD
3	3. B. Song Chan	4. A. Krasang	11.0	9.0	8	4	ARD
4	4. A. Krasang	5. B. Wa	7.0	3.0	8	4	R.2078
5	5. B. Wa	21. Lamchi	14.0	9.0	9	4	R.2078
11	12. J.ARD	21. Lamchi	5.0	5.0	5	5	R.2078
12	11. C. Surin	12. J.ARD	6.0	6.0	5	5	R.2078

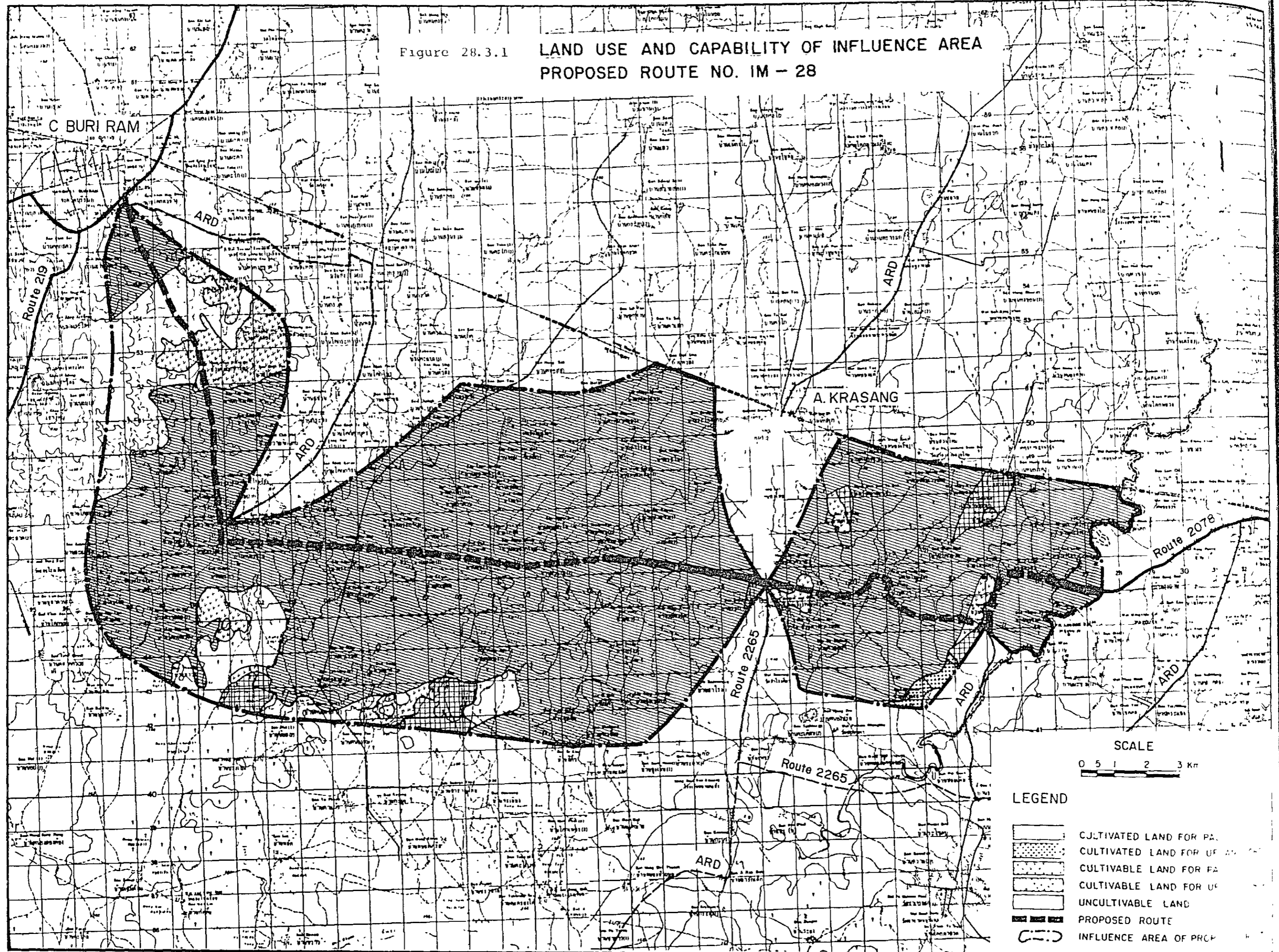
Table 28.2.3 TRAFFIC VOLUME ON ROUTE IM - 28

YEAR	1987						1993						2001						
	LINK	1	2	3	4	5	AVR.	1	2	3	4	5	AVR.	1	2	3	4	5	AVR.
P/C	N+D	23	21	22	20	17	21	51	45	48	44	38	46	119	106	113	103	88	107
	I	12	20	21	23	23	19	27	44	45	50	52	42	64	102	106	118	121	98
	DV	0	0	0	0	0	0	2	2	2	2	2	2	4	5	5	5	5	5
	TOTAL	36	40	43	43	41	40	80	91	96	97	92	90	187	213	225	226	214	210
L/B	N+D	16	14	15	14	12	14	50	44	47	43	37	44	134	119	127	116	99	120
	I	9	14	14	16	16	13	26	42	44	49	50	41	72	115	120	132	136	110
	DV	0	0	0	0	0	0	2	2	2	2	2	2	5	6	6	6	6	6
	TOTAL	25	28	30	30	28	28	78	88	93	94	89	87	211	240	253	254	241	236
M/B	N+D	145	129	137	125	107	130	161	143	152	139	119	144	165	147	157	142	122	148
	I	77	124	129	143	147	119	86	137	143	159	163	132	88	141	147	163	167	136
	DV	0	0	0	0	0	0	6	7	7	7	7	7	6	7	7	7	7	7
	TOTAL	222	253	266	268	254	249	253	287	303	304	288	283	260	295	311	313	296	291
H/B	N+D	9	8	8	7	6	8	27	24	25	23	20	24	72	64	69	62	53	65
	I	5	7	8	9	9	7	14	23	24	26	27	22	39	62	64	71	73	59
	DV	0	0	0	0	0	0	1	1	1	1	1	1	3	3	3	3	3	3
	TOTAL	13	15	16	16	15	15	42	48	50	50	48	47	114	129	136	137	130	127
P/P&T	N+D	211	187	200	181	155	189	277	245	262	237	203	247	397	351	375	340	290	355
	I	114	183	191	212	217	176	150	242	252	279	286	232	217	349	364	403	413	335
	DV	0	0	0	0	0	0	11	12	13	13	12	12	15	17	18	18	17	17
	TOTAL	326	370	391	393	372	365	438	498	526	529	500	491	630	718	758	762	721	707
4/T	N+D	22	19	20	18	15	19	27	23	25	22	18	23	36	31	34	30	25	32
	I	14	22	24	26	26	22	18	29	30	33	33	27	25	41	43	47	48	39
	DV	0	0	0	0	0	0	1	2	2	2	2	2	2	2	2	2	2	2
	TOTAL	36	41	44	44	41	40	46	53	57	57	53	52	64	74	80	80	74	73
6/T	N+D	64	55	60	53	43	56	70	60	65	58	47	61	80	68	74	66	54	69
	I	41	66	70	76	76	63	47	75	80	87	88	72	55	89	95	104	104	86
	DV	0	0	0	0	0	0	3	4	4	4	4	4	4	5	5	5	5	5
	TOTAL	104	120	129	129	120	119	120	139	149	150	139	137	139	163	174	175	163	160
10/T	N+D	19	16	17	15	13	16	35	30	32	29	24	30	73	63	68	60	49	63
	I	12	19	20	22	22	18	23	37	40	43	44	36	50	82	86	95	95	78
	DV	0	0	0	0	0	0	2	2	2	2	2	2	4	4	5	5	4	4
	TOTAL	30	35	37	37	35	34	60	69	74	74	69	68	127	149	159	160	149	146
ADT	N+D	509	448	480	434	368	453	697	613	657	594	504	620	1078	949	1017	919	781	959
	I	283	456	477	526	537	437	391	629	658	727	742	604	610	981	1026	1133	1157	942
	DV	0	0	0	0	0	0	28	32	34	34	32	31	43	49	52	53	50	49
	TOTAL	792	903	956	960	905	890	1115	1274	1349	1355	1278	1255	1731	1980	2095	2105	1988	1950
M/C	N+D	415	394	406	388	359	394	460	443	453	439	413	443	476	479	479	478	469	476
	I	59	89	78	96	123	86	20	23	4	17	53	24	0	0	0	0	0	0
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	474	482	484	484	483	481	479	466	456	456	466	467	476	479	479	478	469	476
TOTAL	N+D	924	842	885	822	727	847	1156	1057	1110	1033	918	1063	1554	1428	1496	1398	1250	1435
	I	342	544	555	622	661	524	411	652	662	744	794	628	610	981	1026	1133	1157	942
	DV	0	0	0	0	0	0	28	32	34	34	32	31	43	49	52	53	50	49
	TOTAL	1266	1386	1440	1444	1388	1371	1595	1740	1805	1810	1744	1722	2207	2459	2574	2584	2457	2426

NOTE

N : NORMAL TRAFFIC
DV : DEVELOPED TRAFFICD : DIVERTED TRAFFIC
I : INDUCED TRAFFIC

Figure 28.3.1 LAND USE AND CAPABILITY OF INFLUENCE AREA PROPOSED ROUTE NO. IM - 28



SCALE
0 5 1 2 3 Km



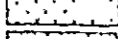
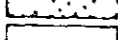

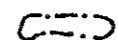

- LEGEND
-  CULTIVATED LAND FOR PA
 -  CULTIVATED LAND FOR UP
 -  CULTIVABLE LAND FOR PA
 -  CULTIVABLE LAND FOR UP
 -  UNCULTIVABLE LAND
 -  PROPOSED ROUTE
 -  INFLUENCE AREA OF PRCP

Figure 28.3.2 CROPPING CALENDAR

1400 CHANGWAT BURI RAM

NAME OF CROP	JAN	FEB	MAR	APR.	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
RICE, 1 st CROP					○	○	○	○	○	○	○	○
GROUND NUT	○	○	○	○	○							
KENAF		○	○	○	○	○	○	○	○	○	○	○
CASSAVA				○	○	○	○	○	○	○	○	○
MAIZE					○	○	○	○	○	○	○	○
SORGHUM								○	○	○	○	○
SUGAR CANE									○	○	○	○

Note

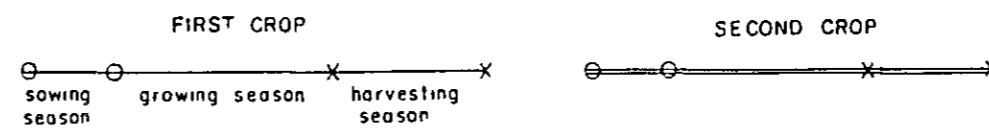


TABLE 28.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[UNIT : 1000 RAI (R.M²)]

AMPHOE	AMPHOE	CULTIVATED LAND			UNUSED CULTIVABLE LAND				
		CODE	NAME	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
				136.250 (218.0)	0.625 (1.0)	136.875 (219.0)	7.813 (12.5)	4.063 (6.5)	11.875 (19.0)
1401	M. BURI RAM			34.375 (55.0)	-	34.375 (55.0)	5.625 (9.0)	0.938 (1.5)	6.563 (10.5)
1405	KARASANG			101.875 (163.0)	0.625 (1.0)	102.500 (164.0)	2.188 (3.5)	3.125 (5.0)	5.313 (8.5)

TABLE 28.3.2 CROP PRODUCTION

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL	
PLANTED AREA (1000 RAI)											
1981	115.44	-	-	0.32	0.61	0.11	1.50	-	2.70	118.14	
1987	115.44	-	-	0.32	0.64	0.11	1.54	-	2.78	118.22	
1993	WITHOUT PROJECT	115.44	-	-	0.32	0.66	0.11	1.59	-	2.87	118.30
	WITH PROJECT	118.23	-	-	0.32	0.72	0.12	1.59	-	2.93	121.16
2001	WITHOUT PROJECT	115.44	-	-	0.33	0.70	0.11	1.65	-	2.98	118.42
	WITH PROJECT	118.23	-	-	0.33	0.76	0.12	1.65	-	3.05	121.28
CROP YIELD (KG/RAI)											
1981	190.7	-	-	213.0	2500.0	6875.0	170.0	-			
1987	191.8	-	-	213.0	2500.0	6916.4	170.0	-			
1993	WITHOUT PROJECT	193.0	-	-	213.0	2500.0	6958.0	170.0	-		
	WITH PROJECT	196.4	-	-	214.3	2515.0	6999.8	170.0	-		
2001	WITHOUT PROJECT	194.5	-	-	213.0	2500.0	7013.8	170.0	-		
	WITH PROJECT	202.8	-	-	216.0	2535.2	7112.5	170.0	-		
CROP PRODUCTION (TON)											
1981	22,008	-	-	67	1,525	770	254	-	2,643	24,651	
1987	22,141	-	-	68	1,590	775	262	-	2,723	24,863	
1993	WITHOUT PROJECT	22,274	-	-	69	1,658	779	270	-	2,805	25,079
	WITH PROJECT	23,227	-	-	69	1,802	832	270	-	3,003	26,230
2001	WITHOUT PROJECT	22,453	-	-	70	1,753	786	281	-	2,921	25,374
	WITH PROJECT	23,981	-	-	71	1,920	846	281	-	3,150	27,131

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 28.3.3 FARMGATE PRICE AND PRODUCTION COST

ITEM	PADDY	MAIZE	BEANS	GRIND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	4,144	-	-	7,468	670	562	4,347	-
WITH PROJECT (1987 - 2001)	4,248	-	-	7,468	687	562	4,456	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	550	-	-	1,023	734	2,183	631	-
WITH PROJECT (1987 - 2001)	568	-	-	1,043	754	2,208	631	-

TABLE 28.3.4 NET PRODUCTION VALUE

YEAR	(1000 BAHT)					
	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	28,213	1,135	29,348	28,491	1,167	29,658
1993	28,764	1,173	29,937	31,517	1,283	32,800
2001	29,505	1,222	30,727	34,719	1,360	36,079

Figure 28.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE

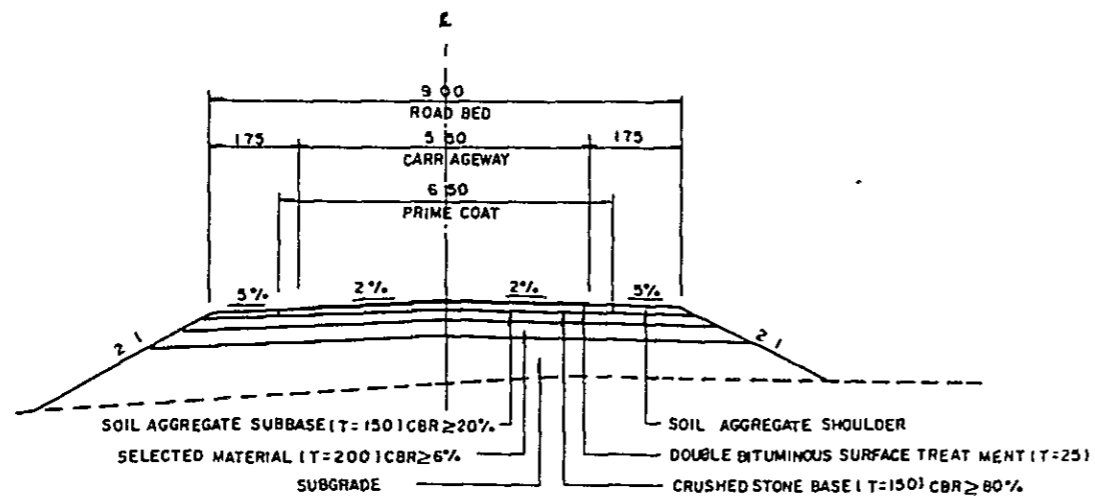
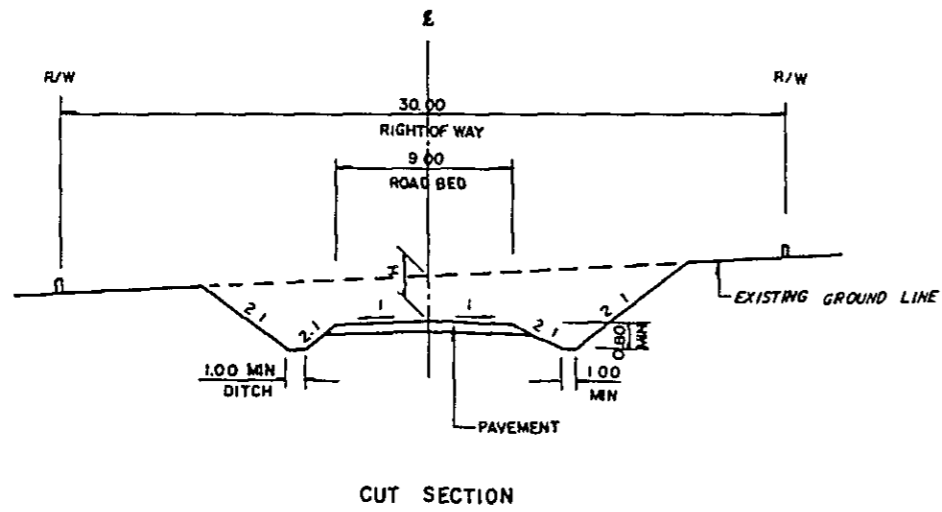
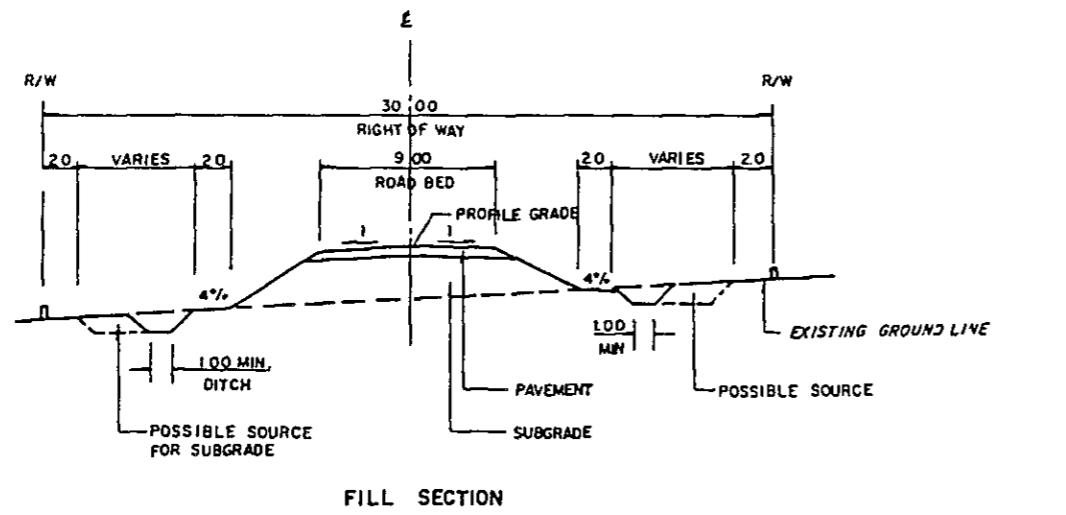
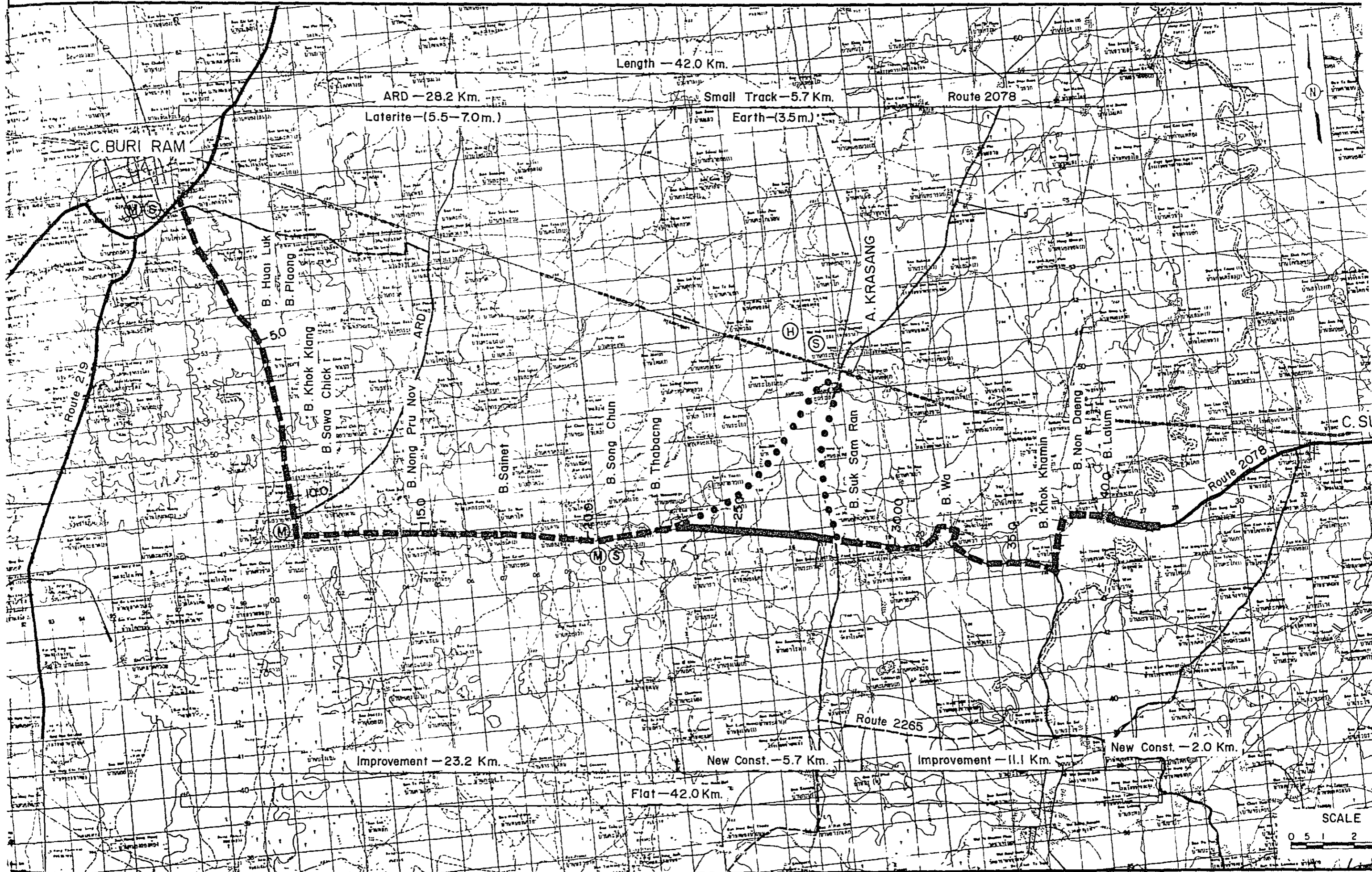
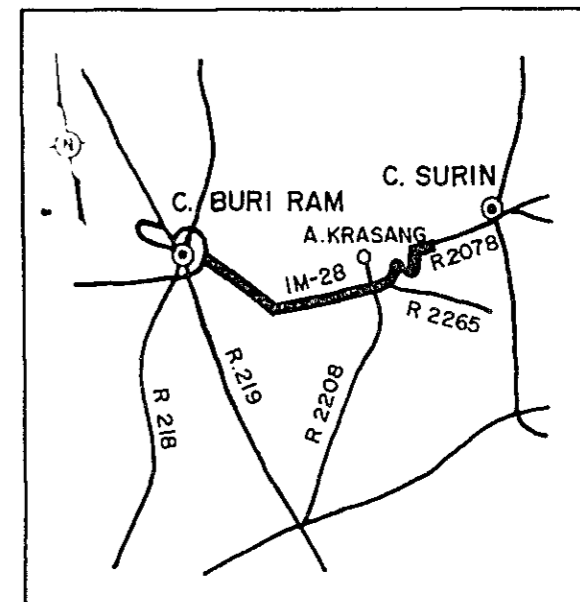


Figure 28.5.2 **PROPOSED ROUTE NO. IM-28 C. BURI RAM**

C. BURI RAM - LAM CHI (J.R. 2078)
ROUTE NO. 2078 + ARD L = 42.0 Km.



LOCATION MAP



BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1.	0.2	—	C-9.75 x 11.50
2.	4.5	C-7.00 x 20.00	—
3.	10.0	—	C-9.80 x 17.80
4.	12.5	C-7.00 x 20.00	—
5.	19.8	C-7.00 x 14.00	W-4.50 x 10.50
6.	40.5	C-7.00 x 12.00	—
7.	40.5	C-7.00 x 30.00	—

LEGEND

- PROPOSED ROUTE (IMPROVEMENT)
- PROPOSED ROUTE (NEW CONSTRUCTION)
- PAVED ROUTE
- UNPAVED ROUTE
- INVENTORY SURVEY ROUTE
- HOSPITAL
- MEDICAL CENTER
- SECONDARY SCHOOL

SCALE

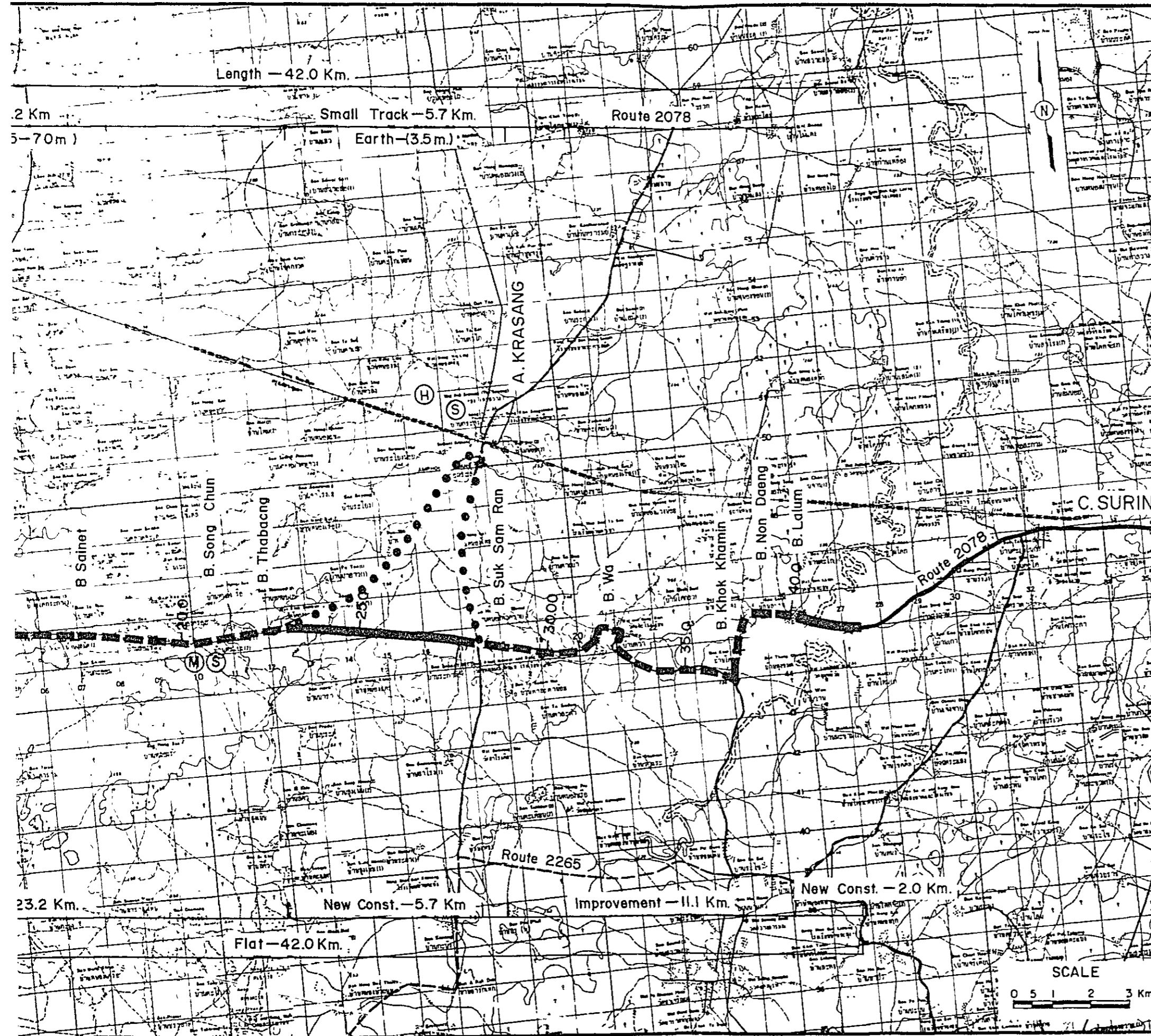


Table 28.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-28 (42.0 km)

Items	Unit of Q'ty	Financial Unit Rate ₪	(DBST)		
			Q'ty	Financial Cost (10 ³ ₪)	Economic Cost (10 ³ ₪)
DIRECT CONSTRUCTION COST					
Clearing and Grubbing	ha	15,000	81	1,215	1,105
Excavation - Soil	m ³	20	0	0	0
Excavation - Hard Rock	m ³	160	0	0	0
Embankment	m ³	45	204,100	9,184	8,357
Selected Material	m ³	80	89,000	7,120	6,336
Soil Aggregate Surface or Subbase	m ³	105	62,400	6,552	5,831
Crushed Stone Base	m ³	370	41,000	15,170	13,956
Soil Aggregate Shoulder	m ³	105	17,600	1,848	1,644
Prime Coat and DBST	m ²	55	231,000	12,705	11,435
Pipe Culvert	m	2,100	1,820	3,822	3,516
Box Culvert	m	16,000	0	0	0
Long Span Bridge	m	80,000	120	9,600	8,544
Short Span Bridge	m	40,000	84	3,360	2,990
Sub Total (a)				70,576	63,718
Miscellaneous Works (a) x 7%				4,940	4,460
Total (b)				75,516	68,178
PHYSICAL CONTINGENCY (b) x 15%				11,327	10,227
ENGINEERING AND ADMINISTRATION (b) x 10%				7,552	6,818
Sub Total				18,879	17,045
LAND ACQUISITION					
Highly Developed Land	ha	50,000	34	1,700	1,700
Less Developed Land	ha	15,000	1	15	15
Sub Total				1,715	1,715
GRAND TOTAL				96,110	86,938

Table 28.6.1 COST AND BENEFITS (F4 STANDARD)

YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VDC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1984	17,388	0	0	0	0	24,429	0
1985	43,469	0	0	0	0	54,528	0
1986	26,081	0	0	0	0	29,211	0
1987	0	310	27,478	789	28,577	0	25,515
1988	0	660	30,043	852	31,555	0	25,156
1989	0	1,010	32,608	916	34,534	0	24,580
1990	0	1,360	35,173	979	37,512	0	23,840
1991	0	1,710	37,737	1,043	40,490	0	22,975
1992	0	2,060	40,302	1,106	43,469	0	22,023
1993	0	2,410	42,867	1,170	46,447	0	21,010
1994	20,328	2,778	47,149	1,271	51,198	9,195	20,678
1995	0	3,146	51,430	1,373	55,949	0	20,176
1996	0	3,513	55,712	1,475	60,700	0	19,544
1997	0	3,881	59,993	1,577	65,452	0	18,816
1998	0	4,249	64,275	1,679	70,203	0	18,019
1999	0	4,616	68,556	1,781	74,954	0	17,177
2000	0	4,984	72,838	1,883	79,705	0	16,309
2001	-40,917	5,352	77,119	1,985	84,456	-7,475	15,430
TOTAL	66,349	42,041	743,279	19,881	805,200	109,887	311,248
DISCOUNTED ECONOMIC COSTS :					109,887		
DISCOUNTED ECONOMIC BENEFITS :					311,248		
AGRICULTURAL DEVELOPMENT BENEFIT					14,141		
VDC SAVING					289,244		
RMC SAVING					7,863		
NET PRESENT VALUE :					201,361		
BENEFIT COST RATIO :					2.83		
INTERNAL RATE OF RETURN :					27.0 %		

Table 28.7.1 SOCIAL INDICATORS
(Proposed Route IM-28)

Population (1,000)		Education		Health	
1982	: 38.6	Access to Secondary School		Access to Hospital	
1993	: 46.3	Number of Student in 1993 (1,000) ^{2/}	: 9.3	Average distance to Hospital (km) ^{1/}	: 7.1 (9.0)
Average travelling speed, without (kph)	: 48	Average distance to school (km)	: 4.9 (6.0)	Per capita time savings (10 ⁻⁴)	: 0.019
Isolation		Per capita time savings (10 ⁻⁴)	: 0.061	Score	: 44
Access to Amphoe		Score	: 33	Access to Medical Facilities	
Average distance to Amphoe (km) ^{1/}	: 7.5	Teacher Intensity		Average distance to facilities (km) ^{1/}	: 3.6 (6.0)
Per capita time savings (10 ⁻⁴)	: 0.019	Number of teachers ^{3/}		Per capita time savings (10 ⁻⁴)	: 0.016
Score	: 56	University graduate	: 1	Score	: 64
Access to Artery Highway		Total	: 21	Total Score	: 715
Average distance to highway (km) ^{1/}	: 12 (21)	Number of Student	: 447		
Per capita time savings (10 ⁻⁴)	: 0.058	Indicators			
Score	: 126	E1 ^{4/}	: 2.2		
Impassability		E2 ^{5/}	: 47.0		
Impassable week a year	: 4	E ^{6/}	: 49.2		
Impassability per year	: 0.077	Degree of Improvement ^{7/}	: 1.39		
Impassability per capita (10 ⁻⁴)	: 0.017	Score	: 89		
Score	: 142	Disparity			
		G.P.V. in 1993 (Mn B) ^{8/}			
		With project	: 102.2		
		Without project	: 95.6		
		Per capita G.P.V. in 1993 (B)			
		With project (W)	: 2,207		
		Without project (w)	: 2,065		
		Degree of Disparity			
		(A/W) - (A/w) ^{9/}	: 0.09		
		Score	: 161		

Note:

- ^{1/} () shows the length or distance in without project case. Unless otherwise, lengths are same both in with project case and without project case.
- ^{2/} Number of secondary school student estimated based on the projected population of the areas of influence applying ratios of secondary school students to the total population in the sample area.
- ^{3/} Numbers of the sample areas
- ^{4/} (Number of University Graduate Teachers)/(Total Number of Student) x 1,000
- ^{5/} (Total of Teachers)/(Total Number of Student) x 1,000
- ^{6/} Sum of ^{4/} and ^{5/}
- ^{7/} Ratio of E value of each route to an average value of the same indicator E in case of the sample areas, 33 in number, along paved road near the proposed routes. The average value of E in case of paved roads were calculated at 68.4 from the following data:
 Number of university graduate teachers 438
 Number of Teachers 1,285
 Number of student 25,196
- ^{8/} Estimated gross value of crop production in the areas of influence
- ^{9/} "A" indicates an average per capita value of crop production in the Northeastern Region, which is estimated assuming that:
 - GRP per capita of the Northeast is estimated at 11,897 Baht in 1993,
 - Agricultural sector shares 40% of GRP, and
 - Crop production shares 80% of agricultural production.