

**Hoa Lac Hi-Tech Park Management Board,  
Ministry of Science and Technology  
Japan International Cooperation Agency (JICA)**

**THE STUDY FOR  
HOA LAC HIGH -TECH PARK  
FEASIBILITY STUDY  
IN THE SOCIALIST REPUBLIC OF  
VIETNAM**

**FINAL REPORT**

**SUPPORTING REPORT**

**MARCH 2009**

**NIPPON KOEI CO., LTD.**

EID

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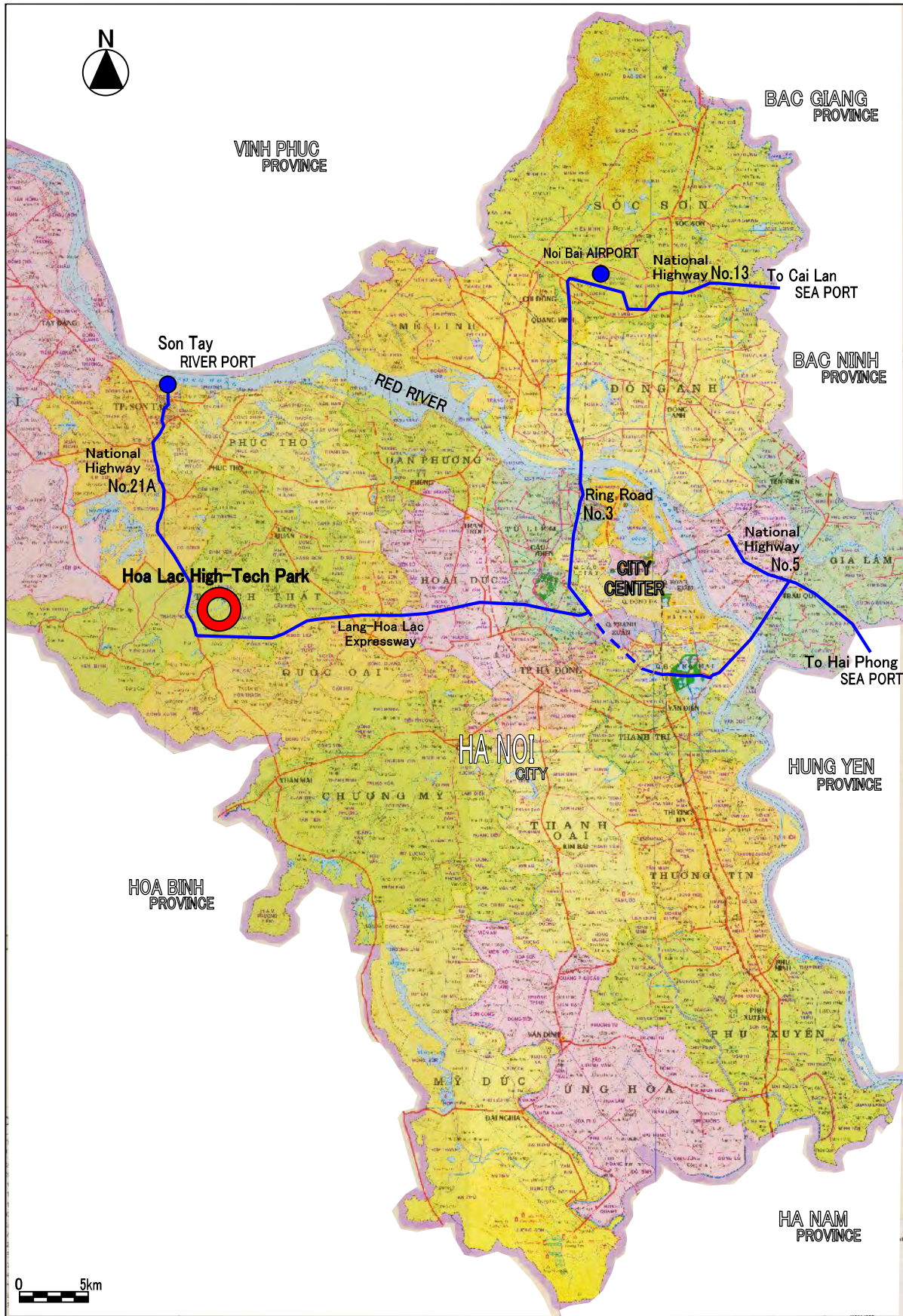
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THE EXCHANGE RATE USED IN THE REPORT IS:

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(AVERAGES 2008)



Location map

**THE FEASIBILITY STUDY  
FOR  
HOA LAC HIGH-TECH PARK FEASIBILITY STUDY**

**FINAL REPORT**

**SUPPORTING REPORT**

**List of supporting  
Abbreviations**

**LIST OF SUPPORTING**

- |              |  |
|--------------|--|
| SUPPORTING A | LAND USE, LAND RECLAMATION, LANDSCAP PLAN AND<br>AREA DEVELOPMENT PLAN |
| SUPPORTING B | ROAD PLAN  |
| SUPPORTING C | DRAINAGE PLAN  |
| SUPPORTING D | WATER SUPPLY PLAN  |
| SUPPORTING E | SEWERAGE PLAN  |
| SUPPORTING F | POWER SUPPLY PLAN  |
| SUPPORTING G | TELECOMMUNICATIONS PLAN  |
| SUPPORTING H | SOLID WASTE MANAGEMENT PLAN  |
| SUPPORTING I | PROJECT IMPLEMENTATION PLAN  |
| SUPPORTING J | SOCIAL AND ENVIRONMENTAL CONSIDERATION                                 |

## **ABBREVIATIONS**

ADB	Asian Development Bank
AIST	Advanced Industrial Science and Technology
BDS	Business Development Services
CIT	Corporate Income Tax
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EVN	Electricity of Vietnam
FDI	Foreign Direct Investment
FIRR	Financial Internal Rate of Return
FPT	Financing and Promoting Technology Corporation
F/S	Feasibility Study
GOV	Government of the Socialist Republic of Vietnam
HAIDEP	The Comprehensive Urban Development Programme in Hanoi Capital City
HBI	High –tech Business Incubator
HCMC	Ho Chi Minh City
HHRP	Hoa Lac High-Tech Human Resource Platform
HHTP	Hoa Lac High-Tech Park
HHTP-MB	HHTP Management Board
HHTP-DC	HHTP Development Company
HLSC	Hoa Lac Space Center
HPC	Hanoi People’s Committee
HUST	Hanoi University of Science and Technology
HWTC	High-tech Workforce Training Center
ICD	Inland Clearance Depot
ICT	Information and Communication Technology
JETRO	Japan External Trade Organization
JAIF	Japan Atomic Industrial Forum Inc.
JAXA	Japan Aerospace Expiration Agency
JICA	Japan International Cooperation Agency
JICA updated M/P	JICA Updated M/P of the Hoa Lac High-Tech Park
JPY	Japanese Yen
LHLE	Lang-Hoa Lac Expressway
MARD	Ministry of Agriculture and Rural Development
MIC	Ministry of Information and Communication
MOC	Ministry of Construction
MOF	Ministry of Finance
MOET	Ministry of Education and Training

MOIT	Ministry of Industry and Trade
MOND	Ministry of National Defense
MONRE	Ministry of Natural Resources and Environment
MOST	Ministry of Science and Technology
MOT	Ministry of Transport
MOU	Memorandum of Understanding
M/P	Master Plan
MPI	Ministry of Planning and Investment
MPT	Ministry of Post and Telecommunication
MSL	Mean Sea Level
NARO	National Agriculture and Food Research Organization
NEDO	New Energy and Industrial Technology Development Organization
NIHE	National Institute of Hygiene and Epidemiology
NIIP	National Institute of Plant Protection
NITE	National Institute of Technology and Evaluation
O&M	Operation and Maintenance
ODA	Official Development Assistance
PMU	Project Management Unit
R&D	Research & Development
ROW	Right of Way
S&T	Science and Technology
SHTP	Saigon High-Tech Park
SME	Small and Medium Enterprise
STI	Space Technology Institute
S/S	Substation
TCVN	Vietnamese Standard
TCXDVN	Vietnamese construction specifications
USD	US Dollar
URENCO	Urban Environment Company
VAEC	Vietnam Atomic Energy Committee
VAST	Vietnamese Academy of Science and Technology
VCCI	Vietnam Chamber of Commerce and Industry
VIETTEL	VIETTEL Corporation
VINASHIN	Vietnam Shipbuilding Industry Corporation
VINACONEX	Vietnam Construction and Import Export Corporation
VITEC	Vietnam Training & Examination Center
VIWASEEN	Vietnam Water Supply, Sewerage and Environment Construction Investment Corporation
VMI	Vietnam Meteorology Institute

VND	Vietnamese Dong
VNPT	Vietnam Posts and Telecommunications Group
VN Revised M/P	Vietnam Revised M/P of the Hoa Lac High-Tech Park
VNU	Vietnam National University

**SUPPORTING A**  
**LAND USE, LAND RECLAMATION, LANDSCAP PLAN AND**  
**ZONE DEVELOPMENT PLAN**

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## CHAPTER 1 PRESENT CONDITION OF LAND PREPARATION

### 1.1 PRESENT STATUS

#### 1.1.1 Land Use

##### (1) Existing Land Use Plan

Utilizing the JICA Updated M/P Study as a base, the VN Revised M/P was prepared that among other changes modified land use plan. The VN Revised M/P was approved by the Prime Minister in May, 2008.

The HHTP is comprised of the Hoa Lac Area (north of the LHLE) and Northern Phu Cat Area (south of the LHLE). The land use plan and the functions of the HHTP are summarized in Table A.1.1.

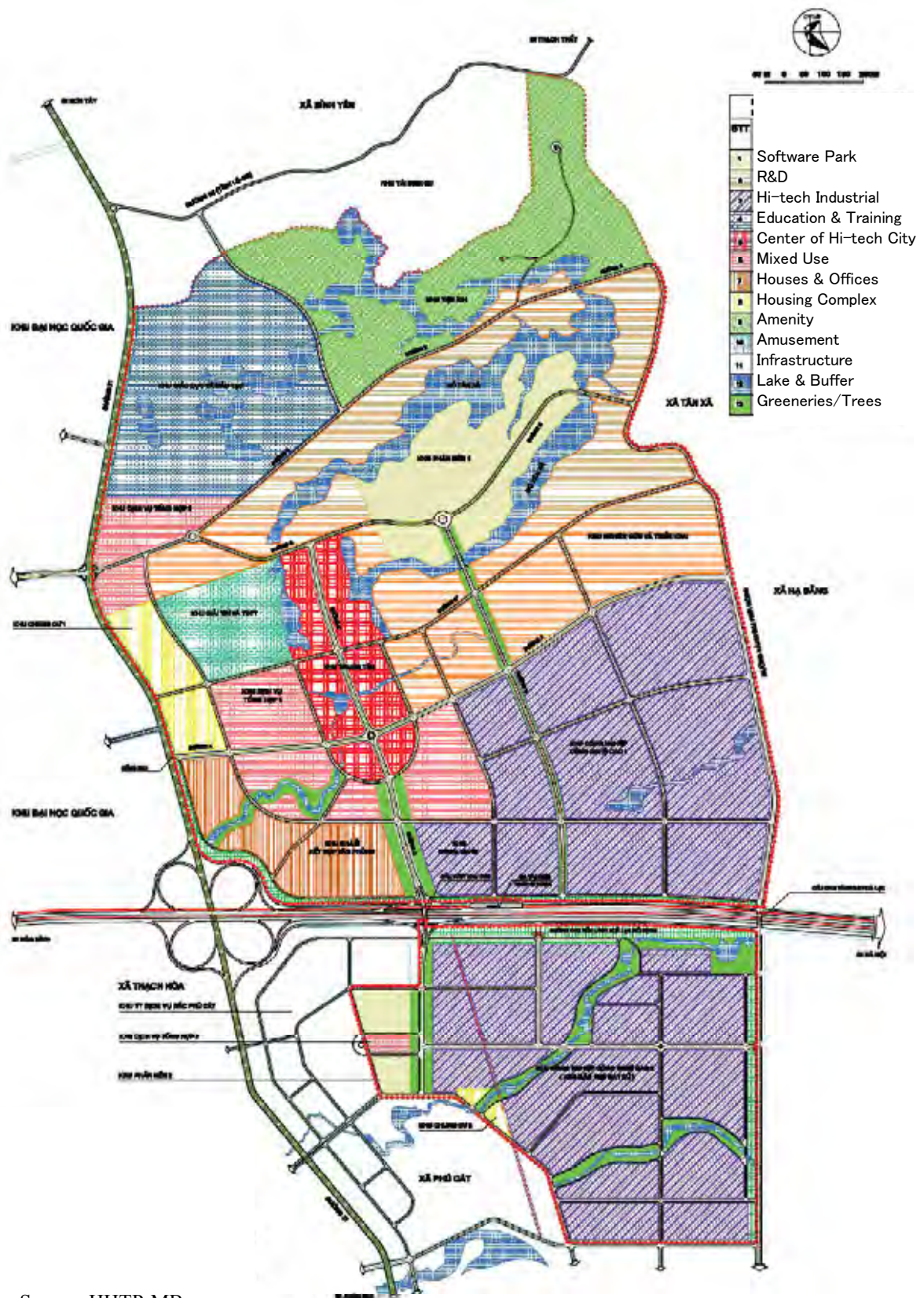
The land use plan for the whole HHTP, which was provided by the HHTP-MB, is shown in Figure A.1.1.

The major differences between the land use plans of the JICA Updated M/P and the VN Revised M/P exists in the southeast area. The development plan for the JICA Updated M/P was not agreed by the former Ha Tay People's Committee.

**Table A.1.1 Land Use Plan for the HHTP (VN Revised M/P)**

Land Use	Area (ha)	Proportion (%)	Function
1 Software Park	75.9	4.8	Software companies.
2 R&D	229.0	14.4	State Research Institutes, high-tech business laboratories and talent incubation.
3 High-tech Industrial	549.5	34.6	Technological product manufacture, factories and plants.
4 Education & Training	108.0	6.8	Universities, vocational training schools, and academies.
5 Center of High-tech City	50.0	3.2	High-tech transfer and services.
6 Mixed Use	87.7	5.5	Trading facilities and houses.
7 Houses and Offices	42.0	2.7	High-quality and luxurious living environment
8 Housing Complex	26.0	1.6	Apartments with required living environment.
9 Amenity	110.0	6.9	Social and recreational facilities, including luxurious housing and golf courses.
10 Amusement	33.5	2.1	Recreational, sporting and health facilities.
11 Infrastructure	115.5	7.3	Roads, wastewater treatment plant and services.
12 Lake and Buffer	117.0	7.4	Eco-friendly areas, including green trees and the water surface.
13 Greenery/Trees	42.0	2.7	
<b>Total</b>	1,586.1	100.0	

Source: VN Revised M/P



Source: HHTP-MB

Figure A.1.1 Land Use Plan for the HHTP

## (2) Present Land Use

The HHTP has a total area of 1,586.51ha which is divided by the Lang-Hoa Lac Expressway (LHLE) into two areas: Hoa Lac Area (north of the LHLE) and Northern Phu Cat Area (south of the LHLE). The present land use pattern in the HHTP is summarized in Table A.1.2.

The Hoa Lac Area, comprising a land area of 1,268.51ha, is located to the north of the LHLE. The present land use pattern in the Hoa Lac Area consists of a waterfront area (11%), the agricultural area (50%), a developed area (34%) and an undeveloped area (5%).

**Table A.1.2 Present Land Use in the HHTP**

Land Use Type	Hoa Lac Area		Northern Phu Cat Area		Total Area of the HHTP	
	Area (ha)	Proportion	Area (ha)	Proportion	Area (ha)	Proportion
<b>I. Developed Area</b>	435.61	34.34%	65.81	20.69%	501.42	31.61%
1 Residential Area	236.22	18.62%	44.55	14.01%	280.77	17.70%
2 New Industrial Area	11.50	0.91%	4.15	1.31%	15.65	0.99%
3 Specialized Use Area	187.89	14.81%	9.55	3.00%	197.44	12.44%
1) Public Utility	20.68	1.63%		0.00%	20.68	1.30%
2) Transportation	80.73	6.36%	9.55	3.00%	90.28	5.69%
3) Irrigation	12.15	0.96%		0.00%	12.15	0.77%
4) Cultural Assets	0.28	0.02%		0.00%	0.28	0.02%
5) Security & Defense	68.13	5.37%		0.00%	68.13	4.29%
6) Cemetery	5.92	0.47%		0.00%	5.92	0.37%
4 Existing Industrial Area		0.00%	7.56	2.38%	7.56	0.48%
<b>II. Agricultural Area</b>	636.00	50.14%	200.77	63.14%	836.77	52.74%
<b>III. Surface Water</b>	139.00	10.96%	34.50	10.85%	173.50	10.94%
<b>IV. Undeveloped Area</b>	57.90	4.56%	16.92	5.32%	74.82	4.72%
1 Forestry Area	51.51	4.06%	16.92	5.32%	68.43	4.31%
2 Open Space	6.39	0.50%		0.00%	6.39	0.40%
<b>Total</b>	1,268.51	100.00%	318.00	100.00%	1,586.51	100.00%

Source: VN Revised M/P

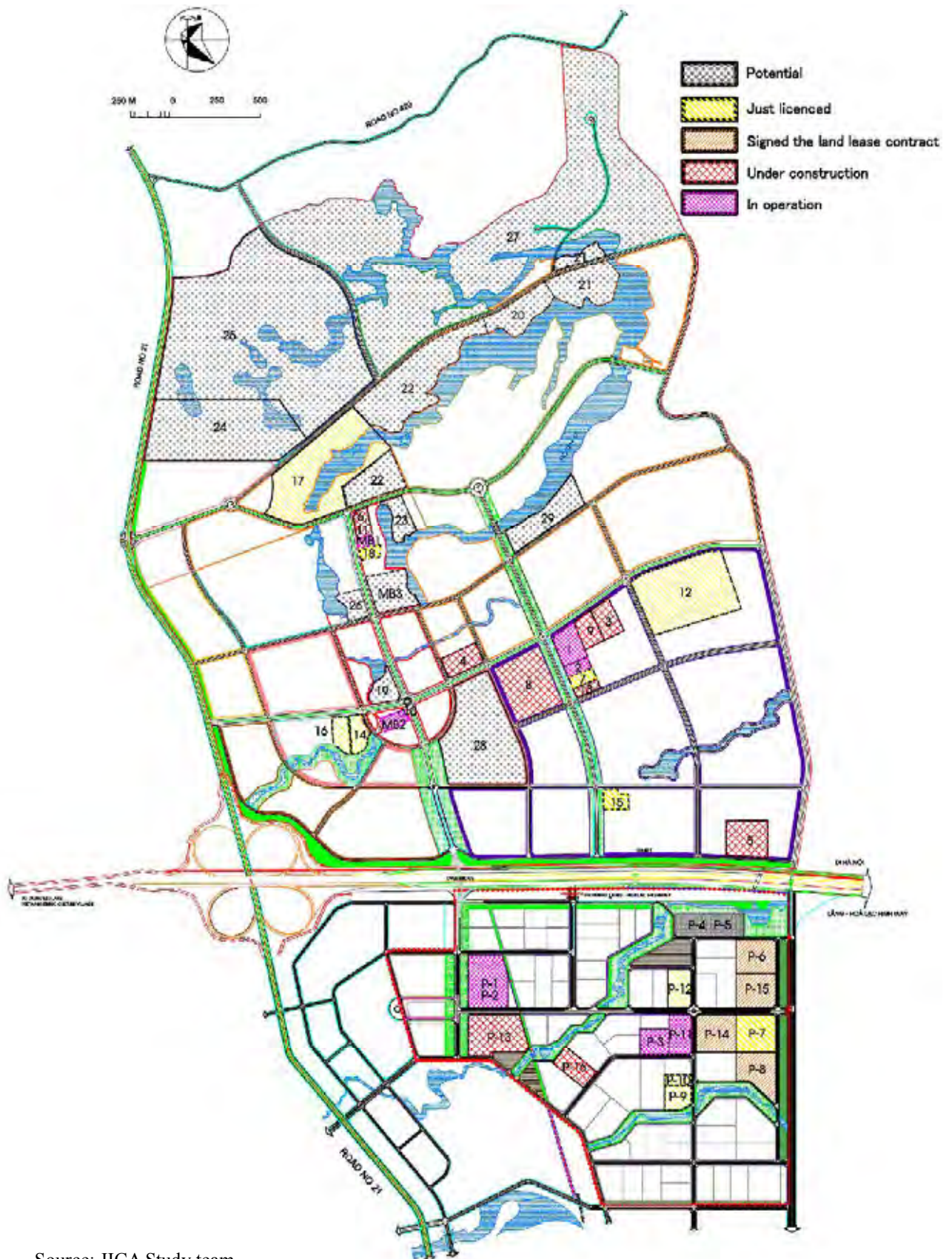
## (3) Investment in Land Development

Based on original M/P and F/S, few places in the HHTP area has already been developed. Earlier established companies were located in various places. An investment certificate must be acquired prior to the land development. The locations of the current investment projects by various companies are shown in Figure A.1.2. A list of licensed land investment companies is shown in Table A.1.3 and A.1.4.

In the Northern Phu Cat Area, 13 enterprises have obtained investment certificates. (One enterprise has obtained the certificates for two different places.) In addition, there are two enterprises which have been excluded for management by HHTP-MB.

In the Hoa Lac Area, 16 enterprises have obtained investment certificates and one research institute has obtained an approval for accepting investments.

In addition, further investment from private enterprises, state research institutions, etc. are expected.



Source: JICA Study team

Figure A.1.2 Land Development Status

**Table A.1.3 Licensed Land Investment Companies (Hoa Lac Area)**

No.	Name of enterprise	Area (ha)	Progress
1	Noble	3.00	OP
2	Oetek	1.00	OP
3	HPT	2.50	UC
4	Vietinbank	2.20	UC
5	IMOSO Thuan Phat	5.00	UC
6	Viettel	1.40	UC
7	Vietnam-Korea Medicine	1.00	LC or SL
8	APSS	10.00	UC
9	Vinagame	2.20	UC
10	Kim Cuong	0.07	OP
11	Viettel - CHT	-	UC
12	V-CAPS	20.00	LC
13	FC Technologies	0.75	UC
14	Misa Company	1.20	LC
15	Medlac Pharma Italy	1.50	LC or SL
16	Vinetworks	2.00	LC
17	VINASHIN	25.00	LC
18	Vietnam Internet Center	0.80	LC
19	VNPT Telecommunication Support Center	2.20	PO
20	NIHE	5.80	PO
21	Space Technology Institute (STI)	9.00	PO
22	VAST (include. STI)	30.00	PO
23	High-tech Business Incubator (HBI)	2.60	PO
24	FPT University	30.00	PO
25	Hanoi University of Science and Technology	60.00	PO
26	Department of Financial Informatics & Statics - Misnistry of Finance	2.00	PO
27	Foxconn Corporation	110.00	PO
28	Foxconn Corporation	22.80	PO
29	Vietnam Metrology Institute (VMI)	6.80	PO
MB1	HHTTP-MB Office	1.30	OP
MB2	Hoa Lac Service Center	1.20	OP
MB3	HHTTP-MB Office (Future Expansion)	5.00	PO
<b>Total</b>		<b>368.32</b>	

Note: OP= in operation, UC=under construction, SL=signed the land lease contract, LC=just licensed, PO=potential  
Source: HHTTP-MB

**Table A.1.4 Licensed Land Investment Companies (Northern Phu Cat Area)**

No.	Name of project	Area (ha)	Progress
P-1	Artificial tile factory Investor: VINACONEX CORPORATION	3.00	OP
P-2	Expansion project for High-advanced stone plant Investor: High-class Advanced Compound Stone Plant - VICOSTONE (Vinaconex)	4.81	
P-3	Project for production of glass fibre pipes Investor: Glass Fibre Jsc. - VIGLAFICO (Vinaconex)	3.70	OP
P-6	Electronic production plant Investor: Kim Dinh Company	5.00	SL
P-7	Pharmaceutical production plant Investor: Ha Tay Pharmaceutical Sjc.	7.00	LC
P-8	Project for producing export handicraft products Investor: Viet Hien Development Corp.	5.00	SL
P-9	Project for producing export handicraft products, stone sculpture products Investor: Phuc Hung - Constrexim Architecture Jsc.	2.00	LC
P-10	Project for investment in export processing Investor: Royal ltd.	1.00	LC
P-11	Project for construction of high-advanced stone processing plant Investor: VINACONEX	5.41	OP
P-12	Project for Construction of Datapost Center Investor: Inter-province and International Posts Company	3.00	LC
P-13	Artificial high-advanced tile stone Plant Investor: VINASTONE and WK-Australia Joint Venture	8.57	UC
P-14	Pharmaceutical production plant Investor: SOHACO Group	5.00	SL
P-15	Project for construction of Pharmaceutical production plant Investor: Vietnam Chemical and Pharmaceutical Jsc.	4.88	SL
P-16	Project for producing fireproof doors Investor: VINACONEX and SANWA-HOLDINGS CORP. Joint Venture	2.00	UC
		60.37	

Note: Progress: OP= in operation, UC=under construction, SL=signed the land lease contract, LC=just licensed  
Source: HHTP-MB

## 1.1.2 Land Acquisition and Resettlement

### (1) Land Acquisition

The land area that has currently been acquired for the development of the HHTP is shown in Figure A.1.3. The current status of land acquisition of the HHTP is shown in Table A.1.5.

**Table A.1.5 Progress of Land Acquisition for the HHTP**

Executing body	Necessary area (ha)	Acquired are (ha)	Remarks
HHTP-MB(stage1:2015)	200	200: completed	Achieved in 2003-2004
PMU (stage2:2020, early stage )	600	395.5	204.5 ha remains
PMU (stage2:2020)	468	0	Targeted to be complete by 2010 Under survey of ownership etc.
VINACONEX	318	231	Phu Cat area (out of the study area)
Total	1,586	826.5	52% of area has been acquired

Source: HHTP-MB

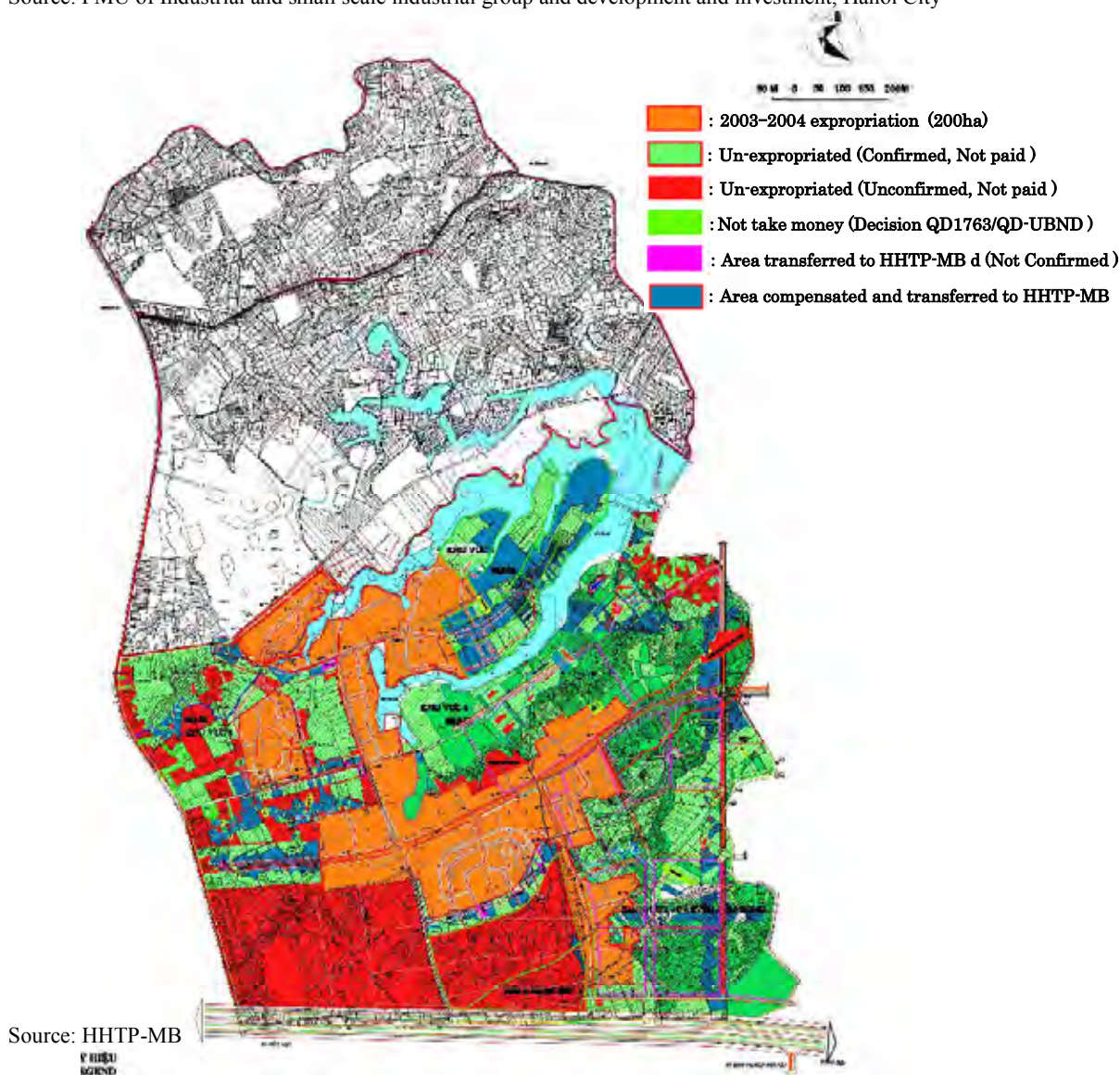
After land acquisition and resettlement were undertaken in early stage of Stage-1(2015) of the Project by HHTP-MB, the responsibility of land acquisition transfers to the PMU of industrial and small scale group Hanoi City, which is also responsible for the development and investment of the former area of Ha Tay Province. Of the total 1,586ha as approved by the VN Revised M/P for the HHTP project, the PMU has implemented land acquisition of 1,080ha.

The current status of the development in resettlement areas for two (2) land acquisition projects is given in Table A.1.6. By June 2010, a total of sixty (60) ha of resettlement area has been planned for development.

**Table A.1.6 Preparation of the Resettlement Area**

Land acquisition project	Resettlement area (ha)	Progress of preparations
600 ha (early stage of stage2(2020) )	36	Area has been cleared. Plan for construction of infrastructure has been approved. All preparation will be complete by June 2009.
480 ha (stage2(2020) )	24	Planned to be completed by June 2010.
Total	60	-

Source: PMU of Industrial and small scale industrial group and development and investment, Hanoi City



**Figure A.1.3 Land Acquisition**



## (2) Resettlement

The development area of the HHTP consists of 5 communities: Thach Hoa, Binh Yen, Tan Xa, Ha Bang, and Phu Cat. The first stage of resettlement has been completed in an area of about 200 ha. Resettlement process started in 2002, and was completed in August, 2007.

The household of resettled and compensated is shown in a Table A.1.7.

**Table A.1.7 Households of Resettlement and Compensation**

Commune	Households to be resettled		Household to be compensated	
	Study Area	HHTP area	Study Area	HHTP area
Thach Hoa	933	1,134	959	1,097
Tan Xa	129	413	540	1,029
Ha Bang	0	0	0	0
Binh Yen	138	138	215	215
Phu Cat	0	37	0	59
<b>Total</b>	<b>1,200</b>	<b>1,722</b>	<b>1,714</b>	<b>2,400</b>

Source: PMU of Industrial and small scale industrial group and development and investment, Hanoi City

## 1.2 PRESENT CONDITION OF LAND RECLAMATION AND LANDSCAPE

### 1.2.1 Present Condition of Land Reclamation

Land reclamation was planned in the VN Revised M/P as well as in the JICA Updated M/P. The results of land reclamation are shown in Table A.1.8. According to VN Revised M/P, for industrial use, the ground level was set at more than 11 m above mean sea level (MSL+11 m) and for public/civil use, it was set above MSL+10 m. Taking in account of last 100 years of flood return period, these set levels ensures that the area wont get flooded.

**Table A.1.8 Design Ground Level**

	VN Revised M/P	JICA Updated M/P
Ground level of the R&D, Education & Training, and High-Tech Industrial Zones	$\geq$ MSL+11.0m	$\geq$ MSL+10.0m
Ground level of Other Zones	$\geq$ MSL+10.0m	$\geq$ MSL+10.0m
Ground level of Road	$\geq$ MSL+10.0m	$\geq$ MSL+8.5m

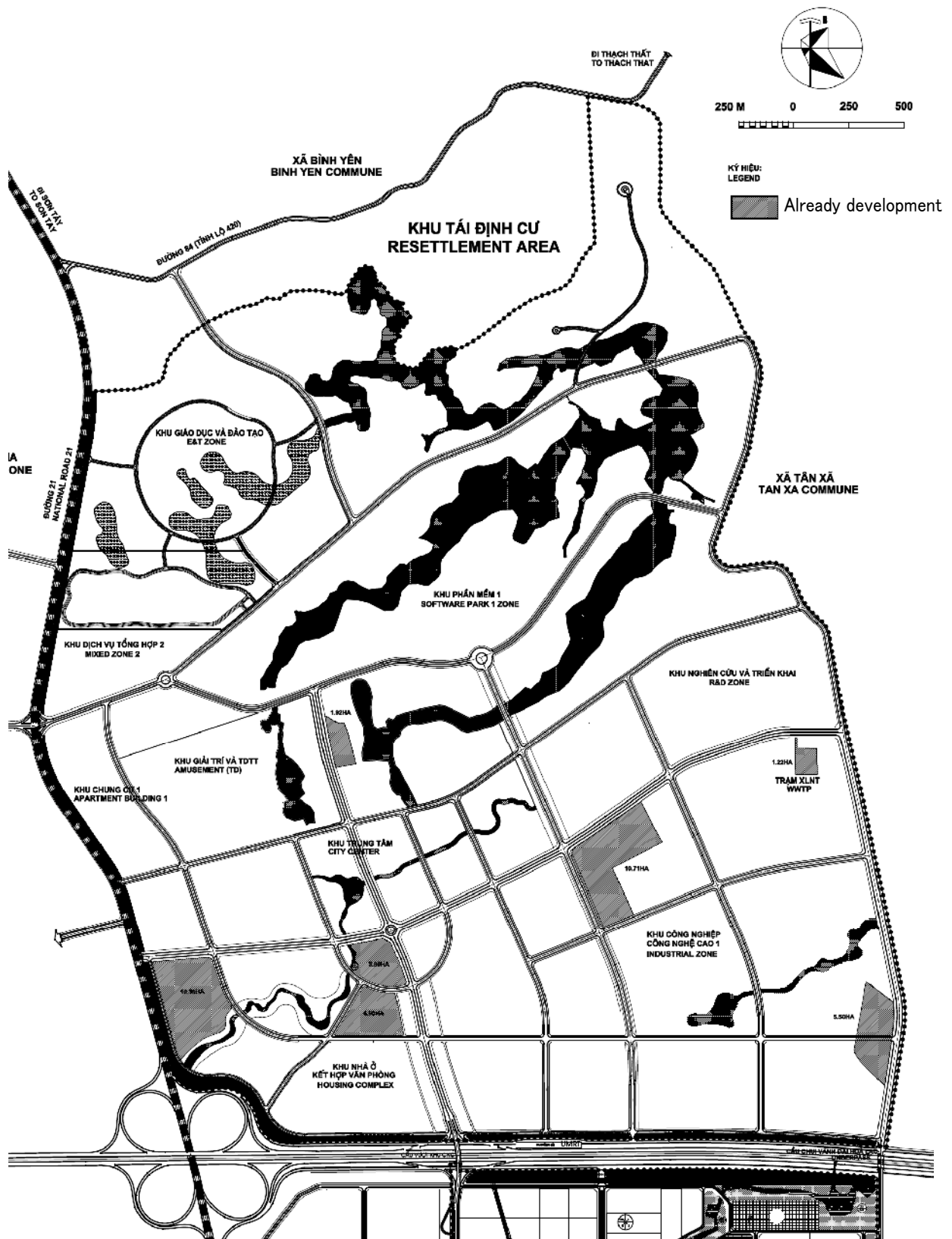
Source: VN Revised M/P and JICA Updated M/P

The current situation is shown in Figure A.1.4, and the places where land reclamation has already been conducted are shown in Figure A.1.5.



Source: JICA Study Team

**Figure A.1.4 Existing Land Reclamation Areas**



Source: JICA Study Team

Figure A.1.5 Location of Existing Land Reclamation

### 1.2.2 Present Condition of Landscape

The HHTP has various scenic attributes, such as lakes, rivers, and low hills. These special features of the scenery are very important to create natural landscape that can provide comfortable and relaxing environment. The Tan Xa Lake is located at the center of the HHTP and provides a very beautiful natural environment. There is also a hill in the northwest part of the HHTP. The current situation of the natural environment around the Tan Xa Lake is shown in Figure A.1.6.

While developing the HHTP, it is necessary to preserve and utilize the natural environment in creating soothing environment and good landscape in the region.

In order to standardize landscape, the HHTP-MB has prepared a guideline (draft); “Management regulations on construction and planning for landscape architecture of Hoa Lac high-tech Park”, which each tenant and the entrepreneur have to follow.



Source: JICA Study Team

**Figure A.1.6 Tan Xa Lake**

## CHAPTER 2 REVIEW OF LAND USE PLAN

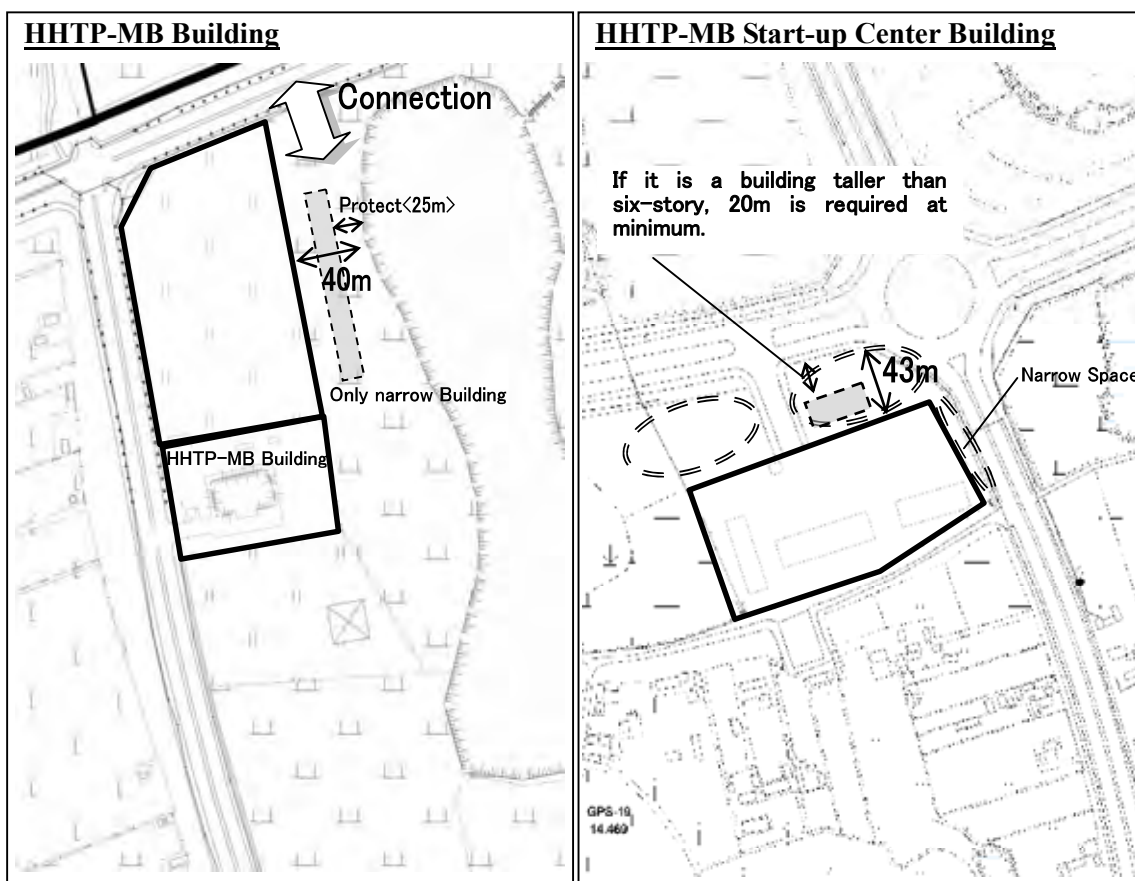
### 2.1 CONSTRAINTS OF EXECUTION AND PLANNING BASIS

#### 2.1.1 Constraints for Execution of Land Use Plan

The main problems and restrictions for the execution of land use plan are as follows:

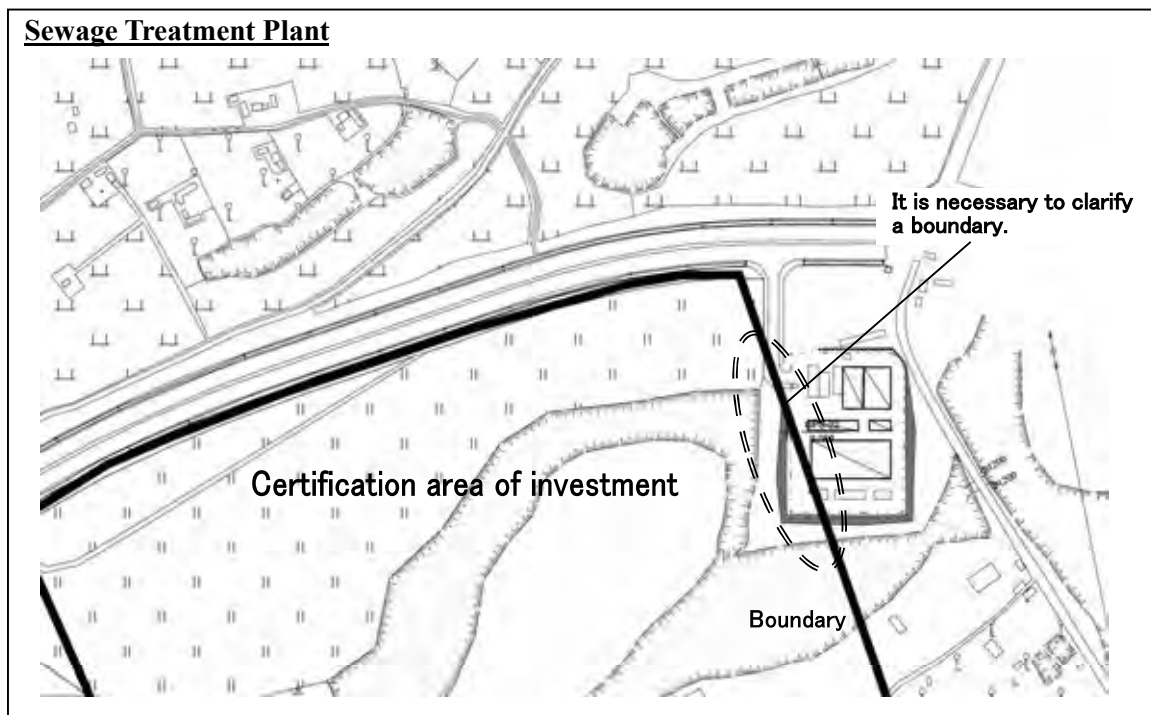
- Investment certificates are issued based on individual applications and as a result the development work is also being carried out individually, thus ignoring the basic concept of coordination and organized land use plans. This resulted in non-optimum utilization of land and improper land use, generating some unused land. Therefore, from the viewpoint of efficient land use, it is necessary to strictly control the land use.
- The detailed plan of each zone has to follow the HHTTP land use plan. Consistency with the HHTTP land use plan is necessary when detailed plans are prepared and implemented.

It is necessary to take due consideration of the current states of development, especially in the areas where facilities have been built or are under construction. An example is shown in Figure A.2.1 describing a place where land use plan restricts the earlier development.



Source: JICA Study Team

Figure A.2.1 Example of Difficult Effective Land Use (1/2)



Source: JICA Study Team

Figure A.2.1 Example of Difficult Effective Land Use (2/2)

As an example, some problems and proposed ameliorative measures are described below.

#### Case 1

##### <Problem>

- Relatively narrow strips of land, which adjoin roads, remains unusable.
- There is no space available for protecting the lakeshore.
- When a part of an area of the land that faces a road is sold, then a irregular part and /or unusable areas of land remains.

##### <Proposed ameliorative measures>

- Land that faces a road should be utilized as an entire package.
- Relatively the narrow strip of land that has no buildings can be utilized for landscaping, a car park, etc., thereby making full and effective use of the available land area.

#### Case 2

##### <Problem>

- An existing facility has been established in a setback position that is distant from a main road and the narrow access road has been constructed to link the setback site to the main road.
- Since the width of the remaining unused land along a main road becomes narrow and considering the setbacks, it will be nearly impossible to construct a large building. In case if a high-rise building is constructed near the main road and in front of the setback building then it is likely that sunshine will be obstructed for the setback building.

**<Proposed ameliorative measures>**

- The development compatible with the existing facilities should be encouraged.
- The construction of a low-rise building is favorable in such situations.

**Case 3**

**<Problem>**

- Based on acquired investment certificate by the company (V-CAPS), the sewage treatment plant has been built on the site whose boundaries are still not clear.
- The investment project has not progressed after the company acquired the investment certificate.

**<Proposed ameliorative measures>**

- The company and HHTP-MB should settle the boundary of the site immediately.
- The investment projects need to be accelerated by the company for which the investment certificate has been issued.

2.1.2 Planning Basis

The Prime Minister's approval for the VN Revised M/P has allowed development of the HHTP. As a result of this approval, the HHTP development work was accelerated. However, if the development plan changes from the VN Revised M/P, then it will take more time and costs. Therefore, it is required to prepare the fundamental concept of planning in line with the VN Revised M/P.

The VN Revised M/P sets out the general planning and vision for development as follows:

**General Planning**

The government's policy is to develop a National High-tech Park in order to create an attractive environment for foreign investment along with a flow of high-tech industries to;

- Build a national high-tech center as a nucleus to boost local economic zones, and
- Develop an environment that will coordinate scientific and technological research. The high-tech human resources and education will be able to deliver a competent workforce and thus can contribute in meeting the national socio-economic, scientific and technological goals.

**Vision**

The HHTP will be an area that will attract different forms of high-tech research and development in a fair and competitive environment. The aim is to promote the development of high-tech industries nationwide. The HHTP shall be a dynamic, flexible and effectively operated high-tech park. It will have an architectural space synchronized with a modern infrastructure system. To ensure sustainable development, the knowledge hub with a high standard of living and working environment will be created.

## **2.2 REVIEW OF LAND USE PLAN**

### **2.2.1 Review of Land Use Plan**

The land use plan has been reviewed based on the actual development status and planned concept as summarized below:

- Land use plan of the VN Revised M/P will act as a base plan and accordingly the land use classification and layout were adopted.
- The proposed land use plan covers 1,036 ha in the Hoa Lac area. A part of the industrial zone has been excluded.
- Idea of detailed plan as prepared by the entrepreneur has been referred and some aspects were considered in the land use plan.
- Infrastructure development plan proposed in the study has been integrated in the land use plan, particularly with reference to calculation of areas.

Basic concept of land use plan mentioned in the VN Revised M/P is summarized in the box below.

- Considering market needs, ease of sales and traffic safety, the High-Tech Industrial Zone will be located on the site having the best access to the LHLE.
- Considering convenience and better accessibility to users, the Center of the High-Tech City and the Mixed Use Zone will be located in the center of the HHTP.
- To strengthen the linkages between the Research and Development and high-tech industries, the Research and Development Zone will be located adjacent to both the High-Tech Industrial Zone and the Software Park. In addition, to popularize science and technology, the location of the Research and Development zone need to be close to the Center of the High-Tech City.
- To maximize the function and performance of the common infrastructure and facilities, the zones with similar characteristics must be closely located. For example, the Software Park and the Education and Training Zone, that requires information technology facilities, should be located close to each other.

The function of the land use zones for the Study area which has been set up by the VN Revised M/P, are summarized below.

#### **(1) Software Park Zone**

The area allocated for the Software Park Zone will be separated from the Research and Development Zone by Tan Xa Lake because these two zones have different functions. Tan Xa Lake will provide a buffer between these two zones. In general, the Software Park Zone will be an island surrounded by the lake and the Research and Development Zone. In addition, the Research and Development Zone will be implemented by HHTP-MB and the Software Park Zone will be implemented by the company appointed for the development of that zone.

#### **(2) Research and Development (R&D) Zone**

Research and development (R&D) are one of the most important functions of the HHTP. In principle, national research institutes are established to attract experts and exceptional qualified people who will be engaged in researching and applying high technologies. The Research and Development Zone will be located adjacent to the Center of the High-Tech City and Tan Xa Lake, and in general will surround the Software Park Zone. The Research and Development Zone, Software Park and the Central Zone are placed near to each other so as to provide flexibility and support land development in future.

(3) High-tech Industrial Zone

The High-tech Industrial Zone will be located in the southeastern part of the HHTP, far away from Tan Xa Lake. Although the Hoa Lac Area comprises 231.6ha, the Study area represents only part of this, covering 114.7ha. Some land adjacent to the High-tech Industrial Zone is within the Hoa Lac Area, but it is outside the Study area.

(4) Education and Training Zone

Training agencies, including the center of technical and vocational training, will be arranged in this zone so as to provide education and training to engineers, technicians, and professional workers. The Education and Training Zone will be located adjacent to Route 21 and near to the Research and Development Zone.

(5) Center of the High-tech City Zone

The Center of the High-tech City Zone will be located near the Research and Development Zone and the Mixed Use Zone. The Center of the High-tech City Zone will have a view of trees and the water surface of Tan Xa Lake. This zone will provide variety of services and will hold various functional activities for the entire HHTP. This includes public function center for holding functions, ceremonies, and the inauguration of factories or research institutes, etc.

(6) Mixed Use Zone

The Mixed Use Zone is a multi-functional zone with functions like commerce, business, etc. The zone will be divided into two sub-zones; one will be located near the gateway to the center of the HHTP, and the other will be located adjacent to Route 21, near the offices and agencies of the Education and Training Zone. The gateway area will connect to Lang-Hoa Lac Expressway and the Route 21 area will be able to provide better accessibility and make it easy for people to use services specially who work in the Research and Development Zone, the Software Park Zone and the people who lives outside the HHTP area.

(7) Houses and Offices Zone

Houses in this zone will be very luxurious with many services and quality infrastructure. The quality infrastructure and services like supermarkets, hospitals, schools, etc. will provide comfortable and relaxing living conditions to the local and foreign residents. In addition, this zone will contain a housing complex with modest prices and other essential services for workers and office staff.

(8) Housing Complex Zone

To produce goods and to provide quality services, HHTP requires the services of highly intellectual and talented workforce. It is natural, the demand for a skilled and talented workforce will be very high. Thus considering this, the housing model adopted for the residential area in the HHTP will provide the workers with a safe and convenient living environment. These facilities will assist them to work effectively.

(9) Amenity Zone

The Amenity Zone consists of entertainment and social facilities, etc. Proposed features of this zone include a golf course and a guesthouse. These facilities will cater the business people and others who expect very high quality services. However, it is to be noted that the Amenity Zone is located outside the Study area.

(10) Amusement Zone

The Amusement Zone is located near the Center of the High-tech City Zone, the Research and Development Zone, and the Mixed Use Zone. It is also relatively close to the Education and



Training Zone. The Amusement Zone closely connects with other functional zones of the HHTP.

(11) Lake and Buffer Zone

The small lakes and a low hill forms the Lake and Buffer Zone. This zone creates open space and provides the most favorable condition for the landscape. One part of Tan Xa Lake is in the golf course (located outside the Study area); other parts of Tan Xa Lake are adjacent to the Research and Development Zone, and the Software Park Zone.

The Proposed land use plan for the Study Area is shown in Figure A.2.2 and the allocated areas are summarized in Table A.2.1.

The arrangement of the land use plan has not changed. However, re-examination of the width of roads was carried out in the road plan. In the VN Revised M/P, roads within the High-tech Industrial Zone were included in the area of this zone. Since the zone areas defined for the HHTP exclude the road part, the area listed for the High-tech Industrial Zone has been decreased. For this reason, the infrastructure area increases and the area of each development zone decreases.

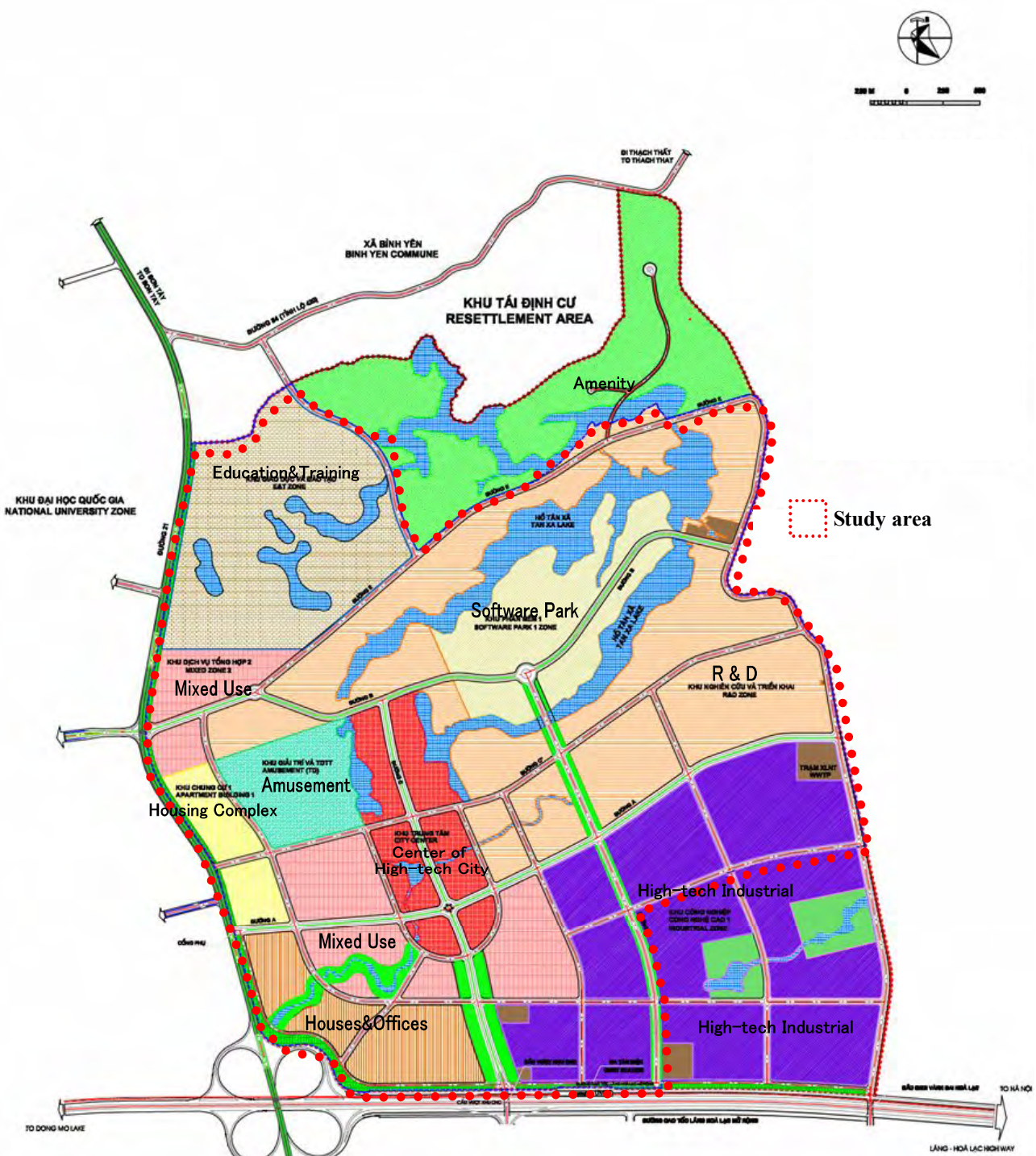
The zone layout was prepared by considering the sequence of construction and accessibility between the related zones, differences in user levels, and safety. Moreover, to make it easier to create synergy between the zone functions, zones that are having the similar functions and characteristics are located near to each other.

In principal, Land use plan of JICA F/S follows the VN Revised M/P. However, area of each zone is slightly changed as follows due to alteration of width of road:

**Table A.2.1 Comparison between VN Revised M/P and JICA F/S**

Land Use	VN Revised M/P		JICA F/S	
	Area (ha)	Proportion (%)	Area (ha)	Proportion (%)
1 Software park	65.0	5.1	64.4	5.1
2 R&D	228.9	18.1	227.9	18.0
3 Hi-tech Industrial	260.5	20.5	231.6	18.3
4 Education & Training	108.0	8.5	108.0	8.5
5 Center of hi-tech City	50.0	3.9	49.0	3.9
6 Mixed Use	85.3	6.7	84.5	6.7
7 Houses & Offices	42.0	3.3	41.9	3.3
8 Housing Complex	23.4	1.8	22.6	1.8
9 Amenity	110.0	8.7	110.0	8.7
10 Amusement	33.5	2.6	33.2	2.6
11 a. Infrastructure	113.6	9.0	133.4	10.5
b. Public service area inside of Industrial Zone	0.0	0.0	13.7	1.1
12 Lake & Buffer	117.0	9.2	117.0	9.2
13 Greeneries/Trees	30.8	2.4	30.8	2.4
Total	1,268.0	100.0	1,268.0	100.0

Note: An area of infrastructure presented by JICA F/S includes areas of road, wastewater treatment plant, power sub-station, Vuc Giang Stream and other public services, while by VN Revised M/P these public service areas are estimated for the area of Hi-tech Industrial zone.



Source: JICA Study Team

Figure A.2.2 Proposed Land Use Plan

### 2.2.2 Population Projection

In general as the land use plan follows the VN Revised M/P, the population projection also follows the VN Revised M/P. The population prediction for the Study area as forecasted for each zone by VN Revised M/P is shown in Table A.2.2.

**Table A.2.2 Proposed Land Use Plan and Predicted Population (Hoa Lac Area)**

Development Zone		Study Area (ha)	Area (ha) Total	Population Projection (persons)		Classification of Population	
				Total	Density (p/ha)	Daytime Population	Nighttime Population
1	Software park	64.4	64.4	12,880	200.0	12,880	0
2	R&D	227.9	227.9	13,674	60.0	13,674	0
3	High-tech Industrial	114.7	231.6	23,160	100.0	23,160	0
4	Education & Training	108.0	108.0	43,200	400.0	25,920	17,280
5	Center of high-tech City	49.0	49.0	12,250	250.0	7,350	4,900
6	Mixed Use	84.5	84.5	12,675	150.0	5,070	7,605
7	Houses & Offices	41.9	41.9	34,149	815.0	0	34,149
8	Housing Complex	22.6	22.6	34,691	1,535.0	0	34,691
9	Amenity	0.0	110.0	220	2.0	220	0
10	Amusement	33.2	33.2	1,660	50.0	1,660	0
11	Traffic & Infrastructure	146.6	147.1	0	—	0	0
12	Lake & Buffer	112.4	117.0	0	—	0	0
13	Greeneries/Trees	30.8	30.8	0	—	0	0
Sub-total		1,036.0	1,268.0	188,559	—	89,934	98,625

Note: Study area is excluding Amenity and a part of High-tech industrial zone from the Hoa Lac Area (north of the LHLE).

Source: JICA Study Team

Based on specific characteristics of a typical high-tech zone in HHTP area and considering the current and future workforce demand, and the forecast of high-tech industry development, the population and workforce size has been predicted.

The HHTP will produce products with a high intellectual content. Therefore, suitably trained and qualified people are needed. As the residential areas, as well as offices are the living environments, they must provide quality services and be comfortable for workers. Many people will reside in this area. It is predicted that 43,000 or more students and lecturers will use the Education and Training Zone, and 17,000 or more people will reside in hostels. The Software Park Zone, Research and Development Zone, Center of the High-tech City Zone, Amenity Zone, and the Amusement Zone are large enough to cater the needs of permanent workforce and fulfill the requirement for services to visitors, short-stay researchers and employees.

During the day time, in Hoa Lac Area, the total population is expected to be about 189,000. This total population comprises of about 100,000 people who will reside in the HHTP during day as well as in night time and about 90,000 people who lives elsewhere and will visit HHTP during the day time only.

## CHAPTER 3 PROPOSED LAND RECLAMATION PLAN AND LANDSCAPE PLAN

### 3.1 PROPOSED LAND RECLAMATION PLAN

#### 3.1.1 Plan Concept

The HHTP covers an extensive area exceeding 1,000ha and a substantial proportion of the area is lower than the required ground level. For this reason, land reclamation will be necessary. This will be done by cut and fill work, and by importing a large volume of soil. However, in order to reduce the cost, the volume of imported soil should be minimized. In addition, considering the safety aspects, such as the prevention of flooding during heavy rain, and so on, it will also be necessary to establish the existing ground level. The VN Revised M/P established the ground level that is required so that the land surface remains above the height of a 100 year return period flood event. The design ground level that was established is shown in Table A.3.1.

**Table A.3.1 Design Ground Level**

	Ground Level
Ground level of R&D, Education & Training, and High-Tech Industrial Zones	$\geq$ MSL+11.0m
Ground level of Other Zones	$\geq$ MSL+10.0m
Ground level of Roads	$\geq$ MSL+10.0m

Source: VN Revised M/P

The height of the reclamation established by the Study is as follows:

- The ground level established by the VN Revised M/P is satisfactory.
- The ground level of the R&D, Education & Training, and High-Tech Industrial Zones will be made higher than MSL+11.0 m.
- Soil preparation (cut and fill) will be the primary means of reclamation.
- The ground level of other zones will be leveled at the road height, or higher.
- The land surface slope will be established by considering drainage in the roads.
- Each tenant will prepare the land according to the respective ground area and building.
- Soil fill will be acquired from the neighborhood of the HHTP.

#### 3.1.2 Evaluation of Soil

Three quarters of the HHTP site is made up of low hills, with the ground level varying from 2.30m to 20.00m ASL. The slope angle of the topography is about 5 - 15 degrees. In general, the topography is not even or flat. Therefore, it should be leveled before executing the HHTP development work.

The ground water level that was determined from twenty one (21) soil quality testing boreholes varied from 0.50m to 5.00m. In the rainy season, the water level could rise and cause problems, such as water flows to excavation areas. The sub-surface soil condition is very complex, with twelve (12) distinct layers being observed.

A description of the sub-surface soil by layer is given in Table A.3.2.

**Table A.3.2 Soil Condition**

<b>Layer</b>	<b>Soil Condition</b>
Layer 1a:	Cultivated soil.
Layer 1b:	Road building soil: Stiff, reddish brown, yellowish grey silty clay mixed grits-gravels.
Layer 2:	Firm, yellowish brown silty clay.
	Resistance Capacity $R_0 = 1.15$ ( kg/cm <sup>2</sup> )
	Deformation module $E_0 = 80.0$ ( kg/cm <sup>2</sup> )
Layer 3:	Stiff to very stiff, yellowish-reddish brown silty clay mixed laterite grits-gravels.
	Resistance Capacity $R_0 = 1.00$ ( kg/cm <sup>2</sup> )
	Deformation module $E_0 = 65.0$ ( kg/cm <sup>2</sup> )
Layer 4:	Soft, brightish grey, pinkish brown silty clay.
	Resistance Capacity $R_0 = 1.25$ ( kg/cm <sup>2</sup> )
	Deformation module $E_0 = 95.0$ ( kg/cm <sup>2</sup> )
Layer 5:	Firm to stiff, reddish brown, yellowish-brightish grey silty clay mixed grits.
	Resistance Capacity $R_0 = 1.30$ ( kg/cm <sup>2</sup> )
	Deformation module $E_0 = 75.0$ ( kg/cm <sup>2</sup> )
Layer 6:	Very Stiff, yellowish-brightish grey silty clay mixed grits.
	Resistance Capacity $R_0 = 1.60$ ( kg/cm <sup>2</sup> )
	Deformation module $E_0 = 120.0$ ( kg/cm <sup>2</sup> )
Layer 7:	Firm, brownish-yellowish grey silty clay.
	Resistance Capacity $R_0 = 1.10$ ( kg/cm <sup>2</sup> )
	Deformation module $E_0 = 50.0$ ( kg/cm <sup>2</sup> )
Layer 8:	Hard, blackish grey silty clay mixed macadams-grits.
	Resistance Capacity $R_0 = 1.70$ ( kg/cm <sup>2</sup> )
	Deformation module $E_0 = 150.0$ ( kg/cm <sup>2</sup> )
Layer 9:	Very strongly weathered greenish-brightish grey sand-gravelstone.
	Nature Compressive Capacity $R_n = 273$ ( kg/cm <sup>2</sup> )
	Saturated Compressive Capacity $R_s = 216$ ( kg/cm <sup>2</sup> )
Layer 10:	Soft, brightish-blackish grey silty clay.
	Resistance Capacity $R_0 = 0.85$ ( kg/cm <sup>2</sup> )
	Deformation module $E_0 = 23.0$ ( kg/cm <sup>2</sup> )
Layer 11:	Very strongly weathered brightish-whitish grey limestone.
	Nature Compressive Capacity $R_n = 847$ ( kg/cm <sup>2</sup> )
	Saturated Compressive Capacity $R_s = 710$ ( kg/cm <sup>2</sup> )

Source: JICA Geological Survey Report

A study of the results obtains from technical investigations carried out for 21 soil quality testing boreholes has allowed the JICA Study Team to make some conclusions and formulate recommendations, as follows:

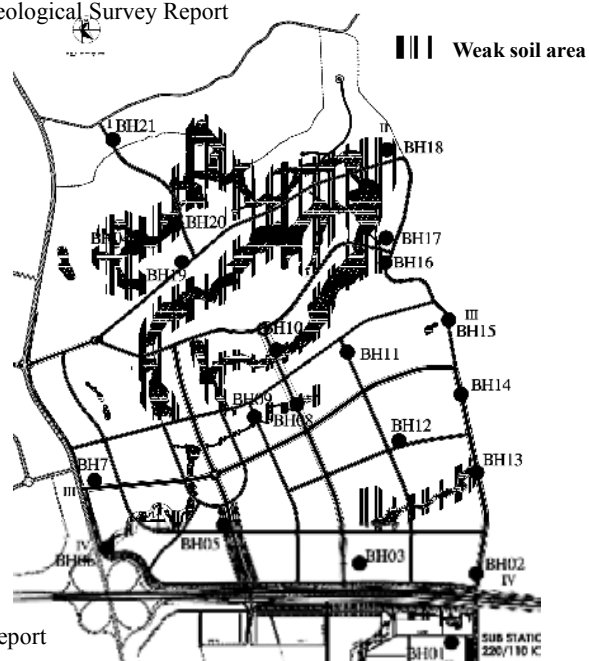
- Soil layer 4 is structurally weak. Building foundations should not rest on this layer, as this may result in large settlement problems when the soil is compressed by loading. For infrastructure such as factories and warehouses, this soil layer should be treated before construction.
- Soil layers 2, 3, 5 and 7 have medium structural strength properties. These layers are suitable for medium loaded buildings.
- Soil layer 6, 8, 9 and 11 have good structural strength properties. These layers will be very good for buildings with high bearing capacity. This layer also follows each other. Therefore, these layers are suitable for highly loaded buildings.
- Before building any structures, it will be necessary to check whether the foundation conditions are strong enough at a particular planned location to bear the proposed building load.

The depth of the base material for each of the 21 soil quality testing boreholes is shown in Table A.3.3. The location of these 21 boreholes is shown in Figure A.3.1. And, weak soil is spread around the lake, as shown in Figure A.3.1.

**Table A.3.3 Depth of Base Material for the Soil Quality Testing Boreholes**

Boreholes	Layers	Distributed depth		Thickness (m) with SPT>30
		Top (m)	Bottom (m)	
BH1	6	8.5	10.0	1.5
	8	10.0	18.0	8.0
	11	18.0	20.0	2.0
BH2	11	24.7	30.0	5.3
BH3	8	14.0	20.0	6.0
BH4	6	10.0	12.0	2.0
	11	12.0	20.0	8.0
BH5	6	34.0	39.0	5.0
BH6	6	9.8	19.0	9.2
	9	19.0	30.0	11.0
BH7	8	9.0	15.0	6.0
BH8	11	42.0	45.0	3.0
BH9	8	9.0	15.0	6.0
BH10	8	8.0	20.0	12.0
BH11	8	4.4	15.0	10.6
BH12	8	4.0	15.0	11.0
BH13	8	14.7	25.0	10.3
BH14	9	25.0	28.0	3.0
	11	28.0	30.0	2.0
BH15	11	34.0	35.0	1.0
BH16	8	13.8	20.0	6.2
BH17	8	12.7	20.0	7.3
BH18	9	19.8	25.0	5.2
BH19	8	11.7	20.0	8.3
BH20	8	9.5	20.0	10.5
BH21	6	10.5	20.0	9.5

Source: JICA Geological Survey Report



Source: JICA Geological Survey Report

**Figure A.3.1 Location of the Soil Quality Testing Boreholes**

### 3.1.3 Ground Level

It is assumed that land within the HHTP site will generally need to be filled to a height that is above the 100-year return period flood level, as established by the VN Revised M/P. In addition, considering the present land height and the height of the water surface, each building site will need to be higher than the height of the road. Considering the need to drain out the storm water, and installation of drainage pipes at the side of roads, generally during the primary land reclamation a gentle slope will be maintained within the HHTP. However, prior to any construction of building, each individual entrepreneur or tenant has to prepare their respective sites and need to finish the leveling work according to the particular location and function of the site.

The estimated volume of soil that will be required during the cut and fill work for land reclamation in the HHTP is summarized in Table A.3.4. The total volume of soil that will need to be moved is 28,000,000m<sup>3</sup>. In other words it means on an average 2.2m of cut and fill in the Study Area. In comparison to the flat area, the cut and fill be large in a hilly or low lying area.

The current estimated volume of soil required for reclamation is a slightly larger than the volume as given in the VN Revised M/P. The following are major reasons for the differences between the soil requirement estimates for land reclamation between the VN Revised M/P and the Study:

- Since topographical surveys were carried out during the Study, the estimate has a relatively high accuracy.
- Farmland, etc. occurs in the HHTP area. It is considered that the surface soil in these agricultural areas will be structurally poor. For this reason, the top 300mm of the surface soil will need to be disposed.
- With the elapsing time, the soil in the site may settle down. Therefore, the soil which will be required to compensate for this settlement is assumed. On an average 30cm of supplement has been assumed.
- Considering the importance of the drainage of the site, a gentle slope will be prepared.

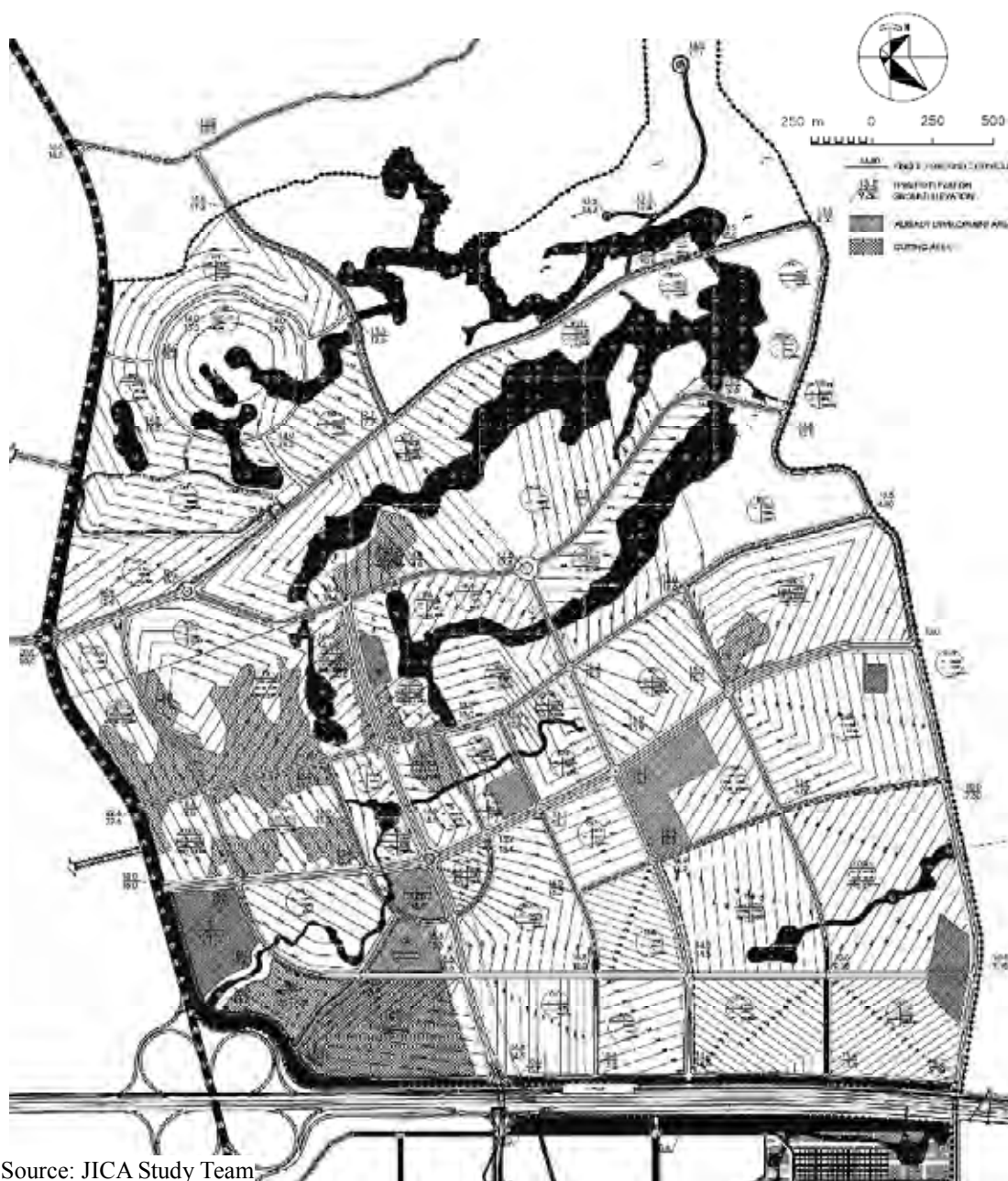
**Table A.3.4 Total Cut and Fill Volume**

(1,000m<sup>3</sup>)

	Filling	Excavation	Sub-Total	Disposal	Supplement	Total
<b>Site total</b>	<b>18,010</b>	<b>3,117</b>	<b>21,127</b>	<b>2,246</b>	<b>2,246</b>	<b>25,619</b>
Research & Development	8,125	200	8,325	662	662	9,649
Education & Training	990	611	1,601	258	258	2,117
Center of High- tech City	916	150	1,066	119	119	1,304
<b>Sub-total (3 zone)</b>	<b>10,031</b>	<b>961</b>	<b>10,992</b>	<b>1,039</b>	<b>1,039</b>	<b>13,070</b>
High-tech Industrial	5,220	569	5,789	655	655	7,099
Software park	1,391	-	1,391	171	171	1,733
Mixed Use	845	146	991	318	318	1,627
Housing Complex	413	133	546	41	41	628
Houses & Offices	-	967	967	-	-	967
Amusement	109	341	450	22	22	494
<b>Sub-total (other zone)</b>	<b>7,979</b>	<b>2,156</b>	<b>10,135</b>	<b>1,207</b>	<b>1,207</b>	<b>12,549</b>
<b>Road</b>	<b>1,745</b>	<b>574</b>	<b>2,319</b>	<b>126</b>	<b>-</b>	<b>2,445</b>
<b>Total</b>	<b>19,755</b>	<b>3,691</b>	<b>23,446</b>	<b>2,372</b>	<b>2,246</b>	<b>28,064</b>

Note: All the high-tech industrial zones are included in other zones.

Source: JICA Study Team



Source: JICA Study Team

**Figure A.3.2 Location of Required Excavation and Fill**

### 3.1.4 Borrow Pit for Filling Material

The required soil volume of filling work has been increased after carefully studied in detailed. Therefore, to reduce construction period/transportation time and its cost, it is necessary to obtain the filling material from inside HHTP and the neighborhood as close as possible.

The alternative of borrow pit of the filling material are listed in Table A.3.5 and shown in Figure A.3.3 and A.3.4.

The site no.1 is located about 3km from HHTP. As for the part, soil has already been extracted. In the extracted areas, the training field for issuing automobile licenses has been made. Soil will be extracted through the side of this course too.

Site no.2 is located about 6km from HHTP. The material also used by LHLE construction and



other construction surrounding HHTP. The old picking position is also saved to the neighborhood. It is still extractable also at this position.

Site no.3 is located about 7km from HHTP. As this particular area comes under the management of the army, prior to any procurement from this site, discussion with an administrator is necessary.

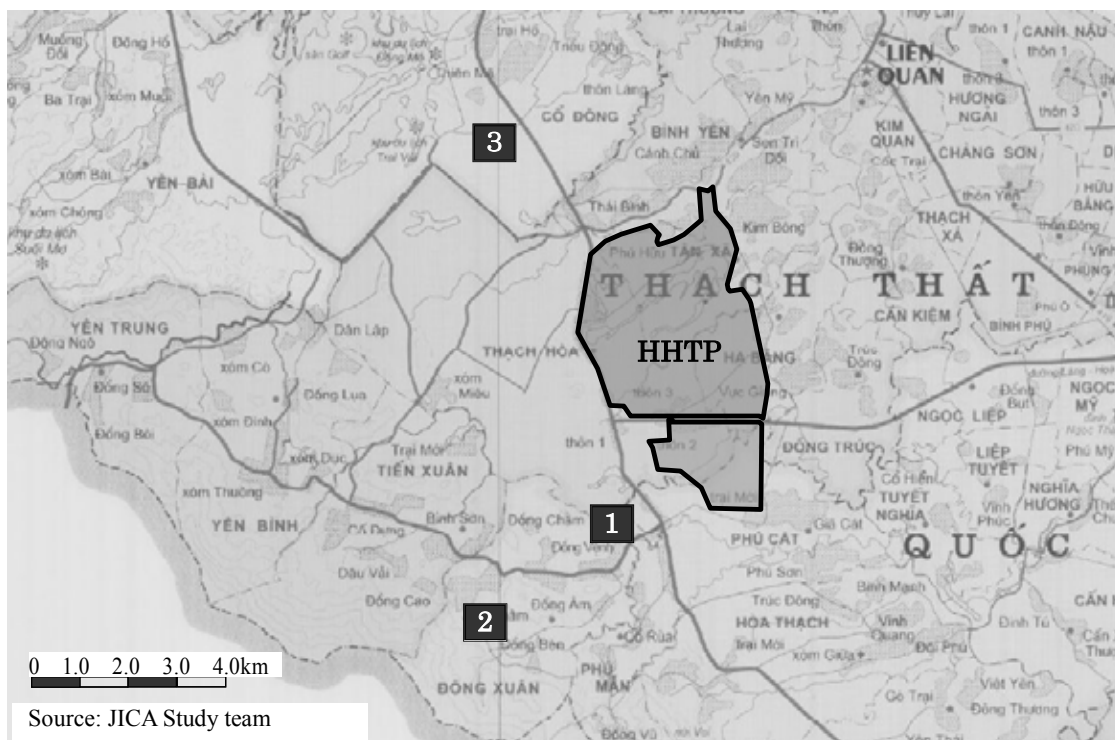
It is expected that the location of the soil extracting will be within 10km of the HHTP. These positions will be utilized and the volume of filling material can be obtained. However, the HHTP-MB needs to make a contract for acquisition of soil.

As for the soils in farmland within the HHTP, the surface soil is rather soft in comparison to non-farming land. Therefore, the soil which is unsuitable for use as filling should be removed. Part of this soil will be used for the scenery (greeneries, hill etc.) in the HHTP. The remaining is necessary to be disposed of off-site. HHTP-MB needs to prepare a site where the unsuitable soil can be disposed off, which estimated for 38ha incase the filling height can be reached to 3m.

**Table A.3.5 List of Borrow Pit for Filling Material**

No	Address/ Owner	Area	Distance
1	Tien Xuan – Dong Xuan – Hoa bin – Ha noi	22,800m <sup>2</sup>	3km
2	Xom ngon - Dong xuantown-Thach That district - Ha tay province	- 20,000m <sup>2</sup>	6km
3	Luc Quan - Son Dong - Son Tay Town	- 50,000m <sup>2</sup>	7km

Note: Based on the interview, not the decided place  
Source: JICA Study Team



**Figure A.3.3 Location of Borrow Pit**



Source: JICA Study Team

**Figure A.3.4 Current Condition of one of the Borrow Pit**

### 3.1.5 Recommendation

The recommended reclamation plan is summarized as follows:

- It is necessary to secure the nearest providers of the filling material as soon as possible to keep the cost as less as possible.
- Disposal of surface soil is not taken into consideration in VN Revised M/P. The soft soil is situated on the surface and in order to stabilize soil, soft soil has to be removed. Following the Vietnamese regulation on the soil contamination, the soft soil at HHTP is affected on arsenic and heavy metal (copper), therefore HHTP-MB needs to provide a space for disposing of the unsuitable soft soil. For the detailed environmental consideration was stated in Appendix (proposed EIA report).
- Required filling volume has been estimated in the Study carefully. However, this volume may change depending on detailed design of the structures to be constructed and land subsidence due to the filling works.

## 3.2 PROPOSED LANDSCAPE PLAN

### 3.2.1 Planning Concept

The HHTP has many natural features, particularly near the Tan Xa Lake. When developing the HHTP, it will be necessary to utilize these natural features to create an attractive working and living environment. For this reason, guidelines have been provided for the landscape design in the HHTP.

Currently, guidelines for landscaping have been prepared by HHTP-MB. In order to ensure that future construction is compatible with the land use plan, synergy between the goals of the HHTP and landscape need to be established. Based on HHTP-MB's proposed regulations (Draft Management Regulations for Construction and Planning of Landscape Architecture for the Hoa Lac High-tech Park), the main policy of the plan to ensure landscape unity is as follows:

- The scope of the regulations should be based on the zone categorization as described in the VN Revised M/P. As mentioned therein, programming for the total land use of premises, organization, town planning and landscaping will be required.
- General regulations depicting the requirements for the town planning framework should be set forth. This will provide guarantee to the planning contents of technical infrastructure systems within the programmed area, including landscaping.
- Specific rules should be provided for each categorized zone, comprising guidelines for land use, spatial design, landscape requirements, architectural design, and construction activities

within the programmed zones.

In order to standardize the landscape in the HHTP, guidelines will be provided in the form of building regulations. The building regulation (draft) has been prepared by HHTP-MB. According to the function of each zone, the height of buildings, the required setback distance from roads, etc. are defined in this proposed building regulation. In addition, the regulations for maintenance of green tracts of land, and water areas such as lakes and rivers; and the specification of building type, color, tone and exterior appearance, are established. These standards were verified by the JICA Study team and found the guidance regulations and standards appropriate.

By following the proposed building regulations, the landscape throughout the HHTP will convey standardization. However, to ensure that the proposed regulation is followed correctly, it will be necessary to guide the entrepreneur when HHTP-MB issues investment certification.

The main regulated items are shown below. For details, refer to a “Management regulations on construction and planning for landscape architecture of Hoa Lac High-tech Park”.

- Land Utilization and Plot size
- Construction limit, set-back space and works height
- Construction density
- Architecture shape and color
- Requirements on green space, external decoration and non- construction space
- Other requirements

### 3.2.2 Landscape Plan

#### (1) Building Restrictions

The volume and the height of buildings should be controlled, and the formation of the urban environment should be promoted. It conforms also to the building codes of Vietnam (Decision No. 682/BXD-CSXD, 1996).

Depending on the function of a zone, the building restriction restricts buildings height, the distance of the setback from a road, etc. The building restrictions by zone which follows the proposed regulation are shown in Table A.3.6.

**Table A.3.6 Proposal of the Building Restrictions by Zone**

Land Zone	Max. Floors	Construction Ratio (%) <sup>*3</sup>	Max Use Coefficient	Setback from Road (m) <sup>*1</sup>			
				2-floor	3-floor	5-floor	6-floor
Software Park	5	30	1.5		5-7	10-12	20 <sup>*2</sup>
R&D	5	30	1.5		5-7	10-14	
High-tech Industrial	5	60	3.0		5-7	10-14	
Education & Training	10	30	3.0		5-50	10-50	20-50
Center of High-tech City	30	50	15.0		5-7	10-14	20
Mixed Use	20	50	10.0		5-7	7-10	14-15
Houses & Offices	15	45	6.8		5-7	7-10	14-15
Housing Complex	15	55	8.3		5-50	10-50	14-50
Amenity	2	3	0.1	5	10		
Amusement	3	5	0.2	5	10		
Greenery, Lake and Buffer				Water areas are not affected.			

Note: \*1 The distance of a setback is based on a front width-of-road.

\*2 In the Software Park Zone, 5 floors is the maximum. However, if the standard is satisfied in part at a place, it may be possible to build more floors in special cases.

\*3 The construction ratio limit may be eased where construction adjacent to shoreline areas is affected by the shoreline protection zone.

Source: JICA Study Team consolidated based on the draft of HHTP-MB.

The ratio of the volume and height of buildings relative to the area of the site are restricted in order to promote harmony and form an urban environment. The building coverage and floor area ratio constrain the volume of a building to be proportional to the area of a site.

An illustration showing how the building dimension regulations are applied is shown in Figure A.3.5.

### **Maximum Floors**

The height of buildings is restricted by limiting the number of stories for buildings in specific zones. The number of stories is decided so that the height of buildings in a particular zone will be uniform.

### **Construction Ratio (Building coverage)**

The ratio of the building area (maximum level projected area of a building) to the area of a site is restricted. The ratio is decided so that buildings do not exceed the limitations of a site.

$$\text{Construction Ratio} = S1 / A \times 100\%$$

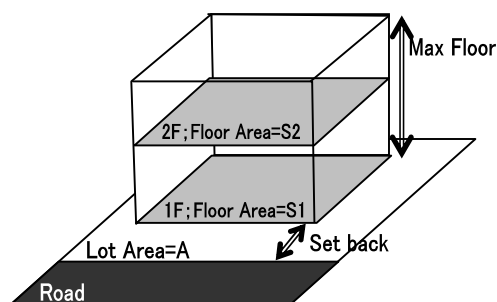
### **Max Use Coefficient (Floor area ratio)**

The ratio of the total floor space to the area of a site is restricted. The capacity of a building is constrained so that the burden on public facilities should be uniform and can be minimized.

$$\text{Max. Use Coefficient} = (S1 \times S2) / A$$

### **Setback from Road**

The setback restricts building construction to a fixed distance from a road. This ensures that there is open space between a building and a road, so that open space is secured and disaster prevention functions are improved.



Source: JICA Study Team

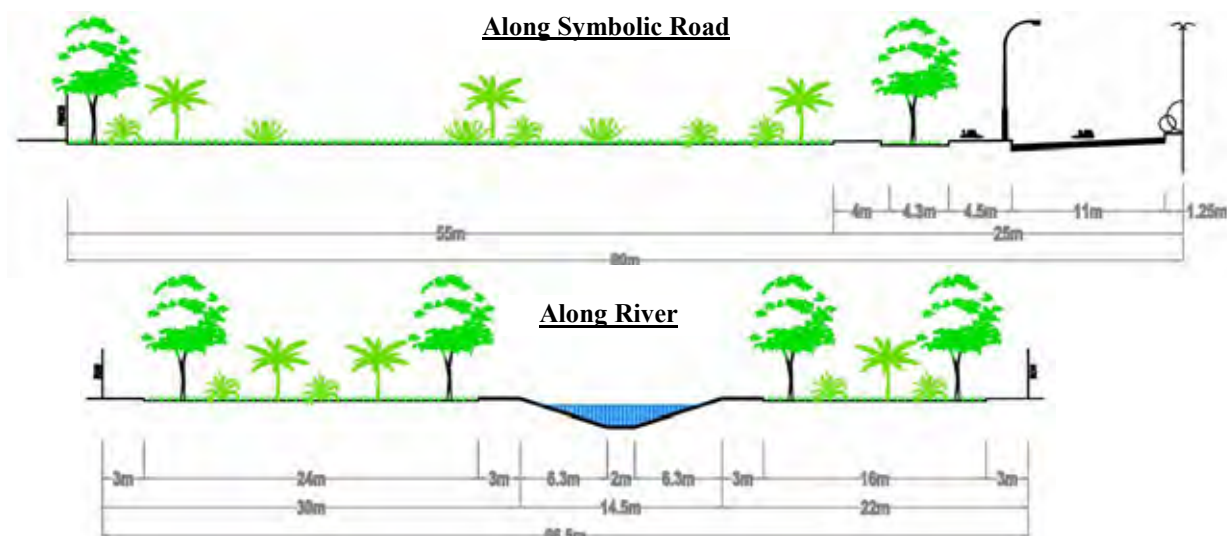
**Figure A.3.5 Illustration of Building Dimension Regulations**

## (2) Green Belt Zone

Green belt will be provided along roads, rivers, and adjacent to lakes within the HHTP. In addition, green belt will be provided beside external roads and highways adjoining the HHTP. These green belt will have the following functions:

- Residential areas will be separated by a green belt, allowing coexistence and co-prosperity between residents and industry, as well as ensuring that the environment is full of grace and vitality.
- The rich plantation will cleanse the air, soften noise, and provide a visual screen. In addition, to some extent the green belt will provide a measure of safety for people in the area by shielding them from industrial disasters. In times of emergency, the green belt will also be used as a refuge place.
- Green belt will give grace to the HHTP and will improve the townscape, as well as will provide a place of peacefulness and relaxation for workers.
- Larger green belt will provide sport and recreation opportunities for the residents and factory employees. In addition, the green belt will assist in creating and maintaining a healthy community in the area, leading to improved productivity in the companies.

Typical sections of green belt are shown in Figure A.3.6.



Source: JICA Study Team

Figure A.3.6 Typical Section of Green Belt

### (3) Tan Xa Lake Protection of the Shoreline

Many shoreline areas, including those adjacent to lakes and rivers, exist within the HHTP. In particular, the Tan Xa Lake is located in the central part of the HHTP, and this is a symbolic shoreline area, which creates rich employment environment. For this reason, it is necessary to protect the environment of shoreline areas as much as possible, and to utilize these areas as places for recreation, relaxation, and for landscape so as to merge with the basic concept of the HHTP development.

The shoreline environment and landscape will be promoted by adopting the following policy:

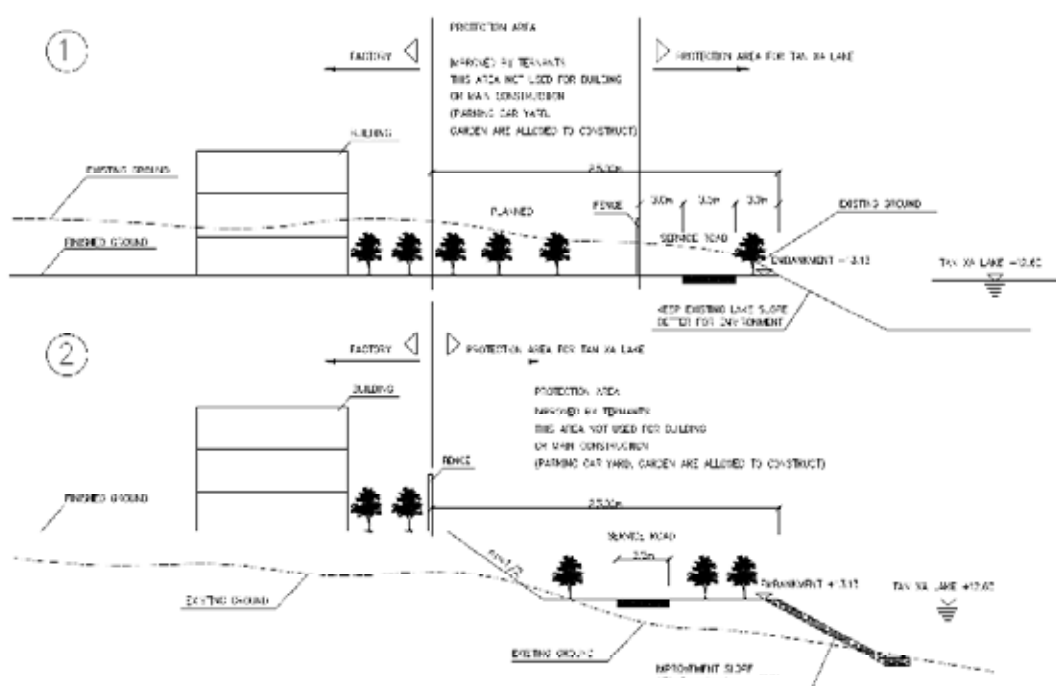
- The existing shoreline of the Tan Xa Lake will be retained as much as possible. Shore protection works will be needed for protection of these areas, particularly where they are near to buildings within the HHTP site. Shore protection will consider the environment and landscape by using natural materials.
- To ensure environmental protection, a fixed distance (25m) buffer will be set to restrict the construction of buildings near shoreline areas.
- Where special circumstances arise and a particular building cannot be setback from the shoreline, the building design must be adjusted to ensure that no detrimental effects will arise.

In order to ensure protection of the Tan Xa Lake shoreline, the environmental protection and landscape plan is proposed as shown in Figure A.3.7. In this plan, the Tan Xa Lake protection zone will extend 25m inland from the shoreline. This zone will include a maintenance road that will be built in accordance with the Building Code of Vietnam (Decision No. 682/BXD-CSXD, 1996). The following scope of work is planned for the Tan Xa Lake environmental protection zone:

- The slope of the shore protection zone will be made as gentle as possible, while being consistent with the needs for the Tan Xa Lake to serve an auxiliary role as a water retention basin. The function and design of the maintenance road, promenade, etc. will consider the design water level and the environment.

- The Tan Xa Lake shoreline will be improved so that the lake can serve an auxiliary role as a water retention basin. The holding capacity will be designed for a 10 year return period storm. (The elevation of bank of the Tan Xa Lake will need to be more than MSL+13.10).
- A regulating gate and overflow weir are to be constructed at the outlet of the Tan Xa Lake.
- Revetment work for the Tan Xa Lake is to be conducted under the HHTP project and will secure a retention capacity of 350,000m<sup>3</sup>.
- The protection zone with width of 25m, including the maintenance road, will be improved.
- Tan Xa Lake is not to be used for irrigation purposes after the development of the HHTP.

Thus in order to keep this conservation area safe, the protection area is necessary. The boundary of protection will basically be the responsibility of entrepreneur and HHTP-MB, and need to be decided among them.



Source: JICA Study Team

**Figure A.3.7 Proposed Shoreline Protection Area**

Comparison study on the shoreline protections are summarized in Table A.3.7 below.

**Table A.3.7 Comparison of Shoreline Protection Methods**

	<b>VN Revised M/P</b>	<b>With Protection Area</b>
Environmental Protection Measures	<ul style="list-style-type: none"> <li>• Provision of revetment for all periphery of lake.</li> <li>• Non consideration of protection area for lake.</li> </ul>	<ul style="list-style-type: none"> <li>• Keep the existing slope of dyke as far as possible.</li> <li>• Minimization of revetment construction.</li> <li>• Provision of protection area according to Vietnamese regulation.</li> </ul>
Landscape	Less nature and more artificial than current condition.	Environmentally friendly.
Greenery	Less green.	Much green.
Rain Water Retaining Function	Less than current condition.	Keep retaining capacity as regulated.

	<b>VN Revised M/P</b>	<b>With Protection Area</b>
Land Use	More use for development.	Less development.
<b>Conclusion</b>	<b>[Not Recommended]</b> considering environmental impact and Tan Xa lake disaster (flood) prevention function.	<b>[Recommended]</b> to provide sufficient atmospheres for environmental and technologies/economics growths are necessary.

Source: JICA Study Team

### 3.2.3 Recommendation

The recommendations for landscape planning are summarized as follows:

- In order to maintain a satisfactory environmental condition and promote landscaping, it will be necessary to retain the lake shore as much as possible. However, considering the potential of flooding, it is also necessary to raise the elevation level. Therefore, considering the environment and safety, it is necessary to prepare a shore protection plan.
- The method of shore protection and preservation by both HHTP-MB and a tenant needs to be examined. The method as proposed by a tenant lot for removing or adjusting the boundary of preservation, and tenant management need to be considered.
- It is desirable to keep the lake shore according to each method. As for a building, it is desirable to follow the standard which HHTP-MB has prepared.

## **CHAPTER 4 PROPOSED ZONE DEVELOPMENT PLAN**

### **4.1 GENERAL**

Land use has been prepared by adapting the development concept of the HHTP that was presented in the VN Revised M/P. The policy of the land use plan for the Research and Development Zone, Education and Training Zone, and the Center of the High-tech City Zone is as follows:

- The plan was made so as not to influence areas where operation and planning have already been carried out within the HHTP.
- Size of the lot already operated and planned has been referred to.
- In order to ensure that each lot can accommodate as many tenants as possible, the roads within each lot section will not be constructed by HHTP-MB. It is considered that each lot will be accessed from the existing road plan, and each tenant will connect to infrastructure, such as power, water and drainage, that follows alongside the existing road plan.
- Considering the present shape, the shore of the Tan Xa Lake improves to the new shore of a lake due to the reason as mentioned below. The present shore protection height will not satisfy the reservation height (+13.13m) of probability for ten years. It is not desirable to change the water surface for a reservoir-water function. Thus to follow the already established land use, the shore of a lake need to be newly prepared.
- Construction adjacent to the shoreline of lakes and rivers will be restricted in order to preserve the Tan Xa Lake. The setback distance from the front road in each zone has been established from the viewpoint of environmental protection, landscape and disaster prevention.

### **4.2 PROPOSED ZONE DEVELOPMENT PLANS**

#### **4.2.1 Research and Development Zone**

##### **(1) Function of the Zone**

The Research and Development Zone provides one of the most important functional areas of the HHTP. Specialists and people with excellent qualifications will come together to join National Research Institutes, etc. This zone adjoins the Tan Xa Lake, which itself surrounds the Software Park Zone and is located near the center of the HHTP. Since the Research and Development Zone, Software Park Zone and the Center of the High-tech City Zone will be able to use land flexibly in the future, they have been arranged in close proximity for mutual benefit.

##### **(2) Planning Concept**

The Research and Development Zone layout plan was prepared based on the concept below:

- It is arranged around the Tan Xa Lake in order to create a conducive environment for research and development that is surrounded by nature.
- In order to exhibit the function of research and development, generous lot scales will be established. The building coverage ratio is basically established at 30 %. As each site is relatively large, it is considered that buildings will generally have 5 floors or less.
- The lots near the Center of the High-tech City Zone will be allocated to advanced smaller organizations and have relatively small lot areas.
- The lots will effectively use the layout of the Tan Xa Lake and the landscape will be



established. Lots which adjoin the Tan Xa Lake will include a shoreline protection zone extending 25m from the shoreline to protect the lake.

### (3) Proposed Zone Development Plan

The proposed zone development plan for the Research and Development Zone is shown in Figure A.4.1. It will be possible to aggregate the planned lots according to the needs of the tenants, and to consider the aggregation as a single large lot. Conversely, subdividing the lot is also possible. When it subdivides, preparation of the road to access is required.

The detailed required land preparation work volume by lots for the Research and Development Zone is shown in Table A.4.1. The breakdown of land use plan is listed in Table A.4.2.

**Table A.4.1 Research and Development Zone – Land Preparation Work Volume**

Lot	Total Area (m <sup>2</sup> )	Fill Area (m <sup>2</sup> )	Cut Area (m <sup>2</sup> )	Filling (m <sup>3</sup> )	Excavation (m <sup>3</sup> )	Disposal (0.3m) (m <sup>3</sup> )	Settle (0.3m) (m <sup>3</sup> )
1	116,161	53,154	63,007	132,885	163,818	15,946	15,946
2	319,566	319,566	—	351,523	—	95,870	95,870
3	70,365	70,365	—	70,365	—	21,110	21,110
4	64,100	64,100	—	243,580	—	19,230	19,230
5	40,224	40,224	—	100,560	—	12,067	12,067
6	178,578	178,578	—	625,023	—	53,573	53,573
7	48,962	48,962	—	195,848	—	14,689	14,689
8	350,863	350,863	—	982,416	—	105,259	105,259
9	41,148	41,148	—	123,444	—	12,344	12,344
10	136,672	136,672	—	341,680	—	41,002	41,002
11	38,472	38,472	—	115,416	—	11,542	11,542
12	23,314	23,314	—	46,628	—	6,994	6,994
13	49,455	49,455	—	79,128	—	14,837	14,837
14	68,078	68,078	—	204,234	—	20,423	20,423
15	229,357	229,357	—	917,428	—	68,807	68,807
16	412,950	376,847	36,103	3,014,776	36,103	113,054	113,054
17	116,022	116,022	—	580,110	—	34,807	34,807
total				<b>8,125,044</b>	<b>199,921</b>	<b>661,553</b>	<b>661,553</b>

Source: JICA Study Team

**Table A.4.2 Research and Development Zone – Breakdown of Land Use Plan**

Function	Area (ha)
Development Area	227.9ha
(Protection area)	(17.6ha)
TOTAL	227.9ha

Note: Protection area is a boundary by which construction is regulated for shore protection preservation. It contains in development area.

Source: JICA Study Team

### Utility area

Two sites which have a function of a utility are established in a Research and Development Zone. These will be prepared as a common infrastructure and the major functions are discussed below.

#### 1) Bus Terminal

A bus terminal was examined at four places in HHTTP. One of them is located in a Research and Development Zone. This share is assumed to be 10% and is the smallest bus terminal. Area is about 540m<sup>2</sup> (25 X 21.6m).

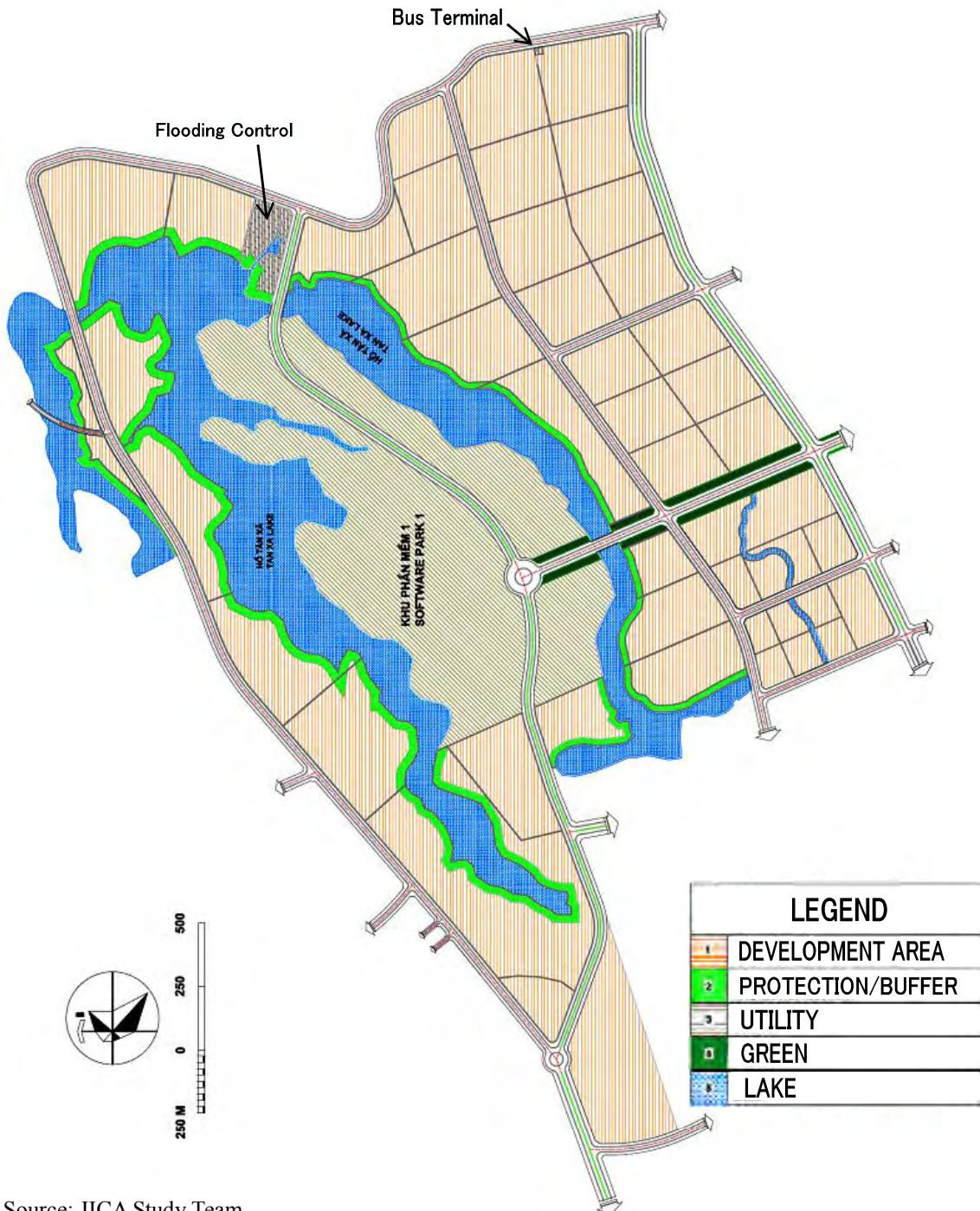
2) Flooding Control

**-Flooding gate**

Tan Xa lake is designed to retain up to scale of 10 years return period, therefore to cope with the unexpected rainfall over 10 years return period, flood gate will be opened to allow the flow to Vuc Giang stream. Two set of Steel Gates will be established.

**-Overflow channel**

Utilizing existing channel, overflow channel will also be constructed. This channel can flow retained storm water from Tan Xa lake with orifice valve to regulate flow capacity to the outlet channel to the Vuc Giang stream.



Source: JICA Study Team

Figure A.4.1 Proposed Zone Development Plan for the Research and Development Zone

## 4.2.2 Education and Training Zone

### (1) Function of the Zone

It is planned that the Hanoi National University will move to the Hoa Lac (the HHTP neighborhood). In addition, within the HHTP, other education and technical training activities will also be carried out.

Establishment of FPT University is planned in the Education and Training Zone. This zone will be arranged in order to educate engineers and professional staff, including special training and vocational training. The Education and Training Zone is located alongside National Highway Route 21 and near to the Research and Development Zone.

### (2) Planning Concept

The Education and Training Zone layout plan was prepared based on following concept:

- The layout was prepared with an aim to attract a university to establish (FPT University, Hanoi National University of Science Technology) in the HHTP. In order to create a learning environment, the Education and Training Zone has been located close to the Research and Development Zone and it is relatively near to the Center of the High-tech City Zone and the Amusement Zone.
- After the general attraction function was decided, function of each lot was given importance considering the plan as proposed by HHTP-MB. Road arrangements were considered on the basis of HHTP-MB proposal, and the form of a lake was examined on the basis of the VN Revised M/P.
- Each lot is extensive, so the layout also considered the movement (walking distances) of students and staff. In addition, importance was given to provide the connections to inner lot roads to the main roads.

### (3) Proposed Zone Development Plan

The proposed zone development plan for the Education and Training Zone is shown in Figure A.4.2. As a result of the actual topographic survey, road arrangement proposed by HHTP-MB necessary to be modified considering its location inside the water body and will affects scenery and water flows. Required land preparation work volume by lots for the Education and Training Zone is shown in Table A.4.3. Required infrastructure is shown in Table A.4.4 and breakdown of the land use plan is listed in Table A.4.5.

The road width in a zone has been set up according to the function and the HHTP-MB proposal, which is under preparation. The proposed width of road is shown in Figure A.4.3.

**Table A.4.3 Education and Training Zone – Land Preparation Work Volume**

Lot	Total Area (m <sup>2</sup> )	Fill Area (m <sup>2</sup> )	Cut Area (m <sup>2</sup> )	Filling (m <sup>3</sup> )	Excavation (m <sup>3</sup> )	Disposal (0.3m) (m <sup>3</sup> )	Settle (0.3m) (m <sup>3</sup> )
1	258,322	258,322	—	387,483	—	77,497	77,497
2	179,831	179,831	—	179,813	—	53,949	53,949
3	305,603	—	305,603	—	611,206	—	—
4	116,128	116,128	—	116,128	—	34,838	34,838
5	306,644	306,644	—	306,644	—	91,993	91,993
<b>Total</b>				<b>990,068</b>	<b>611,206</b>	<b>258,278</b>	<b>258,278</b>

Source: JICA Study Team

**Table A.4.4 Education and Training Zone – Required Infrastructure**

Function	Volume
Road(4-4)(Width=31m)	310m
Road(5-5)(Width=16m)	4,340m
Bridge	380m
Drainage System	5,030m
Water Supply System	5,030m
Sewerage System	5,030m
Power Supply/ Telecommunication	5,030m

Source: JICA Study Team

**Table A.4.5 Education and Training Zone – Breakdown of Land Use Plan**

Function	Area (ha)
Development Area	99.6ha
Roads	8.4ha
Lake & Buffer	14.2ha
<b>TOTAL</b>	<b>122.2ha</b>

Source: JICA Study Team



Source: JICA Study Team

**Figure A.4.2 Proposed Zone Development Plan for the Education and Training Zone**

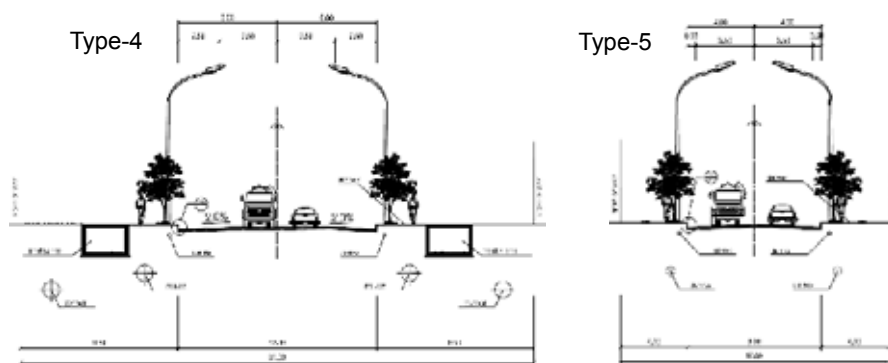


Figure A.4.3 Typical Section of Proposed Road

#### 4.2.3 Center of the High-tech City Zone

##### (1) Function of the Zone

The Center of the High-tech City Zone provides the complicated services and activities that are essential for the whole of the HHTP. This zone, which is accessed from the Main Gate of the HHTP, is located near the Research and Development Zone. It is also near to the Education and Training Zone. In addition, both the Residential and Office Zone and the Housing Complex Zone are relatively close to each other.

##### (2) Planning Concept

The Center of the High-tech City Zone layout plan was planned based on the concept below.

- Since emphasis on the central function of the zone in the HHTP is important, direct access from the Main Gate to the central part of the high development area was arranged. In addition, the HHTP-MB office building and a Start-up Center are located in the Center of the High-tech City Zone, so as to equip a centralized area with better control for maintenance and management in the HHTP.
- Since medium height and high-rise buildings are assumed to be constructed in the Center of the High-tech City Zone, the lot scale is smaller than the lot in the Research and Development Zone and the High-tech Industrial Zone.
- Lots which face the Tan Xa Lake will be relatively bigger, and the arrangement of these lots will also take into the consideration of the landscape.

##### (3) Proposed Zone Development Plan

The proposed zone development plan for the Center of the High-tech City Zone is shown in Figure A.4.4. It will be possible to aggregate the planned lots according to the scale of the tenant, and to consider the aggregation as a single large lot.

The breakdown of the land use plan of Center of the High-tech City Zone is listed in Table A.4.6, and required land preparation work volume is summarized in Table A.4.7.

It recommends that the entrepreneur of each building prepares a parking. When constructing a building, it is necessary to construct underground or a car parking tower. The entrepreneur can prepare a part of protection area of the shore of the Tan Xa Lake as a ground parking.

Table A.4.6 Center of the High-tech City Zone – Breakdown of Land Use Plan

Function	Area (ha)
Development Area	49.0ha
(Protection area)	(1.5ha)
TOTAL	49.0ha

Note: Protection area is a boundary by which construction is regulated for shore protection preservation. It contains in development area.

Source: JICA Study Team

**Table A.4.7 Center of the High-tech City Zone – Land Preparation Work Volume**

Lot	Total Area (m <sup>2</sup> )	Fill Area (m <sup>2</sup> )	Cut Area (m <sup>2</sup> )	Filling (m <sup>3</sup> )	Excavation (m <sup>3</sup> )	Disposal (0.3m) (m <sup>3</sup> )	Settle (0.3m) (m <sup>3</sup> )
1	85,573	65,535	20,038	262,140	20,038	19,661	19,661
2	54,795	32,706	22,089	130,824	39,760	9,812	9,812
3	—	86,346	—	86,346	—	25,904	25,904
4	115,353	85,216	30,137	130,432	90,411	25,565	25,565
5	42,948	42,948	—	85,896	—	12,884	12,884
6	45,669	45,669	—	182,676	—	13,701	13,701
7	Already development			—	—	—	—
8	37,282	37,282	—	37,282	—	11,185	11,185
total				<b>915,596</b>	<b>150,209</b>	<b>118,711</b>	<b>118,711</b>

Source: JICA Study Team



Source: JICA Study Team

**Figure A.4.4 Proposed Zone Development Plan for the Center of the High-tech City Zone**

### **4.3 RECOMMENDATION**

Recommendations for development are summarized as follows:

- Reclamation of land will be carried out for primary reclamation in consideration of flood probability, road height, environmental effects and landscape. Final reclamation for each site is to be carried out by each individual tenant.
- It is desirable to prepare the acquisition plan of soil describing the fill and disposal site for unsuitable soil in the neighborhood of the HHTP. However, at present it is difficult to agree on the site for acquisition and disposal of soil. Therefore, it is necessary for HHTP-MB to secure soil acquisition and disposal place prior to start of any construction works.
- As for the land use plan, it is desirable to follow the land use plan as suggested by the VN Revised M/P. With reference to the land use within each functional zone, it is desirable to carry out development through an orderly licensing system. When evaluating a request for a development license, the desired land use plan concept should be considered.
- In order to protect the lake shoreline, an area which restricts building construction to a fixed distance from the shoreline has been proposed. For this reason, the area of the site for tenants will be decreased marginally, especially in the affected areas. As a result of this measure, for sites adjacent to the Tan Xa Lake, the land area to building coverage ratio will need to be eased out so that the required area can be secured.
- Each tenant will connect to infrastructure (power, water, storm water) from a front road. It is possible to establish the building layout in a site for each tenant. Lot section allocation should be carried out so that each lot may be joined to a road.
- Since the road established for the Education and Training Zone directly connects with a national highway, HHTP-MB should discuss the intersection with the concerned authorities and accordingly should prepare design/plan for crossing.
- In Research and Development zone and Education and Training Zone, the public parking is functionally unnecessary. However, many people visit High-tech City Zone. For this reason, it is required that each entrepreneur prepares a parking area to a building.