

タイ 国
東北部道路網整備計画調査
報告書

第 3 卷：ル ー ト レ ポ ー ト

昭和58年3月

国際協力事業団

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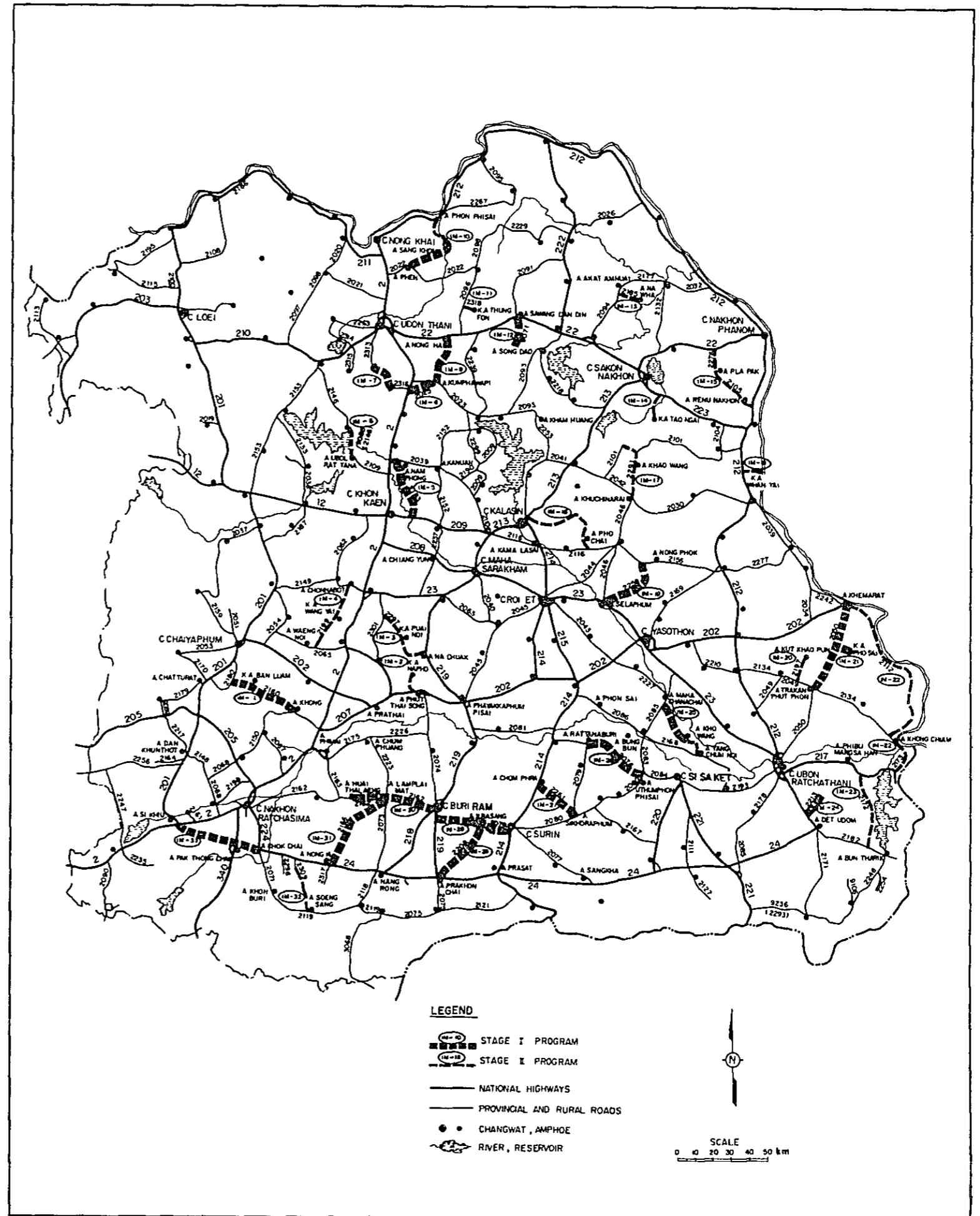
昭和58年3月

国際協力事業団

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STUDY ROAD

Study Road No.	Changwat	Origin - destination	Route Page
1	Nakhon Ratchasima/Chaiyaphum	A.Khong -J.R.2180	1-1 - 1-21
2	Buri Ram	B.Waeo(J.R.202) -K.A.Na Pho	2-1 - 2-17
3	Khon Kaen/Maha Sarakham	J.R.2301 -A.Na Chuak	3-1 - 3-21
4	Khon Kaen	A.Chonnabot(J.R.2057) -B.Kut Ru(J.R.2065)	4-1 - 4-23
5	Khon Kaen	A.Nam Phong(J.R.2039) -J.R.209	5-1 - 5-19
6	Udon Thani/Khon Kaen	B.Sok Chan(J.R.2146) -Ubolrattana Dam(J.R.2109)	6-1 - 6-17
7	Udon Thani	B.Khok Lat(J.R.2313) -B.Tha Yom(J.R.2316)	7-1 - 7-19
8	Udon Thani	B.Huai Koeng (J.R.2) -A.Kumphawapi(J.R.2023)	8-1 - 8-16
9	Udon Thani	A.Nong Han(J.R.22) -A.Kumphawapi(J.R.2023)	9-1 - 9-21
10	Udon Thani/Nong Khai	A.Phen(J.R.2022) -J.R.212	10-1 - 10-23
11	Udon Thani	B.Thung Yai(J.R.2096) -K.A.Thung Fon	11-1 - 11-17
12	Sakon Nakhon	A.Sawang Daen Din(J.R.22) -A.Song Dao	12-1 - 12-16
13	Sakon Nakhon/Nakhon Phanom	B.Chuam(J.R.2094) -A.Na Wha	13-1 - 13-17
14	Sakon Nakhon	J.R.223 -K.A.Tao Ngai	14-1 - 14-17
15	Nakhon Phanom	A.Renu Nakhon(J.R.2031) -B.Ku Ru Khu(J.R.22)	15-1 - 15-19
16	Nakhon Phanom	J.R.212 -K.A.Whan Yai	16-1 - 16-16
17	Kalasin	A.Kuchinarai(J.R.2042,2030) -B.Na Khu	17-1 - 17-19
18	Kalasin/Roi Et	C.Kalasin -B.Khok Nong Bua(J.R.2116)	18-1 - 18-21
19	Roi Et	A.Seiaphum(J.R.23) -B.Kham Phon Sung(J.R.2136)	19-1 - 19-18
20	Ubon Ratchathani	B.Na Hai(J.R.2049) -A.Kut Khao Pun	20-1 - 20-17
21	Ubon Ratchathani	A.Trakan Phut Phon(J.R.2049) -A.Khemarat(J.R.202)	21-1 - 21-20
22	Ubon Ratchathani	A.Khemarat -B.Huasa Phan(J.R.217)	22-1 - 22-27
23	Ubon Ratchathani	B.Don Chik(J.R.217) -B.Non Riang	23-1 - 23-19
24	Ubon Ratchathani	B.Na Suang(J.R.24) -B.Na Yia	24-1 - 24-17
25	Yasothon/Si Sa Ket	A.Maha Chana Chai(J.R.2083) -A.Yang Chum Noi(J.R.2165)	25-1 - 25-23
26	Surin/Si Sa Ket	B.Nong Dang(J.R.2030,2033,2034) -A.Rattana Buri	26-1 - 26-18
27	Surin/Buri Ram	E.Nong Khao(J.R.2079) -A.Chom Phra(J.R.214)	27-1 - 27-19
28	Buri Ram	C.Buri Ram -Lam Chi (River)(J.R.2078)	28-1 - 28-20
29	Buri Ram/Surin	A.Prakhon Chai(J.R.24) -A.Krasang	29-1 - 29-20
30	Buri Ram/Nakhon Ratchasima	A.Huai Thalaeng -B.Kasang(J.R.218)	30-1 - 30-20
31	Buri Ram	A.Lam Plai Mat(J.R.2073) -A.Nong Ki(J.R.24)	31-1 - 31-20
32	Nakhon Ratchasima/Buri Ram	B.Yok Kham(J.R.2309) -A.Soeng Sang(J.R.2119)	32-1 - 32-19
33	Nakhon Ratchasima	J.R.2 -A.Chok Chai(J.R.24)	33-1 - 33-18



PROPOSED ROUTE NO. IM - 1

Changwat : Nakhon Ratchasima / Chaiyaphum

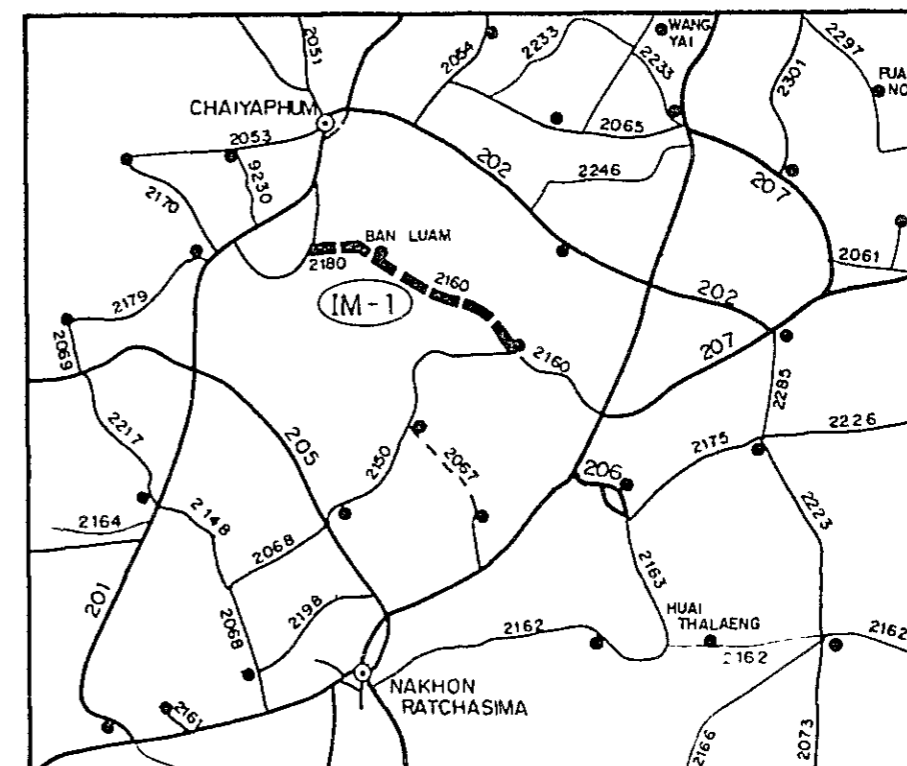
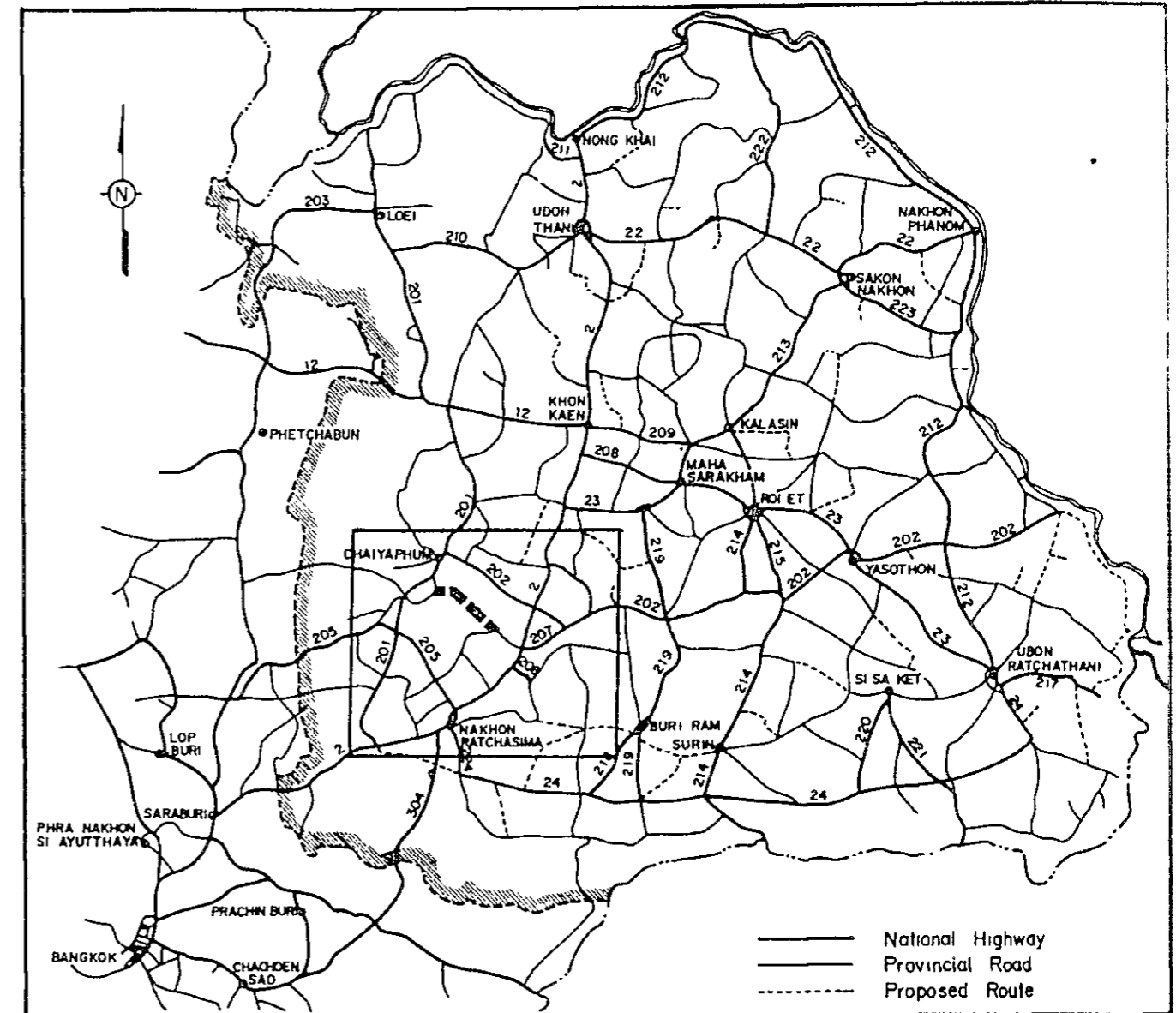
A. Khong - J.R. 2180

Length : 48.0 KM.

SUMMARY
PROPOSED ROUTE IM-1

Item	Description
Changwat	Nakhon Ratchasima/Chaiyaphum
Origin	A. Khong.
Destination	J.R. 2180
Length	
Total	48.0 km
Improvement Section	46.0 km
DOH Road	R.2160 33.5 km
ARD Road	3.0 km
Others	9.5 km
New Alignment Section	2.0 km
Surface Type and Condition	Soil Aggregate, Poor
Terrain	Flat and Partially Rolling
Influence Area	
Area	269 km ²
Population (1982)	27,900
Principal Crops	Paddy
Traffic (ADT)	
Existing	81
1993	521
2001	675
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	91,483 . 10 ³ ฿
Economic	82,908 . 10 ³ ฿
IRR	9.6 %
B/C	0.81
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Nakhon Ratchasima およびChaiyaphumの両県にまたがる。ルートはKhon郡を起点とし、北西に走り、Non Toe 村, Ban Luam 準郡, Non Rai村等を経て、県道2180号線に交差して終る。その総延長は48.0kmである。(Figure 1.5.2 参照)

沿道の地形は、ほぼ平坦であるが、一部に丘陵地を含む。影響圏内には、いくつかの村が存在し、その総人口は27,900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、農業的に開発の進んだ地域において、2つの幹線道路、国道2号線と201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。

この地域と国道201号線(県道2180号線経由)をつなぐ主要な現道は、計画路線起点から37km地点のDon Plao村から北に向い Chi河に沿って走っている。この現道は、しばしば Chi河の氾濫によって、長期間に渡って通交不能となる。そのため、計画路線は、Chi河の氾濫をさけて、約5km南側の地域に路線を選定した。

1.2 現道の状況

計画路線に利用した現道の状況は、Table 1.1.1に要約し、その詳細はTable 1.1.2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Khong, Ban Luam, Muang Chaiyaphum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4リンク、周辺道路について2リンクの計6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 1.2.1およびTable 1.2.1, Table 1.2.2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.の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
1	0	623	222	191	52	223
2	0	0	144	314	32	215
3	0	0	0	199	47	162
4	0	0	0	0	89	220
5	0	0	0	0	0	0
11	0	0	0	0	0	0
Grand Total = 2733						

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	710
2	595
3	691
4	387

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	3.83	3.13	2.35

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	27	98	125
2	22	78	100
3	26	95	121
4	12	45	57

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2)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	0.5	0.4	0.4
PASSENGER MOVEMENT	4.5	4.8	5.0

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981-1987	1987-1993	1993-2001
NON-AGRI. AGRICULTURE	5.8 0.4	6.2 0.4	6.5 0.4
FREIGHT	1.8	2.3	3.0

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	92.6	99.1
DEVELOPED	0.0	1.9	2.0

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
1-4	1982	0.0	52.7	0.0	47.3	0.0	4.5	15.2	65.1	15.2
	1987	3.5	49.2	4.5	40.4	2.4	7.8	15.4	57.2	19.6
	1993	7.6	45.1	9.9	32.1	5.3	11.7	15.7	47.7	24.9
	2001	13.2	39.5	17.1	21.0	9.2	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 1.2.3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	5	6	54	3	70	8	29	10	185	242	428
1993	14	18	57	10	88	9	28	15	239	282	521
2001	34	44	55	24	116	12	26	24	335	339	675

3. 農業開発

3.1. 現況

影響圏内の農耕地の約87%は水田であり、畑地の中では、キャッサバが最も多く、次いでケナフ、メイズ、落花生が続いている。キャッサバ塊根は国道2号線沿線のキャッサバベレットや製粉工場に2150及び2160路線を經由して出荷されている。未開発可耕地は、畑作地のみが残っているに過ぎない。

圏内の土地利用及び土地適応性の状況は、Table 1.3.1.とFigure 1.3.1.に示し、また、Chirphum 県及びNakhon Ratchasima 県地域の作物暦はFigure 1.3.2.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、単位当たり収量及び生産量はTable 1.3.2.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てTable 1.3.3.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 1.3.4.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	Without Project				With Project			
		Length (km)	Road/ ¹ class	Nos. of wooden Bridge	Nos. of Narrow C. Bridge	Length (km)	Road Class/ ¹ case 1	Nos. of Wooden Narrow Bridge case 2	Nos. of Wooden Narrow Bridge
1	Flat	13.0	3	1	0	13.0	1 (F4) } 2A (F5)		0
2	Flat & Rolling	15.0	3	0	0	15.0			0
3	Flat	7.0	3	1	0	7.0			0
4	Flat	13.0	3	7	0	13.0			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: 1,000 Baht)

Road Class	1987	1993	2001
1 (F4)	7,115	9,622	14,919
2A (F5)	4,526	6,541	10,965

5. エンジニアリング

5.1 予備設計

予備設計は、次に示す設計基準を基本に行った。

Design Standard : F4 (if not feasible, P5)

Geometric Design : AASHTO (Rural Highways)

Typical Cross Section : as shown in Figure 1.5.1

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

In case of F5 Standard

Soil Aggregate Surface CBR_>20% : 15.0cm

Selected Material CBR_> 6% : 20.0cm

Pipe Culvert

Standard Size : ø 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 1.5.2

ルート of 線形は, Figure 1.5.2 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 1.5.1 に示す。
道路規程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 ¥)		Remark
		Financial Cost	Economic Cost	
F4 (DBST)	48.0	91,483	82,908	
F5 (Soil Aggregate)	48.0	49,380	44,611	

6. 経済評価

年次別経済費用と便益及び評価結果はTable 1.6.1 及び1.6.2 に示す通りである。
このルートは F 4 規格ではフィージブルでないが F 5 規格では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 1.7.1 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 1.1.1 SUMMARY OF ROAD INVENTORY

Item	Description	
Origin	A. Khong	
Destination	J.R. 2180	
Length		
Total	48.0 km	
Improvement Section	46.0 km	
DOH Road	R. 2160	33.5 km
ARD Road		3.0 km
Others		9.5 km
New Alignment Section		2.0 km
Terrain	Flat and Partially Rolling	
Alignment (Hori./Vert.)	Fair / Fair	
Formation Width	6.0 m - 7.5 m, 6.5 m (Weighted average)	
Embankment Section		
Length	48.0 km	
Height	0.2 m -	1.2 m
Cut Section		
Length	0 km	
Depth	m -	m
Surface Type and Condition		
SBST or DBST	Poor	3.7 km
Soil Aggregate	Poor	40.8 km
Earth	Poor	3.5 km
Pipe Culvert	14 each	
Box Culvert	0 each	0 m
Bridge		
Permanent Bridge	0 each	0 m
Narrow Concrete Bridge	0 each	0 m (4m)
Wooden Bridge	5 each	47.0 m
Overflow Section	1 place	5.0 km

Table 1.1.2 ROAD INVENTORY (1)

PROPOSED ROUTE NO. IM-1

ROUTE NO. 2160
ARD
RURAL

A. KHONG (J.R. 2150, 2160) ~ J.R. 2180
C. NAKHON RATCHASIMA/CHAIYAPHUM

L = 48.0 Km.

STATION (Km)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30			
VILLAGE		A. KHONG																		
- Name																				
- Household (H)																				
- Population (P)																				
TERRAIN		Flat										Rolling				Flat				
CROSS SECTION	Formation Width (m)	6.00	7.00	6.50	7.00			7.50	6.50	7.50	7.00	6.50	7.00	6.00	6.50	7.50				
	Embankment Height (m)	0.40		0.30		0.20	0.50	0.40	0.50	0.40	0.60	1.00	0.40	0.70	0.50	1.80	0.90			
	Cutting Depth (m)																			
PAVEMENT	Type/Length	DT	Laterite							DT	Laterite			DT	Laterite					
	Condition	Good								Poor										
FLOODING	Overflow Length(Km)/Height(m)																			
LAND USE	Left	Paddy		Kenaf	Paddy					Cassava			Paddy	Kanaf	Paddy					
	Right	Paddy							Cassava			Bush	Paddy	Cassava	Paddy					
PIPE CULVERT	Total Number	14 pipes																		
BOX CULVERT & BRIDGE	Station (Km)	2.8																		
	Dimension	W-Br 4.30 x 13.00																		
RIGHT OF WAY (m)																				
ALIGNMENT	Horizontal	Fair																		
	Vertical	Fair																		
ROUTE NO., AGENCIES		DOH 2160																		

ROAD INVENTORY (2)

PROPOSED ROUTE NO. IM-1

ROUTE NO. 2160
ARD
RURAL

A. KHONG (J.R. 2150, 2160) ~ J.R. 2180 (Cont'd)

L = 48.0 Km.

C. NAKHON RATCHASIMA/CHAIYAPHUM

STATION (Km)		30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
VILLAGE																	
- Name																	
- Household (H)																	
- Population (P)																	
TERRAIN		Flat															
CROSS SECTION	Formation Width (m)	7.00	6.50	7.00	6.00												
	Embankment Height (m)	0.40	0.30	1.00													
	Cutting Depth (m)																
PAVEMENT	Type/Length	Laterite			Earth			Laterite									
	Condition	Poor		Fair		Poor		Poor									
FLOODING	Overflow Length(Km)/Height(m)	L=1.0 H=0.4															
LAND USE	Left	Paddy															
	Right	Paddy															
PIPE CULVERT	Total Number																
BOX CULVERT & BRIDGE	Station (Km)	32.7 38.0 44.6 46.1															
	Dimension	W-Br 4.50 x 8.00 W-Br 4.50 x 15.00 W-Br 4.50 x 5.50 W-Br 4.50 x 5.50															
RIGHT OF WAY (m)		15.0 15.0															
ALIGNMENT	Horizontal	Fair															
	Vertical	Fair															
ROUTE NO., AGENCIES		DOH 2160		ARD		Rural		Rural									

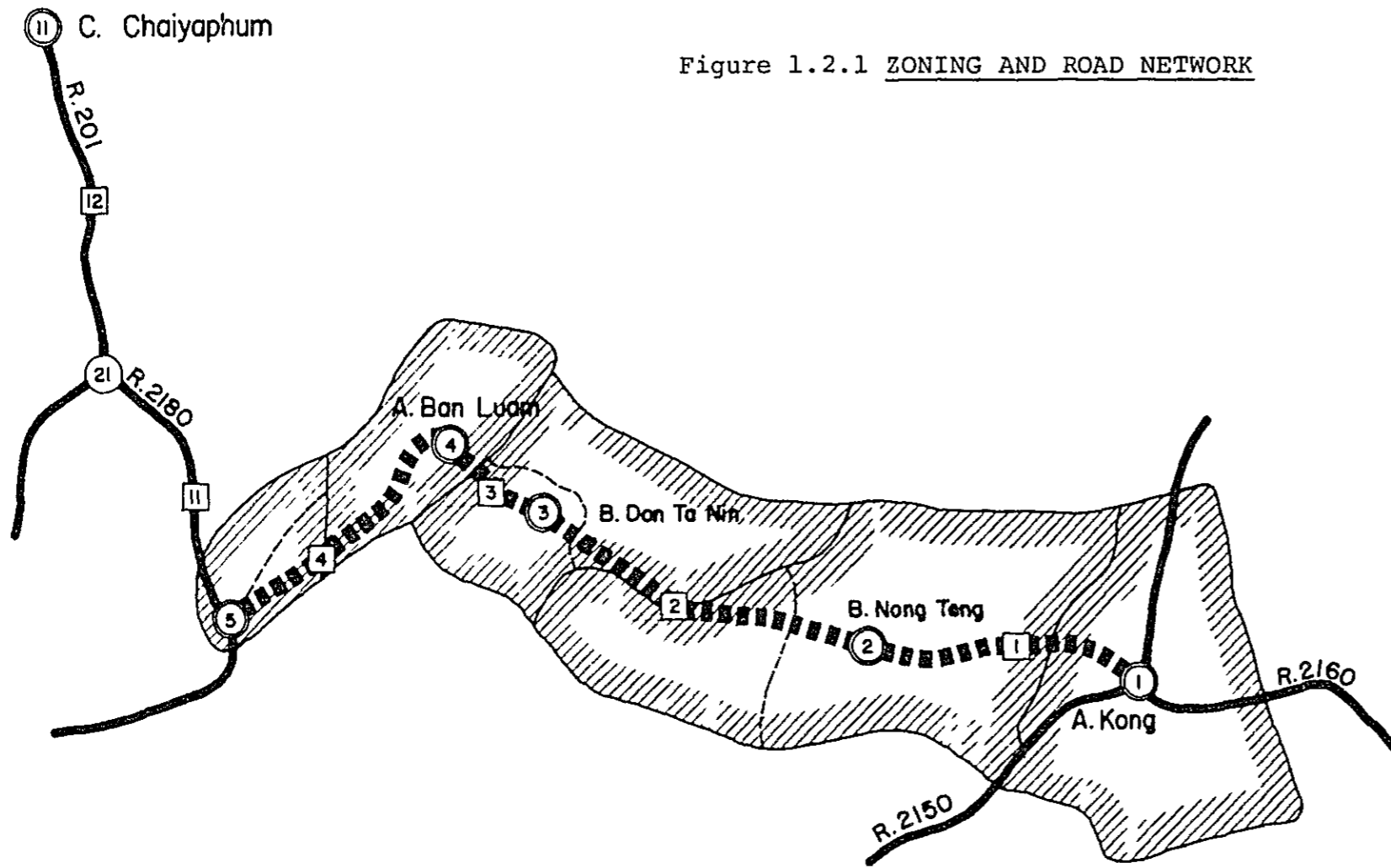


Figure 1.2.1 ZONING AND ROAD NETWORK

PROPOSED ROUTE NO. IM-1

LEGEND

- ① Traffic Zone
- Ⓜ Dummy Node
- 35 Road Link Code
- ▬▬▬▬ Proposed Road Link
- ▬▬▬▬ Other Road

Table 1.2.1 ZONE CHARACTERISTICS

Zone	Administrative Division			Population			Zone Attraction
	Changwat	Amphoe	Tambon Code	Tambon	%	Zone	
1	Nakhon Ratchasima	Khong	1	13,214	100	13.2	64.3
			6	5,849	90		
			7	7,071	70		
			Total			10.2	
3	Nakhon Ratchasima	Ban Luam	2	2,272	100	2.3	
			3	6,575	50		
4	Nakhon Ratchasima	Ban Luam	1	6,349	100	6.3	20.4
5	Chaiyaphum	Chatturat	8	5,317	20	1.1	
			9	4,637	30		
11	Chaiyaphum	Muang	1	15,713	100	15.7	137.4

Table 1.2.2 LINK CHARACTERISTICS

Link No	Node Pair		Length		Grade		Remark
	Start Node	End Node	W	W	W	W	
1	1. A. Kong	2. B. Nong Teng	13.0	13.0	9	4	R.2160
2	2. B. Nong Teng	3. B. Don Ta Nin	15.0	15.0	9	4	R.2160
3	3. B. Don Ta Nin	4. K. A. Ban Luam	7.0	7.0	9	4	P.2160
4	4. K. A. Ban Luam	5. J.R.2180	13.0	13.0	11	4	ARD Rural
11	5. J.R.2180	21. J.R.201	11.0	11.0	4	4	R.2180
12	21. J.R.201	11. C. Chaiya phum	15.0	15.0	3	3	R.2

Table 1.2.3 TRAFFIC VOLUME ON ROUTE IM - 1

YEAR	1987					1993					2001					
	LINK	1	2	3	4	AVR.	1	2	3	4	AVR.	1	2	3	4	AVR.
P/C	N+D	3	2	3	1	2	7	6	7	4	6	19	16	18	10	15
	I	2	3	3	2	3	6	8	8	7	7	16	21	20	17	18
	DV	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	TOTAL	5	5	5	4	5	14	15	15	11	14	35	37	38	28	34
L/B	N+D	3	3	3	2	3	10	8	9	5	8	24	20	24	13	20
	I	3	4	4	3	3	8	11	10	9	9	20	27	25	22	24
	DV	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	TOTAL	6	7	7	5	6	18	19	20	14	18	45	48	50	36	44
M/B	N+D	30	25	29	16	25	31	26	30	17	26	30	25	29	16	24
	I	25	34	32	28	30	26	35	33	29	31	25	33	31	27	29
	DV	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	TOTAL	56	59	61	44	54	59	63	64	47	57	56	60	61	44	55
H/B	N+D	2	2	2	1	1	5	4	5	3	4	13	11	13	7	11
	I	2	2	2	2	2	4	6	5	5	5	11	15	14	12	13
	DV	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
	TOTAL	3	4	4	3	3	10	10	11	8	10	24	26	27	19	24
P/P&T	N+D	40	33	39	22	33	50	41	48	26	40	65	54	63	35	53
	I	32	43	40	35	37	39	52	49	43	46	52	69	65	56	60
	DV	0	0	0	0	0	2	2	2	1	2	2	2	2	2	2
	TOTAL	72	76	79	56	70	91	95	99	70	88	119	126	130	93	116
4/T	N+D	7	5	7	3	5	8	6	7	3	6	9	7	8	4	7
	I	2	3	3	2	2	3	4	4	3	3	4	6	6	4	5
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	9	8	9	5	8	11	10	11	6	9	13	13	14	8	12
6/T	N+D	26	20	25	12	20	23	18	22	10	18	19	15	18	9	15
	I	8	11	10	8	9	9	12	11	9	10	10	13	12	9	11
	DV	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	TOTAL	34	31	35	20	29	32	30	34	19	28	29	28	31	18	26
10/T	N+D	9	7	8	4	7	12	10	12	5	9	17	14	17	8	14
	I	3	4	3	3	3	5	6	6	5	5	9	12	11	9	10
	DV	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	12	11	12	7	10	17	16	18	10	15	26	26	28	17	24
ADT	N+D	119	98	116	61	96	145	120	141	75	118	195	161	190	102	158
	I	77	102	96	82	89	101	134	125	108	117	147	196	183	157	170
	DV	0	0	0	0	0	4	5	5	3	4	6	7	7	5	6
	TOTAL	196	200	211	143	185	251	258	272	186	239	349	364	380	264	335
M/C	N+D	181	158	178	113	155	207	182	203	131	178	250	221	245	163	217
	I	70	97	86	94	87	81	112	99	110	101	95	131	114	134	119
	DV	0	0	0	0	0	3	3	3	3	3	3	3	3	3	3
	TOTAL	252	255	264	207	242	291	297	305	244	282	348	355	363	300	339
TOTAL	N+D	300	256	293	174	251	352	302	344	206	296	445	383	435	264	375
	I	148	199	182	176	176	182	246	224	218	218	242	326	298	291	290
	DV	0	0	0	0	0	7	8	8	6	7	10	10	11	8	10
	TOTAL	448	455	475	350	428	542	555	576	430	521	697	719	743	564	675

NOTE

N : NORMAL TRAFFIC
 DV : DEVELOPED TRAFFIC

D : DIVERTED TRAFFIC
 I : INDUCED TRAFFIC

Figure 1.3.1 **LAND USE AND CAPABILITY OF INFLUENCE AREA**
PROPOSED ROUTE NO. IM - 1

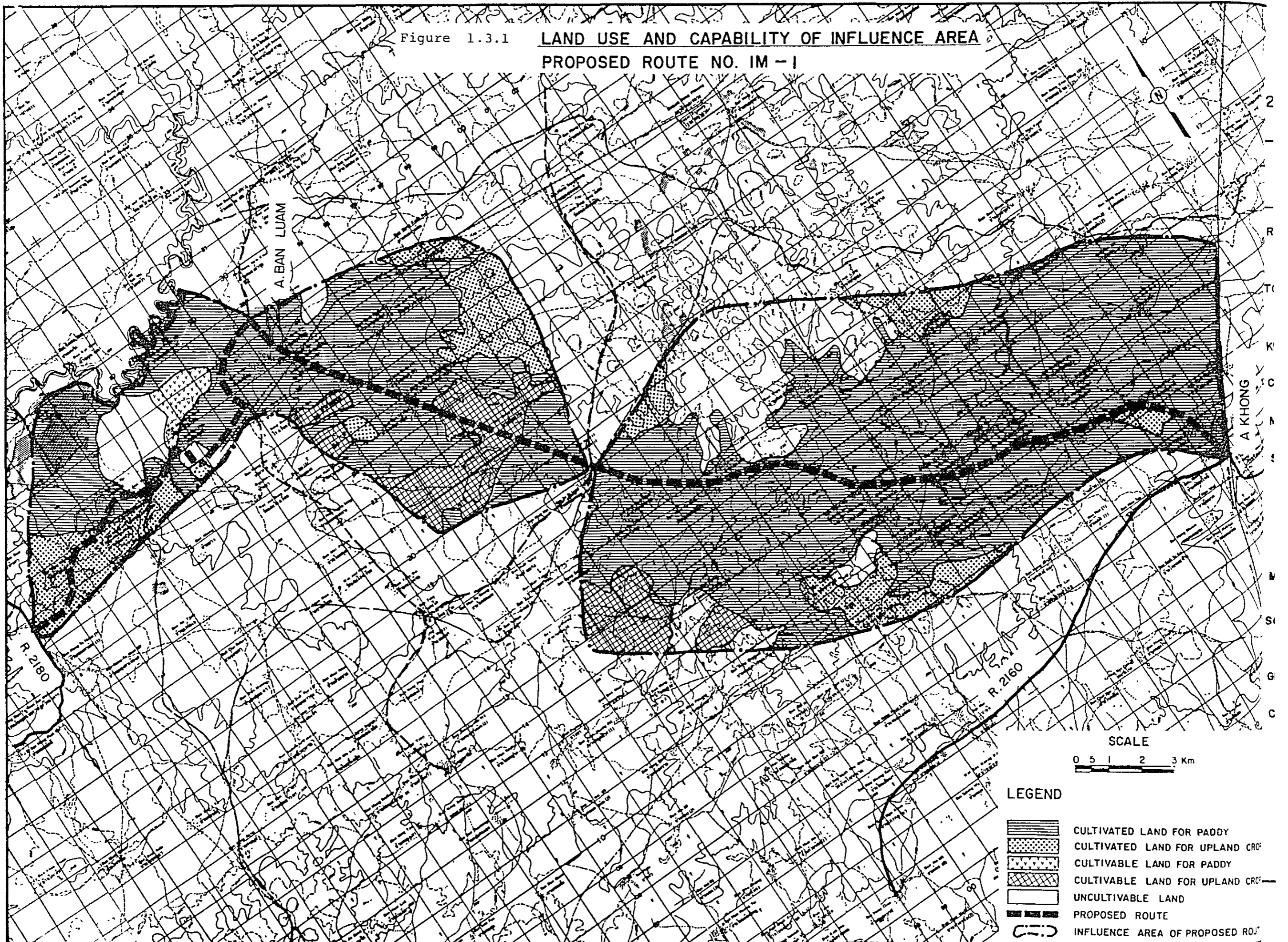
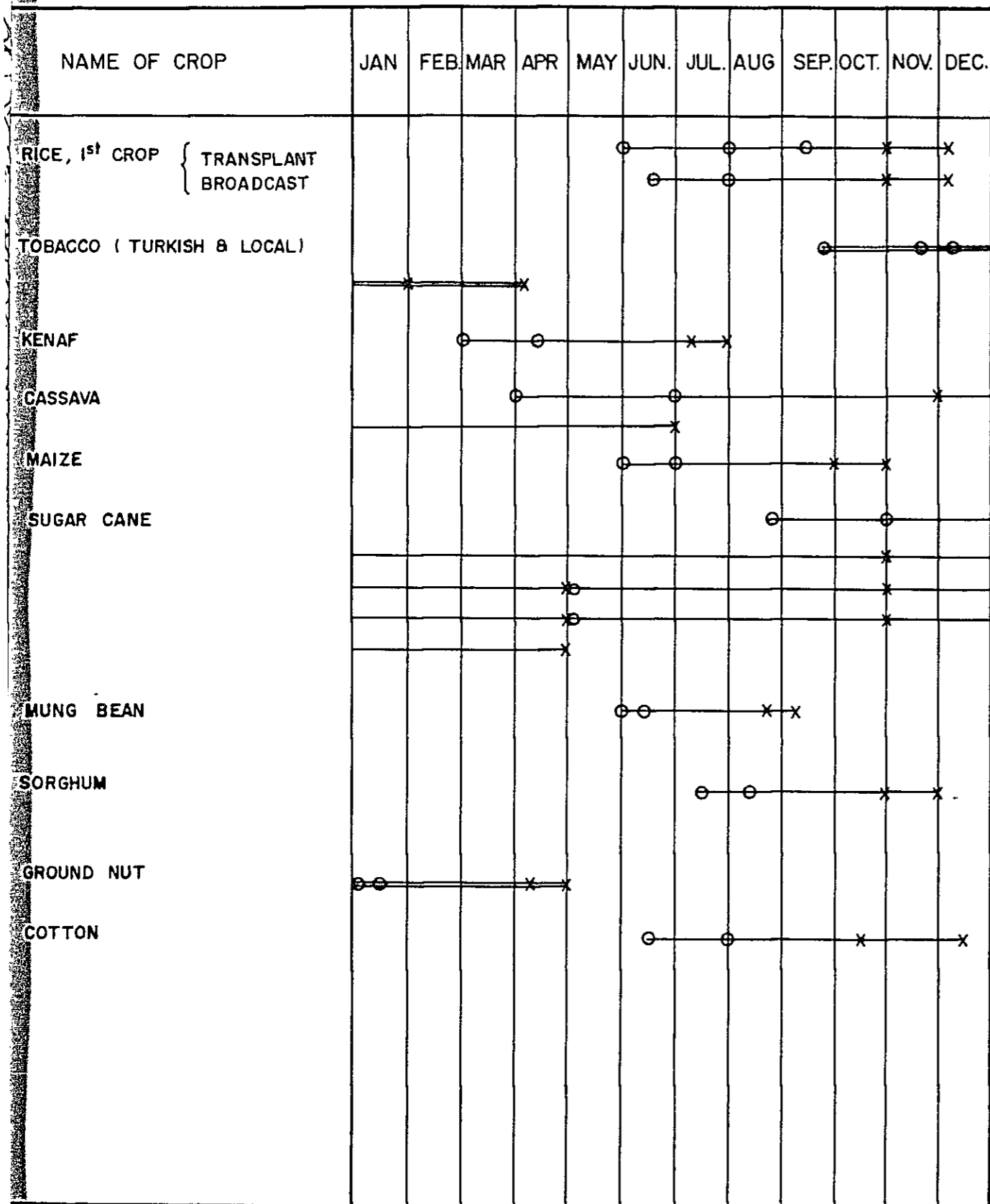


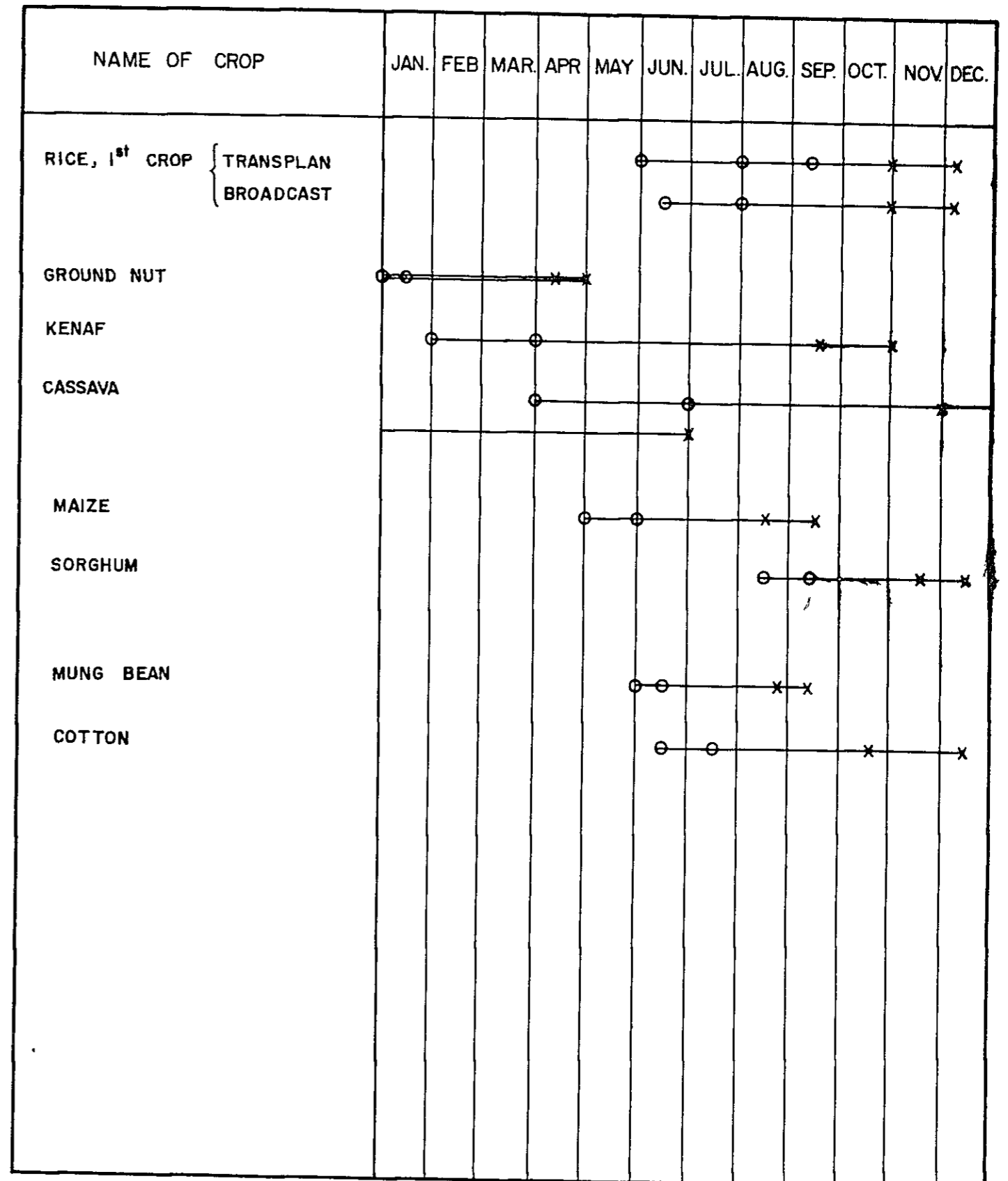
Figure 1.3.2 CROPPING CALENDAR(1)

1200 CHANGWAT CHAIYAPHUM



CROPPING CALENDAR(2)

1300 CHANGWAT NAKHON RATCHASIMA



Note :

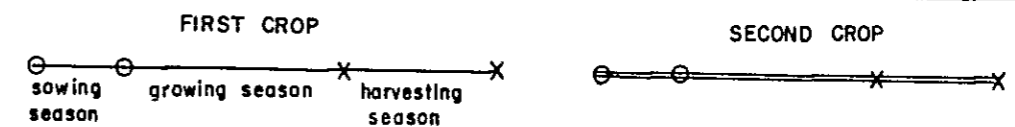


TABLE 1.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[UNIT : 1000 RAI (KM²)]

AMPHOE	AMPHOE	CULTIVATED LAND			UNUSED CULTIVABLE LAND				
		CODE	NAME	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
				121.875 (195.0)	16.250 (26.0)	138.125 (221.0)	1.250 (2.0)	10.313 (16.5)	11.563 (18.5)
1213	CHATTURAT			5.000 (8.0)	5.625 (9.0)	10.625 (17.0)	-	-	-
1303	BAN LUAM			34.375 (55.0)	5.625 (9.0)	40.000 (64.0)	1.250 (2.0)	6.438 (10.3)	7.688 (12.3)
1304	KHONG			82.500 (132.0)	5.000 (8.0)	87.500 (140.0)	-	3.875 (6.2)	3.875 (6.2)

TABLE 1.3.2 CROP PRODUCTION

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)										
1981	97.77	0.25	-	0.06	11.11	-	4.92	-	16.34	114.12
1987	97.77	0.26	-	0.06	11.58	-	4.92	-	16.84	114.61
1993 WITHOUT PROJECT	97.77	0.28	-	0.06	12.08	-	4.92	-	17.35	115.12
WITH PROJECT	99.02	0.30	-	0.06	13.05	-	4.92	-	18.35	117.37
2001 WITHOUT PROJECT	97.77	0.30	-	0.06	12.77	-	4.92	-	18.07	115.84
WITH PROJECT	99.02	0.33	-	0.07	13.80	-	4.92	-	19.13	118.15
CROP YIELD (KG/RAI)										
1981	234.3	293.1	-	150.0	2044.2	-	198.5	-		
1987	234.3	294.9	-	150.0	2056.5	-	198.5	-		
1993 WITHOUT PROJECT	234.3	296.7	-	150.0	2068.9	-	198.5	-		
WITH PROJECT	237.1	300.2	-	150.9	2081.3	-	198.5	-		
2001 WITHOUT PROJECT	234.3	299.0	-	150.0	2085.5	-	198.5	-		
WITH PROJECT	240.9	307.5	-	152.1	2114.8	-	198.5	-		
CROP PRODUCTION (TON)										
1981	22,907	72	-	9	22,711	-	976	-	23,770	46,678
1987	22,907	77	-	9	23,824	-	976	-	24,889	47,796
1993 WITHOUT PROJECT	22,907	82	-	9	24,992	-	976	-	26,062	48,970
WITH PROJECT	23,480	91	-	9	27,153	-	976	-	28,233	51,713
2001 WITHOUT PROJECT	22,907	90	-	9	26,638	-	976	-	27,717	50,624
WITH PROJECT	23,858	101	-	10	29,174	-	976	-	30,265	54,123

NOTE : SYMBOL "--" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 1.3.3 FARMGATE PRICE AND PRODUCTION COST

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	4,332	2,478	-	6,651	677	-	4,841	-
WITH PROJECT (1987 - 2001)	4,440	2,540	-	6,651	694	-	4,962	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	596	490	-	886	829	-	717	-
WITH PROJECT (1987 - 2001)	606	510	-	906	856	-	717	-

TABLE 1.3.4 NET PRODUCTION VALUE

YEAR	(1000 BAHT)					
	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	40,923	7,805	48,728	42,419	8,017	50,436
1993	40,923	8,191	49,114	44,203	9,092	53,295
2001	40,923	8,740	49,663	45,883	9,867	55,750

Figure 1.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE

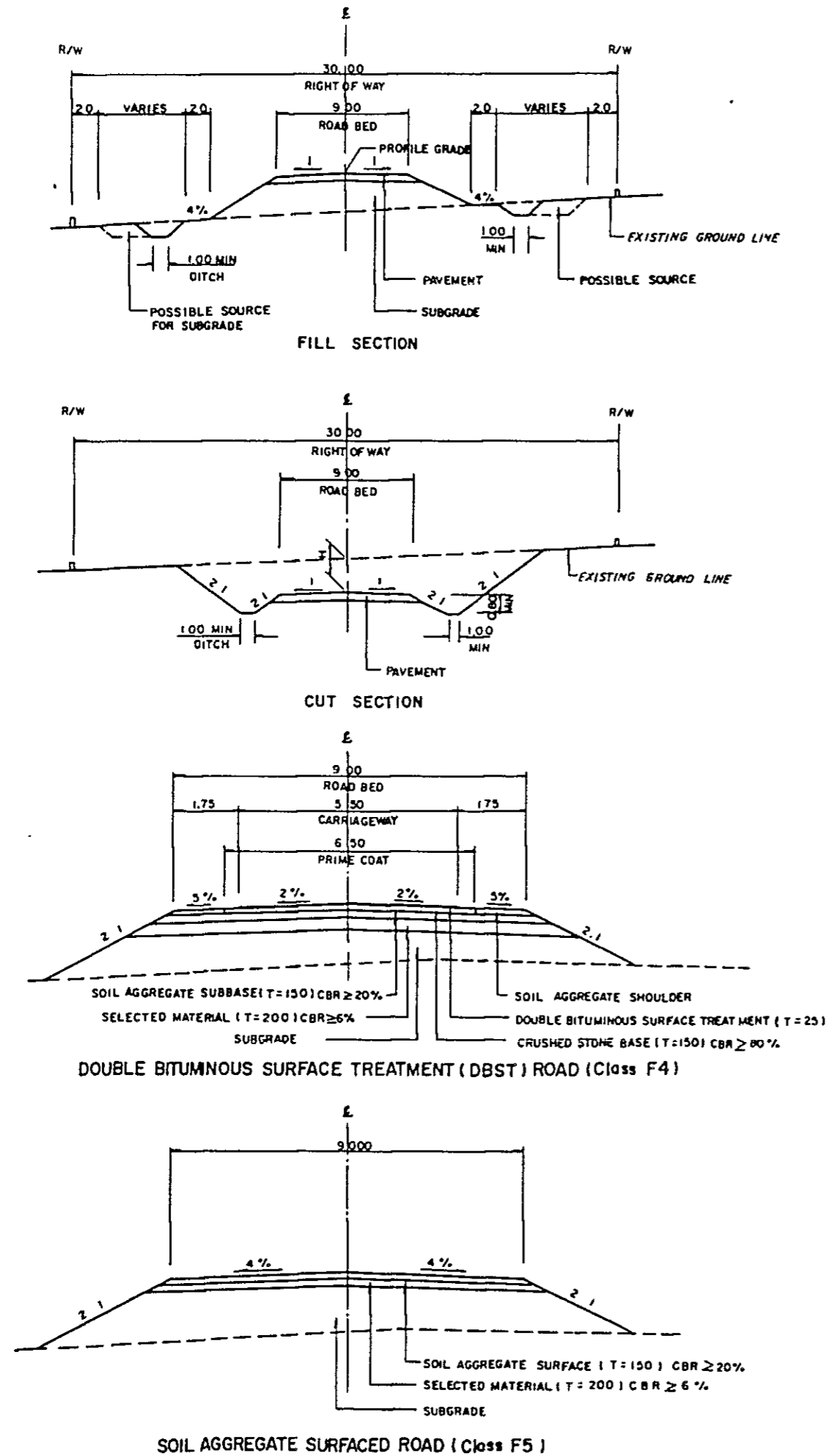
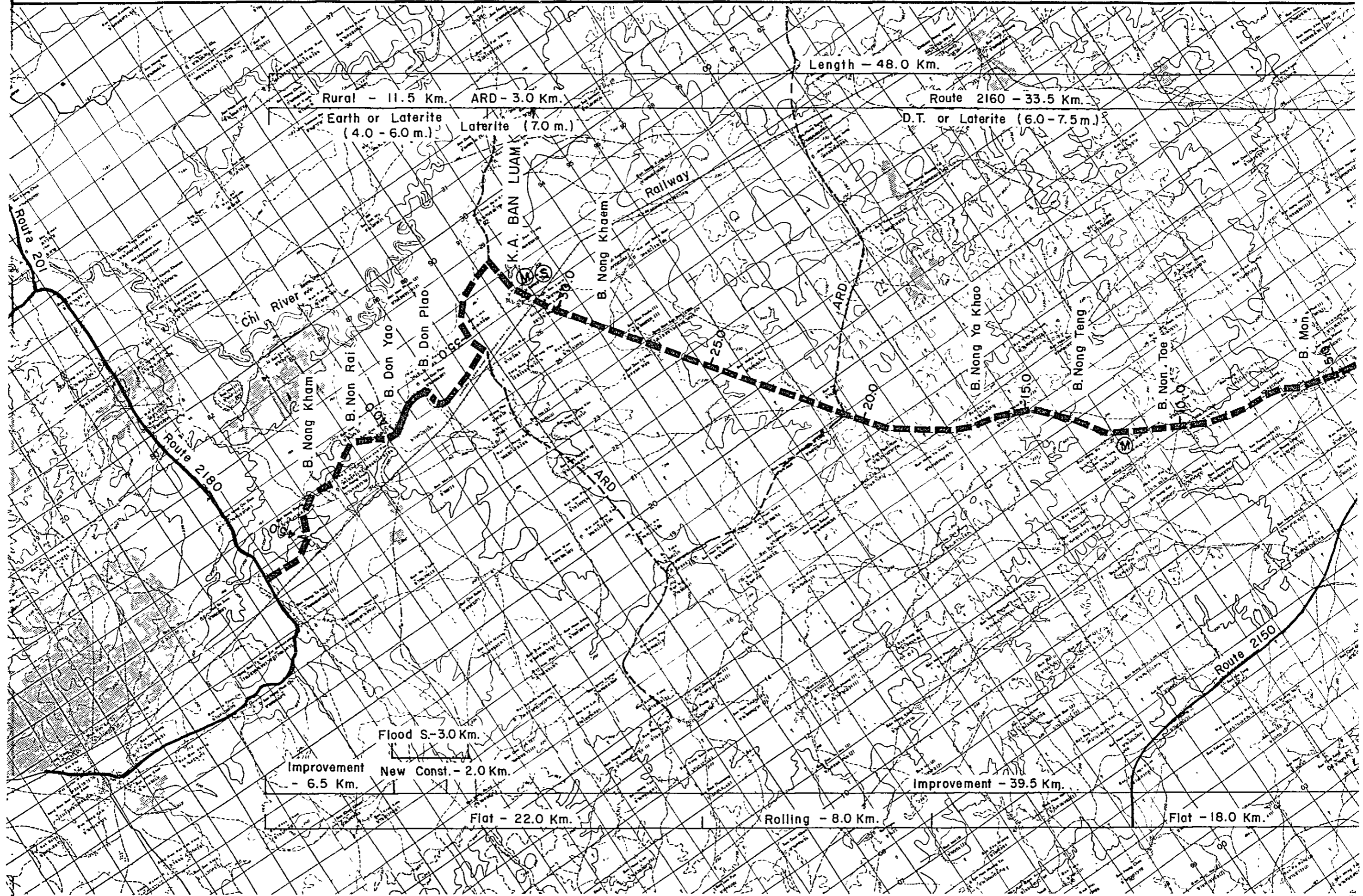
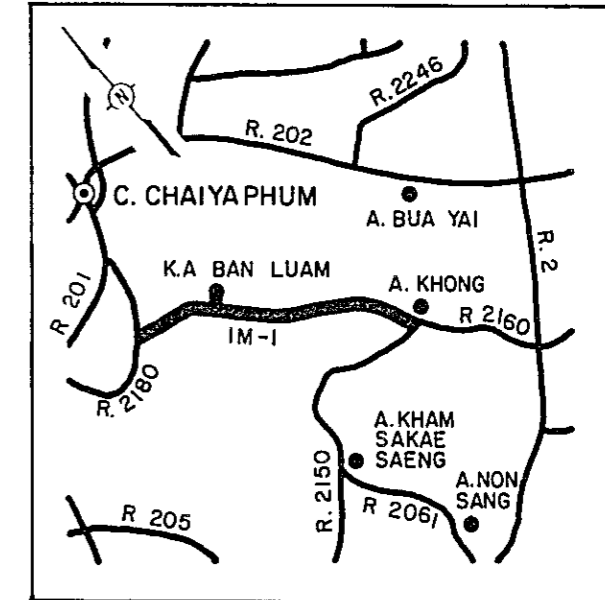
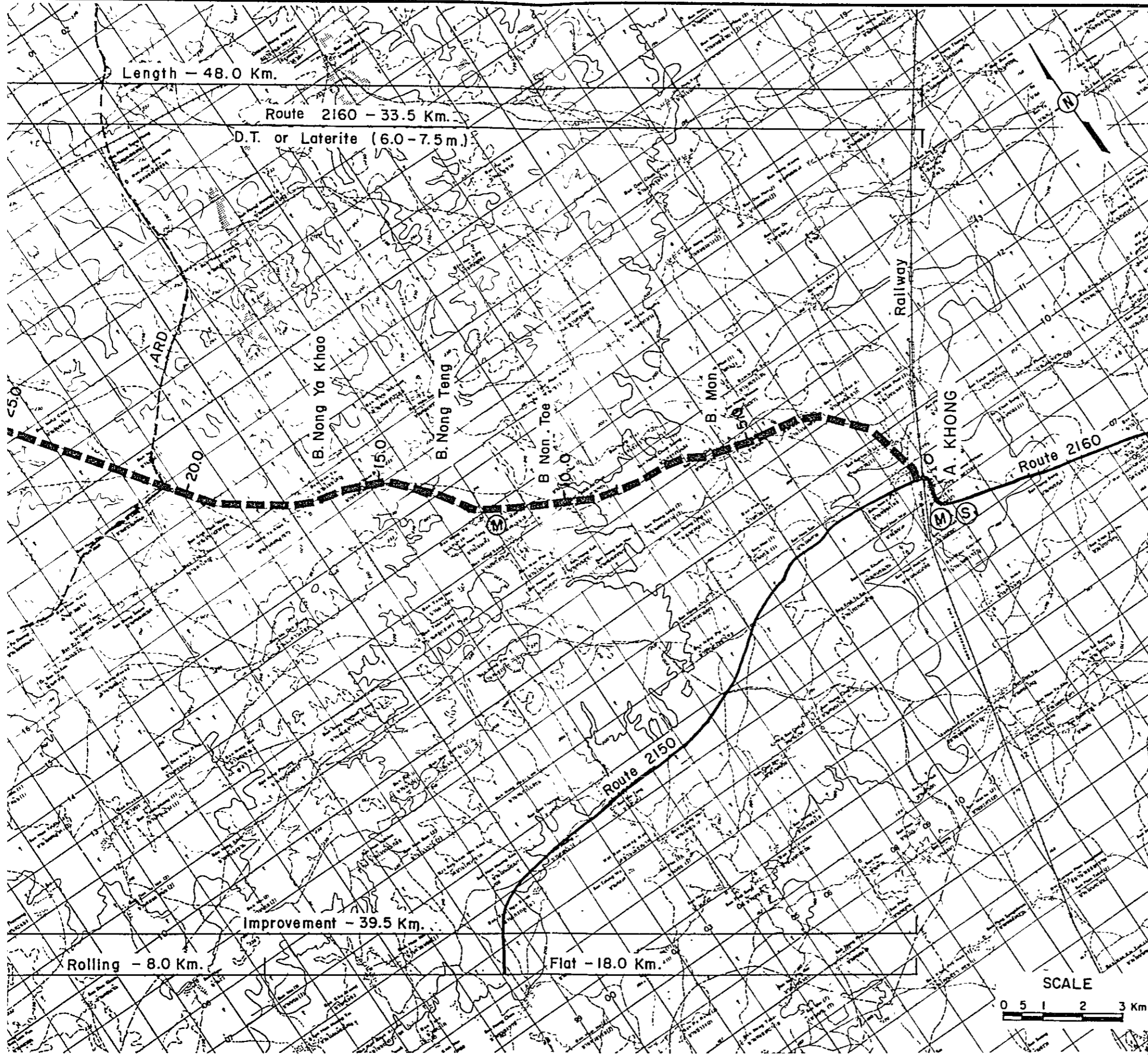


Figure 1.5.2 PROPOSED ROUTE NO. IM-1

C. NAKHON RATCHASIMA
C. CHAIYAPHUM

A. KHONG (J.R. 2150, 2160) - J. R. 2180
ROUTE NO. R. 2160 + ARD + RURAL





BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	2.8	C-7.00 x 16.00	W-4.30 x 13.00
2	32.7	C-7.00 x 10.00	W-4.50 x 8.00
3	38.0	C-7.00 x 18.00	W-4.50 x 15.00
4	39.0	C-7.00 x 10.00	-
5	44.6	C-7.00 x 8.00	W-4.50 x 5.50
6	46.1	C-7.00 x 8.00	W-4.50 x 5.50

LEGEND

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

SCALE



Table 1.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-1 (48.0 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	114	1,710	1,556	114	1,710	1,556
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	196,800	8,856	8,058	196,800	8,856	8,058
Selected Material	m ³	80	101,800	8,144	7,248	101,800	8,144	7,248
Soil Aggregate Surface or Subbase	m ³	105	71,300	7,486	6,662	71,300	7,486	6,662
Crushed Stone Base	m ³	370	46,800	17,316	15,930	3,400	1,258	1,157
Soil Aggregate Shoulder	m ³	105	20,200	2,121	1,887	1,500	157	140
Prime Coat and DBST	m ²	55	264,000	14,520	13,068	19,300	1,062	956
Pipe Culvert	m	2,100	2,110	4,431	4,076	2,110	4,431	4,076
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	72	2,880	2,563	72	2,880	2,563
Sub Total (a)				67,464	61,052		35,985	32,420
Miscellaneous Works (a) x 7%				4,722	4,274		2,519	2,269
Total (b)				72,186	65,326		38,504	34,689
PHYSICAL CONTEGENCY (b) x 15%				10,828	9,799		5,776	5,203
ENGINEERING AND								
ADMINISTRATION (b) x 10%				7,219	6,533		3,850	3,469
Sub Total				18,047	16,332		9,626	8,672
LAND ACQUISITION								
Highly Developed Land	ha	50,000	25	1,250	1,250	25	1,250	1,250
Less Developed Land	ha	15,000	0	0	0	0	0	0
Sub Total				1,250	1,250		1,250	1,250
GRAND TOTAL				91,483	82,908		49,380	44,611

Table 1.6.1 COST AND BENEFITS
(F4 STANDARD)

YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
	(1000 BAHT)						
1984	16,581	0	0	0	0	23,295	0
1985	41,452	0	0	0	0	51,997	0
1986	24,871	0	0	0	0	27,856	0
1987	0	1,708	7,115	-278	8,545	0	7,629
1988	0	2,061	7,533	-262	9,332	0	7,439
1989	0	2,414	7,951	-246	10,119	0	7,202
1990	0	2,767	8,369	-230	10,906	0	6,931
1991	0	3,120	8,786	-213	11,693	0	6,635
1992	0	3,473	9,204	-197	12,480	0	6,323
1993	0	3,826	9,622	-181	13,267	0	6,001
1994	23,232	4,107	10,284	-157	14,235	10,509	5,749
1995	0	4,389	10,946	-133	15,203	0	5,482
1996	0	4,671	11,608	-109	16,171	0	5,207
1997	0	4,953	12,271	-85	17,139	0	4,927
1998	0	5,235	12,933	-61	18,107	0	4,648
1999	0	5,517	13,595	-37	19,075	0	4,371
2000	0	5,798	14,257	-13	20,043	0	4,101
2001	-38,812	6,080	14,919	12	21,011	-7,091	3,839
TOTAL	67,324	60,118	159,392	-2,188	217,323	106,566	86,484

DISCOUNTED ECONOMIC COSTS :	106,566
DISCOUNTED ECONOMIC BENEFITS :	86,484
AGRICULTURAL DEVELOPMENT BENEFIT	22,979
VOC SAVING	64,780
RMC SAVING	-1,276
NET PRESENT VALUE :	-20,082
BENEFIT COST RATIO :	0.81
INTERNAL RATE OF RETURN :	9.6 %

Table 1.6.2 COST AND BENEFITS
(F5 STANDARD)

YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
	(1000 BAHT)						
1984	0	0	0	0	0	0	0
1985	17,844	0	0	0	0	22,384	0
1986	26,767	0	0	0	0	29,979	0
1987	0	1,708	4,526	-118	6,115	0	5,460
1988	0	2,061	4,861	-108	6,815	0	5,433
1989	0	2,414	5,197	-97	7,514	0	5,348
1990	0	2,767	5,533	-86	8,214	0	5,220
1991	0	3,120	5,869	-76	8,913	0	5,058
1992	0	3,473	6,205	-65	9,613	0	4,870
1993	0	3,826	6,541	-54	10,312	0	4,665
1994	1,694	4,107	7,094	-38	11,164	766	4,509
1995	0	4,389	7,647	-21	12,015	0	4,333
1996	0	4,671	8,200	-5	12,866	0	4,143
1997	0	4,953	8,753	12	13,718	0	3,943
1998	0	5,235	9,306	28	14,569	0	3,739
1999	0	5,517	9,859	45	15,420	0	3,534
2000	0	5,798	10,412	61	16,272	0	3,329
2001	-21,196	6,080	10,965	77	17,123	-3,872	3,128
TOTAL	25,109	60,118	110,968	-445	170,642	49,256	66,712

DISCOUNTED ECONOMIC COSTS :	49,256
DISCOUNTED ECONOMIC BENEFITS :	66,712
AGRICULTURAL DEVELOPMENT BENEFIT	22,979
VOC SAVING	44,125
RMC SAVING	-393
NET PRESENT VALUE :	17,456
BENEFIT COST RATIO :	1.35
INTERNAL RATE OF RETURN :	15.7 %

Table 1.7.1 SOCIAL INDICATORS
(Proposed Route IM-1)

Population (1,000)		Education		Note:
1982	: 27.9	Access to Secondary School		
1993	: 29.3	Number of Student in 1993 (1,000) 2/	: 4.4	
Average travelling speed, without (kph)	: 40	Average distance to school (km)	: 8.4 (8.5)	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.
		Per capita time savings (10 ⁻⁴)	: 0.218	
Isolation		Score	: 117	3/ Numbers of the sample areas
Access to Amphoe		Teacher Intensity		
Average distance to Amphoe (km) 1/	: 8.7 (8.8)	Number of teachers 3/		4/ (Number of University Graduate Teachers)/(Total Number of Student) x 1,000
Per capita time savings (10 ⁻⁴)	: 0.034	University graduate	: -	
Score	: 100	Total	: 8	5/ (Total of Teachers)/(Total Number of Student) x 1,000
Access to Artery Highway		Number of Student	: 239	
Average distance to highway (km) 1/	: 12 (13)	Indicators		6/ Sum of 4/ and 5/
Per capita time savings (10 ⁻⁴)	: 0.054	E1 4/	: -	
Score	: 117	E2 5/	: 33.5	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
Impassability		E 6/	: 33.5	
Impassable week a year	: 12	Degree of Improvement 7/	: 2.04	8/ Estimated gross value of crop production in the areas of influence
Impassability per year	: 0.231	Score	: 130	
Impassability per capita (10 ⁻⁴)	: 0.079	Disparity		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.
Score	: 658	G.P.V. in 1993 (Mn B) 8/		
Health		With project	: 128.3	
Access to Hospital		Without project	: 121.2	
Average distance to Hospital (km) 1/	: 12 (14)	Per capita G.P.V. in 1993 (B)		
Per capita time savings (10 ⁻⁴)	: 0.062	With project (W)	: 4,379	
Score	: 147	Without project (w)	: 4,137	
Access to Medical Facilities		Degree of Disparity		
Average distance to facilities (km) 1/	: 5.1 (5.3)	(A/W) - (A/w) 9/	: 0	
Per capita time savings (10 ⁻⁴)	: 0.021	Score	: 0	
Score	: 84	Total Score	: 1,374	

PROPOSED ROUTE NO. IM - 2

Changwat · Buri Ram

B. Waeo (J.R. 202) - K.A. Na Pho

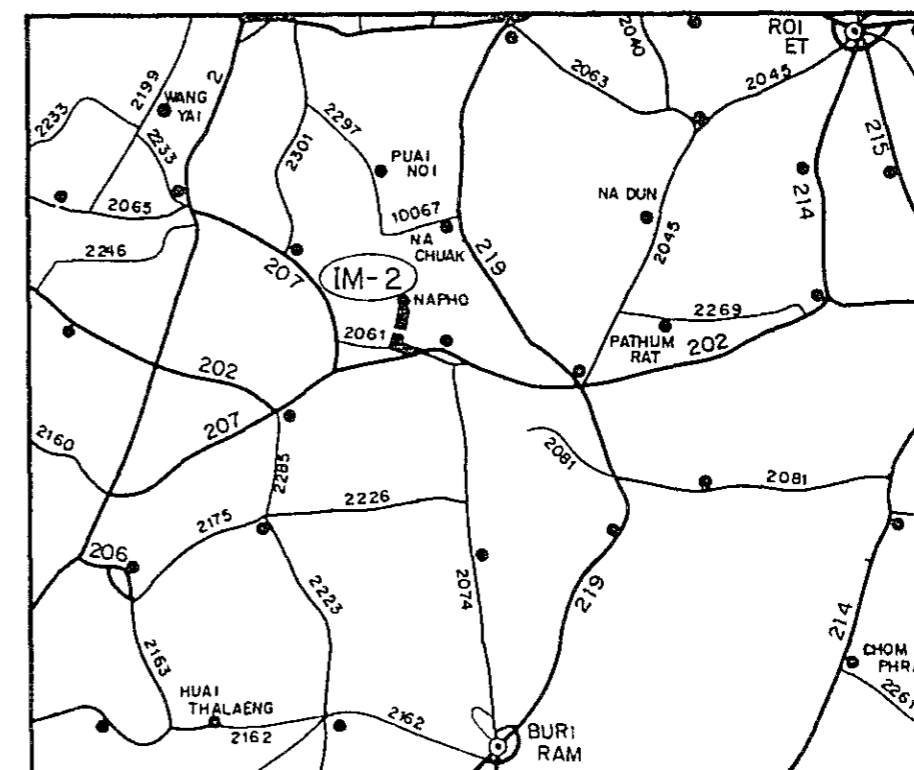
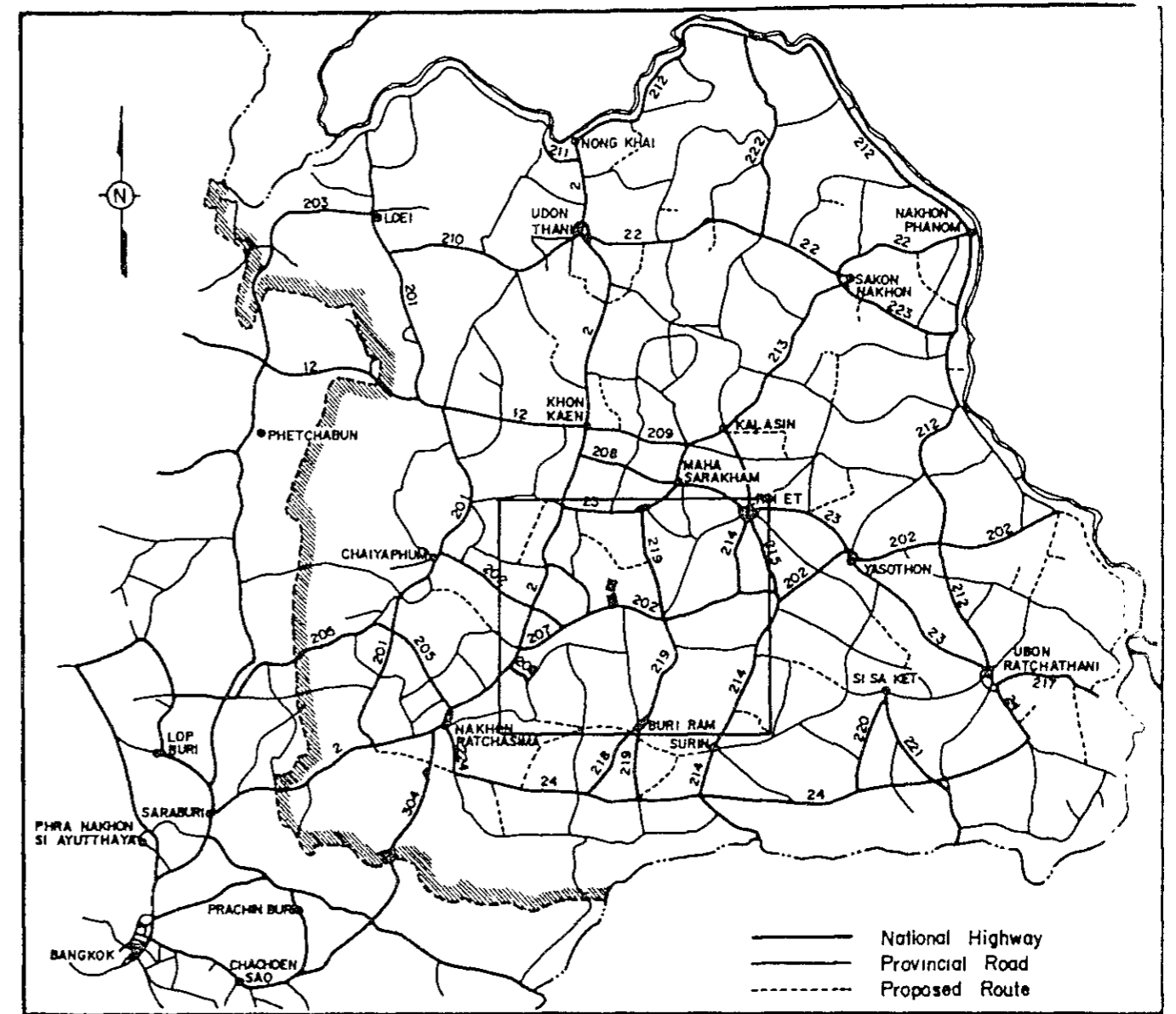
Length · 9.4 KM.

LOCATION OF PROPOSED ROUTE

SUMMARY

PROPOSED ROUTE IM-2

Item	Description
Changwat	Buri Ram
Origin	B Waec (J.R. 202)
Destination	K.A. Na Pho
Length	
Total	9.4 km
Improvement Section	9.4 km
DOH Road	R.2061 1.0 km
ARD Road	8.4 km
Others	0 km
New Alignment Section	0 km
Surface Type and Condition	Soil Aggregate, Good
Terrain	Flat
Influence Area	
Area	58 km ²
Population (1982)	11,400
Principal Crops	Paddy
Traffic (ADT)	
Existing	169
1993	668
2001	900
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	16,277 .10 ³ ฿
Economic	14,778 .10 ³ ฿
IRR	10.2 %
B/C	0.86
Recommendation	For further consideration



1. 概要

1.1 計画路線の概要

本路線は、Buri Ram県の北部に位置する。県道 202号線のWaeo村を起点とし、ルートは北に走りNapho 準県で終る。その総延長は 9.4kmである。(Figure 2.5.2 参照)

沿道の地形はほぼ平坦である。影響圏内には、いくつかの村が存在しその総人口は11,400である。

沿道のNapho 準郡には、ただ一ヶ所の医療センターしかないが、本路線の起点近くのPhut Thaisong 郡には、病院が1ヶ所ある。

本路線はNapho 準郡と幹線道路、国道 202号線とを結ぶ重要な路線となる。

1.2 現道の状況

計画路線に利用した現道の状況は、Table 2.1.1 に要約し、その詳細はTable 2.1.2 のインベントリー調査の結果に示した。

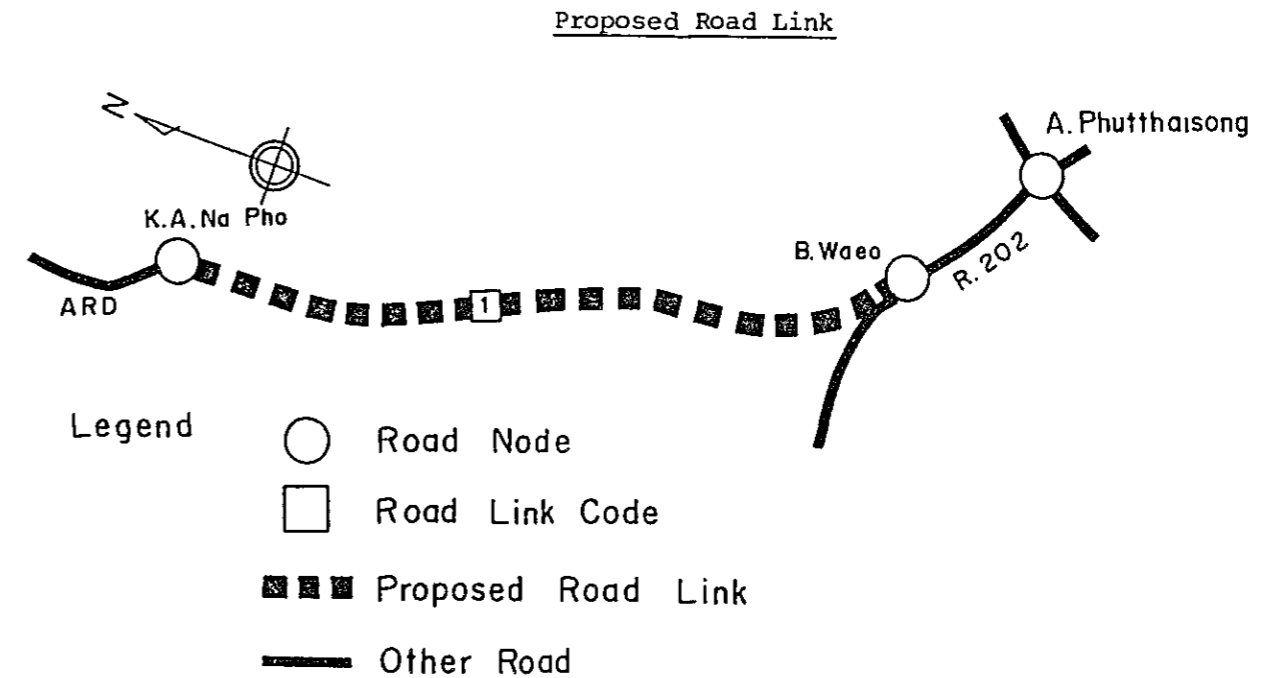
2. 交通

2.1 予測手法

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、本調査で実施したマニュアルカウンティングのデータ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
Manual Counts (1982)	1	-	83	1	33	1	9	14	23	5	169

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	1048

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	94	14	109

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2)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	1.2	1.1
PASSENGER MOVEMENT	5.5	5.6	5.7

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981	1987	1993
	1987	1993	2001
NON-AGRI. AGRICULTURE	7.1	7.2	7.3
FREIGHT	6.2	6.3	6.4

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
DEVELOPED	0.0	3.0	3.0

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

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	0.0	70.3	0.8	28.0	0.8	17.6	27.5
	1987	4.6	65.7	3.4	24.1	2.1	17.5	24.4	42.4	15.6
	1993	10.2	60.2	6.6	19.4	3.7	17.3	20.8	39.3	22.7
	2001	17.6	52.8	10.7	13.2	5.8	17.0	16.0	35.0	32.0

2) 将来 A D T

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 2.2.1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	F/P&T	4/T	6/T	10/T			
1987	8	6	43	4	128	16	28	10	243	282	525
1993	26	16	49	9	165	17	32	19	333	334	668
2001	68	42	51	22	224	18	39	35	499	401	900

3. 農業開発

3.1. 現況

影響圏は、極めて狭いが、農耕地は水田のみであり、残余の未開発可耕地も水田用地である。既墾の水田地帯は、広い範囲で塩害の影響が甚しいため、水稻の平均収量は、他の地帯と比較して低くなっている。

圏内の土地利用及び土地適応性の状況は、Table 2.3.1.とFigure 2.3.1.に示し、また、Buri Ram県地域の作物暦はFigure 2.3.2.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、単位当たり収量及び生産量はTable 2.3.2.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てTable 2.3.3.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 2.3.4.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							
	No. Terrain	Without Project				With Project		
		Length (km)	Road/ ¹ class	Nos. of wooden Bridge	Nos. of Narrow C. Bridge	Length (km)	Road Class/ ¹ case 1	case 2
1 Flat	9.4	2B	1	0	9.4	1 (F4)	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

(unit: 1,000 Baht)

Road Class	1987	1993	2001
1 (F4)	1,074	1,692	3,002
2A (F5)	399	821	1,754

5. エンジニアリング

5.1 予備設計

予備設計は、次に示す設計基準を基本に行った。

Design Standard	:	F4 (if not feasible, F5)
Geometric Design	:	AASHTO (Rural Highways)
Typical Cross Section	:	as shown in Figure 2.5.1
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
In case of F5 Standard		
Soil Aggregate Surface CBR _{>} 20%	:	15.0cm
Selected Material CBR _{>} 6%	:	20.0cm
Pipe Culvert		
Standard Size	:	φ 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: 2.5.2

ルートの線形は、Figure 2.5.2 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 2.5.1 に示す。道路規程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。

TOTAL FINANCIAL AND ECONOMIC CONSTRUCTION COST

Road Class	Length (km)	Construction Cost (10 ³ ¥)		Remarks
		Financial Cost	Economic Cost	
F4 (DBST)	9.4	16,277	14,778	
F5 (Soil Aggregate)	9.4	8,809	7,985	

6. 経済価格

年次別経済費用と便益及び評価結果はTable 2.6.1及び2.6.2に示す通りである。

このルートはF4規格ではフィージブルでないがF5規格では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 2.7.1に示す通りである。

Table 2.1.1 SUMMARY OF ROAD INVENTORY

Item	Description	
Origin	B. Waeo (J.R. 202)	
Destination	K.A. Na Pho	
Length		
Total		9.4 km
Improvement Section		9.4 km
DOH Road	R. 2061	1.0 km
ARD Road		8.4 km
Others		0 km
New Alignment Section		0 km
Terrain	Flat	
Alignment (Hori./Vert.)	Fair / Fair	
Formation Width	6.5 m - 8.0 m, 6.7 m (Weighted average)	
Embankment Section		
Length		9.4 km
Height	0.3 m - 0.8 m	
Cut Section		
Length		0 km
Depth	m - m	
Surface Type and Condition		
SBST or DBST		0 km
Soil Aggregate	Good	9.4 km
Earth		0 km
Pipe Culvert	9 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	5.1 m
Overflow Section	0 place	0 km

Table 2.1.2 ROAD INVENTORY

PROPOSED ROUTE NO. IM-2

ROUTE NO. 2061
ARD

B. WAEO (J.R. 202) ~ K.A. NA PHO

L = 9.4 K

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)	8.00	6.50		6.80													
	Embankment Height (m)	0.80	0.50	0.30	0.70	0.80												
	Cutting Depth (m)																	
PAVEMENT	Type/Length	Laterite																
	Condition					Good		Poor		Fair								
FLOODING	Overflow Length(Km)/Height(m)																	
LAND USE	Left	Paddy																
	Right	Paddy																
PIPE CULVERT	Total Number	9 Pipes																
BOX CULVERT & BRIDGE	Station (Km)	2.6																
	Dimension	W-Br. 4.60 x 5.10																
RIGHT OF WAY (m)		16.50																
ALIGNMENT	Horizontal	Fair																
	Vertical	Fair																
ROUTE NO., AGENCIES		DOH 2061	ARD															

Table 2.2.1 TRAFFIC VOLUME ON ROUTE IM - 2

YEAR	1987		1993		2001	
LINK	1 AVR.		1 AVR.		1 AVR.	
P/C	N+D	7 7	22 22	58 58		
	I	1 1	3 3	9 9		
	DV	0 0	1 1	2 2		
	TOTAL	8 8	26 26	68 68		
L/B	N+D	5 5	14 14	35 35		
	I	1 1	2 2	5 5		
	DV	0 0	0 0	1 1		
	TOTAL	6 6	16 16	42 42		
M/B	N+D	37 37	41 41	43 43		
	I	6 6	6 6	6 6		
	DV	0 0	1 1	2 2		
	TOTAL	43 43	49 49	51 51		
H/B	N+D	3 3	8 8	19 19		
	I	0 0	1 1	3 3		
	DV	0 0	0 0	1 1		
	TOTAL	4 4	9 9	22 22		
P/P&T	N+D	111 111	139 139	189 189		
	I	17 17	21 21	28 28		
	DV	0 0	5 5	7 7		
	TOTAL	128 128	165 165	224 224		
4/T	N+D	14 14	14 14	15 15		
	I	2 2	2 2	2 2		
	DV	0 0	1 1	1 1		
	TOTAL	16 16	17 17	18 18		
6/T	N+D	24 24	27 27	33 33		
	I	4 4	4 4	5 5		
	DV	0 0	1 1	1 1		
	TOTAL	28 28	32 32	39 39		
10/T	N+D	9 9	16 16	30 30		
	I	1 1	2 2	4 4		
	DV	0 0	1 1	1 1		
	TOTAL	10 10	19 19	35 35		
ADT	N+D	211 211	281 281	421 421		
	I	32 32	42 42	63 63		
	DV	0 0	10 10	15 15		
	TOTAL	243 243	333 333	499 499		
M/C	N+D	259 259	306 306	374 374		
	I	22 22	24 24	23 23		
	DV	0 0	5 5	5 5		
	TOTAL	282 282	334 334	401 401		
TOTAL	N+D	471 471	587 587	795 795		
	I	54 54	66 66	86 86		
	DV	0 0	15 15	19 19		
	TOTAL	525 525	668 668	900 900		

NOTE

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

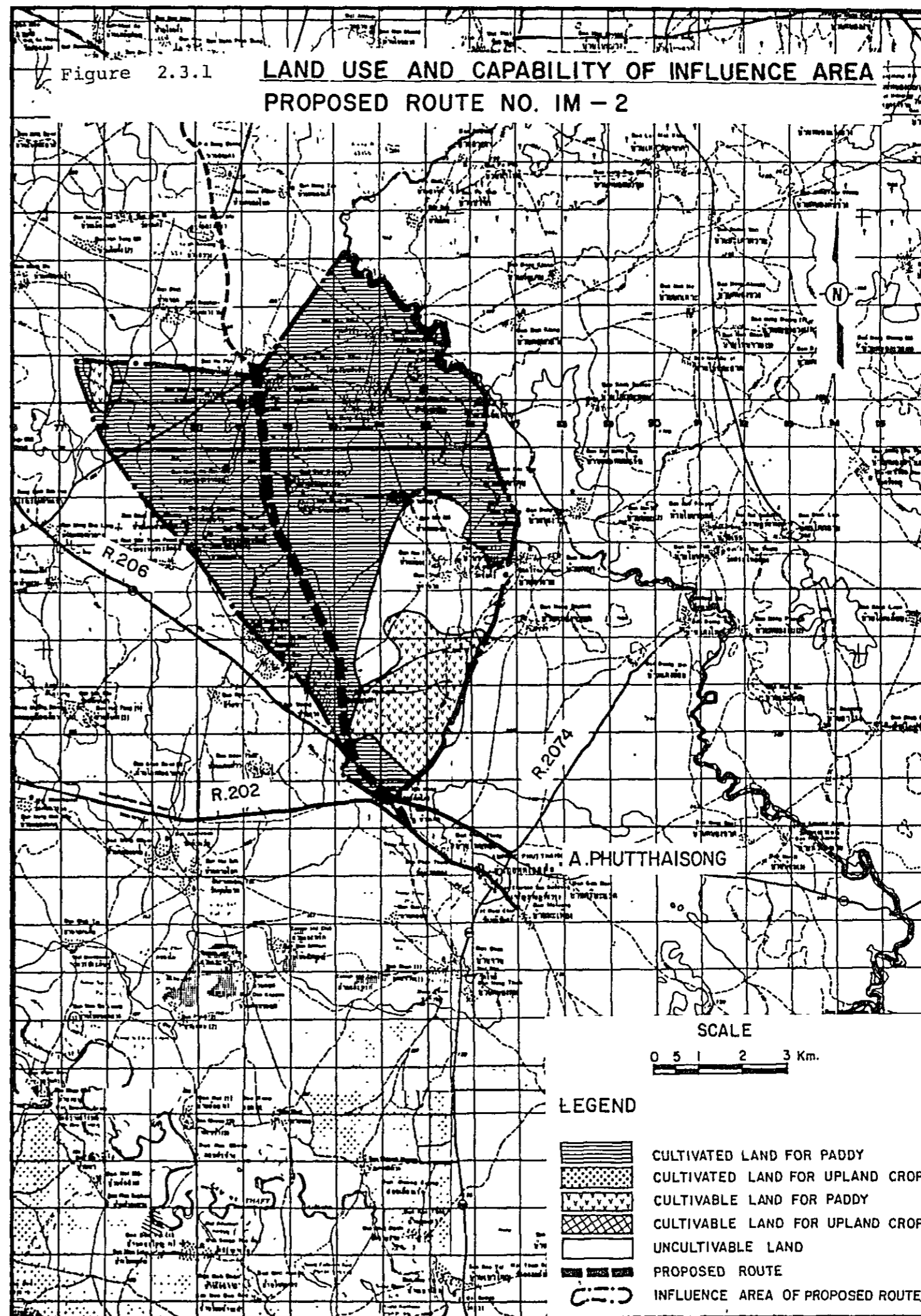


Figure 2.3.2 **CROPPING CALENDAR**

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 :

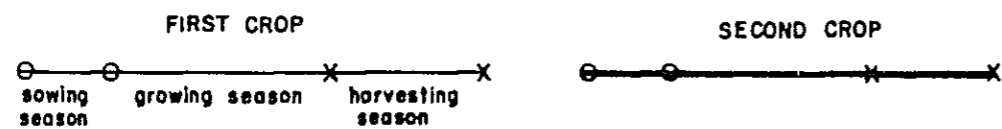


TABLE 2.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[UNIT : 1000 RAI (KM²)]

AMPHOE CODE	AMPHOE NAME	CULTIVATED LAND			UNUSED CULTIVABLE LAND		
		PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
		27.500 (44.0)	-	27.500 (44.0)	3.750 (6.0)	-	3.750 (6.0)
1402	PHUTTHAISONG	27.500 (44.0)	-	27.500 (44.0)	3.750 (6.0)	-	3.750 (6.0)

TABLE 2.3.2 CROP PRODUCTION

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)										
1981	24.99	-	-	-	-	-	-	-	-	24.99
1987	25.60	-	-	-	-	-	-	-	-	25.60
1993	26.22	-	-	-	-	-	-	-	-	26.22
WITHOUT PROJECT	27.01	-	-	-	-	-	-	-	-	27.01
WITH PROJECT	27.07	-	-	-	-	-	-	-	-	27.07
2001	27.89	-	-	-	-	-	-	-	-	27.89
WITHOUT PROJECT	27.89	-	-	-	-	-	-	-	-	27.89
WITH PROJECT	27.89	-	-	-	-	-	-	-	-	27.89
CROP YIELD (KG/RAI)										
1981	199.0	-	-	-	-	-	-	-	-	-
1987	199.0	-	-	-	-	-	-	-	-	-
1993	199.0	-	-	-	-	-	-	-	-	-
WITHOUT PROJECT	203.8	-	-	-	-	-	-	-	-	-
WITH PROJECT	203.8	-	-	-	-	-	-	-	-	-
2001	199.0	-	-	-	-	-	-	-	-	-
WITHOUT PROJECT	199.0	-	-	-	-	-	-	-	-	-
WITH PROJECT	210.4	-	-	-	-	-	-	-	-	-
CROP PRODUCTION (TON)										
1981	4,973	-	-	-	-	-	-	-	-	4,973
1987	5,094	-	-	-	-	-	-	-	-	5,094
1993	5,217	-	-	-	-	-	-	-	-	5,217
WITHOUT PROJECT	5,217	-	-	-	-	-	-	-	-	5,217
WITH PROJECT	5,505	-	-	-	-	-	-	-	-	5,505
2001	5,386	-	-	-	-	-	-	-	-	5,386
WITHOUT PROJECT	5,386	-	-	-	-	-	-	-	-	5,386
WITH PROJECT	5,868	-	-	-	-	-	-	-	-	5,868

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 2.3.3 FARMGATE PRICE AND PRODUCTION COST

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	4,144	-	-	-	-	-	-	-
WITH PROJECT (1987 - 2001)	4,248	-	-	-	-	-	-	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	573	-	-	-	-	-	-	-
WITH PROJECT (1987 - 2001)	593	-	-	-	-	-	-	-

TABLE 2.3.4 NET PRODUCTION VALUE

YEAR	(1000 BAHT)					
	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	6,441	-	6,441	6,460	-	6,460
1993	6,598	-	6,598	7,369	-	7,369
2001	6,811	-	6,811	8,393	-	8,393

Figure 2.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE

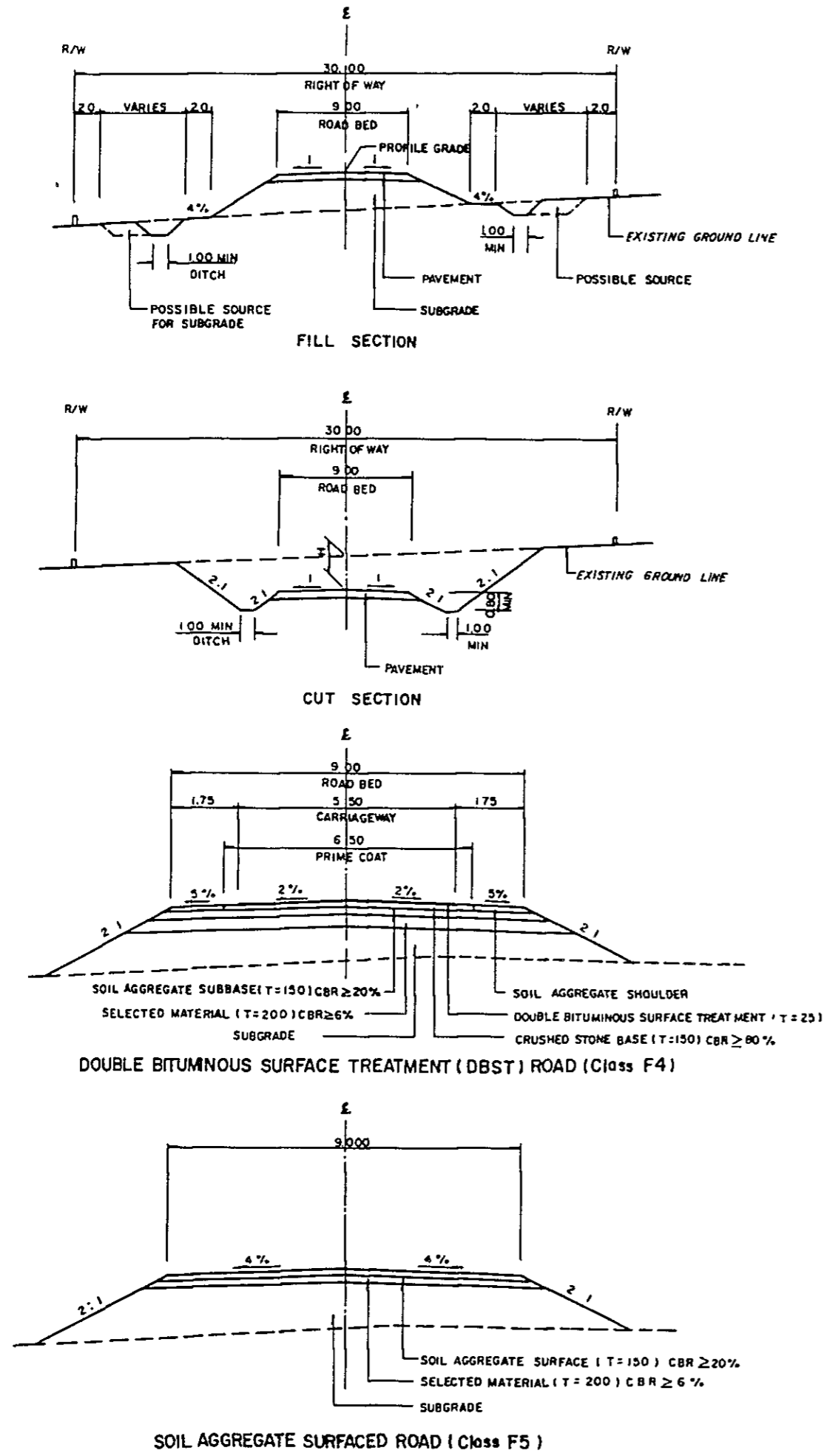


Figure 2.5.2

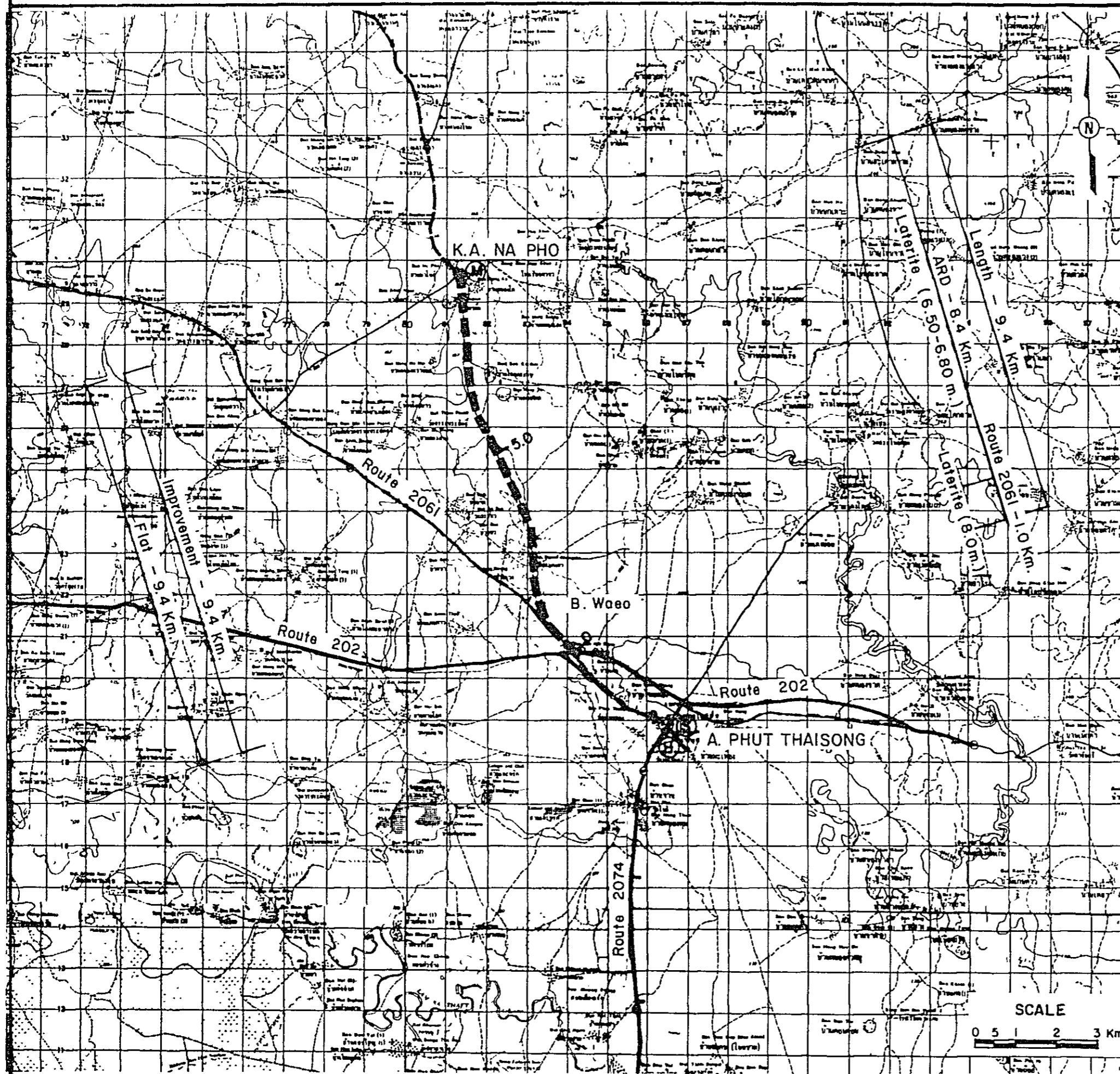
PROPOSED ROUTE NO. IM-2

C. BURI RAM

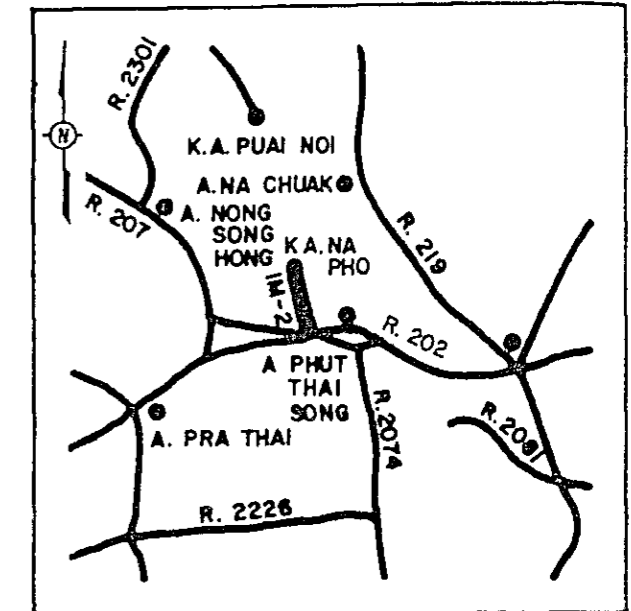
B. WAO (J.R. 202) - K.A. NA PHO

ROUTE NO. 2061 + ARD

L = 9.4 Km.



LOCATION MAP



BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	2.6	C-7.00 x 8.00	W-4 60 x 5 10

LEGEND



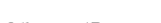





-  PROPOSED ROUTE (IMPROVEMENT)
-  PROPOSED ROUTE (NEW CONSTRUCTION)
-  PAVED ROUTE
-  UNPAVED ROUTE
-  INVENTORY SURVEY ROUTE
-  HOSPITAL
-  MEDICAL CENTER
-  SECONDARY SCHOOL

Table 2.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-2 (9.4 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	22	330	330	22	330	300
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	15,000	675	614	15,000	675	614
Selected Material	m ³	80	19,900	1,592	1,416	19,900	1,592	1,416
Soil Aggregate Surface or Subbase	m ³	105	14,000	1,470	1,308	14,000	1,470	1,308
Crushed Stone Base	m ³	370	9,200	3,404	3,131	1,500	555	510
Soil Aggregate Shoulder	m ³	105	3,900	409	364	600	63	56
Prime Coat and DBST	m ²	55	51,700	2,844	2,560	8,300	456	410
Pipe Culvert	m	2,100	340	714	656	340	714	656
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	8	320	284	8	320	284
Sub Total (a)				11,759	10,638	6,175	5,558	
Miscellaneous Works (a) x 7%				823	745	432	389	
Total (b)				12,582	11,383	6,607	5,948	
PHYSICAL CONTINGENCY (b) x 15%				1,987	1,707	991	892	
ENGINEERING AND								
ADMINISTRATION (b) x 10%				1,258	1,138	650	594	
Sub Total				3,145	2,845	1,651	1,486	
LAND ACQUISITION								
Highly Developed Land	ha	50,000	11	550	550	11	550	550
Less Developed Land	ha	15,000	0	0	0	0	0	0
Sub Total				550	550	550	550	
GRAND TOTAL				16,277	14,778	8,809	7,985	

Table 2.6.1 COST AND BENEFITS
(F4 STANDARD)

YEAR	COST					BENEFITS			DISCOUNTED(12%)	
	CONST.	AGRI.	VOC	RMC	TOTAL	COST	BENEFIT			
	COST	BENEFIT	SAVING	SAVING						
1984	0	0	0	0	0	0	0			
1985	2,956	0	0	0	0	3,708	0			
1986	11,822	0	0	0	0	13,241	0			
1987	0	19	1,074	-12	1,080	0	965			
1988	0	123	1,177	-9	1,291	0	1,029			
1989	0	228	1,280	-6	1,502	0	1,069			
1990	0	332	1,383	-2	1,713	0	1,089			
1991	0	437	1,486	1	1,924	0	1,091			
1992	0	541	1,589	4	2,134	0	1,081			
1993	0	645	1,692	7	2,345	0	1,061			
1994	4,550	762	1,856	12	2,631	2,058	1,062			
1995	0	879	2,020	17	2,916	0	1,052			
1996	0	995	2,184	22	3,201	0	1,031			
1997	0	1,112	2,347	27	3,487	0	1,002			
1998	0	1,229	2,511	32	3,772	0	968			
1999	0	1,346	2,675	37	4,058	0	930			
2000	0	1,462	2,838	42	4,343	0	889			
2001	-7,095	1,579	3,002	47	4,629	-1,296	846			
TOTAL	12,233	11,690	29,114	223	41,026	17,711	15,165			

DISCOUNTED ECONOMIC COSTS :	17,711
DISCOUNTED ECONOMIC BENEFITS :	15,165
AGRICULTURAL DEVELOPMENT BENEFIT	3,779
VOC SAVING	11,343
RMC SAVING	43
NET PRESENT VALUE :	-2,546
BENEFIT COST RATIO :	0.86
INTERNAL RATE OF RETURN :	10.2 %

Table 2.6.2 COST AND BENEFITS
(F5 STANDARD)

YEAR	COST					BENEFITS			DISCOUNTED(12%)	
	CONST.	AGRI.	VOC	RMC	TOTAL	COST	BENEFIT			
	COST	BENEFIT	SAVING	SAVING						
1984	0	0	0	0	0	0	0			
1985	1,597	0	0	0	0	2,003	0			
1986	6,388	0	0	0	0	7,155	0			
1987	0	19	399	4	422	0	377			
1988	0	123	469	5	598	0	476			
1989	0	228	540	6	773	0	550			
1990	0	332	610	7	949	0	603			
1991	0	437	680	8	1,125	0	638			
1992	0	541	751	9	1,300	0	659			
1993	0	645	821	10	1,476	0	668			
1994	726	762	938	11	1,711	328	691			
1995	0	879	1,054	13	1,946	0	702			
1996	0	995	1,171	15	2,181	0	702			
1997	0	1,112	1,288	16	2,416	0	695			
1998	0	1,229	1,404	18	2,651	0	680			
1999	0	1,346	1,521	20	2,886	0	661			
2000	0	1,462	1,637	21	3,121	0	639			
2001	-3,970	1,579	1,754	23	3,356	-725	613			
TOTAL	4,741	11,690	15,037	185	26,911	8,761	9,354			

DISCOUNTED ECONOMIC COSTS :	8,761
DISCOUNTED ECONOMIC BENEFITS :	9,354
AGRICULTURAL DEVELOPMENT BENEFIT	3,779
VOC SAVING	5,511
RMC SAVING	65
NET PRESENT VALUE :	593
BENEFIT COST RATIO :	1.07
INTERNAL RATE OF RETURN :	12.7 %

Table 2.7.1 SOCIAL INDICATORS
(Proposed Route IM-2)

Population (1,000)		Education	
1982	: 11.4	Access to Secondary School	
1993	: 13.2	Number of Student in 1993 (1,000) ^{2/}	: 1.5
Average travelling speed, without (kph)		Average distance to school (km)	: 2.5
	: 48	Per capita time savings (10 ⁻⁴)	: 0.116
Isolation		Score	: 63
Access to Amphoe		Teacher Intensity	
Average distance to Amphoe (km) ^{1/}	: 5.0	Number of teachers ^{3/}	
Per capita time savings (10 ⁻⁴)	: 0.026	University graduate	: -
Score	: 76	Total	: 7
Access to Artery Highway		Number of Student	: 129
Average distance to highway (km) ^{1/}	: 10	Indicators	
Per capita time savings (10 ⁻⁴)	: 0.053	E1 ^{4/}	: -
Score	: 115	E2 ^{5/}	: (51.0)
Impassability		E ^{6/}	: 51.0
Impassable week a year	: -	Degree of Improvement ^{7/}	: 1.34
Impassability per year	: 0	Score	: 85
Impassability per capita (10 ⁻⁴)	: 0	Disparity	
Score	: 0	G.P.V. in 1993 (Mn B) ^{8/}	
Health		With project	: 23.4
Access to Hospital		Without project	: 21.6
Average distance to Hospital (km) ^{1/}	: 5.0	Per capita G.P.V. in 1993 (B)	
Per capita time savings (10 ⁻⁴)	: 0.026	With project (W)	: 1,773
Score	: 60	Without project (w)	: 1,636
Access to Medical Facilities		Degree of Disparity	
Average distance to facilities (km) ^{1/}	: 2.9	(A/W) - (A/w) ^{9/}	: 0.15
Per capita time savings (10 ⁻⁴)	: 0.015	Score	: 268
Score	: 60	Total Score	: 727

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 - 3

Changwat : Khon Kaen / Maha Sarakham

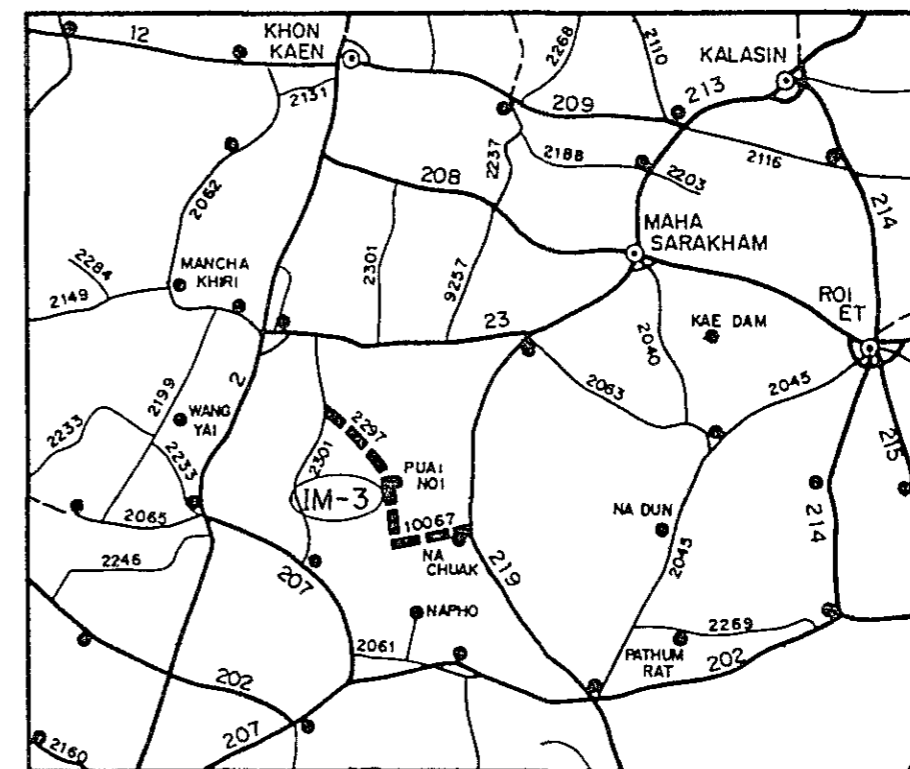
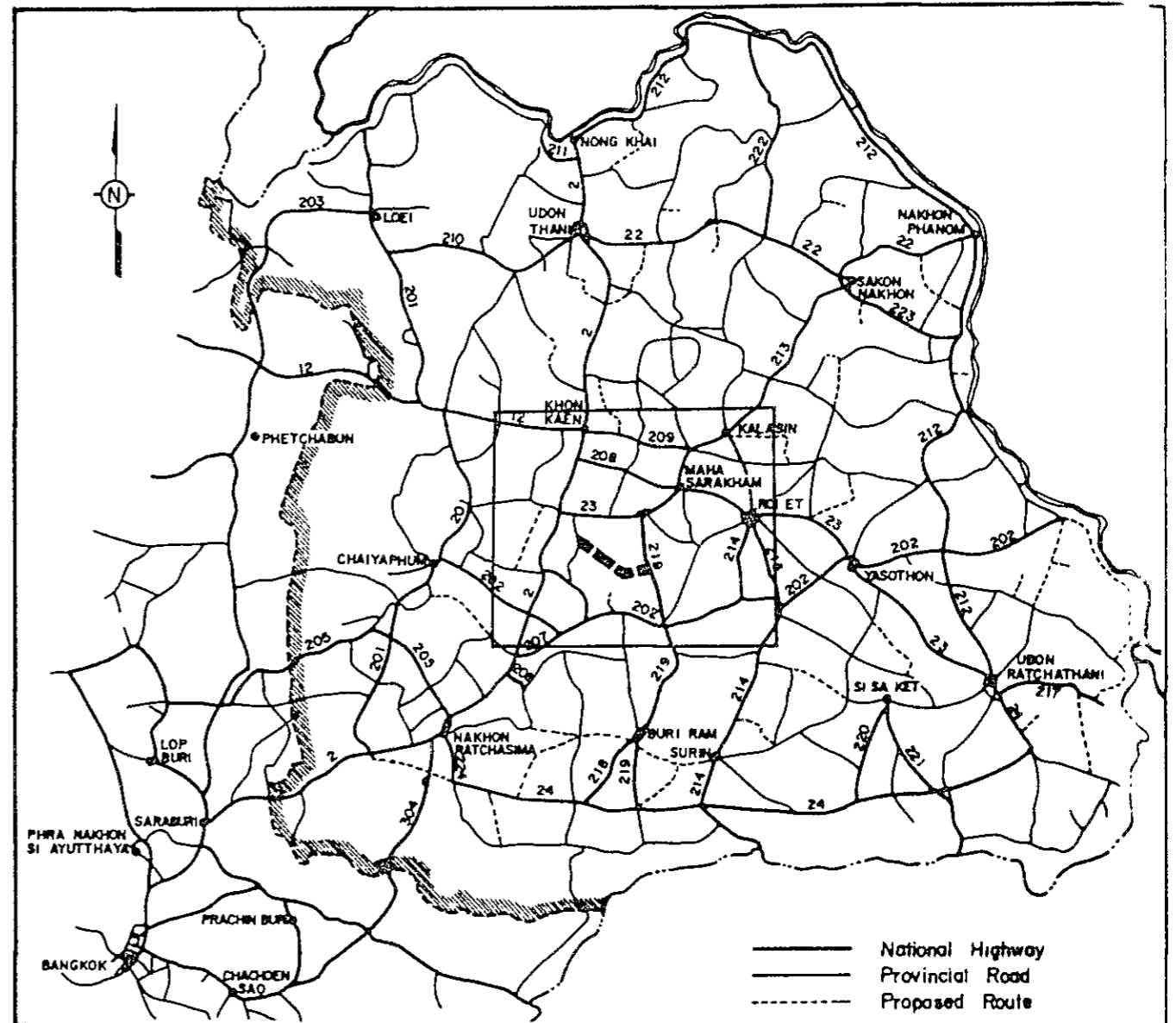
J.R. 2301 - A Na Chuak

Length · 30.6 KM.

SUMMARY
PROPOSED ROUTE IM-3

Item	Description
Changwat	Khon Kaen/Maha Sarakham
Origin	J.R. 2301
Destination	A. Na Chuak
Length	
Total	30.6 km
Improvement Section	27.6 km
DOH Road	R.2297 15.0 km
ARD Road	3.0 km
Others	0 km
New Alignment Section	3.0 km
Surface Type and Condition	Soil Aggregate, Good Poor
Terrain	Flat and Rolling
Influence Area	
Area	211 km ²
Population (1982)	26,000
Principal Crops	Paddy
Traffic (ADT)	
Existing	105
1993	397
2001	519
Proposed Standard	F4 (DBST)
Construction Cost	
Financial	57,753 . 10 ³ ฿
Economic	52,360 . 10 ³ ฿
IRR	7.4 %
B/C	0.67
Recommendation	For further consideration

LOCATION OF PROPOSED ROUTE



1. 概要

1.1 計画路線の概要

本路線はKhon Kaen 県の南部に位置する。県道2310号と交差する所を起点とし、ルートは南に走りDon Ngoen 村, Puai Noi準郡, Baa Po Phon 村を経て県道 219号線のNa Chuak 郡で終わる。その総延長は30.6kmである。(Figure 3.5.2 参照)

沿道の地形はほぼ丘陵地であるが一部は平坦である。影響圏内には、いくつかの村が存在し、その総人口は26,000人である。

本路線沿道には医療センターが2ヶ所、教育施設として中学校が2ヶ所あるが病院はない。

本路線は2つの幹線道路、県道2301号を通り国道23号線と国道 219線にあるPuai Noi準郡とを結ぶ重要な道路網の形成を目途として計画されたものである。

本路線の20km付近の現道は、しばしば Chi河支流の氾濫によって、通行不能となる。このため、この区間は約 3.0kmの新計画路線を設定した。

1.2 現道の状況

計画路線に利用した現道の状況は、Table 3.1.1に要約し、その詳細はTable 3.1.2のインベントリー調査の結果に示した。

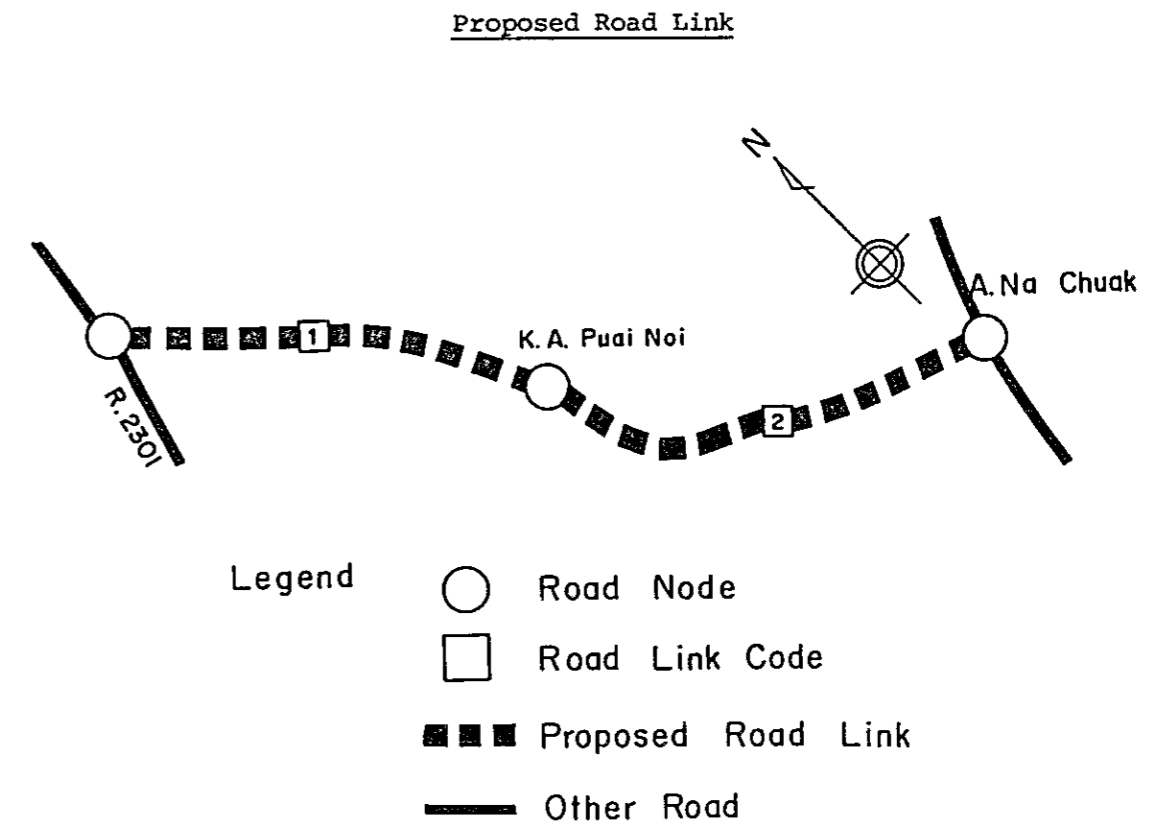
2. 交通

2.1 予測手法

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、DOII交通量調査結果および本調査で実施したマニュアルカウンティングのデータ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}	44	62	34	41	7	10	32	16	11	259
	2	N.A.									
Manual Counts (1982)	1	-	21	7	38	-	2	28	16	-	112
	2	-	16	-	19	-	2	10	-	1	48

Note: /1 Route 2297, Section 0100, Station Km 1 + 175

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	1509
2	452

FREIGHT MOVEMENT (1982)

PROPOSED ROAD LINK	TONAGE PER DAY		
	NON-AGRI.	AGRI.	TOTAL
1	38	74	112
2	6	11	17

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	1.2	1.1
PASSENGER MOVEMENT	5.5	5.6	5.7

GROWTH RATE OF FREIGHT MOVEMENT

ITEM	GROWTH RATE (% P.A.)		
	1981	1987	1993
	-	-	-
	1987	1993	2001
NON-AGRI. AGRICULTURE	7.1	7.2	7.3
	1.2	0.9	0.1
FREIGHT	3.2	3.0	2.6

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	0.0	0.0

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	17.1	32.6	16.3	31.0	3.1	10.3	51.7	27.6	10.3
	1987	15.8	33.8	16.8	28.7	4.9	12.1	42.3	29.5	16.0
	1993	14.4	35.3	17.4	26.0	7.0	14.2	31.0	31.9	22.9
	2001	12.4	37.2	18.2	22.4	9.8	17.0	16.0	35.0	32.0
2	1982	0.0	45.7	0.0	54.3	0.0	15.4	76.9	0.0	7.7
	1987	3.0	42.7	5.2	46.3	2.8	15.8	60.9	9.2	14.1
	1993	6.6	39.1	11.3	36.8	6.1	16.3	41.7	20.3	21.8
	2001	11.4	34.3	19.6	24.1	10.6	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 3.2.1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	15	16	38	5	46	16	9	6	150	193	343
1993	19	25	45	10	61	11	10	8	188	229	417
2001	28	43	53	23	91	5	11	10	266	279	544

3. 農業開発

3.1. 現況

影響圏内の農耕地の約85%は、水田であるが、今後の未開発可耕地は、畑作地帯のみ僅かにあり、水田用地は残っていない。畑地では、キャッサバが一番多く、ケナフと砂糖きびこれに次いでいる。

圏内の土地利用および土地適応性の状況は、Table 3.3.1.とFigure 3.3.1.に示し、また、Khon Kaen 県及びMaha Sarakham 両県地域の作物暦はFigure 3.3.2.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 3.3.2.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てTable 3.3.3.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

3.3.4.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	Without Project				With Project				Nos. of Wooden Narrow Bridge	
		Length (km)	Road/ ¹ class	Nos. of wooden Bridge	Nos. of Narrow C. Bridge	Length (km)	Road Class/ ¹	case 1	case 2		case 3
1	Rolling	14.0	2B	0	0	14.0	1	1	1	2A	0
2	Flat & Rolling	20.1	3	1	1	16.0	(F4) 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

(unit: 1,000 Baht)

Road Class	1987	1993	2001
1 (F4)	3,065	4,449	7,015
1+2A (F4+F5)	2,701	4,005	6,424
1 (F4: only Link 1)	1,421	2,133	3,413
2A (F5)	1,636	2,667	4,561

5. エンジニアリング

5.1 予備設計

予備設計は、次に示す設計基準を基本に行った。

Design Standard	: F4 (if not feasible, F5)
Geometric Design	: AASHTO (Rural Highways)
Typical Cross Section	: as shown in Figure 3.5.1.
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

In case of F5 Standard

Soil Aggregate Surface CBR _{>} 20%	: 15.0cm
Selected Material CBR _{>} 6%	: 20.0cm

Pipe Culvert

Standard Size	: φ 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 3.5.2.

ルートの線形は、Figure 3.5.2 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 3.5.1 に示す。

道路規程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 B)		Remark
		Financial Cost	Economic Cost	
F4 (DBST)	30.6	57,753	52,366	
F5 (Soil Aggregate)	30.6	32,127	29,060	
F4 + F5	30.6	49,995	45,174	Adopted to link ≥ 300 in ADT
F4	14.0	28,848	26,000	Adopted to link ≤ 300 in ADT
F5	16.6	21,147	19,174	

6. 経済評価

年次別経済費用と便益及び評価結果はTable 3.6.1, 3.6.2, 3.6.3.及び3.6.4 に示す通りである。

このルートはF 4 規格ではフィージブルでないがF 5 規格では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 3.7.1 に示す通りである。

Table 3.1.1 SUMMARY OF ROAD INVENTORY

Item	Description	
Origin	J.R. 2301	
Destination	A. Na Chuak	
Length		
Total		30.6 km
Improvement Section		27.6 km
DOH Road	R. 2297	15.0 km
ARD Road		3.0 km
Others		0 km
New Alignment Section		3.0 km
Terrain	Flat and Rolling	
Alignment (Hori./Vert.)	Fair / Fair	
Formation Width	4.0 m - 8.0 m, 6.2 m (Weighted average)	
Embankment Section		
Length		30.6 km
Height	0.6 m -	2.5 m
Cut Section		
Length		0 km
Depth	m -	m
Surface Type and Condition		
SBST or DBST		0 km
Soil Aggregate	Good - Poor	30.6 km
Earth		0 km
Pipe Culvert	42 each	
Box Culvert	2 each	14.7 m
Bridge		
Permanent Bridge	1 each	22.5 m
Narrow Concrete Bridge	1 each	7.7 m (4m)
Wooden Bridge	1 each	22,5 m
Overflow Section	1 place	3.0 km

Table 3.1.2 ROAD INVENTORY

PROPOSED ROUTE NO. IM-3

ROUTE NO. 2297
ARD

(J.R. 2301) ~ A. NA CHUAK (J.R. 219)

L = 30.6 km

KHON KAEN/MAHA SARAKHAM

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		Rolling																							
CROSS SECTION	Formation Width (m)	8.00																							
	Embankment Height (m)	1.20	0.70	1.80	1.00	0.70	1.20	1.70	2.50	0.60				4.50'	4.80	5.20	6.00								
	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	42 Pipes																							
BOX CULVERT & BRIDGE	Station (Km)	1.2																11.8			18.0			28.8	30.1
	Dimension	C-Box 1.70 x 4.50																C-Br. 8.20 x 22.50			W-Br. 4.80 x 26.00			C-Br. 4.00 x 7.70	C-Box 1.50 x 0.75 x 10.20
RIGHT OF WAY (m)		16.0																							
ALIGNMENT	Horizontal	Fair																							
	Vertical	Fair																							
ROUTE NO., AGENCIES		DOH 2297																							
		ARD																							
		ARD																							

Table 3.2.1 TRAFFIC VOLUME ON ROUTE IM - 3

YEAR	1987			1993			2001		
LINK	1	2	AVR.	1	2	AVR.	1	2	AVR.
N+D	26	1	13	32	4	17	41	11	25
P/C I	4	0	2	5	1	3	6	2	4
DV	0	0	0	0	0	0	0	0	0
TOTAL	30	2	15	37	5	19	47	12	28
N+D	28	2	14	39	7	21	60	18	38
L/B I	4	0	2	6	1	3	9	3	6
DV	0	0	0	0	0	0	0	0	0
TOTAL	32	3	16	44	8	25	70	21	43
N+D	47	21	33	58	23	39	74	23	46
M/B I	7	3	5	9	3	6	11	3	7
DV	0	0	0	0	0	0	0	0	0
TOTAL	54	24	38	66	26	45	86	26	53
N+D	8	1	4	15	4	9	33	10	20
H/B I	1	0	1	2	1	1	5	1	3
DV	0	0	0	0	0	0	0	0	0
TOTAL	9	1	5	18	4	10	37	11	23
N+D	62	21	40	86	26	53	132	34	79
P/P&T I	9	3	6	13	4	8	20	5	12
DV	0	0	0	0	0	0	0	0	0
TOTAL	72	24	46	98	29	61	152	39	91
N+D	23	6	14	16	4	9	8	1	4
4/T I	3	1	2	2	1	1	1	0	1
DV	0	0	0	0	0	0	0	0	0
TOTAL	27	7	16	19	4	11	9	1	5
N+D	16	1	8	17	2	9	18	3	10
6/T I	2	0	1	3	0	1	3	0	1
DV	0	0	0	0	0	0	0	0	0
TOTAL	19	1	9	19	2	10	21	3	11
N+D	9	1	5	12	2	7	16	3	9
10/T I	1	0	1	2	0	1	2	0	1
DV	0	0	0	0	0	0	0	0	0
TOTAL	10	2	6	14	2	8	19	3	10
N+D	219	56	130	274	71	164	384	102	231
ADT I	33	8	20	41	11	25	58	15	35
DV	0	0	0	0	0	0	0	0	0
TOTAL	252	64	150	315	81	188	441	118	266
N+D	270	107	181	308	127	210	368	165	258
M/C I	23	12	17	25	14	19	25	17	21
DV	0	0	0	0	0	0	0	0	0
TOTAL	294	118	198	333	141	229	393	182	279
N+D	489	162	312	583	198	374	752	267	489
TOTAL I	56	20	37	66	24	43	83	32	55
DV	0	0	0	0	0	0	0	0	0
TOTAL	546	182	348	649	222	417	835	300	544

NOTE

N : NORMAL TRAFFIC

DV : DEVELOPED TRAFFIC

D : DIVERTED TRAFFIC

I : INDUCED TRAFFIC

Figure 3.3.1 **LAND USE AND CAPABILITY OF INFLUENCE AREA**
PROPOSED ROUTE NO. IM - 3

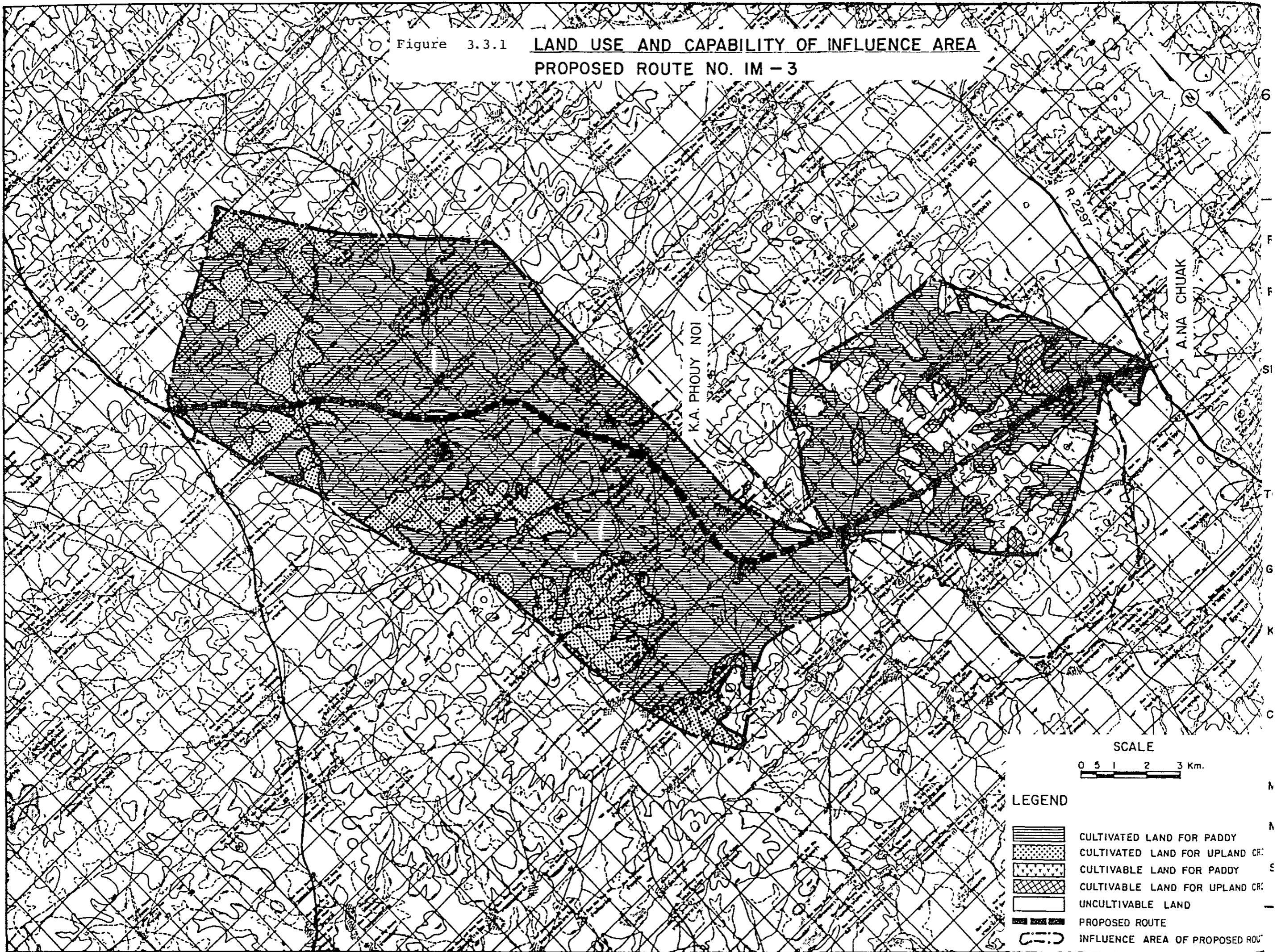
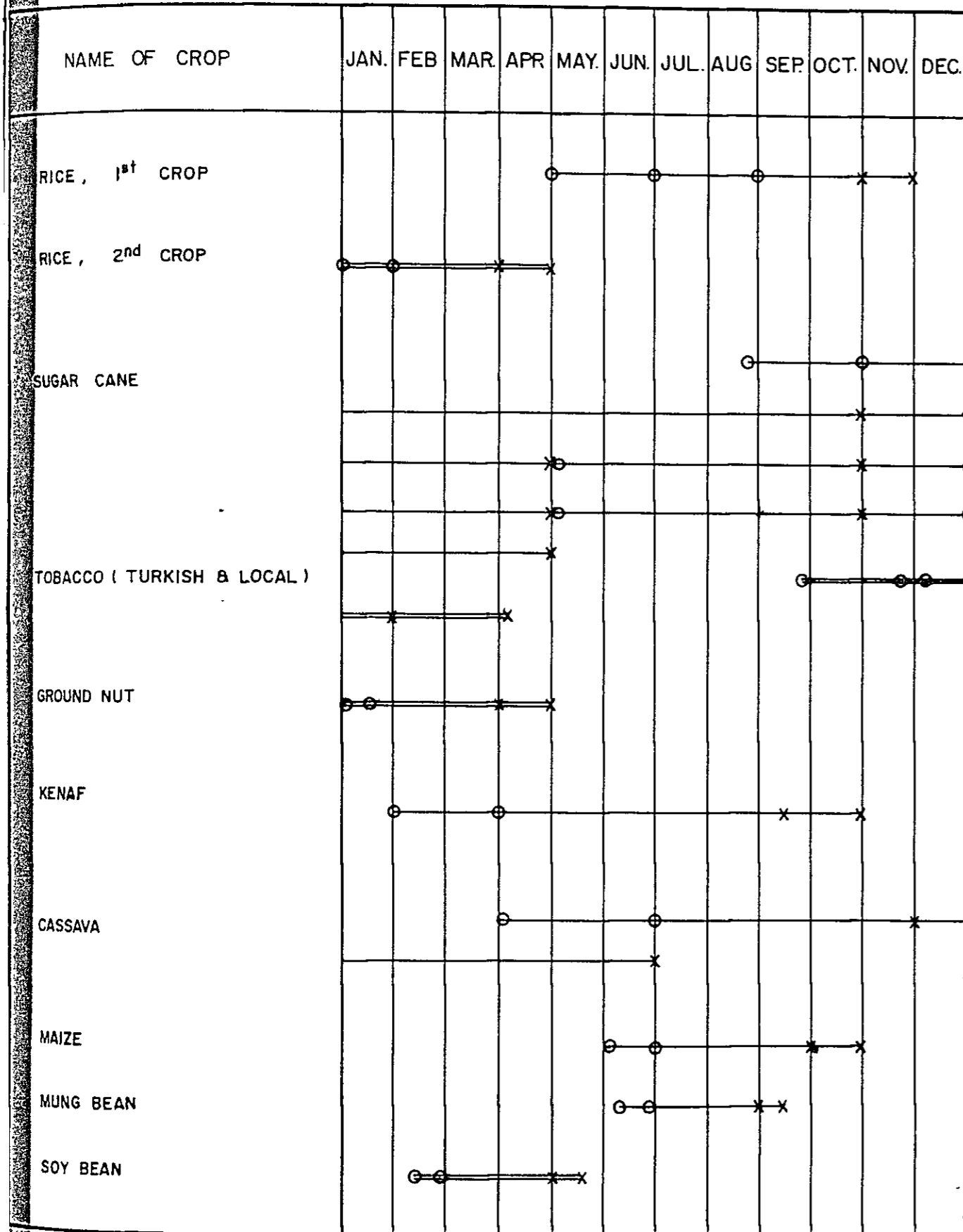


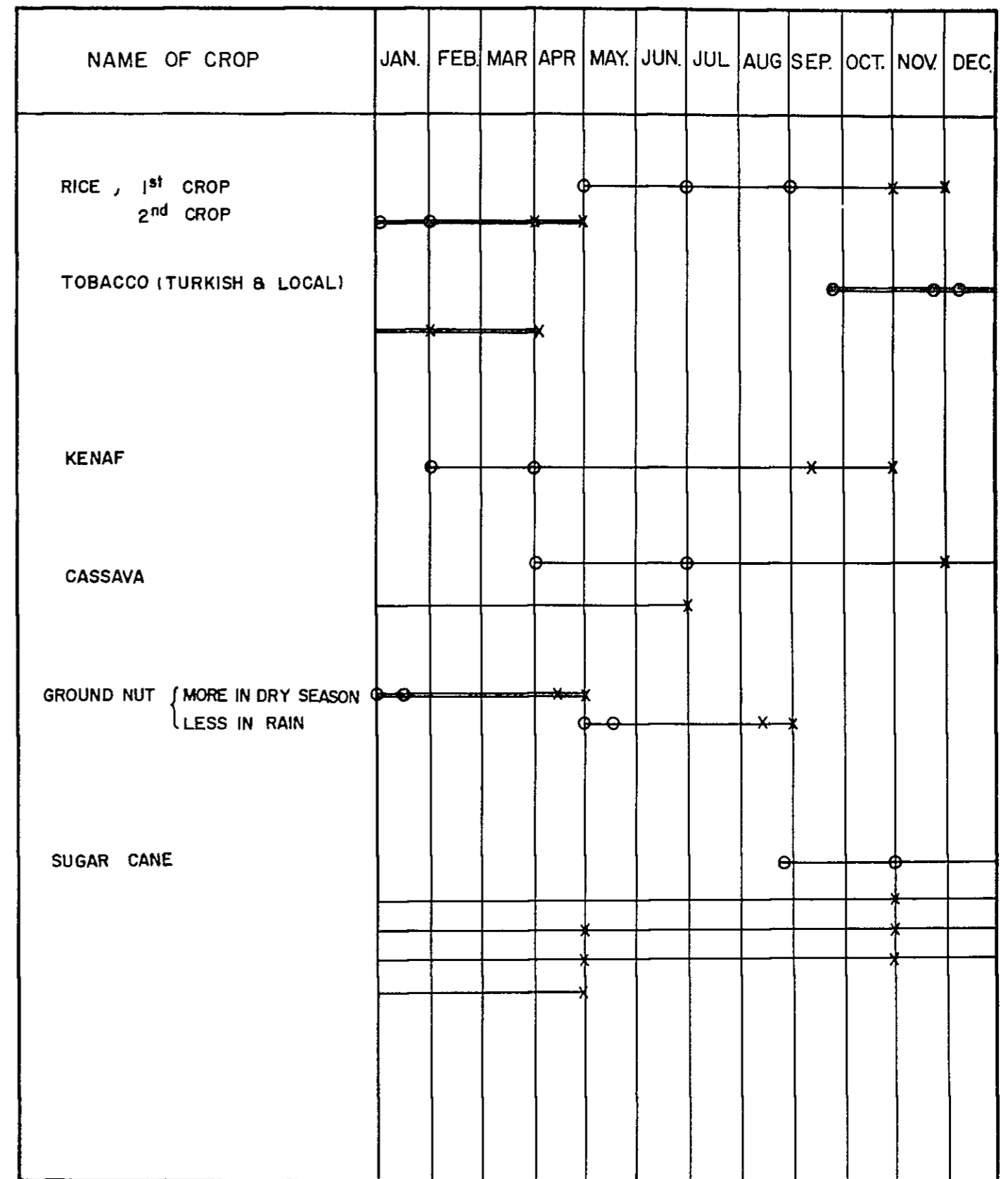
Figure 3.3.2 CROPPING CALENDAR (1)

0600 CHANGWAT KHON KAEN



CROPPING CALENDAR (2)

0700 CHANGWAT MAHA SARAKHAM



Note :
 ○ — ○ FIRST CROP ○ — ○ SECOND CROP
 sowing season growing season harvesting season sowing season growing season harvesting season

TABLE 3.3.1 CULTIVATED & CULTIVABLE LAND

(1979)

[UNIT : 1000 RAI (KM²)]

AMPHOE	AMPHOE	CULTIVATED LAND			UNUSED CULTIVABLE LAND				
		CODE	NAME	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
				100.000 (160.0)	18.750 (30.0)	118.750 (190.0)	-	2.188 (3.5)	2.188 (3.5)
0613	BAN PHAI			12.500 (20.0)	8.125 (13.0)	20.625 (33.0)	-	-	-
0618	NONG SONG HONG			5.625 (9.0)	3.750 (6.0)	9.375 (15.0)	-	0.438 (0.7)	0.438 (0.7)
0619	PHOUY NOI			51.250 (82.0)	6.875 (11.0)	58.125 (93.0)	-	-	-
0705	BORABU			8.125 (13.0)	-	8.125 (13.0)	-	-	-
0707	NA CHUAK			22.500 (36.0)	-	22.500 (36.0)	-	1.750 (2.8)	1.750 (2.8)

TABLE 3.3.2 CROP PRODUCTION

ITEM	PADDY	MAIZE	BEANS	GRUND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON	UPLAND TOTAL	TOTAL
PLANTED AREA (1000 RAI)										
1981	93.89	-	-	-	15.67	0.19	3.01	-	18.97	112.86
1987	93.89	-	-	-	17.65	0.19	3.01	-	20.95	114.84
1993	93.89	-	-	-	19.29	0.19	2.92	-	22.50	116.39
	93.89	-	-	-	19.43	0.20	2.78	-	22.50	116.39
2001	93.89	-	-	-	19.70	0.17	2.55	-	22.50	116.39
	93.89	-	-	-	19.83	0.18	2.42	-	22.50	116.39
CROP YIELD (KG/RAI)										
1981	228.8	-	-	-	1992.2	7256.1	165.3	-	-	-
1987	228.8	-	-	-	1992.2	7299.8	165.3	-	-	-
1993	228.8	-	-	-	1992.2	7343.7	165.3	-	-	-
	231.6	-	-	-	2004.2	7387.8	165.3	-	-	-
2001	228.8	-	-	-	1992.2	7402.6	165.3	-	-	-
	235.3	-	-	-	2020.3	7506.8	165.3	-	-	-
CROP PRODUCTION (TON)										
1981	21,483	-	-	-	31,224	1,382	498	-	33,116	54,599
1987	21,483	-	-	-	35,163	1,415	498	-	37,088	58,571
1993	21,483	-	-	-	38,437	1,407	483	-	40,340	61,823
	21,742	-	-	-	38,951	1,488	459	-	40,909	62,651
2001	21,483	-	-	-	39,250	1,266	421	-	40,947	62,430
	22,092	-	-	-	40,055	1,348	400	-	41,813	63,905

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE SMALL

TABLE 3.3.3 FARMGATE PRICE AND PRODUCTION COST

ITEM	PADDY	MAIZE	BEANS	GRIND NUTS	CASSAVA	SUGAR CANE	KENAF	COTTON
FARMGATE PRICE (BAHT/TON)								
WITHOUT PROJECT (1981 - 2001)	3,605	-	-	-	608	652	4,621	-
WITH PROJECT (1987 - 2001)	3,695	-	-	-	623	652	4,737	-
CROP PRODUCTION COST (BAHT/RAI)								
WITHOUT PROJECT (1981 - 2001)	553	-	-	-	724	2,879	685	-
WITH PROJECT (1987 - 2001)	564	-	-	-	752	2,920	685	-

TABLE 3.3.4 NET PRODUCTION VALUE

(1000 BAHT)

YEAR	WITHOUT PROJECT			WITH PROJECT		
	PADDY	UPLAND	TOTAL	PADDY	UPLAND	TOTAL
1987	25,525	9,214	34,739	26,431	9,288	35,719
1993	25,525	10,009	35,534	27,389	10,307	37,696
2001	25,525	10,145	35,670	28,683	10,637	39,320

Figure 3.5.1 TYPICAL CROSS SECTION AND TYPICAL PAVEMENT STRUCTURE

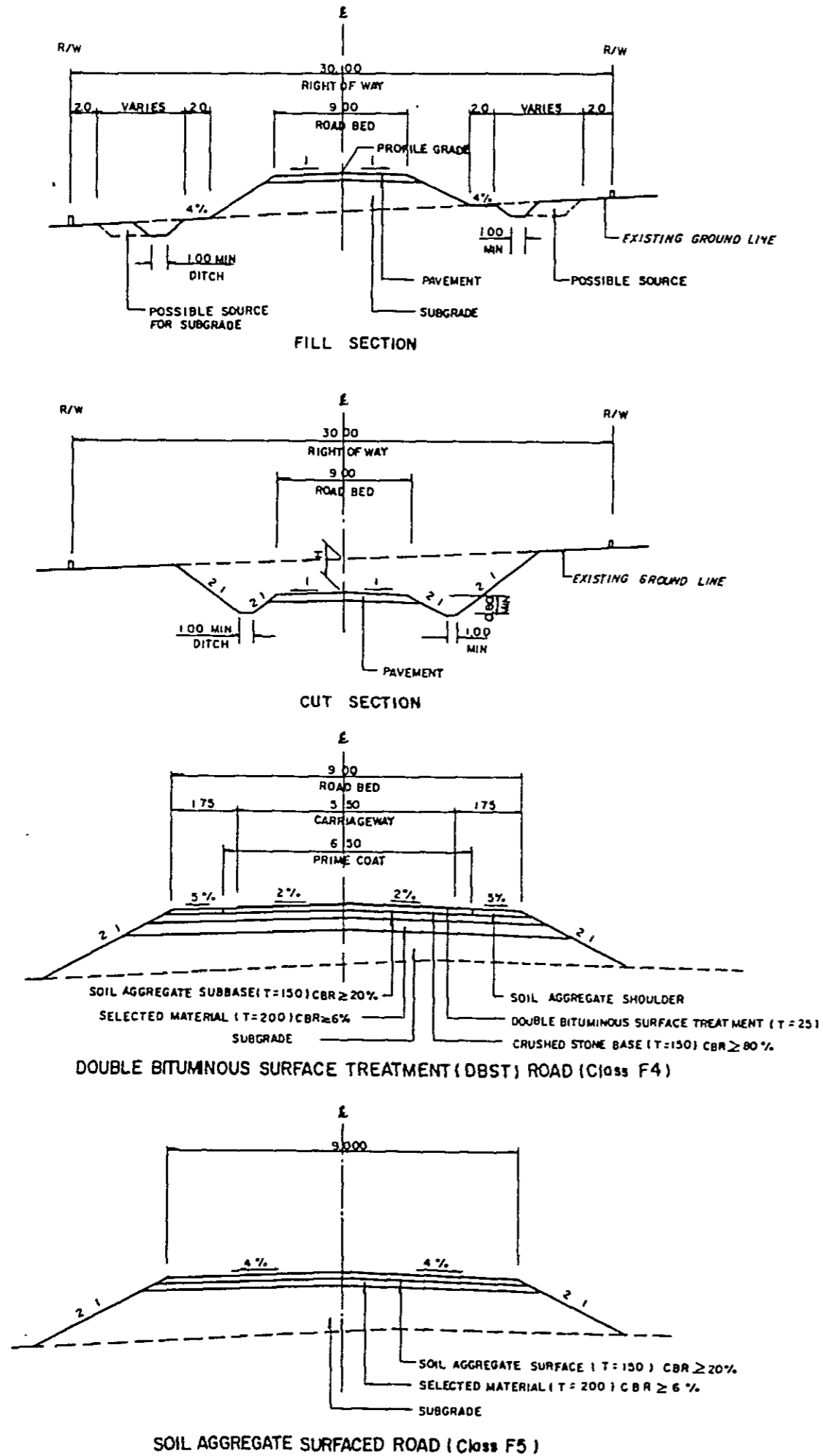
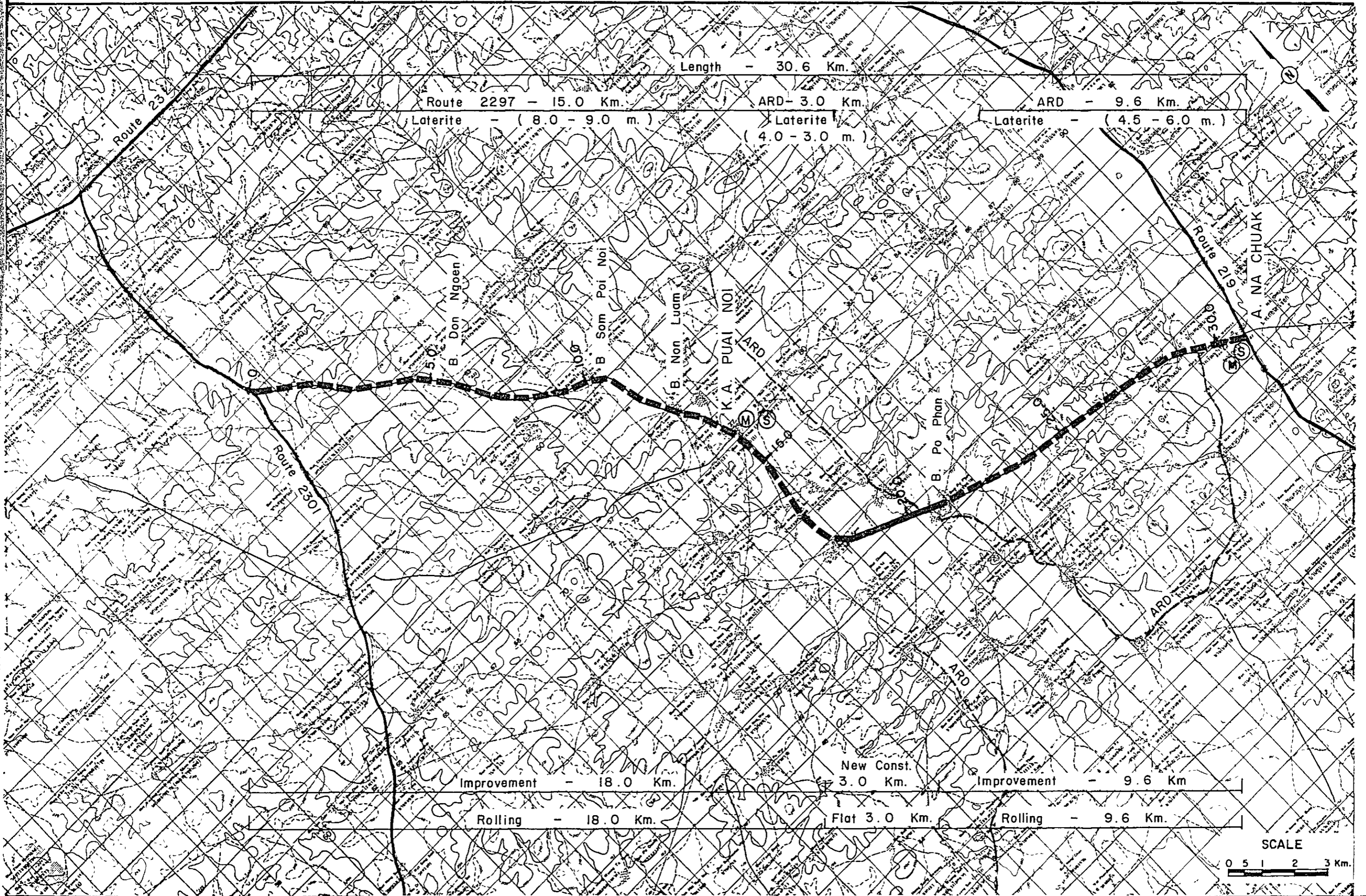


Figure 3.5.2 PROPOSED ROUTE NO. IM-3

C. KHON KAEN
C. MAHA. SAKHAM

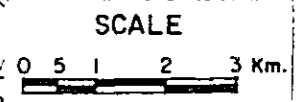
J.R. 2301 - A. NA CHUAK (J.R. 219)
ROUTE NO. 2297 + ARD L = 30.6 Km.

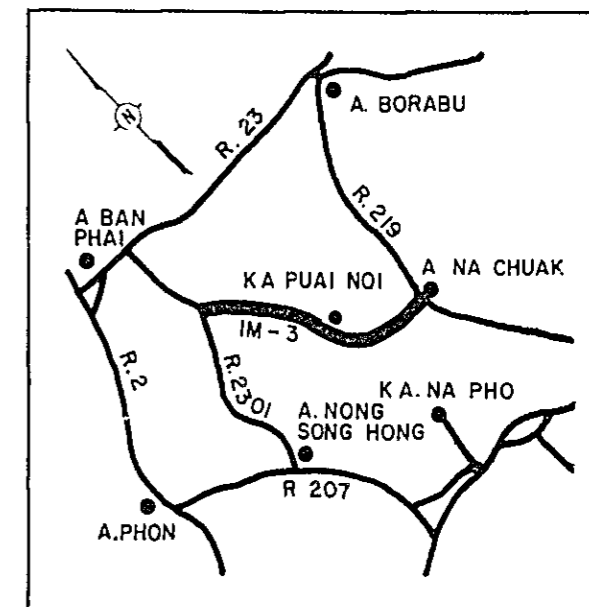


No.	St.
1	11
2	18
3	19
4	28

LEGEND

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



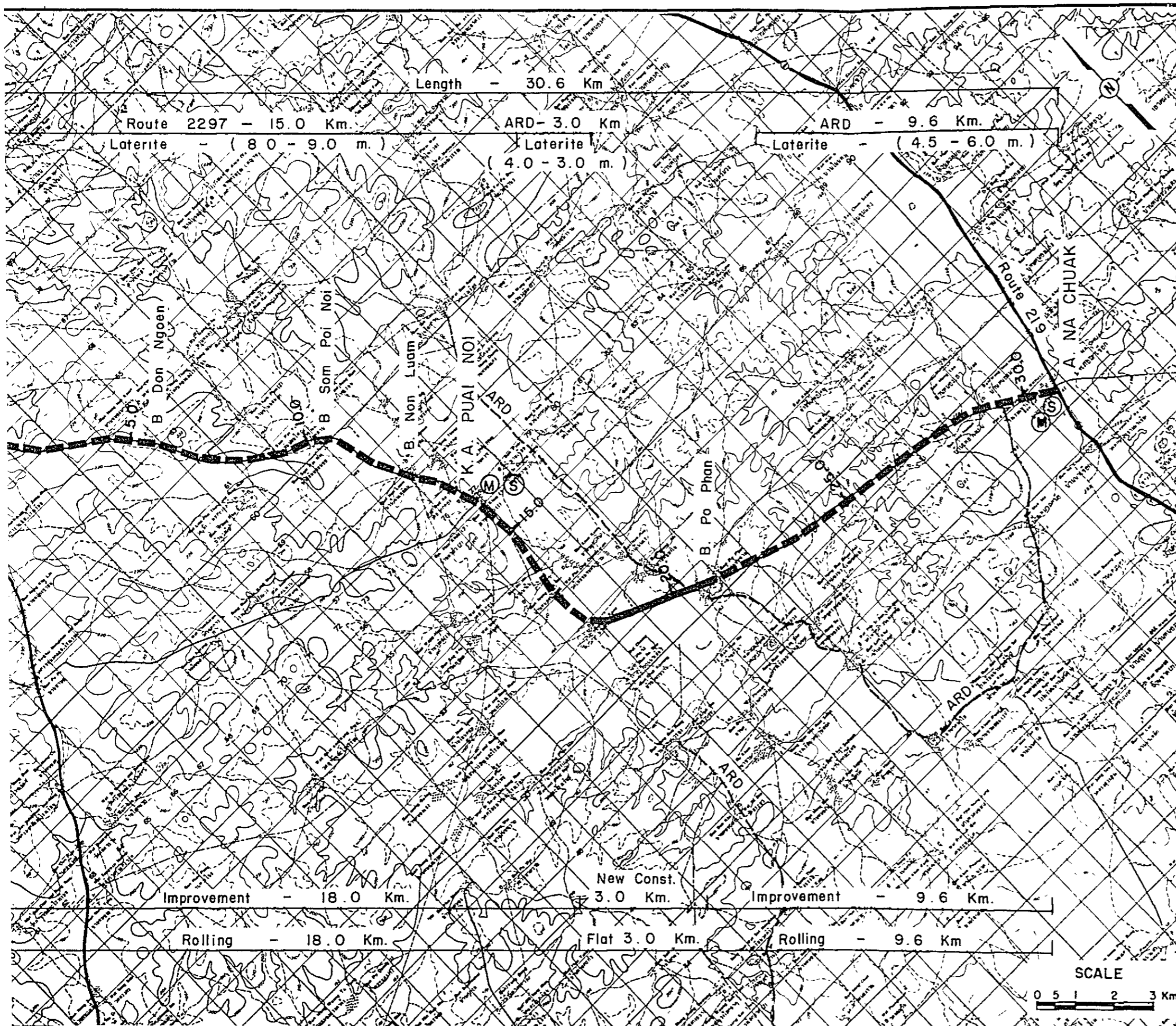


BRIDGE LIST

No.	Station Km.	Proposed Bridge	Existing Bridge
1	11.8	-	C-8 20x22.50
2	18.0	C-7 00x 28.00	W-4 80x26.00
3	19.5	C-7 00x 30.00	-
4	28.8	C-7 00x 7.70	C-4 00x 7.70

LEGEND

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



Length - 30.6 Km

Route 2297 - 15.0 Km. ARD - 3.0 Km. ARD - 9.6 Km.

Laterite - (8.0 - 9.0 m.) Laterite (4.0 - 3.0 m.) Laterite - (4.5 - 6.0 m.)

Improvement - 18.0 Km. New Const. 3.0 Km. Improvement - 9.6 Km.

Rolling - 18.0 Km. Flat 3.0 Km. Rolling - 9.6 Km.

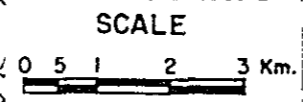


Table 3.5.1 CONSTRUCTION QUANTITIES AND COSTS IM-3 (35.3 km) (1)

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	82	1,230	1,119	82	1,230	1,119
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	86,300	3,883	3,533	86,300	3,883	3,533
Selected Material	m ³	80	64,900	5,192	4,620	64,900	5,192	4,620
Soil Aggregate Surface or Subbase	m ³	105	45,400	4,767	4,242	45,400	4,767	4,242
Crushed Stone Base	m ³	370	29,800	11,026	10,143	3,400	1,258	1,157
Soil Aggregate Shoulder	m ³	105	12,900	1,354	1,205	1,500	157	140
Prime Coat and DBST	m ²	55	168,300	9,257	8,331	19,300	1,062	956
Pipe Culvert	m	2,100	1,280	2,688	2,472	1,280	2,688	2,472
Box Culvert	m	16,000	6	96	86	6	96	86
Long Span Bridge	m	80,000	0	0	0	0	0	0
Short Span Bridge	m	40,000	66	2,640	2,340	66	2,640	2,349
Sub Total (a)				42,134	38,106	22,974	20,680	
Miscellaneous Works (a) x 7%				2,949	2,667	1,608	1,448	
Total (b)				45,083	40,773	24,582	22,128	
PHYSICAL CONTINGENCY (b) x 15%				6,762	6,116	3,687	3,319	
ENGINEERING AND ADMINISTRATION (b) x 10%								
Sub Total				11,270	10,193	6,145	5,532	
LAND ACQUISITION								
Highly Developed Land	ha	50,000	28	1,400	1,400	28	1,400	1,400
Less Developed Land	ha	15,000	0	0	0	0	0	0
Sub Total				1,400	1,400	1,400	1,400	
GRAND TOTAL				57,753	52,366	32,127	29,060	

CONSTRUCTION QUANTITIES AND COSTS (DBST + Soil Aggregate Surface) (2)

Items	Unit of Q'ty	Financial Unit Rate ₪	Proposed Route Number									
			IM-3 (1-2) (14.0 km) 1/			IM-3 (1-2) (16.6 km) 2/			IM-3 (T) (30.6 km) 3/			
			Q'ty	Financial Cost (10 ³ ₪)	Economic Cost (10 ³ ₪)	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	31	465	423	51	765	696	82	1,230	1,119	
Excavation - Soil	m ³	20	0	0	0	0	0	0	0	0	0	
Excavation - Hard Rock	m ³	160	0	0	0	0	0	0	0	0	0	
Embankment	m ³	45	3,600	162	147	82,700	3,721	3,386	86,300	3,883	3,533	
Selected Material	m ³	80	29,700	2,376	2,114	35,200	2,816	2,506	64,900	5,192	4,620	
Soil Aggregate Surface or Subbase	m ³	105	70,800	7,434	6,616	24,100	2,530	2,252	94,900	9,964	8,868	
Crushed Stone Base	m ³	370	13,700	5,069	4,663	1,000	370	340	14,700	5,439	5,003	
Soil Aggregate Shoulder	m ³	105	5,900	619	551	400	42	37	6,300	661	588	
Prime Coat and DBST	m ²	55	77,000	4,235	3,812	5,500	303	272	82,500	4,538	4,084	
Pipe Culvert	m	2,100	560	1,176	1,081	720	1,512	1,391	1,280	2,688	2,472	
Box Culvert	m	16,000	2	32	28	4	64	57	6	96	86	
Long Span Bridge	m	80,000	0	0	0	0	0	9	0	0	0	
Short Span Bridge	m	40,000	0	0	0	66	2,640	2,349	66	2,640	2,349	
Sub Total (a)				21,568	19,439	14,764	13,289	36,333	32,728			
Miscellaneous Works (a) x 7%				1,510	1,361	1,033	930	2,543	2,291			
Total (b)				23,078	20,800	15,797	14,219	38,876	35,019			
PHYSICAL CONTENGENCY (b) x 15%				3,462	3,120	2,370	2,133	5,831	5,253			
ENGINEERING AND ADMINISTRATION (b) x 10%												
ADMINISTRATION (b) x 10%				2,308	2,080	1,580	1,422	3,888	3,888	3,502		
Sub Total				5,763	5,200	3,950	3,555	9,719	8,755			
LAND ACQUISITION												
Highly Developed Land	ha	50,000	0	0	0	28	1,400	1,400	28	1,400	1,400	
Less Developed Land	ha	15,000	0	0	0	0	0	0	0	0	0	
Sub Total				0	0	1,400	1,400	1,400	1,400			
GRAND TOTAL				28,848	26,000	21,147	19,174	49,995	45,174			

Note: 1/ = DBST Link
 2/ = Soil Aggregate Surface Link
 3/ = Total Link

Table 3.6.1 COST AND BENEFITS
(F4 STANDARD)

(1000 BAHT)							
YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1984	0	0	0	0	0	0	0
1985	20,946	0	0	0	0	26,275	0
1986	31,420	0	0	0	0	35,190	0
1987	0	980	3,065	-78	3,967	0	3,542
1988	0	1,177	3,296	-70	4,403	0	3,510
1989	0	1,374	3,527	-62	4,838	0	3,444
1990	0	1,571	3,757	-54	5,274	0	3,352
1991	0	1,768	3,988	-46	5,709	0	3,240
1992	0	1,965	4,219	-38	6,145	0	3,113
1993	0	2,162	4,449	-31	6,581	0	2,977
1994	14,810	2,348	4,770	-19	7,099	6,699	2,867
1995	0	2,534	5,091	-8	7,617	0	2,747
1996	0	2,720	5,411	3	8,135	0	2,619
1997	0	2,906	5,732	14	8,652	0	2,487
1998	0	3,092	6,053	26	9,170	0	2,354
1999	0	3,278	6,374	37	9,688	0	2,220
2000	0	3,464	6,694	48	10,206	0	2,088
2001	-24,844	3,650	7,015	59	10,724	-4,539	1,959
TOTAL	42,332	34,989	73,441	-222	108,208	63,625	42,519

DISCOUNTED ECONOMIC COSTS :	63,625
DISCOUNTED ECONOMIC BENEFITS :	42,519
AGRICULTURAL DEVELOPMENT BENEFIT	13,260
VOC SAVING	29,493
RMC SAVING	-235
NET PRESENT VALUE :	-21,107
BENEFIT COST RATIO :	0.67
INTERNAL RATE OF RETURN :	7.4 %

Table 3.6.2 COST AND BENEFITS
(F4&F5 COMBINED)

(1000 BAHT)							
YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1984	0	0	0	0	0	0	0
1985	18,069	0	0	0	0	22,666	0
1986	27,105	0	0	0	0	30,358	0
1987	0	980	2,701	2	3,683	0	3,288
1988	0	1,177	2,918	9	4,105	0	3,272
1989	0	1,374	3,136	16	4,526	0	3,222
1990	0	1,571	3,353	24	4,948	0	3,144
1991	0	1,768	3,570	31	5,369	0	3,047
1992	0	1,965	3,788	38	5,791	0	2,934
1993	0	2,162	4,005	45	6,212	0	2,810
1994	7,260	2,348	4,307	55	6,710	3,284	2,710
1995	0	2,534	4,610	65	7,209	0	2,599
1996	0	2,720	4,912	75	7,707	0	2,481
1997	0	2,906	5,215	85	8,205	0	2,359
1998	0	3,092	5,517	94	8,703	0	2,234
1999	0	3,278	5,819	104	9,202	0	2,109
2000	0	3,464	6,122	114	9,700	0	1,985
2001	-21,536	3,650	6,424	124	10,198	-3,935	1,863
TOTAL	30,898	34,989	66,397	880	102,266	52,373	40,057

DISCOUNTED ECONOMIC COSTS :	52,373
DISCOUNTED ECONOMIC BENEFITS :	40,057
AGRICULTURAL DEVELOPMENT BENEFIT	13,260
VOC SAVING	26,516
RMC SAVING	281
NET PRESENT VALUE :	-12,316
BENEFIT COST RATIO :	0.76
INTERNAL RATE OF RETURN :	9.0 %

Table 3.6.3 COST AND BENEFITS
(F4,SECTION 1)

(1000 BAHT)

YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1984	0	0	0	0	0	0	0
1985	10,400	0	0	0	0	13,046	0
1986	15,600	0	0	0	0	17,472	0
1987	0	780	1,421	-13	2,188	0	1,954
1988	0	937	1,540	-9	2,468	0	1,967
1989	0	1,093	1,658	-4	2,747	0	1,955
1990	0	1,250	1,777	0	3,027	0	1,924
1991	0	1,407	1,896	4	3,307	0	1,876
1992	0	1,563	2,014	9	3,586	0	1,817
1993	0	1,720	2,133	13	3,866	0	1,749
1994	6,776	1,868	2,293	19	4,180	3,065	1,688
1995	0	2,016	2,453	25	4,494	0	1,621
1996	0	2,164	2,613	31	4,808	0	1,548
1997	0	2,312	2,773	38	5,122	0	1,472
1998	0	2,459	2,933	44	5,436	0	1,395
1999	0	2,607	3,093	50	5,750	0	1,318
2000	0	2,755	3,253	56	6,064	0	1,241
2001	-11,960	2,903	3,413	62	6,378	-2,185	1,165
TOTAL	20,816	27,834	35,263	325	63,421	31,398	24,690

DISCOUNTED ECONOMIC COSTS :	31,398
DISCOUNTED ECONOMIC BENEFITS :	24,690
AGRICULTURAL DEVELOPMENT BENEFIT	10,549
VOC SAVING	14,067
RMC SAVING	74
NET PRESENT VALUE :	-6,707
BENEFIT COST RATIO :	0.79
INTERNAL RATE OF RETURN :	9.2 %

Table 3.6.4 COST AND BENEFITS
(F5 STANDARD)

(1000 BAHT)

YEAR	COST		BENEFITS			DISCOUNTED(12%)	
	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	COST	BENEFIT
1984	0	0	0	0	0	0	0
1985	11,624	0	0	0	0	14,581	0
1986	17,436	0	0	0	0	19,528	0
1987	0	980	1,636	24	2,640	0	2,357
1988	0	1,177	1,808	28	3,013	0	2,402
1989	0	1,374	1,980	33	3,386	0	2,410
1990	0	1,571	2,152	37	3,760	0	2,389
1991	0	1,768	2,323	42	4,133	0	2,345
1992	0	1,965	2,495	46	4,506	0	2,283
1993	0	2,162	2,667	51	4,880	0	2,207
1994	1,694	2,348	2,904	57	5,308	766	2,144
1995	0	2,534	3,140	63	5,737	0	2,069
1996	0	2,720	3,377	69	6,166	0	1,985
1997	0	2,906	3,614	75	6,594	0	1,896
1998	0	3,092	3,850	81	7,023	0	1,803
1999	0	3,278	4,087	86	7,452	0	1,708
2000	0	3,464	4,324	92	7,880	0	1,612
2001	-14,124	3,650	4,561	98	8,309	-2,580	1,518
TOTAL	16,630	34,989	44,918	881	80,787	32,295	31,129

DISCOUNTED ECONOMIC COSTS :	32,295
DISCOUNTED ECONOMIC BENEFITS :	31,129
AGRICULTURAL DEVELOPMENT BENEFIT	13,260
VOC SAVING	17,542
RMC SAVING	327
NET PRESENT VALUE :	-1,166
BENEFIT COST RATIO :	0.96
INTERNAL RATE OF RETURN :	11.6 %

Table 3.7.1 SOCIAL INDICATORS
(Proposed Route IM-3)

		Education		Note:
Population (1,000)		Access to Secondary School		<u>1/</u> () shows the length or distance in without project case. Unless otherwise, lengths are same both in with project case and without project case.
1982	: 26.0	Number of Student in 1993 (1,000) <u>2/</u>	: 5.7	<u>2/</u> 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.
1993	: 30.0	Average distance to school (km)	: 5.5 (5.8)	<u>3/</u> Numbers of the sample areas
Average travelling speed, without (kph)	: 43	Per capita time savings (10 ⁻⁴)	: 0.103	<u>4/</u> (Number of University Graduate Teachers)/(Total Number of Student) x 1,000
Isolation		Score	: 56	<u>5/</u> (Total of Teachers)/(Total Number of Student) x 1,000
Access to Amphoe		Teacher Intensity		<u>6/</u> Sum of <u>4/</u> and <u>5/</u>
Average distance to Amphoe (km) <u>1/</u>	: 5.9 (6.3)	Number of teachers <u>3/</u>		<u>7/</u> 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:
Per capita time savings (10 ⁻⁴)	: 0.022	University graduate	: 3	Number of university graduate teachers 438
Score	: 65	Total	: 18	Number of Teachers 1,285
Access to Artery Highway		Number of Student	: 195	Number of student 25,196
Average distance to highway (km) <u>1/</u>	: 14 (14)	Indicators		
Per capita time savings (10 ⁻⁴)	: 0.044	E1 <u>4/</u>	: 15.4	
Score	: 96	E2 <u>5/</u>	: (51.0)	
Impassability		E <u>6/</u>	: 66.4	
Impassable week a year	: 2	Degree of Improvement <u>7/</u>	: 1.03	
Impassability per year	: 0.038	Score	: 66	
Impassability per capita (10 ⁻⁴)	: 0.013	Disparity		<u>8/</u> Estimated gross value of crop production in the areas of influence
Score	: 108	G.P.V. in 1993 (Mn B) <u>8/</u>		<u>9/</u> "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.
Health		With project	: 107.8	
Access to Hospital		Without project	: 104.1	
Average distance to Hospital (km) <u>1/</u>	: 15.5 (17.0)	Per capita G.P.V. in 1993 (B)		
Per capita time savings (10 ⁻⁴)	: 0.060	With project (W)	: 3,593	
Score	: 140	Without project (w)	: 3,470	
Access to Medical Facilities		Degree of Disparity		
Average distance to facilities (km) <u>1/</u>	: 5.5 (5.8)	(A/W) - (A/w) <u>9/</u>	: 0	
Per capita time savings (10 ⁻⁴)	: 0.019	Score	: 0	
Score	: 76	Total Score	: 608	