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STAFF APPRAISAL REPORT

THAILAND

BANGKOK TRAFFIC MANAGEMENT PROJECT

November 30, 1978

Urban Projects Department

CURRENCY EQUIVALENTS

Currency Unit	:	Baht (B)
US$1	=	B 20
B 1	=	US$0.05
B 1 million	=	US$50,000

MEASURES AND EQUIVALENTS

1 meter (m)	=	39.37 inches (in)
1 square meter (sq m)	=	10.8 square feet (sq ft)
1 cubic meter (cu m)	=	35.3 cubic feet (cu ft)
1 kilometer (km)	=	0.62 mile (mi)
1 hectare (ha)	=	10,000 sq m or 2.471 acres

ABBREVIATIONS AND ACRONYMS

BMA	-	Bangkok Metropolitan Administration
BMTA	-	Bangkok Mass Transit Authority
ETA	-	Expressway and Rapid Transit Authority
MOI	-	Ministry of Interior
NTB	-	National Traffic Board
TPD	-	Traffic Police Division, Metropolitan (Bangkok) Police Bureau
UTPO	-	Urban Transportation Planning Office
VOC	-	Vehicle Operating Costs

GOVERNMENT OF THAILAND FISCAL YEAR

October 1 - September 30

THAILAND

STAFF APPRAISAL REPORT

BANGKOK TRAFFIC MANAGEMENT PROJECT

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This report is based on the findings of a preappraisal mission consisting of D.B. Cook (chief of mission), G.J. Roth, R. Podolske, K. Willen, and K. Huddart (consultant) who visited Bangkok during January 30 - February 17, 1978, and the appraisal mission consisting of K. Willen (chief of mission), and R. Podolske who visited Bangkok April 15 to May 5, 1978. Irmgard Kretzer assisted in preparation of the report.

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BANGKOK TRAFFIC MANAGEMENT PROJECT

I. BACKGROUND

A. Urban Development in Thailand

1.01 Thailand's urban sector is characterized by a moderately rapid rate of growth and the predominance of Bangkok. In 1976, 7.3 million people (or 17% of the nation's population) lived in urban areas. During 1970-76, the urban areas grew at an average rate of 4.9% per annum, compared to a total national population growth rate of about 2.9% per annum. The urban growth rate is expected to increase during the next decade because of the diminishing supply of unoccupied agricultural land.

1.02 Bangkok, with a 1977 population of 4.8 million and an annual growth rate of about 5%, accounts for 60% of Thailand's total urban population. Although the city accounts for only 10% of the total national population, it contributed 27% of national GDP in 1976, and its Gross Regional Product per capita (B 20,006) was 2.6 times greater than the Gross Domestic Product per capita (B 7,582). In 1976, Thailand's second largest city, Chiang Mai, had an urban population of only 105,000.

1.03 Government urban policies articulated in the Fourth Development Plan (1977-81) emphasize the promotion of regional urban centers as well as improvement of conditions in Bangkok. However, the Government has not developed an explicit strategy and investment program to develop the nine regional centers designated in the Plan. The technical assistance component of the proposed project includes funds to prepare projects to promote urban development outside Bangkok (Annex 1).

B. Bangkok Metropolitan Area

Economy and Poverty Population

1.04 Bangkok is an economically dynamic city. The private sector is characterized by small firms, competition and price responsiveness. The city's manufacturing industries are diversified, with textiles and apparel accounting for almost 30% of industrial employment. Basic metal industries, including manufacture of metal products, machinery, transport equipment and appliances, account for another 28%. Unemployment rates have been unusually low, estimated at less than 2.5% during the first half of the 1970s.

Poverty Population

1.05 The city of Bangkok is relatively prosperous compared to overall Thai income standards. Only 9% of the city's population is below the "absolute poverty" line established by the Bank. Approximately 15%, however, are below the "relative poverty" line. With the exception of the Klong Toey

area next to the port complex, there are no large concentrations of squatter settlements which might demand special localized transportation services. There are, however, large numbers of small poverty pockets scattered throughout the metropolitan area. The average Thai family at the 10% income percentile (approximately equal to the absolute poverty line) makes over 14,000 Baht annually (approximately $60/month) which is sufficient to accommodate regularly at least one bus rider in the family. It is estimated that less than 10% of Bangkok families can afford a car and that, at most, 20% can afford some form of private motorized transportation; the remainder, including all of the urban poor, rely exclusively on buses for their motorized travel (see also paras 5.19-5.25).

General Pattern of City Development

1.06 Bangkok can be perceived as a city growing in a generally concentric fashion, with a densely populated core and with densities diminishing in inverse proportion to the radius to a distance of approximately 8 km from the center. Then there is a sharper decrease in density as urbanization blends into the rural area. Poor accessibility to the area west of the river, combined with the rolling and high-valued farmland, has stunted development of this area. Nevertheless, Thonburi has developed as a twin city to Bangkok on the west bank and has potential for further growth. In recent years, Bangkok has grown mostly east and north. It can be expected that, with the construction of new roads, a substantial amount of development will occur on large vacant tracts of land on the city's northeast and south sides.

Land Use Characteristics

1.07 Bangkok can be generally typified as a highly amorphous city with a mixture of land-use activities which minimizes work-related travel. Shop houses, with their attendant residential, industrial and commercial uses, can be found in all parts of the city. There is no single strong central business district in the western sense and, in the core area of the city which is about 5 km in diameter, a large amount of residential development is mixed with commercial development. On the city's north and east sides, large areas of predominantly residential use have developed but, even in these areas, there is a mixture of income levels and dwelling types as the population tries to remain close to places of work and commerce.

1.08 Responsibility for the city's administration rests primarily with the Bangkok Metropolitan Administration (BMA), created in 1972 to consolidate urban management functions in the greater metropolitan area. BMA has over 30,000 employees. Its responsibilities include primary education, construction and maintenance of roads and canals ("klongs"), sanitation, drainage, medical services and social welfare, with over half of its (1978) budget of approximately Baht 2.8 billion ($142 million) going to education (21%) and public works (29%). While BMA enjoys considerable local autonomy, several municipal services are provided by other government agencies, the most important being the Metropolitan Water Works Authority, the Metropolitan Electricity Authority, the Telephone Organization of Thailand, the Metropolitan Police Bureau, the National Housing Authority, and the Bangkok Mass Transit

Authority. The tax base of the city is weak with only about 14% of BMA's revenues being levied locally. The bulk of BMA's revenues comes from a business tax (30%), vehicle registration (25%) and government grants (11%); only 2% come from property valuation taxation.

C. Existing Transport Conditions in Bangkok

Road System

1.09 Bangkok's transportation infrastructure can be generally characterized by a very low proportion of space devoted to roadways (not more than 10% in the inner core) and a road network dependent on a limited number of major roads with only a few connecting links, particularly outside the grid network in the central area of the city. The remaining road network, consisting of a discontinuous jumble of minor streets or "sois," is typically narrow, winding, and has poor system continuity. The net result is a supply and configuration of road space that is unable to cope adequately with existing transport demand, let alone projected or latent transport growth. As the motor vehicle fleet expands at an approximate rate of over 8% annually (see Table I-1), the comparatively modest road building and traffic management measures that have been introduced have not been able to keep pace. Travel speeds have accordingly declined and will decline further until a point is reached where certain trips are deferred or altogether eliminated as the costs of travel become too high. There is some evidence to indicate that this point may have already been reached as typical car speeds are only 12 km/h and bus speeds 9 km/h during the heaviest travel hours in the central area of the city. Furthermore, congestion has reached such high levels that no discernible "peak hour" can be determined as heavy traffic spreads throughout most of the working day.

Table I-1: SIZE OF MOTOR VEHICLE FLEET IN BANGKOK: 1967-76

Type of Vehicle	Vehicles Registrations (1,000s) 1967	1976	Average Annual Growth 1/ %	1976 Share of Total Motor Vehicle Fleet %
Private Car	82.5	202.0	+10.5	51.1
Motorcycle	47.3	94.2	+ 8.0	23.9
Truck /2	34.0	61.5	+ 6.8	15.6
Taxi	9.0	14.3	+ 5.2	3.6
Samlor /3	6.9	6.6	-	1.7
Bus	2.8	5.1	+ 6.9	1.3
Others	6.5	11.1	+ 6.1	2.8
TOTAL	189.0	394.8	+ 8.5	100.0

/1 According to registration records, total motor vehicle registrations remained constant between 1974-76.
/2 Includes minibuses, many of which are converted trucks.
/3 A small, covered 3-wheeled motor vehicle for two passengers.
Source: Ministry of Interior.

Public Transport

1.10 More than 60% of person trips in the primary direction of travel on arterial streets are carried by buses and minibuses which constitute only 6% of the stream of passenger vehicles. In contrast, private cars which form the bulk of the traffic stream (57% of all vehicles) carry only 26% of all person trips (see Table I-2).

Table I-2: ESTIMATED PERSON TRIPS BY MODE IN PRIMARY TRAVEL DIRECTION ON ARTERIAL STREETS, CENTRAL BANGKOK: NOVEMBER 1977 /1

Public or Private Transportation	Specific Vehicle Type	Percentage of Vehicles	Estimated Occupancy	Estimated Percentage of Person Trips
Private transportation	Private car	57.5	1.9	26.1
	Motorcycle	23.0	1.3	7.2
Subtotal		80.5		33.3
Public transportation	Bus	3.5	60.0 /2	50.2
	Minibus	2.5	20.0	12.0
	Taxi	9.0	1.5	3.3
	Samlor	4.5	1.2	1.2
Subtotal		19.5		66.7
TOTAL		100.0		100.0

/1 Based on observations at 13 locations generally between 07:30-0900 and 17:00-17:45. All observations made in primary travel direction.

/2 Seating capacity of bus is 40 passengers; actual average occupancy may have been substantially higher.

1.11 Fixed route bus services are provided by the Bangkok Mass Transit Authority (BMTA). In addition, a large number of authorized and unauthorized minibus services operate in the city.

1.12 The BMTA was established by the Government as a state enterprise under the Ministry of Communications in April 1976 by the amalgamation of 24 private bus companies. The Authority has recently expanded its fleet, assisted by Government financing; by fall 1978, the total operational fleet consisted of approximately 4,740 units (see Table I-3), making it one of the largest in the world. It operates about 100 regular routes and an additional

11 routes which offer air-conditioned services. In March 1978, the total number of daily passenger trips averaged about 3.3 million. Estimated peak demand was about 75% over off-peak, while peak supply was only 35% above off-peak. This implies considerable overloading of buses during peak travel hours.

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Table I-3: COMPOSITION OF BMTA BUS FLEET: OCTOBER, 1978

Type of Bus	Total Fleet	Not Operational /1	Operational Fleet	% of Operational Fleet
Old buses acquired from former operators /2	2,670	1,260	1,410	29.7
New ordinary buses purchased by BMTA /3	2,300	-	2,300	48.5
New air conditioned buses purchased by BMTA /3	200	-	200	4.2
Ordinary buses leased from private owners	690	-	690	14.6
Air conditioned buses leased from private owners	140	-	140	3.0
TOTAL	6,000		4,740 /4	100.0

/1 Considered to be unserviceable
/2 The only buses being maintained by BMTA
/3 Acquired in 1977 and 1978; all being maintained by private service contracts
/4 Approximately 4,000 operational on typical day

Source: P.G. Pak-Poy and Associates

1.13 In order to accommodate the modal shift that will be generated by Government policy measures under the proposed project, BMTA must improve on its operations. Certain factors adversely affecting BMTA's services, such as traffic congestion, are beyond its control. However, BMTA has to overcome internal problems, created by the amalgamation and basically related to the enlarged scale of operations in management, operations, maintenance and finance.

1.14 Because of poor financial performance since its establishment, BMTA has accumulated operational deficits which at October 31, 1977 amounted to about B 340 million and exceed the paid-up capital of the Authority.

cording to the summary balance sheet available at that date, total assets ounting to about B 690 million were represented entirely by external debt ability of which 40 percent related to trade creditors and overdraft cilities. Current assets amounted to about B 10 million compared to cur- nt liabilities of nearly B 300 million. The substantially increased fleet pacity and recently revised fares structure will result in FY 1978 revenues more than double the FY 1977 revenue level. However, in the absence of ternal financial resources, the fleet expansion is being financed by long- rm loans involving substantial interest expenses and requiring a considerably creased depreciation provision. The April 1, 1978 fare increase from B 0.75 S¢3.75) to B 1.00 (US¢5.00) will help stem further deterioration in financial rformance, but additional measures will need to be taken to rationalize the thority's capital structure and secure financial viability over the medium rm. Technical assistance included in the project provides for a detailed view of BMTA finances and development of financial targets and the design d installation of effective systems for financial control and forward anning (para 2.35).

15 Minibuses, whether authorized or unauthorized, provide valuable blic transport services in Bangkok. About 2,000 authorized minibuses, erated under a franchise by three groups of independent operators on BMTA utes, carry about 600,000 daily passenger trips, 1/ and most of them charge vernment established fares. In addition, a range of 5,000 to 8,000 "illegal" either properly licensed nor franchised) minibuses operate in the city, 2/ arging about the same as regular fares during the daytime, but up to 100% ove those fares during the night time. A Government-appointed committee considering all relevant issues related to the role of minibuses as well other modes of public transport in Bangkok. They perform a valuable rvice as they cut excess peak demand for public transport, and ply many rrow streets not accessible to standard size buses. During negotiations, surances were obtained that the Government will define in consultation with e Bank and not later than December 31, 1979, the role of all modes of public ansport in Bangkok in order to meet the needs of the travelling public, and plement an agreed policy by mid 1980.

D. Ongoing and Planned Transport Infrastructure Investments Independent of the Proposed Project

16 There are at least four major transport investments currently under y in Bangkok that have some relationship to the proposed project: (a) a 11 road being constructed by the Expressway and Rapid Transit Authority TA) from the port area to Din Daeng, where it links up with the "Super- ghway" leading northward to the airport and points beyond (see Map 13577R);) a "Middle Ring" Road being constructed by BMA, one-third of which is in istence (mostly on the Thonburi side) and another third under construction;

As tentatively estimated by the Ministry of Communications.

No reliable information exists on the number of daily passenger trips by "illegal" minibuses.

(c) a Sathorn Road extension and bridge being constructed by BMA. This road will provide a much needed southern by-pass to the congested core area; and (d) a road also being constructed by BMA extending easterly from the intersection of Din Daeng and Soi Asoke to Soi 71 providing traffic relief to Petchburi Road and better access to the developing northeastern quadrant of the city. Additionally, the ETA has appointed consultants to undertake a feasibility study of constructing a mass transit system on its own right of way.

E. Bank Involvement and Strategy in Urban Transport Sector

1.17 Bank involvement in the urban transport sector in Bangkok dates back to 1969 when a Bank mission explored the possibility of supervising a proposed UNDP study of transport in the city. Subsequently the Bank was involved in reviewing the proposed terms of reference for an urban transport study to be financed by the Government of the Federal Republic of Germany. During the years 1973-1976, the Bank was actively involved in reviewing the work of this study produced by a team of German consultants F.H. Kochs and Rhein-Ruhr Ing-GMBH which was attached to the Office of Metropolitan Traffic Planning. The consultants proposed a number of improvements which could be basically classified as (a) long-term capital intensive extensions to the transport infrastructure and (b) short-term low capital improvements to the existing infrastructure. The Bank responded positively to the Government's request for financial assistance to implement many of the proposed short-term low capital investments provided the Government would undertake steps to discourage the uneconomic use of private cars in favor of higher occupancy vehicles.

1.18 These discussions were not immediately successful due principally to the Government's reluctance to institute strong traffic restraint policy measures and its desire to place highest priority on the proposed capital intensive projects including a toll road system currently being constructed by the Expressway and Rapid Transit Authority (ETA). In the meantime an Urban Transportation Planning Office (UTPO) was created based on the German consultants' recommendations and served as a base for updating the consultants recommendations and for continuing the transportation planning process in Bangkok.

1.19 During late 1977 the Government/Bank dialogue came to fruition in the face of continually deteriorating traffic conditions. At this time the Government decided to proceed with short-term traffic relief measures combined with stringent policy measures aimed at discouraging uneconomic use of low occupancy vehicles (principally private autos) and encouraging high occupancy vehicles (principally buses). In support of these policy commitments the Minister of Interior has appointed four committees, reporting to the National Traffic Board (see para 3.02) to prepare detailed proposals for (i) area pricing (paras 2.26 and 2.27), (ii) parking (paras 2.28, 2.29 and 2.30), (iii) staggered working and school hours (para 2.31), and (iv) traffic noise abatement and air pollution detection (para 2.17). The Government has also strengthened the UTPO by giving it greater powers and staff; and the Cabinet intends to further strengthen this office (para 3.02).

II. PROJECT COMPONENTS, COSTS, AND FINANCING

A. Project Objectives

2.01 Bangkok's traffic situation has deteriorated to the point where congestion is placing serious restraints on the continued economic development of the city. The costs of travel (measured in person-time and vehicle operating costs) are very high and promise to climb still higher, threatening strangulation of economic activity and the increases in economic potential offered by a dynamic urban environment. Accordingly, the principal project objectives are to increase (a) travel speeds and (b) person-trip capacity of the existing transportation system in order to facilitate the continued economic development of Bangkok, without diverting scarce resources from other high priority development activities in Thailand. The project further aims to improve permanently the capability of Bangkok officials to plan, design, execute and enforce projects and programs directed at maintaining and improving transportation conditions within the metropolis. Recognizing the importance of decentralizing urban development in Thailand, a separate but related project objective is to encourage urban and industrial growth outside of Bangkok (see Annex 1).

B. Main Project Features

Principal Project Components

2.02 The proposed project will include: (a) strengthening of urban transport management, particularly as it relates to strengthening the Urban Transportation Planning Office (UTPO) and the Traffic Police Division (TPD), (b) increasing the capacity of the urban road network through low cost improvements to selected intersections and road links, and through the provision of equipment for more effective traffic control; (c) improving public transport by strengthening the Bangkok Mass Transit Authority (BMTA), by providing additional bus lanes and bus bays and by giving priority to high occupancy vehicles; (d) implementing specific policies designed to discourage the uneconomic use of low occupancy vehicles; and (e) technical assistance to support the above project activities, and to conduct an Eastern seaboard and national secondary cities development study.

2.03 The basic feature of the project is the policy package -- including area pricing, bus priority measures, parking controls, and staggering of working and school hours -- which will discourage the use of non-essential private vehicle travel. Without this policy package, unchecked traffic growth, particularly in Bangkok's central area, would offset the impact of proposed low-cost physical improvements in a short-term period. The only alternative solution would require substantial, costly, and time-consuming additions to the existing road network which, however, has low priority in

Thailand's economic development needs. By combining these policy measures with selected high-priority traffic engineering and management schemes, the Government will achieve expeditious relief to Bangkok's traffic congestion at a high rate of return (see Chapter V).

Project Elements Summarized

2.04 The proposed project components described above would be made up of specific project elements as outlined below and as further described in Section E of this chapter. The intended effect of each specific project element is summarized in Table II-1.

(a) strengthen urban transport management:

(i) strengthening the Urban Transportation Planning Office (UTPO), to improve its ability to plan and design traffic management projects (no project cost allocation);

(ii) restructuring and strengthening the Traffic Police Division (TPD) of the Metropolitan (Bangkok) Police Bureau to improve traffic operations and enforcement (no project cost allocation);

(iii) specialized police equipment to improve police mobility and communications in improving traffic management and enforcement ($1.1 million);

(iv) traffic monitoring and air pollution detection equipment to quantify changes in traffic volumes and speeds and to determine levels of air and noise pollution ($100,000); and

(v) establishment of a traffic noise abatement program and air pollution detection program to reduce high noise and air pollution levels along major road arteries (no project cost allocation).

(b) increase capacity of the urban road network:

(i) improvements in traffic signalling, including centralized traffic signal control, modernization of existing signals, and new signal installations to increase system capacity and safety ($2.5 million);

(ii) road flyovers (seven) to increase road capacity at critical intersections in the road network ($10.5 million);

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Table II-1: OBJECTIVES OF PROJECT ELEMENTS

Project Elements		Project Objectives: Improve Transport System Performance (principally speed)			Improve Safety and Environmental Conditions			Area of Project Appliaation
		Increase System Vehicle Capacity	Manage Travel Demand	Encourage High-Occupancy Vehicle Use	Improve Pedestrian and Vehicular Safety	Reduce Traffic Noise	Improve Transport Project Execution & Management	
Strengthen Urban Transport Management	Strengthen UTPO	-	-	-	-	-	x	-
	Traffic police reorganization	-	-	-	-	-	x	-
	Police equipment	x	-	-	x	-	x	Traffic police
	Monitoring equipment	-	-	-	-	0	x	Portable
	Noise abatement program	-	-	-	-	x	-	City-wide
Increase Capacity of Road Network	Centralized signal control	x	-	-	-	-	-	Central area
	Signal modernization	0	-	-	x	-	-	City-wide
	Signalize new intersections	x	-	-	0	-	-	City-wide (20 locations)
	Road flyovers	x	-	-	-	-	-	Mostly central area (7 locations)
	Street widening	x	-	-	-	-	-	Mostly central area (10 km)
	Junction improvements	x	-	-	0	-	-	City-wide (60 locations)
	Street signing and marking	x	-	-	x	-	-	City-wide
	Missing street links	x	-	-	-	-	-	City-wide (10 locations)
Improve Public Transport	Bus lanes	x	-	x	-	-	-	City-wide (100 km)
	Extended bus bays	x	-	0	-	-	-	Mostly central area
	Bus shelters	-	-	x	-	-	-	City-wide
	Bus and pedestrian priority streets	-	-	x	x	0	-	Central area
Policy Measures to discourage the Use of Low Occupancy Vehicles	Area road pricing	-	x	x	0	0	-	Central area
	Parking controls	-	x	-	-	-	-	Mostly central area
	Staggered work and school hours	-	x	x	-	-	-	Mostly central area
Technical Assistance	Traffic engineering (UTPO)	-	-	-	-	-	x	-
	Bus management (BMTA)	-	-	-	-	-	x	-
	Staff training (TPD, BMTA, UTPO)	-	-	-	-	-	x	-

LEGEND: x primary objective 0 secondary objective

(iii) street improvements, including road widening, junction improvements, and street signing and marking, to increase traffic capacities and safety ($3.50 million); and

(iv) construction of missing road links to provide additional road network elements capable of handling significant traffic volumes ($2.5 million).

(c) improve public transport:

(i) bus priority measures, including reserved bus lanes, special bus and pedestrian street priority measures; extended bus bays, and bus shelters to encourage bus usage and to improve traffic operations ($1.1 million);

(d) policy measures designed to discourage the uneconomic use of low occupancy vehicles:

(i) introduction of an area pricing scheme aimed at discouraging the use of congested roads by low-occupancy vehicles (principally cars) in the central area during the working day ($0.25 million);

(ii) parking controls to discourage long-term "commuter" parking, to encourage short-term business parking, and to remove obstructions to moving traffic ($0.2 million); and

(ii) staggering of working and school hours to reduce passenger overloading of the bus system during peak travel hours (no project cost allocation).

(e) technical assistance and training:

(i) to the UTPO, about 120 expert-months of consultancy services, to assist in preparation and implementation of the project, as further detailed in paras 2.32 and 2.33 ($900,000);

(ii) to the UTPO, about 8 expert-months ($60,000) to augment financing by the British Ministry of Overseas Development of monitoring activities to be carried out by the Asian Institute of Technology under contract with the U.K. Transport and Road Research Laboratory (paras 2.16, and 4.09, 4.10);

(iii) to the BMTA, including 75 expert-months of consultancy services, in areas of management, operations, maintenance and finance, as further detailed in para 2.38 ($567,000);

(iv) to the UTPO ($30,000), the BMTA ($20,000), and the TPD ($150,000) for staff training programs (see paras 2.33, 2.35 and 2.36);

(v) to the UTPO for public relations assistance to advise the public on project matters with particular emphasis on policy measures ($45,000); and

(vi) to the Ministry of Interior for an Eastern seaboard and national secondary cities development study ($0.72 million).

Relationship of Project Elements

2.05 The above project elements are designed as a package and will require some care in scheduling to assure smooth project performance (see proposed project scheduling, para 4.01). Basically, the administrative changes and technical assistance components of the project should be expedited to facilitate project execution. The policy and physical components can be introduced simultaneously with careful scheduling. However, introduction of the road pricing scheme must follow sufficient physical improvements and improved transit service that will accommodate expected shifts in travel patterns.

C. Cost Estimates

2.06 The total project cost is estimated at B 680 million ($34.0 million) including taxes and duties of B 60 million ($3.0 million) with a foreign exchange component of about B 320 million ($16.0 million) or about 47% of total project cost. Property and land acquisition costs included are about B 10 million ($0.5 million). Cost estimates are summarized in Table II-2.

2.07 Cost estimates are based on the following guidelines: (a) for area pricing, on preliminary specifications, subject to further technical studies; (b) for traffic signal system, on an existing negotiated contract by a signal manufacturer and comparable installed costs for non-negotiated equipment; (c) for bus lanes, on preliminary engineering; (d) for flyovers, on detailed engineering for two flyovers; (e) for other street improvements, on preliminary engineering; (f) for police and monitoring equipment, on recent bid prices for similar equipment; and (g) for technical assistance, on February 1978 estimates. Local services are estimated at an average inclusive rate of B 30,000 per expert month and foreign services at about $7,500 per expert-month, including allowances for accommodation and transport.

2.08 All costs are expressed in 1978 prices. Physical contingencies of about 15% have been included. Price escalation on all works, goods and services is estimated at 6.5% to 7% per year for goods and 7.5% to 8% per year

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Table II-2: SUMMARY OF PROJECT COST ESTIMATES/1

Project Component	Baht '000 Local	Baht '000 Foreign	Baht '000 Total	US$ '000 Local	US$ '000 Foreign	US$ '000 Total	% Foreign Exchange
A. Strengthen Urban Transport Management							
1. Police equipment	3,300	18,700	22,000	165	935	1,100	85
2. Traffic monitoring equipment	300	1,700	2,000	15	85	100	85
Subtotal A	3,600	20,400	24,000	180	1,020	1,200	85
B. Increase Capacity of Urban/2 Road Network							
1. Area signal control system	15,300	18,700	34,000	765	935	1,700	55
2. Existing signal modernization	2,700	3,300	6,000	135	165	300	55
3. Signalize new intersections	4,500	5,500	10,000	225	275	500	55
4. Road flyovers	105,000	105,000	210,000	5,250	5,250	10,500	50
5. Street improvements	42,000	28,000	70,000	2,100	1,400	3,500	40
6. Missing road links	35,000	15,000	50,000	1,750	750	2,500	30
Subtotal B	204,500	175,500	380,000	10,225	8,775	19,000	46
C. Improve Public Transport							
Bus priority measures	13,200	8,800	22,000	660	440	1,100	40
Subtotal C	13,200	8,800	22,000	660	440	1,100	40
D. Policy Measures							
1. Introduction of road pricing	2,500	2,500	5,000	125	125	250	50
2. Parking controls	2,000	2,000	4,000	100	100	200	50
Subtotal D	4,500	4,500	9,000	225	225	450	50
E. Technical Assistance and Training							
1. Traffic engineering (UTPO)	3,600	14,400	18,000	180	720	900	80
2. Monitoring (UTPO)/3	240	960	1,200	12	48	60	80
3. Bus management (BMTA)	2,268	9,072	11,340	113	454	567	80
4. Training/4	800	3,200	4,000	40	160	200	80
5. Public relations	180	720	900	9	36	45	80
6. Secondary cities project	3,600	10,800	14,400	180	540	720	75
Subtotal E	10,688	39,152	49,840	534	1,958	2,492	79
Subtotal A - E	236,488	248,352	484,840	11,824	12,418	24,242	51
F. Design and Supervision/5	48,484	-	48,484	2,424	-	2,424	0
Subtotal A - F	284,972	248,352	533,324	14,248	12,418	26,666	47
G. Contingencies							
1. Physical/6	35,473	37,253	72,726	1,773	1,863	3,636	51
2. Price/7	35,473	37,253	72,726	1,773	1,863	3,636	51
Subtotal G	70,946	74,506	145,452	3,546	3,726	7,272	51
TOTAL A - G	355,918	322,858	678,776	17,794	16,144	33,938	47
Say	360,000	320,000	680,000	18,000	16,000	34,000	47

/1 Includes duties and taxes estimated at B 60 million (US$3.0 million).

/2 Includes cost of property and land acquisition estimated at B 10 million (US$0.5 million).

/3 Monitoring directly financed under the proposed loan. In addition, the U.K. Transport and Road Research Laboratory will finance on a grant basis monitoring of project inputs for UTPO, estimated total cost about B 1.44 million (US$72,000).

/4 For TPD, UTPO and BMTA.

/5 Estimated at 10% of the project costs.

/6 Estimated at 15% on components A through E.

/7 Estimated at 15% for the three-year construction period, 1978-81, on components A through E.

for works and services. This amounts to an overall price contingency of about 15% through 1981.

D. Financing

2.09 A proposed Bank loan of $16.0 million (B 320 million) would finance 47% of total project cost, equal to the foreign exchange cost, or about 52% of project cost net of taxes, duties and land acquisition ($3.5 million). The loan would be made to the Government at 7.35% interest, for a term of 20 years, including a grace period of five years. The balance, $18.0 million (B 360 million) would be financed by the Government, as direct expenditures to be channelled through the Ministry of Interior (MOI). Project funds will be allocated by the Government through the annual budget to five agencies as shown in Table II-3 below. During negotiations, assurances were received that the Government will provide project funds on a timely basis to allow expeditious project implementation.

2.10 In addition to the above amounts an equivalent of $72,000 (B 1.44 million) will be provided in the form of a grant by the U.K. Transport and Road Research Laboratory for the purpose of monitoring project impacts (see also paras. 4.09, 4.10). Beyond initial project costs, recurrent project costs for implementing (a) area pricing (B 30 million), (b) parking controls (B 30 million), and (c) bus lanes (B 6 million) are estimated. However, it is further estimated that revenues from these schemes will greatly exceed the recurrent costs (see Table V-3).

Table II-3: ALLOCATION OF PROJECT FUNDS /1
(Million Baht)

Project Component	Government Agency					
	UTPO	TPD	BMTA	BMA	MOI	Total
A. Policy Measures	-	-	-	12.6	-	12.6
B. Traffic signal system	70.1	-	-	-	-	70.1
C. Bus priority measures	-	-	-	30.9	-	30.9
D. Road flyovers	-	-	-	294.5	-	294.5
E. Street road improvements	-	-	-	98.2	-	98.2
F. Missing street links	-	-	-	70.1	-	70.1
G. Police equipment	-	30.9	-	-	-	30.9
H. Traffic Monitoring equipment	0.6	1.0	-	1.2	-	2.8
I. Technical assistance and training, traffic	29.1	4.2	16.4/2	-	-	49.7
J. Technical assistance, secondary cities	-	-	-	-	20.2	20.2
Total allocation	99.8	36.1	16.4	507.5	20.2	680.0
Distribution percentage	14.7	5.3	2.4	74.6	3.0	100.0

/1 Including contingencies, and design and supervision costs.
/2 To be channelled through UTPO.

Collection and Disbursement of Revenues Generated by the Project

2.11 The project will generate substantial revenues through the mechanisms of (a) area pricing, and (b) to a lesser extent, through more extensive and higher priced parking charges 1/. The Government is considering either to (a) allow these collections to be part of general revenues, or (b) earmark them, e.g. in a Bangkok Road Improvement Fund.

2.12 Whatever option the Government prefers to select, it is important that appropriate charges will be levied for area pricing and parking schemes, and that these schemes will be adequately operated and maintained. The policy package to be submitted to the Bank will provide a financial plan on the collection and disbursement of funds generated by area pricing and increased parking charges.

E. Detailed Description of Project Elements

Strengthen Urban Transport Management

2.13 The UTPO - The Urban Transportation Planning Office, as the key planning, design, and management agency for the project, needs permanent staff strengthening and interim technical assistance for the duration of the project. Measures to strengthen the staff and to give the office more authority are described separately in paras. 3.02, 3.03, and 3.04.

2.14 The Traffic Police Division. To date, responsibility for traffic control and traffic law enforcement in the city has been undertaken by a 800 man traffic police force with assistance from police located in district stations. Realizing the need for more coordinated action in these areas, the Government has decided to reorganize the Metropolitan (Bangkok) Police to provide a separate traffic-oriented line of command, the Traffic Police Division (TPD), for about 2,000 traffic police. The police equipment to be provided under the project will be procured, operated and maintained by the TPD (see also para 3.05).

2.15 Police Equipment. This equipment, including motorcycles and radio communications, will enhance police mobility and reduce the need for point duty at individual junctions (see Table II-4). Agreement was reached during negotiations that the government will provide the TPD in a timely manner with the resources, staff and facilities required for operation and maintenance of police equipment procured under the project.

1/ While the exact specifications of the Government's proposals at not known at this date, it is plausible that B 300 million could be collected annually from a central area pricing scheme under which half of the non-exempt vehicles elected to pay.

Table II-4: POLICE EQUIPMENT

Category	Quantity	Total Baht, million	Total $
Radio Units	107	5.00	250,000
Police cars	18	4.50	225,000
Motorcycles	36	4.00	200,000
Crane trucks	8	1.80	90,000
Jeeps	16	1.80	90,000
Light trucks	4	0.60	30,000
Workshop equipment	-	1.10	55,000
Spare Parts		2.00	100,000
Miscellaneous /1	-	1.20	60,000
TOTAL		22.00	1,100,000

/1 Includes: Hazard warning lights, and training aids (for traffic safety campaigns).

2.16 Traffic and Pollution Monitoring Equipment. To permit adequate monitoring of motor vehicle traffic, as well as to detect noise and air pollution levels of this traffic, $100,000 will be allocated to cover the costs of (a) permanent and temporary traffic count stations, (b) equipment for measuring traffic speeds, and (c) air pollution and noise detection equipment. (See also para. 2.17).

2.17 Traffic Noise Abatement and Air Pollution Detection. The traffic noise level along most arterial streets in Bangkok is much higher than on streets with comparable levels of traffic in cities where reasonable compliance with noise muffling standards has been attained. The proposed noise control program, to be enforced by the Traffic Police Division, will involve systematic noise monitoring along heavily traveled streets and enforcement priorities assigned to those street links with the highest registered decibel levels. It is anticipated that this program can be accomplished at a minimum of public expense, the burden of costs being directed at offending private motor vehicle operators, who will be required principally to install adequate noise mufflers. This will be accomplished by establishing a continuing air pollution monitoring program within BMA assisted by the UTPO. Proposals for traffic noise abatement and air pollution detection, including time schedules for implementation, will be prepared in detail by the NTB and sent to the Bank for review and comment by June 30, 1979. During negotiations, assurances were received that such proposals mutually agreed between the Government and the Bank will be implemented under the project.

Increase Capacity of the Urban Road Network

2.18 Improvements in Traffic Signalling. The project will provide for coordination of traffic signals at 92 junctions (see Map 13577), upgrading

of existing signals, and the further installation of signals at new intersections. In the core area, new trafic signal controllers will be installed at 48 junctions and connected to a mini-computer at a traffic control center. This system will be designed and programmed to achieve optimum signal timings, and deviations will be monitored at the center for immediate remedial action. Outside the central area, the requirement for computer control is reduced because junctions are more widely separated. Here, all traffic controlled intersections will be coordinated through cableless linking equipment which also provides for different control plans to be selected automatically by time of day. In addition, closed-circuit television cameras will be provided at critical junctions and monitored at the traffic control center to assist the traffic police to resolve exceptional traffic situations.

2.19 Recognizing the poor visibility and general poor condition of the existing signal heads, approximately 70 sets of signals will be refitted or replaced. An additional 20 sets of signals will be installed at new intersection locations as part of the junction improvement project element.

2.20 Construction of Road Flyovers. Flyovers are to be located at principal road intersections where the greatest person-trip time savings can be realized after appropriate remedial traffic management procedures such as changes in signal timing and intersection channelization are accomplished at ground level. Seven sites have been selected for inclusion in the proposed project, as listed below and shown in Map 13578R1: (a) Phaholyothin/Padipat/Suthisarn; (b) Sukumvit/Rama IV/Soi 71; (c) Sathorn/Rama IV/Wireless; (d) Dindaeng/Raj Prarop; (e) Raj Withee/Rama VI; (f) Rama I/Phya Thai; and (g) Sri Ayudhaya/Phya Thai. Flyovers (a) and (b) are at relatively isolated locations designed to improve particularly congested outlying road intersections. The remaining five flyovers are considered as a package of improvements designed to facilitate movement to and around the central area of Bangkok and will thus facilitate introduction of the area pricing scheme.

2.21 The basic design standards for road flyovers have been established by the Public Works Department of the BMA. The majority of the existing (and proposed) flyovers consist of two-lane carriageways constructed by laying simply supported precast prestressed beams on reinforced concrete piers and columns, founded on precast concrete piles. Although more expensive, there may be a need to substitute steel structures in a few locations where either (a) traffic disruption time needs to be minimized, or (b) the potential of removing flyovers to accommodate proposed (but currently not programmed) elevated rail or mass transit lines remains a distinct future possibility.

2.22 Street Improvements. To add traffic capacity outside the core area, this component will provide for:

(a) Selected road widening and related improvements. A selective program of street widening will be undertaken where such widening would meet one or more of the following criteria: (i) facilitating the deployment of

a new bus lane; (ii) permitting the creation of a needed "standard" traffic lane where such widening will increase street capacity; and (iii) accommodating a shift in traffic flows due to the impact of the area pricing scheme. All such widening should not be undertaken at the expense of significantly adversely affecting pedestrian traffic. Pavement specifications will vary depending on number of heavy axle vehicles using the roads and will be in accordance with the standards established by BMA's Public Works Department;

(b) junction improvements. The capacity of several junc-ions could be improved at comparatively low cost. Right turn movements, both at at-grade intersections and under existing flyovers, have not always been adequately dealt with and cause additional conflicts with traffic waiting to make other movements. The large junctions at Democracy Monument and Victory Monument (where for aesthetic reasons flyovers would not be acceptable) will benefit from chan-nelization schemes. Junction improvements will include: (i) channelization (especially left turn lanes); (ii) new signal installations; (iii) repaving; (iv) signing and striping; and (v) other low to moderate cost measures to increase junction capacity; and

(c) street signing and marking. The project provides for improving road signing and marking to appropriate standards along major arterial roads to ensure better safety and traffic discipline. A standardized sign and marking system will be developed by the UTPO during the course of the project and will form the basis for all future signing and marking in the BMA area.

2.23 Construction of missing road links. The BMA has recently initiated a short-term program which calls for the improvement of 49 minor street ("soi") segments to improve road continuity. Construction of approximately ten such missing road links, generally less than 1/2 km in length, is included under the proposed project. The final selection of appropriate links (to be accom-plished by the end of 1978) will be on the grounds that they will contribute effectively to the traffic capacity of the main road system, either directly by introducing effective additional links into the frequently widely spaced network, or indirectly by providing inter-connections within large traffic generating areas.

2.24 Specifications for the missing links will be based on standards established by BMA's Public Works Department. The travel surface will con-sist of 20 cm thick reinforced concrete and will range in width between 6.0 and 14.0 meters, with typical rights-of-way being 2.0 to 4.0 meters additional in width. Traffic lane widths will ideally be 3.5 meters, but in some cases may be reduced to 3.0 meters. For those pavements 6.0 meters or less in width,

a notched gutter section flush with the pavement will be provided; wider pavements will have curbs. During negotiations, assurances were received by the Government that land and buildings required for carrying out the project will be acquired by December 31, 1979.

Improve Public Transport

2.25 Bus Priority Measures. To improve public transport speeds, this component will provide for:

(a) reserved bus lanes (see Map 13579R). Many of the existing arterial roads in Bangkok are wide enough to accommodate special lanes for buses without severely restricting other road traffic. The proposed project would provide for "with - flow" bus lanes--totalling about 100 km--along heavily congested roads. These bus lanes will be selected and designed by the UTPO. Bus lanes will be provided along roads where traffic queues are the longest and the highest volumes of bus passengers are carried; in general this will apply to routes with over 100 buses per hour.

(b) core area bus and pedestrian street priority measures. There are opportunities within the core area of the city, where the streets are spaced closer together, to institute measures giving higher priority to buses and pedestrians, and lesser priority to private cars. Under the proposed project, it is anticipated that these measures will include the narrowing of roadway widths to permit the widening (or inclusion of) sidewalks, and other special measures such as physical barriers and special channelization to give buses priority or exclusive use of selected street segments. Final design of this project element will be the responsibility of the UTPO, assisted by the technical assistance provided under the project;

(c) extended bus bays. At present, bus bays are too short, and buses are forced to queue to reach a single stop. The project would include about 40 extended bus bays, allowing dispersal of stops at these bays so that buses with different destinations will have separate stops. These bays will be provided in those locations where at least 50, and most likely over 100, buses stop in one hour; and

(d) bus shelters. Recognizing the lack of suitable shelter from rain and intense sunlight at several heavily used locations 100 bus shelters will be provided as part of the project.

Policy Measures Designed to Discourage The Uneconomic Use of Low Occupancy Vehicles

2.26 Introduction of Area Pricing. Even with the placement of new physical facilities (such as road overpasses), there will still be a lack of balance between the availability of road capacity and growing traffic levels. As proved by international experience, additional private cars will be attracted by the expansion of road capacity, leaving road congestion much as before, unless effective restraint measures are introduced. The proposed project will therefore include a scheme that will reduce the demand for road space by charging low-occupancy vehicles directly for the use of roads in central Bangkok.

2.27 At this stage of surveying and analysis, it would be premature to be definite about the details of the area pricing scheme to be adopted. However, the Government and Bank missions have jointly developed a set of specifications and guidelines to serve as the starting point for detailed technical investigations. The specifications assume that a Singapore or cordon type proposal will emerge as the preferred option; this may not be the case, however, and at this stage it is essential to remain flexible. The specifications may be modified as technical studies proceed and as local realities become more fully understood. However, the Government has accepted the principle of area pricing (which it prefers to call "traffic restraint"), to be introduced not later than by December 31, 1980. By that time, most other project measures would have been carried out, other related road projects such as the Sathorn Road and Bridge extension, the new tollroad, and parts of the middle ring road will have been completed; and public transport in Bangkok would be geared to absorb much of the modal shift stimulated by area pricing. Whatever area pricing system is finally chosen, some physical investments will be needed, including (a) clear and distinctive traffic signs, (b) physical traffic divertors and other traffic management oriented civil works, and (c) license sales outlets. Most signing would be on the approach routes to the zone, and most physical divertors would be at or near the zone boundaries to manage traffic (see Map 13578R1). Not later than June 30, 1979, proposals for an area pricing scheme will be prepared in detail by the National Traffic Board (NTB) and sent to the Bank for review and comment. During negotiations, assurances were received that an area pricing scheme mutually agreed between the Government and the Bank be introduced by December 31, 1980.

2.28 Parking Controls. At present, there are approximately 38,400 parking spaces in central Bangkok (see Table II-5). Approximately 14,600 spaces (38% of the total) are off-street governmental or private spaces not available to the general public. Among the remaining 23,800 spaces, only 9%, or about 2,000, are price regulated. Demand for, and occupancy of, available spaces varies considerably within the central area.

Table II-5: ALLOCATION OF PARKING SPACES IN CENTRAL BANGKOK

Type of Spaces	Spaces	Percent of Spaces	Percent of Spaces Available to General Public
Available to General Public	23,785	(62%)	(100%)
On-street non-priced	20,505	54%	86
On-street priced	2,015	5%	9
Off-street priced	1,265	3%	5
Private and Government	14,590	(38%)	-
Total	38,375	100%	100%

2.29 The Government has tentatively established a number of parking policy measures designed to: (a) discourage long-term commuter parking; (b) improve the convenience of existing parking spaces for short term parking; and (c) increase the traffic capacity of arterial streets. More specifically these policy measures will be accomplished by:

(a) institution of parking charges on a higher percentage of on-street spaces as a means of discouraging uneconomic use of street-space. As an approximate guideline, those areas within which 85% or more parking spaces are occupied during prime business hours will be priced to bring about an 85% utilization;

(b) increasing on-street parking charges to discourage long term "commuter" parking and to improve availability of parking spaces for short term "convenience" parking;

(c) improvement in the enforcement of parking regulations to ensure better usage of existing parking spaces and to increase parking revenues. These improvements will be achieved by stiff penalties and a graduated increase in fines;

(d) increased use of parking attendants as a means of generating employment and improving collections. It is expected that an attendant parking system could become more effective than parking meters which have proved to be unsuccesful in Bangkok. In addition, this could provide useful employment. As an example, at a ratio of one attendant per 20 spaces, over 1,000 parking attendants would be needed; and

(e) removal of on-street parking where such parking reduces the traffic-carrying capacity of arterial streets.

2.30 A scheme for parking controls, including a time schedule for implementation, will be prepared in detail by the NTB and sent to the Bank for review and comment as part of the proposals submitted by end June 1979. During negotiations, assurances were received that such a scheme mutually agreed between the Government and the Bank will be implemented under the project.

2.31 Staggering of Working and School Hours. Surveys show that at least 90% of governmental offices located in the central area have official work hours beginning between 8:30 and 9:00 a.m. and terminating between 4:30 and 5:00 p.m. This concentration of work oriented travel is exacerbated by heavy concentrations of school travel, particularly by public transit during much of the same time period. A program of staggered working and school hours would spread bus loadings, which would improve comfort and reduce delays for bus passengers, and might also delay the need to increase the bus fleet size as transport demand increases. Accordingly the government will introduce a formal staggered work and school hour plan for all public offices and schools beginning in the central area, and will seek similar commitments from large private concerns and private schools in the same area. By June 30, 1979, a scheme for introduction of staggered working and school hours, including a time schedule for implementation, will be prepared in detail by the NTB and sent to the Bank for review and comment. During negotiations, assurances were received that such a scheme mutually agreed between the Government and the Bank will be implemented under the project.

Technical Assistance and Training

2.32 The UTPO. This organization will require assistance in its administration and development as well as in the detailed design of the identified policy and physical project packages. The project will entail about 120 expert-months of technical assistance over a four-year period to address these needs.

2.33 In the area of administration and management, the assistance will focus on the development of technical procedures, and data collection, for analysis, design and evaluation of traffic schemes both under the proposed project and for general traffic matters in Bangkok and other urban areas in Thailand. Further, the consultants will advise UTPO on policies and measures concerning taxi, minibus and other "informal" public transport to ensure that their standards and fares reflect the demands of the travelling public. In addition, the role of mini-buses in Bangkok will be evaluated and a strategic plan developed by the UTPO and the consultants for early implementation by the Government. Finally, professional and technical staff training in traffic matters will be provided so that UTPO can increasingly carry out traffic engineering work by its own staff. At the end of the four-year period, a completely staffed UTPO would be fully competent to continue this work on its own. During negotiations, agreement was reached that UTPO will implement a staff training program in traffic engineering and traffic control mutually agreed between the government and the Bank.

2.34 Most of the monitoring of project impacts will be undertaken by the Asian Institute of Technology under contract with the U.K. Transport and Road Research Laboratory using British Ministry of Overseas Development funds. However, it is anticipated that an additional 8 expert-months of technical assistance will be required to augment this work as well as to set up a continuing traffic monitoring program within the UTPO. (See also paras. 4.09, 4.10.)

2.35 The BMTA. The project will provide about 75 expert-months of technical assistance to BMTA over a 15-month period. In addition approximately $20,000 equivalent will be earmarked for special training of BMTA staff. A Steering Committee will be established by the Ministry of Communications to supervise this assistance, which will be carried out by a Task Force headed by BMTA's Chief Executive Officer. The Task Force, including experts in traffic operations, maintenance and materials management, and finance and accounting, will review BMTA's present operations, identify areas requiring special study, and prepare preliminary reports for consideration by the Steering Committee. Agreed recommendations will be implemented and supervised by the Task Force, assisted by the consultants. While the technical assistance will cover almost all aspects of BMTA and its operations, special focus will be on traffic operations, including rationalization of routes and schedules, management and management information systems, and establishment of a long-term financial policy. During negotiations, assurances were received that recommendations mutually accepted between the Government and the Bank will be implemented by BMTA.

2.36 The TPD. The reorganized and strengthened Traffic Police Division needs training to cope with its responsibilities for managing actuated traffic control and law enforcement activities under the project. During negotiations, agreement was reached that the TPD will implement such a training program mutually agreed upon between the government and the Bank.

2.37 The UTPO: Public Relations Assistance. Recognizing the pioneering and potentially controversial nature of the traffic restraint aspects of the project, the UTPO will receive approximately six expert-months of technical assistance to advise the general public on the purpose of measures to be implemented and the procedures to be followed in their implementation.

2.38 Eastern Seaboard amd National Secondary Cities Development Study. The Government will receive approximately 100 expert-months of technical assistance spread over a two-year period to prepare regional cities development projects designed to encourage development outside Bangkok and thus reduce the urbanization pressure on this primate city. The primary emphasis will be on urban development of the Eastern Seaboard (see Annex 1). During negotiations agreement was reached in principle on draft terms of reference for the study.

III. EXECUTING AGENCIES AND PROJECT MANAGEMENT

A. Project Organization and Management

3.01 The UTPO will be the Government agency responsible for coordination of project implementation. It will be supported by a Project Executive Committee, chaired by the Minister of Interior and comprised of representatives of involved agencies, that will have the authority to make decisions required to expedite project implementation. The UTPO will review all project-related proposals by the BMA and the TPD before furnishing such proposals for Bank review. As is mentioned in para. 3.06, BMA will execute all civil works under the project to be financed by the Government and the Bank. During negotiations, the government agreed to a division of responsibilities among project executing agencies as set out in Table III-1.

B. The Urban Transportation Planning Office

3.02 The UTPO currently operates within the Office of Policy and Planning which is located within the Ministry of the Interior, but additionally acts as the secretariat to the National Traffic Board (NTB) which reports directly to the Cabinet. This arrangement, while adequate for the purposes of carrying out the project is not formally imbedded in Thai legislation. The Cabinet recently submitted to the National Assembly a draft Act on the "Systematization of National Traffic". Under this law the NTB would become the "Committee for the Systematization of National Traffic" and the UTPO would become this committee's secretariat and would be called the "Office of the Committee for the systematization of National Traffic". This proposed legislation in essence will formalize the existing arrangement.

3.03 The current staff of the UTPO, numbering about 80, is undertrained and lacks the qualifications and experience to carry out the project which will require sophisticated planning, design, and management. The UTPO will eventually require a staff of approximately 200 and will take some time to reach full capacity; it is important, however, to fill key posts early in the project cycle to assure smooth project performance. As further described in paras 2.32 and 2.33, extensive technical assistance to the UTPO over a three-year period is a key project element. During negotiations, assurances were received on minimum professional staff requirements at UTPO as indicated in Annex 2.

3.04 As the UTPO improves its staff it will be organized in four divisions, (1) transportation planning, (2) traffic engineering, (3) traffic control (in Bangkok), and (4) administration (see Chart III-2). The traffic engineering division, focussing only on Bangkok during the first year, will be responsible for data collection, analysis, traffic engineering design, functional specifications and monitoring related to the proposed project. Final designs, preparation of bid documents, supervision of construction, and maintenance of

BANGKOK TRAFFIC MANAGEMENT PROJECT

Table III-1: DIVISION OF RESPONSIBILITIES BETWEEN BMA, BMTA, MOI, TPD AND UTPO

Project Component	Project Activity [a]		
	Planning, Traffic Engineering Design & Related Research	Structural Design, Installation or Construction, Maintenance	Operation or Enforcement
Policy Measures to Encourage More Efficient Use of Available Road Capacity			
(i) Road Pricing Scheme	UTPO	BMA	TPD/BMA
(ii) Parking Controls	UTPO	BMA	TPD/BMA [b]
(iii) Staggered Work & School Hours	UTPO	-	MOI [c]
Improve Urban Management			
(i) technical assistance for transportation planning, project design and monitoring	UTPO	-	-
(ii) equipment, vehicles and training for traffic control and traffic law enforcement	TPD	TPD	TPD
(iii) noise abatement and air pollution detection	UTPO	-	TPD
(iv) technical assistance for Project related public relations	-	-	UTPO [d]
(v) technical assistance for planning regional urbanization	MOI	-	-
Increase Capacity and Safety of Road System			
(i) Traffic Signalling Equipment	UTPO [e]	UTPO [f]	TPD/UTPO [g]
(ii) Road Flyovers, Missing Links, Street Widening, Junction Improvements, Street Signing and Marking	UTPO [e]	BMA	-
Improve Public Transport			
(i) Technical Assistance to BMTA	-	-	BMTA
(ii) Bus Lanes, Bus Bays, Bus Shelters	UTPO	BMA	TPD

(a) UTPO responsible for review of all project related procurement.
(b) Collection of all charges will be carried out by parking attendants employed by BMA.
(c) Ministry of Interior acts as agent for Government in assuring plan compliance among all central government and BMA agencies.
(d) UTPO to coordinate all public relations efforts.
(e) Location, traffic engineering details, and priority to be determined by UTPO.
(f) New equipment to be maintained initially under contract with equipment supplier.
(g) TPD responsible for routine daily operation; UTPO engineers to have override authority.

completed works will be undertaken by BMA with traffic specifications prepared by UTPO. Through its traffic control division, the UTPO will be directly responsible for specifying, ordering and maintaining the traffic signal system and the television camera system, and for overall supervision responsibility of traffic control center operations.

C. The Traffic Police Division

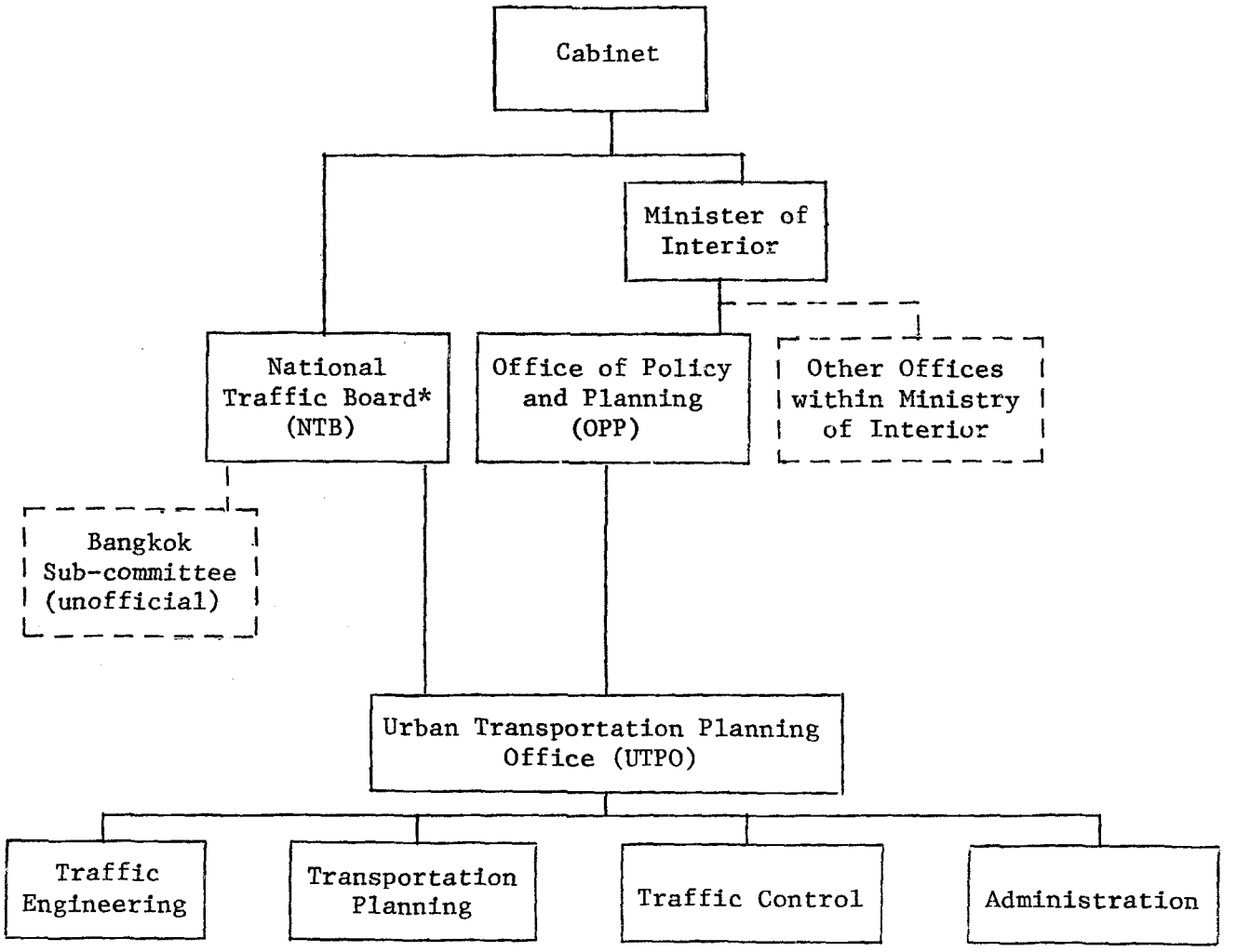
3.05 The Traffic Police Division (TPD) will inter-alia be responsible for day-to-day operation of the traffic control center and directing mobile patrols to resolve urgent problems. The Division will also continue to be responsible for traffic law enforcement, including enforcement of parking and road pricing regulations, even though certain functions (such as removal of vehicles and collection of monies owed) may be delegated to non-police personnel. At present, the Bangkok Police design certain traffic management schemes, but this will in the future be the sole responsibility of the UTPO.

D. The BMA Public Works Department

3.06 The organization and management of the Public Works Department of BMA, which is responsible for all civil works under the proposed project, has been thoroughly appraised. It has a total staff of about 2,200 (150 engineers) and is organized into six divisions: Design, Building and Repair, Construction Control, Building Control, Land Management and Public Land, and a Secretariat. The Department is doing a substantial amount of work, and is capable of designing and constructing major works such as concrete or steel flyovers, road works, bridges and drainage. Contractors have often been used for major construction works in the past, and the Department has undertaken supervision in a satisfactory manner. The Department is fully competent to undertake the tasks assigned to it under the proposed project.

BANGKOK TRAFFIC MANAGEMENT PROJECT

Chart III-2: ORGANIZATION OF UTPO AND LOCATION IN GOVERNMENT STRUCTURE



*Chairman of NTB is Minister of Interior

IV. PROJECT IMPLEMENTATION

A. Implementation Schedule

4.01 The project would be implemented over a 3 year period (1978-81), as shown in Table IV-1. Equipment procurement and installation under the project would be completed by July 1980, and civil works related to physical components would be completed by January 1981. All policy measures would be implemented by December 1980.

B. Procurement

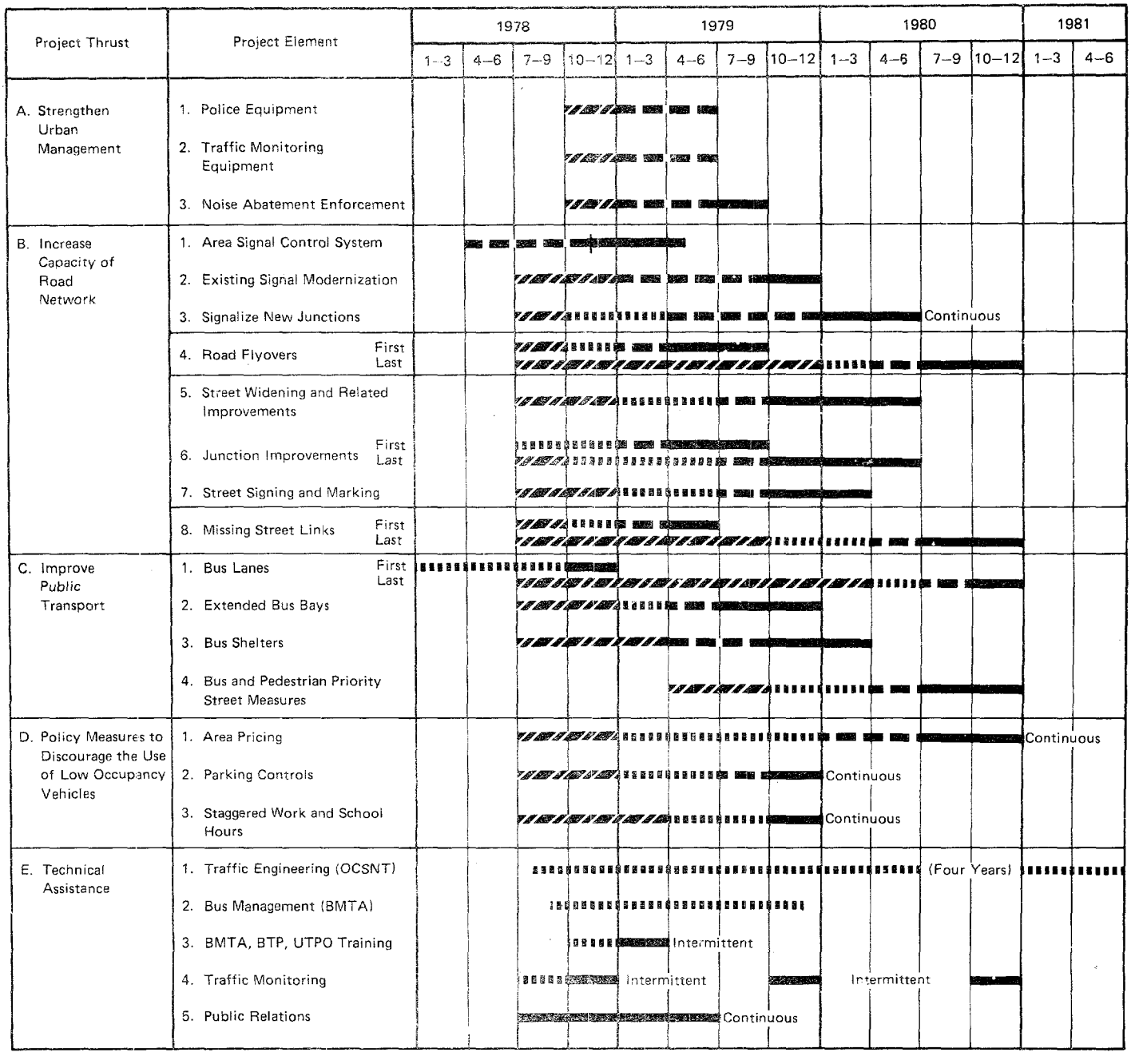
4.02 Contracts for equipment totalling about $1.5 million will be awarded on the basis of international competitive bidding in accordance with Bank guidelines. A margin of preference equal to 15% or the customs duty, whichever is lower, would be granted to local manufacturers. Smaller equipment contracts totalling about $500,000 equivalent, which would not be attractive to foreign bidders, will be awarded on the basis of competitive bidding advertised locally. Approximately $1.7 million worth of traffic signal equipment is recommended for sole source procurement (see para 4.03).

4.03 The Government signed, on June 28, 1978, a contract with Traffic Engineering Systems (TES) Ltd., a Thai company associated with GEC-Elliot Traffic Automation, U.K., for procurement and installation of a traffic control system in Bangkok. The contract, estimated total value $1.7 million provides for completed installation by June 1979. This contract has not been awarded on the basis of international competitive bidding, but based on a proposal by GEC, who have supplied and installed almost all existing traffic signals in Bangkok. The appraisal mission has carefully reviewed the contract and has concluded that the equipment offered is appropriate for the required system and that the foreign exchange component of the contract (corresponding to about $0.9 million) is reasonable for the equipment offered. The Government committee that negotiated the contract is satisfied that the local cost portion of the contract is reasonable. By awarding this negotiated contract, the Government will achieve the principal advantage of time saving of up to two years, due to the complexity of drawing up detailed but fair specifications.

4.04 It should be noted that in addition to the above traffic signal control system, modernization of about 70 existing signalized intersections and about 20 new signal installations at intersections currently not served and located outside the central area of Bangkok, would also be part of the proposed project. This equipment is estimated to cost about $0.8 million. Procurement of this equipment is less urgent and, consequently, the Government intends to award the corresponding contract on the basis of international competitive bidding, in accordance with procedures consistent with those of the "Guidelines."

4.05 In view of the above circumstances, it is recommended that the Bank finance the foreign exchange component of the TES contract, estimated

BANGKOK TRAFFIC MANAGEMENT PROJECT
Table IV–1: PROPOSED PROJECT SCHEDULE



LEGEND:

- Location/Feasibility Study
- Design
- Procurement
- Construction/Implementation

World Bank – 19524

at about $0.9 million equivalent, and retroactively finance such costs incurred prior to Loan signing (see para 4.07).

4.06 Civil works contracts for flyovers, with an estimated total value about $10.5 million equivalent, will be awarded under international competitive bidding in accordance with Bank guidelines. All other civil works, total estimated value about $7 million equivalent, are too small and diverse to interest foreign contractors. These contracts would be awarded on the basis of competitive bidding advertised locally under procedures acceptable to the Bank.

C. Disbursement

4.07 The proposed loan would be disbursed for 40% of the cost of civil works, 100% of foreign expenditures of directly imported equipment (traffic signalling, police and pollution monitoring equipment) and vehicles, 100% of local expenditures (ex-factory) for locally manufactured items and 65% for other locally procured items, and 100% of total expenditures for consulting services, technical assistance and training. In view of the urgency of the project, the Government has already incurred expenditures exceeding $1 million equivalent on project related activities. Retroactive financing is therefore proposed from June 1, 1978 in an aggregate amount not exceeding the equivalent of $1.75 million including the cost of technical assistance, procurement of equipment, and civil works. Bank disbursements are expected to be completed by September 30, 1982. The estimated quarterly disbursement schedule is given in Table IV-2.

Table IV-2: SCHEDULE OF ESTIMATED DISBURSEMENTS
(in thousands of US$)

Quarter	Quarter Ending	Amount Disbursed	Cumulative Disbursement	% Cumulative Disbursement
1	March 31, 1979	1,500	1,500	9
2	June 30, 1979	1,300	2,800	17
3	September 30, 1979	1,500	4,300	27
4	December 31, 1979	1,700	6,000	38
5	March 31, 1980	1,700	7,700	48
6	June 30, 1980	1,800	9,500	59
7	September 30, 1980	1,800	11,300	71
8	December 31, 1980	1,700	13,000	81
9	March 31, 1981	1,400	14,400	90
10	June 30, 1981	900	15,300	96
11	September 30, 1981	200	15,500	97
12	December 31, 1981	200	15,700	98
13	March 31, 1982	200	15,900	99
14	June 30, 1982	100	16,000	100

D. Accounts, Audit and Progress Reports

4.08 Separate project accounts will be maintained by each implementing agency, and a comprehensive project account by the UTPO. Assurances were obtained during negotiations that the Government will (a) maintain in the Ministry of Interior separate accounting records, and a separate bank account for all project revenues and expenditures, and (b) have the project accounts audited annually by an independent auditor acceptable to the Bank. Assurances were also obtained at negotiations that quarterly progress reports will be prepared by UTPO and furnished to the Bank, focussing on, among other things, the policy, physical, contractual and financial progress of the project including project performance relative to key performance indicators (see para. 4.11).

E. Monitoring and Evaluation

4.09 Monitoring of key transport characteristics is included in the project to enable the authorities to assess the success of the transport improvement measures. The UTPO is to be the agency responsible for setting up the monitoring program, which is to include at least the following measurements: (a) traffic speeds and flows along street links improved as part of the project and also, on a sample basis, at other points on the road network; (b) bus and car occupancy, on a sample basis; (c) regular measurements of door-to-door journey speeds by bus and car, on a sample basis; (d) pollution and noise levels, on a sample basis; and (e) measurements by means of sample household surveys of travel characteristics of different income groups, including daily distance travelled, number of trips, and total time and money spent on travel.

4.10 Assistance in the monitoring process is to be provided by the U.K. Transport and Road Research Laboratory and the Transportation Engineering Department of the Asian Institute of Technology under the over-all guidance of the UTPO.

4.11 Performance Indicators. The performance indicators as listed in Table IV-3 will serve as the basis for quantitatively evaluating progress towards the objectives of the proposed project. Emphasis will be placed on rigorous testing of comparative sample locations under (a) existing and (b) project completion conditions.

F. Supervision

4.12 The UTPO will supervise the project on behalf of the Government. Since the Office is still being developed, and since the project will contain several novel features, close monitoring and supervision will be provided by the Bank. About 35 staff-weeks of Bank supervision will be required during the first year, and about 50 staff-weeks during the following 24 months.

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Table IV-3: SELECTED PERFORMANCE INDICATORS

	Indicator	Objective
1.	Increase travel speeds	Increase private vehicle speeds 25% and bus speeds 40+% on principal arterials in city's central area.
2.	Reduce intersection delays at flyover locations	At intersections with flyovers, traffic delays should be reduced 20%.
3.	Reduce peak hour bus overloading	Reduce number of buses with severe overcrowding (beyond rated standing capacity) during peak travel hours.
4.	Increase car occupancy	Increase car occupancy within proposed area pricing zone by 20%.
5.	Maintain or increase person trips into central area of city	While increasing travel speeds and decreasing bus overloading, the number of person trips into and within the central area should at least remain constant.
6.	Increase public transit share of central area travel	Increase the public transit modal share of peak hour travel into the central area by 15%.
7.	Reduce travel noise	Reduce noise levels on arterial streets to accepted decibel (dB) level standards.
8.	Improve parking efficiency	Regulate by price mechanism those on-street spaces with 85% or higher occupancy.

V. IMPACT AND ECONOMIC ANALYSIS

A. Expected Impact

5.01 The purpose of the proposed project is to increase mobility in Bangkok by: (a) traffic management methods to increase efficiency in the use of existing roads and vehicles; and (b) selective physical investments, particularly at road intersections, to increase the capacity of the road network.

5.02 The best estimates of likely travel characteristics in the Bangkok area in 1972, 1978 and 1981 -- the first year after expected project completion -- are shown in Table V-1. The 1972 data are based on the results of the Bangkok Transportation Study, and 1978 data on mission estimates. Three separate estimates are given for 1981:

(a) on the assumption that the proposed project would not be implemented; that 1972 transport policies would be continued; and that the road network would be as at present, with the addition of such improvements (e.g. the Din Daeng/Port toll road and the Sathorn Bridge and road extension) which are already committed;

(b) on the assumption that only the traffic management elements of the proposed project would be implemented, (e.g. the bus lanes and road pricing) but not its physical elements (e.g. the flyovers, road widening and signal improvements); and

(c) on the assumption that the complete project will be implemented before 1981.

The 1981 estimates are based on relationships between network capacity, traffic flows and traffic speeds, and from population travel characteristics, that were developed from the 1972 data. They form the numerical basis of the economic evaluation, which assesses the costs and benefits associated with the (a) traffic management measures above and, (b) the additional benefits and costs due to the physical components, assuming prior implementation of the management measures.

Summary of Expected Travel Impacts

5.03 As a result of the project: (a) travel speeds within and adjacent to the core area are likely to increase substantially; 10-40% increases are expected, depending upon the exact road link and location; (b) the increased travel speeds would bring about savings in vehicle operating costs (VOC) and time, especially to the 80% of population who depend on buses for their mechanized transport; (c) the savings in time and VOC would generate more

BANGKOK TRAFFIC MANAGEMENT PROJECT

Table V-1: OBSERVED TRAVEL DATA IN 1972 AND ESTIMATES FOR 1978 AND 1981

ITEM	UNIT	Base Year 1972	Appraisal Year 1978	DESIGN YEAR 1981 Without Project	With Policy Elements Only	With Complete Project
1. Population	1,000s	4,067	5,000	5,600	5,600	5,600
2. Households	1,000s	625.7	769.2	861	861	861
3. Vehicle Fleet	1,000s	320	471	602	577	577
3.1 Private cars	"	175	244	325	300	300
3.2 Motorcycles	"	75	110	138	138	138
3.3 Taxis (including Samlors)	"	16	22	24	24	24
3.4 Buses	"	2.8	4	4	4	4
3.5 Minibuses	"	0	6	6	6	6
3.6 Commercial vehicles	"	51	85	105	105	105
4. Motorization	vehicles per 1,000 pop.					
4.1 Private cars	"	43	49	58	58	58
4.2 Private cars and motorcycles	"	61	71	83	83	83
4.3 Total vehicles	"	79	94	108	108	108
4.4 Private cars per household		0.28	0.32	0.38	0.35	0.35
5. Road Network						
5.1 All-purpose roads	km	778	778	850	850	850
5.2 Flyovers	no.	4	4	6	6	13
5.3 Expressways	km	0	0	9	9	9
6. Mechanized Person-Trips	1,000s	4,089.7	(5,400)	(6,200)	(7,050)	(7,200)
6.1 By public transport (bus & minibus)	"	2,330.9	(3,300)	(3,450)	(4,200)	(4,350)
6.2 By private transport (incl. taxis)	"	1,758.8	2,097.7	2,750	2,850	2,850
7. Vehicle-km						
7.1 Cars	1,000s	4,487.9	5,182.6	7,020	6,900	6,930
7.2 Motorcycles	"	1,923.4	2,336.4	2,980	3,174	3,188
7.3 Taxis (paid)	"	1,718.2	1,940.4	2,160	2,304	2,419
7.4 Taxis (cruising), commercial vehicles	"	3,360.0	(3,800)	(4,000)	(4,725)	(5,400)
7.5 Buses	"	500.6	(480)	(480)	(624)	(672)
7.6 Minibuses	"	0	(792)	(792)	(1,008)	(1,080)
8. Vehicle-hours						
8.1 Cars	1,000s	201.25	287.92	390.00	345.00	330.00
8.2 Motorcycles	"	86.25	129.80	165.60	158.70	151.80
8.3 Taxis (paid)	"	77.05	107.80	120	115.20	115.20
8.4 Taxis (cruising), commercial vehicles	"	176.68	(300)	(351)	(325)	(325)
8.5 Buses	"	33.60	(48)	(48)	(48)	(48)
8.6 Minibuses	"	0	(72)	(72)	(72)	(72)
9. Person-km						
9.1 In cars	1,000s	7,853.8	9,328.6	12,636	13,110	13,167
9.2 On motorcycles	"	2,442.7	3,037.3	3,875	4,126	4,144
9.3 In taxis	"	3,006.9	3,492.7	3,888	4,378	4,596
9.4 In buses	"	17,295.3	(16,800)	(17,280)	(21,840)	(22,848)
9.5 In minibuses	"	0	(7,128)	(7,920)	(9,072)	(9,720)
10. Person-hours						
10.1 In cars	"	352.19	518.26	702.00	655.50	627.00
10.2 On motorcycles	"	109.54	168.74	215.28	206.31	197.34
10.3 In taxis	"	134.84	194.04	216.00	218.88	218.88
10.4 In buses	"	1,095.05	(1,680)	(1,728)	(1,680)	(1,632)
10.5 In minibuses	"	0	(648)	(720)	(648)	(648)
11. Vehicles-occupancy	persons					
11.1 Car occupancy	"	1.75	1.8	1.8	1.9	1.9
11.2 Motorcycles occupancy	"	1.27	1.3	1.3	1.3	1.3
11.3 Bus occupancy	"	34.5	35	36	35	34
11.4 Minibus occupancy	"	--	9	10	9	9
12. Characteristics of Average Mechanized Trip on Road Network						
12.1 Length of bus trip	km	7.42	7.3	7.3	7.4	7.5
12.2 Time of bus trip	hours	0.50	0.73	0.53	0.57	0.54
12.3 Speed of bus trip	k/h	14.9	10	10	13	14
12.4 Length of car and motorcycle trip	km	7.56	7.4	7.4	7.6	7.7
12.5 Time of car and motorcycle trip	hours	0.34	0.41	0.41	0.38	0.37
12.6 Speed of car and motorcycle trip	k/h	22.3	18	18	20	21
12.7 Speed of minibus trip	k/h	16	11	11	14	15
13. Daily Vehicle Travel Time on Road Networks						
13.1 Private cars and motorcycles	hours	1.15	1.18	1.20	1.15	1.10
13.2 Taxis	"	10.3(4.815 paid)	10.5(4.9)	11(5)	10.3(4.8)	10.3(4.8)
13.3 Buses and minibuses	"	(12)	(12)	(12)	(12)	(12)
13.4 Commercial vehicles	"	2	(2.1)	(2.2)	(2)	(2)

(Figures in brackets are particularly rough estimates)

travel, especially by public transport; (d) the area pricing scheme is expected to eliminate some private car travel, with consequent loss to the individuals concerned. These losses would be more than offset by improved travel conditions to the traffic remaining; (e) the shift from low-occupancy to high-occupancy vehicles, combined with increased travel speeds, is expected to increase the person-trip capacity of the roads leading into the core area of the city; this in turn should increase the development potential of the core area; (f) the increased travel speeds and increased person-trip capacity of the road system could defer for some time additional major capital investments in the road network as well as investments in a rapid transit system on separate rights-of-way; (g) the reduction in private motor vehicle traffic is expected to have positive environmental implications principally through the reduction of air and noise pollution.

B. Evaluation of Costs and Benefits

5.04 The economic analysis consists of a comparison of project costs with the expected benefits due to (a) net savings in time and vehicle operating costs (VOC) (b) modal shifts and (c) increased travel. The effects of land-use changes, environmental improvements, and safety improvements are noted but not quantified. Economic rates of return are estimated on the basis of an assumed 10-year life of project components. The effects of the different components are assumed to be additive, i.e. the benefits from each are assumed independent of the implementation of the others.

Evaluation of Costs

5.05 The Economic Costs of the project include (a) the initial investment costs and (b) annual implementation costs. The initial investment costs include all project costs indicated in Table II-1, with the exception of price contingencies, taxes and technical assistance for secondary cities. Those expenditures for which direct economic benefits which cannot be readily calculated (such as bus shelters) have been allocated to those project components which are most likely to benefit from the expenditures (such as bus lanes). Annual implementation costs are estimated in those cases where substantial additional staff time will be needed; this includes the area pricing and bus lane components. The costs of staff for increased parking control are not included as the revenues generated from the scheme are expected to substantially exceed the staffing costs and are not included in the estimated project benefits.

Evaluation of Benefits

5.06 Savings in VOC. Use-related VOC at different speeds are based on the Bangkok Transportation Study and updated to 1975. All vehicle costs, except half of depreciation, are assumed to be use-related, and are tabulated in Table V-2 net of taxes. The vehicles for which the figures are given are: A 100 cc motorcycle; a 1,600 cc car; a 300 cc Samlor; a 6,400 cc bus; a 4,300 cc light truck; and a 6,100 cc heavy truck. In the evaluation, the VOC of minibuses and commercial vehicles are assumed to be those of "light trucks."

Table V-2: VEHICLE USE-RELATED OPERATING COST IN BANGKOK - 1975
(Baht per km, exclusive of taxes)

	Speed in km per hour						
	10	15	20	25	30	40	50
Motorcycles	0.69	0.56	0.44	0.40	0.36	0.31	0.29
Cars and Taxis	1.69	1.41	1.26	1.15	1.05	0.90	0.85
Samlors	0.75	0.63	0.56	0.51	0.47	0.40	0.38
Buses	3.98	0.30	2.92	2.62	2.36	1.99	1.86
Light Trucks	3.35	2.78	2.46	2.21	2.00	1.69	1.68
Heavy Trucks	5.28	4.38	3.87	3.47	3.13	2.65	2.47

Source: Bangkok Transportation Study, updated by Trent J. Bertrand.

5.07 Savings in Time Costs. The "value of time" -- the extent to which people are willing to trade time for money -- is a behavioral characteristic strongly influenced by income. Working time is valued at the wage rates, assumed to be B 30 per hour for wage-earning car and taxi passengers, B 20 for motorcycle riders, and B 10 for wage-earning bus occupants. Non-working travel time is valued at one-third of wage rates, and this rate is applied to all travelers whether wage earners or not.

5.08 Benefits from Area Pricing. The levying of charges for the use of congested road space in Bangkok is expected to eliminate about a quarter of private car traffic in congested areas and to increase the speeds of remaining traffic by a similar percentage, with bus speeds, and travel speeds into the core area, showing particularly marked improvements. The increase in bus speeds will increase the capacity of the existing bus fleet, but much of this increased capacity is likely to be taken up by additional bus travel generated by the higher speed. Half of the private trips displaced are expected to shift to buses or minibuses; a quarter to car pools; and a quarter to change destination or time of day, or to be lost. The gains and losses are classified as follows:

(a) all bus passengers gain from higher bus speeds, provided sufficient bus capacity is available for the additional bus traffic that is expected to be (i) newly generated by the higher speed and, (ii) transferred from private transport;

(b) car passengers who transfer to buses will pay less, as bus fares are cheaper than private transport. They are

however expected to suffer time losses, which are offset in the evaluation against the time savings gained by car passengers who do not transfer;

(c) car passengers who pay the increased fee and remain in their vehicles will save both time and VOC in consequence of the higher speed. The area pricing fee will be a loss to them, but a gain of equivalent amount to the public revenue, and is therefore excluded from the general evaluation;

(d) car passengers who change destinations or journey times, or who abandon trips, are assumed to suffer on the average can economic loss equivalent to half the area pricing fee.

5.09 Benefits from Bus Priority Measures. The provision of special bus lanes will increase bus vehicle speeds by reducing delays at intersection queues and only nominally decreasing non-bus vehicle speeds, resulting in net time savings and VOC gains. Given that most person-trips (approximately 60%) are by bus, but most vehicle-miles are by non-buses, most benefits due to bus lanes will be time savings as opposed to VOC savings.

5.10 Benefits from Traffic Signal Equipment. The coordination or traffic signals was conservatively estimated to result in travel speed increases of 5% over the affected area. Both travel time and VOC savings for all vehicles are expected.

5.11 Benefits from Flyovers. The proposed flyovers are estimated to greatly reduce delays at junctions for that proportion of the traffic stream removed by grade separation from the junction. The remaining traffic was estimated to benefit as well, but by a lesser amount by virtue of less traffic being accommodated at the intersections.

5.12 Benefits from Missing Road Links. Given the wide spacing of the Bangkok road system, the construction of missing links is expected to reduce vehicle miles of travel which, in turn, will result in travel time and VOC savings.

5.13 Benefits from Other Road Improvements. Selected junction improvements, street widening, and new traffic signal installations at high priority locations are all expected to increase operating speeds and reduce delays of both public and private vehicles.

5.14 Calculation of Economic Rate of Return (ERR). Each project component is conservatively assumed to have a ten-year life. In that period incomes are expected to continue rising, and so is car ownership. Bus ridership is also likely to increase, so long as the public transport industry is allowed to provide high-quality services for those who are prepared to pay for comfort, as well as low-cost services for those who are not. It may be conservatively assumed that savings in vehicle operating costs will grow at

least in proportion to the increases in the vehicle population, say 8% per year, and that benefits from time savings will, additionally, grow at least in proportion to income growth, say 4% per year. Annual project implementation costs, which principally includes labor oriented traffic enforcement costs are estimated to increase 4% per year.

5.15 On the basis of the above considerations, of the initial and operating costs of the different project elements, and of the assumed unit savings in time and VOC, the project benefits in the first full year of each element, and the ERRs, are summarized in Table V-3. As is shown, the total first-year benefits are estimated at B 722 million ($36 million), or approximately 135% of estimated project costs. If benefits from just the physical components (excluding area pricing and bus lanes) are compared with their costs, the first year returns are 48% of costs.

C. Distribution of Benefits

5.16 The proposed project, by increasing efficiency in the use of the road system, is expected to benefit all classes of road users except certain private car travellers. This group may become worse off by being priced out of some journeys. The main benefits will accrue to those who use buses, minibuses, shared cars, and other modes that are economic in road use. Operators of public transport (buses, minibuses, taxis) and of commercial vehicles are also expected to benefit. Many of the benefits may be passed on: for example, reductions in operating costs could result in more frequent, or less costly, bus services.

5.17 The initial distribution of benefits as between bus travellers, car travellers (including taxi passengers), public transport operators and commercial vehicle operators is shown, for each project component, in Table V-4.

D. Sensivitity Analysis

5.18 The most doubtful elements in the economic evaluation are the value of time and the rate of growth of benefits. Table V-5 shows the likely ERR for the whole project in the event that savings in non-working time are (i) valued at only one-sixth of wage rates, and (ii) ignored. The possibility of only half the growth in benefits materializing is also considered, (i) on its own, and (ii) in conjunction with the reduced valuations of time savings.

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Table V-3: SUMMARY OF COSTS, FIRST YEAR BENEFITS, AND ECONOMIC RATES OF RETURN

Project Component	Investment Costs (B millions) (a)						First Year Net Economic Benefits (B millions)					
	Initial Capital (f)	Taxes and Duties (b)	Physical Contingencies (c)	Technical Assistance Design and Supervision	Police and Monitoring Equipment (d)	Total Investment Costs	Vehicle Operation	Passenger Time	Annual Project Implementation Costs (g)	Net Economic Benefit	Ratio of First Year Net Benefits to Initial Investment Costs	Economic Rate of Return (%) (e)
Area Pricing	9	- 2	6	8	8	29	242	193	-30	405	13.96	1400 (k)
Bus Priority Measures	22	- 3	6	6	3	34	21	77	- 6 (h)	92	2.71	280
Traffic Signal System	50	-12	10	10	6	64	46	36	- (i)	82	1.28	139
Road Flyovers	210	-28	35	30	2	249	45	35	-	80	0.32	39
Road Capacity Improvements	70	- 9	15	16	2	94	28	18	-	46	0.49	57
Missing Road Links	50	- 6	10	8	1	63	10	7	-	17	0.27	33
TOTAL	411	-60	82	78	22	533	392	366	-36 (j)	722	1.35	142

(a) Does not include price contingencies (Approx. B 82,000) and Technical Assistance for secondary cities (Approx. B 14,400); see Table II-1

(b) Are excluded from investment costs as they do not entail use of economic resources .

(c) Vary on basis of estimated risks.

(d) A separate project component assigned to other project components of basis of estimated usage.

(e) Economic rates of return are based on 10-year life with benefit and cost streams increasing at varying rates (see para 5.14).

(f) Includes all parking component costs as parking management is supportive of area pricing.

(g) Assumed at 10% of estimated annual revenues of B 300 million.

(h) Assumed 1 traffic enforcement officer per kilometer of lane at 20B/hour, 10 hours/day, 300 days/year.

(i) Should result in net reduction in traffic police personnel in manning signal system.

(j) Does not include costs of additional parking wardens assumed as follows: 1 warden/20 spaces for 20,000 spaces, at 10B/hour, 10 hours/day, 300 days/year = B 30 million; parking revenues reflecting more economic use of street spaces are expected to exceed these costs substantially.

(k) Rate of return based on no dependence on other project elements; more conservatively, it is estimated that approximately 1/4 of Traffic Signal System, Road Flyovers , and Road Capacity Investments should be in place before area pricing scheme can be safely implemented. Assuming these costs the ERR for area pricing would be approximately 290%.

Table V-4: DISTRIBUTION OF FIRST-YEAR BENEFITS

(Baht million)

Project Element	Class of Beneficiary				
	Bus Travel	Car and Taxi Travel	Motorcycle Travel	Commercial Vehicles	Total Benefits
Area pricing and police equipment	125	163	32	85	405
Traffic signal system	22	41	5	14	82
Bus priority measures	92	0	0	0	92
Road flyovers	21	40	5	14	80
Road capacity improvements	12	23	3	8	46
Missing road links	5	8	1	3	17
TOTAL	277	275	46	124	722
Percent of Total	38%	38%	7%	17%	100%

Table V-5: RECALCULATION OF ECONOMIC RATE OF RETURN FOR COMPLETE PROJECT ON THE BASIS OF REDUCED TIME VALUATIONS AND LOWER GROWTH RATES

Time Valuation	Growth Rate	
	Best Estimate	Halved
best estimate	142	138
halved	108	97
assumed zero	76	73

E. Impact on the Urban Poor

5.19 All income groups are expected to benefit from the project by means of (a) increased travel speeds, (b) improved person-trip capacity of the transport system, and (c) improved environmental conditions. However, these benefits are expected to be obtained using a key project strategy aimed at the discouragement of low occupancy vehicles (principally cars) and the encouragement of high occupancy vehicles (principally buses). Thus, the project is expected to provide relatively few benefits to the high income groups (approximately the upper 10%) and relatively more to the lower income groups who cannot afford a car, but can afford public transport.

5.20 Since the Bangkok bus fare is still low, even by LDC standards, it is estimated that all but a small fraction of the urban poor have the means to benefit from the proposed improvements in public transport service. As is shown in Table V-6, a family at the 10th income percentile would only have to devote 5-7% of its income for two bus rides daily--the amount needed to send one family member on a commute to work. Even double this amount of bus travel would not appear prohibitively costly for this income group.

Table V-6: COST OF PUBLIC TRANSPORT TO FAMILY AT 10TH PERCENTILE OF MONTHLY HOUSEHOLD INCOME IN BANGKOK (1976) /1
(Baht)

Monthly Family Income	Number of Daily Bus Trips per Family	Monthly Fare /2		Percent Transport Cost to Income
		Assuming No Transfers	Assuming 1.4 Transfers Per Trip /3	
825	2	40	56	5 - 7
825	4	80	112	10 - 14
825	6	120	168	15 - 20

/1 See Table I-1.
/2 Assumes 20 days/month, 2 trips/day.
/3 The present Bangkok bus fare is B 1.0 per route, and a full additional fare is charged for each transfer. According to BMTA, there is a daily average of 1.4 transfers per passenger in each direction.

5.21 Beyond considerations of affordability, the regular bus system provides reasonably good coverage to the scattered slum settlements in Bangkok, ensuring that the benefits of improved service will reach the poor. Only in a few instances does the average walking distance to the nearest bus stop exceed 1 km, and in most cases the distance is less than 500 meters. In many cases, minibus service on flexible route patterns services those areas away from regular bus routes.

5.22 Determination of the share of project benefits that reach the urban poor of Bangkok is heavily dependent upon what definition of "urban poor" is used. The "absolute poverty" level in Bangkok is only 9% of the population while the "relative poverty" level ranges up to 15%. These calculated percentages are among the lowest of LDCs, with more common ranges of relative urban poor being 25-40% of the population for nations in similar GNP ranges.

5.23 Conservatively assuming that the lower 5% of the population profile cannot easily afford bus services, that the top 10% of the population does not regularly ride buses, that the 15th percentile income level is the relative poverty level for Bangkok, and that only bus service improvements would assist the urban poor (see Table V-4), then only 7% of project benefits would reach the poor. Assuming a more liberal urban poverty threshold at the 33rd income percentile, 13% of project benefits would go to the poor.

5.24 Notwithstanding the relatively small percentage of project benefits directed at the "poor," they will enjoy a high rate of return on project costs. Considering the substantial economic rates of return estimated for the project, the investment could be justified solely on the basis of benefits to the relatively poor population of Bangkok. For example, counting only benefits accruing to the lower 50% of the population, the economic rate of return on the <u>whole</u> project cost would be 20%; the economic rate of return counting only the lower 33% of the population would be 13%; and the rate counting only the lower 15% of the population would be 7%.

5.25 Other direct or indirect project benefits to the urban poor would be as follows: (a) public transit technical assistance which should improve the bus routing (para 2.35), and (b) a monitoring component which includes a survey of travel characteristics of different income groups, including number of trips and total time and money spent on travel; this survey will provide a better understanding of travel habits of the poor and enable bus services and other transport improvement measures to be planned for their benefit, particularly with a view to increasing access to employment opportunities (para 4.09).

F. Risks and Uncertainties

5.26 The proposed area pricing for Bangkok--being considered on price restraints on traffic for the entire working day (at least 10 hours) over a wide area (as much as 20 sq. km.)--is without precedent anywhere. Only Singapore has implemented an area-wide traffic restraint scheme and this

only for a 6 sq. km. area over a limited time period (approximately 3 hours) each day. The risks are principally ones of enforcement and political acceptability. There are also attendant technical and economic impact risks associated with such a new approach to traffic management. While these risks must be viewed as being considerable, the potential payoffs are viewed to be very high. Even if area pricing were not applied, potential project payoffs would be substantial; with area pricing pricing restraining the uneconomic use of low occupancy vehicles, the benefits will be exceptionally large.

VI. AGREEMENTS REACHED AND RECOMMENDATIONS

6.01 During negotiations, agreement was reached on the following points:

(a) role of various public transport modes (para 1.15);

(b) timely allocation by Government of project funds to allow expenditious project implementation (para 2.09);

(c) resources, staff and facilities for operation and maintenance of police equipment (para 2.15);

(d) submission of policy proposals by June 30, 1979, and timing of their implementation (paras 2.17, 2.27, 2.30, 2.31);

(e) acquisition of land and buildings (para 2.24);

(f) staff training programs for UTPO and TPD (paras 2.33 and 2.36);

(g) implementation by BMTA of mutually agreed upon recommendations (para 2.35);

(h) terms of reference (in principle) for an Eastern Seaboard Regional Planning Study (para 2.38);

(i) distribution of responsibilities between executing agencies (para 3.01);

(j) staffing of UTPO (para 3.03); and

(k) accounts, audit and progress report (para 4.08).

6.02 The project is suitable for a Bank loan of US$16 million equivalent.

ANNEX 1

THAILAND

BANGKOK TRAFFIC MANAGEMENT PROJECT

TECHNICAL ASSISTANCE: EASTERN SEABOARD AND NATIONAL SECONDARY CITIES DEVELOPMENT STUDY

1. It is Government policy to decentralize urban development in Thailand. The Fourth Development Plan (1977-81) designates nine provinces (Chiang Mai, Chonburi, Khon Kaen, Nakon Ratchasima, Phitsanulok, Phuket, Songkhla-Hat Yai, Ubon Ratchathani and Udon Thani) for promotion as regional urban centers, but an explicit strategy for promoting these centers has not been formulated. The Basic Economic Report and a supporting Urban Sector Annex concur with the importance of decentralizing urban development, but argue that the initial effort should be focused on a few cities with strong economic potential. The eastern seaboard corridor, Songkhla-Hat Yai and, to a lesser extent, Chiang Mai and either Nakon Ratchasima or Khon Kaen have been identified as the most attractive cities on these grounds.

2. The Technical Assistance component of the proposed project includes US$720,000 for an Eastern Seaboard and National Secondary Cities Development Study. This estimate is based on about 100 man-months of technical assistance; the consultants would work with a team of Thai counterparts under the direction of a subcommittee of the Cabinet-appointed Eastern Regional Development Committee. About 85% of the study effort would be devoted to planning the urban-industrial development of the eastern seaboard corridor (from Chonburi to Sattahip and Rayong). The study would analyze alternative patterns of regional development and prepare proposals for the urban infrastructure of the first phase of the preferred strategy. The study would also formulate a more detailed strategy for the promotion of other secondary cities and identify initial projects.

3. During negotiations agreement was reached in principle on draft terms of reference for the study.

BANGKOK TRAFFIC MANAGEMENT PROJECT

MINIMUM STAFF OF UTPO FOR PROJECT IMPLEMENTATION

Position	Qualifications	Minimum Key Staff Required (*) January 1979	January 1980	Time Commitment to Project
Chief of Office	Degree in Related Field & 5 years Transport Planning experience, at least 2 supervisory	1	1	-
Deputy Chief	5 years experience in Office Management	1	1	(f.t.)
Chief Engineer	Degree in Engineering & 5 years experience, at least 2 supervisorary	1	1	(p.t.)
Senior Engineer	Degree in Engineering and 3 years experience	3	10	(f.t.)
Engineer	Degree in Engineering	10	20	(f.t.)
Senior Transport Planner	Advanced Degree in related field and 3 years experience	-	1	(p.t.)
Transport Planner	Degree in Related Field	2	4	(f.t.)
Senior Transport Economist	Advanced degree in Economics and 3 years experience in Economics	1	1	(p.t.)
Transport Economist	Degree in Economics	1	2	(f.t.)
Chief Accountant	5 years related experience	1	1	(p.t.)
Accountant/ Bookkeeper	2 years related experience	2	2	(f.t.)
Chief Draftsman	5 years experience, at least 2 supervisorary, or a civil engineer with degree	1	1	(p.t.)
Chief of Signal Maintenance		1	1	(f.t.)
TOTAL		25	46	-

(f.t.) - Full time equivalents for first two years of Project

(p.t.) - At least 50% committed to Project for first two years

(*) - Assumed to be permanently assigned to UTPO to carry out important mission of office after completion of the Project

ANNEX 3

THAILAND

BANGKOK TRAFFIC MANAGEMENT PROJECT

Related Documents and Data Available in Project File

A. Reports Relating to Project

Traffic Signals, by David T. Overton	December 1977
First Bangkok Urban Transport Project, by Richard C. Podolske	January 1978
Report on Traffic Signal Control System, by David T. Overton	February 1978

B. Documents Related to Project

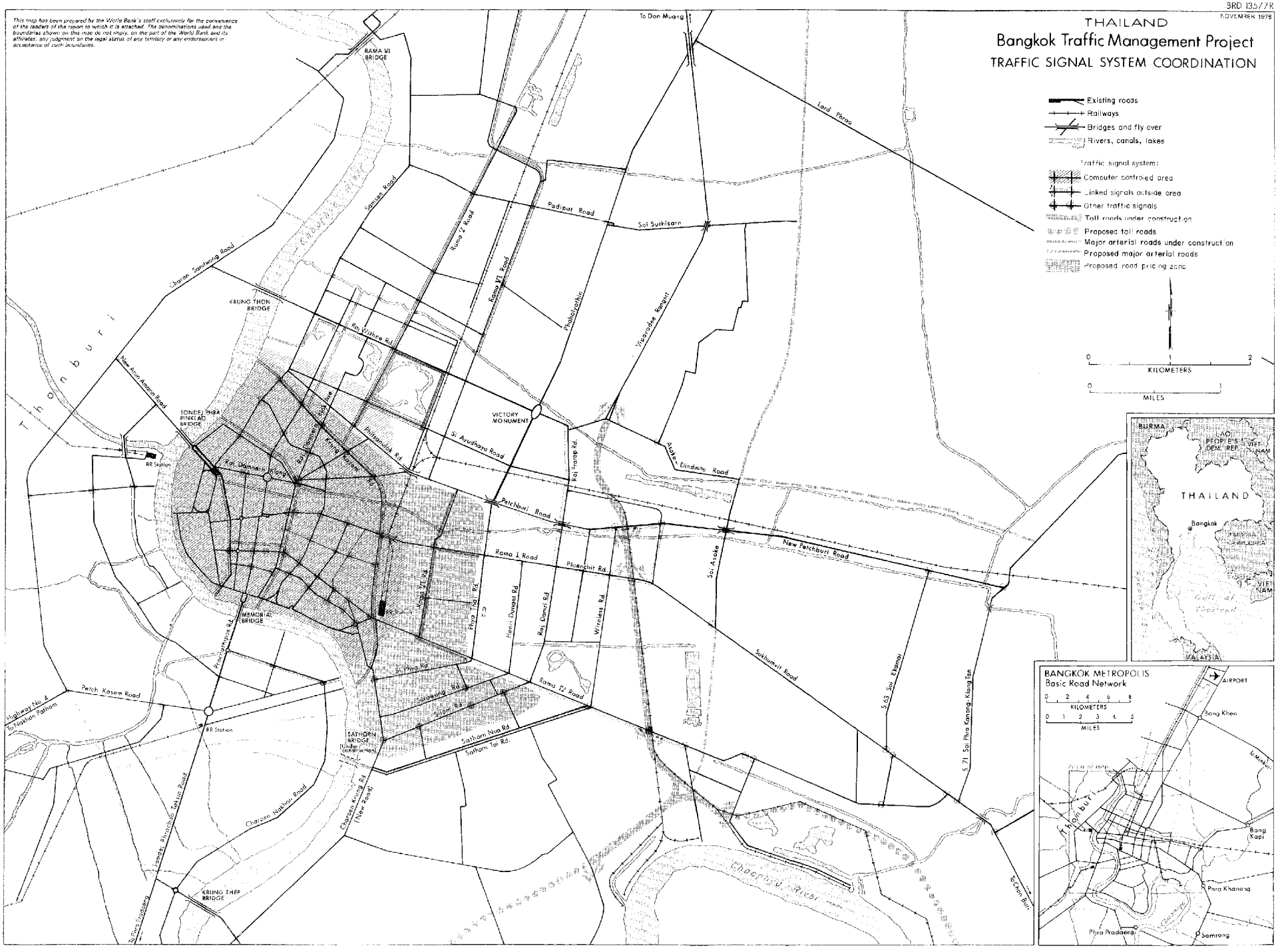
Memorandum on Pricing the Use of Congested Roads	March 16, 1978

C. Terms of Reference for Technical Assistance

Technical Assistance to the UTPO	February 10, 1978
Technical Assistance to the BMTA	April 18, 1978

IBRD 13577R
NOVEMBER 1978

THAILAND
Bangkok Traffic Management Project
TRAFFIC SIGNAL SYSTEM COORDINATION



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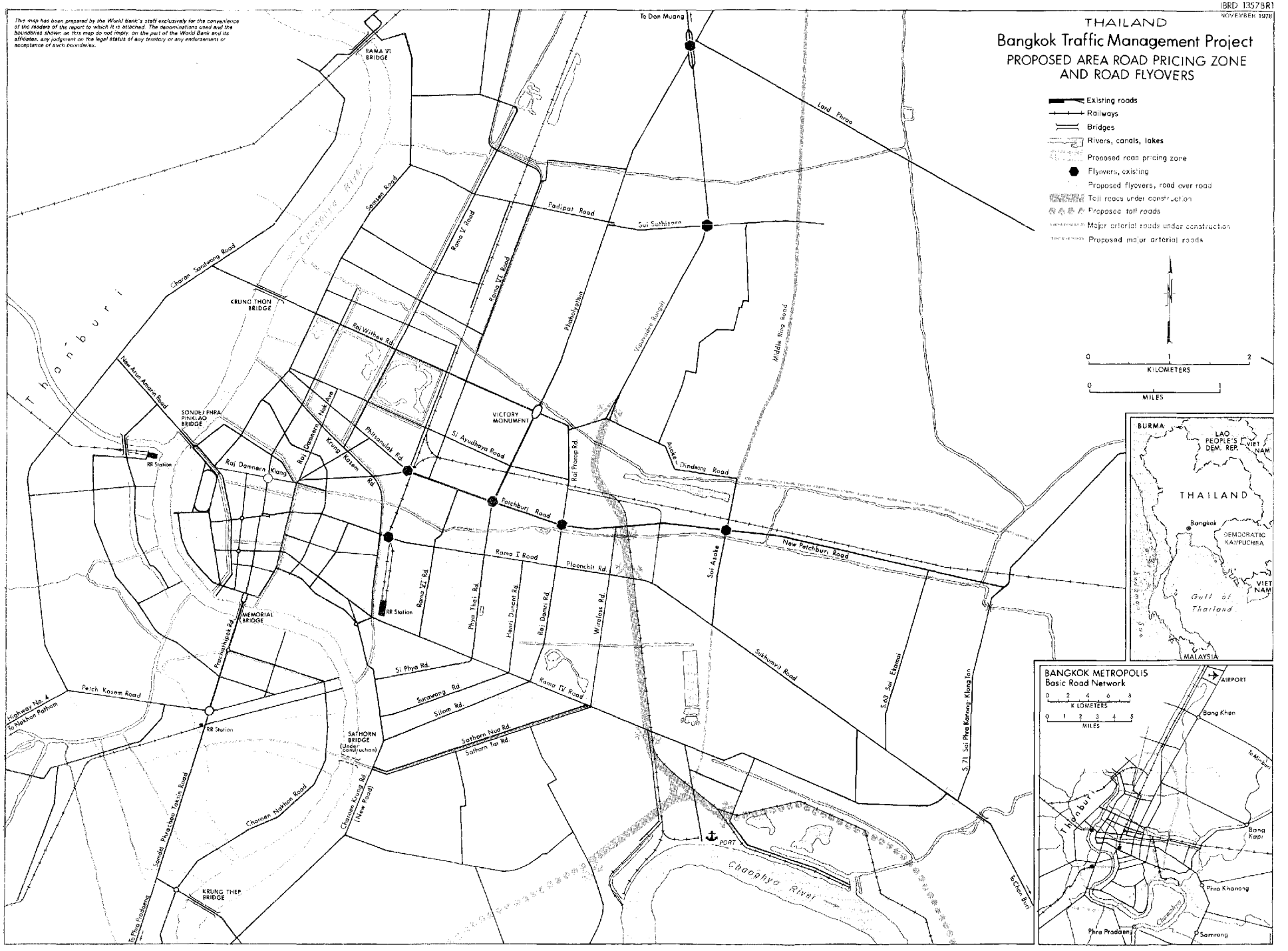

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NOVEMBER 1978

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Bangkok Traffic Management Project
Proposed Bus Lanes