

3. Preliminary Design of Priority Project

PROJECT NC-1

CHUMPHON CITY LINK

CHANGWAT: CHUMPHON

2) ROUTE MAP

3. PRELIMINARY DESIGN OF PRIORITY PROJECTS

3.1 Chumphon City Link (NC-1)

1) Summary

The aim of the project is to ease traffic congestions on the access road from Route 4 to Chumphon city (Route 327) as well as to secure undisrupted connection even in case of emergency. The existing access road has only a limited width of right-of-way.

"F1" standard is applied to the link with asphaltic concrete carriageway of 7.0 meter width and soil aggregate shoulders of 2.5 m width on both sides of carriageway.

The proposed route originates at the junction with Route 4 at Ban Khao Lon and ends at the junction with Route 327 with a total length of 9.4 kilometers. The first section of 1.8 km is a reconstruction section based on the existing PWD road and the remaining 7.6 kilometers are for new construction. About half of the link from Route 4 is situated in hilly terrain and the rest is in flat terrain. Height of the embankment is planned to be 2.5 meters in hilly and flat terrain so as to avoid flooding damages in rainy season.

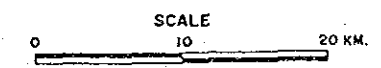
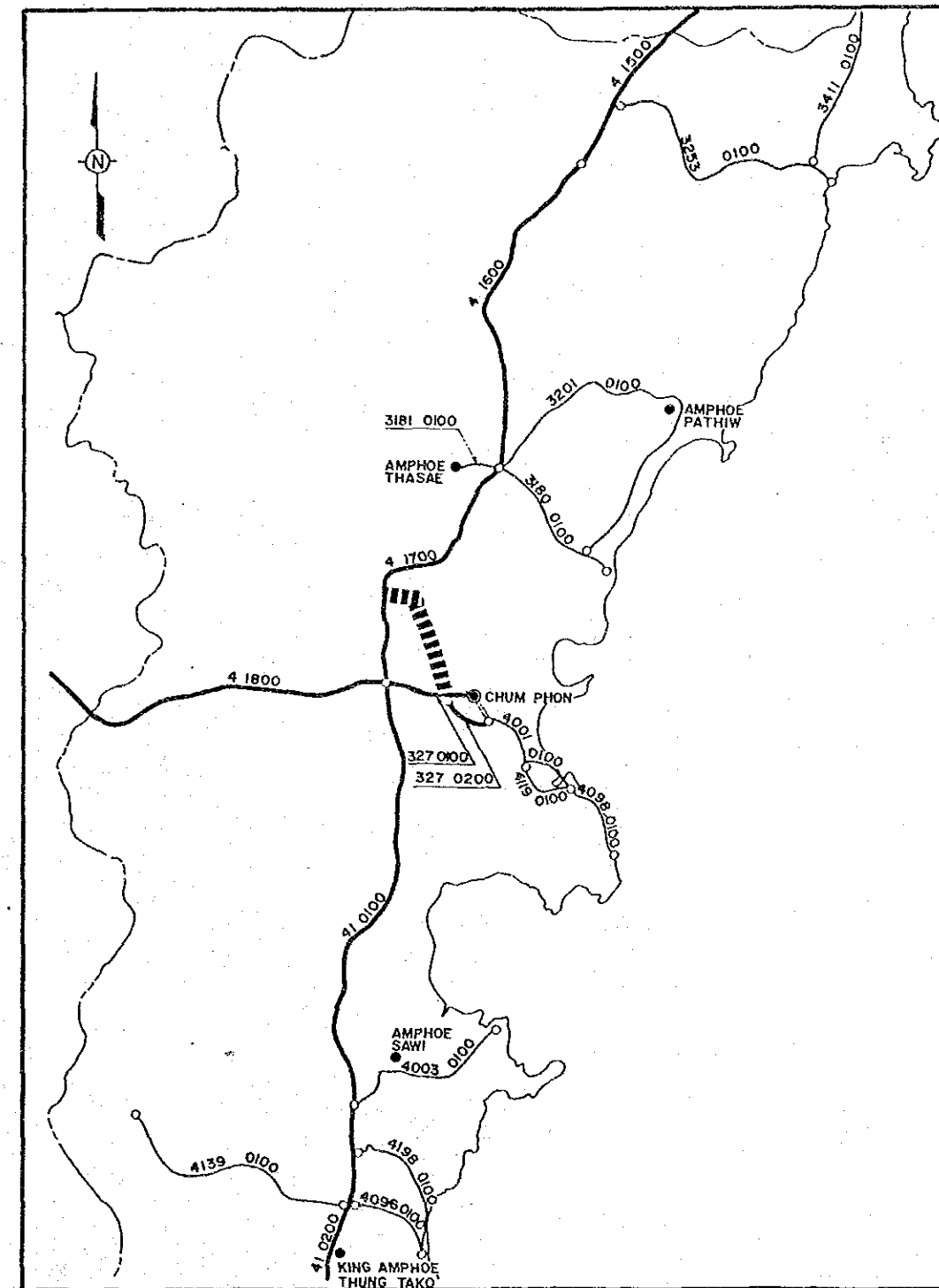
The EIRR is calculated at as high as 73.5 % because of the absolute capacity deficiency of the existing Route 327 connecting Chumphon city with Route No. 4.

NC-1	Description
Changwat	: Chumphon
Name or Location	: Chumphon City Link J.Rt.4 - J.Rt.327
Road Class	: F1
Cross Section (m)	: 2.50+7.00+2.50 (6.00:PWD)
Surface Type	: SA / ASC/ SA (SA)
Length: Total	: 9.4 km
DOH Road	: 7.6 km:New
Others	: 1.8 km:PWD

AADT<'96/'01/'06>	: 5,600 / 11,100 / 16,200

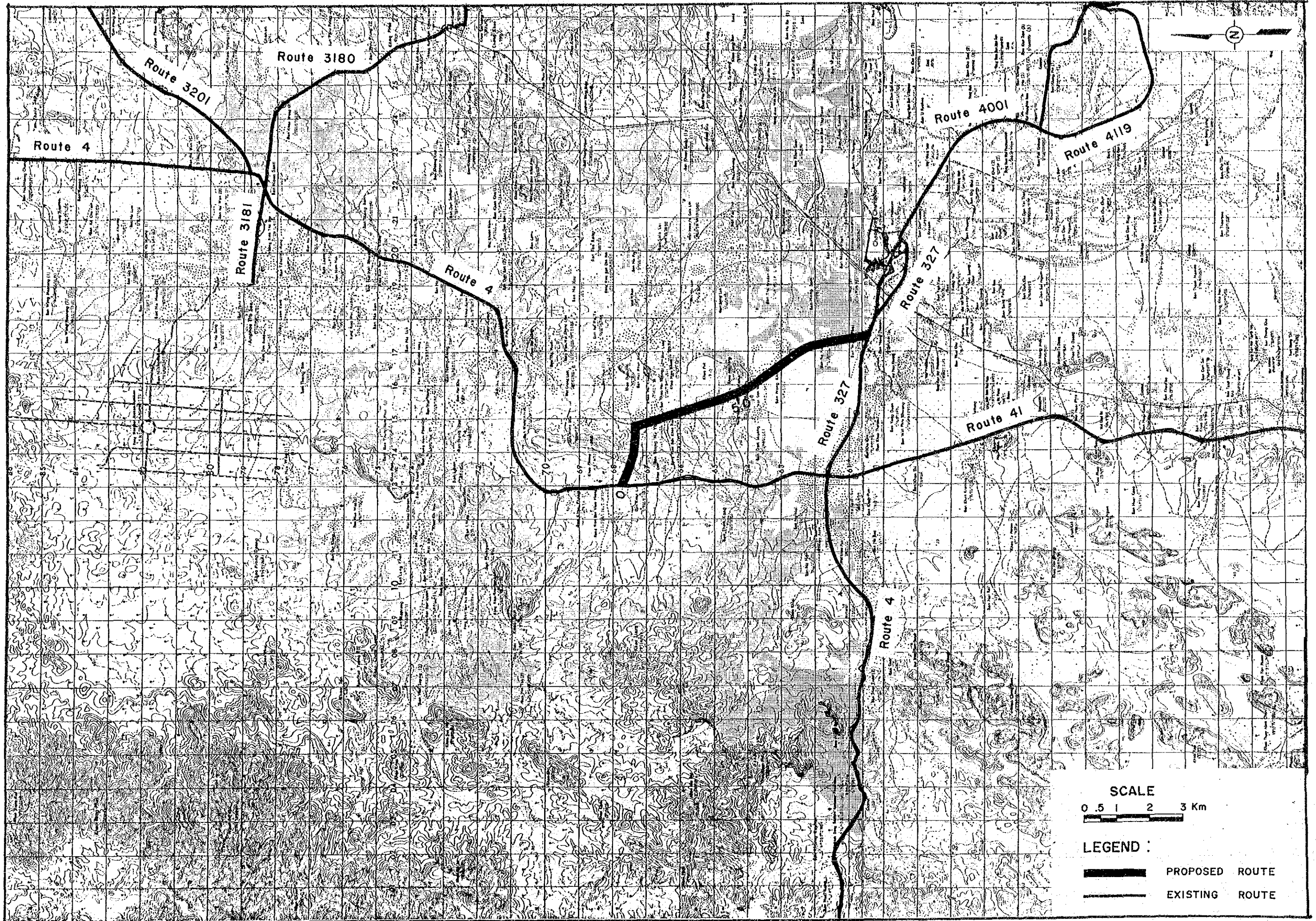
Financial Cost	: 93.5 million baht
NPV	: 514 million baht (12% discount rate)
B/C	: 12.4 (12% discount rate)
EIRR	: 73.5 %

(): Existing Condition or Value



LEGEND :

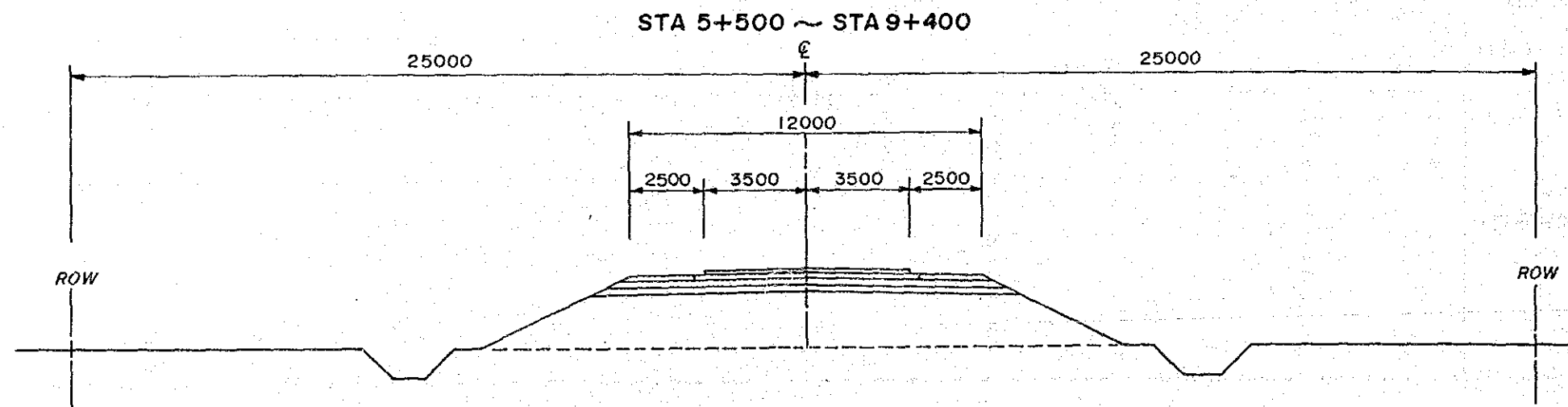
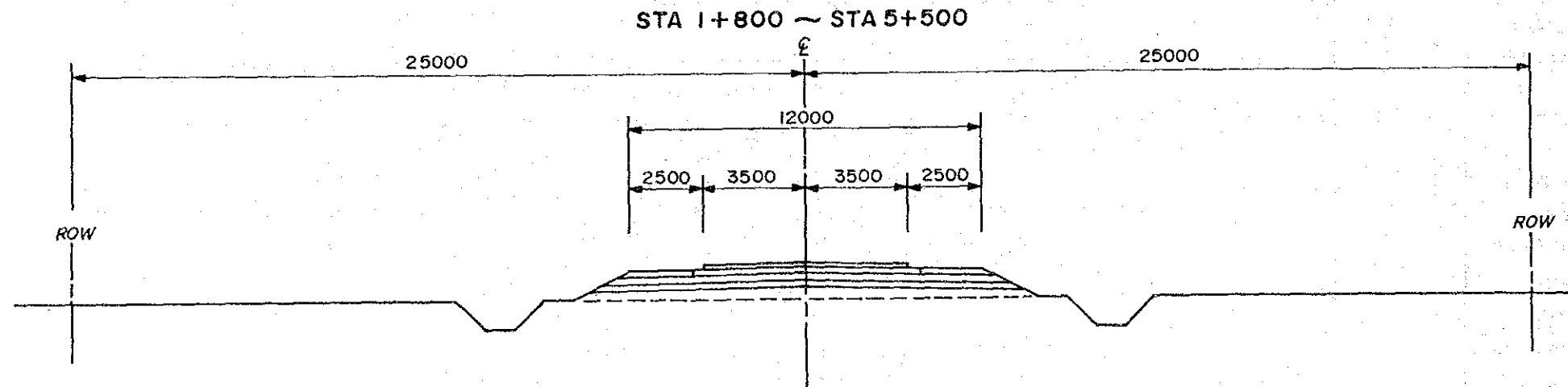
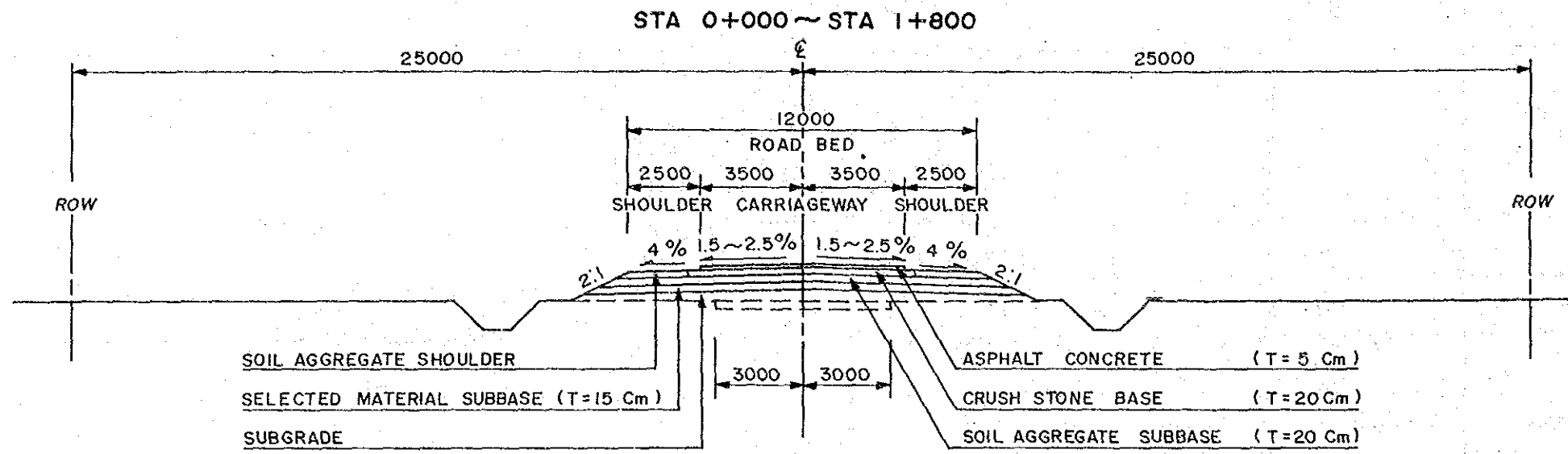
	PROJECT ROUTE		PROVINCIAL HIGHWAYS
	DIVIDED HIGHWAYS		CHANGWAT, AMPHOE
	NATIONAL HIGHWAYS		



4) PROFILE OF PROJECT
PROJECT NO. NC-I: CHUMPHON CITY LINK

STATION (KM)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	
VILLAGE ROAD INTERSECTION		J. Rt. 4		KHAO HOI KHONG			NONG KHLA			J. Rt. 327								
LAND USE				PLANTATION			RICE											
TERRAIN				ROLLING			FLAT											
FLOODING LENGTH																		
EXISTING CONDITIONS	RIGHT OF WAY	6.00 M																
	ALIGNMENT	HOR.																
		VER.																
	CROSS SECTION	PWD 6.00M																
	SURFACE	SA																
BRIDGES AND (Type - Width - Length (m))	BOX CULVERTS (Width - Height - Length (m))																	
PROPOSED CONDITIONS	CROSS SECTION	RC, FI R/W=50.00M		NC, FI, 2.5(SA)+7.0(ASC)+2.5(SA)=12.00M R/W = 50.00 M														
	EMBANKMENT / CUT (Height (m))	1.5 (E)		2.5 (E)														
	BRIDGES (Type - Width - Length (m))	0+000	2+200	5+500	7+500	9+400												
		RC 12.0 x 15.0			RC 12.0 x 15.0													

5) TYPICAL CROSS SECTION



6) CONSTRUCTION QUANTITIES AND COSTS

CONSTRUCTION QUANTITIES AND COSTS
(Project NC -1 Length = 9.400 Km)
(Improved Length 9.400 Km)

ITEM	Unit	Financial		Financial		Economic cost		Residual Value	
		Unit Cost	Quantity	Total cost		%	%	%	%
		Baht		1000 Baht		1000 Baht	%	1000 Baht	%
EARTH WORK									
Clearing & Grubbing	SQ.M	1	196,008	196			83		90
Roadway Excavation(Unclassified)	CU.M	30	0	0					
Embankment(Borrowed Material)	CU.M	100	273,752	27,375					
Slope Protection(Stripe Sodding)	SQ.M	6	93,018	558					
Sand Mat (t=0.5m)	SQ.M	50	0	0					
Excavate Existing									
Surface	SQ.M	2	0	0					
Thickness Over 10cm (2 Lay)	SQ.M	14	0	0					
SUB TOTAL				28,129			23,347		21,013
SUBBASE AND BASE									
Subbase(Selected Material)	CU.M	190	20,304	3,858			83		50
Subbase(Soil Aggregate)	CU.M	190	27,072	5,144					
Base Coarses(Crush Stone)	CU.M	280	14,288	4,001					
Shoulder(Soil Aggregate)	CU.M	190	8,272	1,572					
SUB TOTAL				14,574			12,096		6,048
SURFACE									
Asphaltic Prime coat	SQ.M	13	65,800	855			83		50
Asphaltic Tack coat	SQ.M	7	0	0					
Asphalt concrete Surfacing	CU.M	1,900	3,290	6,251					
SUB TOTAL				7,106			5,898		2,949
STRUCTURES(Equivalent)									
RC Pipe Culvert(D= 600 m)	M	1,380	538	742			83		50
(D= 800 m)	M	1,950	0	0					
(D=1000 m)	M	2,650	0	0					
(D=1200 m)	M	3,850	0	0					
RC Box Culvert(1-2.40*2.40 m)	M	5,700	190	1,083					
RC Bridge Wideing	SQ.M	9,600	0	0					
RC Bridge (W=15.0 m)	M	96,000	30	2,880					
PC Bridge (W=15.0 m)	M	150,000	0	0					
SUB TOTAL				4,705			3,906		1,953
TOTAL (a)				54,515			45,247		31,963
Miscellaneous Works [(a)*7%]	Ls	1		3,816			3,167		2,237
CONTRACT AMOUNT (b)				58,331			48,415		34,200
PHYSICAL CONTINGENCIES [(b)*10%] (c)	Ls	1		5,833			4,841		3,420
ENGINEERING & SUPERVISION [(((b)+(c))*10%] (d)	Ls	1		6,416	85	5,454	0	0	0
LAND ACQUISITION(Average) (e)	SQ.M	50	459,200	22,960	100	22,960	100	22,960	22,960
PROJECT COST [(b)+(c)+(d)+(e)]				93,540			81,670		60,580
AVERAGE COST PER KM				9,951					

MAINTENANCE BUDGET CALCULATION

Project Road No, NC -1 Na= 8,200 Baht/Km/year
(Proposed Road) Km= 1.001
 Length = 9.400 Km

Asphalt Pavement

ITEMS	Proposed Road		
	Condition		Factor
1. Surface /Base Type	X1	AC	0.00
2. Subgrade CBR	X2	4 %	0.50
3. A.D.T	X3	2,900	1.02
4. Service Life (year)	X4	NEW	0.00
5. Pavement Width (m)	X5	7 m	0.19
6. R-Q-W Width (m)	Y1	50 m	0.05
7. Shoulder, Access, Median Width (m)	Y2	2.50 m	0.05
8. Traffic Service Operation Topography	Y3	0 - 3 %	0.00
9. Drainage Topography	Y4	0 - 3 %	0.00
10. Bridge Quantity (m/Km)	Y5	3	0.00
11. NO. Of Lanes		2	

$Ka(\text{Existing}) = 1+0.5(X1+X2+X3+X4+X5+Y1+Y2+Y3+Y4+Y5) = 1.905$
 Maintenance cost + Overhead = $Ka * Km * Na * 1.28 = 20,015$ Baht/Km/year
 Total Cost(Existing) = $\text{Length} * (\text{Baht/Km/year}) = 188,140$ Baht/year
 Financial Cost = 188,000 Baht/year
 Economic Cost = 156,000 Baht/year
 (156,040 Baht/year

7) Construction Schedule

Project NC-1 Chumphon City Link

year and Month	First Year												Second Year											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Land Acquisition	=====																							
Preparatory Works	=====																							
Earth Works	=====												===											
Pavement Works													=====											
Bridge Works	=====												=====											
Miscellaneous Works	=====												=====											
Clearing -Up													=====											
Percentage Of Disbursement (%)	47 %												55 %											

8) Economic Evaluation

Project NC-1 Chumphon City Link

(unit ; 1000 Baht)

Year	Const- ruction Cost	Mainte- nance Cost	Total Cost	VOC Saving	Time Saving	Balance	Sensi. Analysis
						Benefit= Cost=	0.8 1.2
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0
1994	53198	0	53198	0	0	-53198	-63837
1995	28471	0	28471	0	0	-28471	-34165
1996	0	109	109	9,467	29,569	38927	31098
1997	0	109	109	13,997	64,487	78375	62656
1998	0	109	109	18,527	99,405	117823	94215
1999	0	109	109	23,056	134,324	157271	125773
2000	0	109	109	27,586	169,242	196719	157332
2001	0	109	109	32,116	204,160	236167	188890
2002	0	109	109	29,617	201,570	231077	184818
2003	0	109	109	27,118	198,979	225988	180747
2004	0	109	109	24,618	196,389	220898	176675
2005	0	109	109	22,119	193,798	215809	172603
2006	0	109	109	19,620	191,208	210719	168532
2007	0	109	109	19,620	191,208	210719	168532
2008	0	109	109	19,620	191,208	210719	168532
2009	0	109	109	19,620	191,208	210719	168532
2010	0	109	109	19,620	191,208	210719	168532
Total	81669	1635	83304	326321	2447963	2690980	2119462
				IRR =		73.48%	58.36%
				NPV (i;12%) =		513,613	
				B/C (i;12%) =		12.42	

PROJECT NC-2

NAKHON SI THAMMARAT BYPASS

CHANGWAT: NAKHON SI THAMMARAT

2) ROUTE MAP

3.2 Nakhon Si Thammarat Bypass (NC-2)

1) Summary

The aim of the project is to streamline the traffic flow comprising urban and inter-city traffics on Route 401 and 408 along the east coast near the city center of Nakhon Si Thammarat. The existing bypass is to be extended to the north and south of the city center.

"F1" standard is applied to the bypass with asphaltic concrete carriageway of 7.0 meter width and soil aggregate shoulders of 2.5 meters on the both sides.

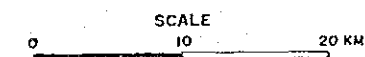
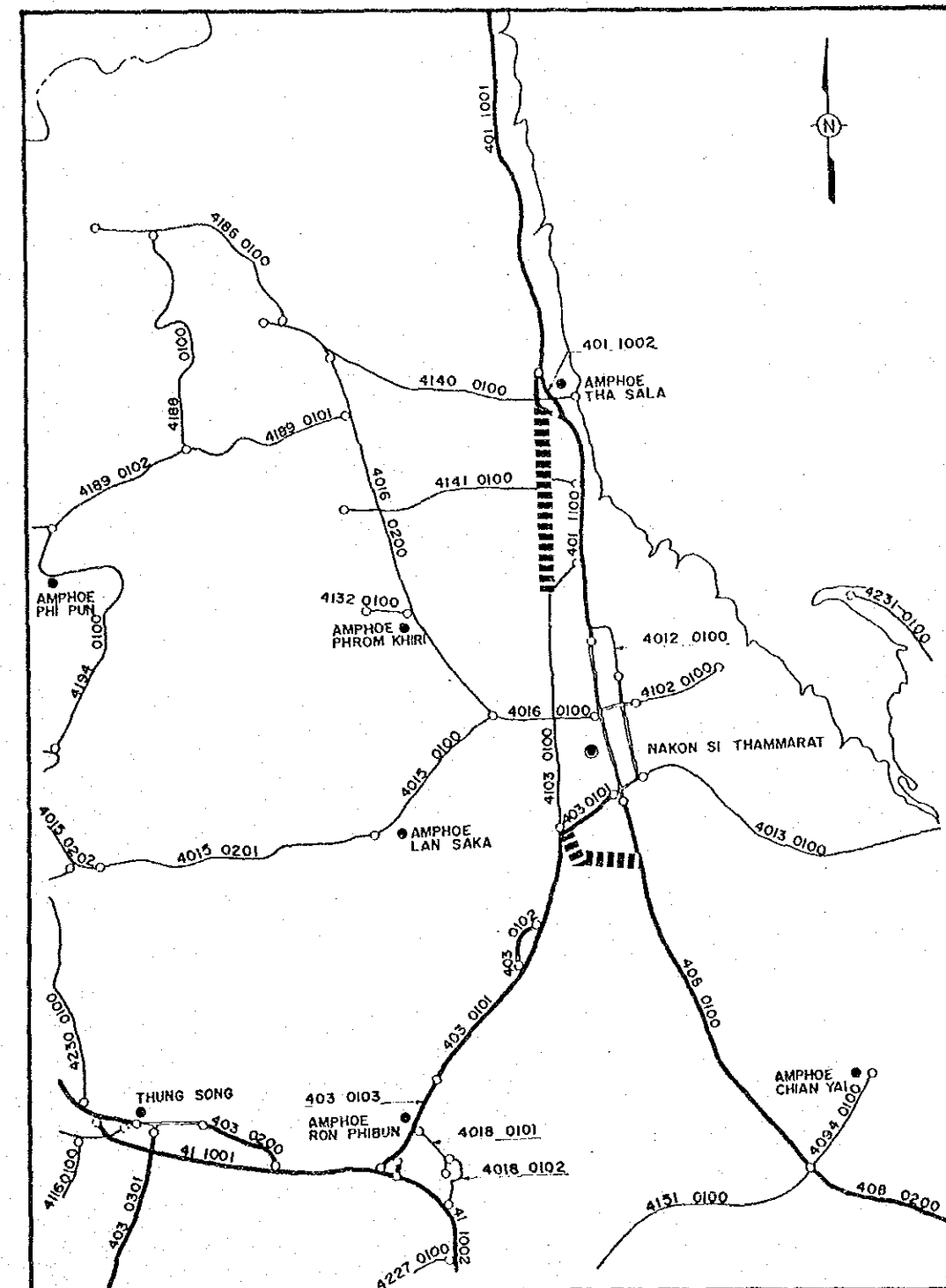
The total length of the bypass is 20.5 kilometers, comprising two sections: one situated in the south of the city center connecting Route 408 with Route 403 over a distance of 8.0 kilometers; and another in the north of the city center connecting Route 401 with Route 4013 over a distance of 12.5 kilometers. The former is for new construction and the latter for reconstruction of the existing ARD road. The height of embankment is planned to be 2.5 meters since the project area is located entirely in flood prone area.

NC-2	Description
Changwat	: Nakhon Si Thammarat
Name or Location	: Nakhon Si Thammarat Bypass
Road Class	: F1
Cross Section (m)	: 2.50+7.00+2.50 (6.00:ARD)
Surface Type	: SA /ASC / SA (SA)
Length: Total	: 20.5 km
DOH Road	: 8.0 km:New
Others	: 12.5 km:ARD

AADT<'96/'01/'06>	: 2,700 / 5,700 / 7,100

Financial Cost	: 280.4 million baht
NPV	: 9 million baht (12% discount rate)
B/C	: 1.1 (12% discount rate)
EIRR	: 12.6 %

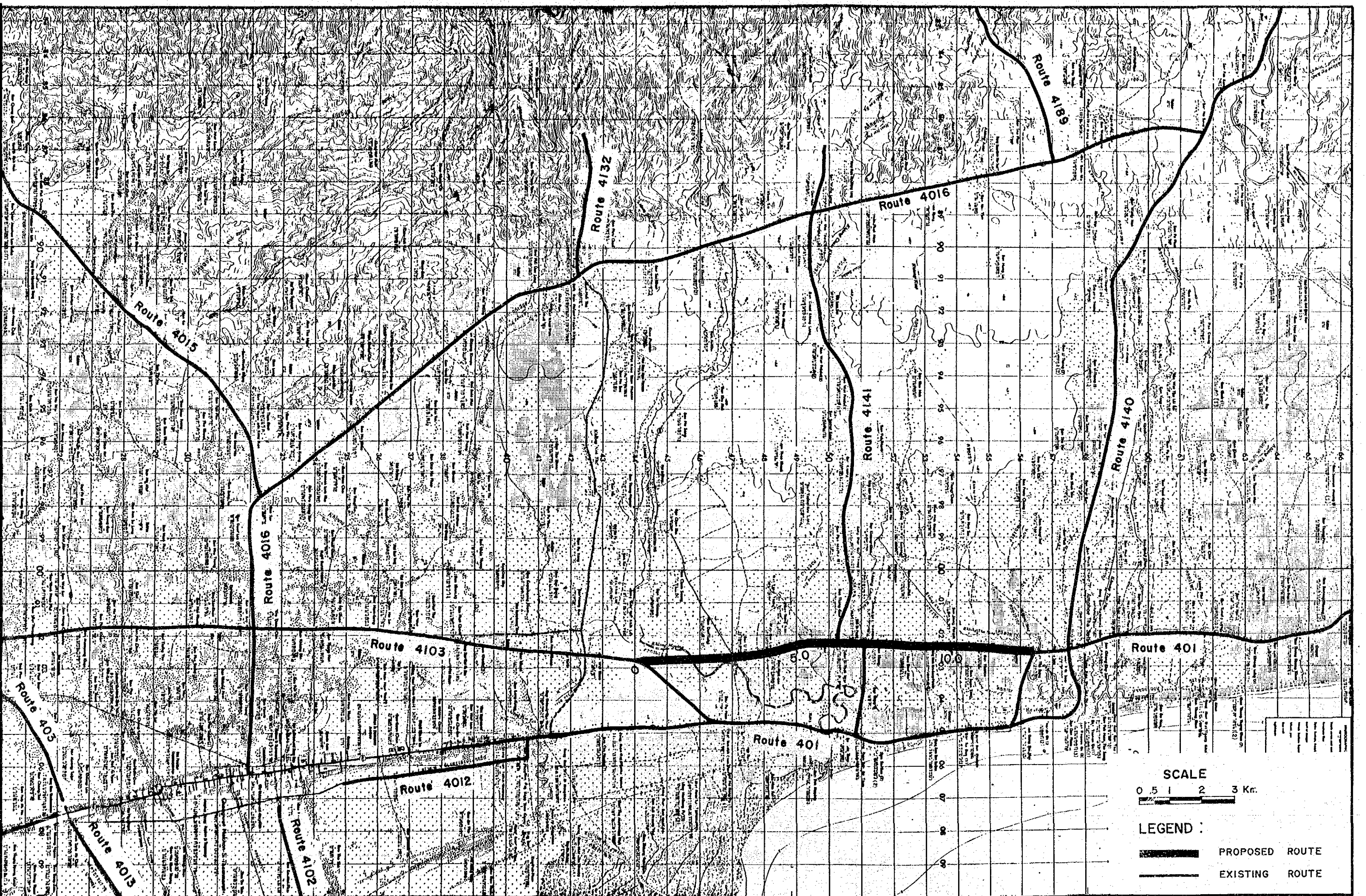
(): Existing Condition or Value



LEGEND :

	PROJECT ROUTE		PROVINCIAL HIGHWAYS
	DIVIDED HIGHWAYS		CHANGWAT, AMPHOE
	NATIONAL HIGHWAYS		





4) PROFILE OF PROJECT
PROJECT NO. NC-2: NAKHON SI THAMMARAT BYPASS

(1/2)

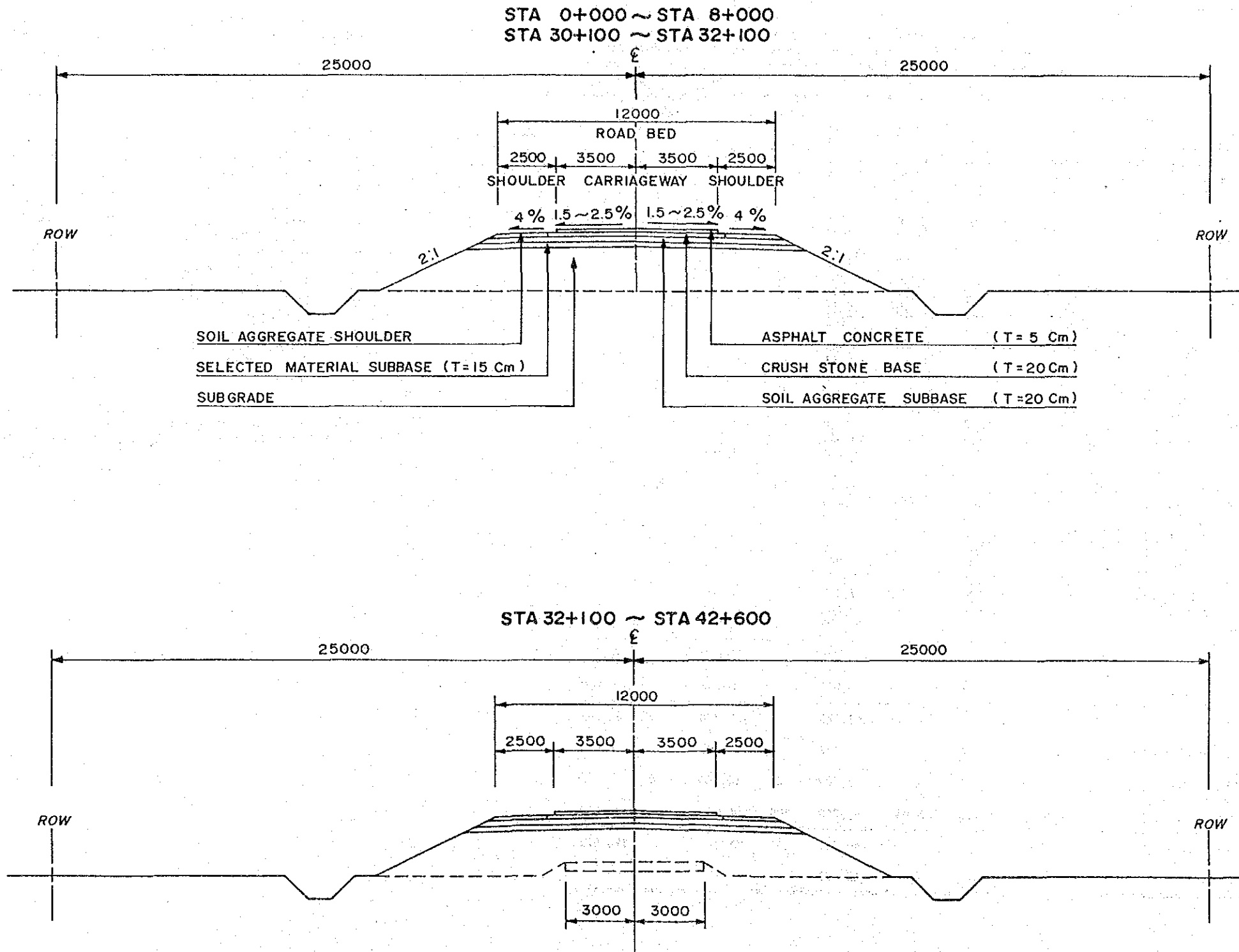
STATION (KM)		0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
VILLAGE ROAD INTERSECTION		J. Rt. 408		SA KHU		NA PHRU	J. Rt. 403 Rt. 4103										
LAND USE				RICE													
TERRAIN				FLAT													
FLOODING LENGTH																	
EXISTING CONDITIONS	RIGHT OF WAY																
	ALIGNMENT	HOR.															
		VER.															
	CROSS SECTION																
	SURFACE																
BRIDGES AND (Type - Width - Length (m))																	
	BOX CULVERTS (Width - Height - Length (m))																
PROPOSED CONDITIONS	CROSS SECTION	NC, FI, 2.5(SA)+7.0(ASC)+2.5(SA) = 12.00M. R/W = 50.00 M															
	EMBANKMENT / CUT (Height (m))	2.5 (E)															
	BRIDGES (Type - Width - Length (m))	0+000 RC 12.0 x 10.0	0+600	2+500 RC 12.0 x 10.0		6+800 RC 12.0 x 15.0	8+000										

PROJECT NO. NC-2: NAKHON SI THAMMARAT BYPASS

(2/2)

STATION (Km)		30+100	32	34	36	37+200	38	40	42	42+600	44	46	48	50	52	54	56	58	60		
VILLAGE ROAD INTERSECTION		J. Rt. 4103 (22+100)		U TAPHAO		J. Rt. 4141	J. Rt. 4141		BON THANON	J. Rt. 401											
LAND USE				ORCHARD, PLANTATION																	
TERRAIN				FLAT																	
FLOODING LENGTH																					
EXISTING CONDITIONS	RIGHT OF WAY					6.00 M															
	ALIGNMENT	HOR.				STRAIGHT															
		VER.				FLAT															
	CROSS SECTION						6.00M (ARD)														
	SURFACE						SA														
	BRIDGES AND (Type - Width - Length(m))							35+200	36+100												
BOX CULVERTS (Width - Height - Length(m))							RC 6.0 x 20.0	RC 6.0 x 20.0													
PROPOSED CONDITIONS	CROSS SECTION					RECONSTRUCTION FI = 12.00 M R/W = 50.00 M															
	EMBANKMENT / CUT (Height (m))						2.5(E)														
	BRIDGES AND (Type - Width - Length (m))		30+100 (8+000)	31+700	35+200	36+100	42+600 (20+500)														
		PC 12.0 x 60.0		RC 12.0 x 20.0		RC 12.0 x 20.0															

5) TYPICAL CROSS SECTION



6) CONSTRUCTION QUANTITIES AND COSTS

CONSTRUCTION QUANTITIES AND COSTS
(Project NC -2 Length = 42.600 Km)
(Improved Length 20.500 Km)

ITEM	Unit	Financial		Financial Total cost 1000 Baht	Economic cost		Residual Value	
		Unit Cost Baht	Quantity		%	1000 Baht	%	1000 Baht
EARTH WORK								
Clearing & Grubbing	SQ.M	1	451,000	451	83		90	
Roadway Excavation(Unclassified)	CU.M	30	0	0				
Embankment(Borrowed Material)	CU.M	100	708,890	70,889				
Slope Protection(Stripe Sodding)	SQ.M	6	229,190	1,375				
Sand Mat (t=0.5m)	SQ.M	50	0	0				
Excavate Existing								
Surface	SQ.M	2	0	0				
Thickness Over 10Cm (2 Lay)	SQ.M	14	0	0				
SUB TOTAL				72,715		60,354		54,318
SUBBASE AND BASE								
Subbase(Selected Material)	CU.M	190	44,280	8,413	83		50	
Subbase(Soil Aggregate)	CU.M	190	59,040	11,218				
Base Coarses(Crush Stone)	CU.M	280	31,160	8,725				
Shoulder(Soil Aggregate)	CU.M	190	18,040	3,428				
SUB TOTAL				31,783		26,380		13,190
SURFACE								
Asphaltic Prime coat	SQ.M	13	143,500	1,866	83		50	
Asphaltic Tack coat	SQ.M	7	0	0				
Asphalt concrete Surfacing	CU.M	1,900	7,175	13,633				
SUB TOTAL				15,498		12,863		6,432
STRUCTURES(Equivalent)								
RC Pipe Culvert(D= 600 m)	M	1,380	1,694	2,338	83		50	
(D= 800 m)	M	1,950	0	0				
(D=1000 m)	M	2,650	0	0				
(D=1200 m)	M	3,850	0	0				
RC Box Culvert(1-2.40*2.40 m)	M	5,700	572	3,260				
RC Bridge Widening	SQ.M	9,600	0	0				
RC Bridge (W=15.0 m)	M	96,000	75	7,200				
PC Bridge (W=15.0 m)	M	150,000	60	9,000				
SUB TOTAL				21,798		18,092		9,046
TOTAL (a)				141,794		117,689		82,986
Miscellaneous Works [(a)*7%]	Ls	1		9,926		8,238		5,809
CONTRACT AMOUNT (b)				151,720		125,928		88,795
PHYSICAL CONTINGENCIES [(b)*10%] (c)	Ls	1		15,172		12,593		8,880
ENGINEERING & SUPERVISION [(b)+(c)*10%] (d)	Ls	1		16,689	85	14,186	0	0
LAND ACQUISITION(Average) (e)	SQ.M	100	968,000	96,800	100	96,800	100	96,800
PROJECT COST [(b)+(c)+(d)+(e)]				280,381		249,506		194,475
AVERAGE COST PER KM				13,677				

MAINTENANCE BUDGET CALCULATION

Project Road No, NC -2 Na= 8,200 Baht/Km/year
(Proposed Road) Km= 1.001
Length = 42.600 Km

Asphalt Pavement

ITEMS	Proposed Road		
	Condition	Factor	
1. Surface /Base Type	X1	AC	0.00
2. Subgrade CBR	X2	4 %	0.50
3. A.D.T	X3	2,600	0.86
4. Service Life (year)	X4	NEW	0.00
5. Pavement Width (m)	X5	7 m	0.19
6. R-O-W Width (m)	Y1	50 m	0.05
7. Shoulder, Access, Median Width (m)	Y2	2.50	0.05
8. Traffic Service Operation Topography	Y3	0 - 3 %	0.00
9. Drainage Topography	Y4	0 - 3 %	0.00
10. Bridge Quantity (m/Km)	Y5	7	0.00
11. NO. Of Lanes		2	

$Ka(\text{Existing}) = 1 + 0.5(X1 + X2 + X3 + X4 + X5 + Y1 + Y2 + Y3 + Y4 + Y5) = 1.825$
 Maintenance cost + Overhead = $Ka * Km * Na * 1.28 = 19,174 \text{ Baht/Km/year}$
 Total Cost(Existing) = $\text{Length} * (\text{Baht/Km/year}) = 816,828 \text{ Baht/year}$
 Financial Cost = 817,000 Baht/year
 Economic Cost = 678,000 Baht/year
 (678,110) Baht/year

7) Construction Schedule

Project NC-2 Nakhon Si Thammarat Bypass

year and Month	First Year												Second Year												Third Year											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Land Acquisition	=====																																			
Preparatory Works	=====																																			
Earth Works	=====																																			
Pavement Works													=====																							
Bridge Works													=====						=====																	
Miscellaneous Works													=====						=====						=====											
Clearing -Up																									=====											
Percentage Of Disbursement (%)	41 %												54 %												5 %											

8) Economic Evaluation

Project NC-2 Nakhon Si Thammarat Bypass

(unit ; 1000 Baht)

Year	Const- ruction Cost	Mainte- nance Cost	Total Cost	VOC Saving	Time Saving	Balance	Sensi. Analysis D.8 1.2
1990	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0
1993	143,643	0	143,643	0	0	(143,643)	(172,372)
1994	95,584	0	95,584	0	0	(95,584)	(114,701)
1995	10,279	0	10,279	0	0	(10,279)	(12,334)
1996	0	237	237	2,666	6,171	8,600	6,785
1997	0	237	237	4,213	9,753	13,730	10,889
1998	0	237	237	5,761	13,336	18,860	14,993
1999	0	237	237	7,308	16,918	23,989	19,097
2000	0	237	237	8,856	20,501	29,119	23,201
2001	0	237	237	10,403	24,083	34,249	27,304
2002	0	237	237	14,956	34,623	49,342	39,379
2003	0	237	237	19,509	45,163	64,435	51,453
2004	0	237	237	24,061	55,704	79,528	63,528
2005	0	237	237	28,614	66,244	94,621	75,602
2006	0	237	237	33,167	76,784	109,714	87,676
2007	0	237	237	33,167	76,784	109,714	87,676
2008	0	237	237	33,167	76,784	109,714	87,676
2009	0	237	237	33,167	76,784	109,714	87,676
2010	0	237	237	33,167	76,784	109,714	87,676
Total	249,506	3,555	253,061	292,182	676,416	715,537	471,206
						IRR =	12.64%
						NPV (i;12)	9,361
						B/C (i;12)	1.06