4.3.5 Future Road Traffic Volume Study

Next, from the estimated maximum development volume in 4.3.1, the effect on to the future road traffic around the area was studied. As same as in 4.3.1, the Japanese manual of "Large Development Area traffic volume planning manual(by Ministry of Land,, Infrastructure, and Tourism) was used to estimate the road traffic volume in the area under this maximum development. The outputs of the road traffic volume created, including the peak time volume by each area is shown below.

Table-4.3.23 Year 2030 Road Traffic Volume Estimation Under Maximum Development

(Source : Study Team)

		Site Area	Floor Area	Floor Ratio	Automobile OD Traffic Volume		
					(/day)	AM (/h)	PM (/h)
A	Housing		23,300	10.0%	100	7	6
	Commercial		46,599	20.0%	4,500	315	450
	Office		139,797	60.0%	2,400	288	240
	Hotel		23,300	10.0%	300	33	33
	Total	15,533	232,995	100.0%	7,300	643	729
D -1	Housing		19,235	10.0%	100	7	6
	Commercial		38,469	20.0%	3,700	259	370
	Office		115,407	60.0%	2,000	240	200
	Hotel		19,235	10.0%	200	22	22
	Total	12,823	192,345	100.0%	6,000	528	598
D -2	Housing		16,469	10.0%	100	7	6
	Commercial		32,937	20.0%	3,100	217	310
	Office		98,811	60.0%	1,700	204	170
	Hotel		16,469	10.0%	200	22	22
	Total	10,979	164,685	100.0%	5,100	450	508
East Total		39,335	590,025		18,400	1,621	1,835
B	Housing		13,823	10.0%	100	7	6
	Commercial		27,645	20.0%	2,600	182	260
	Office		82,935	60.0%	1,400	168	140
	Hotel		13,823	10.0%	200	22	22
	Total	9,215	138,225	100.0%	4,300	379	428
C	Housing		19,863	10.0%	100	7	6
	Commercial		39,726	20.0%	3,800	266	380
	Office		119,178	60.0%	2,100	252	210
	Hotel		19,863	10.0%	300	33	33
	Total	13,242	198,630	100.0%	6,300	558	629
West Total		22,457	336,855		10,600	937	1,057
Total		**61,792**	**926,880**		**29,000**	**2,558**	**2,892**

The road traffic volume created from each development, and the road route to select is based on equal route selection and using left turn arrival and left turn departure avoiding traffic effects.

For Case 1, the estimation of the route pattern is based on not relying on the inner development areas' internal roads but from outer primary roads. For Case2, is based on estimation of using internal roads of the development mainly and bundling the traffic volume on the approach on outer primary road.

The future road effect under this estimation, for the road survey dimension (from An-O, 20 dimensions), the designed traffic volume per lane is under 1080pcu/h (1800pcu/hx0.6), in both case 1 and case2, as conclusion, the effect of this development is the area will not heavily effect the road traffic around the area.

Table-4.3.24 Road Traffic Volume per Route Under Development (Source : Study Team)

Case 1

	ルート	PM Peak IN: An-s	An-n	As-s	As-n	B	C	D	E	E1	F	G	H	I	J	K	L	M	N	O	1
A-D	1	1				1	1														
	2	1				1	1														
	3	1				1	1														
	4									1	1	1									
	5				1		1	1								1					1
	6									1	1	1									
EAST	計	3	0	0	1	3	4	1	0	2	2	2	0	0	0	1	0	0	0	0	1
B-C	1														1					1	
	2														1					1	
	3														1					1	
	4				1												1				
	5				1												1				
	6				1												1				
WEST	計	0	0	0	3	0	0	0	0	0	0	0	0	0	3	0	3	0	0	3	0
Total	1																				
	2																				
	3																				
	4																				
	5																				
	6																				
	計	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	ルート	OUT: An-s	An-n	As-s	As-n	B	C	D	E	E1	F	G	H	I	J	K	L	M	N	O	1
A-D	1						1							1							
	2							1													
	3							1													
	4	1		1					1	1											
	5	1		1					1	1											
	6	1		1					1	1											
EAST	計	3	0	3	0	0	1	2	3	3	0	0	0	1	0	0	0	0	0	0	0
B-C	1						1							1	1					1	1
	2		1													1					
	3		1													1					
	4	1		1			1				1	1		1	1					1	1
	5	1		1			1				1	1		1	1					1	1
	6	1		1			1				1	1		1	1					1	1
WEST	計	3	2	3	0	0	4	0	0	0	3	3	0	4	4	2	0		4	0	4
Total	1																				
	2																				
	3																				
	4																				
	5																				
	6																				
	計	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Case 2

	ルート	Percentage	Lanes	PM Peak IN: An-s	An-n	As-s	As-n	B	C	D	E	E1	F	G	H	I	J	K	L	M	N	O	1
A-D	1	16	153	1				1	1														
	2	16	153	1				1	1														
	3	16	153	1				1	1														
	4	16	153									1	1	1									
	5	16	153					1		1	1						1						
	6	16	153									1	1	1									
East	Total	100 0	1	3	0	0	1	3	4	1	0	2	2	2	0	0	0	1	0	0	0	0	1
B-C	1	16															1					1	
	2	16															1					1	
	3	16															1					1	
	4	16			1		1										1					1	
	5	16			1		1										1					1	
	6	16			1		1										1					1	
West	Total	100 0	52	0	3	0	3	0	0	0	0	0	0	0	0	0	6	0	0	0	0	6	0
Total	1		241																				
	2		241																				
	3		241																				
	4		241																				
	5		241																				
	6		242																				
	Total		1 44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	ルート	OUT: An-s	An-n	As-s	As-n	B	C	D	E	E1	F	G	H	I	J	K	L	M	N	O	1
A-D	1						1							1							
	2								1												
	3								1												
	4						1							1							
	5	1	1	1						1	1										
	6						1														
East	Total	1	1	0	1	0	0	3	2	1	1	0	0	3	0	0	0	0	0	0	0
B-C	1						1							1	1					1	1
	2		1													1					
	3		1													1					
	4	1	1	1											1	1				1	
	5	1	1	1											1	1				1	
	6						1							1	1					1	1
West	Total	2	4	2	0	0	2	0	0	0	0	0	0	2	4	4	0		4	0	2
Total	1																				
	2																				
	3																				
	4																				
	5																				
	6																				
	Total			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

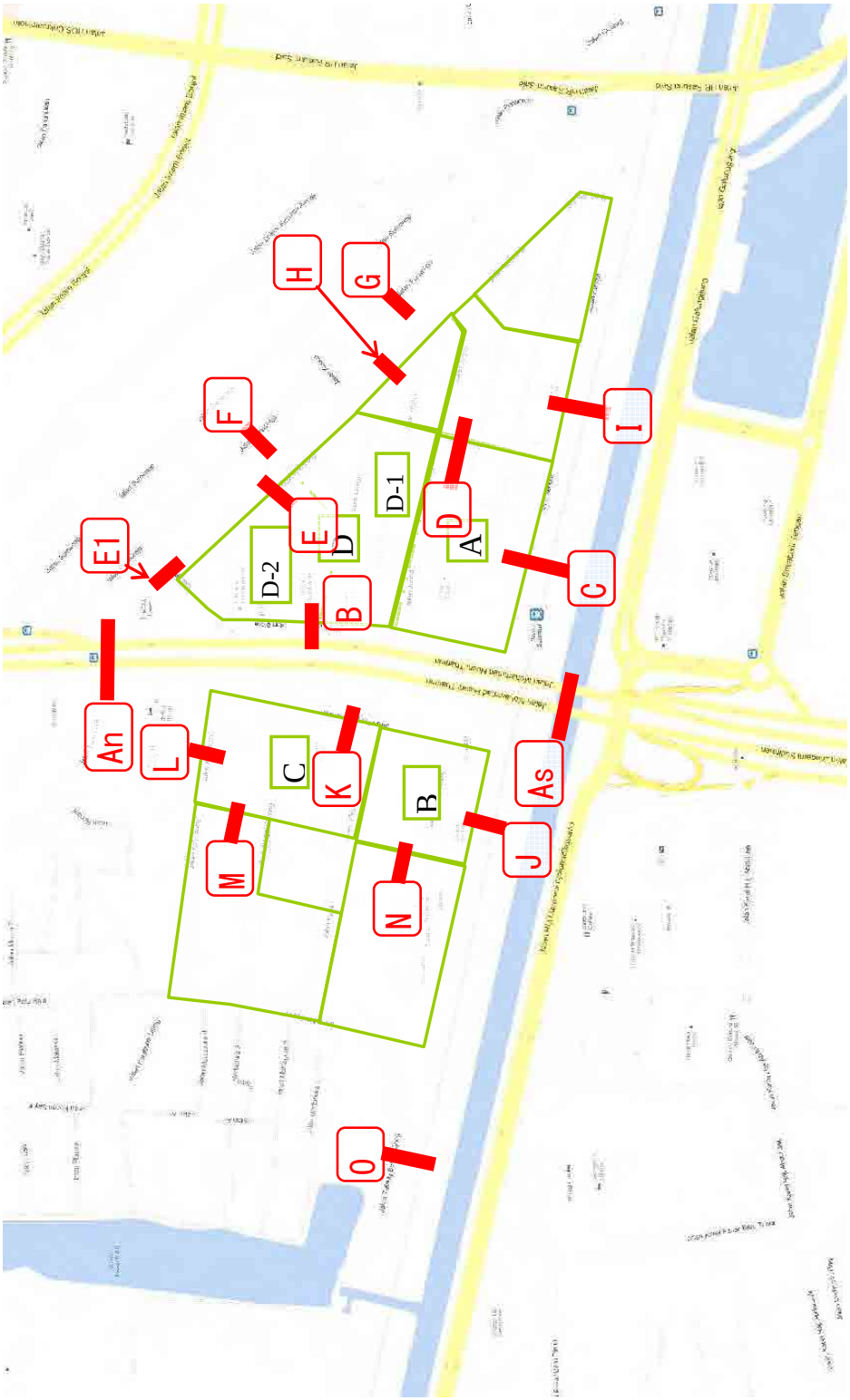
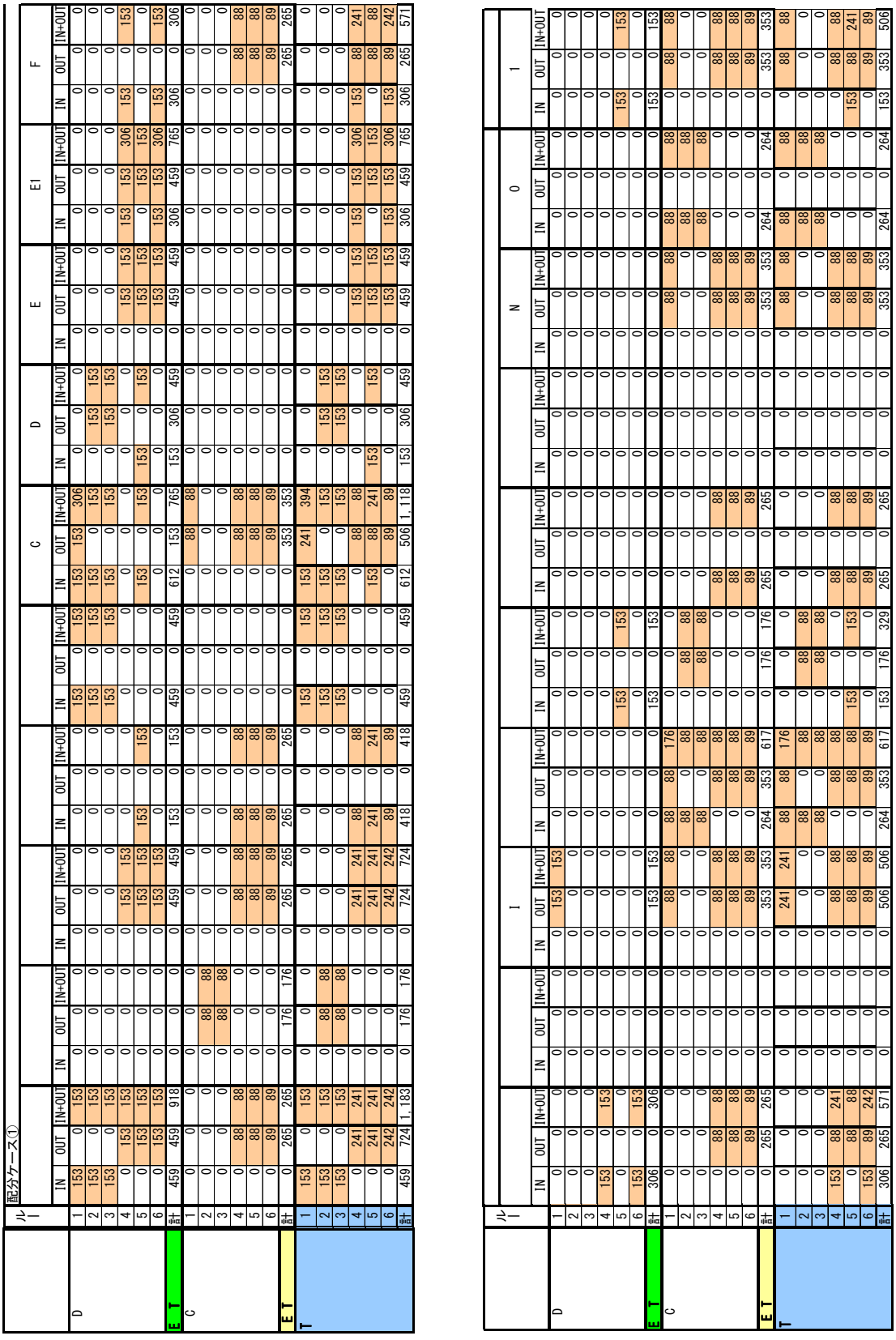


Figure-4.3.38 Road Survey Dimension Position (Source : Study Team)

Table-4.3.25 Case1 Route and Dimension Check (Source : Study Team)



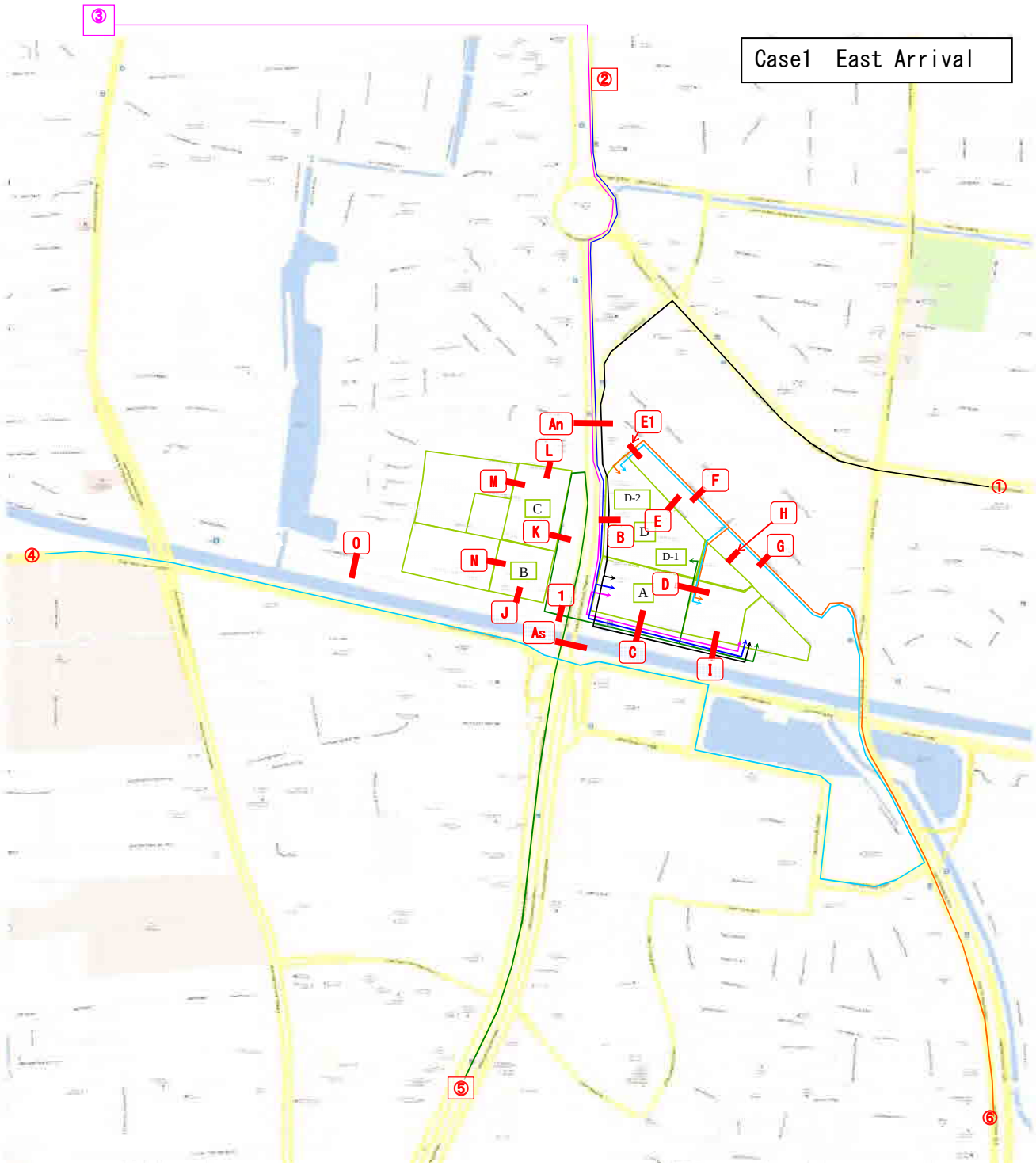


Figure-4.3.39 Case1 East Arrival Route (Source : Study Team)

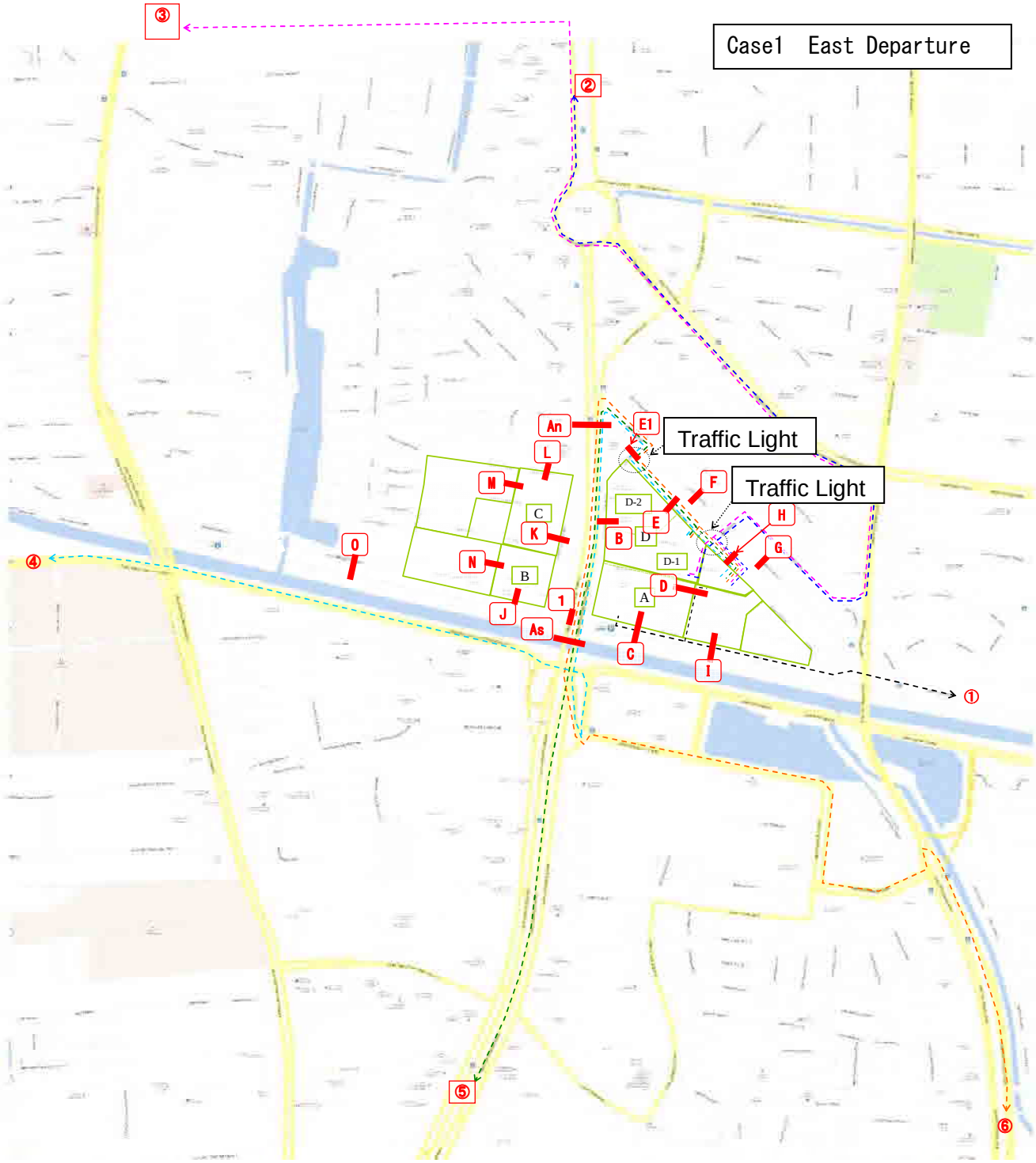


Figure-4.3.40 Case1 East Departure Route (Source : Study Team)

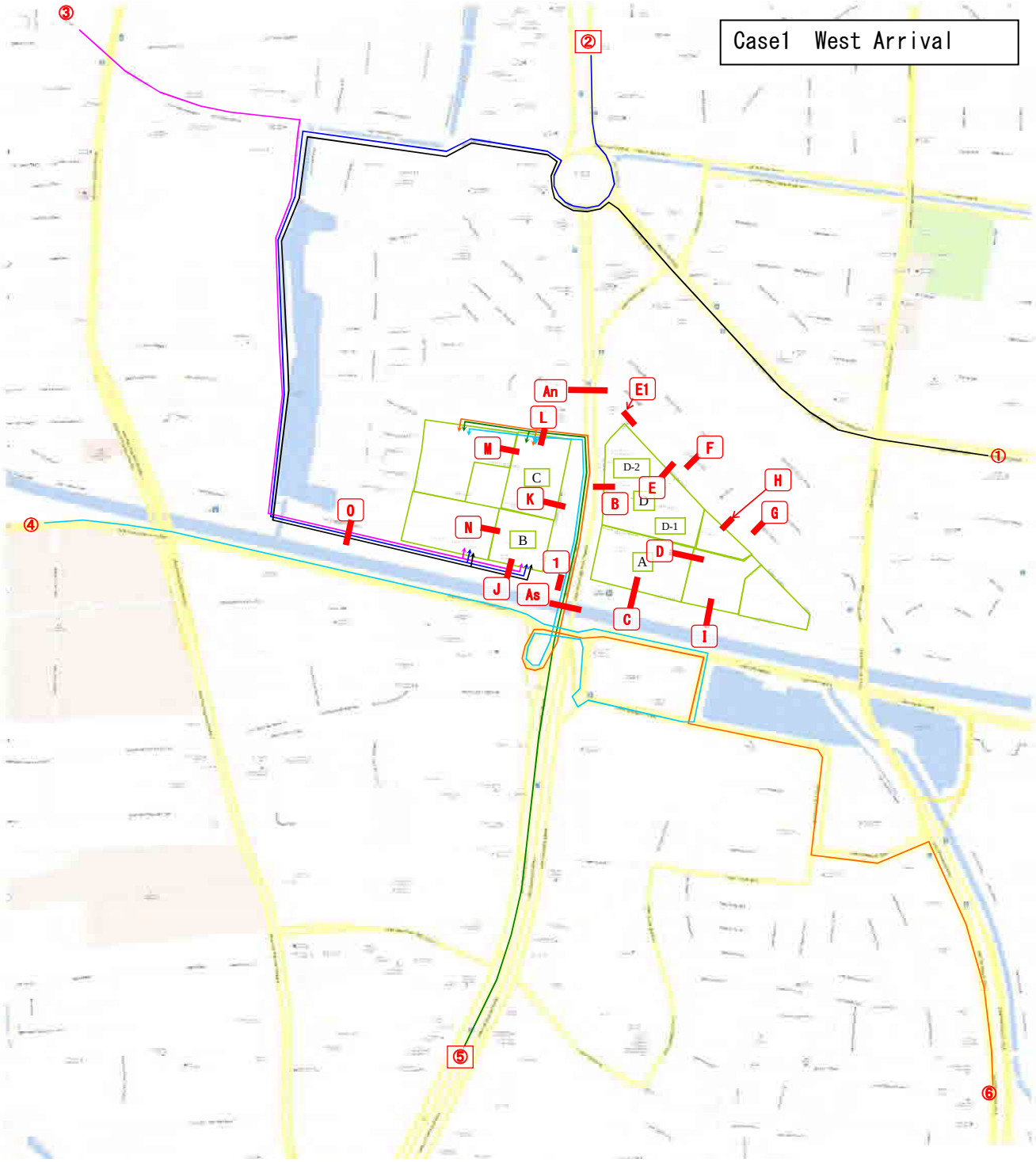


Figure-4.3.41 Case1 West Arrival Route (Source : Study Team)

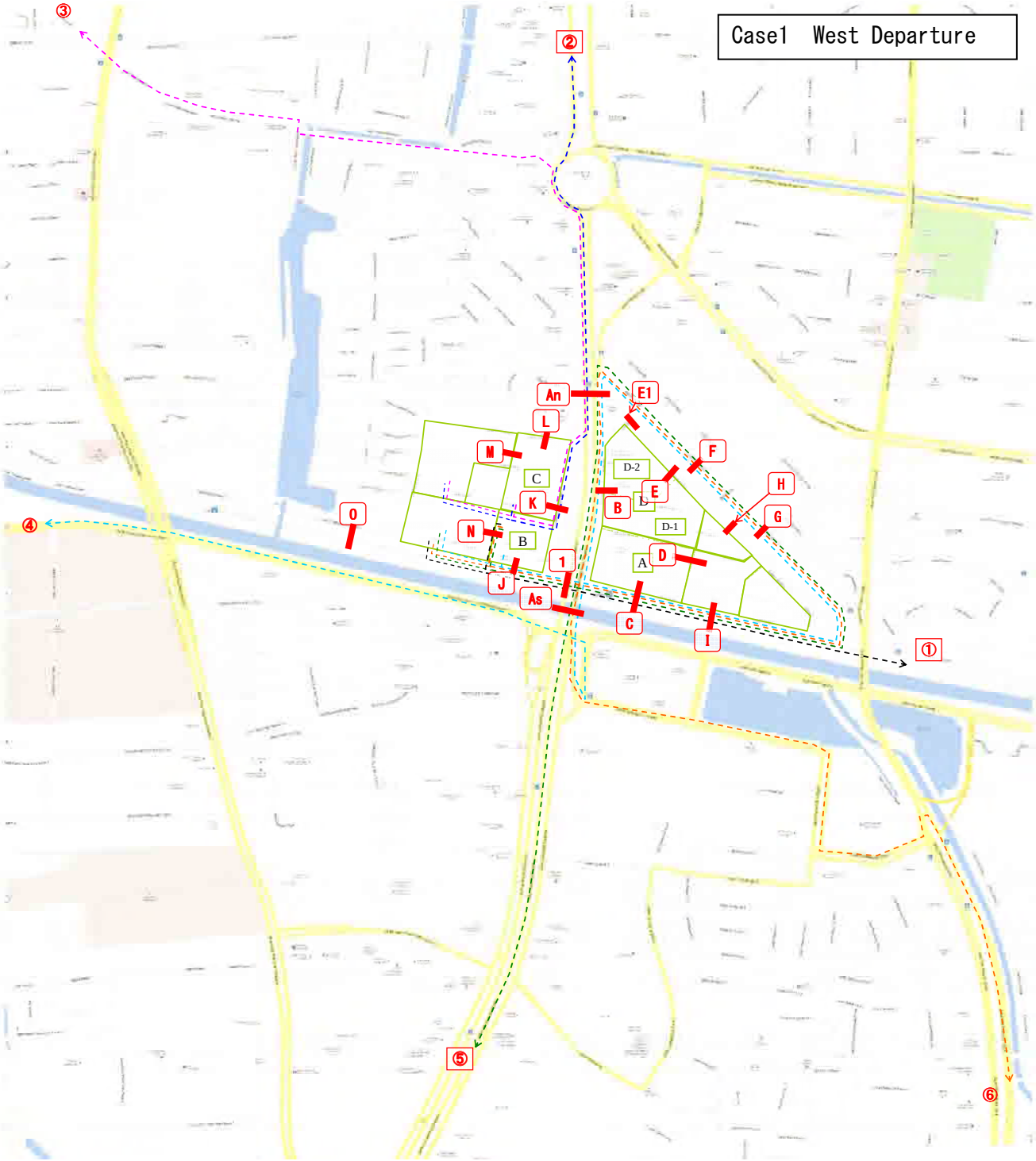
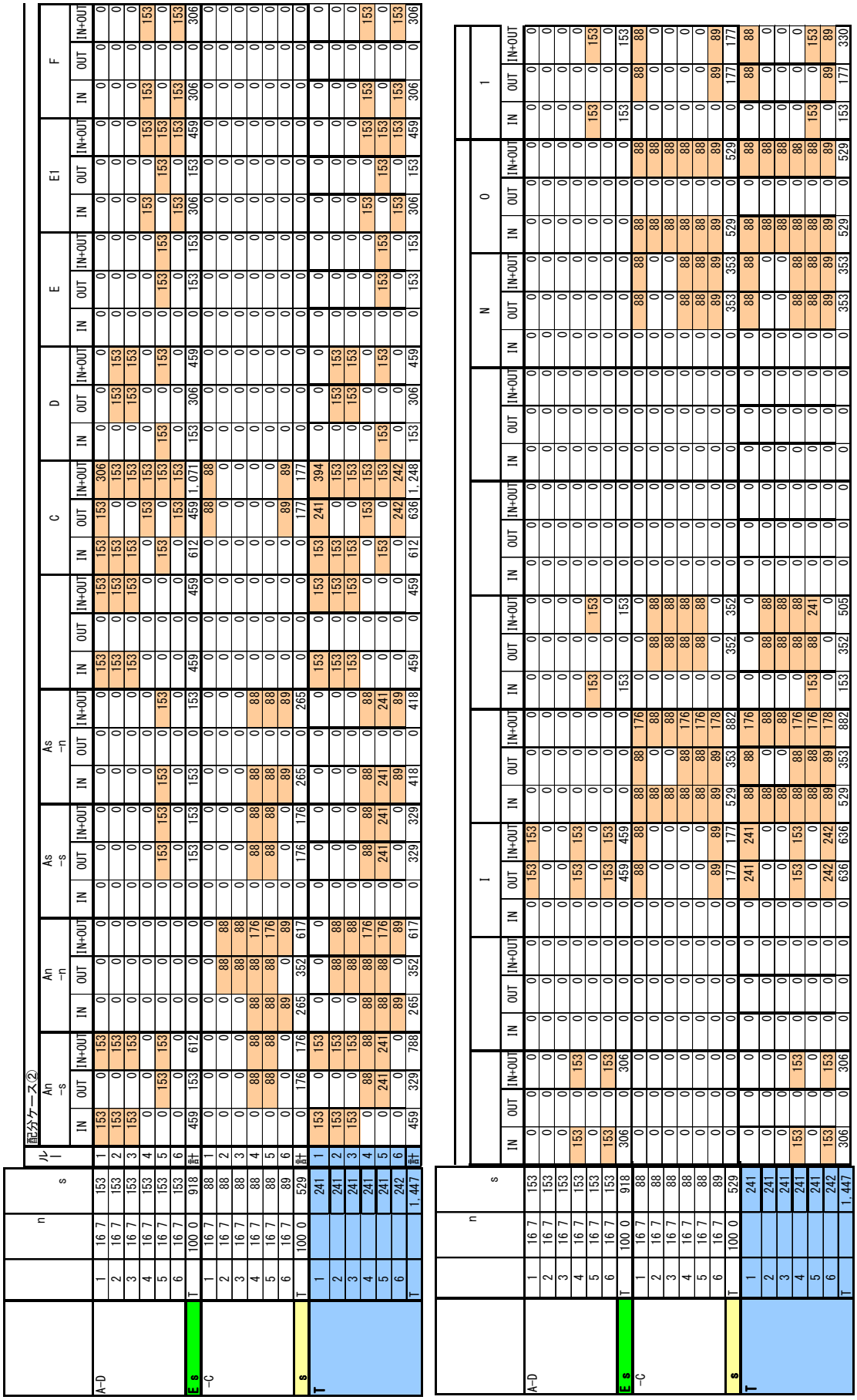


Figure-4.3.42 Case1 West Departure Route (Source : Study Team)

Table-4.3.26 Case Route and Dimension Check (Source : Study Team)



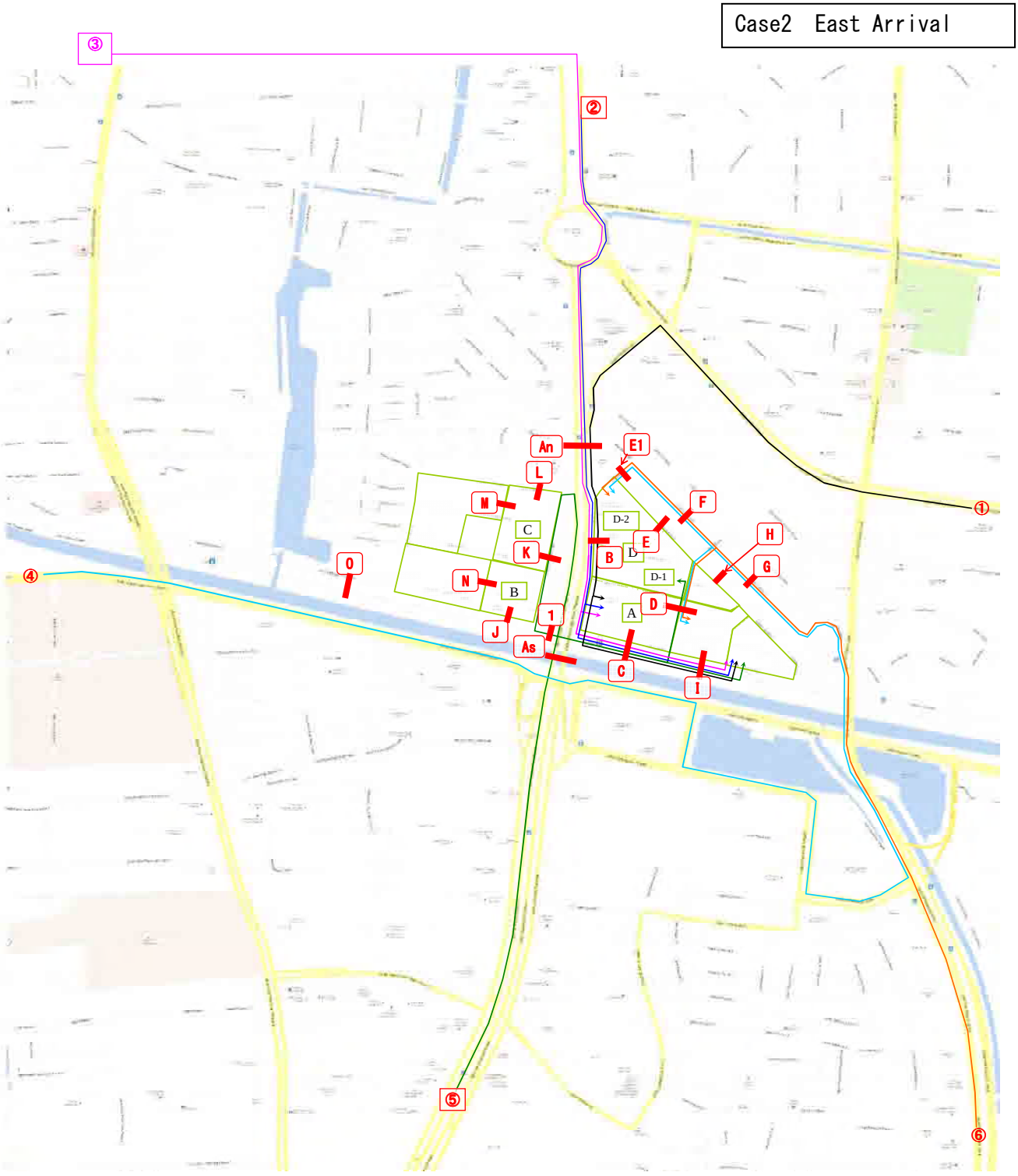


Figure-4.3.43 Case② East Arrival Route (Source : Study Team)

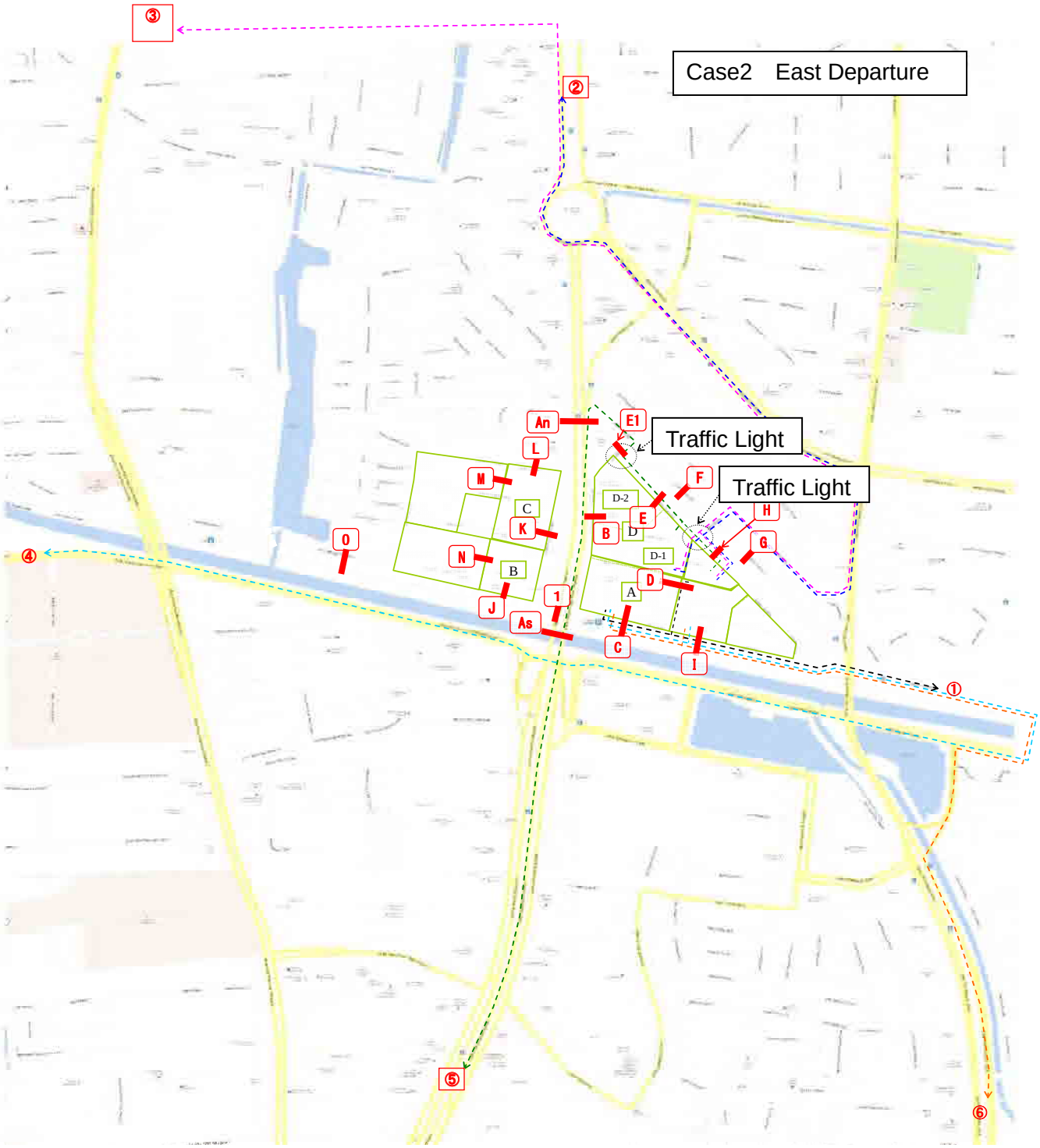


Figure-4.3.44 Case② East Departure Route (Source：Study Team)

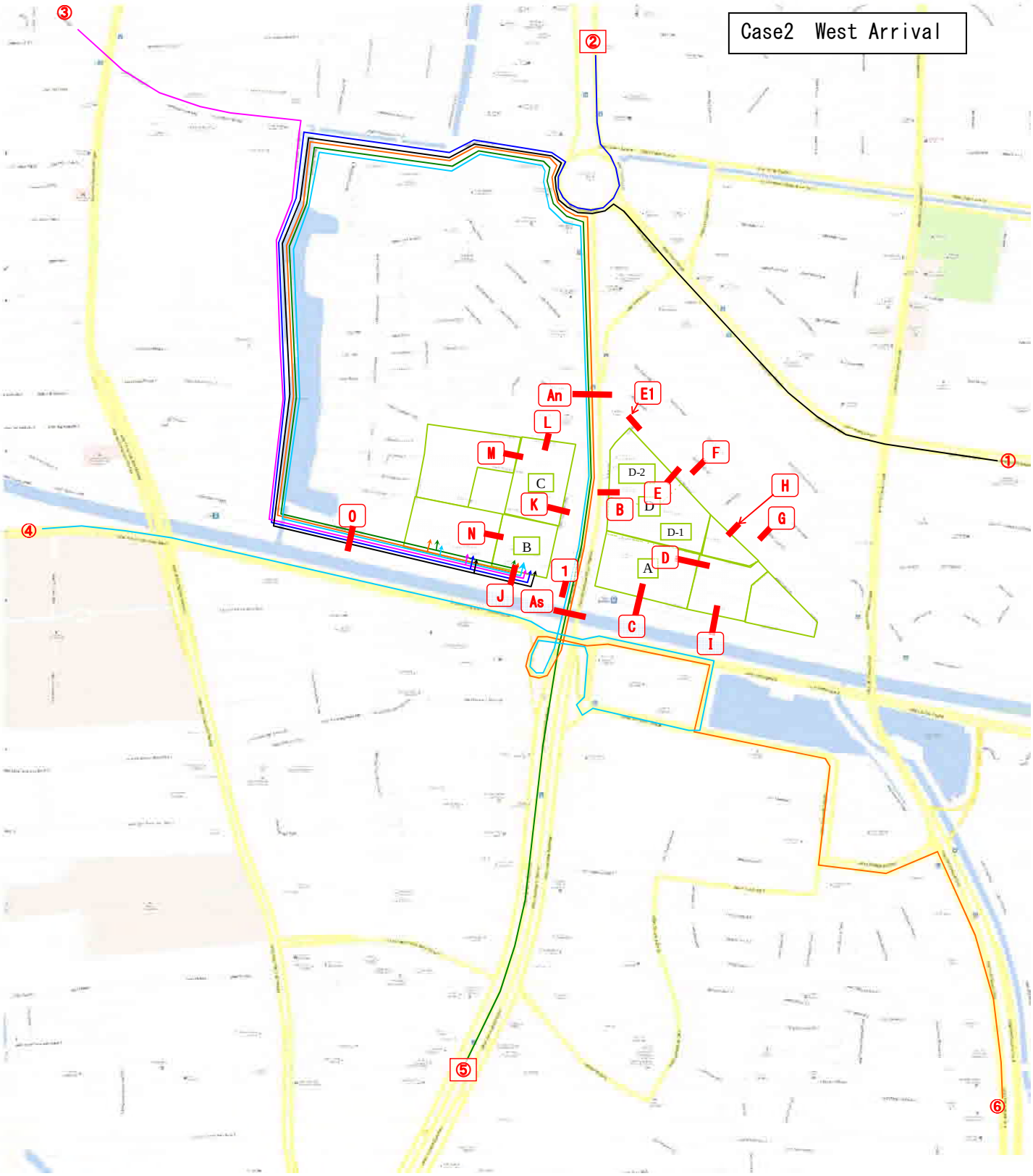


Figure-4.3.45 Case② West Arrival Route (Source：Study Team)

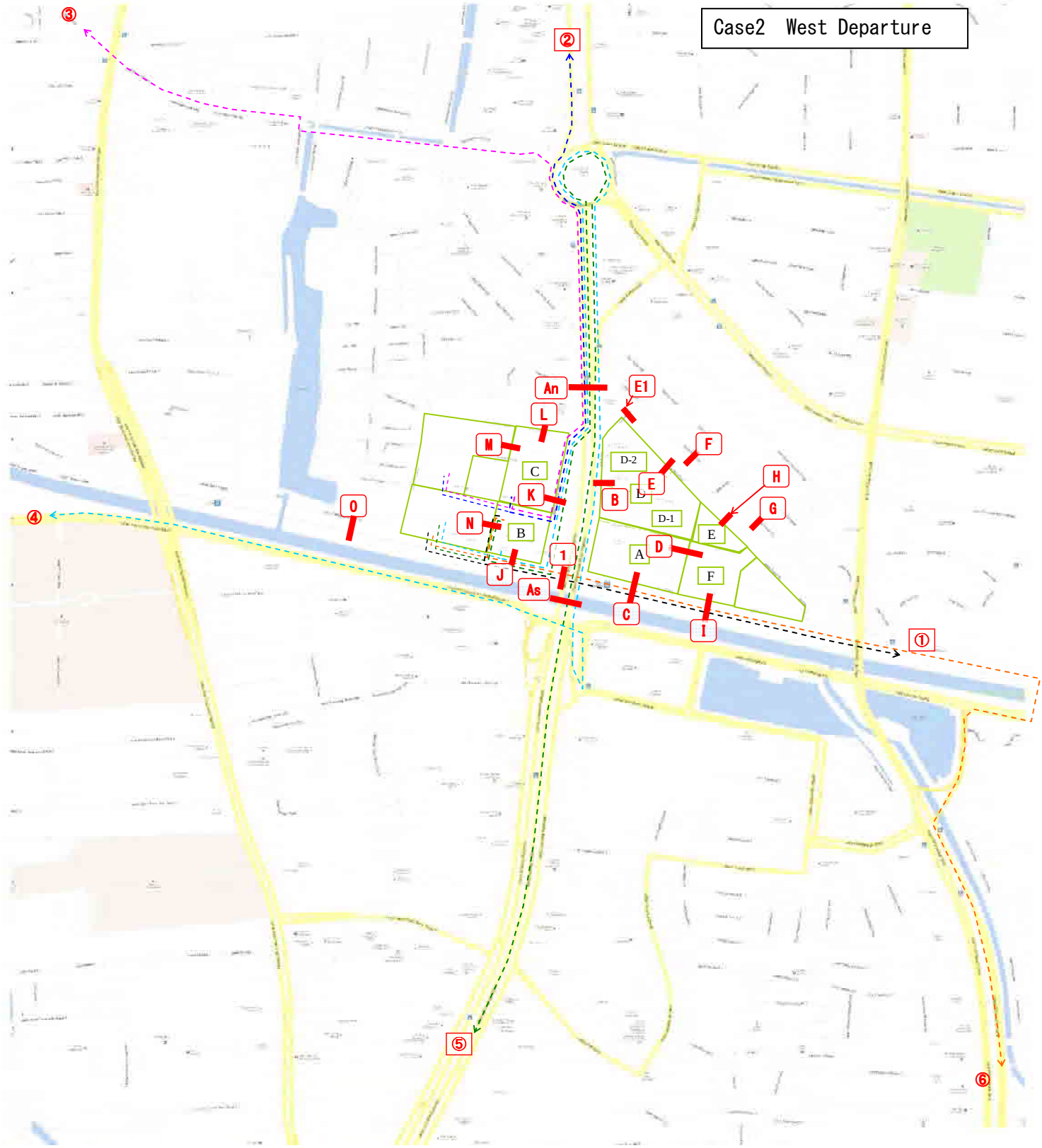


Figure-4.3.46 Case② West Departure Route (Source : Study Team)

4.3.6 Infrastructure Utility Plan

The main target is to estimate the possible demand of the infrastructure utility volume (electricity ,water supply, sewage, and gas) in the area. The estimation and plan must be revised according to the progress of the project.

1) Condition of the Demand Estimation

The volume used for future estimation is according to 4.3.1.

The basic estimation volume is using Japanese standards.

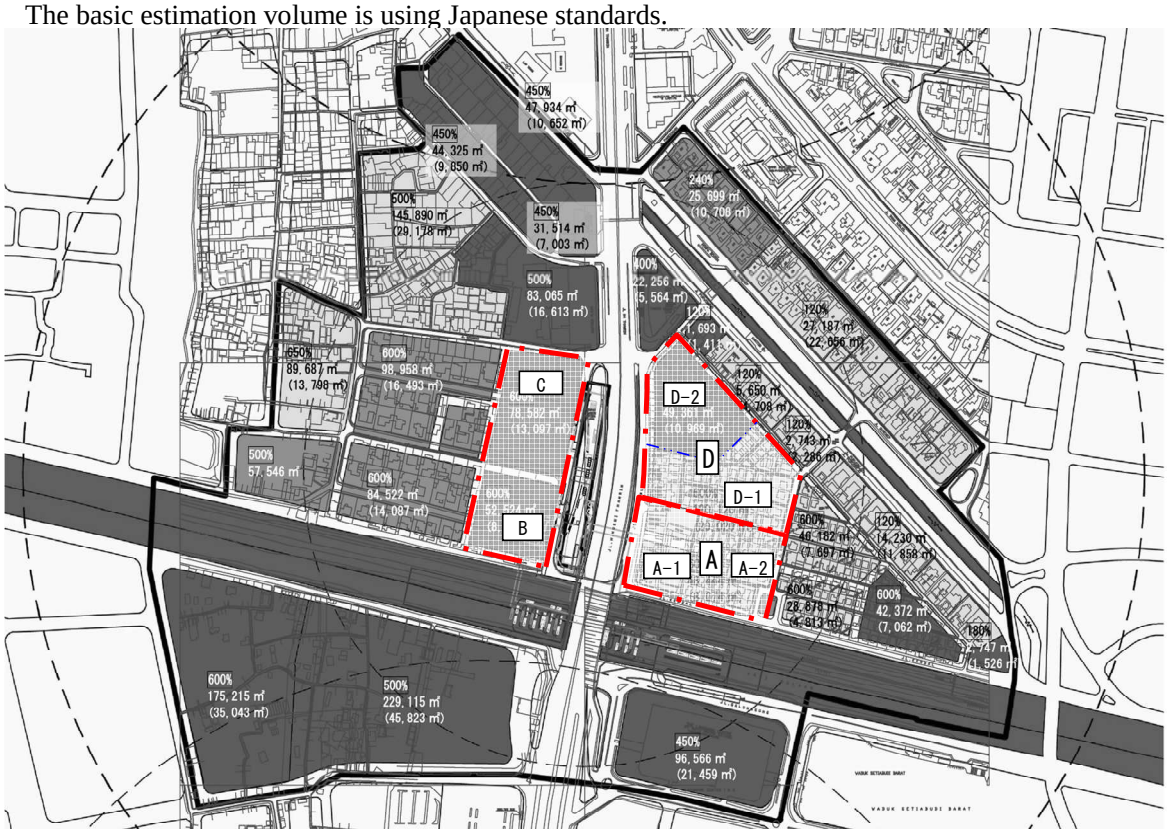


Figure-4.3.47 Area Used for Future Utility Estimation （Source:Study Team）

2) Estimation of Current Land and Building Area

(1) Current Land and Building Area

The current land area, building usage, and floor volume are shown in the Figure and table below. These outputs are surveyed under 1:2500 scale land survey map.

Under the outputs of the survey, for the area east of Thamrin/Sudirman the land area is apx.6.3ha, west area is apx 11.9ha.

Figure-4.3.48 Current Area Code （Source:Study Team）

Table-4.3.27 Current Area Code,Size,Usage (Source:Studay Team)

Code	Land Area (㎡)	Volume (%)	Usage
4	1,036	180	Office
3	1,974	180	Office
8	659	180	Office
5	667	180	Office
11	702	180	Office
2	2,516	240	Office
1	2,146	300	Office
20	7,789	300	Office
9	1,071	180	Residence
6	1,082	180	Residence
7	1,380	180	Residence
13	1,412	180	Residence
15	1,446	180	Residence
10	1,450	180	Residence
12	1,514	180	Residence
19	1,529	180	Residence
16	1,854	180	Residence
14	2,415	180	Residence
18	2,496	180	Residence
17	4,006	180	Residence
21	4,097	180	Office
26	1,685	180	Residence
25	3,096	180	Residence
22	3,574	180	Residence
24	4,775	180	Residence
23	6,407	180	Residence
East	62,778		
27	1,397	450	Office
28	3,275	450	Office
29	3,349	450	Office
30	2,869	450	Office
31	7,223	450	Office
32	13,355	450	Residence
33	13,534	450	Residence
34	10,884	450	Residence
West	55,886		
Total	**118,664**		

3) Estimation of Infrastructre Utilties in the Area

(1) Current Infrastructure Utilities

Estimation volume of the current infrastructure utilities are done by survey of the building area, floor volume, and building usage. Building usage is estimated by doing visual survey in the area. The estimations are shown on Table-4.3.23.

Table-4.3.28 Current Area Usage (Source: Study Team)

	Usage	Volume	Usage Balance				
			residence	commercial	office	hotel	Total
A, D	Residence	180%	100.0%	0.0%	*0.0%*	0.0%	100.0%
A, D	Office・Commercial	180%	0.0%	20.0%	*80.0%*	0.0%	100.0%
A, D	Office・Commercial	240%	0.0%	20.0%	*80.0%*	0.0%	100.0%
A, D	Office・Commercial	300%	0.0%	20.0%	*80.0%*	0.0%	100.0%
E, F, G	Residence	180%	100.0%	0.0%	*0.0%*	0.0%	100.0%
E, F, G	Office・Commercial	180%	0.0%	20.0%	*80.0%*	0.0%	100.0%
B, C, H, I	Residence	450%	100.0%	0.0%	*0.0%*	0.0%	100.0%
B, C, H, I	Office・Commercial	450%	0.0%	20.0%	*80.0%*	0.0%	100.0%

Table-4.3.29 Current Volume Estimation of Utility (Source: Study Team)

	Utility Volume		
	East	West	Total
Power (kW)	6,694	8,192	14,886
Water (m3/day)	1,272	1,624	2,896
Sewage (m3/day)	1,272	1,624	2,896
Gas (m3/h)	879	921	1,800

Table-4.3.30 Current Utility Volume Under Estimation （Source: Study Team）

		Land Area	Floor Area	87.5 Housings Residence	Power (W/Housing・W/㎡)	Power Volume (kW)	Water Supply (L/Housing per day・L/Person per day)	Water Supply Volume (m3/day)	Sewage (L/dayHousing・L/day㎡)	Sewage Volume (m3/day)	Gas (m3/hhousing・m3/h㎡)	Gas Continous Usage	Gas Volume (m3/h)
A -D	Residence		25,986	297	5,000	1,485	800	238		238	4	0.25	297
	Commercial		8,982	7,546	90	808	60	453	Same as Water Supply	453	0.06	0.50	269
East	Office		35,929	2,516	70	2,515	100	252		252			
	Hotel		0	0	50	0	40	0		0	0	0.50	0
	Total	39,144	70,898			4,808		942		942			566
E -G	Residence		23,444	268	5,000	1,340	800	214		214	4	0.25	268
	Commercial		1,475	1,239	90	133	60	74	Same as Water Supply	74	0.06	0.50	44
East	Office		5,900	413	70	413	100	41		41			
	Hotel		0	0	50	0	40	0		0	0	0.50	0
	Total	23,634	30,819			1,886		330		330			312
A -G	Residence		49,430	565	5,000	2,825	800	452		452	4	0.25	565
	Commercial		10,457	8,785	90	941	60	527	Same as Water Supply	527	0.06	0.50	314
East	Office		41,829	2,929	70	2,928	100	293		293			0
計	Hotel		0	0	50	0	40	0		0	0	0.50	0
	Total	62,778	101,717			6,694		1,272		1,272			879
B -I	Residence		37,773	432	5,000	2,160	800	346		346	4	0.25	432
	Commercial		16,302	13,694	90	1,467	60	822	Same as Water Supply	822	0.06	0.50	489
West	Office		65,207	4,565	70	4,564	100	457		457			
	Hotel		0	0	50	0	40	0		0	0	0.50	0
	Total	55,886	119,282			8,192		1,624		1,624			921
	Residence		**87,203**	997	5,000	4,985	800	798		798	4	0.25	997
	Commercial		**26,759**	22,479	90	2,408	60	1,349	Same as Water Supply	1,349	0.06	0.50	803
	Office		**107,036**	7,494	70	7,493	100	749		749			0
	Hotel		**41,829**	0	50	0	40	0		0	0	0.50	0
Grand Total		**118,664**	**262,827**			14,886		2,896		2,896			1,800

(2) Future Infrastructure Utility Estimation

As from the assumptions of 4.3.1, considering the volume of the maximum station area private development, the estimated need of infrastructure utilities in the area are shown in table -4.3.26. The used assumptions are listed on table-4.3.27. Using the outputs on the estimation of the report, more detail planning should be done in the area.

Table-4.3.31 Future Utility Volume Under Estimation (Source: Study Team)

	Power (kW)	Water Supply (m3/day)	Sewage (m3/day)	Gas (m3/h)
A	16,480	4,473	4,473	1,781
D-1	13,602	3,692	3,692	1,470
D-2	11,650	3,162	3,162	1,259
East	41,732	11,327	11,327	4,510
B	9,775	2,653	2,653	1,056
C	14,051	3,813	3,813	1,519
West	23,826	6,466	6,466	2,575
TOTAL	65,558	17,793	17,793	7,085

Tabe-4.3.32 Future Detail Utility Volume Under Estimation (Source: Study Team)

		Land Area	Floor Area	Housings Residence	Power		Water Supply		Sewage		Gas		
					(W/Housing・W/m²)	Volume (kW)	(L/Housing per day・L/Person per day)	Volume (m3/day)	(L/dayHousing・L/daym²)	Volume (m3/day)	(m3/hHousing・m3/hm²)	Continous Usage	Volume (m3/h)
A	Residence		23,300	267	5,000	1,335	800	214		214	4	0.25	267
	Commercial		46,599	39,144	90	4,194	60	2,349	Same as Water Supply	2,349	0.06	0.50	1,398
	Office		139,797	9,786	70	9,786	100	979		979			
	Hotel		23,300	23,300	50	1,165	40	932		932	0	0.50	116
	Total	15,533	232,995			16,480		4,473		4,473			1,781
D-1	Residence		19,235	220	5,000	1,100	800	176		176	4	0.25	220
	Commercial		38,469	32,314	90	3,462	60	1,939	Same as Water Supply	1,939	0.06	0.50	1,154
	Office		115,407	8,079	70	8,078	100	808		808			
	Hotel		19,235	19,235	50	962	40	769		769	0	0.50	96
	Total	12,823	192,345			13,602		3,692		3,692			1,470
D-2	Residence		16,469	189	5,000	945	800	151		151	4	0.25	189
	Commercial		32,937	27,668	90	2,964	60	1,660	Same as Water Supply	1,660	0.06	0.50	988
	Office		98,811	6,917	70	6,917	100	692		692			
	Hotel		16,469	16,469	50	823	40	659		659	0	0.50	82
	Total	10,979	164,685			11,650		3,162		3,162			1,259
A-D	**Residence**		**59,003**	**676**	**5,000**	**3,380**	**800**	**541**		**541**	**4**	**0.25**	**676**
	Commercial		**118,005**	**99,126**	**90**	**10,620**	**60**	**5,948**	**Same as Water Supply**	**5,948**	**0.06**	**0.50**	**3,540**
	Office		**354,015**	**24,782**	**70**	**24,781**	**100**	**2,478**		**2,478**			**0**
	Hotel		**59,003**	**59,003**	**50**	**2,950**	**40**	**2,360**		**2,360**	**0**	**0.50**	**295**
	Total	**39,335**	**590,025**			**41,732**		**11,327**		**11,327**			**4,511**
B	Residence		13,823	158	5,000	790	800	126		126	4	0.25	158
	Commercial		27,645	23,222	90	2,488	60	1,393	Same as Water Supply	1,393	0.06	0.50	829
	Office		82,935	5,806	70	5,805	100	581		581			
	Hotel		13,823	13,823	50	691	40	553		553	0	0.50	69
	Total	9,215	138,225			9,775		2,653		2,653			1,056
C	Residence		19,863	228	5,000	1,140	800	182		182	4	0.25	228
	Commercial		39,726	33,370	90	3,575	60	2,002	Same as Water Supply	2,002	0.06	0.50	1,192
	Office		119,178	8,343	70	8,342	100	834		834			
	Hotel		19,863	19,863	50	993	40	795		795	0	0.50	99
	Total	13,242	198,630			14,051		3,813		3,813			1,519

4.3.7 Disaster planning

1) Fire measures

The underground connecting passageways will be provided for pedestrian use only, so in general they will contain nothing flammable and are considered to be facilities where fires will not occur.

However, it is possible that the local fire department will require provision of fire extinguishers or other pieces of equipment, and this must be checked carefully at the detailed design stage.

2) Heavy rain and flood control measures

Jakarta does not have adequate flood control and drainage facilities, and as a result urban flooding and situations in which rivers in the city overflow their banks occur frequently. In the Dukuh Atas area as well, the existing railroad tracks have been submerged in the past, so heavy rain and flood control measures for underground facilities are particularly important. The underground connecting passageway between the planned Dukuh Atas Station on the MRT North-South Line and the existing Sudirman Station will connect to the concourse of Dukuh Atas Station on the MRT North-South Line, so in general the same flood control measures as for Dukuh Atas Station will be provided for the passageway.

At Dukuh Atas Station on the MRT North-South Line, the entrances for the stairs will be raised 0.9 m above the ground height, so the same policy will be followed for the underground connecting passageway.

Figure. 4.3.49 Artist's depiction of flood control measures for underground connecting passageway
(Singapore underground passageway entrance Source: Study Team)

3) Earthquake measures

Underground structures are not as affected by earthquakes as above-ground structures, so in the case of a simple structure such as a box culvert, the usual calculation is sufficient. However, sections that connect to other structures, etc., tend to be affected by displacement in the event of an earthquake or water leakage that occurs as a result, so this must be given thorough consideration at the detailed design stage.

4.3.8 Green Building

1) Greening-related Laws and Regulations

Ministry of the Environment Ordinance 8-21 issued in 2010 regarding environmentally conscious building standards and certification established the standards that must be met through the construction of buildings classified as environmentally conscious buildings. Buildings that meet these standards are certified as environmentally conscious buildings. As a rule, this certification has an effective period of two years, but this can be renewed by means of a set procedure.

The Ministry of the Environment issued these regulations with the aim of encouraging building owners to participate in sustainable environmental protection activities.

The organization that evaluates and certifies environmentally friendly buildings (hereafter "green buildings") as referred to in the law is the Green Building Council of Indonesia (GBCI). GBCI was organized in 2009, the year before the law was enacted, with building specialists, real estate companies, government representatives, and educational researchers and researchers as members. GBCI is the legal organization for providing information on and educating the public about green buildings, and certifying green buildings as described above, using Indonesia's own evaluation criterion which is referred to as Greenship.

Greenship is organized with three categories: new buildings, existing buildings, and interior spaces, which are revised as required by GBCI. Greenship for new buildings related to this project was revised on February 2012 to Version 1.1. Application for Greenship is currently optional, but in the near future it is scheduled to become obligatory for certain large-scale developments to obtain green building certification.

The evaluation criteria set for Greenship, and the buildings that are subject to evaluation are as shown below.

Evaluation Criteria (Rating Tool - describes a particularly close-up of greening)

1) Appropriate Site Development

Basic landscape space of 10% or more the proposed site area (above ground)

Landscape space of 40% or more of the proposed site area including the above, however the landscape area can include greening on artificial ground, roofs, and wall surfaces in accordance with Ministry of Public Works Ordinance Regarding Green Spaces No. 5-2.3.1 which was promulgated in 2008. Also according to 2.2.1-g of the law greenery under elevated structures can also be included.

2) Energy Efficiency Measure

Green and healthy interiorscape using natural energy

3) Water Conservation

Green spaces with good water efficiency using processed water or rainwater for watering

4) Material Resource Recycling

Reduce transport distance by using plants and materials for planting bed that have been cultivated locally

5) Indoor Health and Comfort

6) Building Environmental Management

Buildings Subject to Evaluation

a) Schools and educational organizations: 10,000 m^2

b) Hotels and health facilities: 20,000 m^2 or more

c) Offices and housing complexes: 50,000 m^2 or more

2) Target facilities for greening

a) Preconditions

The existing west line tracks and the Banjir Kanal are within the proposed site, and the green spaces along the tracks and the canal are preserved in accordance with Ministry of Public Works Ordinance Regarding Green Spaces No. 5-2.2.3-g1/g3, which was promulgated in 2008. At present these areas contain many tall trees that form a dense green landscape.

It is envisaged that these existing trees would be an obstruction to the construction for the artificial ground that is planned above Banjir Kanal and 6 Toll Road that will cover the space above the north side of the Banjir Kanal, or the new buildings. It is necessary to carry out studies of a landscape scheme so that the existing amount of greenery is not reduced by this project and the scenery and microclimate of the area is not worsened, by preserving or transplanting the existing trees, or replacing them with new plantings.

b) Public sector-led development

The public facilities that are intended to be developed in this project include the underground walkway, the connecting deck, and the artificial ground over the Banjir Kanal. The aim is to create a base with the artificial ground forming a transport hub as the center, connecting the stations to the city by passageways mainly for pedestrians.

To create attractive public spaces here, a people-friendly design is necessary to make it easier for people to walk around and to congregate, to make the spaces relaxing and healthful, to improve the microclimate, and provide abundant greenery. It should also be noted that in order to obtain Green Building certification, it is necessary to provide 40% or more of the proposed site area as green area.

Therefore, it should be an objective to provide the maximum amount of greenery, and create a green core in the urban transport hub, by selecting the construction methods and types of trees that are suitable for difficult growth conditions (load, sunlight, rainwater) such as the underground passageway, the artificial ground, under elevated areas, etc.

① Underground passageway

Realize the interiorscape mainly by using greenery on wall surfaces, and planters (ornamental foliage plants). By providing artificial plants in locations that cannot be reached, a pleasant appearance will be given to the inorganic underground passageway.

② Connecting deck

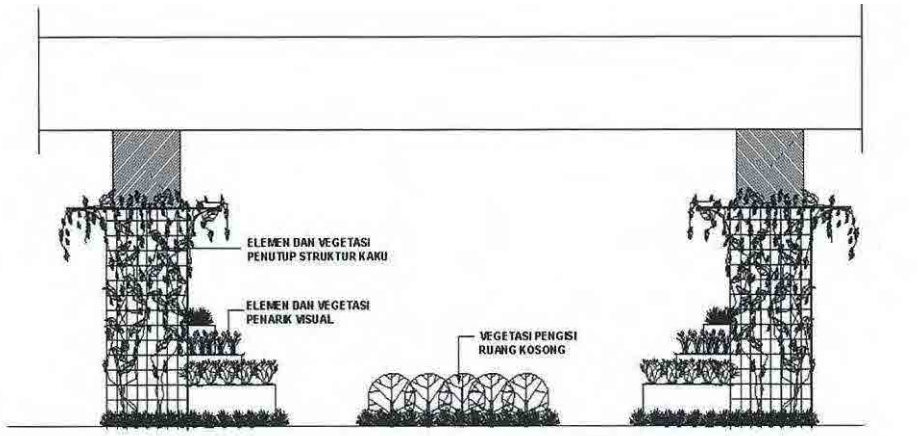
A green guideway can be formed by providing planting strips on both sides of the passageway, and planting low trees and climbing plants.

③ Artificial ground

Many medium-sized and tall trees can be planted by providing planting strips with a thickness of 250 to 800 mm of artificial lightweight soil, while also taking the loads into consideration. Tall trees can also be positively provided in those areas that tend to be paved surfaces where traffic and people meet. (It is considered that the load of a tall tree would not be a problem provided the structure is similar to that for a large bus.) In addition, by positively providing greenery on the canopy (roof) and wall surfaces, it is possible to create a transport hub rich in greenery that gives the users the feeling that they are on the ground, although they are on artificial ground.

④ Below elevated structures

Bridge piers can be greened by fitting a material such as mesh, etc., and planting shade tolerant vines from the top and thickly growing plants from below. In addition, planting strips with medium-sized and short trees can be provided scatteringly. The dimly lit and shady negative spaces that are covered by overhead structures can be transformed into beautiful spaces by the power of greenery. This type of planting is described in Ministry of Public Works Ordinance Regarding Green Spaces No. 5-2.2.3f (Open green spaces under road overpass). The following Figure. 2.13 is provided for reference.



Gambar 2.13 Contoh Pemanfaatan Vegetasi pada RTH di Bawah Jalan Layang

Large-scale greening of artificial ground already provides many beautiful spaces that have been constructed in Jakarta and are properly managed. In this project, it is most important to maintain and take care of the greening after the construction is completed, to plan a budget for management of the

planting. Another important task is to establish a watering system based on rainwater storage and recycled water.

c) Private sector-led development

Greenery associated with the development of the surrounding areas is a private sector-led development. It is necessary however that there be a development policy for the Dukuh Atas area and administrative guidance so that rich green outdoor spaces are developed, sustainable tree planted areas are obtained by planning and installing rainwater collection facilities, and positively employing building schemes and building management methods which considers the microclimate and microclimate fluctuations.

The following is a (image plan) development policy that takes greenery into consideration.

① The green area of each development site shall provide landscape spaces that exceed the Greenship evaluation criterion (50% or more of the site area).

② Each site shall provide a 6 m or more green path o around its periphery and maintained by the site, to provide a safe and comfortable space for pedestrians, and a green buffer zone.

③ Garden green spaces above ground shall not be fenced off , but shall be self managed green spaces that are open to the public. These shall be connected by the pedestrian network described on the previous page to form a single urban garden in the whole area.

④ To soften the impact of building façades facing the roads, arcade or terrace spaces shall be provided either indoor or outdoor, and if possible planting shall be provided in spots, to gently connect the outdoors and indoors. In addition, greenery similar to the outdoor greenery shall be provided on the wall surface. Stairs-shaped terrace gardens shall also be constructed in places and the external greenery shall be drawn into the building.

⑤ Green shade providing trees shall be planted in the planar car parks, to cover the artificial paved surface with the tree trunks and mitigate the adverse microclimate. Also, the use of greenery blocks in car parking strips shall be investigated, to promote the percolation of rainwater underground. A parking landscape shall be positively implemented.

⑥ Greenery shall be provided on underground structures, rooftops, and roofs, to develop court gardens, roof gardens, and green roofs. In this way the exposure of artificial structures is reduced and the heat island phenomenon is mitigated.

Urban redevelopment accelerates the development of artificial structures. The ground surface and water surfaces are covered with artificial structures, which obstructs the ordinary natural circulation of heat and water. By using landscape design which has always respected nature together with the latest technology and materials, a planted environment can be effectively created on the ground surfaces, walls, roofs, etc., to improve the environment.

Ground surfaces that have hard paving will be allowed to breath, the walls of buildings will become similar to the ridges of rice fields, and rooftops and roofs will be changed to fields and gardens. Creating such a tropical garden city is an important task for this project from the greenery point of view.

Indoor garden wall

Artificial

Hanging

Wall

Ceiling

Figure-4.3.50 Image of the interiorscape a. (Underground passageway) (Source: Study Team)

Individual potted plants Mixed potted plants Signscape

Figure-4.3.51 Image of the interiorscape b. (Underground passageway)
(Source: Study Team)

Public pedestrian bridge Privately-managed pedestrian deck

Landscaped walkways

Figure-4.3.52 Image of greenery on connecting decks
(Source: Study Team)

Figure-4.3.53 Image of greenery on artificial ground a (transport hub, planting tall trees)
(Source: Study Team)


Sloping road – tall trees


Sloping road, medium-sized trees


Providing depth for planting using a retaining wall


Providing depth for planting using an embankment

Figure-4.3.54 Image of artificial ground b (transport hub, planting tall trees)
(Source: Study Team)





Wall surface greenery using a mesh (applied to bridge piers) (vines)




Greenery in spaces below canopies (applied to below elevated structures)

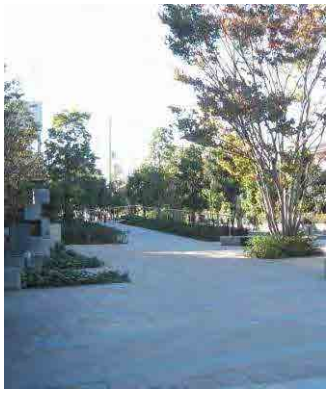
Figure-4.3.55 Image of greening of artificial ground below elevated structures
(Source: Study Team)



External peripheral green path





Green open plaza


Green terrace space connecting exterior and interior

Figure-4.3.56 Image of greening associated with development a (Source: Study Team)


Stairs-shaped terrace greening (greenery brought into the building)




Wall surface greening




Car park greening (parkscape)



Court garden (artificial ground courtyard)



Roof garden (on the roof of artificial ground)

Figure-4.3.57 Image of greening associated with development b (Source: Study Team)

Roof garden (on roof of artificial ground)

Green roof

Figure-4.3.58 Image of greening associated with development c (Source: Study Team)