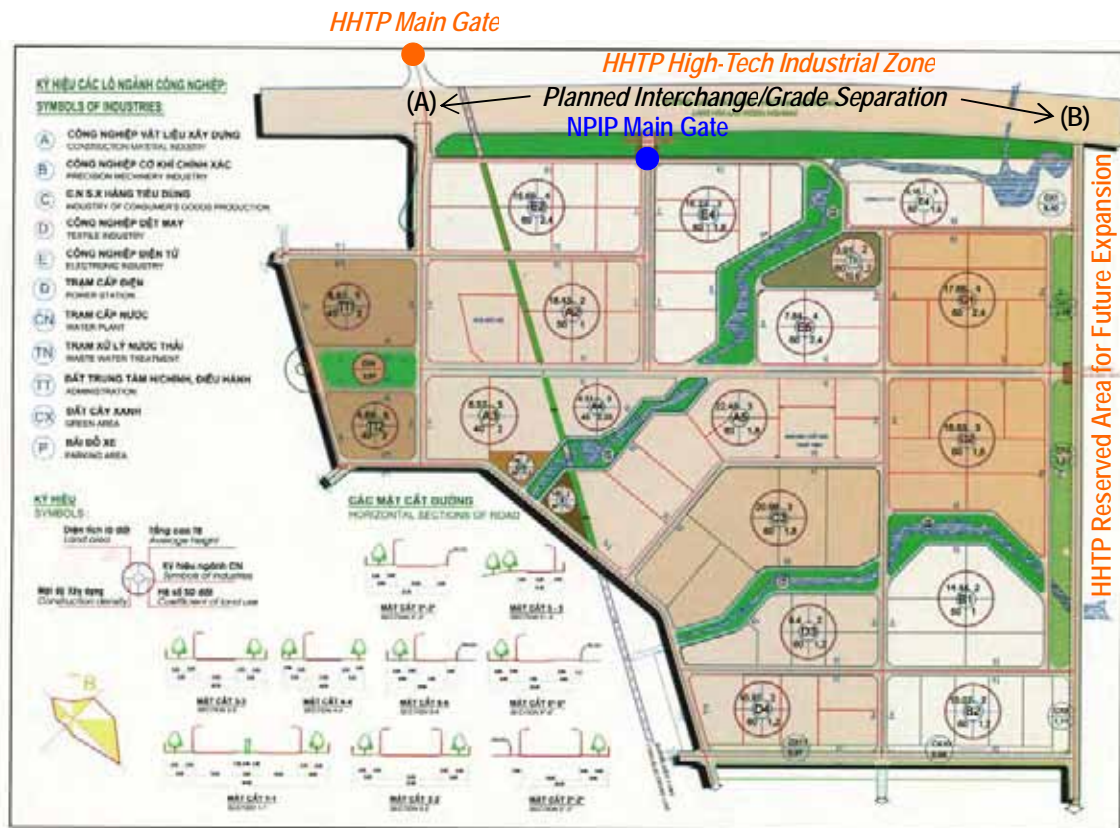


Another grade separation that is planned to connect with the HHTP main gate (Location A) will also connect with the western-edge road of the NPIP. The main gate of the NPIP is located on the north side, and will be connected to the planned interchanges/grade separations through the internal roads of the NPIP.



Source: VINACONEX

Figure 3.3-7 Master Plan of Northern Phu Cat Industrial Park

3.4 Proposed Project List

A list of proposed road projects is summarized in Table 3.4-1. Proposed plans are grouped into six projects by type of structure and by phase.

Table 3.4-1 Project List for Roads

No.	Project	General description	Specification	Phase
1	Construction of Internal and Zonal Roads (Phase-1)	To construct internal and zonal roads planned in HHTP for Phase-1 (Type I: 4,231 m, Type II: 6,956 m, Type III: 7,988 m)	Pavement (asphalt) (incl. lane addition in Road A (2.5 km) and road widening in Road C (0.8 km))	1
			Sidewalk (inter-locking)	
			L-type Side Ditch	
			Concrete Curbs	
			Lighting pole	
			Plants	
2	Construction of Internal and Zonal Roads (Phase-2)	To construct internal and zonal roads planned in HHTP for Phase-2 (Type II: 2,018 m, Type III: 1,429 m)	Pavement (asphalt)	2
			Sidewalk (inter-locking)	
			L-type Side Ditch	
			Concrete Curbs	
			Lighting pole	
			Plants	
3	Construction of Bridges and Culverts (Phase-1)	To construct bridges and culverts planned in HHTP for Phase-1	9 Bridges (PC, I-girder) (No. 5-11, 13-14)	1
			1 Bridge (PC, Arch) (No. 15)	
			Culverts (2@2mx2m) for 2 road sections (No. 17-18)	
4	Construction of Bridges and Culverts (Phase-2)	To construct bridges and culverts planned in HHTP for Phase-2	1 Bridge (PC, I-girder) (No. 12)	2
			Culverts (2@2mx2m) for 1 road section (No. 19)	
5	Construction of a Grade Separation (Overpass)	To construct a grade separation (overpass) connecting HHTP and Lang-Hoa Lac Highway (KM28+971)	On-Ramp	1
			Overpass	
			Vehicle Guardrail	
6	Construction of an Interchange (Underpass)	To construct an interchange (underpass) connecting HHTP and Lang-Hoa Lac Highway (KM27+000)	On/Off-Ramps	1
			Asphalt Pavement for Underpass	
			Sidewalk for Underpass	

(1) Construction of Internal and Zonal Roads (Phase-1)

This is a project to construct internal and zonal roads planned in the HHTP for Phase-1 as shown in Figure 3.4-1. It should be noted that, from a transportation point of view, roads should be constructed to form a continuous network regardless of the areas to be developed under Phase-1 as long as the land is available. Thus, the project covers construction of internal roads; that is, all of Type I roads (4.2 kilometers in length) and part of Type II roads (7.0 kilometers). It also covers zonal roads that have been planned as Type III roads (8.0 kilometers). In addition, the existing 50-meter wide main road (i.e., Road A in Figure 3.2-1) needs to be upgraded from four lanes to six lanes, and the existing 26-meter wide road on Road C (south of the roundabout) needs to be upgraded to a 50-meter wide internal road of Type I.



Source: JICA Study Team

Figure 3.4-1 HHTP Internal and Zonal Road Development Plan (Phase-1)

(2) Construction of Internal and Zonal Roads (Phase-2)

In the Phase-2 project of internal and zonal roads, the remaining roads are to be constructed to complete the HHTP road network. The roads in this project consist of internal roads of Type II (2.0 kilometers in length) and zonal roads of Type III (1.4 kilometers).

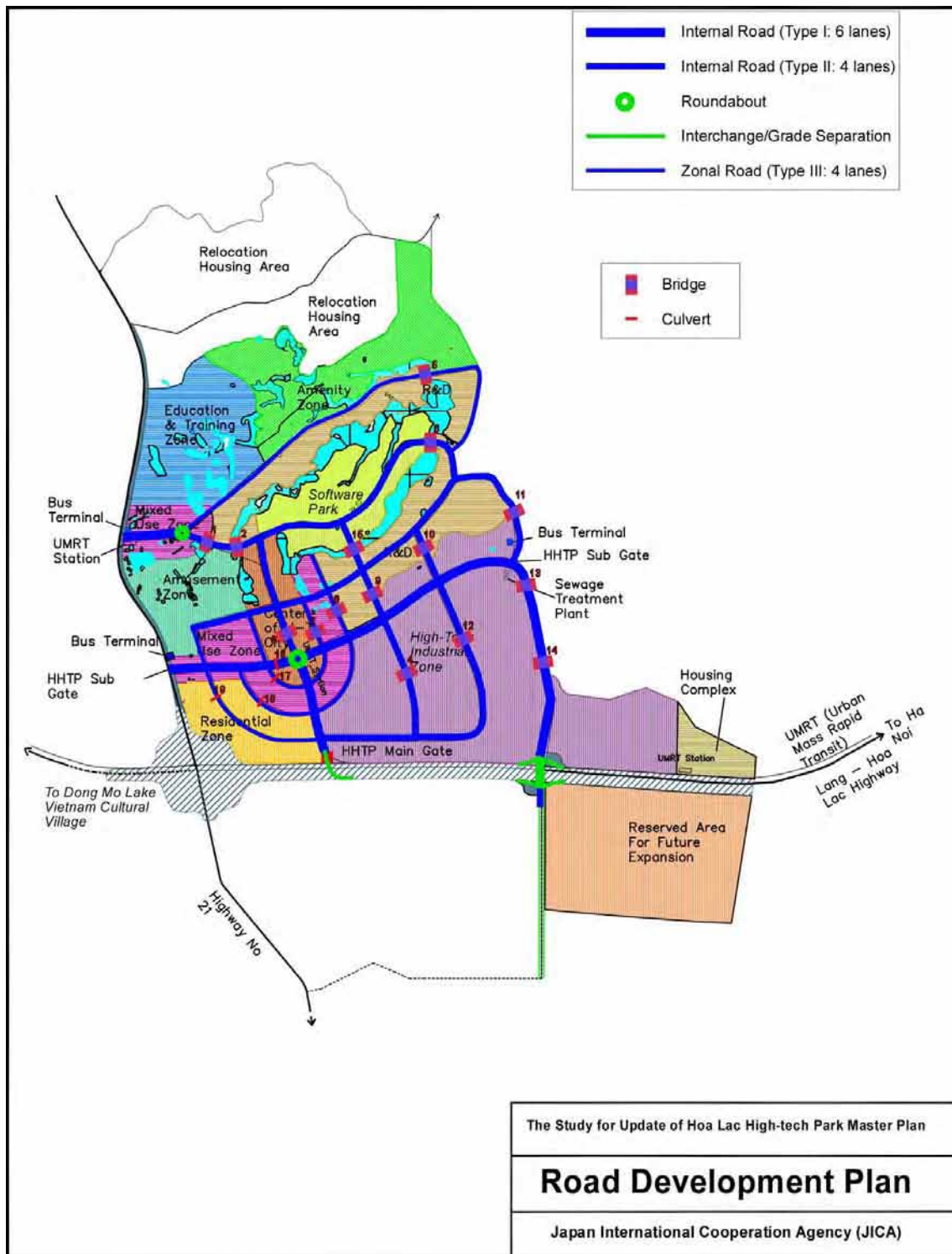
(3) Construction of Bridges and Culverts (Phase-1)

This is a project to construct nine PC I-girder bridges (No. 5-11 and 13-14 in Figure 3.4-2), one arch (or extradosed) bridge (No. 15), and two box culverts (of two cells) (No. 17-18) that are located on the internal and zonal roads planned for Phase-1. The bridges and culverts planned in the HHTP are listed in Table 3.4-2 and the locations are shown in Figure 3.4-2. Among others, the bridge crossing Tan Xa Lake (No. 15) is about 100 meters long and the longest of all the bridges. As such, this bridge is planned as a different bridge type such as an arch or extradosed bridge which should match with the landscape of the lake area. Meanwhile, some drainage channels are smaller in scale, and box culverts are planned for these locations (No. 17-18).

Table 3.4-2 List of Bridges and Culverts

No.	Length (m)	Phase	Remarks
1	58.15	-	Existing bridge
2	40.0	-	Existing bridge
3	15.0	-	Existing bridge
4	34.1	-	Existing bridge
5	60	1	PC I-girder bridge
6	60	1	PC I-girder bridge
7	24	1	PC I-girder bridge
8	24	1	PC I-girder bridge
9	24	1	PC I-girder bridge
10	24	1	PC I-girder bridge
11	24	1	PC I-girder bridge
12	42	2	PC I-girder bridge
13	42	1	PC I-girder bridge
14	80	1	PC I-girder bridge
15	100	1	Arch or extradosed bridge
16	50	-	Existing culvert (2 @ 2 x 2 m)
17	22	1	Box culvert (2 @ 2 x 2 m)
18	22	1	Box culvert (2 @ 2 x 2 m)
19	22	2	Box culvert (2 @ 2 x 2 m)

Source: JICA Study Team



Source: JICA Study Team

Figure 3.4-2 Location of Bridges and Culverts in HHTP

(4) Construction of Bridges and Culverts (Phase-2)

In the Phase-2 project of bridges and culverts, the remaining bridges and culverts are to be constructed in line with the roads to be constructed in Phase-2. In fact, construction of one bridge (No. 12) and one box culvert (with two cells) (No. 19) is included in this project.

(5) Construction of a Grade Separation (Overpass)

This is a project as part of the HHTP internal road infrastructure and aims at constructing a grade separation with an overpass and continuing on-ramp from the HHTP to the direction of Hanoi. The location is around KM28+971 post on Lang-Hoa Lac Highway, namely, in front of the HHTP main gate. Though the structure crossing Lang-Hoa Lac Highway is tentatively planned as an overpass, further study is necessary for determining the structure including the scope of the project (i.e., whether it is a simple grade separation or a full-scale interchange). Detailed position of the main gate and landscape design should also be studied.

(6) Construction of an Interchange (Underpass)

This is a project to construct an interchange with an underpass as part of the HHTP internal road infrastructure. The location is around KM27+000 post on Lang-Hoa Lac Highway, connecting the HHTP eastern sub-gate. Though the structure crossing Lang-Hoa Lac Highway is tentatively planned as an underpass and the design of Lang-Hoa Lac Highway will need to be changed to a bridge structure, further study is necessary for determining the structure as well as the interchange type.

3.5 Technical Studies for Phase-1 Development

3.5.1 Project Description

Phase-1 development includes construction of internal and zonal roads as well as bridges/culverts and interchanges/grade separations that are planned for Phase-1. As shown in the plan (Figure 3.5-1), the roads to be constructed for Phase-1 should not be limited to the Phase-1 land use zones but should be extended to form a continuous network of transportation and other infrastructure. As a result, total length of the roads to be constructed is 19.2 kilometers, consisting of 4.2 kilometers of Type I roads, 7.0 kilometers of Type II roads, and 8.0 kilometers of Type III roads. The topographical map and the roads with height at major intersections are presented in Figure 3.5-2. The design speeds have been set at 50 km/h for internal roads (i.e., Types I and II) and at 40 km/h for zonal roads (i.e., Type III).

With respect to the underground space for utilities, they should be installed under the sidewalks and buffer zones in order to avoid obstruction to the vehicular traffic in case of maintenance or repair works. Furthermore, utility pipes/ditches/cables should be installed keeping the minimum separation distance from each other as stipulated in the Vietnamese construction standards (Table 3.5-1). Assuming the maximum size of each

utility, typical cross-sectional positions of utilities for Type I (two cases), Type II (two cases), and Type III (one case) roads are presented in Figures 3.5-3, 3.5-4, and 3.5-5, respectively. It should also be noted that the minimum face-to-face distance has been kept as 0.3 meters for digging works.

Table 3.5-1 Minimum Separation Distance of Utility Lines

[Unit: m]

Utilities	Water supply	Drainage	Electrical cable < 35kV	Communication cable
Horizontal distance				
Water supply	0.7	1.5	1.0	0.5
Drainage	1.5	0.4	0.5	0.5
Electrical cable < 35kV	1.0	1.0	0.1	0.5
Communication cable	0.5	0.5	0.5	0.5
Vertical distance				
Water supply	-	0.1	0.5	-
Drainage	0.1	-	0.1	0.1
Electrical cable < 35kV	0.5	1.0	1.25	0.3
Communication cable	0.2	-	0.5	0.5

Source: Vietnamese Construction Code

In Phase-1, nine PC I-girder bridges (No.5-11 and 13-14 in Figure 3.5-1), one arch (or extradosed) bridge (No. 15), and two box culverts (of two cells) (No. 17-18) are to be constructed. The arch (or extradosed) bridge which is 100 meters long and crosses Tan Xa Lake (No. 15) should become one of the symbolic structures for the HHTP. It should also be noted that, for all the planned bridges, utility pipes are to be attached to the structure.

As for interchanges/grade separations, they are included in the Phase-1 development though further study is necessary to determine the shape and structure. While the HHTP main gate and its gateway road are planned to be connected at grade with the frontage road of Lang-Hoa Lac Highway (KM28+971), an overpass and continuing on-ramp should be necessary for traffic from the main gate to the direction of Hanoi. Meanwhile, an interchange is planned at around KM27+000 post on Lang-Hoa Lac Highway, connecting the HHTP eastern sub-gate. The crossing road is tentatively planned as an underpass because Lang-Hoa Lac Highway will be about five meters higher than the crossing road level around this location. The design of Lang-Hoa Lac Highway will also need to be changed to a bridge structure. The subsequent section discusses types of the interchange that may be appropriate for this location.



Figure 3.5-1 Phase-1 Development Plan for Roads and Land Use

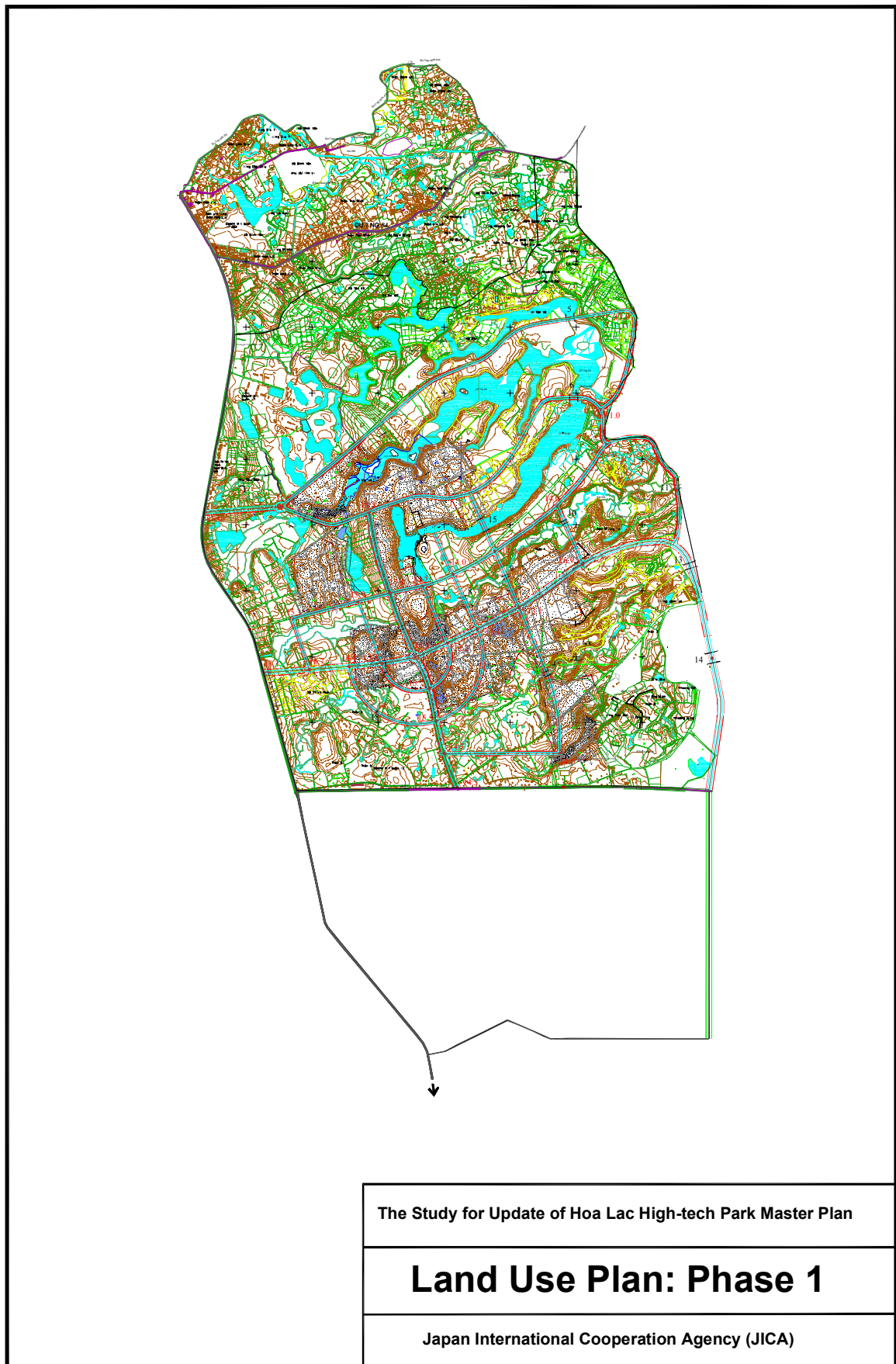
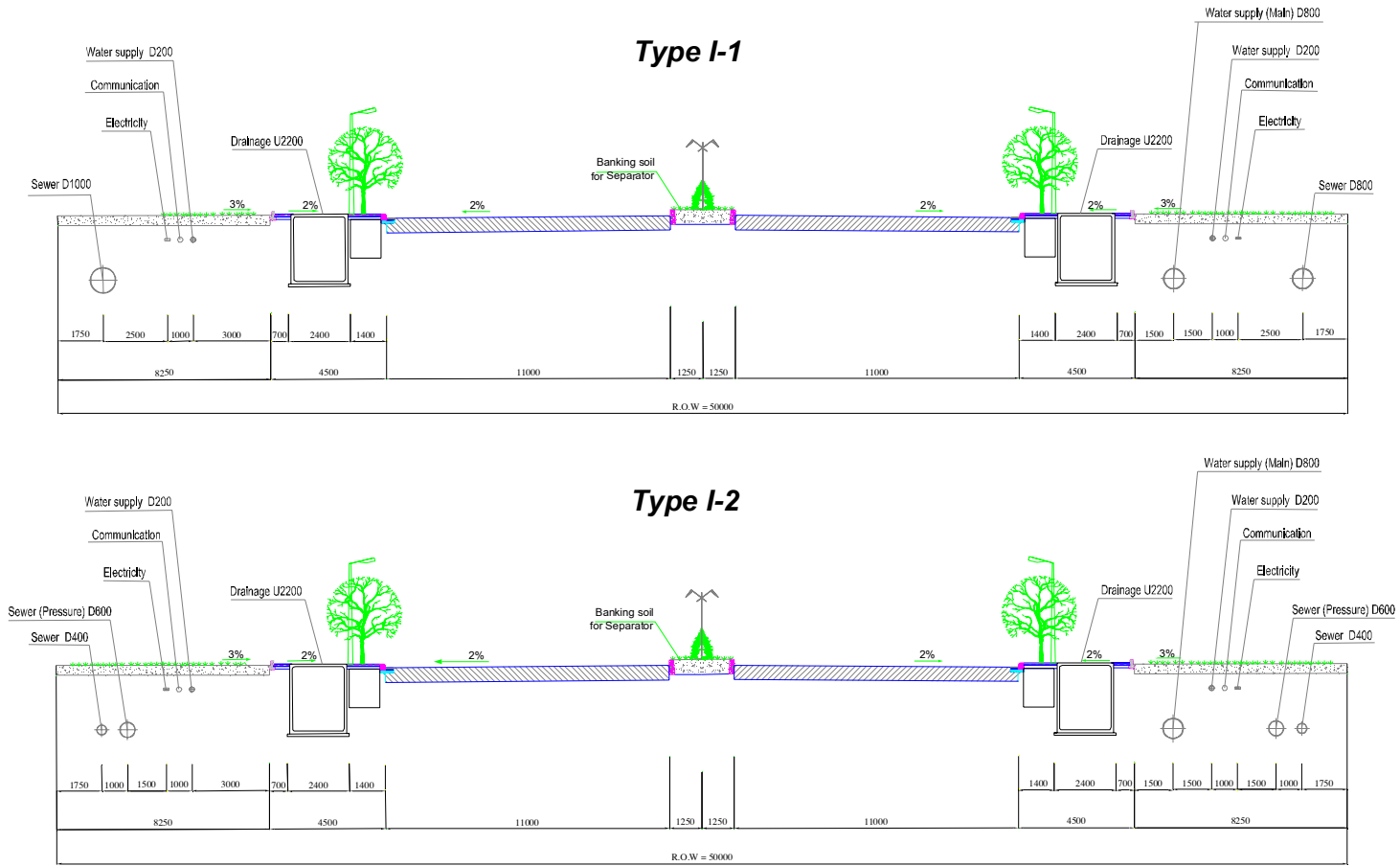


Figure 3.5-2 Phase-1 Development for Roads on the Topographical Map

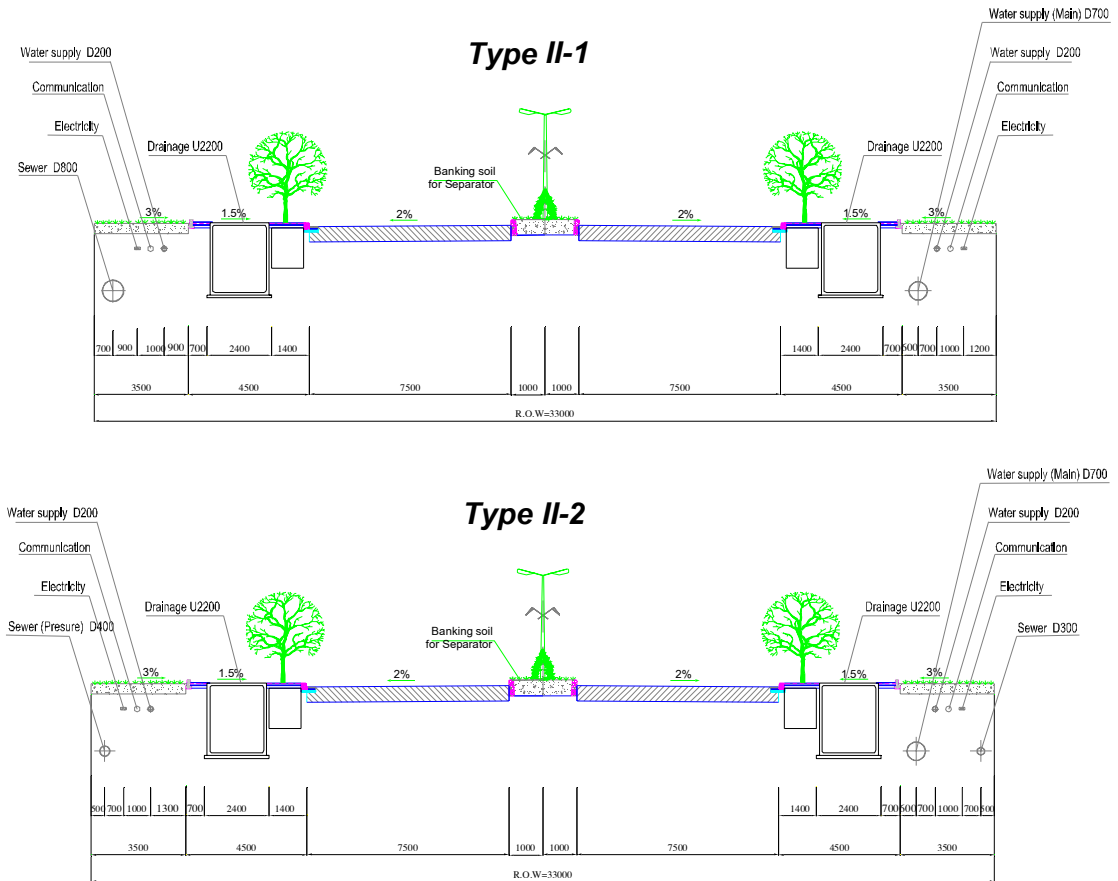
[Type I]



Source: JICA Study Team

Figure 3.5-3 Typical Cross Section with Utilities: Type I Road

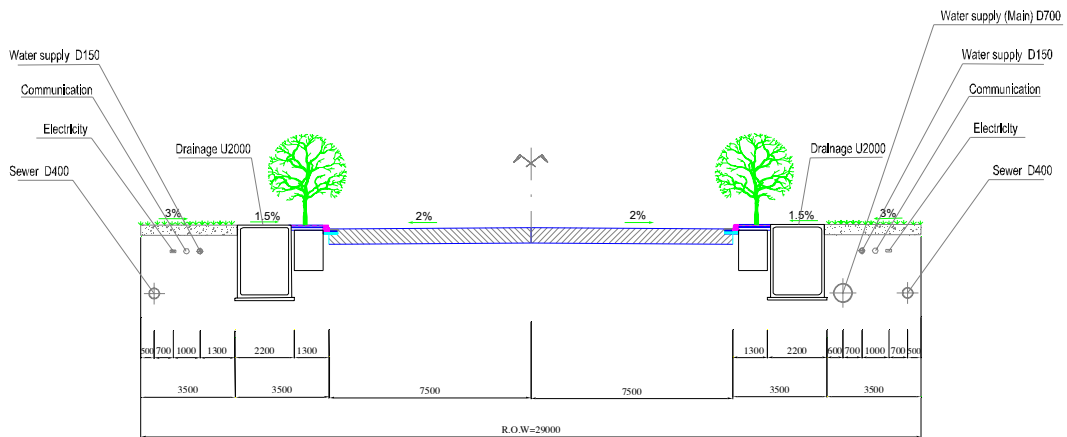
[Type II]



Source: JICA Study Team

Figure 3.5-4 Typical Cross Section with Utilities: Type II Road

[Type III]



Source: JICA Study Team

Figure 3.5-5 Typical Cross Section with Utilities: Type III Road