

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

**MUNICIPALITY OF PHNOM PENH  
THE KINGDOM OF CAMBODIA**

**THE STUDY  
ON  
THE TRANSPORT MASTER PLAN  
OF  
THE PHNOM PENH METROPOLITAN AREA  
IN  
THE KINGDOM OF CAMBODIA**

**FINAL REPORT**

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**APPENDIX**

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**APPENDIX 3**

**PRESENT URBAN AND SOCIOECONOMIC PROFILE**

## APPENDIX 3 PRESENT URBAN AND SOCIOECONOMIC PROFILE

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### A3.1 HISTORICAL GROWTH OF PHNOM PENH

The historical growth of Phnom Penh shows two liner towns in 1860's, one was along a road at the right side of the bank of Sap River and the other was along the waterfront of the left bank of Sap River. Phnom Penh used to be an island and was expanded by reclaiming the land in the rivers and swamps. The city expanded by constructing dikes in six stages, 1920, 1940, 1950, 1970, 1972 and 1987 (Figure A3.1). The city was drastically expanded toward the western and the southern directions in 1950s. The shape of the city after 1950s has been almost the same as current urban area.

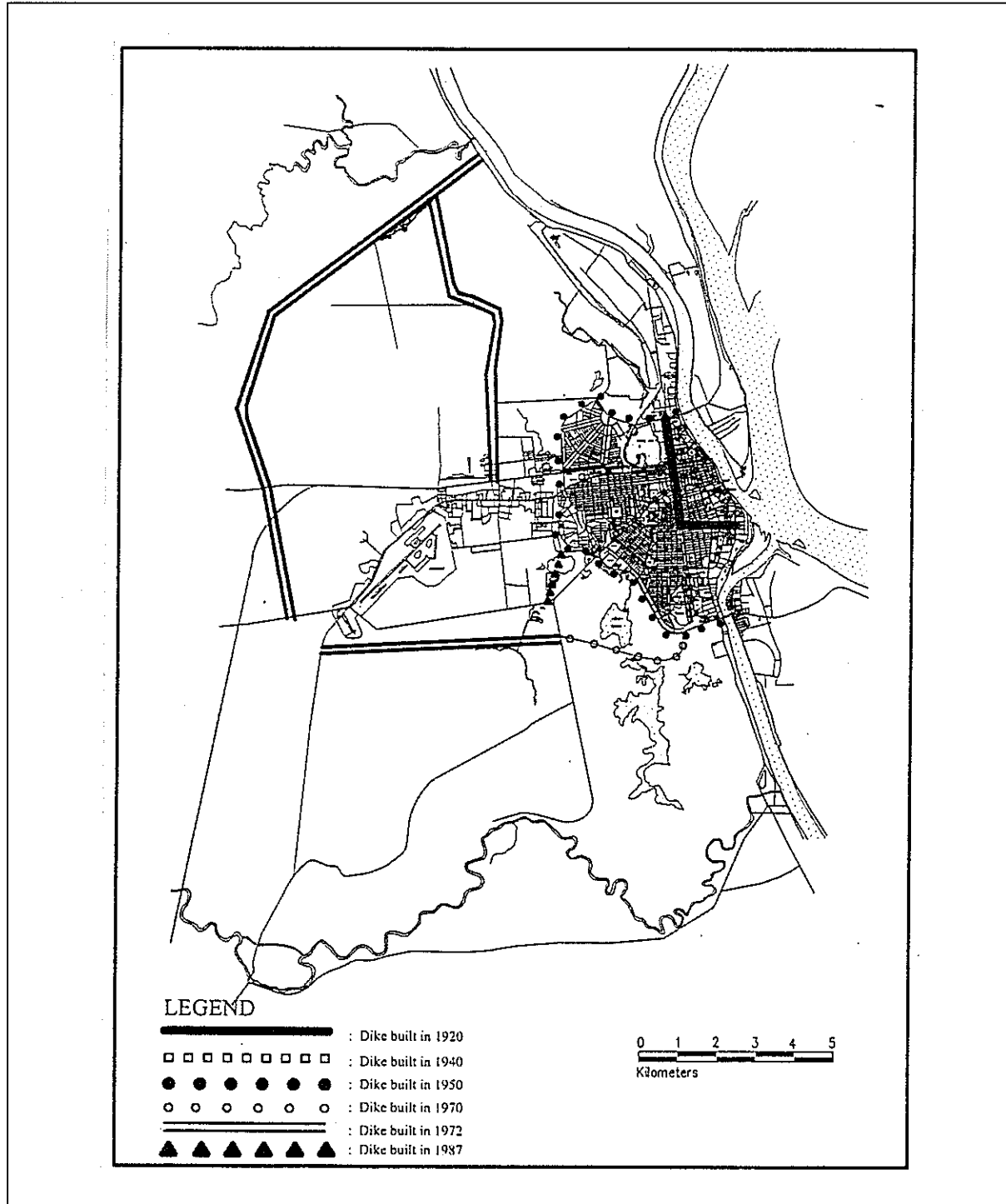


Figure A3.1 Growth of Phnom Penh

**APPENDIX 4**

**TRAFFIC SURVEY AND ANALYSIS**



## APPENDIX 4 TRAFFIC SURVEY AND ANALYSIS

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## TRAFFIC SURVEY AND ANALYSIS

### A4.1 OVERVIEW

#### A4.1.1 Study Area

The Study Area covers the Municipality of Phnom Penh and the adjacent area surrounded by the proposed Outer Ring Road in the Kandal Province. It has an area of approximately 300 square kilometers and population of 1.1 million according to the General Population Census of Cambodia 1998 and other informations provided by the Government of Cambodia and Municipality of Phnom Penh (hereinafter referred as "MPP").

#### A4.1.2 Traffic Surveys

Fifteen (15) different types of traffic surveys were conducted from mid May through mid June 2000. This period was chosen to avoid biased traffic conditions during rainy season starting from mid June. However, due to mishap caused by unpredicted incidents, some data were collected from supplemental surveys carried out from mid July through late August 2000. Table A4.1.1 shows outline of the traffic surveys.

Table A4.1.1 Outline of the Traffic Surveys

#	Survey Item	Contents
(1)	Person Trip Survey (Household Interview)	6,000 households (76+3 sub-district)
(2)	Cordon Line Survey	8 stations (24 & 15 hrs.)
(3)	Screen Line Survey	9 stations (15 hrs.)
(4)	Roadside Traffic Volume Count	33 stations (24 & 15 hrs.)
(5)	Intersection Traffic Volume Count	8 stations (14 hrs.)
(6)	Travel Speed Survey	7 routes (3 x 3 times)
(7)	Commodity Movement Survey	30 companies & 3 terminals
(8)	Parking Condition Survey	3 areas & 5 blocks (2 hrs x 3 times)
(9)	Inter-Regional Terminal Passenger Interview	3 terminals (300 sample)
(10)	Bus and Taxi-Bus Owner/Driver Interview	5 terminals (100 sample)
(11)	Bus and Taxi-Bus Passenger Interview	5 terminals (300 sample)
(12)	Para Transit Driver Interview	5 terminals (500 sample)
(13)	Para Transit Passenger Interview	5 terminals (600 sample)
(14)	Bus/Taxi-Bus Terminal Traffic Count	5 terminals (14 hrs.)
(15)	Motorcycle Count (by Sample Marking)	9 stations

#### A4.1.3 Traffic Zones

The Study Area was divided into eighty (80) inner zones. Seventy-six (76) of inner zones are as same as the MPP's sub-districts and one (1) is the Pochentong Airport area itself, remaining three (3) inner zones are set into the adjacent area surrounded by the proposed Outer Ring Road in the Kandal Province. The rest of the national excluding the Study Area was divided into seven (7) outer zones along the National Road No.1 to No.7 respectively. The Traffic Zones are shown in Figures A4.1.1 (a) and A4.1.1 (b).

#### A4.1.4 Transport Modes

Eleven (11) transport modes (including others & walking) were adopted for all traffic surveys. However, in the intersection traffic volume count, six (6) transport modes (excluding walking) were adopted in consideration of technical difficulties involved. Furthermore, for the analysis purpose, sometimes these

eleven (11) transport modes or six (6) transport modes are summarized into four (4) modes (excluding walking). Table A4.1.2 shows these relations of the transport modes.

Table A4.1.2 Transport Modes for Traffic Surveys and Analysis

#	11 Transport Modes	6 Modes	4 Modes
1.	Passenger Car (including Station Wagon & 4WD)	Passenger Car & Mini Bus	Light Vehicles
2.	Taxi (Sedan Type Taxi with Yellow Line)		
3.	Light Bus / Passenger Van (Mini Bus)		
4.	Pick-up / Cargo Van	Pick-up & Van	Heavy Vehicles
5.	Standard and Large Bus	Large Bus	
6.	Large Truck, Semi & Full Trailer	Truck & Trailer	
7.	Motorumo (Motorbike Trailer)	Motorcycles	Motorcycles
8.	Motorbike (including "Motodop" - Motorbike Taxi)		
9.	Cyclo (Tricycle Taxi)	Pedal Cycles	Pedal Cycles
10.	Bicycle		
11.	Others (Tractor, Bicycle & Horse Trailer, etc.) / Walking	(Others/Walking)	(Others/Walking)

#### A4.1.5 Vehicle Capacity Conversion

For analysis purpose, traffic data containing various classes of vehicles are converted to passenger car units (pcu's). Table A4.1.3 (a) shows conversion factors used in road and intersection designs which are prescribed in the Road Design Standard prepared by the Ministry of Public Works and Transport (hereinafter referred as "MPWT"), Kingdom of Cambodia.

Table A4.1.3 (a) Passenger Car Equivalents in the Road Design Standard

Type of Vehicle	Equivalent Value in Passenger Car Units (PCU's)			
	Rural Standard	Urban Standard	Roundabout Design	Traffic Signal Design
Passenger Cars	1.00	1.00	1.00	1.00
Motorcycles	1.00	0.75	0.75	0.33
Light Vans	2.00	2.00	2.00	2.00
Medium Lorries	2.50	2.50	2.80	1.75
Heavy Lorries	3.00	3.00	2.80	2.25
Buses	3.00	3.00	2.80	2.25

(Source: Cambodian Road Design Standard [CAM PW 03-101-99])

However, in consideration of the other countries' design standards (i.e. United States, EU countries, Japan, and some ASEAN countries) and characteristics and/or classifications of vehicles within the Study Area, following modified conversion factors shall be applied in further analysis, as shown in Table A4.1.3 (b).

Table A4.1.3 (b) Passenger Car Equivalents in This Chapter

Type of Vehicle	Equivalent Value in Passenger Car Units (PCU's)	
	Urban & Suburb Road Standard	Roundabout & Intersection Design
Light Vehicles	1.00	1.00
Heavy Vehicles	3.00	2.50
Motorcycles	0.50	0.33
Cyclo/Bicycles	0.50	0.33

### A4.1.6 Arterial Level of Service

Arterial level of service is based on average through-vehicle travel speed for the segment, section, or entire arterial under consideration. For further analysis purpose, in this chapter, following arterial level of service shall be applied in consideration with the characteristics of the central districts of the Study Area. Table A4.1.4 shows typical arterial level of service and their average travel speed with arterial classifications according to the functional and design categories.

Table A4.1.4 Arterial Level of Service and Average Travel Speed

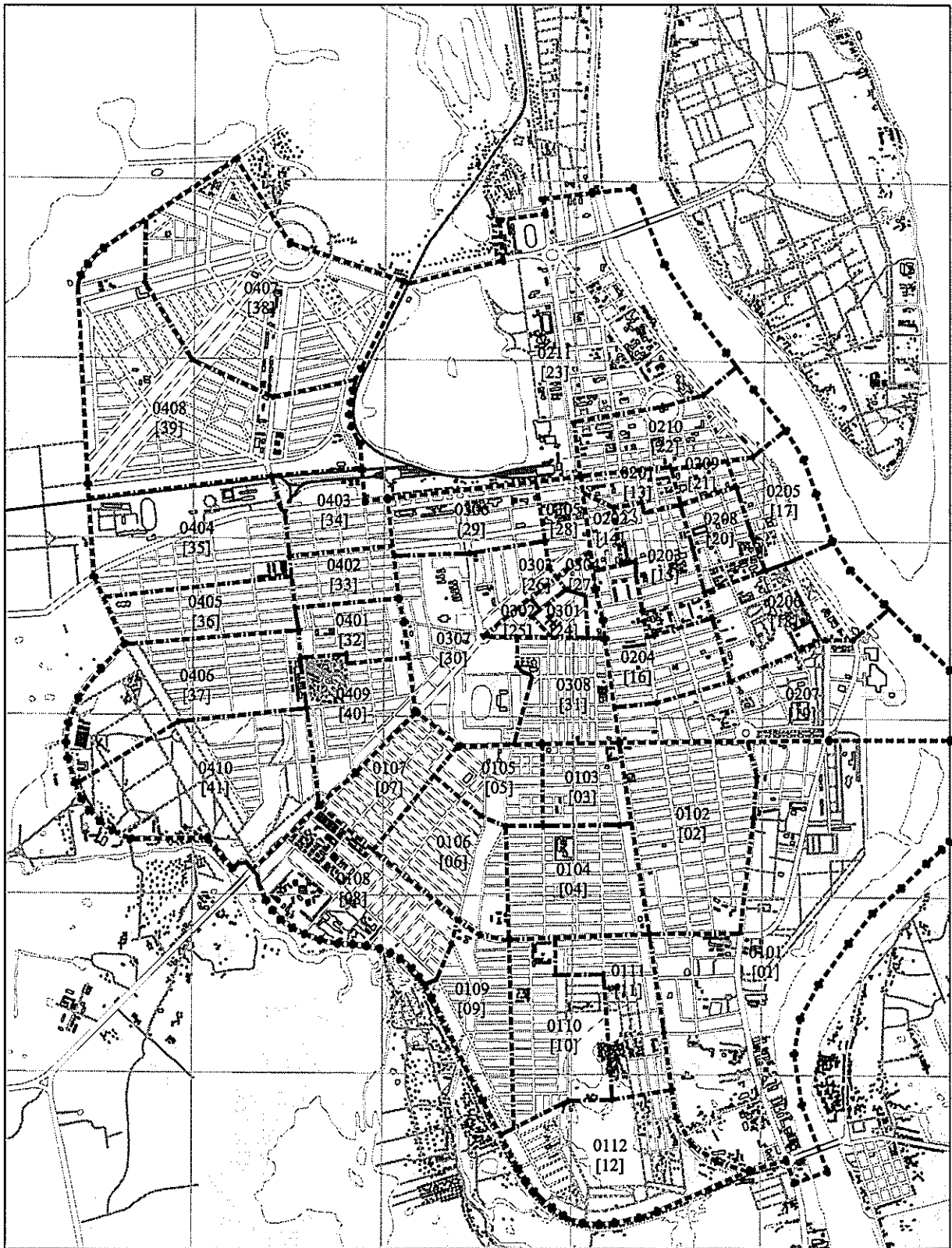
Arterial Classification		Highway Capacity Manual (converted)*			Study (applied)
		I	II	III	
Design Categories		Suburban	Intermediate	Urban	Urban
Range of Free-Flow Speeds (km/h)*		72~56	56~48	48~40	50~40
Typical Free-Flow Speeds (km/h)*		64	52	44	45
Level of Service	Flow Characteristics	Average Travel Speed (km/h)*			
A (90%~)	Free Flow	56~	48~	40~	40~
B (70%~)	Stable Flow	45~	38~	30~	30~
C (50%~)	Stable Flow	35~	29~	21~	20~
D (30%~)	Approaching Unstable Flow	27~	22~	14~	15~
E (25%~)	Unstable Flow	21~	16~	11~	10~
F (~25%)	Forced Flow	~21	~16	~11	~10

(Source: Highway Capacity Manual 1994 and Cambodian Road Design Standard [CAM PW 03-101-99])

### A4.1.7 Location of the Traffic Surveys

Figure A4.1.2 (a), (b), (c), and (d) shows the location of the traffic surveys in the Study Area.

\* Unit of Travel Speed: (km/h) in the table are converted from (mph) in the Highway Capacity Manual (HCM)



**LEGEND**

**BORDER**

- District Border
- Sub-District Border

**CODE No.**

(Central Districts)

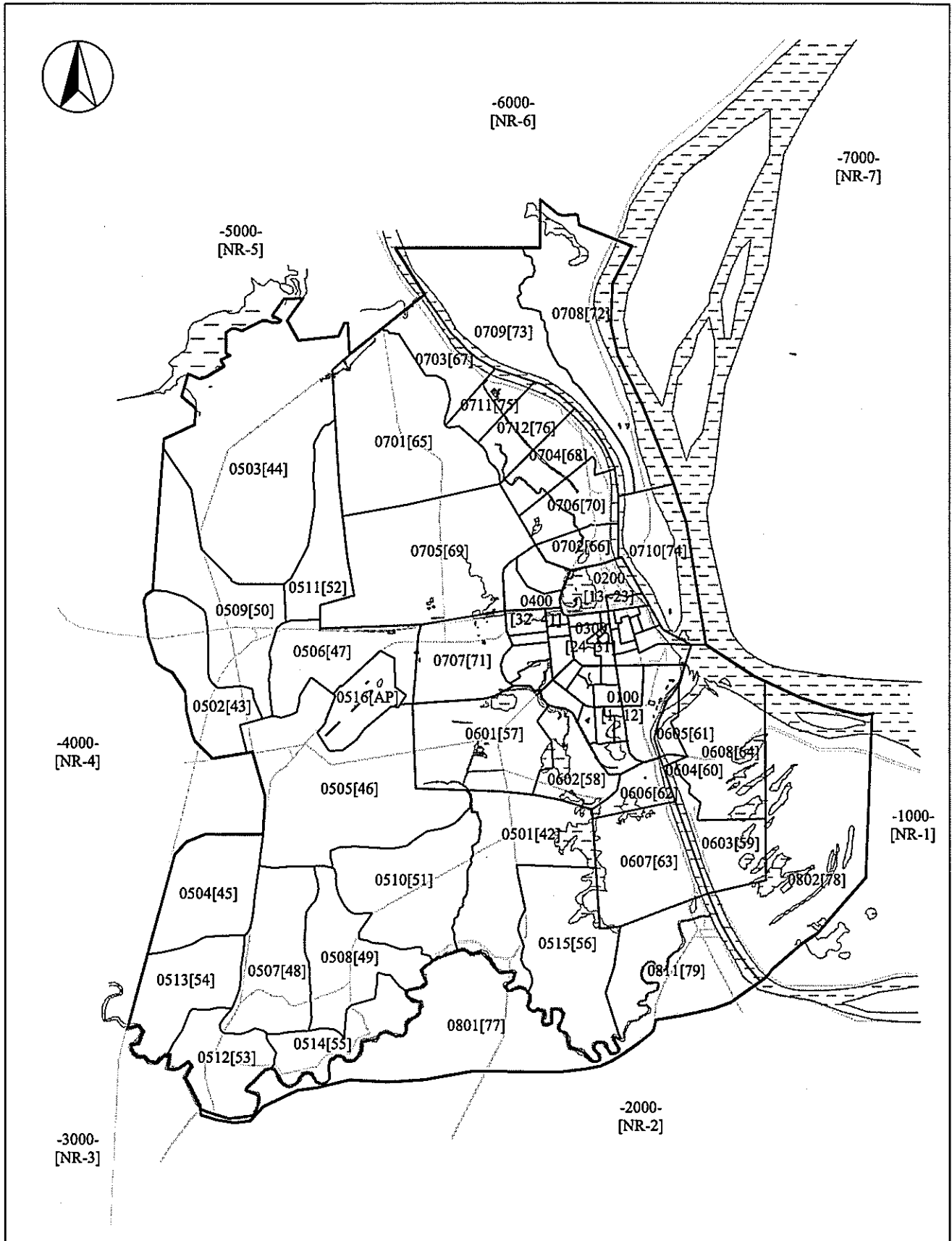
- 0100[01~12] Chamkar Mon
- 0200[13~23] Doun Penh
- 0300[24~31] Prampir Meakkakra
- 0400[32~41] Tuol Kouk

(Suburban Districts)

- 0500[42~56] Dangkao
- 0600[57~64] Mean Chey
- 0700[65~76] Ruessei Kaev
- 0800[77~79] Kandal (Province)

500 m 0 m 500 m 1,000 m  
SCALE:1/40,000

Figure A4.1.1(a) Traffic Zones (Central Area)



**LEGEND**

- Study Area Border
- - - - - District Border
- ..... Sub-District Border
- 0100 [1~12] : Inner Zone - Zone Code [Series No.]
- 1000-[NR-1] : Outer Zone - Zone Code [National Road No.]

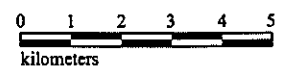
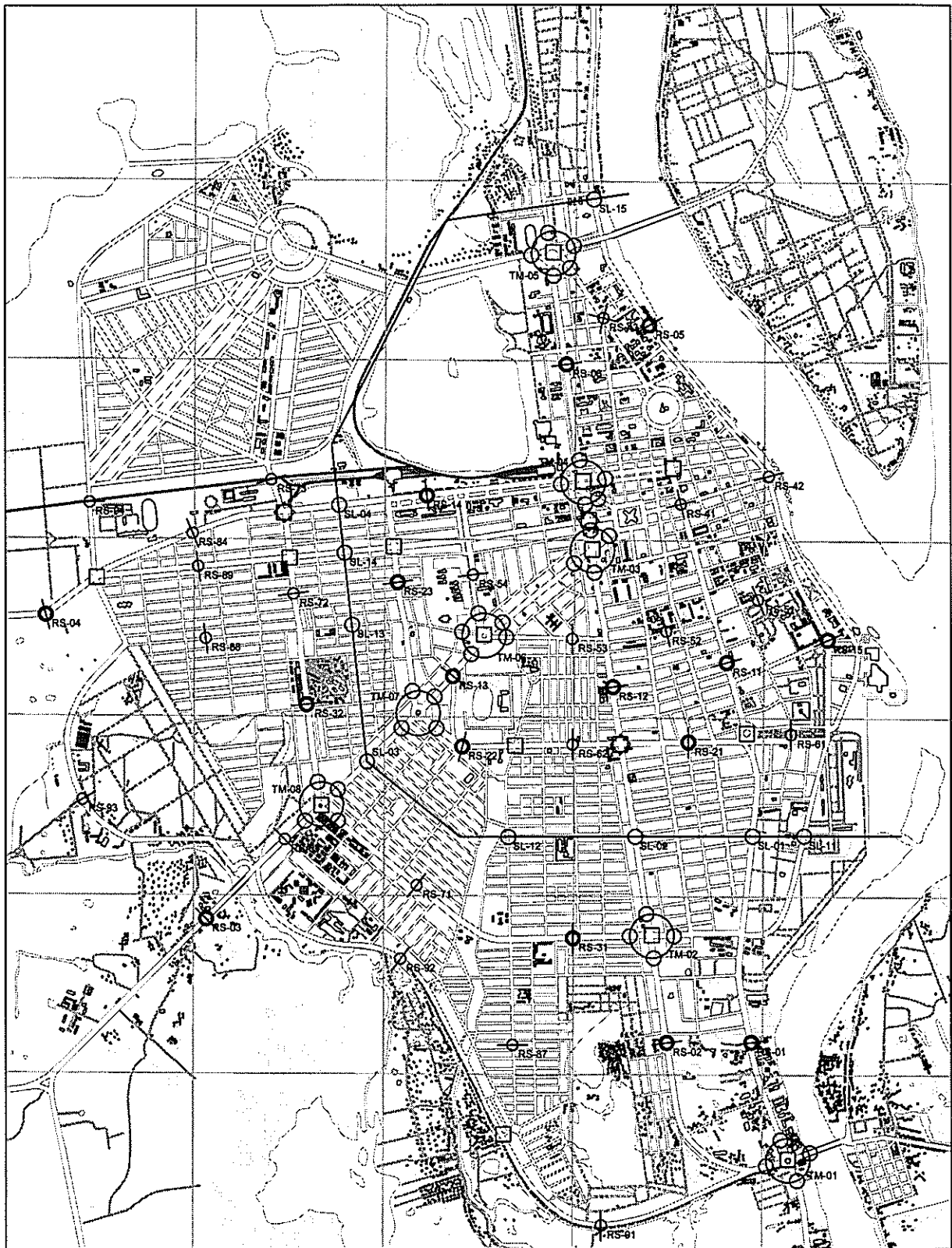





Figure A4.1.1(b) Traffic Zones (Suburban Area)







**LEGEND**

**TRAFFIC SURVEY STATION**

-  Intersection Traffic Movement Survey (14 hrs.)
-  Roadside Traffic Volume Sueuey (15 & 24 hrs.)
-  Screen Line Sueuey (15 hrs.)

-  Intersection Traffic Survey done by the World Bank in 1995
-  Intersection Traffic Survey done by the JICA Expert in 1999

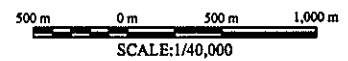
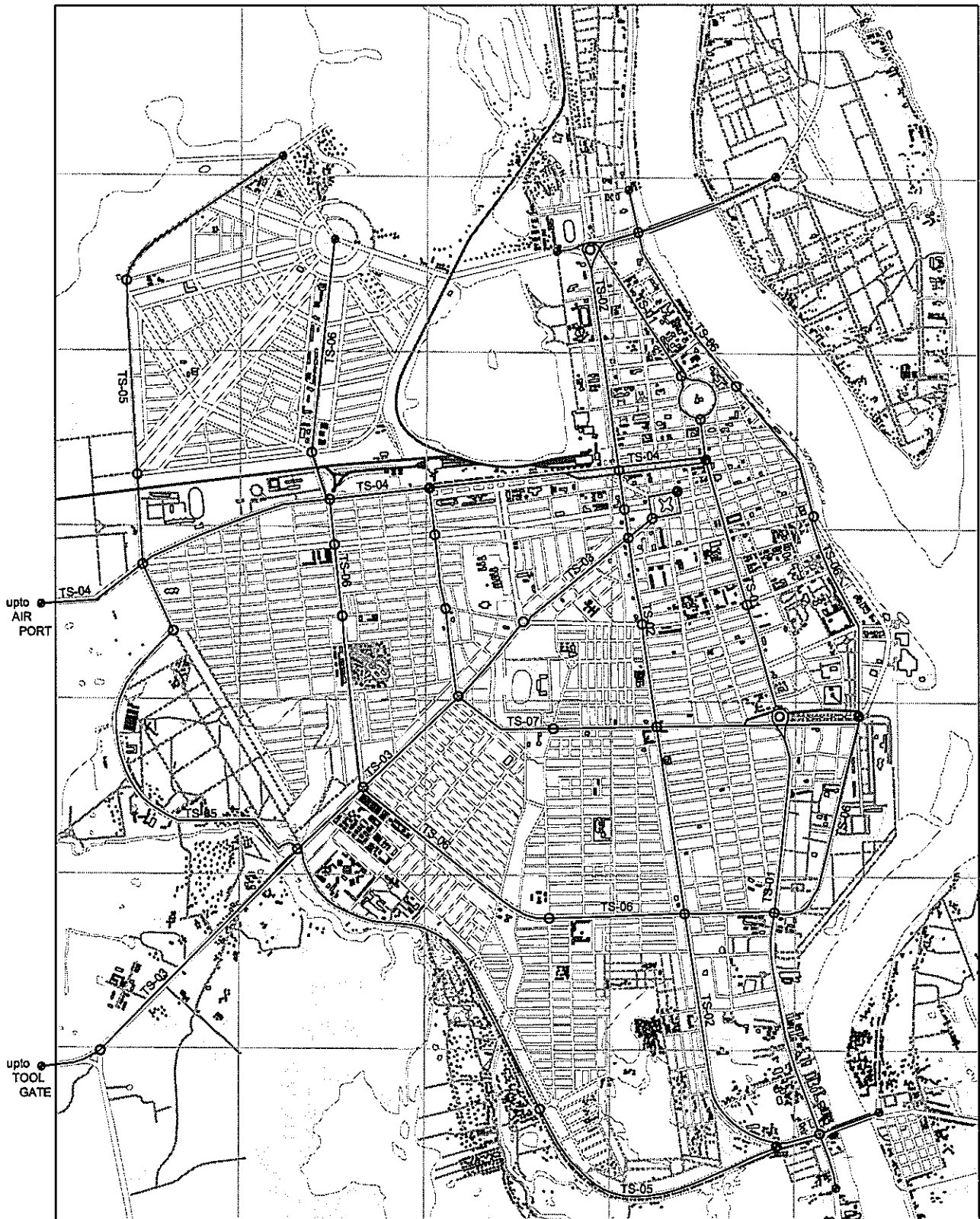


Figure A4.1.2 (b) Traffic Survey Stations in the Study Area (Central Districts)





**LEGEND**

**TRAFFIC SURVEY ROUTES & LOCATIONS**

●—● TS-01 Travel Speed Survey

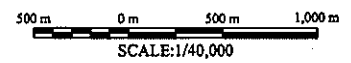
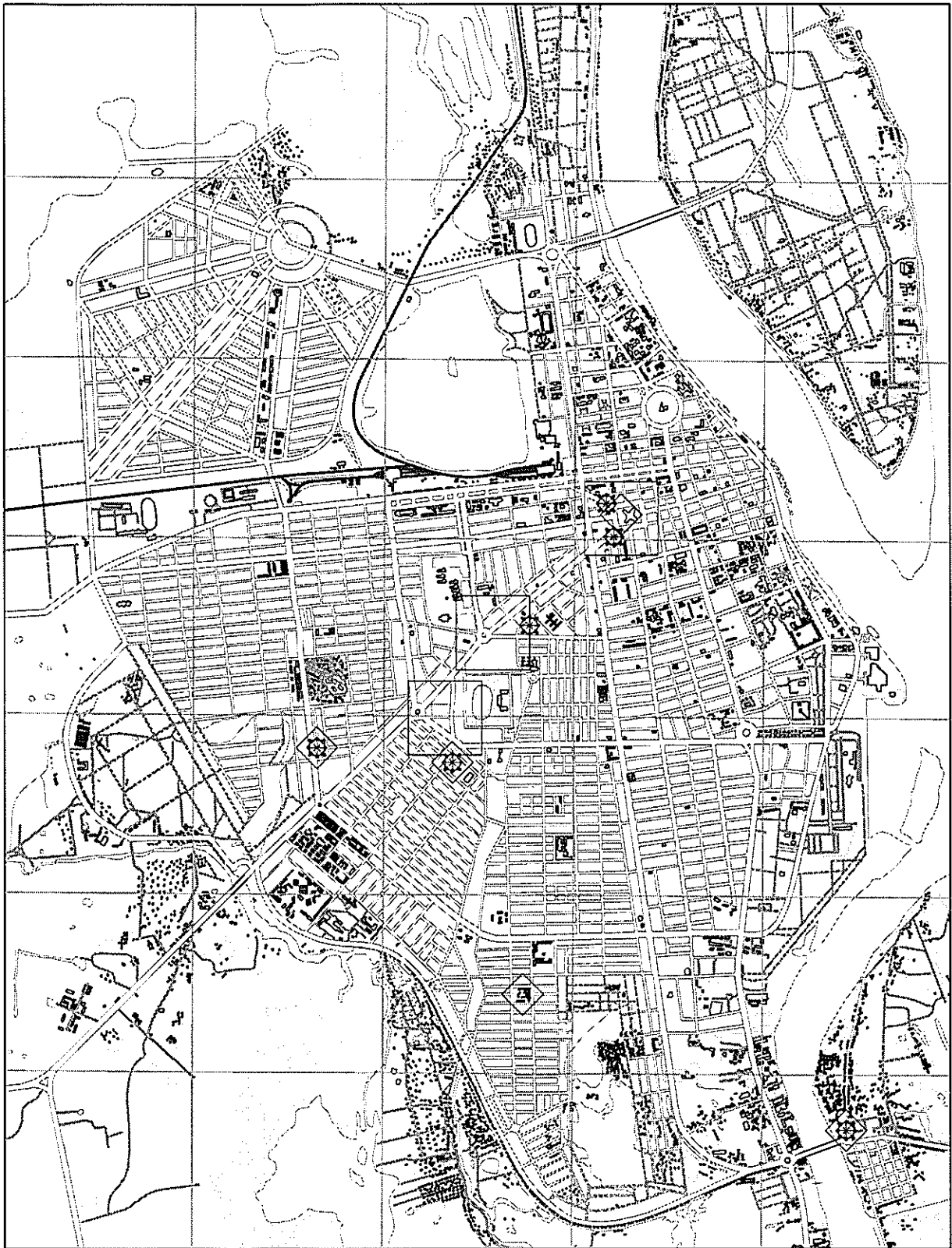


Figure A4.1.2 (c) Traffic Survey Stations in the Study Area (Central Districts)



**LEGEND**

**TRAFFIC SURVEY LOCATION**

- |   |   |   |  |
|---|---|---|--|
|  | Parking Condition Survey                        |  | Taxi-Bus & Para Transit Owner/Driver Interview |
|  | Bus/Taxi-Bus Terminal Traffic Count             |   |  |
|  | Bus/Taxi-Bus & Para Transit Passenger Interview |   |  |

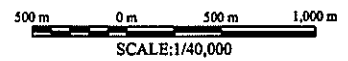


Figure A4.1.2 (d) Traffic Survey Stations in the Study Area (Central Districts)