# 26.2 AGRICULTURAL DEVELOPMENT

### 26.2.1 Present Condition

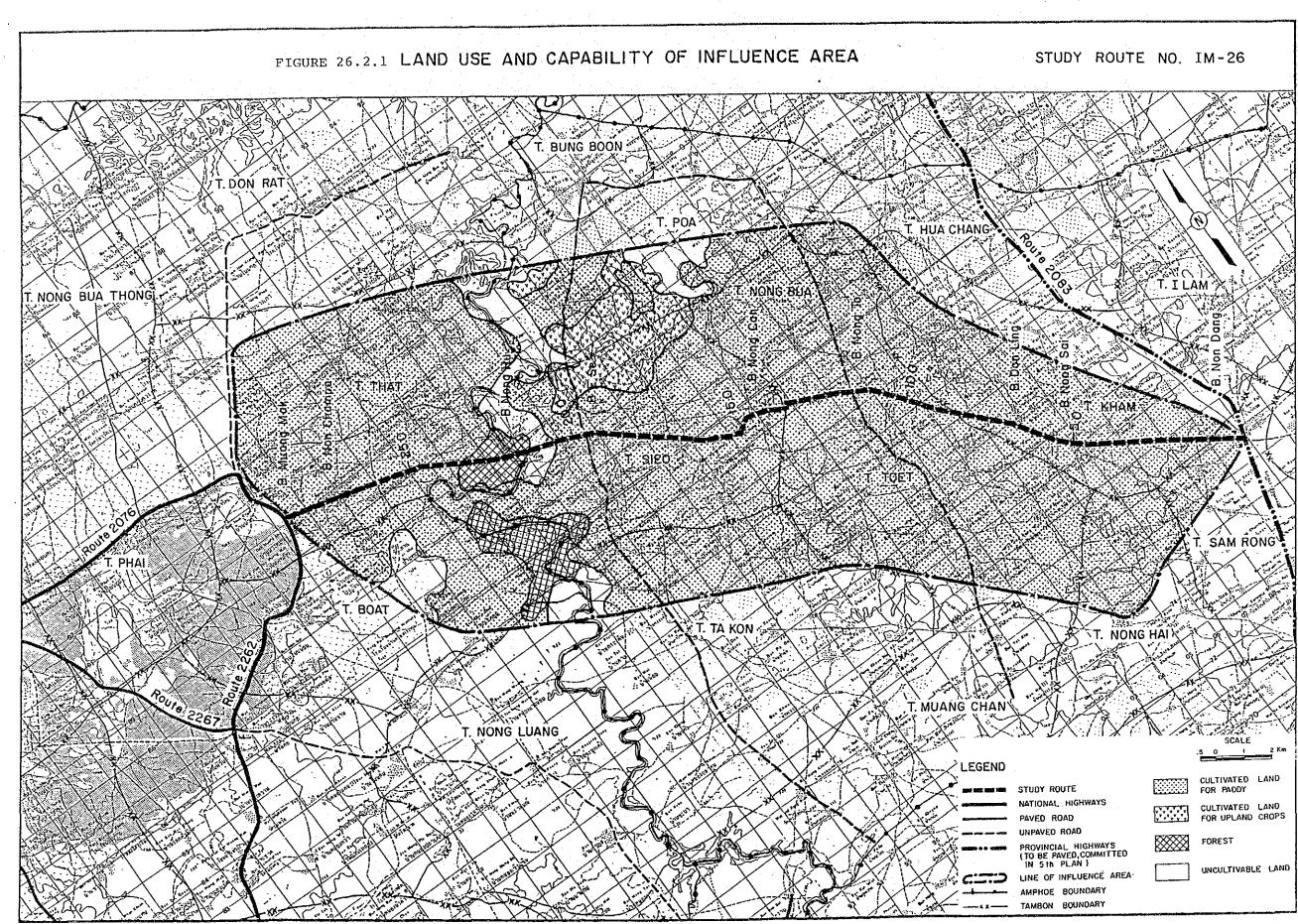
Almost all of cultivated land in the influence area is covered by paddy fields. Kenaf was the only main crop planted in upland fields in the 1983 crop year.

Land use and capability conditions in the area are shown in Table 26.2.1 and Figure 26.2.1. A typical cropping calendar in the area is shown in Figure 26.2.2.

## 26.2.2 Development Projection

Future agricultural development in the area of influence was projected for the two cases of "with and without project". The projected planted area, unit yields by crop, and the consequent production amount are shown in Table 26.2.2.

Based on the above projected production amount, farmgate prices and production costs estimated separately, net production value (NPV) was obtained as shown in Table 26.2.3. The difference in NPV between the two cases is deemed to be the development benefit of the study route.



26-8 26-7

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FIGU

ROUTE IM-26

MONTH JAN FEB MAR APR MAY RICE LOWLAND RAINFED LOWLAND IRRIGATED UPLAND RAINFED KENAF

<u>Note:</u> FIRST CROP

sowing growing harvesting season season season

26-9

# FIGURE 26.2.2 CROPPING CALENDAR

	Related	Amphoes:	1506	Rat	tana Bi	ıri
			1605	Uth	umphon	Phisai
•			1611	κ.	Bung	Boon

JUN	JUL	AUG	SEP	OCT	NON	DEC
C	·			-0	×	
				—— <b>X</b>		
<del></del>				<b>X</b>		—Х
ч.						

SECOND CROP

 $\cap$ 

=()

# TABLE 26.2.1 CULTIVATED LAND

				سه الما الله الله الله الله الله الله الل				Γ.ι	JNIT : 1	000 RAI	(KM2) ]			
		CHANG	WAT	AMF	HOE		وموجدة هيد الله في الدو التي الي ال	CULTIVATE	D LAND					
		NAM	E	NA	ME	PADDY	/ FIELD	UPLANE	) FIELD	T(	TAL			
		SURIN SI SA KET		RATTANAB UTHUMPON BUNG BOO	PHISAI	75.25	( 47.71) (120.40) ( 10.30)	2.25 ( 1.48 (	3.60) 2.37)	77.50 7.92	( 47.71) (124.00) ( 12.67)			
· · · · · · · · · · · · · · · · · · ·		TOTAL				111.51	(178.42)				(184.38)			
					TABLE	26.2.2 CI	ROP PRODU	CTION						
	ITEM		RICE (PADDY)		SORGHUM	BEANS	GROUND NUTS	CASSAVA	KENAF	SUGAR	COTTON	CASTOR BEANS	UPLAND TOTAL	тота
PLANTED AF	REA	(1000 RAI)			<b>_</b> _			· · · · · · · · · · · · · · · · · · ·						
BASE YE	AR i	(1983)	107.83	8 -	· - ·	· · · ·	••••	-	2.61		-	_ `	2.61	110.4
WITHOUT	PROJECT	(1988) (1994) (2002)	107.83 107.83 107.83	) –	-			-	2.61 2.61 2.61		-		2.61	110.4 110.4 110.4
WITH	PROJECT	(1988)	107.83		· · ·		·		2.65					110.4
4 <b>47</b> 7 7 3 3	110000001	(1994) (2002)	107.83	) -	-		·		2.87	-			2.87	110.7
	· ·													
CROP YIELD	I .	(KG/RAI)												
BASE YE	AR	(1983)	292.5	; -		· .	. –	-	200.0	-		-		
WITHOUT	PROJECT	(1988)	292.5		. –	-	-	-	200.0		- -	_		
-		(1994) (2002)	292.5 292.5		-	-		-	200.0 200.0	· _				
WITH	PROJECT	(1988) (1994) (2002)	293.2 297.4 303.0		-			· · · ·	200.0 200.0 200.0			- - -		
					· · · ·	· · ·								
CROP PRODU	CTION AMOUN	NT (TON)			1	· · ·								
BASE YE	AR	(1983)	31,540			-	. <b></b>	-	522	_		-	522	32,06
WITHOUT	PROJECT	(1988) (1994)	31,540 31,540		· · · · · · · · · · · · · · · · · · ·	-		-	522 522			-	522 522	32,06 32,06
		(2002)	31,540						522		· -	-	522	32,00
WITH	PROJECT	(1988) (1994)	31,615 32,064				-		529 575	-			529 575	32,14 32,63
		(2002)	32,064			_	-	· · ·	642	-	-	-	575 642	32,63

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE

x	ITEM	n an air an Air an Airtean An an Airtean Airtean Airtean	RICE (PADDY)	MAIZE	SORGHUM	BEANS	GROUND NUTS	CASSAVA	KENAF	SUGAR CANE	COTTON	CASTOR BEANS	UPLAND TOTAL	TOTAL
FARMGATE P	RICE	(BAHT/TON)		**** **** **** <b>***</b> *		******	and the second international second second second second							
WITHOUT	PROJECT	(1983 - 2002)	3,653	 <del></del>	· · · · -	-	با	1 <u>1</u> <b></b>	4,470		<u> </u>			. 7
WITH	PROJECT	(1988 - 2002)	3,668		· · · · · · · · · · · · · · · · · · ·	 	. <b></b>	<del>-</del> .	4,499	-				
n an the second seco		Nacional de Calendaria A substantin de Calendaria		· ·			1. ee			, the star	· · · · · ·			· .
CROP PRODU	CTION COS	T (BAHT/RAI)				n n Ng								
BASE YE	AR	(1983)	700	ан ал <u>н</u>	· · · · · ·		<u> </u>		790	•	- <sup>-</sup> -	·		
WITHOUT	PROJECT	(1988)	700	· _			<u> </u>	-	790	-				
	i se sta a	(1994) (2002)	700 700	·		<u>ن</u> ے ہے۔ سر ا		-	790 790	-		· · · ·		
WITH	PROJECT	(1988)	701	_		-	-		790	• <u> </u>				
		(1994) (2002)	709 720	-	-			-	790 790	-				
NET PRODUCT	TION VALL	E (1000 BAHT)								a tang t	1 A. A.	an the second		
WITHOUT	PROJECT	(1988)	39,736	-			-	-	271 271	•			271	40,007 40,007
		(1994) (2002)	39,736 39,736	-		-			271	· -	<del>.</del>		271	40,007
WITH	PROJECT	(1988)	40,373			· _	-	- · · ·	290	-	<b>"</b>		290	40,663
•••		(1994)	41,159	-		-			316			· · -	316 352	41,475
		(2002)	42,205			-	-	· -	352				- <b>-</b>	743
NET VALUE	ADDED	(1000 BAHT)			·			•		· ·	· · ·			
	1988		637				<u>-</u>	-	19	-		-	19	656
	1994 2002		1,423 2,469		_	-			45 81	-		· _	45 81	1,468 2,550

.

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# TABLE 26.2.3 NET PRODUCTION VALUE

# NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE

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# 26.3 VOC SAVINGS

# 1.1. 数据基本 28.868 医新林病的 自然不可能 机运行的 经分子的

an an ann an a stàitean an thairtean thairtean an thairtean an thairtean an thairtean an thairtean an thairtean Thairtean an thairtea In accordance with the concept and data given in Section 3.4 of the Text Report, VOCs on the road link concerned were calculated in the two cases of "with and without project".

Road length by road class is shown in Table 26.3.1. Data for additional VOCs are shown in Table 26.3.2. 1997 **- 1**997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997

VOC savings, obtained as the balance of total link VOCs between the two cases, were calculated as shown in Table 26.3.3.

# TABLE 26.3.3 VEHICLE OPERATING COST SAVING

					e la sul	· ·	()	UNIT : 10	00 BAHT)
LINK		1988			1994			2002	······································
NO.	WITHOUT	WITH	SAVING	WITHOUT	WITH	SAVING	WITHOUT	WITH	SAVING
1 2	10,194 1,805	6,289 1,715	3,907 91	13,907 2,387	8,655 2,064	5,253 323	21,388 3,420	13,444 2,730	7,944 690
TOTAL	12,001	8,004	3,997	16,295	10,719	5,576	24,308	16,174	8,634
					=======================================				

.

NOTE

(1) WITHOUT : WITHOUT PROJECT CASE
(3) SAVING : VEHICLE OPERATING COST SAVING
(4) LINK NO. = 1 - 9 : PROPOSED LINK

1.045

. . . . .

### TABLE 26.3.1 ROAD LENGTH BY ROAD CLASS

					· •		
					· .	(U	NIT : KM)
LINK			WITHOUT PR	OUECT CASE			WITH
NO.	FAVED		LATERITE		EARTH	TOTAL	CASE
		600D	FAIR	POOR		iorac	PAVED
1	_	-	i.1	17.0	_	18.1	18.1
2	-	-	4.3	6.0		10.3	10.3
*****	===========		*========			******	

### TABLE 26.3.2 DATA FOR ADDITIONAL VOC COST

**==						~	<u></u>												(UNI)	OF LENG	(M : HT
LINK	CASE				C	URVE					<b>-</b> -		GRADE			V	LLAGE	NO. OF	NO, OF	NO. OF	NO. OF
NO.	UHOC.	100	150	200	250	300	375	500	750	1500	1	2	З	4	5	NO.	LENGTH	INTER- SECTION	TIMBER BRIDGE		CORNER
1	WITHOUT WITH			-	-			  		2364 2364	7600 7600	-	100 200	300		3	900 900	6	-		
2	WITHOUT WITH					402 402	 -	287 287	136 136		2500 2500	400 425	  	  	25	4	600 600	<u>i</u> _			

26-12

### (2) WITH WITH PROJECT CASE

### (5) LINK NO. = 11 - 19 : SURROUNDING LINK

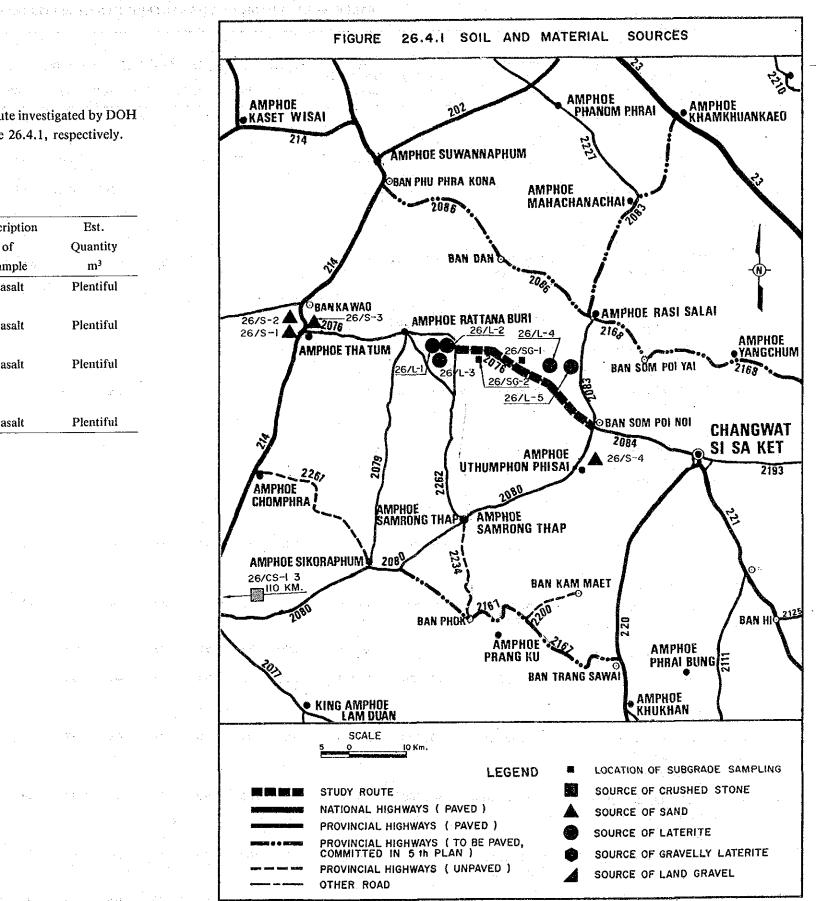
# 26.4 ENGINEERING

### 26.4.1 Soil and Materials

Existing subgrade soil and material sources in the vicinity of the study route investigated by DOH and their physical characteristics are shown in Figure 26.4.1 and Table 26.4.1, respectively.

Rock aggregate sources were assumed as shown below:

		Description	Est.
No.	Source	of	Quantity
		Sample	m³
26/CS-1	KM. 13+400 Rt 2 KM. Surin-Prasat	Basalt	Plentiful
	KM. 14+450 Rt 2 KM. Surin-Prasat	Basalt	Plentiful
26/CS-2	KM. 14+450 Rt 2 KM. Surin-Prasat	Basalt	Plentiful
	(Sirathanakit Quarry)		t ut
26/CS-3	KM. 14+450 Rt 2.0 KM. Surin-Prasat	Basalt	Plentiful



	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	a serie and and	TABLE 2									·····							
No.	Source	Description of	Est. Quantity m <sup>3</sup>	AASHTO Classifi- cation	50.0	25,0	Sieve			assing #10	#40	#200	<u>Plastici</u> LL P	Öp	Comp I-TSI ot. 5% gr	tand.		C.B.R. Swell	Dural	bility Dur
		Sample		Gatton	<u> </u>													• •		
SUBGI	LADE				n an tha tha tha tha tha tha tha tha tha tha tha tha tha tha tha		- - -					n ener				n and Nation	an di sana Rohi ya	i se stationale se stationale		ann
/sG-l.	KM. 19+600 Rt 12 M.			A-4		• • • • •				100	99.2	69.4	N-P	10	0.0 1	L.915	13.0	-		
/SG-2.	KM. 24+800 Lt 15 M.	1963) 1973 - 1975 1975 - 1975	San Arrent San Arrent	A-4		· .	· ·		100	96.8	84.4	57.0	N-P	9	.3 1	L.907	19.0	-		
SANI	2 · · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·								:	1994 (* 19		÷ .		•					
26/S-1	KM. 2+700 Lt 300 M. Tha Tum - Suwan Na Phum	Huai Kudh Wiensand	Plentiful	A-3	ч. У.,	· .		100	99	98	66	2	N.P.					 : <u>.</u>	-	
6/S~2	KM. 53+000 Rt, Lt	Mun River	Plentiful						<del>.</del> .					:	Loci			n stand		
	close to Surin - Tha Tum - Suwan Na. Phum	sand							e e e e e e e e e e e e e e e e e e e					· •			L CHAI	i scano	, ru	
6/S-3 :	KM. 1+000 Lt, 1.5 KM.		Plentiful	A-1-b					100	99	23	1	N.P.	·			w t	· · · ·		
	Tha Tum - Rattana Buri	sand		· •					*		·* :	· .		and the	1	••••••	÷			<b>x</b> •
6/S-4	KM. 1+500 Rt 100 M. Uthumphon Phisai - Kam Kern Kaew	Mun River sand					-			100	54	1	N.P.	San	me as	stand	lard c	olor		
LATE	RITE						· · ·													
6/L-1	KM. 17+100 Rt 1 KM. Rattana Buri - Sri Saket	Red laterite	100,000	A-2-4	<b>100</b>	97	94	81	55	43	39	28	26.2 5.	D		-			62.4	60.6
	KM. 1+100 Lt 1 KM. Tha Tum - Rattana Bur	Mun River i sand	5,000	A-l-b				100	99	95	11	1	N.P.							
. •	L1:51 = 3:2 by weight	andra		A-2-4	100	98	96	89	73	67	27	17	N.P.	9.	5 2	.143	16.4	0.89		
6/L-2	KM. 30+000 Rt 5 KM. Sam Rong Tap - Rattana Buri	Laterite	100,000	<b>A-2-4</b>	100	96	91	63	46	38	30	18	27.3 8.	66.	82	.229	30.5	0.04	43.2	63.3
6/L-3	км. 30+000 Rt 3 км. Sam Rong Tap	Laterite	150,000	A−2:−4 A−2:−4	100	97	96	83	65	57	47	31	N.P.						72.5	60.0
5/L-4	Rattana Buri KM. 16+800 Lt 16 KM.	Laterite	30,000		n (1997) Statesticker Statesticker		98	88	57	39	34	28	29.6 17.	1			·		55.2	29.5
	Uthumphon Phisai - Kam Kern Kaew	ماني کې د د اندې د ا	n o seriespecie A constantespecie	i definition Alternation	en e grane. E e e grane			<b>a</b> 1		67	20	10	17.0 10.	n 10		100	63 9	_		
	L3:S1 = 3:2 by weight	Laterite and sand		<ul> <li>(1993)</li></ul>	di tere		99	91	69	56	39									
6/L-5	KM. 16+800 Lt 7.5 KM. Uthumphon Phisai -	Laterite		А-2-ь		96	90	76	66	61	43	19	23.2 11.	57.	.62.	.218	12.0	0.10	34.0	48.8

26-14

.

Kam Kern Kaew

26.4.2.1 Design Criteria

Standardized type

Others

Standard intervals Paddy area

Pipe Culvert

Location

Design Standard	: F4	
Geometric Design Criteria	: DOH (Provincial Highway)	
Typical Cross Section	: as shown in Figure 26.4.2	e de
Minimum Height of Embankment in		
Flooding Section	: 0.7 m above flood level	
Pavement Structure	and the second	the second
DBST	: 2.5 cm	÷.
Crushed Aggregate Base CBR≥ 80%	: 15.0 cm	
Soil Aggregate Subbase CBR≥ 25%	: 10.0 cm (minimum requirement)	
Selected Materials $CBR \ge 6\%$	: as required	

: as required

: 200 m

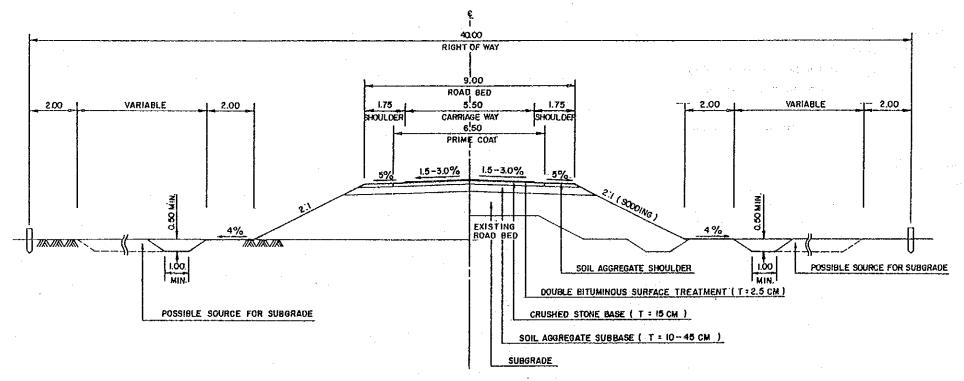
: 500 m

: 80, 100, 120 & 150 cm in diameter

Box Culvert Standard size Location Bridge Reinforced concrete standard type Substructure

The existing and designed plan and profile are shown in Drawings 26-1/26-4.





PROVINCIAL HIGHWAY ( CLASS F4 )

26-15

:  $1.5 \times 1.5$ ,  $2.4 \times 2.4$  &  $3.0 \times 3.0$  m : as required

: Width 9.0 m : Pile-bent type

# 26.4.2.3 Pavement Design

- 1) Cumulative number of ESA in one direction
- ESA conversion factors
- Heavy bus : 0.50 Medium truck. : 0.76 Heavy truck : 1.24
- Forecasted ADT by vehicle type

Year	T	19	88			19	94		
Traffic/road link	1	2	3	4	1	2	3	4	· , <sup>·</sup> · ·
Heavy bus	5	4		-	13	6		. —	
Medium truck	37	13	_		56	18	-		
Heavy truck	30	8	<u> </u>		38	11		<u> </u>	

3

-3

3

- Cumulative number of ESA in one direction by road link 2 Road link 1
- 0.105 0.033 7 years (10<sup>6</sup>) 2) Design CBR values
- Road link 2 1 9.8 15.5 Design CBR (%)
- 3) Required thickness of pavement
  - : DBST (2.5 cm) Surfacing : 15 cm (CBR not less than 25%) Aggregate base Subbase : Minimum requirement 10 cm Road link 1 2
    - 10 cm 10 cm
- 4) Overlay required in 7 years DBST resurfacing

# 26.4.2.4 Drainage and Structures

The locations of existing and designed RC box culverts and RC bridges and their dimensions are shown below:

	EXISTING	STRUCTURES	PROPOSED STRUCTURES						
STATION	TYPE	SIZE	түре	SIZE					
4 + 263	Box Culvert	3-1.8 x 1.8 x 8.0	Extd.	10.0 m					
5 + 605	H II	3-1.8 x 1.5 x 9.0	Extd.	9.0 m					
6 + 189	. 19 . 11	3-1.8 x 1.8 x 10.0	Extd.	8.0 m					
10 + 380	RC Bridge	8.0 x 22.0	n an an 11 fan de an <del>12</del> 1 - 1911 - Barnes Anna III						
16 + 272	n teachtra tha an teachtra Be	8.0 x 18.0	<u> </u>						
21 + 537	n u	8.0 x 130.0	_						
				••••••••••••••••••••••••••••••••••••••					
				·					



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# 26.4.3 Quantities and Construction and Road Maintenance Costs

### 26,4.4 Construction and Disbursement Schedules

The required construction costs were estimated based on the results of the preliminary design as shown in Table 26.4.2. Financial costs with breakdown into local and foreign currency portions, economic costs and residual values were estimated as follows and in 26.4.4:

(baht) IM - 26 L = 28.4 km : 47,336,000 Financial cost: : 39,558,000 Economic cost : 16,175,000 Residual value

The required road maintenance cost savings are shown in Table 26.4.3.

Length = 28.4 km IM---26

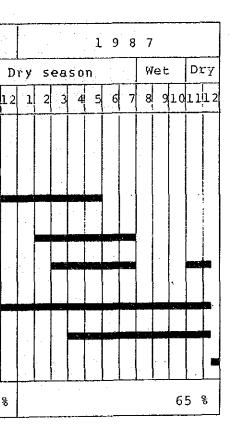
Construction Schedule

Assumption: Completion date December 31, 1987

Year &1 9 8 6MonthDry seasonWetWORK ITEMS1 2 3 4 5 6 7 8 910111CONTRACTPREPARATORY WORKSPREPARATORY WORKSMAJOR WORKS(PRECEDING)PAVEMENT WORKSMAJOR WORKS(FOLLOWING)STBUCTURE_WORKSMISC. WORKSCLEARING-UPPAYMENT IN %										_				
WORK ITEMS       1       2       3       4       5       6       7       8       910111         CONTRACT       PREPARATORY WORKS       V       V       V       V       V         PREPARATORY WORKS       MAJOR WORKS       V       V       V       V       V         PREPECEDING)       PAVEMENT WORKS       V       V       V       V       V       V         PAVEMENT WORKS       MAJOR WORKS       V       V       V       V       V       V         STBUCTURE_WORKS       MISC. WORKS       V	•.	Year &			:		1	9	8	- 6	es te			1
CONTRACT PREPARATORY WORKS MAJOR WORKS (PRECEDING) PAVEMENT WORKS MAJOR WORKS (FOLLOWING) STBUCTURE_WORKS MISC. WORKS CLEARING-UP		Month		Dr	Y	se	as	on		W	et		•	
PREPARATORY WORKS MAJOR WORKS (PRECEDING) PAVEMENT WORKS MAJOR WORKS (FOLLOWING) STBUCTURE_WORKS MISC. WORKS CLEARING-UP	۰	WORK ITEMS	1	2	3	4	5	6	7	8	9	10	11	1
(PRECEDING) PAVEMENT WORKS MAJOR WORKS (FOLLOWING) STBUCTURE_WORKS MISC. WORKS CLEARING-UP								7	7.	_				
MAJOR WORKS (FOLLOWING) STBUCTURE_WORKS MISC. WORKS CLEARING-UP	· ·													
MISC. WORKS CLEARING-UP		MAJOR WORKS		-										
PAYMENT IN % 35 %		MISC. WORKS		-							•			
		PAYMENT IN %			' :	·				! 		3	5	200 

# Yearly Disbursement Schedule Assumption: Annual rise in prices

	Yea		Base 198	year 34	()	.985)	198	36	1987	
	Local		1	00	]	.10.0	121	L.0	133.	1
	Forei	gn	10	00	]	.06.5	113	3.4	120.	8
	LOCAL	AND FOREI	GN COMP	ONENTS OF	CONSTR	UCTION C	051			
·			( ដូចម	te IM - 26	<b>)</b>			(Unit	: M1)11	on Baht
	3 # # # # # # # # # # # # # # # # # # #		1986			1987		12426-0-	otal	
		L/C	F/C	Total	L/C	F/C	Total	L/C	F/C	Total
Constructi Price Con		8.1 1.7	8.3	16.4 2.8	15.3	15.6 3.2	30.9 8.3	23.4	23.9 4.3	47.3
	otal Stal	9.8 (0.36)	9.4 (0.35)	19.2 ( 0.71) (	20.4 0.76)	18.8 (0.70)	39.2 (1.45)	30.2 (1.12)	28.2 (1.04)	58.4 (2.16
,u≠≈===== Remarks f	L/C : Loca F/C : Fore () : US\$	l Currency ish Current Equivalent	y Port:	ion	t)					



DBST						a a a a a a a a a a a a a a a a a a a		n ni ni ni ni ni		incasa	
	Item	lin i t	Financial Unit Pato	Quantity -		nancial Co			omic Cost	Residu	al Valu
•				Quantiti		Local		× %	1000 B	72	1000
EARTHWORK								83		90	
Clearing & G		ha 7	10:000	69	690					14 a.e	
	vation, Unclassified Common Soil	ന് പ ന 3	38	208:400	53 7,919					۰.	· · · ·
	Selected Material	m3	103088 19 38 70 88	0	D						
Replacement	of Soft Spot	m 3	88	3,600	317 8,979	4.570	<u>λ</u> .λοσ	n entre	7,453	÷ • •	6,70
Sub Total		1 .	a an a ta a	алар 1. тар	03777	41277	41700		11400		0170
SUBBASE & BASE								83		50	
Subbase, Soi		m3	112		2:990						
Cement Stabi	Se*	m3 m3	372	27,600	10,267 0						
Shoulder: So		ສ3 ສ3	120	10,700	1,284						
Sub Total				······································	14+542	7:852	6,689		12:070		6,03
SURFACE COURSE	<b>q</b>	·	2 <u>.</u>					85	•	50**	
	ime/Tack Coat	m2	12	184,700	2,216						
	inous Surface Treatment*	m2	39	156,300	6:096						
	ncrete Surfacins**	t	750	Ð	0				<b>.</b>	. *	
Sub Total			au a la catal		8:312	3,657	4,655		7,065		
STRUCTURES					· · · ·			83		50	·
	ert (D 1.Om Equivalent)	m		1,603	3 206						
	rt (2.4mx2.4m Equivalent)		18,800	81	1,523						
••••	7.Om L=10m Equivalent)	៣	46,500	0	0	A 7/1	2,364		3,925		1,96
Sub Total					41729	2;364	∠1364 		31723		1370
Total (a)		·.• ·			36,562	18,454	18,108		30,512		14:70
INCIDENTALS						· .		83		Û	
Miscellane	ous Work ((a)x7%)	15	in set fit i ligit a	·	2,559	1,280	1:280		2,124		)
CONTRACT AMOUN	Г (Ъ)	t en alegad	an a		39,121	19:733	17,388		32,637		14,70
PHYSICAL CONTI	NGENCIES ((b)x10%) (c)	15			3,912	1:973	1,939		3,264		1,47(
ENGINEERING AN	SUPERVISION		an an third					85		D	
(((b)+(c))		ls			4,303	1,721	2,582		3,458		(
LAND ACQUISITI	NN THE REPORT OF THE REPORT			· · · · ·				100		100	
Hishly Devel		ha	50,000	· O	0			100			
Less Develop	ed Land		15,000	0	0.						
Sub Total	(e)	15	· · · .		0	0	0		0		)
PROJECT COST (	(P)+(C)+(q)+(6))				47,336	23,428	23,909	• •	37,558		16,175
. Accept over (						201920	/				
AVERAGE COST P	ER KM & Constant of the state o	n na san Angelar Angelar	n an		1,667						

# TABLE 26.4:2 CONSTRUCTION QUANTITIES AND COSTS (ROUTE IM-26 Length = 28.4 km)

Note : \* The unit prices are modified by assresate haulase distance \*\* Rate is applied only for Asphaltic Concrete Surfacing

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				:		TABLE	26.4.3 ROAD MA	INTENANCE					علك وتكاو شكم كمغر وكمر سطار ددرور برسو برسام بعام وعدو كلمة د	مر هاه الله منه مين وي ميش من وي
	ng ang ang ang ang ang ang	البين في من من خين من		WITHOUT	PROJECT	CASE					PROJECT	CASE	یک و یک و یک و بید وجہ وجہ وجہ وجہ وجہ وجہ وجہ وجہ وجہ و	ROAD
LINK NO.	YEAR	AVERAGE DAILY TRAFFIC <adt> (VEHICLE)</adt>	LENGTH OF LINK <l> (KM)</l>	FACTOR FOR	ROAD CHARA. FACTOR <ka></ka>	UNIT MAINTE. COST <u> (BAHT/KM)</u>	TOTAL MAINTE. COST <t> (1000 BAHT)</t>	AVERAGE DAILY TRAFFIC <adt> (VEHICLE)</adt>	LENGTH OF LINK <l> (KM)</l>	FOR	CHARA.	UNIT MAINTE. COST <u> (BAHT/KM)</u>	TOTAL MAINTE. COST <t> (1000 BAHT)</t>	MAINTE COST SAVING
1	1988 1994 2002	225.7 329.9 558.9	18.1 18.1 18.1	0.36 0.60 0.95	1.29 1.46 1.71	13,619 15,402 17,966	247 279 325	256.4 374.7 628.6	18.1 18.1 18.1	0.00 0.00 0.00	1.14 1.14	12,793 12,793 12,793 12,793	aliter "and" along	15 47 94
	1988 1994 2002	83,3 111.0 163.1	10.3 10.3 10.3	0.03 0.09 0.22	1.06 1.11 1.19	11,183 11,657 12,548	120 129	113.7 134.5 175.8	10.3 10.3 10.3	0.00 0.00 0.00	1.14 1.14	12,793	132 132 132	-17
OTAL	1988 1994 2002	174.1 250.5 415.4	28.4 28.4 28.4		, 1999 yang yang yang yang yang yang yang yang	12,735 14,044 16,001	362 399 454	204.7 287.6 464.4	28.4 28.4			12,793 12,793 12,793	363 363 363	-2 36 91
		) TOTAL ) UNIT M	MAINTEN	ANCE CO IFIED MA	ST P	I = M * (KA ICE COST SE M =	A or KB) * F4 7,700 BAHT/1 8,200 BAHT/1	<m< th=""><th>₹) * FE</th><th></th><th></th><th>a di A</th><th></th><th></th></m<>	₹) * FE			a di A		
		F	A = 1.44 R = 0.14 E = 0.84	5. 5. ja – 1944	EMERGEN	ICY REHABIL	ACTOR FOR DIN LITATION COST ANCE COST FAM	FACTOR	1. 		• :	)ST		
:	(3	W	ITHOUT	RISTIC   PROJECT PROJECT	CASE		04 + 0.70 * / 14 + 0.05 * )							
·	(4		ITHOUT .	T PROJECT PROJECT	CASE CASE	A1 = -0, X3 = -0,	.1630 + 0.003 .2034 + 0.000	2320 * AD 0409 * (AD	T T / LANI	E)	; LANE =	= 2		
					, 									

TABLE 26,4,3 ROAD MAINTENANCE COST SAVING

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# **26.5 EVALUATION**

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# 26.5.1 Economic Evaluation

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The yearly distribution of the economic costs and benefits and the calculated economic indicators for evaluation are given in the table below. 

The results indicate that the improvement of this study route is feasible by employing the F4 stan-dard with DBST surfacing. a de la composición d La defendada de la composición de la com La defendada de la composición de la com

	COST A	ND BENEFI	T STATEM	ENT OF F	NOUTE IN		O BAHT)
**********	COST	**=======	BENEF	ITS		DISCOUN	ED(12%)
YEAR	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL		TOTAL BENEFIT
1986	13,845	0	0	0	ò	17,367	0
1987	25,713	Ó	O C	0	0	28,799	
1988	0	656	3,997	-2	4,652	Ó	4,153
1989	0	791	4,260	៍ ១	5,056	0	4,031
1990	0	927	4,523	11	5,461	0	3,887
1991	0	1,062	4,786	17	5,865	0	3,728
1992	0	1,197	5,049	- 23	6,270	0	3,558
1993	0	1,333	5,313	,29	6,675	0	3,382
1994	0	1,468	5,576	36	7,079	0	3,202
1995	10,223	1,603	5,958	42	7,604	4,624	3,071
1996	0	1,739	6,340	49	8,128	0	2,931
1997	0	1,874	6,723	56	8,653	Ŭ	2,786
1998	0	2,009	7,105	63	9,177	0	2,638
1999	0	2,144	7,437	70	9,702	0	2,490
2000	0	2,280	7,869	77	10,226	0	2,344
2001	0	2,415	8,252	84	10,751	0	2,200
2002	-16,175	2,550	8,634	91	11,275	-2,955	2,060
TOTAL	33,606	24,047	91,873	653	116,573	47,835	46,460
DISCOUNTED	47,835	9,058	37,196	205	46,460		

NET PRESENT VALUE -1,375 3 BENEFIT/COST RATIO f. 0.97 INTERNAL RATE OF RETURN 11.6 % : FIRST YEAR RATE OF RETURN 1 9.0 % OPTIMUM OPENING YEAR 1990 1

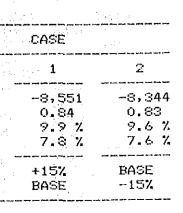
# SENSITIVITY TESTS

st ti		
		BASE
	NET PRESENT VALUE BENEFIT/COST RATIO INTERNAL RATE OF RETURN FIRST YEAR RATE OF RETURN	-1,375 0.97 11.6 % 9.0 %
	COSTS BENEFITS	BASE BASE

# 26.5.2 Social Impact

) and a second s	The social impact brought about by the improvement of the Stuing social benefit indicators:
	Construction Cost (million baht)
	<ol> <li>General Accessibility Benefit (million baht)</li> <li>Education Benefit (million baht)</li> </ol>
	<ol> <li>Medical Care Benefit (million baht)</li> <li>Total Social Benefits (million baht) (1+2+3)</li> <li>Social Benefit/Cost Ratio (×10<sup>-2</sup>)</li> <li>Ranking by Social Benefits</li> </ol>
en Song States (Song Song States) Song	<ul> <li>7) Weighted Production Value Gain/Cost (×10<sup>-2</sup>)</li> <li>8) Ranking by 7</li> <li>9) Combined Ratio (×10<sup>-2</sup>)</li> </ul>

### **Overall Ranking**



tudy Route is shown in the follow-

-,

: 39.6 3.04 ; 4.06 ; : 0.070 7.17 : : 18.13 : 3 : 4.22 : 13 : 22.35 :

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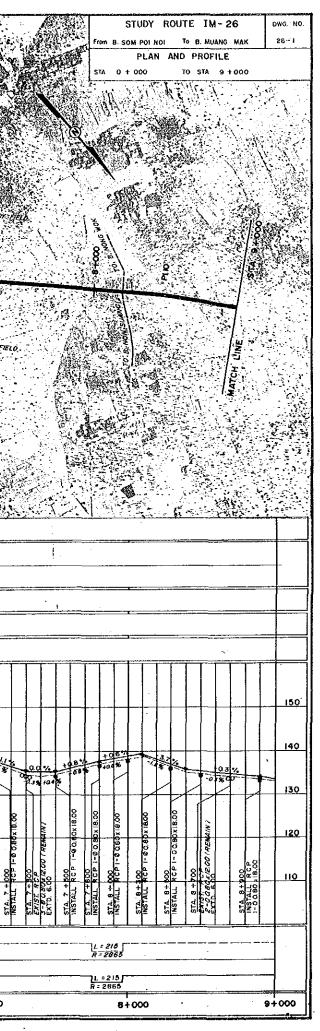
26.5.3 Overall Evaluation

It is concluded that, considering the overall ranking and possible schedule of the improvement of the study routes with due consideration to the prevailing opportunity cost of capital, the improvement of this study route with the opening year 1990 is recommended.

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( <del>.</del> . )	130				2 - 06 % C0 % DP % +0, 8 0/2 € 2 € 2 € 2 € 2 € 2 € 2 € 2 € 2 € 2 €		PROFILE GRADE a.E -0.1% -0.	- 24 <b>3 2</b>
ELEVATION	120		ACP 1 - 6 0 ACP 1 - 6 0 ACP 2 - 6 0 8 ACP 1 - 6	INSTALL RCP I- & 0.46 x 18.00 STAL 2+900 INSTALL RCP I- # 0.80 x 18.00 INSTALL RCP I- # 0.80 x 18.00 INSTALL RCP I- # 0.80 x 18.00 INSTALL RCP I- # 0.80 x 18.00 STA. 3 + 800 INSTALL RCP I- # 0.80 x 18.00 STA. 3 + 900 STA. 3 + 900	131         131         131         131           131         131         131         131         131           131	1.4         4.80         1.820           1.514.4         4.80         1.800           1.505.60         1.800         1.800           574.5         5.425         1.800           2.505.60         1.800         1.800           2.455.60         1.800         1.800           2.455.60         1.800         1.800           2.455.60         1.800         1.800           2.455.60         1.800         1.800           1.850.60         1.800         1.800           2.955.60         1.800         1.800           2.955.60         1.800         1.800           2.955.60         1.800         1.800           2.955.60         1.800         1.800           2.905.60         1.800         1.800		1.857.812 82.5 1.807.814.00 STA 6 + 500 MAL CCF - 9030A19.00 1.874.4 CCF - 9030A19.00 MSTAL RCP 1-0.080A18.00
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- 0.4 %		- EXISTING PROFILE	0.7 % +0.4 % -0.1 %	+ c 4 % + 0 7 % - 0 / % - 2 / %	0.3 % +1 %		2.0 74 3 -0.7 % 1 2111-134 6+ 0	+0.3 % +0.8 % + 0.9 % + 0.8 % + 0.8 %	130
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L=205	<u>R = 1910</u> L = 140L = 175	5 <u> </u>	L = 198	L = 124 R = 716	L = 101			· · · · · · · · · · · · · · · · · · ·	

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STUDY ROUTE NO. IM - 27 Changwat : Surin / Buri Ram A. Chom Phra (J.R. 214) - B. Nong Khawao (J.R. 2079) Length : 31.1 KM.

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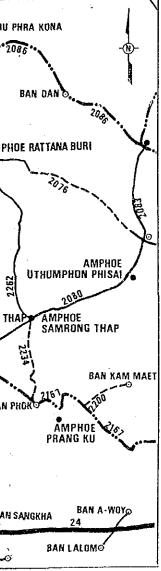
GeneralChangwat: Surin/Buri RamOrigin and Destination: A. Chom Phra — B. Nong KhawaoConnected Road Network: 2079—214Amphoe on Route:Number of Related Villages: 10Influence Area: 215 km²Area: 215 km²Cultivated Area Ratio to:Total Land Area in %: 93Population in 1983: 37,400Main Crops: Paddy & BeansNumber of Public Activities:Public Health Service Centers:Public Health Service Centers:Amphoe Level:SchoolsPrimarySecondary:Traffic (ADT): 1984—159Nomenclature of Study Route:Total Length:Improvement Section:JOH Road:ARD Road:Other Road:Suble Road:Suble Road:State Road:	AMPHOE SIKORAPHUM
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DOH Road:31.1 kmARD Road:-Other Road:-	2265 CHANGWAT SURIN
ARD Road   -     Other Road   -	
Other Road	
New Construction Section : -	AMPHOE PRASAT
Design Standard Employed : F4	24 AMPHUE PRASAL SANGK
Construction Cost in Baht	BAN KRATHIAM
Financial : 50,333,000	SGALE
Economic : 42,064,000	504CE 5 0 [0 Km.
Economic Indicators	LEGEND
IRR : 8.8% Ranking: 15	STUDY ROUTE
	NATIONAL HIGHWAYS ( PAVED )
Social Impact	PROVINCIAL HIGHWAYS ( PAVED )
Social B/C Ratio : 0.273 Ranking: 4	

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 $(\mathbf{x}_{i})_{i\in \mathbb{N}}$  , where  $(\mathbf{x}_{i})_{i\in \mathbb{N}}$  , the transmission of the set

27-2



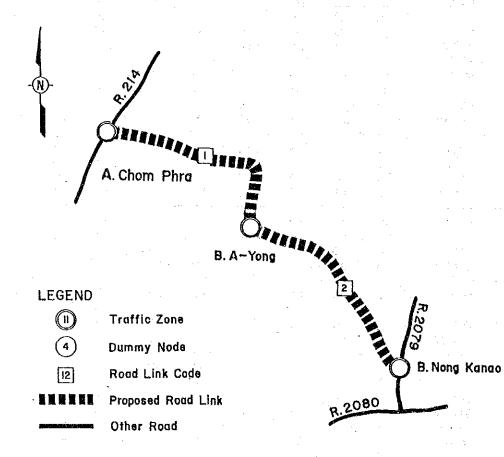
INCIAL HIGHWAYS ( TO 8E PAVED, RITTED IN 5 IH PLAN ) INCIAL HIGHWAYS ( UNPAVED ) R ROAD

# 27.1 TRAFFIC

# 27.1.1 Method Employed in Traffic Forecasting

The growth rate method was employed in forecasting traffic because no diverted traffic after improvement was expected on this study route.





# 27.1.3 Traffic Forecast

- 1) Items necessary for forecasting traffic were:
- Traffic volume in base year
- Passenger and freight movement in base year
- Growth rates of passenger and freight movement
- Rate of induced and developed movement
- Traffic composition

TRAFFIC VOLUME IN BASE YEAR

LINK			TY		VEHICL	E	
5., 2 INPS					P/P&T	4/T	677
1	20	7	30	4	38	16	2
2	21	13	16	8	40	13	, . 
AVE.	21	10	23	6	39	14	2

# PASSENGER AND FREIGHT MOVEMENT IN BASE YEAR

PROPOSI ROAD					FREIGHT MOVEMENT (TONNAGE PER DA					
LINK		(TRIPS PER DAY)			NON-AGRI.		GRI.	TOTAL		
1 2			1082 994		150.2 144.4		59.5 57.2	209.7 201.7		
			GROWTH	RATE OF	- PASSENGE		MENT T : % P.A			
		YE		PER CAP	ITA POPUL	ATION	PASSENG MOVEME			
	198	38 -	1988 1994 2002	3.1 3.1 3.1	1	.4 .2 .0	5.8 5.6 5.5			
	~~=	====						==		

## GROWTH RATE OF FREIGHT MOVEMENT

			(UNI	
	YEAR	NON-AGRI. FREIGHT	AGRI. FREIGHT	FREIGHT
1	984 - 1988 988 - 1994 994 - 2002	7.0	0.1 0.1 0.1	5.3 5.6 5.9

	· · · · · · · · · · · · · · · · · · ·			
 /T	 10/T	ADT	MZC	TOTAL
· · ·			-	بنير عدر برب عنو جند
29	18	162	96	258
27	18	156	200	356
	····· ···· ···· ···· ····			
_28	18	159	149	307

YE	EAR .		1988			1994			2002
L1	NK	1	2	AVR.	1	2	AVR.	1	2
v surfa a	<sup>S</sup> ∶N+Ď⊷	43	44	43	•	68			-120
P/C	I	6	7	6	10	<u>10</u>	10	20	18
	DV TOTAL	0 49	0 50	0 50	0	0 78	0 79	0 150	138
	N+D	7		10	9	12	10	10	9
L/B	I DV	1 0	2 0	1	1 0	2 0	2 0	2 0	1
·	TOTAL	8	14	11	10	14	12	12	11
	N+D	31	18	25	37	25	31	44	40
M/B	I DV	5	3	4 0	6 0.	4	. 5	× 50 7. 5 0	6 1 0
	TOTAL	36		28	43	29	36	50	46
· · · · · · · · · · · · · · · · · · ·	N+D	6	9	8	11		12	23	22
Н/В	I DV	1	1 0	1	2	'	.: 2 ⊧.:::0:	4	. 3 • 0
	TOTAL	7	11	9	13	15	14	27	25
	N+D	68	70	69	96	95	95	151	140
P/P&T	I DV	10 0	11 0.	10). - 0	14 0	14	14 0	23 0	21 0
·	TOTAL	78	81	80	111	109	110	174	161
	N+D	17	14	16	19	17	18	20	19
4/T	I DV	3	2	2	3	3.0	е Ос <sup>а</sup> лас	3	3
	TOTAL	20	17	18	22	19	21	23	22
	N+D	37	35	36	54	5 <u>1</u>	53 8	91 14	88 13
6/T	I DV	6	5 . 0	5 0	8 0	8		14	1
	TOTAL	43	40	41	63	59	61	106	102
* ** /**	N+E	22	22	22	30	30	30	47	46
10/T	I DV	0	ं 0	3 0 25	0 0	0	0	7 0,	ó
-	TOTAL	25 		25	35			55	53
ADT		232	224	228 - 24	327	312	319 49	518 79	484 70
ADT		30 0	. 0	34 0	1	1	1	2	ు:ీ. 2
	TOTAL	266	258	262	376	359	368	597	558
	N+D I	289	285	287 20	339	333	336	406	396
M/C	ŪΥ	· 0	0	0	0	0	Ō	5. st <b>O</b> .	Ö
	TOTAL	310	305	308	360	353	357	427	417
TOTAL	N+D I	521	509	515				924 100	880 99
DU AL	DV	0	0	. O	1	1	1	- 2	2
1.1	TOTAL	576	563	570	736	713	724	1024	975

### RATE OF INDUCED AND DEVELOPED MOVEMENT

in dia t		INDUCED	e e la sur la sur e	DEVELOPED		
·	· · · ·		FASSENGER	NON-AGRI. FREIGHT	AGRI. FREIGHT	
	·	1 2	MUVEMENT	MOVEMENT	MOVEMENT	
	1988	15.0 15.0	0.0	0.0	0.5 m	1 M. 18
2 e	1994 🐇	15.0 15.0	0.0	la justa Ö <b>; O</b> statu v	ebuer <b>3,2</b> ee ee	· · ·
	2002	15.0 15.0	0.0	0.0	7.0	

 TRAFFIC
 COMPOSITION
 Statement (Composition)

 Statement (Composition)
 Statement (Composition)
 Statement (Composition)

 Statement (Composition)
 Statement (Composition)
 Statement (Composition)

									(UNI) = %)		
LINK	PASSENGER						FREIG	HT	· · · · ·		
NO.		P/C	P/P	L/B	M/B	H/B	P/T	4/T	6/T	10/T	
1	1984 1988 1994 2002	26.4 29.2 33.4 39.0	41.0 40.3 39.3 38.0	5.0 4.1	17.8	4.0 5.3	10.0 10.7 11.7 13.0	-	41.4 43.3 46.2 50.0	25.7 25.8 25.9 26.0	
2	1984 1988 1994 2002	27.4 30.0 33.8 39.0	43.0	6.1	12.4 12.6	63 66	9.4 10.2 11.4 13.0	20.3 18.2 15.1 11.0	42.2 43.9 46.5 50.0	28.1 27.7 26.9 26.0	

				21 a.
		- 	· · · · ·	11
2)	The following were	output:	<u> </u>	
	- Forecasted ADT	e Terris de la del 1999 en la	 unu ninu nu sun o n	trii it

- Traffic volumes

and the second second states that the

AVERAGE FUTURE TRAFFIC ON PROPOSED ROUTE

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			ΤY	PE OF	VEHICL	E seato stat		ΔΠΤ	MZE	τοται
TCHK	P/C	L/B	M/B	H/B	P/P&T	4/T 6/T				
1988	50	11	28	9	80	18 41	. 25	262	308	570

1988	50	11	28	<u> </u>	80	18	41	- 25	262	308	570
1994	79	12	36	14	- 110 -	21	C 61	35	368	357	724
2002	144	11	48	26	167	23	104	54	577	422	999

27-4

N : NORMAL TRAFFIC DV : DEVELOPED TRAFFIC D : DIVER I : INDUCE

RTED	TRAFFIC
	TRAFFIC

# 27.2 AGRICULTURAL DEVELOPMENT

### 27.2.1 Present Condition

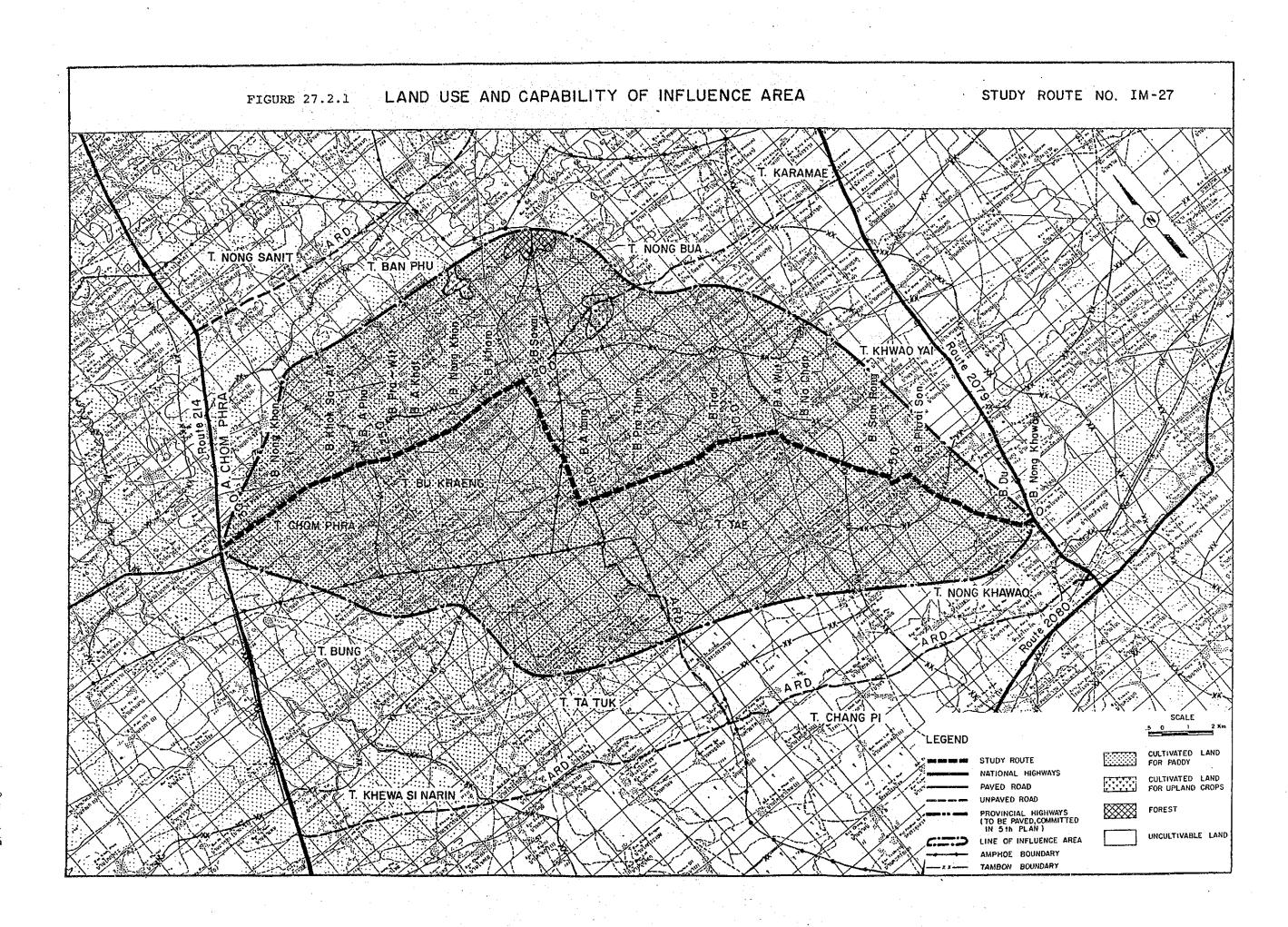
Almost all of the cultivated land in the influence area is covered by paddy fields. Beans, maize and kenaf were planted in upland fields in the 1983 crop year.

Land use and capability conditions in the area are shown in Table 27.2.1 and Figure 27.2.1. A typical cropping calendar in the area is shown in Figure 27.2.2.

### 27.2.2 Development Projection

Future agricultural development in the area of influence was projected for the two cases of "with and without project". The projected planted area, unit yields by crop, and the consequent production amount are shown in Table 27.2.2.

Based on the above projected production amount, farmgate prices and production costs estimated separately, net production value (NPV) was obtained as shown in Table 27.2.3. The difference in NPV between the two cases is deemed to be the development benefit of the study route.



27-8

一点,一点不可能投入的过去式和过去分词形式 • •

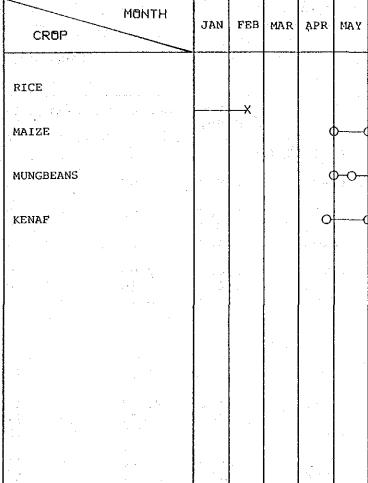
e de la companya de la companya de la ROUTE IM<del>a</del> 27

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FIGURE 27.2.2 CROPPING CALENDAR

and the state of the state



Note:

FIRST CROP 0----0 growing sowing harvesting season

. . . . . . . . .

season season

Related	1501 M. Surin 1504 Chom Phra 1508 Sikoraphum
с	

-							
	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	0-			0		—x—	
	у		X	X			
		_x_	×				
	)		· · · · · ·			-X-	—х
	-						
and the second se							

SECOND CROP

TABLE	27.2.1	CULTIVATED	LAND

	CHA	NGWAT	AMF	PHOE			CULTIVATE	ED LAND	·	· · ·	
	N	AME	NA	1ME	PADDY	( FIELD	UPLANI	) FIELD	T(	TAL	
an a	SURIN		M. SURIN CHOM PHR SIKHORAF	RA .	46.94 62.69	( 20.70) ( 75.10) (100.30)	0.25 ( 0.75 (	0.40)	47.19 63.44	( 75.50)	>
a da anti-arrende a construction de la construcción de la construcción de la construcción de la construcción de La construcción de la construcción d La construcción de la construcción d	TOTAL		na port			(196.11)	-			(197.71)	
				TABLE	27.2.2 CF	OP PRODUC	CTION				
ITEM		RICE (PADDY)		SORGHUM	BEANS	GROUND NUTS	CASSAVA	KENAF	SUGAR CANE	COTTON	CAST BEA
PLANTED AREA	(1000 RA)	()					<b></b>				
BASE YEAR	(1983)	115.22	0.07	· _	0.30	-		0.02	-	-	
WITHOUT PROJECT	(1988)	115.22			0.34		_	0.02	-	-	
	(1994) (2002)	115.22 115.22			0.38 0.46		_ 	0.03 0.03		-	•
WITH PROJECT	(1988)	115.22		· _	0.34		-	0.02	_	-	
	(1994) (2002)	115.22 115.22			0.42 0.50			0.03 0.03	-	-	
CROP YIELD	(KG/RA)	)			- - - -						
BASE YEAR	(1983)	265.5	209.2	_	115.0	-		180.0	-		
WITHOUT PROJECT	(1988)	266.9			116.7		-	180.0	. –		
	(1994) (2002)	268.7 271.0			118.9 121.7			180.0 180.0		-	
WITH PROJECT	(1988)	268.1	213.6	_	117,1		-	180.0			
	(1994) (2002)	277.3 290.0			121.4 127.3			180.0 180.0	-		
CROP PRODUCTION AMOUN	T (TON	13		nin Nin Nin	. *: - <u>.</u> 						
• •			•				. 1				
BASE YEAR	(1983)	30,591	15		35	_	·	4	_		
WITHOUT PROJECT	(1988)	30,756			39		-	4		-	
•	(1994) (2002)	30,956 31,225			46 56			5			
WITH PROJECT	(1988)	30,896	17	· 	40	- -		4	_	·	
crain incoment	(1994)	31,951			51			5	_		

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE

UPLAND TOTAL	TOTAL
0.39	115.61
0,44	115.66
0.50	115.72
0.60	115.82
0.44	115.66
0.54	115.76
0.65	115.87
0.00	117.04

53	30,644
60	30,816
70	31,026
86	31,311
61	30,756
77	32,028
96	33,510

					TABLE 27.	2,3 NET F	PRODUCTIC	N VALUE				1. 1.		· · · ·	ala a the
	ITEM	an i waa ya da sa	RICE (PADDY)	MAIZE	SORGHUM	BEANS	GROUND	CASSAV	A KEN	IAF	SUGAR CANE	COTTON	CASTOR BEANS	UPLAND TOTAL	TOTAL
FARMGATE P	RICE	(BAHT/TON)							<b>.</b>				lan ∙r gota		<u>.</u>
WITHOUT	PROJECT	(1983 - 2002)	3,653	2,627	·····	6,953	1.	an an an tao amin' an taon	- 4,	687		et stal <del>e</del>	• · <del>~</del>	·	
WITH	PROJECT	(1988 - 2002)	3,669	2,643	-	6,969	· · -		- 4,	719					
			•				. •						$(e_{i})^{(i)} = (e_{i})^{(i)} (e_{i})^{(i)$	n an tra	e en en en
CROP PRODU	CTION COS	T (BAHT/RAI)		 1 j.										• •	
BASE YE	AR	(1983)	713	516		488	· · _	•		790					
WITHOUT	PROJECT	(1988)	716	518	- -	488 488		- -		790 790		-			
	1	(1994) (2002)	720 725	521 525	1	493		• •		790	-				
WITH	PROJECT	(1988)	718	518	-	488		•	<b>—</b> •	790 790			·		
		(1994) (2002)	735 760	521 525		493 498			_	790 790	-				
NET PRODUCT	TION VALU	E (1000 BAHT)									<u>.</u>				
WITHOUT	PROJECT	(1988)	29,855	3	_	109				1	_	-	• •••	113	29,968
		(1994) (2002)	30,125 30,529	້5 7		130 163		•		2	 	-	·	137 172	30,262 30,701
WITH	PROJECT	(1988)	30,628	4	-	111				1	-	-	· -	116	30,744
		(1994) (2002)	32,540 35,028	6 10	-	147 195		· .		22	. <del>.</del>		·	155 207	32,695 35,235
		(20027	007020	1.0											
NET VALUE	ADDED	(1000 BAHT)					• .				· .				. •
	1988		773	1	-	2				Ŏ		. <u> </u>		3 18	776 2,433
	1994 2002		2,415 4,499	13	· –	17 32			-	0	-			-18 -35	4,534

# TABLE 27.2.3 NET PRODUCTION VALUE

NOTE : SYMBOL "-" MEANS ZERO OR NEGLIGIBLE

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# 27.3 VOC SAVINGS

In accordance with the concept and data given in Section 3.4 of the Text Report, VOCs on the road link concerned were calculated in the two cases of "with and without project".

Road length by road class is shown in Table 27.3.1. Data for additional VOCs are shown in Table 27.3.2.

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VOC savings, obtained as the balance of total link VOCs between the two cases, were calculated as shown in Table 26.3.3.

# TABLE 27.3.3 VEHICLE OPERATING COST SAVING

NO. W	ITHOUT	WITH	SAVINO	WITHOUT	WITH	SAVING	WITHOUT	WITH	SAVINO
1 2	8,452 8,282	7,137 7,217	1,315 1,064	11,643 11,329	9,730 9,754	1,912 1,574		14,823	3,201 2,666
TOTAL	16,734	14,355	2,379	22,972	19,485	3,487	35,356	29,488	5,867

## TABLE 27.3.1 ROAD LENGTH BY ROAD CLASS

	-	-				(1	INIT : KM)
			WITHOUT FRO	JECT CASE			WITH
	PAVED		LATERITE		EARTH	TOTAL	CASE
NO.	PAVED	6000	FAIR	POOR			PAVED
1	-		1.4 0.6	14.0 14.1	-	15.4 14.7	15.4 14.7

## TABLE 27.3.2 DATA FOR ADDITIONAL VOC COST

																			(UNIT	OF LENG	TH : M)
LINK	*********	****				URVE						*****	GRADE	222225		V1	ILLAGE	NO. OF INTER-	NO. OF TIMBER	NO. OF NARROW	NO. OF
NO.	CASE	100	150	200	250	300	375	500	750	1500	1	2	3	4	5	NO.	LENGTH	SECTION	BRIDGE	BRIDGE	CORNER
1	WITHOUT WITH	 	 	 		-	-	372 372		1532 1532	3650 3600		-	-		8	3400 3400	3			2
2	WITHOUT WITH	147 147		158 158	**	263 263	267 267	521 521		529 529	2200 2200	100 200		-	-	7 7	1700 1700	2	1	·	1 2

化化学 化化学学 化化学学 化化学学

(UNIT : 1000 BAHT)

### NK

# 27.4 ENGINEERING

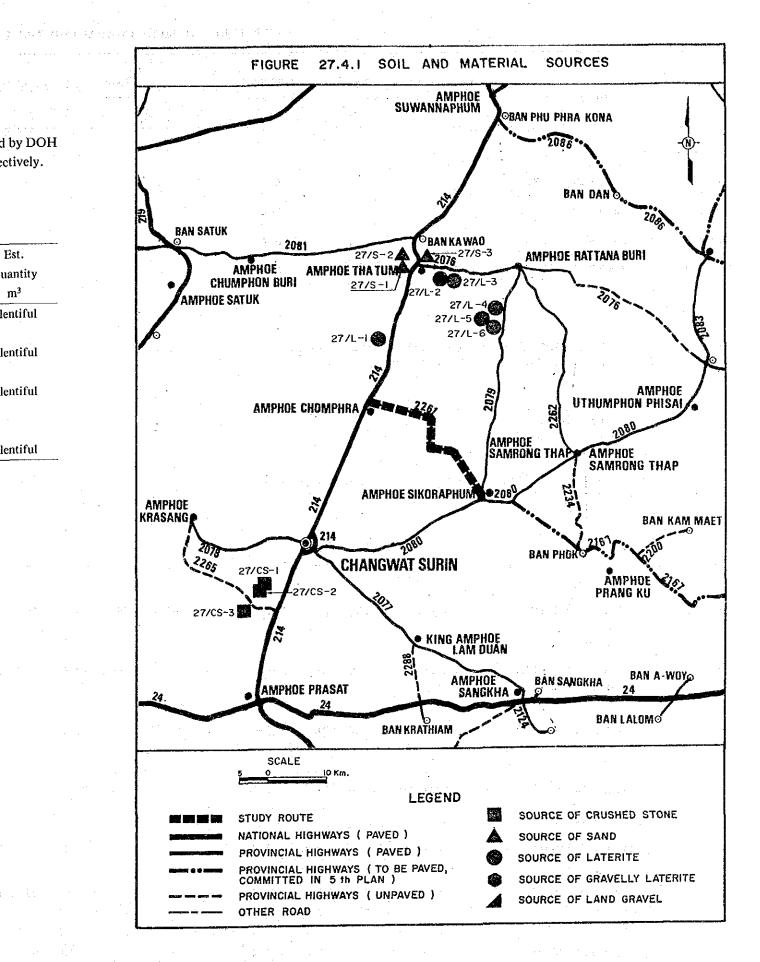
## 27.4.1 Soil and Materials

Existing subgrade soil and material sources in the vicinity of the study route investigated by DOH and their physical characteristics are shown in Figure 27.4.1 and Table 27.4.1, respectively.

とうさい むしょうい

Rock aggregate sources were assumed as shown below:

No.	Source	Description of Sample	Est. Quantity m <sup>3</sup>
27/CS-1	KM. 13+400 Rt 2 KM. Surin-Prasat	Basalt	Plentiful
	KM. 14+450 Rt 2 KM. Surin-Prasat	Basalt	Plentiful
27/CS-2	KM. 14+450 Rt 2 KM. Surin-Prasat (Sirathanakit Quarry)	Basalt	Plentiful
27/CS-3	KM. 14+450 Rt 2.0 KM. Surin-Prasat	Basalt	Plentiful



	•			TABLE 27	.4.1 PH	IYSICAL	CHARA	CTERI	STICS	OF MAT	ERIALS	<b>;</b>							
			· · · · · · · · · · · · · · · · · · ·												**				
- 				ABCURO			Ciana A	 		D - 1 - 5			Dlacticity		omp.	tab	CPP	Dur	ability
No.	Source	Description		Classifi-		<u>.</u>	Sieve A	<u>marvs</u>	15 8	Passing			Plasticity	$\frac{Da-1}{Opt}$	Stand.		C.B.R. Swell		ability
		Sample	m <sup>3</sup>	cation	50.0	25.0	19.0	9.5	#4	#10	#40	#200	LL PT.	95%	gm/cc	95%	8	Abr.	Dur.
SUBG	RADE			·		2.4 1.1.1			e i é ș	i kapit		ange inte		1 de 1 e 1 e	in de frei	sa 1.	· · · ,		z -
			$e_{1} = e_{1}^{2}$	• •	1:				. 11 y .	1.1	(177) 177		e na strange	e de la co	gin serie.	4 - 15 A	х <del>с</del> т. т.		(1) 1
//SG-1.	KM. 5+500 Rt 13 M.		•	A-4		j.	1		100	99.6	91.6	51.6	N-P		1.762				
/SG-2.	KM. 12+000 Lt 15 M.		. *	A-4						100	98.8	95.0	20.0 5.5		1,880			· ·	
/SG-3.	KM. 20+000 Rt 15 M.		·	A-4	a an					100		89.1	N-P	11.1	1.880	9.3	0.1		
7/SG-4.	KM. 28+000 Lt 15 M.		1971年1月1日 1971年1月1日 1971年1月1日	A-4					n de la composition References	100	99.8	90.6	N-P	10.9	1.891	10.0	0.1		
							-							-					
SAM	<u>1D</u>			1114	1123 (1224) 1					- 		-		n Na 18		· ·.	1997. 1997		
			n Maria ang A						·	· .									
27/s-1	км. 2+700 Lt 300 м. Tha Tum - Suwan	Huai Kudh Wien sand	Plentifu	1] A-3				100	·99	98	66 🖓	2	N.P.	e di i	. <sup>.</sup>		4 - 4 g 4		
	Na Phum	· · · ·							n na fa	·		1		•	e ter f				· .
27/S-2	KM. 53+000 Rt, Lt	Mun River	Plentifu	$(1^{(i+1)}) \in \mathbb{R}^{k}$		·		2							Less co	lor th	an stan	idard	
	close to Surin - Tha Tum - Suwan Na	Sand					-												
	Phum		¥.								· · · · · · · ·	e e e e e	1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 - 1997 -		· .	· .			
27/S-3	KM. 1+000 Lt, 1.5 KM.	Mun River		I] A-l-b					100	99	23	1	N.P.						
	Tha Tum – Rattana Buri	Sand				gi e dess Se en ses			-			÷							
LATER						3199년 4년						ŝ.					•		
							;	- <b>A</b> - F		20.0	25,0	20.1	22 1 0 0		2 100	15 4	0 42		
27/L-1	KM. 46+000 Lt 3,000 M. Surin - Tha Tum	Yellow laterite	200,000	A-2-4	100	96.2	) (	64.5	-	30.8	25.9	20.1	32.1 8.9	7.0	2.100	T7.4	0.42		
27/L-2	KM. 10+300 Rt 5 KM.	Laterite	100,000	A-l-a	100	98.0	96	76.0	47	31.0	26.0	19.0	N.P.	8.4	2.200	30.0	0.48	53.2	64.5
	Tha Tum -										·.								
	Rattana Buri											·		- 4	0 005	12.0	0.10	r	07 5
27/L-3	<u>KM. 10+300 Rt 53 KM.</u> Tha TUM -	Laterite	30,000	A-1a	100	97.0	96	79.0	52	37.0	29.0	17.0	N.P.	1.4	2,205	13.0	0.15	51.5	87.5
	Rattana Buri		andra an Article Article and a construction		1. N	n de la com-													
27/L-4	KM. 6+000 Rt 2,000 M.	Yellow			100	95.7		53.8	~	23.4	19.7	10.5	28.6 7.4	8.4	2,021	18.1	0.84		
· · · · ·	Rattana Buri -	laterite			· · · · · · · · · ·	en en													
	Sikoraphum			n egen son der Standen eine son der Standen eine son der		· .	fille Fille												11 7
7/L-5	KM. 6+100 Rt 3 KM.	Laterite	100,000	A-2-6			100	99.0	82	38.0	32.0	24.0	28.2 13.4		-			4.0	41.7
	Rattana Buri - Sikoraphum			la de la composición de la com	<u>in an an</u>	tes y	- 			· · · ·									
	Ll:Sl = 7:3 by weight	Laterite		A-2-4			100	99.0	87	57.0	29.0	17.0	N.P.	9.3	2.095	25.0	0.02		
		and sand					· · ·					-							
27/L-6	KM. 6+100 Rt 4 KM.	Laterite		1 A A				100	92	64.0	53.0	26.0	N.P.					37.8	40.0
	Rattana Buri -			General de la composita de la c				· · ·		•			. ·						
	Sikoraphum		an a		e agentidae T				•	· · ·									•
	L2:S2 = 1:1 by weight	Laterite		A-2-4				100	97	81.0	38.0	15.0	N.P.	9.9	2.170	27.2	377		

## 27.4.2 Preliminary Design

## na an an tha an an an an tha tha an an tha tha an an tha an an tha an an tha an tha an tha an tha an tha an tha

27.4.2.1 Design Criteria

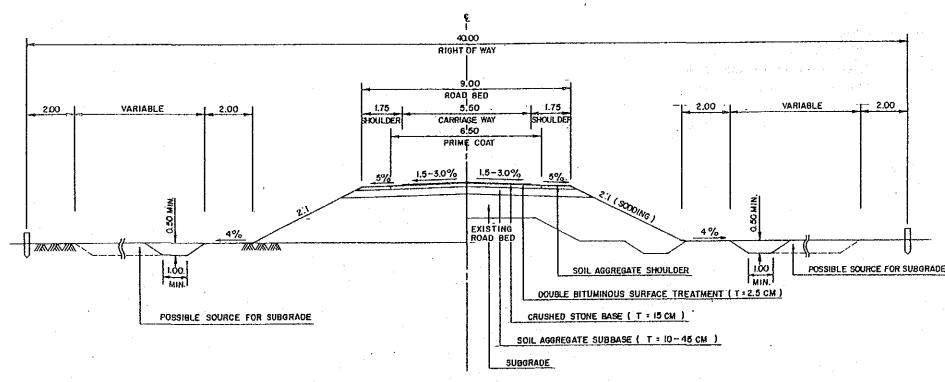
Others

Design Standard	: F4	Box Culv
Geometric Design Criteria	: DOH (Provincial Highway)	Standa
Typical Cross Section	: as shown in Figure 27.4.2	Locati
Minimum Height of Embankment in Flooding Section	: 0.7 m above flood level	Bridge Reinfo Substr
Pavement Structure		
DBST	: 2.5 cm	The exist
Crushed Aggregate Base CBR≥ 80%	: 15.0 cm	
Soil Aggregate Subbase CBR≥ 25%	: 10.0 cm (minimum requirement)	
Selected Materials $CBR \ge 6\%$	: as required	
Pipe Culvert		
Standardized type	: 80, 100, 120 & 150 cm in diameter	
Location	: as required	
Standard intervals		
Paddy area	: 200 m	
Others	: 500 m	

lvert ard size ion orced concrete standard type ructure

ting and designed plan and profile are shown in Drawings 27-1/27-4.





PROVINCIAL HIGHWAY ( CLASS F4 )

: 1.5×1.5, 2.4×2.4 & 3.0×3.0 m : as required

: Width 9.0 m : Pile-bent type

## 27.4.2.3 Pavement Design

1) Cumulative number of ESA in one direction

- ESA conversion facto	ors	
Heavy bus	:	0,50
Medium truck	:	0.76
Heavy truck	:	1.24

# - Forecasted ADT by vehicle type

•	· · · · /	121 - 1							
Year		19	88			19	94		
Traffic/road link	1	2	3	4	 1	2	3	4	
Heavy bus	7	11	· 		13	15	_	<u> </u>	
Medium truck	43	40			63	59			
Heavy truck	25	25			35	34			

# - Cumulative number of ESA in one direction by road link

Road link	1	. 2	3
7 years (10 <sup>6</sup> )	0.105	0.102	- '
2) Design CBR values			
Road link	1	2	3
Design CBR (%)	10.4	9.3	-

# 3) Required thickness of pavement

Surfacing	: DBST (2.5 cm)
Aggregate base	: 15 cm (CBR not less than 25%)
Subbase	: Minimum requirement 10 cm
Road link	$\sim$ . The second secon
	10 cm 10 cm

# 4) Overlay required in 7 years DBST resurfacing

# 27.4.2.4 Drainage and Structures The locations of existing and designed RC box culverts and RC bridges and their dimensions are shown below:

# 1.1 EXISTING STRUCTURES STATION SIZE TYPE 25 + 155 Timber Bridge 4.0 x 15.0 RC Br: 영영 이 위험이 있는 것을 못 들었다. 이는 것 같은

1. 1.

- 4

		÷ *	
PROPOSED	STRUCTURES	. :	
1000	STZE	· .	

TYPE	\$1ZE
Tradicity of the	
C Bridge	9.0 x 20.0

27.4.3 Quantities and Construction and Road Maintenance Costs

The required construction costs were estimated based on the results of the preliminary design as shown in Table 27.4.2. Financial costs with breakdown into local and foreign currency portions, economic costs and residual values were estimated as follows and in 27.4.4:

IM27	L = 31.1  km		(baht)
1111 27	Financial cost	:	50,333,000
•	Economic cost	:	42,064,000
	Residual value	:	17,657,000

The required road maintenance cost savings are shown in Table 27.4.3.

IM---27

\$ 1

Sector Street

27-17

Length = 31.1 km

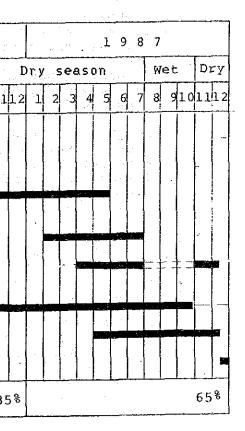
Construction Schedule

Assumption: Completion date December 31, 1987

	Year &					1	. 9	8	6	. 1 <sup>1</sup> 1		
es 1	Month		Dr	У	se	as	on		W	et	Ч	
	WORK ITEMS	1	2	3	4	5	6	7	8	9	10	11
	CONTRACT					7	7					
	PREPARATORY WORKS MAJOR WORKS (PRECEDING)										1. 1. 1.	
•	PAVEMENT WORKS											
	MAJOR WORKS (FOLLOWING)											
	STRUCTURE WORKS											
	MISC. WORKS					•.			;			
	CLEARING-UP											
•	PAYMENT IN %											3

Yearly Disbursement Schedule Assumption: Annual rise in prices

Ye Currency	ar	Base 198		(1	.985)	198	6	1987	
Local		10	)0	1	10.0	121	.0	133.1	Ĺ
Foreig	n	10	00	1	.06.5	113	. 4	120.8	3
LOCAL	AND FORE	IGN COMP	ONENTS OF	CONSTR	UCTION C	OST	·		
· · · · · ·		( Rout	e IM - 2	7 )			(Unit	: Millio	in Baht) Seeses
	*********	1786	, a a a a a a a a a a a a a a a a a a a	*******	1987		]	otal	
	۔۔۔۔ ٤/٥	F/¢	Total	L/C	F/C	Total -	L/C	F/C	Total
Construction Cost Price Continsency	8.7 1.8	8.8	17.5	16.2 5.4	16.6 3.5	32.8	24.9 7.2	25.4	50.3
Total	10.5 ( 0.39)	10.0 ( 0.37)	( 0.76)	21.6 ( 0.80)	20.1	41.7	32.1 (1.19)	30.1 ( 1.11)	62.2 ( 2.30
Remarks : L/C : Local F/C : Forei ( ) : US\$ 8	an Curren	ις γ κογτ:	1016		=====				
· · · · · ·									



BST	362822	VE 30 Financial		*********			*****			
Iten Seigung Lagers vie auf	Unit	Unit Rate Base	Quantity	Total	Local	Foreisn	%	1000 B	7.	1000 B
	 · .									
ARTHWORK Clearins & Grubbins	ha	10,000	72	720	·	. *				
Roadway Excavation: Unclassified Embankment: Common Soil	mЗ	19	0	· 0				en di tari di di Mana di Antonio		
	mJ	38	259,000	91842						
Embankment, Selected Material	m3	70 88	4,000	0 352						
Replacement of Soft Spot Sub Total	mЗ	00	41000	10,914	5,566	5,348	n eta di p	9,059	*	8,153
								·.		
BBASE & BASE COURSES			00 700			·	83		50	
Subbase, Soil Assresate	m3 	112 320	29:300 30:300	3,282 9,696						
Assresate Base* Cement Stabilized Base	m3 m3	320	301300 O	73070					·	
Shoulder: Soil Assresate	mJ	120	11,700	1,404						
Sub Total				14,382	71766	6:616		11,937		5,968
		·					85	•	50**	•
JRFACE COURSES Asphaltic Prime/Tack Coat	m2	12	202,200	2,426	· .		20		50	•
Double Bituminous Surface Treatment*		38		6,502						
Asphaltic Concrete Surfacin9**	t	750	· 0	0	· ·					
Sub Total Semanation of the land sectors	· .		gar de la companya de la	8,928	3,928	5,000		7,589		0
RUCTURES	-						83		50	
RC Pipe Culvert (D 1.Dm Equivalent)	m	2,000	1,861	3,722			00		24	
RC Box Culvert (2.4mx2.4m Equivalent)	ល	18,800	0	0		•				
RC Bridge(W=9.0m L=10m Equivalent)	m	46,500	20	930	·	<u>`</u> `				
Sub Total				4,652	2,326	2,326		3:861		1,931
Total (a)			: ···	38,876	19,587	19,289		32,445		16,052
ICIDENTALS							83		0	
Miscellaneous Work ((a)x7%)					1,361	1,361		2;259		D
NTRACT AMOUNT (b)	• جدہ میں جدر ہیا ۱۰	<u></u>		41,597	20,947	20,650		34,704		16:052
YSICAL CONTINGENCIES ((b)x10%) (c)	15			4,160	2,095	2:065		3,470		1,605
		e a construction de la construction								- •
GINEERING AND SUPERVISION		an an tai na sa		,		e	85	7 000	D	
(((b)+(c))×10%) (d)	15			4,576	1,830	2:745		3:889		0
ND ACQUISITION	- 						100		100	
lishly Developed Land	ha	50,000	. 0	0			•			
ess Developed - Lander were supported as	ha	15,000	0	0	ана 1919 — Полиски странование и странование и странование и странование и странование и странование и странование 1919 — Полиски странование и	-		~		~
Sub Total (e)	15 			0	0	0		0		U 
0JECT_COST_((b)+(c)+(d)+(e))		e de la construcción de la constru La construcción de la construcción d	e Leanairtí an Chailte Chailte	50,333	24,872	25,460		42,064		17,657
				20,000	~ 13012	221100				
ERAGE COST PER KM		and the second	and the second second	1,618						· · · · ·

is a subscription of states the second spin

# the second start TABLE 27.4.2 CONSTRUCTION QUANTITIES AND COSTS

Note : \* The unit prices are modified by assresate haulase distance \*\* Rate is applied only for Asphaltic Concrete Surfacing

	YEAR	WITHOUT PROJECT CASE					WITH PROJECT CASE					ROAD		
LINK NO.		AVERAGE DAILY TRAFFIC <adt> (VEHICLE)</adt>	LENGTH OF LINK <l> (KM)</l>	FACTOR FOR ADT <a1></a1>	ROAD CHARA. FACTOR <ka></ka>	UNIT MAINTE. COST <u> (BAHT/KM)</u>	TOTAL MAINTE. COST <t> (1000 BAHT) (</t>	AVERAGE DAILY TRAFFIC <adt> (VEHICLE)</adt>	LENGTH OF LINK <l> (KM)</l>		ROAD CHARA, FACTOR <kb></kb>	UNIT MAINTE. COST <u> (BAHT/KM)</u>	TOTAL MAINTE. COST <t> (1000 BAHT)</t>	MAINTE. COST SAVING (1000 BAHT)
1	1988 1994 2002	222.8 323.6 537.0	15.4 15.4 15.4	0.35 0.59 0.95	1.41 1.57 1.83	14,833 16,559 19,231	228 255 296	248.9 351.2 556.5	15.4 15.4 15.4	0.00 0.00 0.00	1.14 1.14 1.14	12,793 12,793 12,793	197 197 197	31 58 99
2	1988 1994 2002	212.8 304.4 492.7	14.7 14.7 14.7	0.33 0.54 0.75	1.39 1.54 1.83	14,662 16,231 19,231	216 239 283	241.2 335.3 519.9	14.7 14.7 14.7	0.00 0.00 0.00	1.14 1.14 1.14	12,793 12,793 12,793 12,793	188 188 189	27 51 95
OTAL	1988 1994 2002	217.9 314.2 515.4	30.1 30.1 30.1			14,750 16,399 19,231	444 494 579	245.1 343.4 538.6	30.1 30.1 30.1			12,793 12,793 12,793 12,793	385 385 385 385	59 109 194
NOT	E (1		MAINTENA MAINTENA	ANCE COS		' = U * L   = M * (KA	) or KB) * FA		···			• •		
		· ·						* (1 + F)	R) * FE					
-		M	; SPECI	UT PRO.	IECT CAS	CE COST E M =	7,700 BAHT/KM 8,200 BAHT/KM	1	R) * FE					
-	•	Fi Fi	; SPECI WITHC WITH A = 1.40	)UT PRO. PRO. )	IECT CAS IECT CAS ADMINIS EMERGEN	CE COST E M = E M = TRATION FA CY REHABIL	7,700 BAHT/KM	1 1 FACTOR	R OPERAT		· · ·	IST		
-		Fi Fi Fi ) Road Ci W	; SPECI WITHO WITH A = 1.40 R = 0.15 E = 0.85 HARACTER ITHOUT F	DUT PRO PRO 5 5 11STIC F	JECT CAS JECT CAS ADMINIS EMERGEN ECONOMI ACTOR CASE	CE COST E M = E M = TRATION FA CY REHABIL C MAINTENA KA = 1.1	7,700 BAHT/KM 8,200 BAHT/KM ACTOR FOR DIRE ITATION COST	1 1 ECT LABOUR FACTOR TOR TO FIN	R OPERAT		· · ·	IST		

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TABLE 27.4.3 ROAD MAINTENANCE COST SAVING

# 27.5 EVALUATION

### 27.5.1 Economic Evaluation

The yearly distribution of the economic costs and benefits and the calculated economic indicators for evaluation are given in the table below.

The results indicate that the improvement of this study route is feasible by employing the F4 standard with DBST surfacing.

COST AND BENEFIT STATEMENT OF ROUTE IM - 27

		• ; 				(10	OO BAHT)	
	COST		BENEF	ITS	DISCOUNTED(12%)			
YEAR	CONST. COST	AGRI. BENEFIT	VOC SAVING	RMC SAVING	TOTAL	TOTAL COST	TOTAL BENEFIT	
1986	14,722	0	0	0	0	18,467	6	
1987	27,342	0	0	0	Ō	30,623	0	
1988	0	776	2,379	59	3,214	0	2,870	
1989	0	1,052	2,564	67	3,683	0	2,936	
1990	0	1,328	2,743	75	4,152	• • • • •	2,955	
1991	0	1,604	2,933	84	4,621	0	2,937	
1992	Q	1,831	3,117	· 92	5,090	0	2,888	
1993	0	2,157	3,302	100	5,559	0	2,816	
1994	0	2,433	3,487	109	6,028	0	2,727	
1995	11,050	2,696	3,784	119	6,599	4,998	2,665	
1996	0	2,958	4,082	130	7,170	0	2,586	
1997	0	3,221	4,379	141	7,741	0	2,492	
1998	0	3,484	4,677	151	8,312	0	2,389	
1999	0	3,746	4,975	162	8,883	0	2,280	
2000	0	4,009	5,272	172	9,453	· · · · • O	2,166	
2001	0	4,271	5,570	183	10,024	0	2,051	
2002	-17,657	4,534	5,867	194	10,595	-3,226	1,936	
TOTAL	35,457	40,150	59,137	1,838	101,125	50,863	38,695	
DISCOUNTED	50,863	14.534	23,459	703	38,695			

NET PRESENT VALUE : -12,168 BENEFIT/COST RATIO : 0,76 INTERNAL RATE OF RETURN : 0.8 % FIRST YEAR RATE OF RETURN : 5.8 % OPTIMUM OPENING YEAR : 1993

### SENSITIVITY TESTS

10000

				Alter Alt	19 <sup>1</sup> 41
•					1
		ITEM		BA	ISE
•. •	NET PRESEN BENEFIT/COS INTERNAL R FIRST YEAR	C E	2,168 ) 76   8 %   8 %		
	COSTS BENEFITS				ISE ISE
· · · ,					·

# 27.5.2 Social Impact

The social impact brought about by the improvement of the study route is shown in the following social benefit indicators:

### Construction Cost (million baht)

1) General Accessibility Benefit (million baht)

2) Education Benefit (million baht)

3) Medical Care Benefit (million baht)

4) Total Social Benefits (million baht) (1+2+3)

5) Social Benefit/Cost Ratio ( $\times 10^{-2}$ )

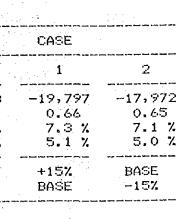
6) Ranking by Social Benefits

7) Weighted Production Value Gain/Cost ( $\times 10^{-2}$ )

8) Ranking by 7

9) Combined Ratio  $(\times 10^{-2})$ 

**Overall Ranking** 



: 42.1 : 3.22 : 3.86 : 0.074 : 7.15 : 17.00 : 4 : 10.27 : 7 : 27.27

: 4

# 27.5.3 Overall Evaluation

It is concluded that, considering the overall ranking and improvement schedule of the study routes with due consideration to the prevailing opportunity cost of capital, the improvement of this study route with the opening year 1993 is recommended.