

## **CHAPTER EIGHT:**

### **PHYSICAL REDEVELOPMENT PLAN**

#### **8.1 LAND USE PLAN**

##### **8.1.1 Land Use Composition**

Policies of Alternative A are adopted in the land use plan. Table 8.1 shows the composition of land use along with building area and floor area after the project. Major characteristics are as follows.

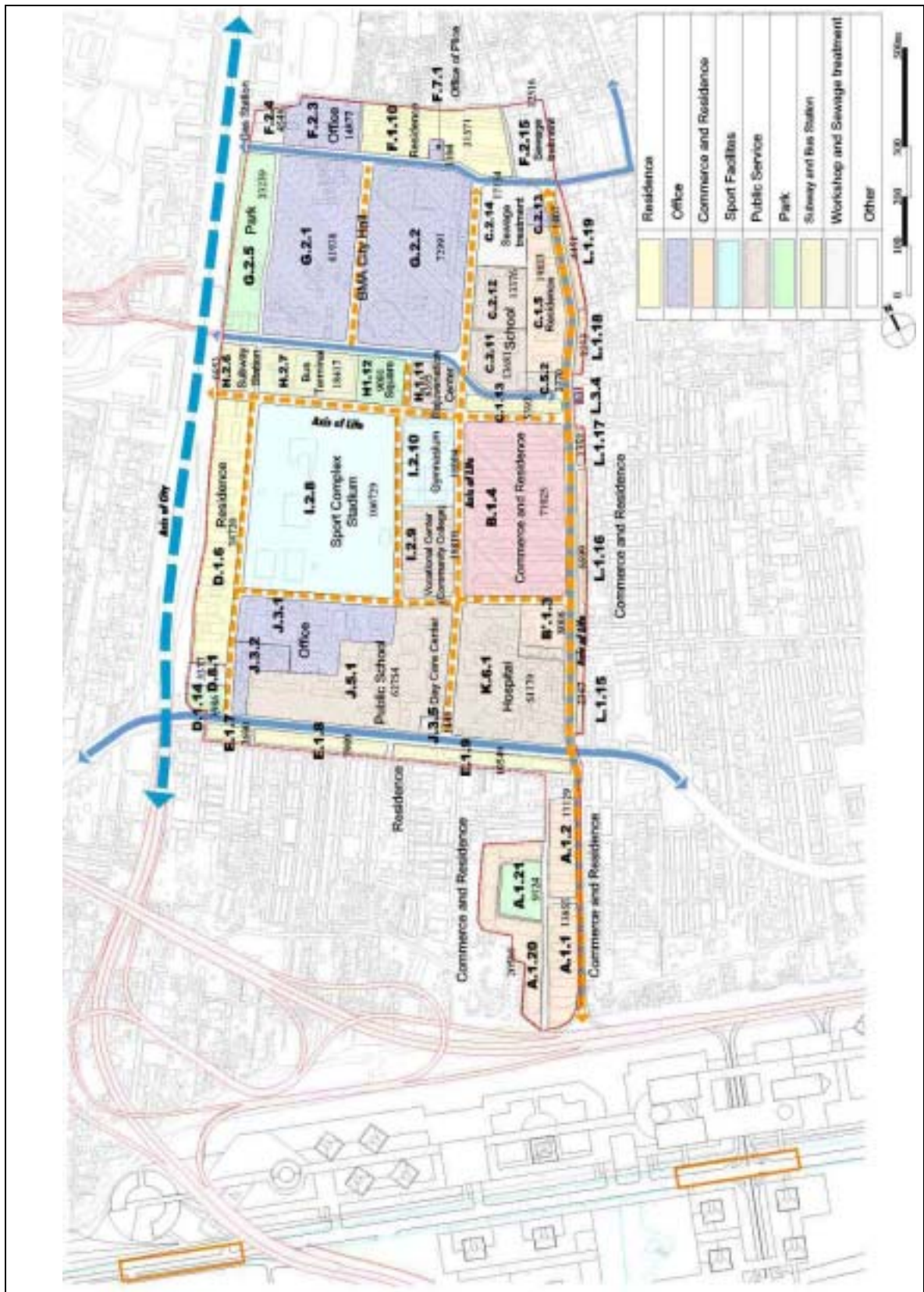
- The floor area ratio after the project will increase from 83% to 169%, though the building coverage ratio is kept similar at 25%.
- The share of public space is improved from 9.6% to 23.1%, as a result of contribution by the related organizations.
- The land for roads becomes twice larger than the existing share.

The land use plan at the full development of the project is shown in the Figure 8.1.

**Table 8.1: Land Use in DC Area at Full Development**

Land Use	Land Area (m <sup>2</sup> )		Building Area (m <sup>2</sup> )	BCR (%)	Floor Area (m <sup>2</sup> )	FAR (%)
<b>1. Total of Building Site</b>	<b>790,877</b>	<b>76.9%</b>	<b>255,335</b>	<b>32.3%</b>	<b>1,741,000</b>	<b>220%</b>
1.1 Residential	120,346	11.7%	42,418	35.2%	305,797	254%
1) Residential Floor					266,677	
2) Car Parking					39,120	
1.2 Office	192,895	18.8%	41,164	21.3%	562,028	291%
1) Office Floor					446,017	
2) Car Parking					116,011	
1.3 Commercial and Residential	142,918	13.9%	83,133	58.2%	714,523	500%
1) Commercial Floor					230,789	
2) Residential Floor					316,127	
3) Public Service					28,559	
4) Car Parking					139,048	
1.4 Sport Facilities	124,733	12.1%	20,533	16.5%	38,998	31%
1.5 Public Service	172,410	16.8%	37,519	21.8%	88,779	51%
1) Public Service	9,840	1.0%	5,136	52.2%	19,316	196%
2) School	111,391	10.8%	22,088	19.8%	48,409	43%
3) Hospital	51,179	5.0%	10,295	20.1%	21,054	41%
1.6 Workshop and Sewage Treatment Plant	34,198	3.3%	30,005	87.7%	30,005	88%
1.7 Others	3,377	0.3%	563	16.7%	870	26%
<b>2. Public Space</b>	<b>237,840</b>	<b>23.1%</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
2.1 Park	45,332	4.4%	-	-	-	-
2.2 Public facilities	25,070	2.4%	-	-	-	-
2.3 Road	167,438	16.3%	-	-	-	-
<b>Total</b>	<b>1,028,717</b>	<b>100.0%</b>	<b>255,335</b>	<b>24.8%</b>	<b>1,741,000</b>	<b>169%</b>

Figure 8.1: Land Use Plan in DC Area at Full Development



## 8.1.2 Land Distribution by User

At the land use planning, efforts are made to keep the difference of the land share (building area) before and after the project around 1% for each party. The land distribution after the project and detailed composition is summarized in Table 8.2.

**Table 8.2: Land Distribution by Users in DC Area in 2011**

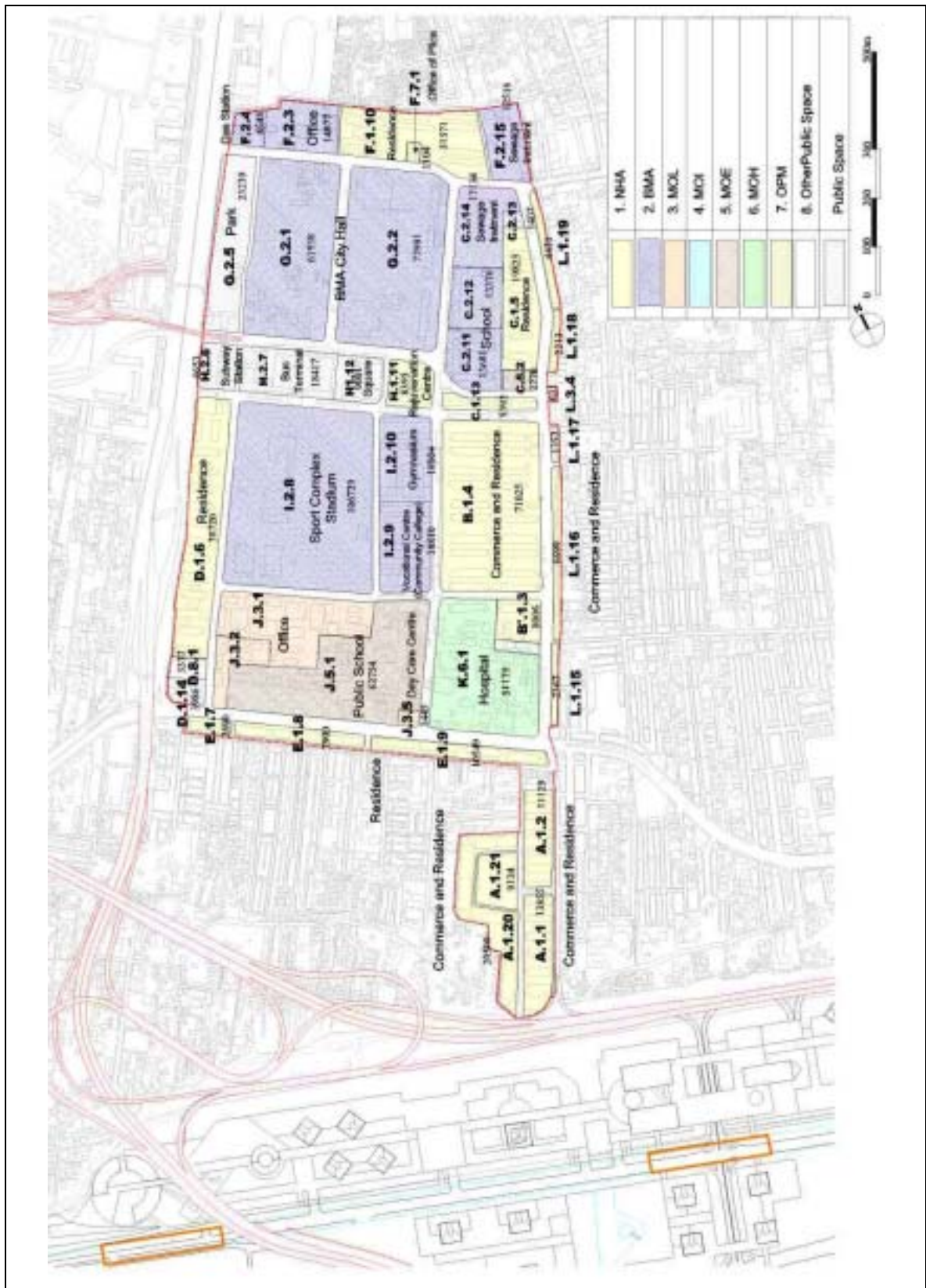
Organizations	NHA				BMA				MOL			
	Existing		Future		Existing		Future		Existing		Future	
Residential	275,483	29.6%	120,346	15.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Office	3,996	0.4%	0	0.0%	210,536	22.6%	151,213	19.1%	36,526	3.9%	40,578	5.1%
Commercial and Residential	48,015	5.2%	142,918	18.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sport Facilities	0	0.0%	0	0.0%	131,263	14.1%	124,733	15.8%	0	0.0%	0	0.0%
Public Service	0	0.0%	8,395	1.1%	51,660	5.6%	45,867	5.8%	10,619	1.1%	1,445	0.2%
1) Public Service	0	0.0%	8,395	1.1%	0	0.0%	0	0.0%	10,619	1.1%	1,445	0.2%
2) School	0	0.0%	0	0.0%	51,660	5.6%	45,867	5.8%	0	0.0%	0	0.0%
3) Hospital	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Workshop and STP	0	0.0%	0	0.0%	37,275	4.0%	34,198	4.3%	0	0.0%	0	0.0%
Other	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Total Building Site</b>	<b>327,494</b>	<b>35.2%</b>	<b>271,659</b>	<b>34.3%</b>	<b>430,734</b>	<b>46.3%</b>	<b>356,011</b>	<b>45.0%</b>	<b>47,145</b>	<b>5.1%</b>	<b>42,023</b>	<b>5.3%</b>
<b>Public Space</b>	0		22,093		18,651		48,309		0		0	
Park	0		22,093		18,651		23,239		0		0	
Public facilities	0		0		0		25,070		0		0	
<b>Total</b>	<b>327,494</b>		<b>293,752</b>		<b>449,385</b>		<b>404,320</b>		<b>47,145</b>		<b>42,023</b>	
Organizations	MOE				MOH				OPM			
	Existing		Future		Existing		Future		Existing		Future	
Residential	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Office	0	0.0%	0	0.0%	0	0.0%	0	0.0%	1,360	0.1%	1,104	0.1%
Commercial and Residential	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Sport Facilities	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Public Service	67,062	7.2%	65,524	8.3%	52,385	5.6%	51,179	6.5%	0	0.0%	0	0.0%
1) Public Service	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
2) School	67,062	7.2%	65,524	8.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
3) Hospital	0	0.0%	0	0.0%	52,385	5.6%	51,179	6.5%	0	0.0%	0	0.0%
Workshop and STP	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Total Building Site</b>	<b>67,062</b>	<b>7.2%</b>	<b>65,524</b>	<b>8.3%</b>	<b>52,385</b>	<b>5.6%</b>	<b>51,179</b>	<b>6.5%</b>	<b>1,360</b>	<b>0.1%</b>	<b>1,104</b>	<b>0.1%</b>
<b>Public Space</b>	0		0		0		0		0		0	
Park	0		0		0		0		0		0	
Public facilities	0		0		0		0		0		0	
<b>Total</b>	<b>67,062</b>		<b>65,524</b>		<b>52,385</b>		<b>51,179</b>		<b>1,360</b>		<b>1,104</b>	

**Table 8.2: Land Distribution by Users in DC Area in 2011 (Continued)**

Organizations	Other				Total			
	Existing		Future		Existing		Future	
Residential	0	0.0%	0	0.0%	275,483	29.6%	120,346	15.2%
Office	0	0.0%	0	0.0%	252,418	27.2%	192,895	24.4%
Commercial and Residential	0	0.0%	0	0.0%	48,015	5.2%	142,918	18.1%
Sport Facilities	0	0.0%	0	0.0%	131,263	14.1%	124,733	15.8%
Public Service	0	0.0%	0	0.0%	181,726	19.5%	172,410	21.8%
1) Public Service	0	0.0%	0	0.0%	10,619	1.1%	9,840	1.2%
2) School	0	0.0%	0	0.0%	118,722	12.8%	111,391	14.1%
3) Hospital	0	0.0%	0	0.0%	52,385	5.6%	51,179	6.5%
Workshop and STP	0	0.0%	0	0.0%	37,275	4.0%	34,198	4.3%
Other	3,377	0.4%	3,377	0.4%	3,377	0.4%	3,377	0.4%
<b>Total Building Site</b>	<b>3,377</b>	<b>0.4%</b>	<b>3,377</b>	<b>0.4%</b>	<b>929,557</b>	<b>100.0%</b>	<b>790,877</b>	<b>100.0%</b>
<b>Public Space</b>	0		0		99,160		237,840	
Park	0		0		18,651		45,332	
Public facilities	0		0		0		25,070	
Road					80,509		167,438	
<b>Total</b>	<b>3,377</b>		<b>3,377</b>		<b>1,028,717</b>		<b>1,028,717</b>	

Remarks: Public service facilities include local community rejuvenation centers, welfare centers, and medical care facilities.

Figure 8.2: Land Distribution by Users



## **8.2 BUILDING LAYOUT PLAN**

### **8.2.1 Building Facilities**

The total floor area after project completion is planned to be 1,741,000 m<sup>2</sup>. Criteria for planning of major buildings are mentioned below:

- Total residential floor area is approximately 580,000m<sup>2</sup> to accommodate 8,761 households or 91% of forecasted housing needs;
- Commercial floor area is 230,800 m<sup>2</sup>, equivalent to 82% of forecasted floor demand;
- Additional office floor area is 358,600 m<sup>2</sup>, while additional floor demand is assumed to be 405,000 m<sup>2</sup>;
- Public service facilities are provided with 47,875 m<sup>2</sup> for local community rejuvenation center, welfare centers, primary school (expansion), vocational center (renewal), and medical care facilities; and
- Total land allocation for transport is 2.5 ha for mass transit system such as Orange Line, station plaza, and bus terminal.

Details are presented in Table 8.3. The building plan and a perspective view are presented in Figures 8.3 and 8.4.

**Table 8.3: Building Facilities by Blocks**

Use	Block						
	A	B	C	D	E	F	G
Residential	154,750	50,000	104,192	124,260	45,000	69,930	0
Commercial	15,686	200,000	6,145	0	0	0	0
Office	0	0	2,012	0	0	4,819	422,589
Public Service	8,691	0	14,003	0	0	0	0
School	0	0	20,615	0	0	0	0
Sport Facilities	0	0	0	0	0	0	0
Hospital	0	0	0	0	0	0	0
Workshop & STP	0	0	17,134	0	0	12,871	0
Other	0	0	0	870	0	0	0
Car Parking	12,370	104,167	13,910	39,120	0	0	116,011
Total Floor Area	191,497	354,167	178,011	164,250	45,000	87,620	538,600
Building Area	21,036	51,200	34,137	13,563	9,018	30,051	28,361
Land Area	55,337	71,205	77,284	46,065	21,139	64,616	158,168
BCR	38%	72%	44%	29%	43%	47%	18%
FAR	346%	497%	230%	357%	213%	136%	341%
Use	Block						Total
	H	I	J	K	B'	L	
Residential	0	0	0	0	18,145	16,527	582,804
Commercial	0	0	0	0	4,816	4,142	230,789
Office	0	0	16,597	0	0	0	446,017
Public Service	18,640	0	676	0	5,865	0	47,875
School	0	8,940	18,854	0	0	0	48,409
Sport Facilities	0	38,998	0	0	0	0	38,998
Hospital	0	0	0	21,054	0	0	21,054
Workshop & STP	0	0	0	0	0	0	30,005
Other	0	0	0	0	0	0	870
Car Parking	0	0	0	0	8,601	0	294,179
Total Floor Area	18,640	47,938	36,127	21,054	37,427	20,669	1,741,000
Building Area	4,460	24,701	17,616	10,295	3,997	6,900	255,335
Land Area	42,466	143,543	104,146	51,179	8,418	17,713	861,279
BCR	11%	17%	17%	20%	47%	39%	30%
FAR	44%	33%	35%	41%	445%	117%	202%



Figure 8.3: Building Layout at Full Development



**Figure 8.4: Perspective View after the Redevelopment**



## 8.2.2 Housing Facilities in NHA Portion

### (1) Provision of Housing Facilities

The total number of housing units will be 8,761 combining 4,955 new units and 3,806 units existing. While the total floor area for housing use is increased from 543,355 m<sup>2</sup> to 582,804 m<sup>2</sup>, the total number of housing units is slightly decreased from the existing 9,012 units as a result of improvement in the living environment.

The standard size of the typical unit is set at 40m<sup>2</sup> for households with four family members. The size of housing units has been determined based on the request by the existing residents, as well as close consultation with NHA.

**Table 8.4: Comparison of Number of Housing Units**

Planned Units			Existing Units		The NHA Master Plan			
Block	Existing Units to be used	New Units	Block	Units				
A.1.1	-	651	1.4	672	<ul style="list-style-type: none"> <li>• 7,212 for existing residents</li> <li>• 6,330 for new residents</li> </ul>			
A.1.2	-	740						
A.1.20	952	-	1.13	952				
B.1.4	-	544	1.2	1,776				
			1.9	352				
C.1.5	-	1,228	1.6	384				
C.1.13	308	-	1.12	308				
D.1.6	-	1,488	1.3	672				
E.1.7	80	-	1.5	640				
						E.1.8	240	-
						E.1.9	320	-
F.1.10	1,242	-	1.11	972				
			1.14	270				
K.1.3	-	304	-	-				
L.1.15	133	-	1.10	664				
L.1.16	266	-						
L.1.17	66	-						
L.1.18	66	-						
L.1.19	133	-						
Sub-total	<b>3,806</b>	<b>4,955</b>						
<b>Total</b>		<b>8,761</b>			<b>13,542</b>			

Note: Housings in Block 1.7 (900 units) and 1.8 (450 units) are redeveloped for the vocational center in Block 1.2.9 and the gymnasium in Block 1.2.10.

Table 8.5 presents the component of housing units by Blocks. A brief description follows. The new housing facilities are planned to have more than 15 stories, because of efficient land use with secured open spaces.

**Table 8.5: Provision of Housing**

Zone	Unit Size (m <sup>2</sup> )	Number of Units	Stories	Floor (m <sup>2</sup> )	No. of Parking
<b>New Units</b>		<b>4,955</b>			
A.1.1	41.25	576	20	27,867	378
	54.76	75			
	(Total)	651			
A.1.2	41.25	740		30,525	0
B	72.00	544		50,000	417
C.1.5	41.00	1,228		76,705	
C.1.13		308	8	27,487	0
D	55.00	1,488		124,260	118
K	41.25	304	19	12,540	244
<b>Existing</b>		<b>3,806</b>			
A.1.20		952	8		
E	41.00	640	5	36,089	0
F	37.00	1,242	5	48,667	0
L	41.00	664	5	16,527	0
<b>Total</b>		<b>8,761</b>			

## (2) Housing Units by Zones

### 1) Zones A, B' and C (for Returning Residents)

Two types of housing units are designed for middle and higher income households, with 33-45m<sup>2</sup> and 50m<sup>2</sup> floor areas respectively. The standard floor plan is depicted for each type of units in Figure 8.5.

### 2) Zones D (for New Residents)

Apartment buildings target the middle income group. The buildings therefore adopt a tower-like layout to make them suitable for the high-rise development. The standard floor plan is presented in Figure 8.6.

### 3) Zone E & F (for Returning Low-income Households)

Types of existing housing units here are two, having 36.9m<sup>2</sup> and 40.6m<sup>2</sup> (including balcony) floor area. No renovation will be exercised here in principle, except some minor refurbishment such as installing handrails in lavatory or bathroom in

housing units. External common facilities will be provided such as a corridor or a staircase.

Figure 8.5: Standard Floor Plans (Type B)

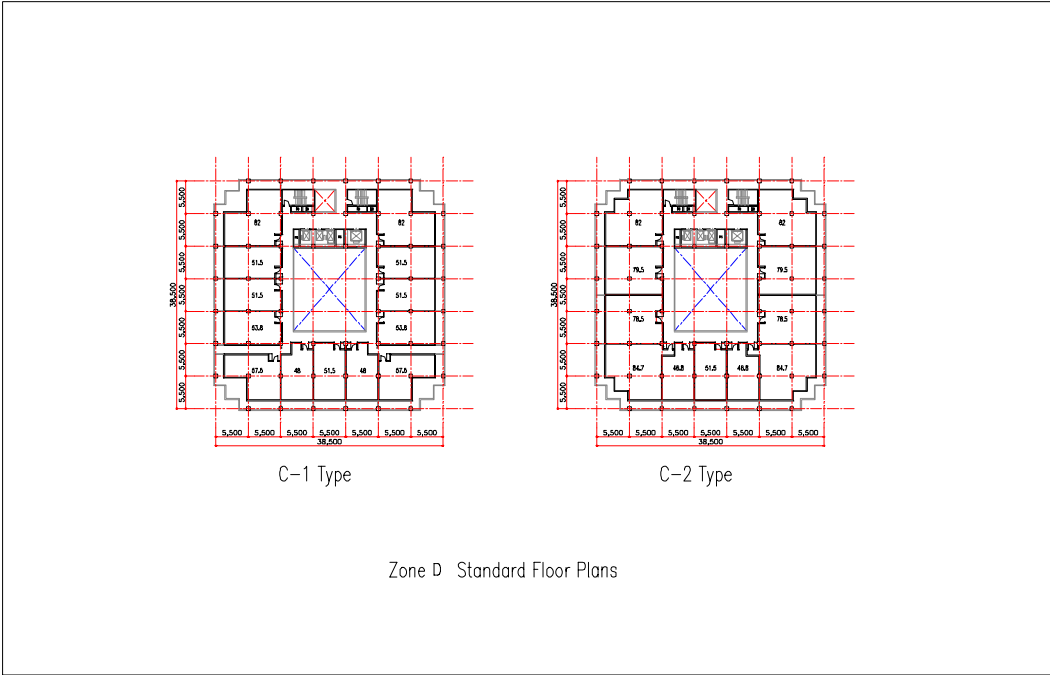
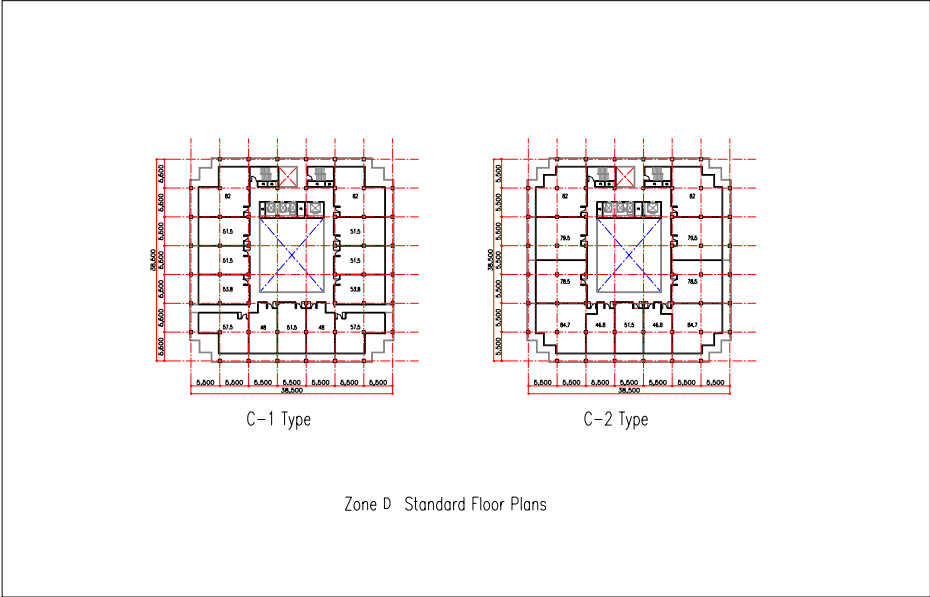


Figure 8.6: Standard Floor Plans (Type C)



### **(3) Plan of Housing Units**

According to the social survey, the attitude of existing residents for new housing unit size varies as 21% for less than 30 m<sup>2</sup>/unit, 28% for 31 - 40 m<sup>2</sup>, and 22% for 41-50 m<sup>2</sup>.

Furthermore, taking subsidy from the central government to housing facilities with units for low income households and with the area less than 30m<sup>2</sup> into consideration, the Study has examined three types of basic housing units, focusing on the existing residents. Those units are named Type As and have areas of 30 m<sup>2</sup>, 31.5 m<sup>2</sup>, and 39 m<sup>2</sup>.

In addition to these, the Study has planned other basic units, named Type Bs and D, which would appeal to newcomers and to existing residents anxious for changes to the living environment and expectation for living environmental improvement. Areas of Type Bs and D vary from 30 to 55.25 m<sup>2</sup>.

As a result, basic units consist of eight types, which should be consulted to select appropriate types for each Block, depending on the proportion of returning residents and new residents.

Apart from these circumstances, the basic unit plans have adopted the following criteria:

- Allocating water places at the balcony sides for the low-rise facilities (TypeA), while units for high-rise buildings have the water places at the corridor sides; and
- Allocating the bedrooms for units more than 30 m<sup>2</sup>.

The description of these basic units are presented in the following tables:

**Table 8.6: Structure of Basic Housing Units**

Items		Type-A			Type-B, C, and D				
		A	A+1	A+2	B	C+1	C+2	C+3	D+2
Room Size	(m <sup>2</sup> )	30	31.5	39	30	42	56.5	64	55.25
Room Type	No. of bedrooms	Multi	1	2	Multi	1	2	3	2
Family Type	Single								
	Young Couple								
	Family with baby								
	Family with child (School age)								
	Family with adult								
Grade	Low cost (Low-income)								
	Standard (Medium income)								
	Luxury (High income)								
Floor-rise	Low-rise								
	Medium-rise								
	High-rise								
Building Type	Single –corridor								
	Center corridor								
	Double corridor								
	Tower								
Layout	Center room								
	Corer room								
Structure	RC								
	Post Tension								



Figure 8.7: Plans of Basic Housing Units (continued)

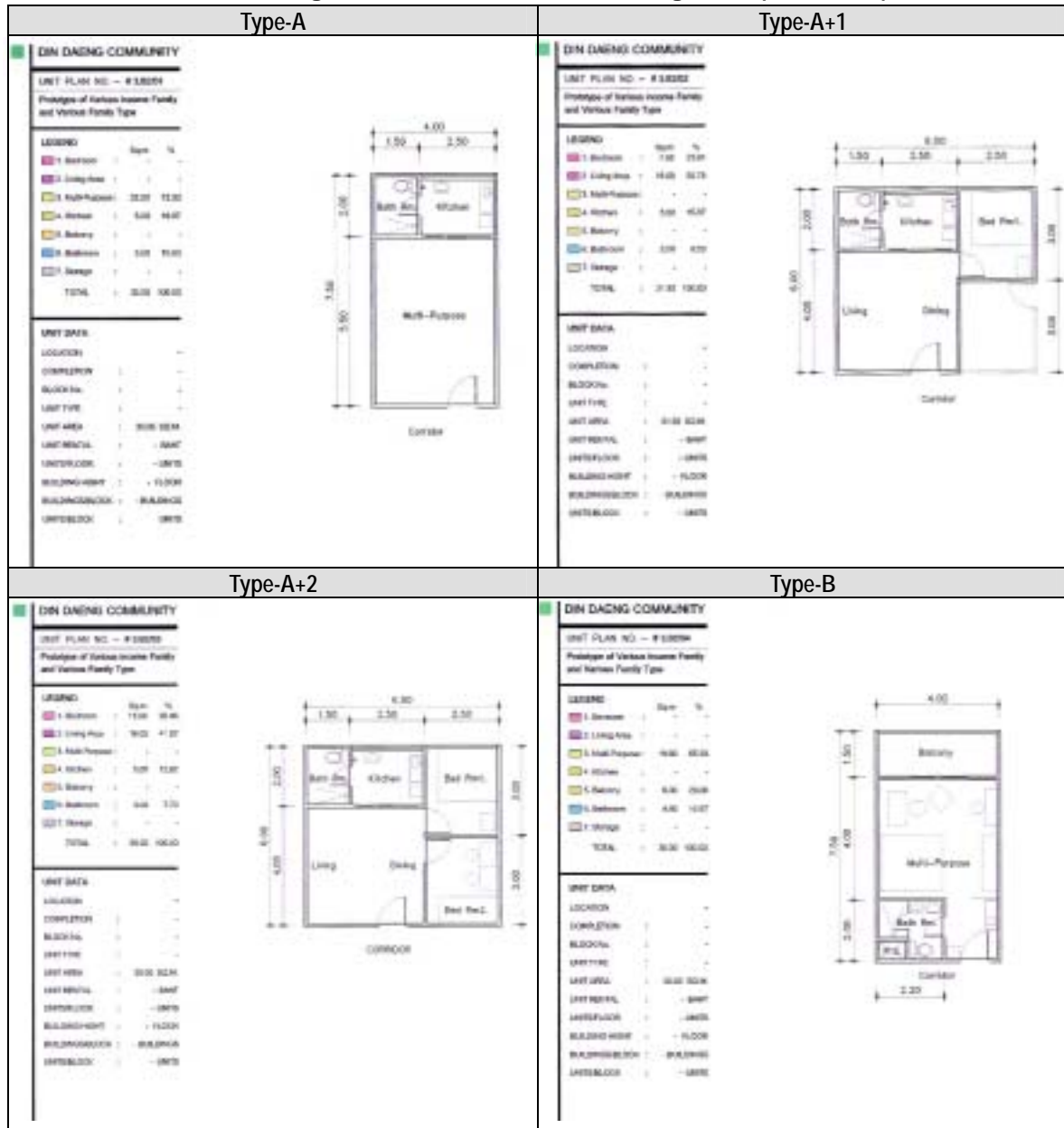
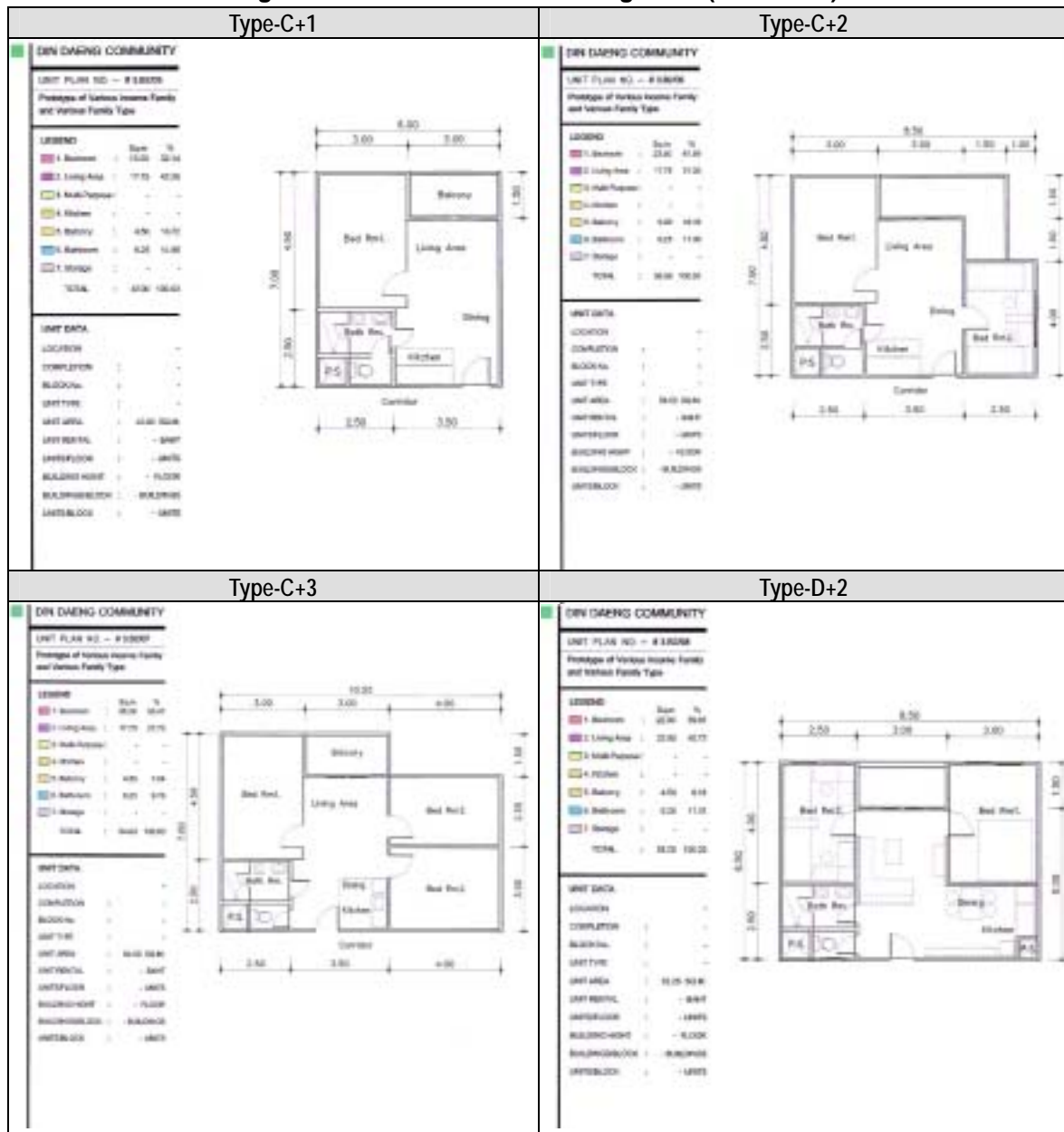




Figure 8.7: Plans of Basic Housing Units (continued)



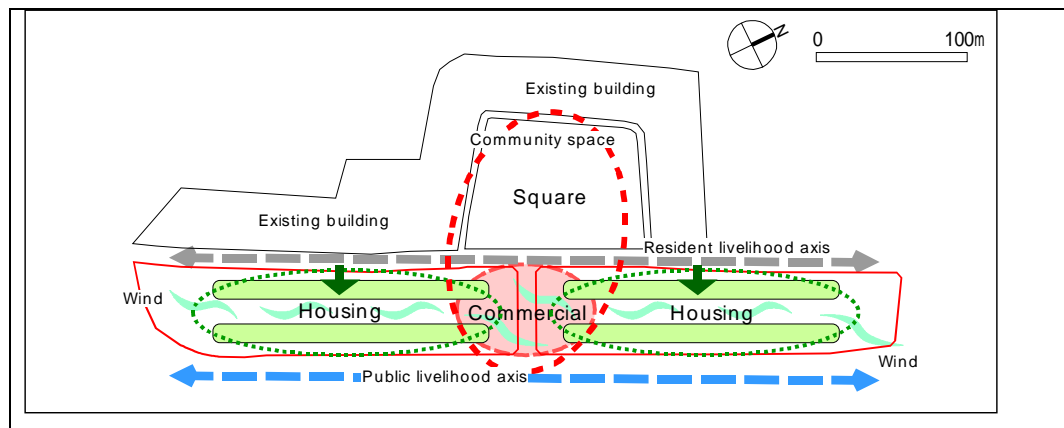
### 8.2.3 Building Layout Plan by Zone

#### (1) Zone A

This place will eventually be a connection point between Din Daeng Community and Makkasan development area with elevated pedestrian decks. A livable residential districts will be formed here by introducing residences for low-middle income population which are accompanied with small-medium scale commercial service functions and various service facilities catering to the residents.

- The west side road of the block will be designated as a livelihood axis for the residents providing access to the buildings. On the other hand, the east side road will be designated as public livelihood axis, which offers access movement line to Makkasan area.
- There will be small-medium scale commercial service facilities and street vendors surrounding the existing square, which, along with abundant greenery, will render it a lively living space.
- First floor will be a piloti where street stalls can provide daily livelihood services.

Figure 8.8: Spatial Concept in Zone A



Major frameworks of Zone A are tabulated in Table 8.7.

**Table 8.7: Major Framework of Zone A**

Items	Block				Total
	A.1.1	A.1.2	A.1.20*1	A.1.21*1	
Land Use	Residential & Commerce	Residential & Commerce	Residential & Commerce	Park	
Land Area (m <sup>2</sup> )	14,584	11,129	20,500	9,124	55,337
Building Area (m <sup>2</sup> )	5,958	4,000	11,078	0	21,036
Floor Area (m <sup>2</sup> )	67,893	34,360	89,244	0	191,497
Residential	43,062	33,600	78,088	0	154,750
Commercial	3,770	760	11,156	0	15,686
Public Service	8,691	0	0	0	8,691
Parking	12,370	0	0	0	12,370
BCR (%)	41	36	54	0	38
FAR (%)	466	309	435	0	346
Housing Unit (unit)	651	740	952	0	2,343
Population (person)					
Residents	2,213	2,516	3,237	0	7,966
Employee*2	251	51	744	0	1,046
Visitor*3	918	185	2,717	0	3,820
Parking	399	-	-	-	399

Note: \*1 Scale of facilities follows existing condition, as those A.1.20 and A.1.21 are not reconstructed.

\*2 Employee of commercial area is based on 15m<sup>2</sup>/employee.

\*3 Number of commercial visitors is calculated by distributing total 55,200 visitors.

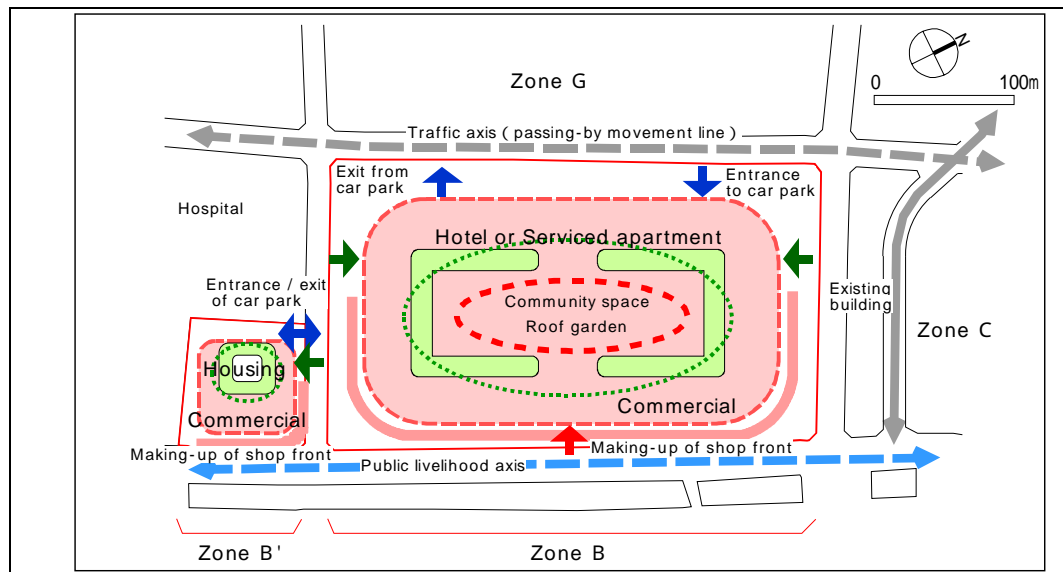
### (1) Zone B

Composite urban functions will be created here by combining commercial, residential, lodging, and business functions around a large scale commercial establishment as a core. The place will be endowed with cultural and entertainment quality in relation with the use of open space in the surroundings.

- Accumulation of modern Thai culture will be attempted centering around the shopping center. For instance, fashion design shops specialized in indigenous Thai textiles, chic craftworks shops from Southeast Asia, which are popular among foreign tourists, restaurants, food courts, street vendors are the examples of such.
- In the adjoining square, flea markets, street live shows and the like will be held on holidays. It will be a social gathering place for young students from the students' quarter in the vicinity.
- There will be apartment houses, serviced apartments or hotels in the upper part of the shopping center rendering residential spaces for middle-high income population or foreign businessmen. This place will also be a residential quarter catering to a high income population or retired foreigners due to advantageous location of being close to the city center.

- The housing section will be put above the car park over the commercial complex. The roof of the car park will be made a roof garden with greenery, which will separate the commercial activities from the residential space, and at the same time creating a community space.
- The entrance to the car park will be placed on the rear side road of the building to avoid conflict with traffic Pracha Songkhro road, concurrently enabling the good façade making- up for the shops.

Figure 8.9: Spatial Concept in Zone B and Zone B'



### (3) Zone B'

The building will be configured in podium and tower, housing commercial facility in the podium and apartments in the tower. The latter will be a high rise (6-22 storeys) producing a FAR of 500%. This block is expected to form a core of livelihood commercial facilities combined with those in Zone B in the whole D C Area.

The major framework of Zone B and B' is tabulated in Table 8.8.

**Table 8.8: Major Framework of Zone B**

Items	Zone B	Zone B'
Land Use	Residential & Commerce	Residential & Commerce
Land Area (m <sup>2</sup> )	71,205	8,418
Building Area (m <sup>2</sup> )	51,200	3,997
Floor Area (m <sup>2</sup> )	354,167	37,427
Residential	50,000	18,145
Commercial	20,000	4,816
Parking	104,167	8,601
Public Service		
BCR (%)	72	47
FAR (%)	497	445
Housing Unit (unit)	544	304
Population (person)		
Resident	1,850	1,034
Employee	13,333	
Visitor	48,710	
Parking	-	244

#### (4) Zone C

The southern half of this block is to be redeveloped earlier in the Case Study Plan. Car park will be provided in the lower floors.

This place will be developed as residential district for low-middle income population, maintaining the existing schools and the central sewage treatment plant. Its living environment will be upgraded by introduction of small-medium commercial facilities and community oriented service facilities. Open spaces will be preserved as much as possible keeping harmony with the schools.

- In block C.1.5, open spaces full of trees will be developed along Pracha Songkhro road, where popular livelihood space will be formed with a number of street vendors. Passages running through the block used by school children to the schools behind the block will be maintained.
- This place will be isolated from the commercial facilities in the adjoining Zone-B by existing residential block C.1.13 and from the block of new city hall of BMA by the existing schools.
- The housing unit will have a slightly larger floor area than that of Zone A, housed in a medium-rise building. Car parking will be provided on the lower floors.
- The building feature will consist of two types; one plate-like and the other tower-like buildings. In the latter building, special provisions will be provided;

spacing of columns will be made suitable for re-modeling housing by combining two units to one and location of piping and wiring shafts will be arranged not to obstruct this modification.

Figure 8.10: Spatial Concept in Zone C

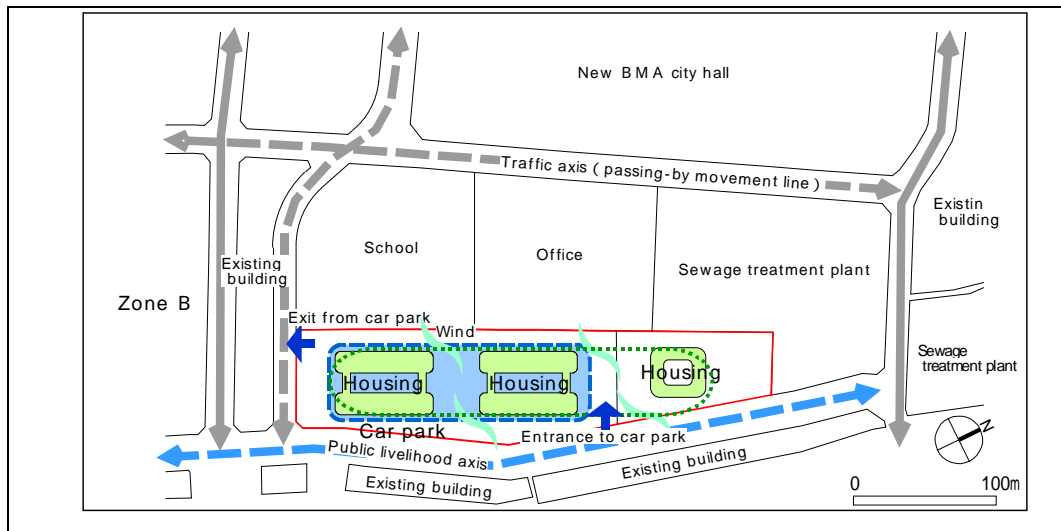


Table 8.9: Major Framework of Zone C

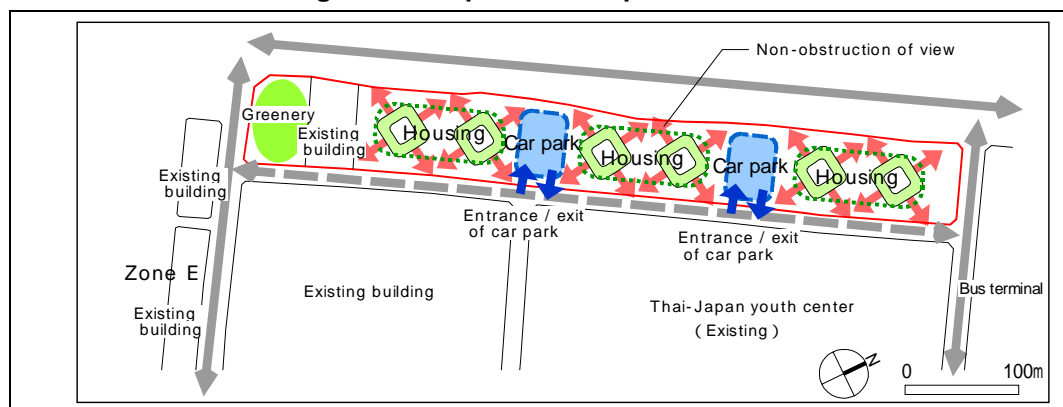
Items	Block							Total	
	C.1.5	C.1.13	C.2.11	C.2.12	C.2.13	C.2.14	C.5.2		
Land Use	Residence	Residence	Public School (Vichakorn)	Public School (Wichutil)	Office	STP	Private School (Samakeebumrungruittaya)		
Land Area (m <sup>2</sup> )	23,524	5,392	13,601	13,376	1,407	17,134	2,770	77,284	
Building Area (m <sup>2</sup> )	6,690	1,902	5,194	1,665	674	17,134	878	34,137	
Floor Area (m <sup>2</sup> )	354,167	27,487	13,966	5,582	2,012	14,134	1,067	178,011	
	Residential	76,705	27,487	0	0	0	-	0	104,192
	Commercial	6,145	0	0	0	0	-	0	6,145
	Office	0	0	0	0	0	-	0	2,012
	Public Service	14,003	0	0	0	0	-	0	14,003
	School	0	0	13,966	5,582	0	-	1,067	20,615
	Other	0	0	0	0	0	17,134	0	17,134
	Parking	13,910	0	0	0	0	-	0	13,910
BCR (%)	28	35	38	12	48	100	32	44	
FAR (%)	471	510	102	42	143	-	39	230	
Housing Unit (unit)	1,228	308	0	0	0	0	0	1,536	
Population (person)									
	Residents	4,175	1,047	0	0	0	0	5,222	
	Employee	0	0	154	153	60	56	423	
	Visitor	6,145	0	0	0	0	0	6,145	
	Students	0	0	1,751	1,952	0	0	3,973	
Parking	599	-	-	-	-	-	-	599	

### (5) Zone D

To create a high grade residential district here with high-rise residential buildings for middle income population. Also provided is a green strip along Vibhavadi Rangsit road to ward off traffic noise.

- This Zone will be developed as a residential district targeted at families of child-rearing generation (30 – 40 years of age) and earning middle-high income since it is conveniently situated for commuting to work places and schools. Residential buildings will be high-rise surrounded with open space and greenery along Vibhavadi Rangsit road acting as a buffer against against the bustle of the road. In the rear side, Thai-Japan Youth Center is providing recreational opportunity. As a consequence, this place is offering an ideal environment for inner city residences owing to its proximity to the shopping center and transport stations.
- The set back line imposed by the road on the east will govern the height of buildings (20 storeys).
- A car park will be provided in a separate building from the viewpoint of efficient circulation.
- The building feature will be tower like, each oblique against the road axis to avoid direct sight lines among the residences.

Figure 8.11: Spatial Concept in Zone D



**Table 8.10: Major Framework of Zone D**

Item	Block			Total
	D.1.14	D.1.6	D.8.1	
Land Use	Park	Residence	Mosque	-
Land Area (m <sup>2</sup> )	3,968	38,720	3,377	46,065
Building Area (m <sup>2</sup> )	0	13,000	563	13,563
Floor Area (m <sup>2</sup> )	0	163,380	870	164,250
Residential	0	124,260	0	124,260
Other	0	0	870	870
Parking	0	39,120	0	39,120
BCR (%)	0	34	17	29
FAR (%)	0	422	26	357
Housing Unit (unit)	0	1,488	0	1,488
Population (person)				
Resident	-	5,059	-	5,059
Visitor	-	-	87	87
Parking	-	1,420	-	1,420

## (6) Zone E

To provide residences for lowest income population who can not afford rent hike, by refurbishing existing residential buildings. This place will eventually be redeveloped upon improvement of livelihood of this population.

Framework of Zone E follows existing conditions as tabulated below.

**Table 8.11: Major Framework of Zone E**

Item	Block			Total
	E.1.7	E.1.8	E.1.9	
Land Area (m <sup>2</sup> )	2,690	7,900	10,549	21,139
Building Area (m <sup>2</sup> )	1,127	3,383	4,508	9,018
Floor Area (m <sup>2</sup> )	5,625	16,875	22,500	45,000
Residential	5,625	16,875	22,500	45,000
BCR (%)	42	43	43	43
FAR (%)	209	214	213	213
Housing Unit (unit)	80	240	320	640
Population (person)	272	816	1,088	2,176
Resident	272	816	1,088	2,176

## (7) Zone F

Refurbishing of existing residential buildings in block F.1.10 will provide residences for lowest income population who cannot afford a rent hike. This place will eventually be redeveloped upon improvement of livelihood of this population.



Blocks F.2.3 and F.2.4 of BMA will also be subject to redevelopment in the future building residences and welfare facilities for BMA employees.

Major framework of Zone F follows existing conditions.

**Table 8.12: Major Framework of Zone F**

Item	Block					Total
	F.1.10	F.2.3	F.2.4	F.2.15	F.7.1	
Land Use	Residence	Construction Center	Gas Station	STP	Police Station	
Land Area (m <sup>2</sup> )	31,571	14,877	4,548	12,516	1,104	64,616
Building Area (m <sup>2</sup> )	11,808	4,872	715	12,516	500	30,051
Floor Area (m <sup>2</sup> )	69,930	4,819	715	12,516	500	87,620
	Residential	0	0	0	0	69,930
	Office	-	4,819	0	500	4,819
	Other	0	0	715	12,516	12,871
BCR (%)	37	33	16	97	45	47
FAR (%)	222	29	16	97	45	136
Housing Unit (unit)	1,242	-	-	-	-	1,242
Population (person)						
	Resident	4,223	0	0	0	4,223
	Employee	0	1,474	20	56	1,774

### (8) Zone G

To form an administrative district of Bangkok Metropolitan Area centering around the new city hall.

- This place is the site for the new city hall of BMA. On the front side (west) of the site, a green belt is stretching from Zone-D in the south along Vibhavadi Rangsit road. Looking from Vibhavadi Rangsit, the city hall will tower above green open space.
- The Zone is spacious with lot of open space. It is merging with the “Symbol Promenade” in public facility zone in Zone H across the road on the south, comprising transport square, bus terminal, and community rejuvenation center. Lively atmosphere will be diffusing from there to this Zone.

**Table 8.13: Major Framework of Zone G**

Item	Block			Total
	G.2.1	G.2.2	G.2.5	
Land Use	City Hall	City Hall	Park	-
Land Area (m <sup>2</sup> )	61,398	72,991	23,239	158,168
Building Area (m <sup>2</sup> )	16,700	11,661	-	28,361
Floor Area (m <sup>2</sup> )	474,610	63,990	-	538,600
Office	358,599	63,990	-	422,589
Parking	116,011	0	-	116,011
BCR (%)	27	16	-	18
FAR (%)	766	88	-	341
Population	32,000 employees		9 employees	32,009
Parking	2,300	-	-	-

### **(9) Zone H (Transitional Block)**

Here will be a MRT station and a bus terminal. Consequently the existing school will be relocated to Zone C.

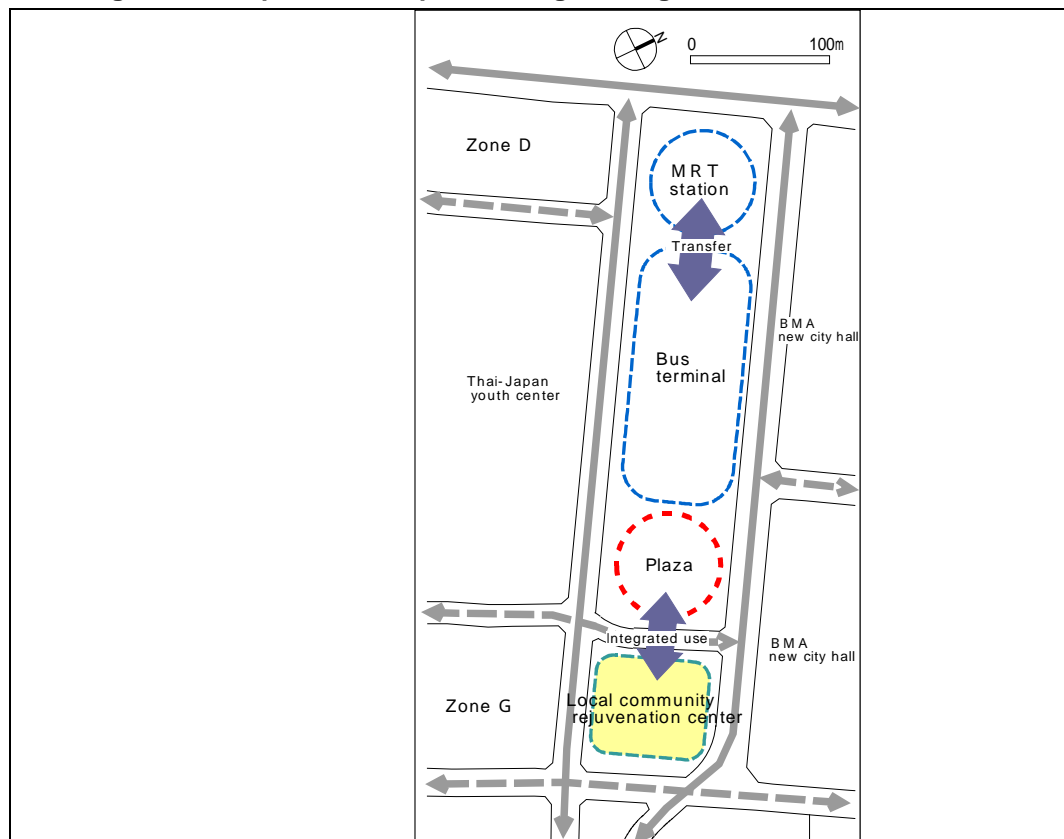
This place will offer intra-modal exchange raising efficiency of public transport. On the east side of the block, there will be a local community rejuvenation center, which will be functionally combined with the public plaza on the west, rendering a space to vitalize community activities.

- To form a wide axial public space “Symbol Promenade” here in a wide 100m strip as representing an urban skeleton and unique character of the Din Daeng Community.
- The “Symbol Promenade” is composed of open space with pond/stream and greenery, and public transport facility block and will be acting as fusing zone combining the surrounding facilities, the new city hall of BMA, sports facility and shopping center.
- The local community rejuvenation center will be the place to form and activate the local community. Attractive and unique shops, that cannot afford high floor rents in the large shopping centers, such as art gallery, craft work shop, do-it-yourself goods shop (e.g. Tokyu Hands in Japan), experimental shop of young designer, small restaurant popular among local community, and street vender village. will be systematically invited at an incentive floor rent (but with a time limit) to contribute to form an important town element. Upper floors can be used for a variety of community activities such as meeting rooms of different sizes for gatherings, community activities and seminars for entrepreneurship.
- The square will be the place for various outdoor events. Service facilities to

support the events will be furnished here. Flea markets, street live shows and the like will be some of the typical free activities.

- The public transport facilities block will be a terminal of public bus systems. It will link Din Daeng Community with the central part of Bangkok and be the hub of the district transport network.

**Figure 8.12: Spatial Concept and Image Collage in Transitional Block H**



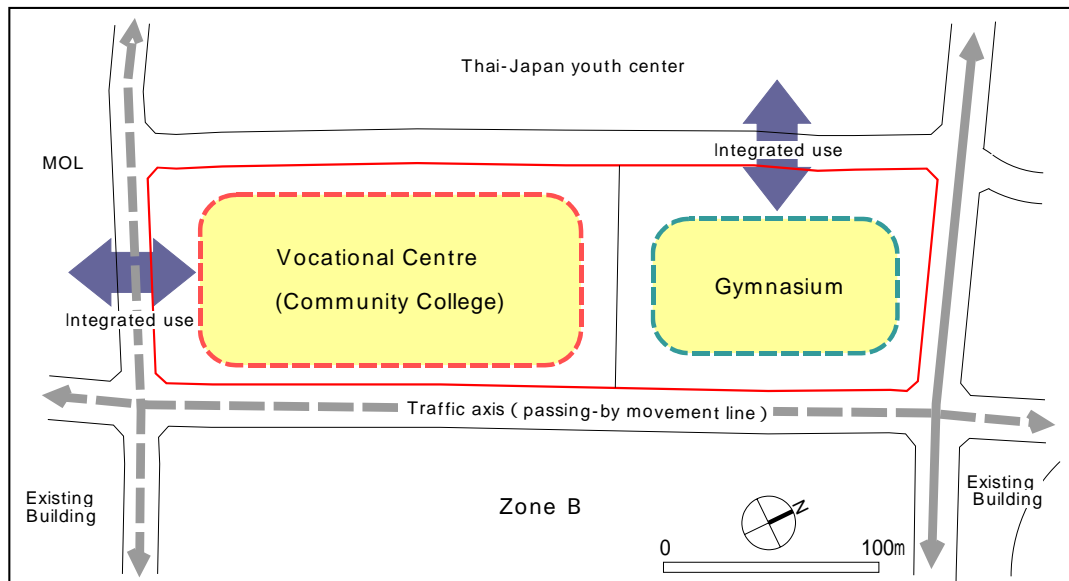
**Table 8.14: Major Framework of Zone H**

Items	Block				Total
	H.2.6	H.2.7	H.1.12	H.1.11	
Land Use	Subway Stations	Bus Terminal	Park	Rejuvenation Center	-
Land Area (m <sup>2</sup> )	6,653	18,417	9,001	8,395	42,466
Building Area (m <sup>2</sup> )	-	-	-	4,460	4,460
Floor Area (m <sup>2</sup> )	-	-	-	18,640	18,640
Public Service	-	-	-	18,640	18,640
BCR (%)	-	-	-	53	10
FAR (%)	-	-	-	222	43

**(10) Zone I**

This zone will be developed as a sports and cultural activity center for all of Bangkok’s citizens centering around the Thai-Japan Youth Center and by relocating a vocational school of BMA at block C.2.12 to block I.2.9 (utilizing the vocational school in C.2.12 as a public school (Vichakorn primary school) located in blocks H.1.11 and H.1.12)

**Figure 8.13: Spatial Concept in Transitional Block I**



**Table 8.15: Major Framework of Zone I**

Item	Block			Total
	I.2.8	I.2.9	I.2.10	
Land Use	Thai-Japan Youth Center	Vocational Center	Gymnasium	-
Land Area (m <sup>2</sup> )	106,729	18,810	18,004	143,543
Building Area (m <sup>2</sup> )	11,533	4,168	9,000	24,701
Floor Area (m <sup>2</sup> )	20,998	8,940	18,000	47,938
	School	8,940	-	8,940
	Other	0	18,000 (gymnasium)	38,998
BCR (%)	11	22	50	17
FAR (%)	20	48	100	33
Population (person)				
	Student	1,693	-	1,693

### (11) Zone J and K

Existing office of MOL, educational facility of MOE, and hospital of MOPH etc. will continue to be maintained at this place, which can be categorized as an administrative service zone. As the Rajanukul hospital of MOPH in block K.6.1 is a mental hospital, relocation elsewhere should be considered. It will also be necessary sooner than later to re-build the hospital to a general hospital because the building is rather old.

Framework of Zone J and K basically follows the existing condition.

**Table 8.16: Major Framework of Zone J and K**

Items	Zone J					Zone K		Total
	J.3.1	J.3.2	J.3.5	J.5.1	Total	K.6.1	K.1.3	
Land Use	Office	Office	Public Service	Private School	-	Hospital	Residential & Commerce	-
Land Area (m <sup>2</sup> )	32,212	7,735	1,445	62,754	104,146	51,179	8,418	59,597
Building Area (m <sup>2</sup> )	4,595	2,162	676	10,183	17,616	10,295	3,997	14,292
Floor Area (m <sup>2</sup> )	12,187	4,410	676	18,857	35,451	21,054	37,427	58,481
	Residential	-	-	-	-	-	18,145	18,145
	Commercial	-	-	-	-	-	4,816	4,816
	Office	12,187	4,410	-	-	-	-	0
	Public Service	-	-	676	-	-	5,865	5,865
	School	-	-	-	18,854	-	-	0
	Hospital	-	-	-	-	21,054	-	21,054
	Parking	-	-	-	-	-	8,601	8,601
BCR (%)	14	28	47	16	17	20	47	23
FAR (%)	38	57	47	30	34	41	445	98
Housing Unit (unit)	-	-	-	-	-	-	1,034	1,034
Population (person)								
	Residents	-	-	-	-	511	1,034	1,545
	Employee	923	334	51	163	-	321	321
	Visitor	-	-	-	-	-	1,173	1,173
	Students	-	-	-	230	-	-	-
Parking	-	-	-	-	-	-	244	244

### (12) Zone L

Existing low-rise composite commercial/residential buildings will be left untouched for the time being. Renewal of buildings will be attempted if there are any major changes in people's movement on Pracha Songkhro Road, as a results of the refurbished townscape and completion of the large scale commercial establishment and BMA's new city hall

Major framework of Zone L basically follows existing situations.

**Table 8.17: Major Framework of Zone L**

Items	Block						Total
	L.1.15	L.1.16	L.1.17	L.3.4	L.1.18	L.1.19	
Land Use	Residential & Commerce	Residential & Commerce	Residential & Commerce	Office	Residential & Commerce	Residential & Commerce	-
Land Area (m <sup>2</sup> )	2,367	6,699	1,352	631	2,213	4,451	17,713
Building Area (m <sup>2</sup> )	1,882	2,509	627	-	627	1,255	6,900
Floor Area (m <sup>2</sup> )	5,637	7,516	1,879	-	1,879	3,758	20,669
Residential	4,502	6,016	1,504	-	1,504	3,001	16,527
Commercial	1,135	1,500	375	-	375	757	4,142
BCR (%)	80	37	46	-	28	28	39
FAR (%)	238	112	139	-	85	84	117
Housing Unit (unit)	452	903	226	-	226	452	664
Population (person)							
Residents	452	903	226	-	226	452	2,259
Employee	-	-	-	99	-	-	99
Visitor							

## 8.3 PUBLIC FACILITIES DEVELOPMENT PLAN

### 8.3.1 Educational Facilities

The number of pupils in 2011 are estimated to be 840 for kindergarden, 2,070 for elementary schools, and 1,070 secondary schools, as presented in Table 8.18.

Existing capacities for the elementary schools, and secondary schools are sufficient for the demand in 2011, though the capacity for the kindergarden is required to accommodate additional six classrooms in Wichutit public school, which will be relocated in the course of the project.

It is also recommended to allocate the additional classrooms in public service areas in NHA housings in order to strengthen the day care services in the DC Area along with introducing the day nursery facilities.

**Table 8.18: Capacity of Educational Facilities**

Public School		Existing (2000)			Future (2011)		
		Pupils	Capacity	Classrooms	Pupils	Capacity	Classrooms
Vichakorn	Kindergarden	324	250	10		250	10
	Elementary	882	1,040	26		1,040	26
	Secondary	0	0	0		0	0
	Lower	0	0	0		0	0
	Upper	0	0	0		0	0
Wichutit	Kindergarden	242	200	8		350	14
	Elementary	1,120	1,200	30		1,200	30
	Secondary	297	320	8		360	9
	Lower	297	320	8		360	9
	Upper	0	0	0		0	0
Others*	Kindergarden	288	250	10		250	10
	Elementary	1,378	1,640	41		1,640	41
	Secondary	780	1,080	27		1,080	27
	Lower	636	270	18		720	18
	Upper	144	360	9		360	9
DC Area	Kindergarden	854	700	28	840	850	34
	Elementary	3,380	3,880	97	2,070	3,880	97
(Total)	Secondary	1,077	1,400	35	1,070	1,400	35
	Lower	933	1,040	26	1,070	1,040	26
	Upper	144	360	9	-	360	9

Note: "Others" include Piboonprachasan Public School for Disabled Pupils (MOE), and Samakeebumrungvittaya Private School which is situated on the MOL land.

### 8.3.2 Other Public Facilities

Required public facilities relate to living zones, which are classified into three levels, namely neighborhood, district, and city levels. The classification of the living zones for the DC Area, the Study Area, and BMA is presented in Table 8.19.

**Table 8.19: Classification of Living Zones for Public Facilities**

Zone	Public Facilities		
	Neighborhood Facilities	District Facilities	City Facilities
Standard Households per Living Zone	300	10,000	30,000
No. of Target Household	8,700 (DC Area)	80,000 (Study Area)	2,600,000 (BMA)

Upon the criteria of public facilities presented in Table 8.20, public facilities in the DC Area are planned to include day nurseries, pharmacies, and elementary schools, etc. as shown in Table 8.21. The total floor area of the public service is sufficiently placed at 47,875m<sup>2</sup>.

**Table 8.20: Criteria of Public Facilities employed for the Study**

Category	Public Facilities			
	Existing Facilities	Neighborhood Facilities	District Facilities	City Facilities
Education	Wichakhon Public School Wichutit Public School Pibulprachasan Public School Vocational Center, BMA	Pre-Elementary School(1)	Elementary School(2) Secondary School (Lower, Upper) (4-9) Vocational Training Center(8)	University, College(39) Vocational School (Higher Education) (39)
Welfare	Day Care Center, MOL Children and Elderly Care Center. MOL	Day Nursery(1)	Day Care Center (4) Elder's Recuperation Home(7) Mother-child Welfare Facility(4)	Elder's Welfare Center(21) Handicapper's Welfare Facility(27)
Public health	Mental Hospital	Pharmacy(1) Medical Clinic(0.5) Dental Clinic(1)	Hospital(6)	Mental Hospital(45) Public Health Center(34)
Personal Communication		Meeting Room for Community(0.5)	Community center(3)	Civic Center, Convention Center(30)
Safety and Security	Fire Protection Water Resource Fire Brigade Police Box Makkasan Police Station	Fire Protection Water(0.5) Fire Brigade(0.5)	Police box(4) Fire station(8)	Police Station(52)
Recreation	Indoor Stadium, BMA Thai-Japan Youth Center, BMA	Play Ground(1)	Neighborhood park(10) Gymnasium(5)	Parks for Exercise(67) Athletic Stadium(67) Library(18) Museum(45) Theater(24) Zoo & Botanical Garden(126)

Note: Figures in () means required householdes for each public facility.



**Table 8.21: Public Facilities in DC Area**

Zone	Public Facilities		
	Neighborhood Facilities	District Facilities	City Facilities
A.1.1 B.1.3 C.1.5	Day nursery, Pharmacy, Medical Clinic, Dental Clinic, Meeting Room for Community, Fire Protection Water, Fire Brigade, and Play Ground		
C.2.11	Pre-Elementary School (Vichakorn)	Elementary School (Vichakorn)	
C.2.12	Pre-Elementary School (Wichutit)	Elementary School (Wichutit) Secondary-Lower school (Wichutit)	
J.5.1	Pre-Elementary School (Piboonprachasan)	Elementary School (Piboonprachasan) Secondary-lower School (Piboonprachasan)	
I.2.9		Vocational Training Center	
I.2.8			Parks for Exercise, and Athletic Stadium
1.2.10		Gymnasium	
K.6.1			Mental Hospital
J.3.5		Day Care Center	
A.1.21		Neighborhood Park	
H.1.12		Neighborhood Park	
H.1.11			Entrepreneur Support Center, Public Health Center, Civic Center, Convention Center, Library, and Museum

## **8.4 TRANSPORT PLAN**

The transport plan is formulated based on the following criteria.

- Roads will be designed basically to have 2 lanes on each side, in facing traffic system: enabling entry to the car park by a left turn. Moreover, traffic control signals will be provided at busy intersections to achieve smooth traffic flow;
- Separation of car traffic from pedestrians is a definite necessity. Commercial or public facilities drawing large crowds will be connected by elevated pedestrian decks to ensure safety of people as well as obstruction-free movement of vehicles underneath;
- There are existing roads carrying heavy traffic loads inside the area and some of the new roads will certainly be burdened with heavy loads. Hence separation of car traffic from pedestrians is a definite necessity. Commercial or public facilities drawing large crowds will be connected by elevated pedestrian decks to ensure safety of people as well as obstruction-free movement of vehicles underneath.
- The planned MRT station will be functionally united with the bus terminal ensuring efficiency and upgrading of transport. The bus terminal will be provided with berths also for tourist buses aiming at inducing many tourists to this Area; and
- Pedestrian decks will be provided to have easy access to the transport hub and core facilities as shown in Figure 8.14.

**Table 8.22: Road Plan and Cross Sections**

Name	Road No.	Width (m)	Length (m)
Pracha Songkhro Rd.	M-1	25	1,130
Din Daeng Rd.	M-2	29	750
Mit Maitri Rd.	M-3	16 ~ 20	630
Under Pass Rd.	M-4	16 ~ 25	660
Chaturathit Rd.	M-5	18	500
Din Daeng Community 1 Rd.	S-1	20	1,100
Din Daeng Community 2 Rd.	S-2	20	650
Din Daeng Community 3 Rd.	S-3	20	400
Din Daeng Community 4 Rd.	S-4	16	620
Din Daeng Community 5 Rd.	S-5	22	360
Din Daeng Community 6 Rd.	S-6	16	
Din Daeng Community 7 Rd.	S-7	14	
Pedestrian Deck	P-1		

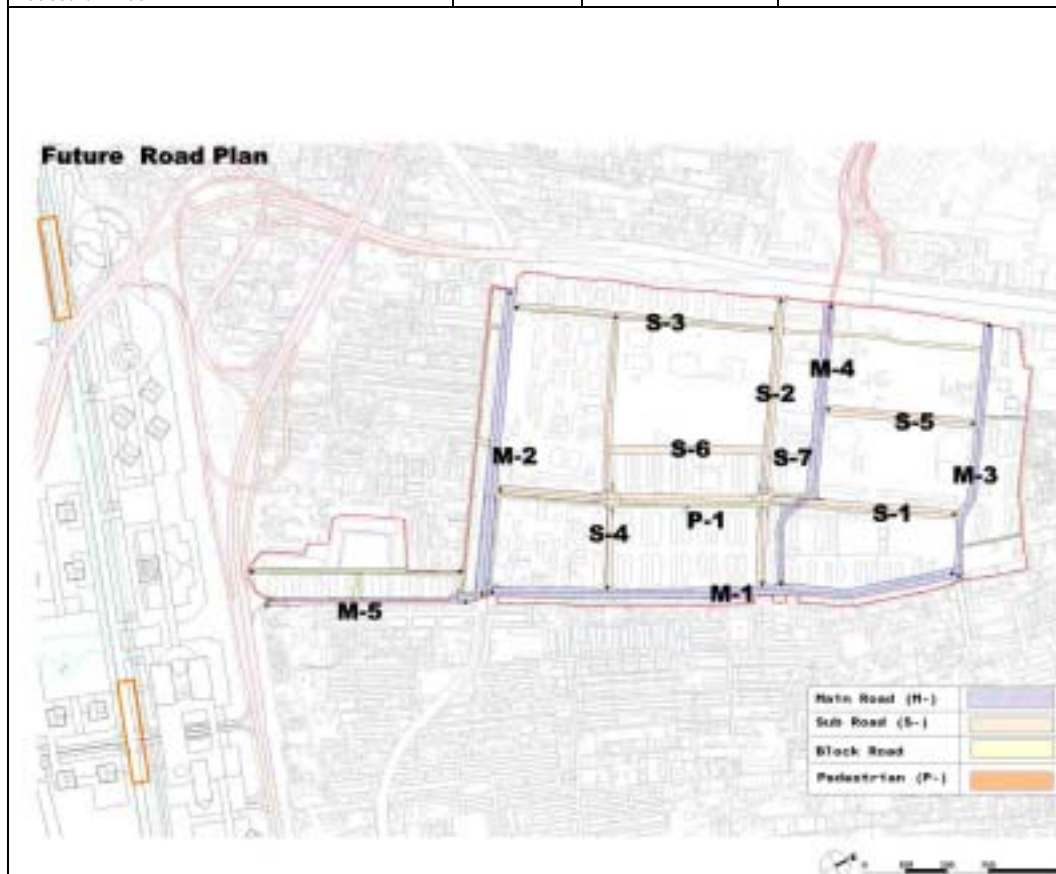


Table 8.22: Road Plan and Cross Sections (Continued)

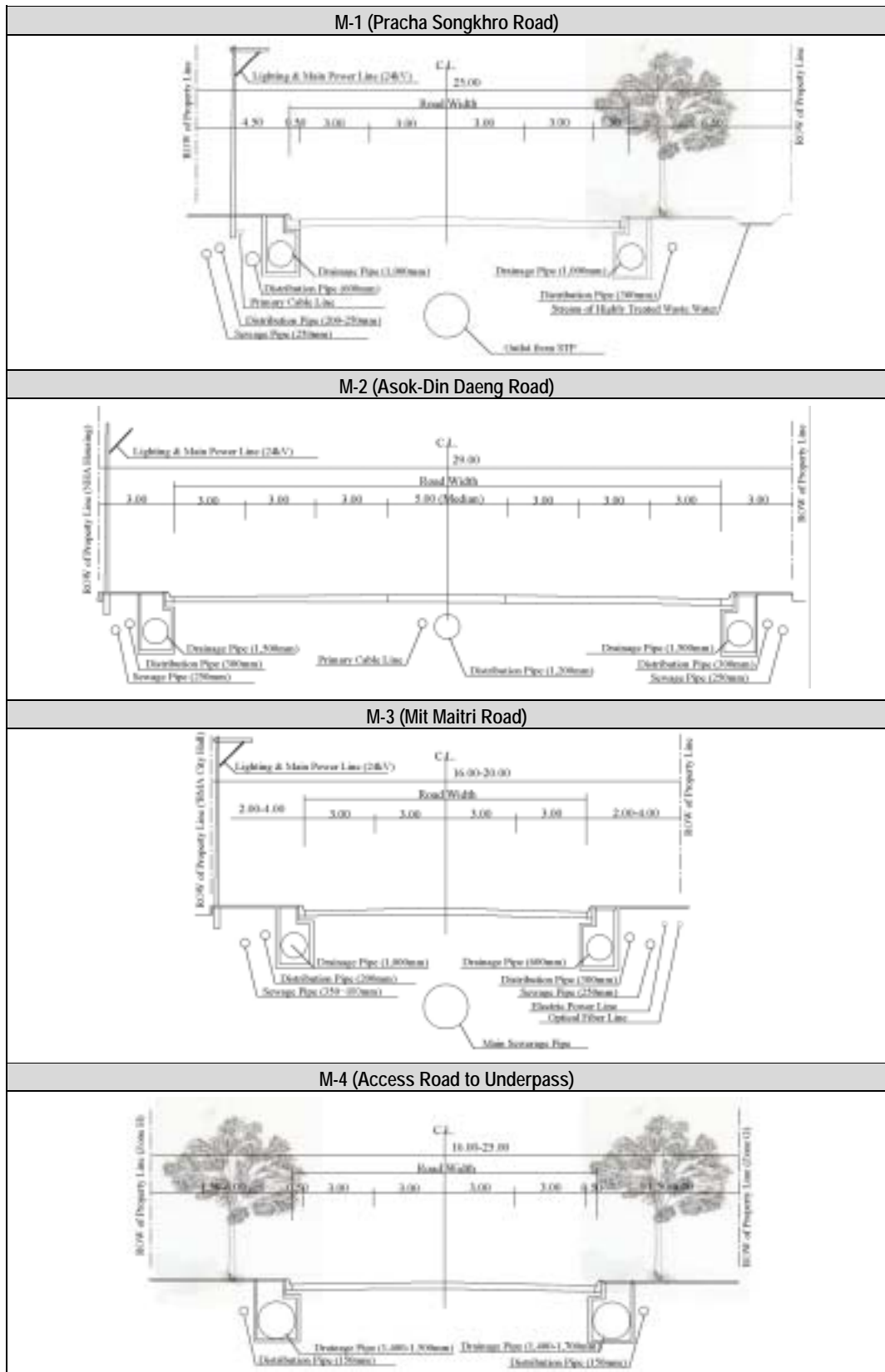
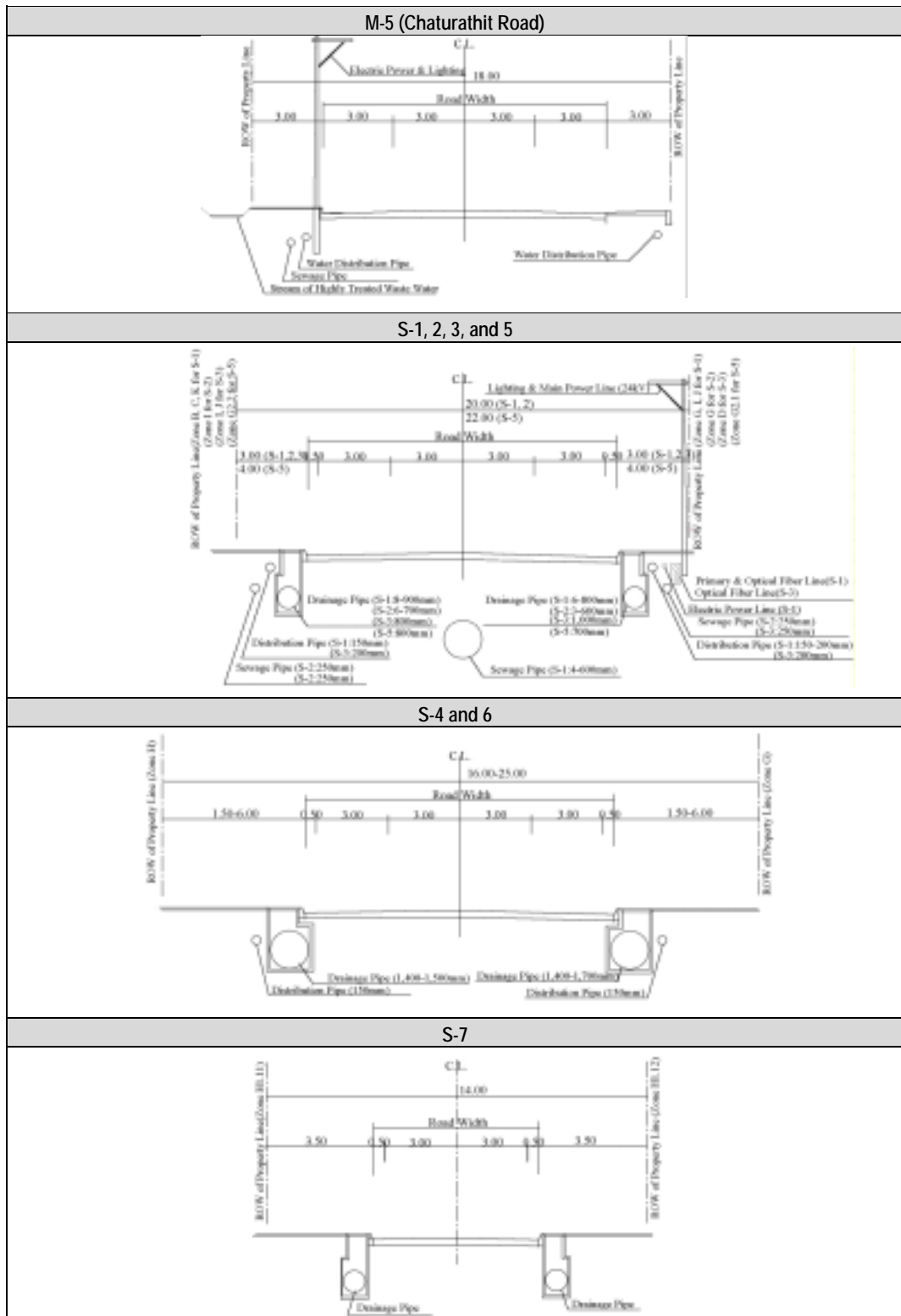
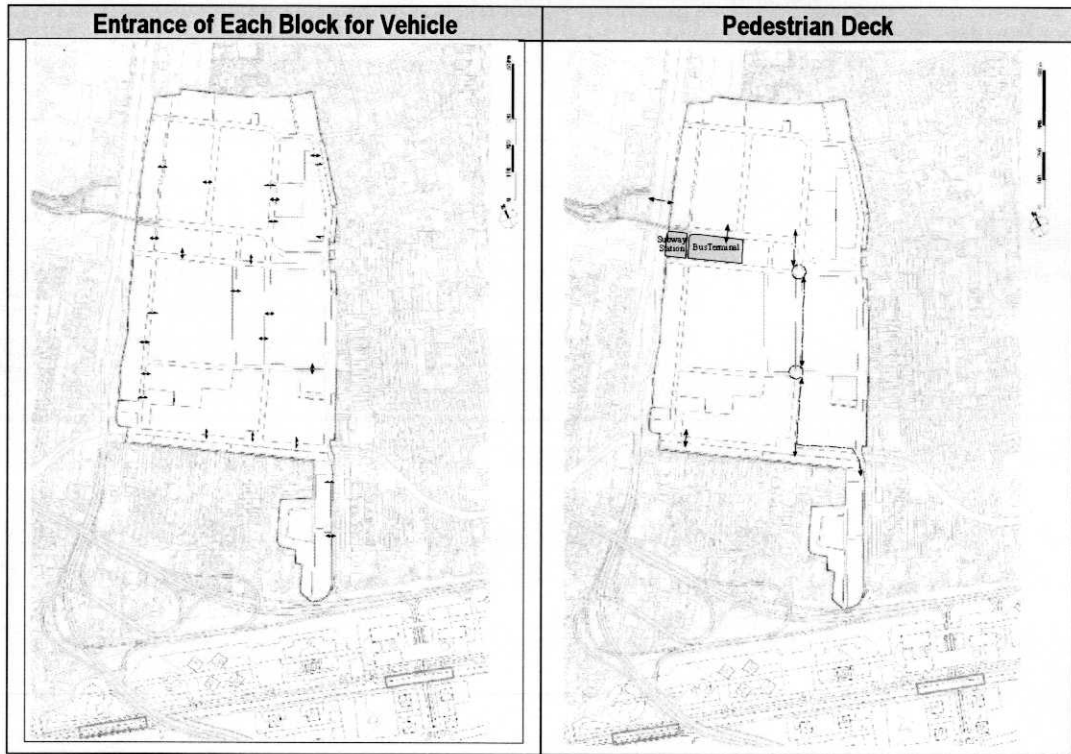


Table 8.22: Road Plan and Cross Sections (Continued)



**Figure 8.14: Assumed Location of Entrance of Each Block and Pedestrian Deck**



## 8.5 INFRASTRUCTURE/UTILITIES PLAN

Infrastructure in the Din Daeng Community Area (DC Area) has been developed except sewerage system, which is still under construction. Furthermore, some of the infrastructures will be constructed by the related organizations, such as MEA and TOT. The following infrastructure plans have been formulated as a desirable system for the Development.

### 8.5.1 Water Supply System

#### (1) General

Water demand of the Study Area in 2015 has been estimated 102,260 m<sup>3</sup>/day which is smaller than the demand of 93,196 m<sup>3</sup>/day in 1990 due to decrease of population.

Therefore the capacity of existing trunk pipelines with diameters more than 600 mm, which are located along Ratchadaphisek Road, Pracha Songkhro Road, and Vibhavadi Rangsit Road, is sufficient to supply water in 2015.

**Table 8.23: Average Water Demand Projection in the DMH Area**

Year	Unit Daily Water Demand per Capita			Water Demand with Redevelopment		
	Residential (l/p/d)	Non-residential (l/p/d)	Total (l/p/d)	Population in DC Area (1,000pop.)	Daily Water Demand (m <sup>3</sup> /day)	Max. Daily Water Demand (m <sup>3</sup> /day)
1990	228	137	365	255.200	93,196	102,515.5
2000	247	127	374	228.909	85,609	94,170.3
2005	248	126	374	234.000	89,394	96,265.4
2011	247	127	375	242.200	92,256	99,789.8
2015	258	119	377	246.800	94,359	102,260.4

Note: Number of population in the year of 2005 to 2015 is estimated by the JICA Study Team.

#### (2) Water Demand Projection

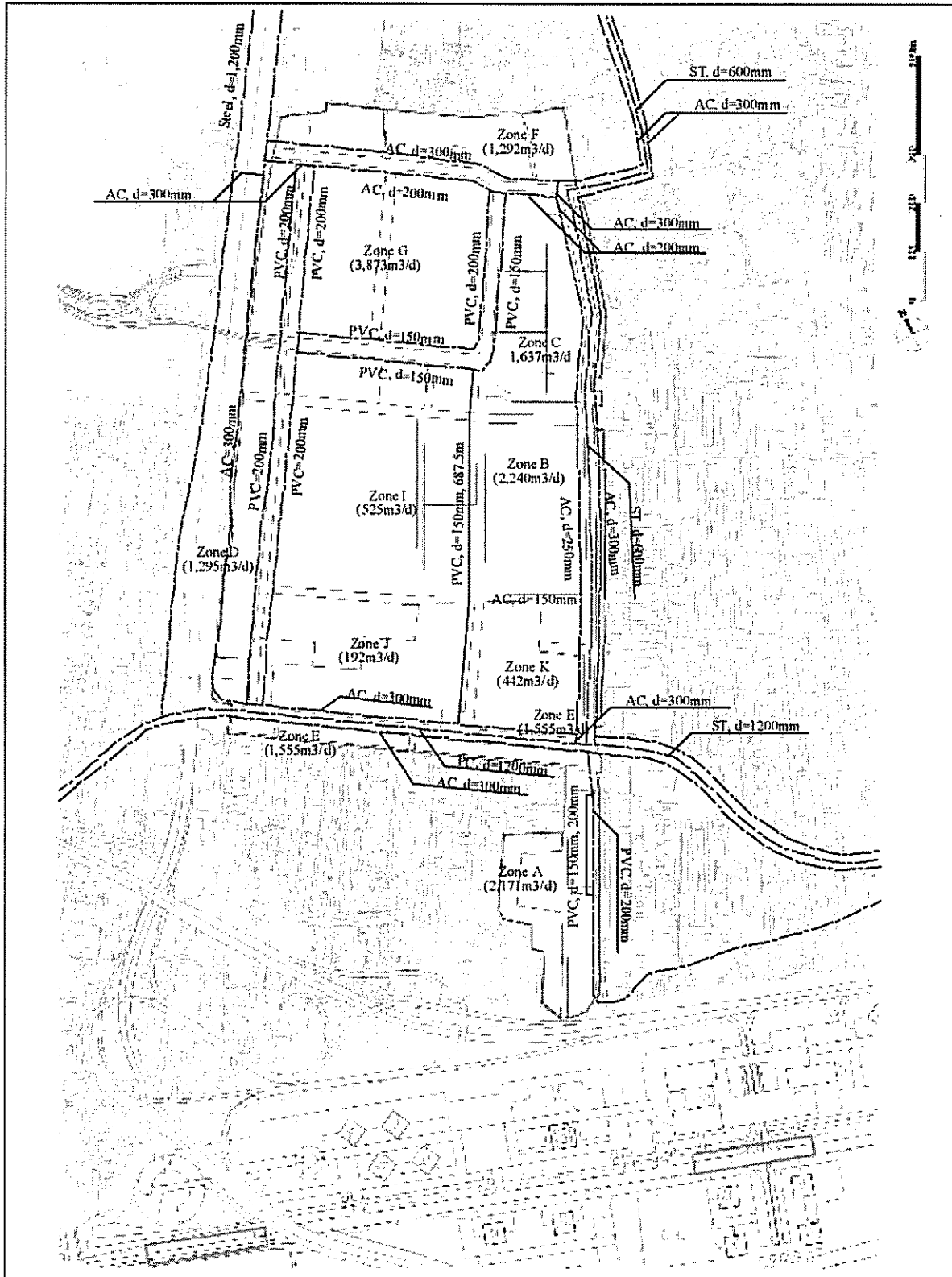
The daily water demand will increase from 11,532 m<sup>3</sup>/day in 2001 to 14,815 m<sup>3</sup>/day in 2011. However, this increase will not cause the improvement of the trunk pipeline, because the capacity of the trunk pipelines of more than 600 mm covering the Study Area is sufficient for the demand in 2015, as discussed in the previous section.

### **(3) Water Distribution System Plan**

Regarding the main distribution pipelines of 300 mm covering the Din Daeng Community Area, these pipelines have three connection points with the trunk pipelines. Based on the conditions according to the MWA's master plan listed below, the maximum inflow of these main pipelines is estimated at 0.318 m<sup>3</sup>/s exceeding the maximum demand of 0.283 m<sup>3</sup>/s.



Figure 8.15: Water Supply System



## **8.5.2 Sewage Treatment System**

### **(1) General**

The sewerage system in DC area adopted a separate system and collected wastewater will be discharged to the main tunnel of the Din Daeng Wastewater Treatment Plant (the treatment plant), to be put in operation in 2002. The capacity of the treatment plant and main effluent discharge tunnel will be sufficiently large, as the water consumption in the DC area will be similar to the consumption in 1990 as described in the previous section.

### **(2) Wastewater Volume Projection**

Wastewater volume was assumed to be equal (100%) of the supplied drinking water. Therefore daily average wastewater volume will be 14,815 m<sup>3</sup>/day.

### **(3) Wastewater Collection System Plan**

Location of the collection system has examined the following conditions.

- Minimizing the reconstruction of road, collection pipes along the existing roads are connected with blocks at points. Collected wastewater flows down to the main sewage pipes along Road S-1;
- Collection pipes are located under pedestrian ways to be expanded for adjustment with in-site pipes of blocks, if necessary; and
- The facilities developed in the first and second phases are required to be equipped with temporary treatment plant to discharge treated water to the existing drainage, while the rest after the third phase discharges to the separate sewage collection system.

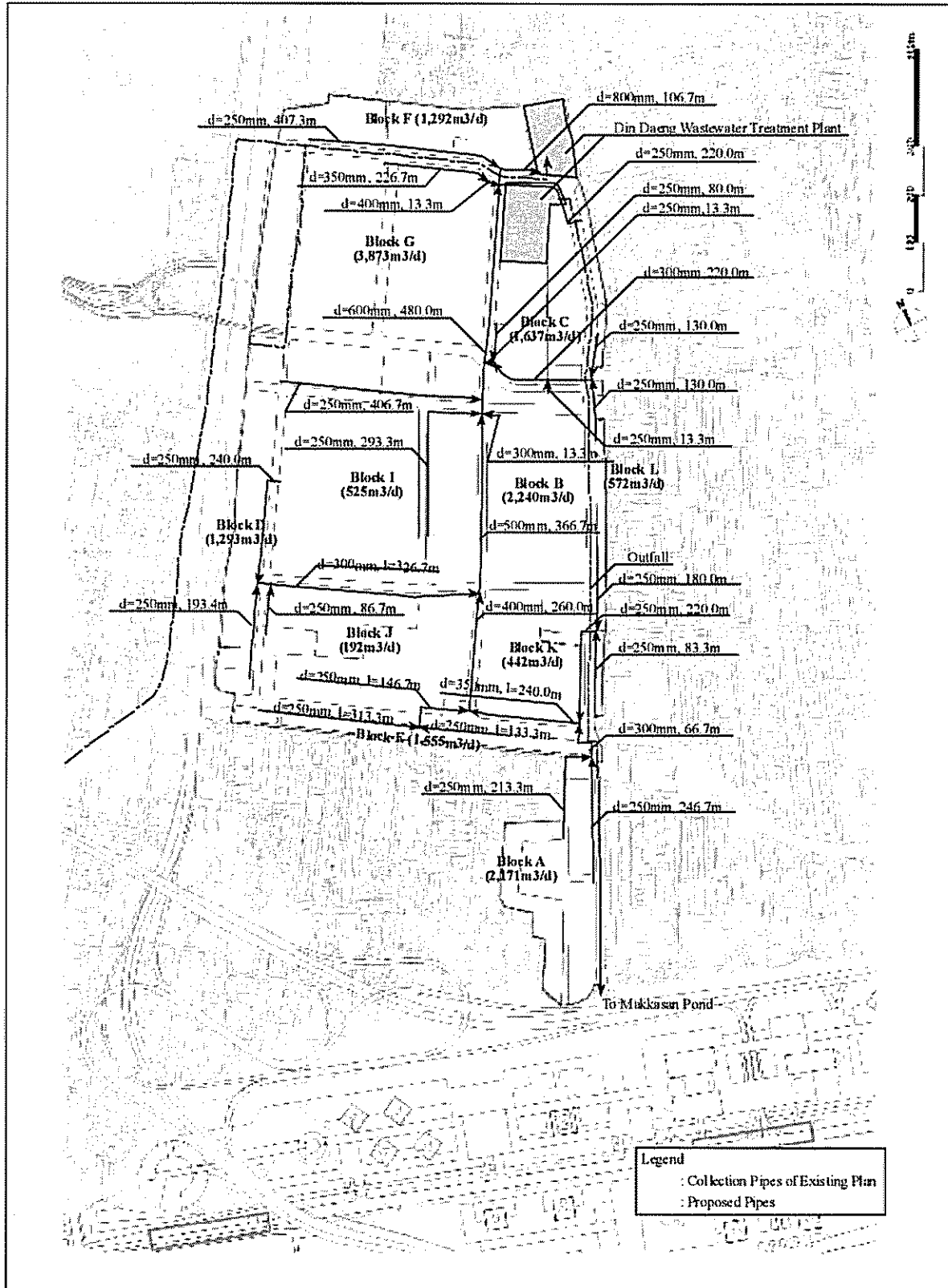
### **(4) Stream of Highly Treated Water**

The Study has examined the stream of highly treated water discussed in Part II, according to examples from Japan and available width along Pracha Songkhlo Road. The outline of the stream is presented in the table below.

**Table 8.24: Flow Capacity Calculation for Wastewater**

Items	Unit	Description
Avg. width	m	1,2
Water depth	cm	3
Velocity	m/s	0,4
Avg. flow volume	m <sup>3</sup> /min	0,86
Avg. flow volume	m <sup>3</sup> /d	1.244
Share to Treated wastewater (Stage 2)	%	0,36

Figure 8.16: Waste Water Collection System



### **8.5.3 Storm Drainage System**

#### **(1) Basic Concept for Planning**

The capacity of existing drainage system in the Study Area allows rainfall discharge of 128,700m<sup>3</sup>, which has an average water depth of 1.9 cm, to be stored. The remaining rainfall discharge causes inundation at the specific areas as discussed in Chapter 3.

Focusing on the DC Area, inundation is located along Pracha Songkhro Road, drainage pipes along both sides of roads and pumping facilities are installed. Reflecting those conditions, the basic concepts for planning of storm drainage system are listed below.

- Demarcation of catchment areas is designed to maintain the rainfall discharge within the capacity of existing facilities along Pracha Songkhro Road, Mit Maitri Road, and Asok-Din Daeng Road.
- The surplus rainfall discharge to the existing facilities is to be collected by the new drainage pipes along a new north-south road and will flow down to the pumping station at the canal along Vibhavadi Rangsit Road.

#### **(2) Design Conditions**

According to the Master Plan of Flood Protection and Drainage Systems in eastern suburban Bangkok by BMA, design criteria for planning are listed below.

- Return period : 2 years
- Rainfall intensity formula :  $I[\text{mm/hr}] = 5,690 / (t[\text{minute}] + 37)$
- Runoff coefficient : 0.58
- Time of entry : 5 minutes
- Flow velocity in drainage pipes : 1.2m<sup>3</sup>/s

#### **(3) Storm Drainage System Plan**

Drainage pipes to be installed have diameters of 300 to 1,700 mm. The locations of those pipes are shown in Figure 8.17. The catchment area of drainage along Pracha Songkhro Road is reduced and the flow is modified to discharge into the north-south road.

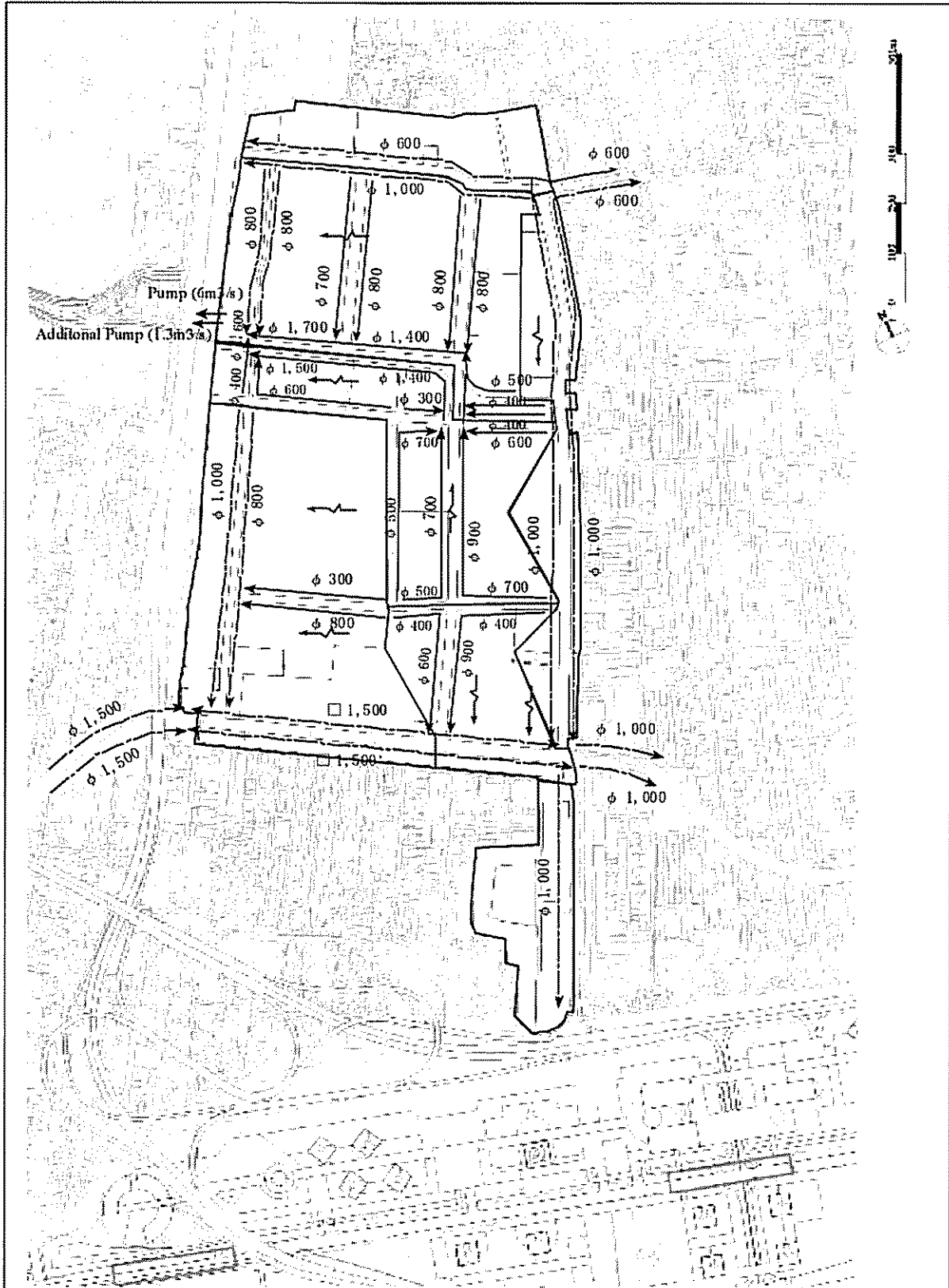
#### **(4) Retention Facility**

Apart from the improvement of the drainage system in the DC Area, there is remaining rainfall discharge in the Study Area. Therefore it is recommended to develop the retention facility by public organizations..

In the case of the DC area, NHA and BMA have land areas of 293,752 m<sup>2</sup> and 404,320 m<sup>2</sup>. In proportion of their land areas, the required retention capacity is estimated 8,191.8 m<sup>3</sup> for NHA portion and 11,275 m<sup>3</sup> for BMA portion.

Dividing the required capacity by the redeveloped land areas of both organizations, the average water depth will be 9 cm in NHA land and 8 cm in BMA land. These depths can be covered by utilizing open spaces in building sites, such as parking.

Figure 8.17: Storm Drainage System



## 8.5.4 Electric Power System

### (1) Electricity Demand Projection

The total electricity demand in 2015 was assumed to be 93.8 MW or 110.4 MVA, which exceeds the existing capacity of Saen Saep substation. However MEA has a plan to develop a new substation of 2 × 60 MVA at the northern side of Mit Maitri road. The new Din Daeng substation will cover the additional demand and be operated in 2004.

**Table 8.25: Required Capacity of Substation**

Descriptions		Electricity Demand		
		2000	2015	
Electricity Demand				
Present Trend	(MW)	37.1	73.7	
Additional Demand by Development	(MW)	-	20.1	
Total	(MW)	37.1	93.8	
Required Capacity of Substation		(MVA)	43.7	110.4
Capacity of Substation				
Existing (Saen Saep, 3*40MVA)	(MVA)	96	96	
Additional(Din Daeng, 2*60MVA)	(MVA)	-	90	
Total	(MVA)	96	186	

Note: 1) Electricity demand and required capacity is actual record in 2000.

2) Electricity demand in 2015 is based on the increasing ratio of MEA master plan.

3) Loading capacity of substation is 80 % for 3 bays and 75 % for 2 bays, according to the F/S for electric power distribution system by JICA, 1990.

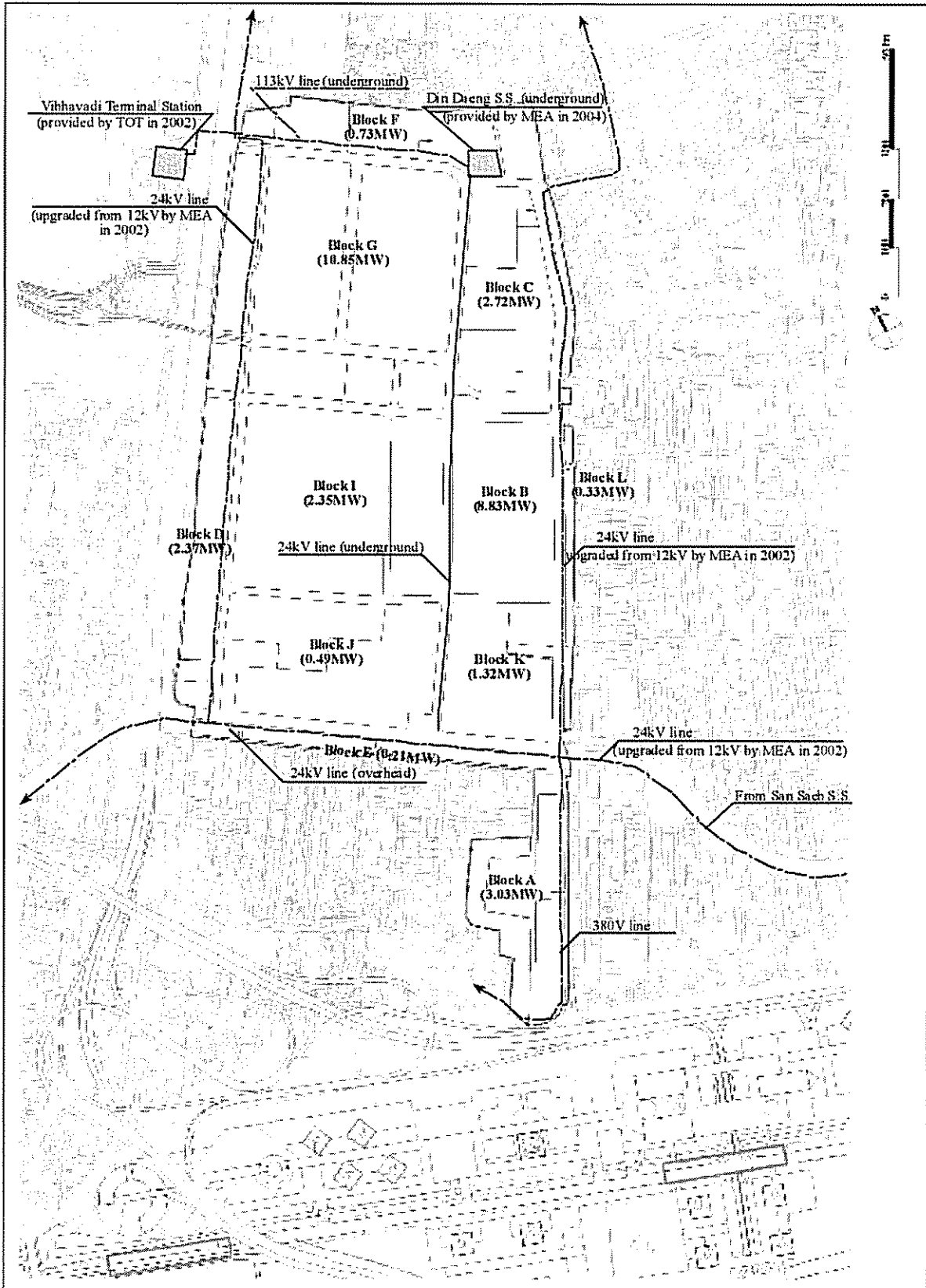
### (2) Electricity Distribution System Plan

Electric power to DC Area will be supplied from a new substation, which will be located in the northern part of Mit Maitri Road. MEA will develop this substation with a capacity of 2 × 60 MVA and put it into operation in 2004.

Electricity demand of new major facilities will generally exceed 1.0 MW individually. These facilities will be supplied by new underground 24kV lines and they will step down the voltage on their own. Other facilities will be supplied through existing power distribution systems, the voltage of which is planned to be upgraded from 12 kV to 24 kV by MEA in 2002.



Figure 8.18: Electric Power Supply System



### **8.5.5 Telecommunication System**

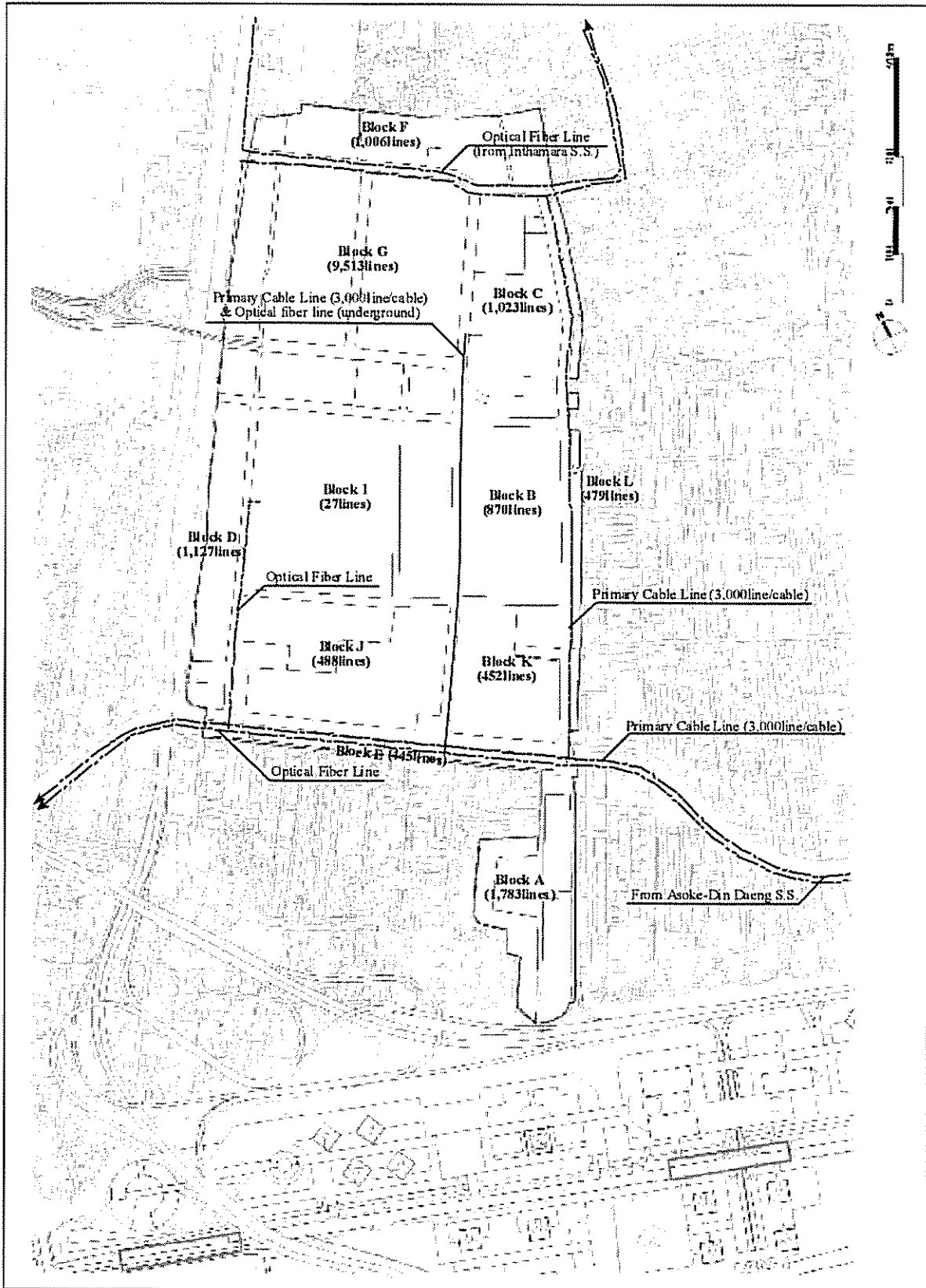
The total amount of connected lines in the Study Area was 4,553 in 1999, which is planned to be 8,641 lines in 2011 in TOT's plan.

On the other hand, demand of the Din Daeng Community Area has been estimated as 10,698 without the project and 17,428 with the project. Thus, the total telecommunication demand for the Asok-Din Daeng switching station is assumed to be 64,463 lines in 2015.

Correspondingly, it is necessary to improve the Asok-Din Daeng S.S. from the existing 40,000 lines, though capacity of cable lines and cabinets covers the demand.

Proposed telecommunication system is shown in the following figure.

Figure 8.19: Telecommunication System



## 8.5.6 Solid Waste Disposal System

### (1) Solid Waste Volume Projection

Solid waste volume in DC Area was estimated at 42.7 ton/day for existing practice and 66.2 ton/day after the redevelopment, based on the survey result of solid waste generation rate of households by DPC, BMA.

### (2) Solid Waste Collection System Plan

Taking the existing conditions of collection system, necessity of additional collection vehicles after the redevelopment in 2015 was confirmed upon the following conditions:

- Number of collection times is the same as existing conditions having 4 categories: i) major roads, ii) *soi* roads, iii) housing areas, and iv) market and school with 4 m<sup>3</sup> or 8 m<sup>3</sup> containers:
- Standard capacity of collection vehicles is 5 tons/vehicle, which constitutes the majority of existing vehicles; and
- When solid waste weight at collection point exceeds 5 tons, container collection is mobilized.

As a result, additional collection trucks after the redevelopment will consist of, i) five 5-ton collection trucks and ii) two 20 m<sup>3</sup> container trucks.

It is expected that the additional collection trucks will be arranged from outside DC Area, as the average trips of collection vehicle in Din Daeng district is still less than 2 trips/vehicle/day.

**Table 8.26: Required Collection Vehicle before and after the Redevelopment**

	Daily Generation (t/day)	Generation per Collection (t/time)	Note	Required No. of Trips	Required No. of Vehicles
<b>Existing</b>					
Major Road	4.8	4.8	1time/day	1	1
<i>Soi</i> Road	2.5	4.9	1time/2days	1	1
Housing	32.7	76.3	3times/week	16	8
School	2.1	2.1	1time/day	1	1
Total	42.1	-			11
<b>Future (2011)</b>					
Major Road	17.99	18.0	1time/day	4	2
<i>Soi</i> Road	2.18	4.4	1time/2days	1	1
Housing	43.89	102.4	3times/week	21	11
School	1.56	3.6	1time/day	1	1
Total	65.62	-			15