9 REVIEW OF THE FEASIBILITY STUDY ON THE EASTERN MISSING LINK OF THE EAST-WEST HIGHWAY

9.1 Introduction

1) Background of the Review

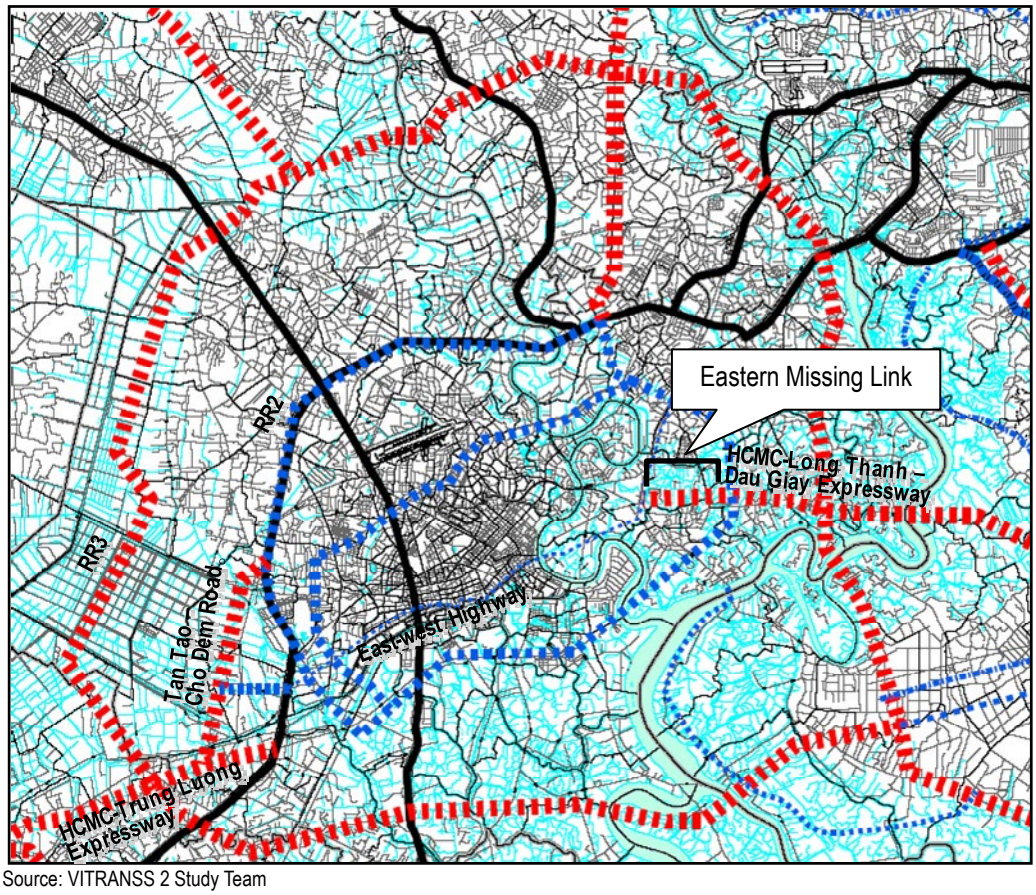
It was agreed by both the MOT and JICA that the VITRANSS 2 Study Team would carry out a review of the feasibility study of the following sections on both ends of the East-West Highway to move them forward smoothly:

Section from the intersection of NH1A and East-West Highway to Tan Tao–Cho Dem road (approx. 3 km), which is labeled the western missing link; and

Section between Km0+000–Km4+000, from An Phu intersection to RR2 interchange on the Ho Chi Minh–Long Thanh–Dau Giay Expressway (the HLDE), which is identified as the eastern missing link.

While the preceding chapter explains the results of the review of the feasibility study on the western missing link, this chapter reports on the results for the eastern missing link.

Figure 9.1.1 Location of the Eastern Missing Link of the East-West Highway



Source: VITRANSS 2 Study Team

2) Scope of the FS Review

The items reviewed by the VITRANSS 2 Study Team based on the documents received from the VEC are listed in Table 9.1.1.

Table 9.1.1 Components of the FS Report Subjected to Review

No.	Study Item	Check	FS 2009	FS 2007
01	Legal Basis	Yes	List provided by TEDI South	Yes
02	Traffic Demand Forecast	Yes	No	Yes
03	Natural Condition Survey	Yes	Partially Yes	Yes
04	Expressway Designs	Yes	Only Drawings	Yes
05	Interchanges/Intersections Designs	Yes	Only Drawings	Yes
06	Linking Roads Designs	Yes	Only Drawings	Yes
07	Bridges Designs	Yes	Only Drawings	Yes
08	Pavement Design	Yes	Only Drawings	Yes
09	Drainage Design	Yes	Only Drawings	Yes
10	Soft-ground Treatment	Yes	Only Drawings	Yes
11	Other Structural Designs	Yes	Only Drawings	Yes
12	Traffic Safety Facilities	Yes	Only Drawings	Yes
13	Utilities Relocation Planning	Yes	Only Drawings	Yes
14	Electrical Facilities Designs	Yes	Only Drawings	Yes
15	ITS Facilities Designs	Yes	No	Yes
16	Construction Planning	Yes	No	Yes
17	Environmental Considerations	Yes	EIA Report, No RAP Report	EIA Report
18	O&M Planning	Yes	No	Yes
19	Drawings	Yes	Yes	No
20	Quantities Take-off	No	No	No
21	Cost estimate	Yes	Yes	Yes
22	Implementation Program	Yes	No	Yes
23	Economic and Financial Analysis	Yes	No	Yes

Source: VITRANSS 2 Study Team

3) Documents Received and Reviewed

The latest FS report was prepared by TEDI South and submitted to DOT-HCMC in May 2009 (see Table 9.1.2 for the composition of the 2009 FS report). However, there were no design reports prepared in 2009. Instead, that of the 2007 FS report (FS2007) was used for the review, among other documents provided to the Team as of January 2010.

Table 9.1.2 Documents Received and Reviewed by the VITRANSS 2 Study Team

Volume	Part	Section	Report Title	Received by Team
1	---		Geological Investigation Report	Yes (Vietnamese)
2	---		Topographic Survey Report	Yes (Vietnamese)
3	---		Hydrological Investigation Report	No
4	1		General Report	---
		1.1	Commentary	No
		1.2	Appendices	---
			(1) Letters	Yes
			(2) Total Investment Cost	Yes (Vietnamese)
	2		Basic Design Report	
		1	Commentary	No
		2	Drawings	
			2.1 An Phu Interchange	Yes (English)
			2.2 Alignment, Drainage	Yes (English)
			2.3 Bridges	Yes (English)

Source: VITRANSS 2 Study Team

9.2 Summary Results of the Review

1) Original Scope of Work

As mentioned earlier, the VITRANSS 2 Study Team received parts of the 2009 FS report and the design report of the 2007 FS. These were reviewed and the brief results of the review are shown in Table 9.2.1. In summary, the 2007 FS report is generally acceptable; however, several items should be updated in the detailed design stage.

Table 9.2.1 Summary Results of the FS Review

Study Item	Evaluation	Required Update
1. General		
a. Design Report	• 2009 report is not available • 2007 report is acceptable	Update the design report from 2007 FS.
b. Document Style		Refer to Decision 48-2008-QD-TTg.
c. Design Standards	Not acceptable	Update design standards and relevant regulations.
2. Legal Basis	Generally acceptable	Include Decision 48-2008-QD-TTg for "General Guidance on Preparation of Feasibility Study Reports for Project Using Official Development Assistance Capital of the Group of Five Banks."
3. Traffic Demand Forecast	Not acceptable	Update traffic demand including directional traffic volume for interchange design.
4. Natural Condition Survey		
a. Topographic Survey	Generally acceptable	Conduct detailed survey based on the updated layout of An Phu IC.
b. (Additional topographic survey)		Conduct topographic survey of potential relocation area of Lien Tinh Lo 25.
c. Geological Survey		Conduct detailed survey based on the updated layout of An Phu IC.
5. Expressway Designs		
a. Typical Cross-section	Not acceptable	Consider and explain clearly typical cross-sections of the phased construction.
b. Horizontal Alignment	Not acceptable	Clarify connection method to RR2 interchange.
c. Vertical Alignment	Not acceptable	Vertical curve too small. Increase radius of vertical curve to desirable levels.
6. Interchanges/Intersections Designs		
a. An Phu Interchange	Not acceptable	Select type of An Phu interchange in accordance with updated traffic demand forecast.
b. Do Xuan Hop Intersection	Not acceptable	Update to meet the phased construction plan.
c. RR 2 Interchange	Need clarification	Clarify connection with RR 2.
7. Linking Roads Designs		
a. Lien Tinh Lo 25	Not acceptable	Relocate intersection of Lien Tinh Lo 25.
8. Bridges Designs		
a. Stage Construction	Not acceptable	Study the phased construction of bridge.
b. Depth of Pile Foundation	Acceptable	Update length of pile foundation.
9. Pavement Design		
a. Design Traffic Volume	Not acceptable	Indicate design traffic volume.
b. Pavement Design	Not acceptable	Update pavement design based on updated design traffic volume.
10. Drainage Design		
a. Catchment Area	Not acceptable	Indicate hydrological design areas.
b. Hydraulic calculation	Not acceptable	Indicate hydraulic calculation of each drainage facility.
11. Soft-ground Treatment		

Study Item	Evaluation	Required Update
a. Selection of Countermeasures	Generally acceptable	Update using a comparison study to include vacuume consolidation method.
12. Other Structural Designs	No SA/PA, O&M building located.	Not applicable
13. Traffic Safety Facilities		
a. Throughway	Acceptable	
b. Connection Road	Not acceptable	Include traffic safety facilities for intersections and interchanges.
14. Utilities Relocation Planning	Not acceptable	Include the outline of existing utilities and their relocation plan.
15. Electrical Facilities Designs	Not acceptable	Include the outline of existing electrical utilities and their relocation plan.
16. ITS Facilities Designs	Not acceptable	Include the ITES facilities plan and design.
17. Construction Planning	Not acceptable	Consider and explain clearly phased construction.
18. Environmental Considerations		
a. Natural Environment	Generally acceptable	Update based on: (i) revised layout of An Phu interchange, (ii) relocation of intersection of Lien Tinh Lo 25, with reference to JICA guidelines.
b. Social Environment	Not acceptable	Prepare RAP report.
19. Operation and maintenance (O&M) Planning	Not acceptable	Further discuss operation of KM0-4 among stakeholders.
20. Drawings		
a. Volume Arrangement	Not acceptable	All drawings should be in one volume.
b. Project Location Map	Not acceptable	Include project location map.
21. Quantities Take-off	Not acceptable	Prepare quantity calculation report with updated design.
22. Cost estimate	Not acceptable	Prepare quantity calculation report with updated design.
23. Implementation Program	Not acceptable	Update the implementation program in consultation with VEC taking into account a practical schedule.
24. Economic and Financial Analysis	Not acceptable	Update with the updated cost and implementation program.

Source: VITRANSS 2 Study Team

2) Additional Scope of Work

The original scope of the review was the section between An Phu intersection (Km0+000) up to the border of ongoing construction works (Km4+000). The eastern missing link was assumed to connect to the present design at the embankment section at Km4+000.

However, during discussions with the VEC, it was requested that the section up to RR 2 Interchange be included in the review, and the VITRANSS 2 Study Team agreed to it.

Table 9.2.2 Scope of the Review

No.	Scope	Coverage
1	Original	KM 0+000 – KM 4+000 (Before RR2 Interchange)
2	Updated	KM 0+000 – KM 5+000 (including RR2 Interchange)

Source: VITRANSS 2 Study Team

3) Legal Basis of 2009 FS Report

The legal documents provided by TEDI South are listed below. At the same time, the Team referred to Decision 48-2008-QD-TTg on the “General Guidance on the Preparation of Feasibility Study Reports for Projects Using Official Development Assistance Capital of the Group of Five Banks” during the review.

Table 9.2.3 Legal Basis of the 2009 FS Report

Document	Issue Date	Subject
1. Notice No.858/TB-VP (HCMC PC)	23/11/2009	The conclusion of Vice Standing Chairman – Nguyen Thanh Tai on the connection road (or missing link)'s boundary between West-East Highway and Expressway Long Thanh–Dau Giay
2. Document No.3421/PKH-CV	03/11/2009	West-East Highway PMU & City Water Environment on Reporting difficulties related to the missing link project in between West-East Highway and HCMC–Long Thanh–Dau Giay Expressway
3. Document No.3005/UBND-DTMT(HCMC PC)	23/06/2009	Ceasing the implementation of An Phu–RR2 section of the HCMC–Long Thanh–Dau Giay Expressway
4. Document No.1048/UBND-DTMT(HCMC PC)	16/03/2009	Monitoring the construction project of Ahn Phu–HCMC's RiR 2 section
5. Document No.32/CDSVN-KHDT	09/01/2009	Responding to the future planning of N-S High Speed Railway (Vietnam Railway Administration)
6. Notice No.546/TB-BGVT	01/12/2008	The conclusion of Vice-Minister Ngo Thinh Duc on Discussion of HCMC's DOT about Road and Rail corridor–Section An Phu–RR2 (MOT)
7. Decision No.618/QD-TNMT-QLMT	07/10/2008	DONRE (HCM PC) on Approving EIA Report of the missing link project (in between West-East Highway and HCMC–Long Thanh–Dau Giay Expressway) of the investment & construction for West-East Highway project
8. Document No.195/SEPMU-KT&MT	18/08/2008	South Expressway PMUs (VEC) on Providing data on connection point between section km0–km4 and section km4 – km54+983 of the HCMC–Long Thanh–Dau Giay Expressway
9. Notice No.164/TB-VPCP	11/07/2008	The conclusion of PM Nguyen Tan Dung about the railway transport development strategy of Vietnam toward 2020 and a vision toward 2050
10. Document No.1266/SGTCG-GT	27/05/2008	Studying and identifying the scope of interchange between HCMC–Long Thanh–Dau Giay Expressway and Do Xuan Hop Road (Department of Public Traffic Works–HCMC's PC)
11. Decision No.334/QD-BGTVT	13/02/2007	Approving the construction project of HCMC–Long Thanh–Dau Giay Expressway (MOT)

Source: VITRANSS 2 Study Team

9.3 Traffic Demand Forecast

1) TEDI South Forecast

(1) Methodology

The methodology to forecast traffic demand which TEDI South adopted for the feasibility study can be summarized as follows:

Traffic volume on road was forecast using the following formulae:

$$Y_t = Y_0 (1 + \alpha\varepsilon)^t$$

Wherein:

Y_t : traffic volume for year *t*.

Y_0 : observed traffic volume of the first year.
α: GDP growth rate.
ε: elasticity factor against GDP growth rate.
t : time (years)

For both national and regional economic growth, low, medium and high assumptions were considered in light of the MPI strategy and development targets of the Southern Focal Economic Zone (SFEZ). Then, using the elasticity of traffic demand against GDP growth rates obtained from past statistics, traffic growth rates were estimated separately for cargo and passenger traffic.

Before applying the formula above, present traffic volume and its OD were analyzed based on traffic count and OD interview survey conducted in 2005 at five stations along NH1. The future diversion rate from existing national roads to the expressway was assumed considering the OD patterns by vehicle type.

Although the forecast was conducted carefully and in detail, the possible structural changes in traffic movement due to the construction of the proposed expressway were not reflected in the forecast.

(2) Results

The forecast result for the eastern missing link is shown in Table 9.3.1.

Table 9.3.1 Traffic Volume Forecast for the Eastern Missing Link

Year	Traffic Volume (PCUs/day)
2010	41,241
2015	48,818
2020	73,005
2025	105,629
2030	149,245

Source: FS for HCM-LT-DG Expressway (TEDI South)
Note: Traffic to/from the proposed Long Thanh Airport is not included.

2) VITRANSS 2 Forecast

(1) Methodology

The VITRANSS 2 Study Team updated the demand forecast for the eastern missing link of the East-West Highway (refer to Appendix 8A for details). Its outline can be summarized as follows:

As the basis of the study, inter-provincial traffic demand was taken from the VITRANSS 2 and organized into OD matrices. 2008 figures were estimated using the results of the traffic count survey conducted at provincial boundaries;

For intra-provincial traffic which may form part of the highway traffic demand and was excluded from VITRANSS 2 inter-provincial OD, trip generation/attraction and distribution models were developed and applied to HCMC. The socio-economic framework is consistent with VITRANSS 2's original models;

The above two OD tables were combined by vehicle type. This procedure was iterated for the years 2020 and 2030; and,

The "base network" was formed in consideration of ongoing and committed road projects and government plans. Traffic was then assigned to the network under three scenarios with different completion years for interchanges including a scenario wherein the project is not implemented (see Table 9.3.2).

Table 9.3.2 Options on Traffic Demand Forecast

Case No.	Time of Opening	
	An Phu Interchange	RR2 Interchange
1	2015–2020	2015–2020
2	2015–2020	2020–2030
3	2020–2030	2015 –2020

Source: VITRANSS 2 Study Team

(2) Results

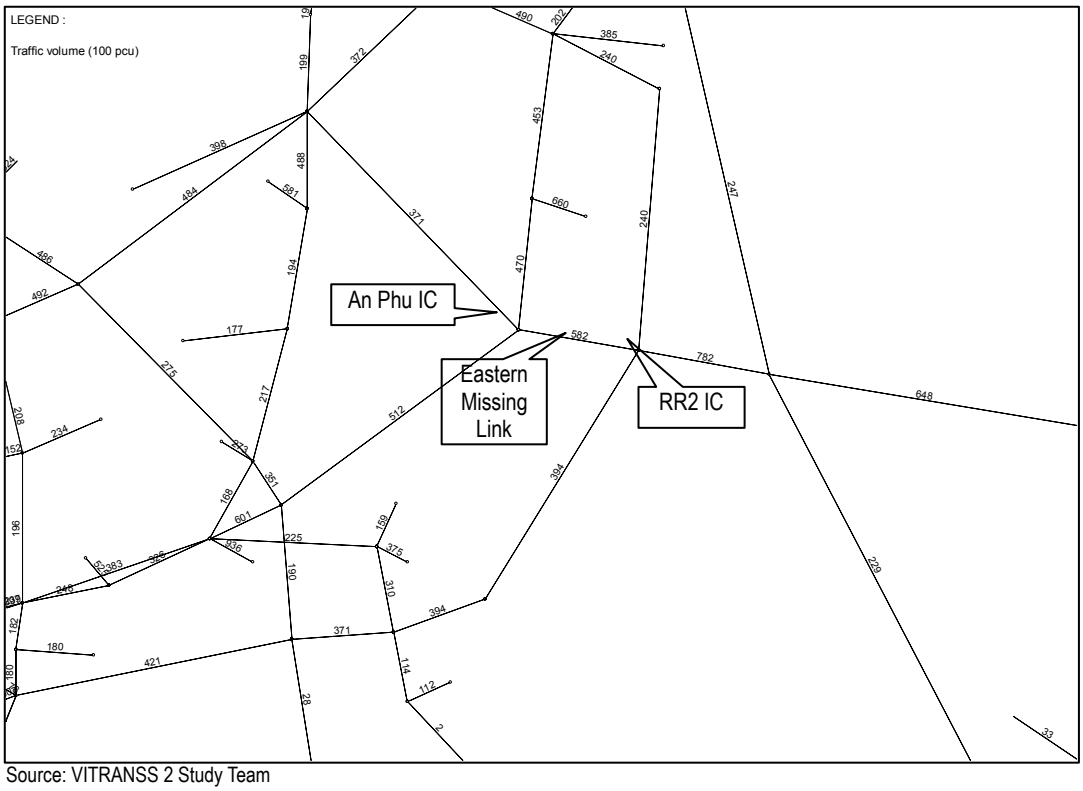
The traffic volume forecast for the eastern missing link by 2020 is 58, 53, and 27 thousand PCUs/day for Case 1, Case 2, and Case 3, respectively, as shown in Figure 9.3.1 to Figure 9.3.3. Obviously, the completion period of An Phu interchange affects the traffic volume on the eastern missing link. Traffic demand by 2030 is estimated to be 81 thousand PCUs/day, as shown in Figure 9.4.4. For Case 1, traffic forecast is substantially smaller than the forecast of TEDI South by 21% and 46% for 2020 and 2030, respectively.

Although further investigation may be needed in the future, the forecast of TEDI South would well be an overestimate.

Figure 9.3.5 to Figure 9.3.12 illustrate the forecast on directional traffic flows at the An Phu and RR2 intersection on both ends of the missing link for 2020 and 2030.

Figure 9.3.1 Traffic Volume Forecast for Case 1 around the Eastern Missing Link, 2020

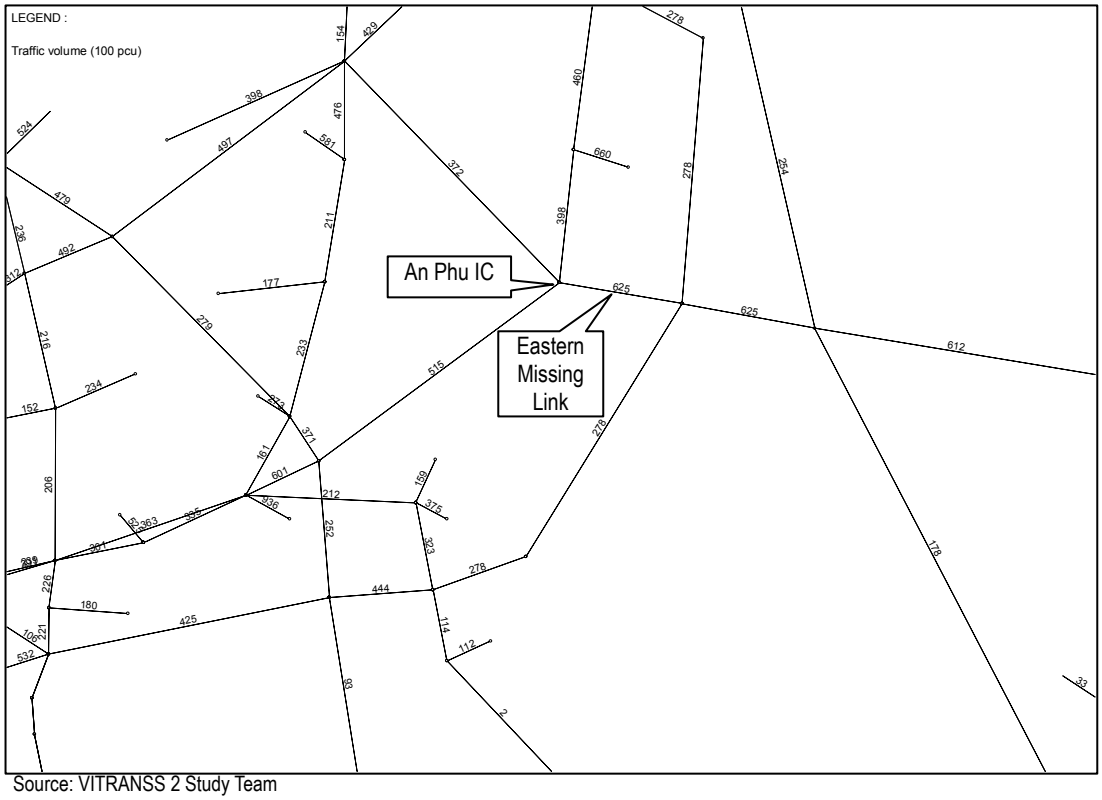
(Unit: 100 PCUs/day)



Source: VITRANSS 2 Study Team

Figure 9.3.2 Traffic Volume Forecast for Case 2 around the Eastern Missing Link, 2020

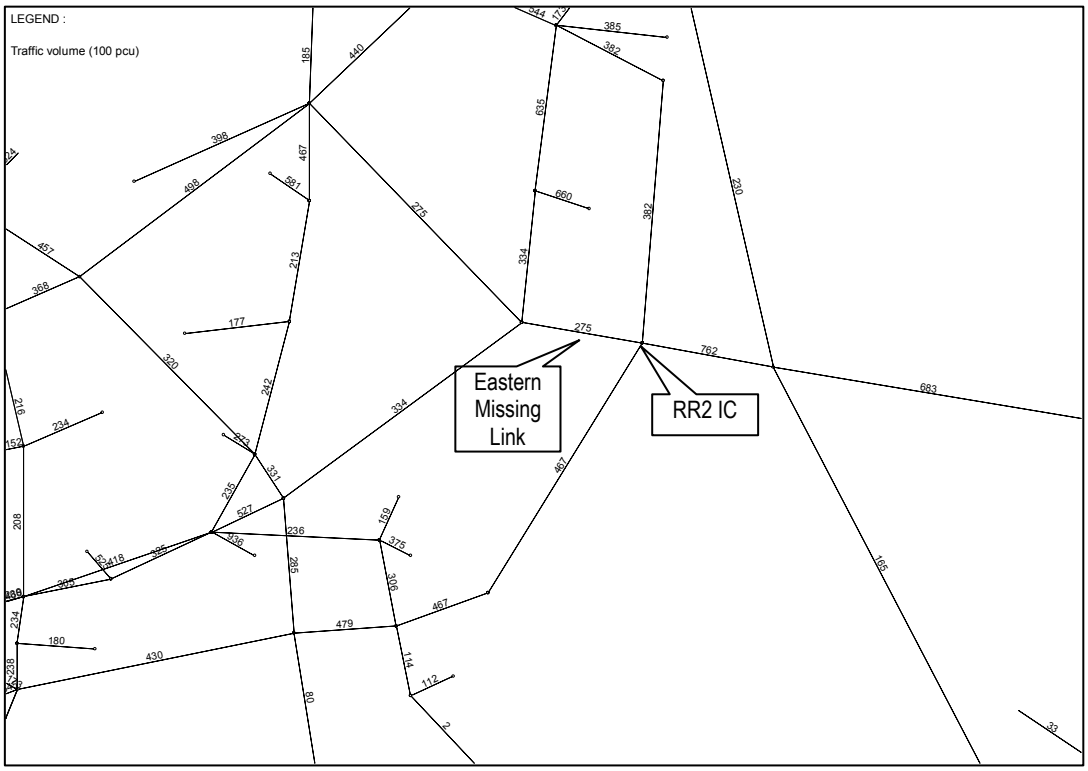
(Unit: 100 PCUs/day)



Source: VITRANSS 2 Study Team

Figure 9.3.3 Traffic Volume Forecast for Case 3 around the Eastern Missing Link, 2020

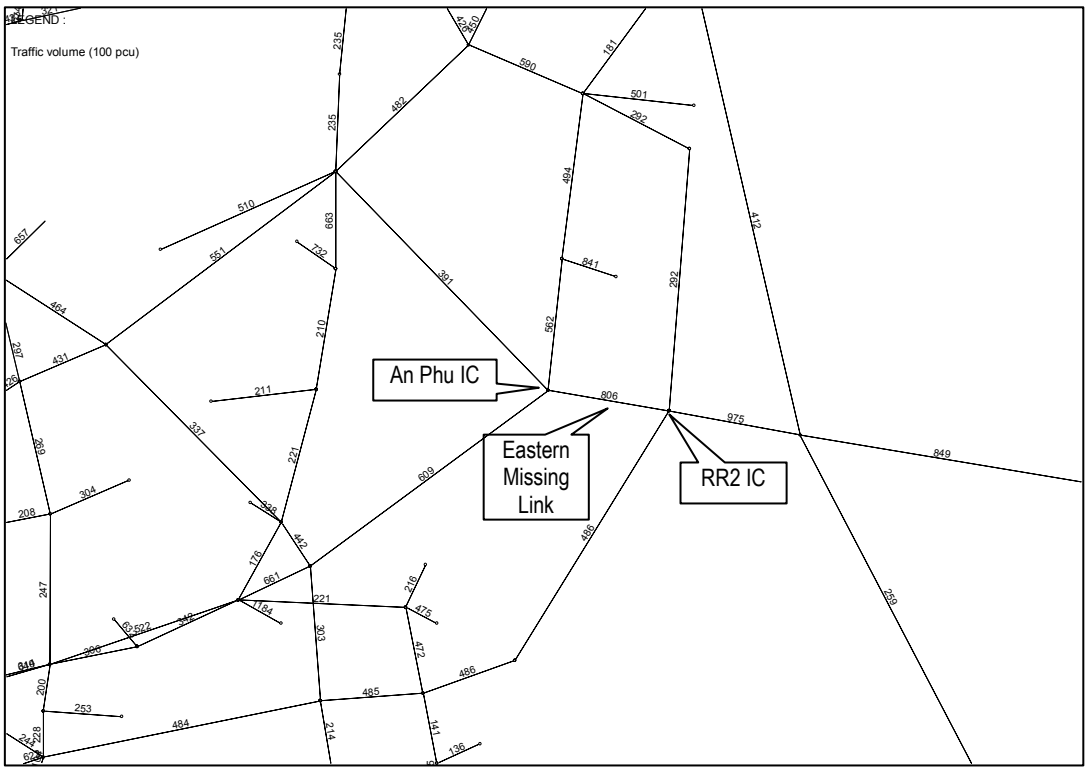
(Unit: 100 pcus/day)



Source: VITRANSS 2 Study Team

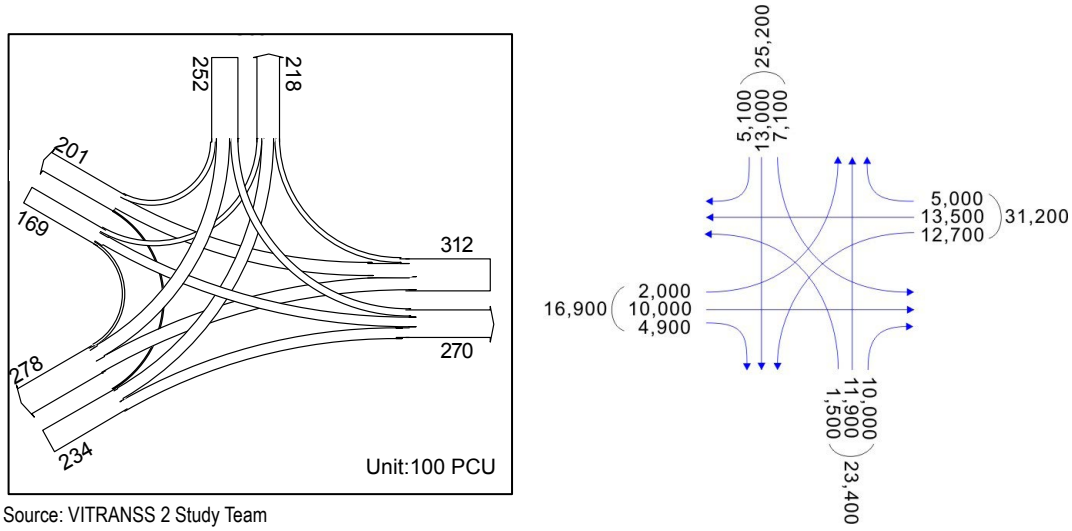
Figure 9.3.4 Traffic Volume Forecast around the Eastern Missing Link, 2030

(Unit: 100 PCUs/day)



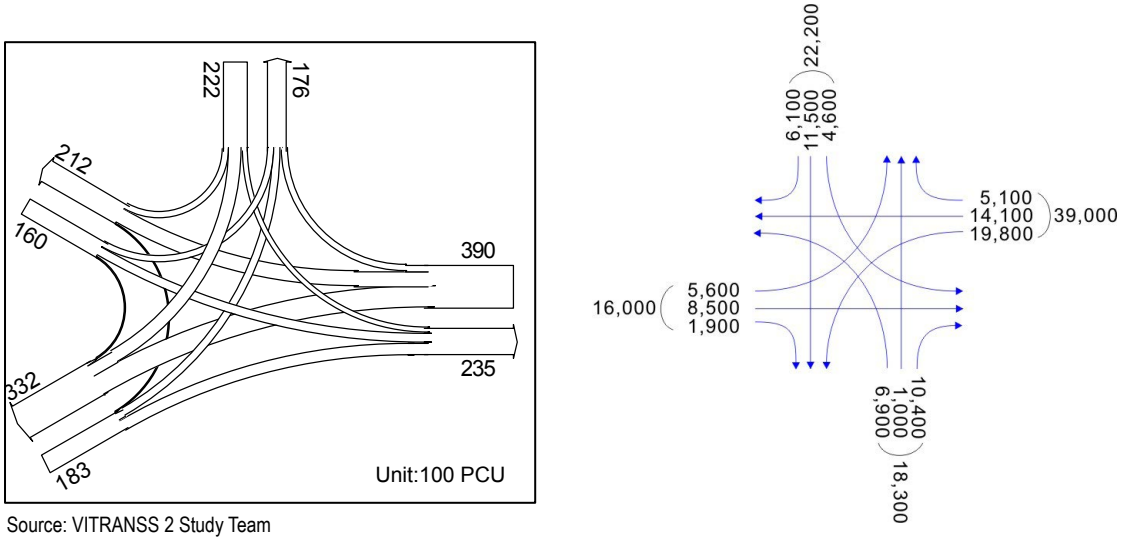
Source: VITRANSS 2 Study Team

Figure 9.3.5 Directional Traffic at An Phu Intersection for Case 1, 2020



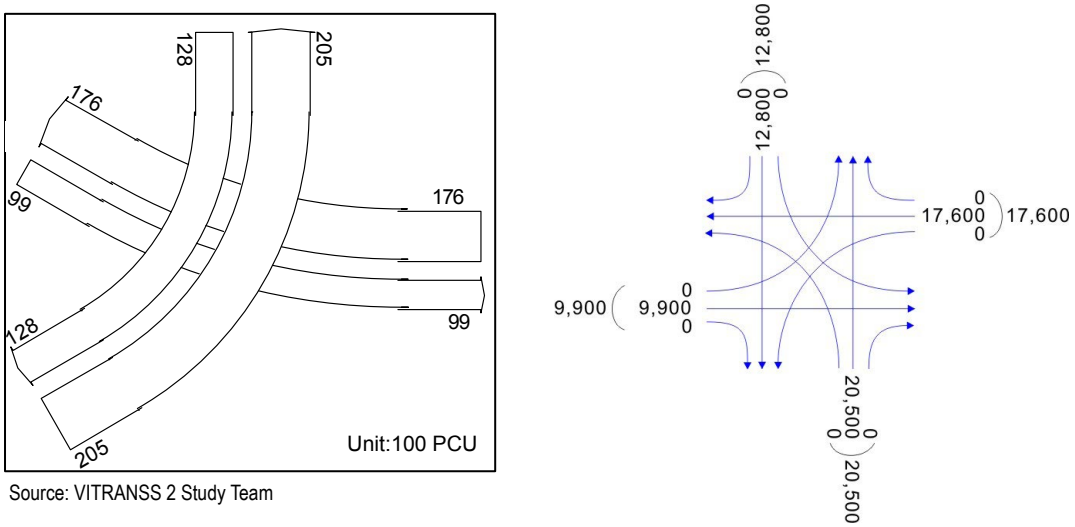
Source: VITRANSS 2 Study Team

Figure 9.3.6 Directional Traffic at An Phu Intersection for Case 2, 2020



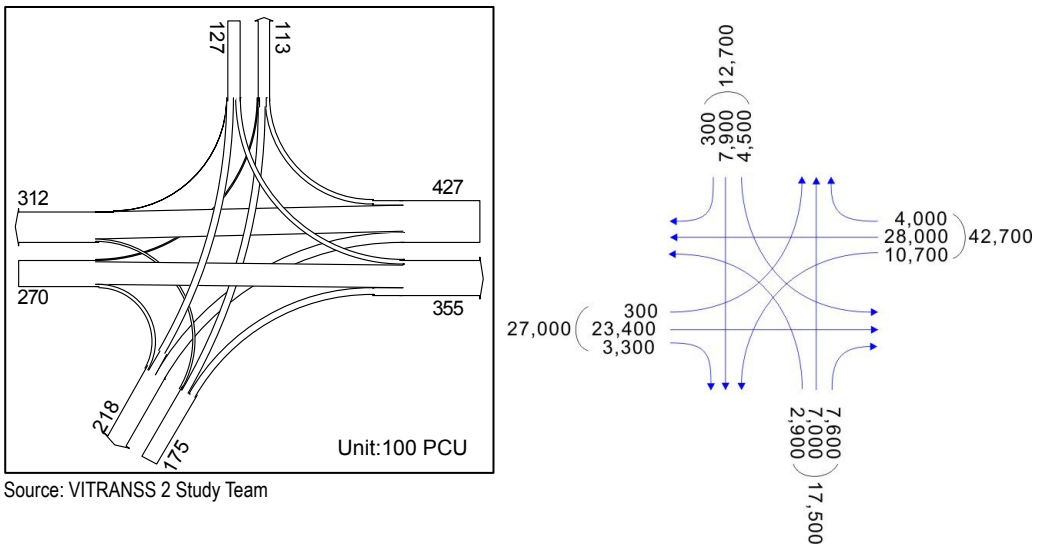
Source: VITRANSS 2 Study Team

Figure 9.3.7 Directional Traffic at An Phu Intersection for Case 3, 2020



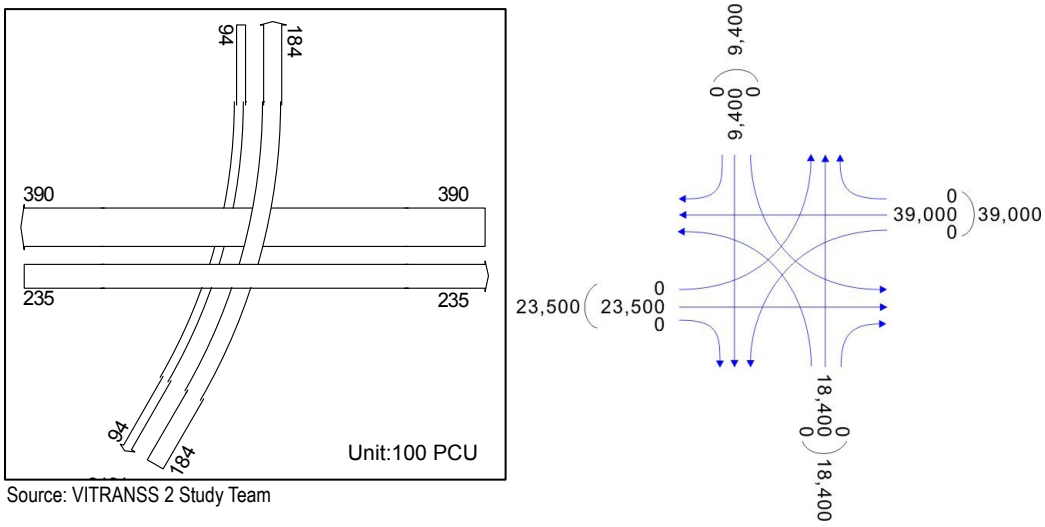
Source: VITRANSS 2 Study Team

Figure 9.3.8 Directional Traffic at RR2 Intersection for Case 1, 2020



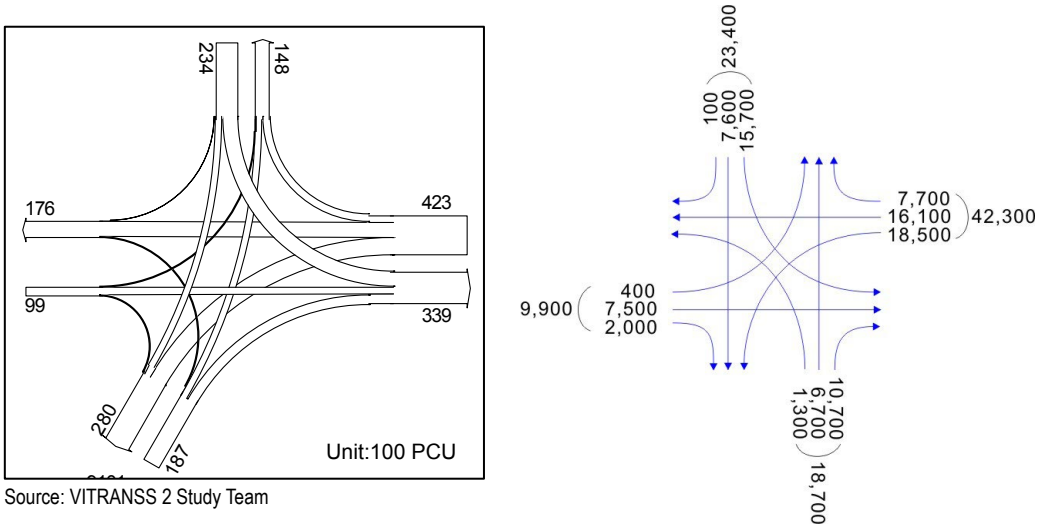
Source: VITRANSS 2 Study Team

Figure 9.3.9 Directional Traffic at RR2 Intersection for Case 2, 2020



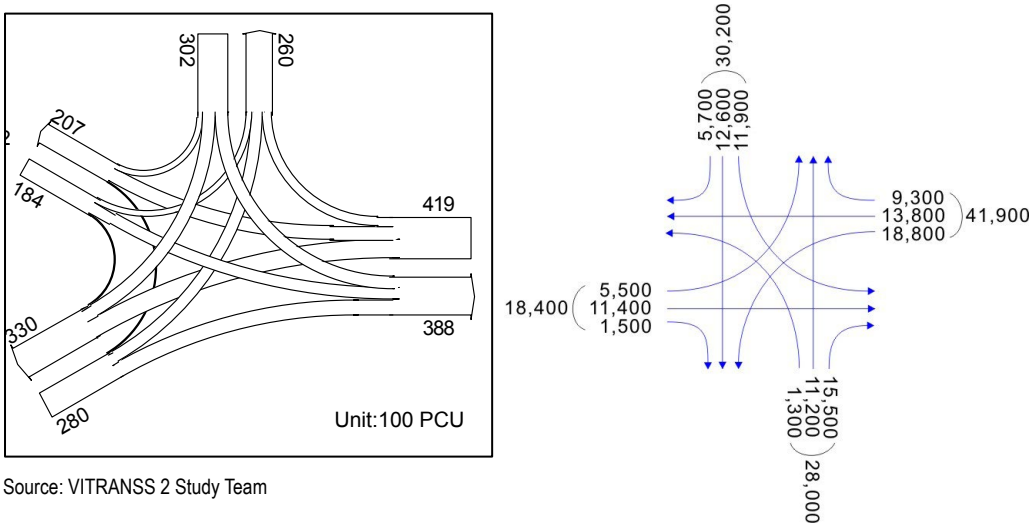
Source: VITRANSS 2 Study Team

Figure 9.3.10 Directional Traffic at RR2 Intersection for Case 3, 2020



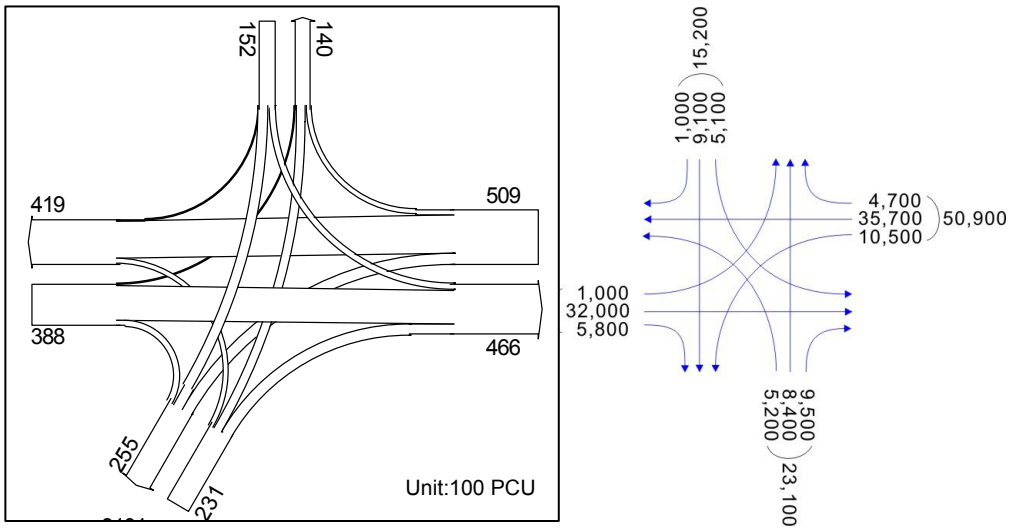
Source: VITRANSS 2 Study Team

Figure 9.3.11 Directional Traffic at An Phu Intersection, 2030



Source: VITRANSS 2 Study Team

Figure 9.3.12 Directional Traffic at An Phu and RR2 Intersection, 2030



Source: VITRANSS 2 Study Team

9.4 Natural Conditions Surveys

(a) **Topographic Surveys:** The topographic surveys included in the 2009 FS (see Table 9.4.1) were carried out based on the updated national coordinates system (VN2000 Center meridian 105 degree 45 minutes). The comments of the VITRANSS 2 Study Team on the surveys and report are listed in Table 9.4.2

Table 9.4.1 Topographic Surveys done in the 2009 FS

No.	Type of Topo Survey	Scale	Qty	Remarks
1	Control point survey, GPS	-	9	Incl.646449
2	Control point survey, BM	-	72	Concrete Monument
3	Planimetric Survey	1/5,000	-	Km0-Km4
4	Longitudinal profile survey	1/500	-	Km0-Km4
5	Cross-section Survey	1/200	86	100 m wide
6	Linking Roads Survey Profile, Cross-section	H=1/2,000, V=1/200		
	(1) Nguyen Thi Dinh Street		18	896.87 m
	(2) Lien Tinh Lo 25 Street		28	1,393.52 m
	(3) Luong Dinh Cua Street		15	638.74 m
	(4) Do Xuan Hop Street		28	No Profile
7	River Survey Plan, Cross-section	1/1,000 H=1/1,000, V=1/100		
	(1) KM 0+350		3	Rach Ba Dai River
	(2) KM 0+820		1	Rach Mieu 1
	(2) KM 1+235		3	Dong Ngoai
	(3) KM 1+938		1	
	(4) KM 2+427		1	
	(5) KM 2+558		1	
	(6) KM 3+032		1	
	(7) KM 3+365		1	
	(8) KM 3+492		1	
	(9) KM 3+875		1	

Source: VITRANSS 2 Study Team

Table 9.4.2 Comments on the Topographic Surveys

No.	Study Item
TS-00	Generally well prepared. English translation needed.
TS-01	Add plan on the control point survey.
TS-02	Add plan for the Ah Phu IC area.
TS-03	Add planimetric survey for potential relocation road area for Lien Tinh Lo 25 Street
TS-04	Add survey centerline for existing roads
TS-05	Cross-section of existing roads should indicate location of nearest house walls.
TS-06	Position of cross-section survey should be indicate in the plan.
TS-07	Cross-section of Km0+0820 is not correct. No indication of dike structure.
TS-08	Cross-section of Km1+235 is not correct.. No indication of dike structure.
TS-09	Cross-section of Km1+938 is not correct. No indication of dike structure.
TS-10	Cross-section of Km2+427 is not correct. No indication of dike structure.
TS-11	Cross-section of Km2+558 is not correct. No indication of dike structure.
TS-12	Cross-section of Km3+875 is not correct. No indication of dike structure.
TS-13	Add profile of Do Xuan Hop Street.
TS-14	Add utility survey.

Source: VITRANSS 2 Study Team

(b) **Geological Survey:** Although the 2009 FS report was provided, it was in Vietnamese and had to be translated. Due to time constraints, the 2007 FS report on the geological conditions in the project area was reviewed. The 2007 FS report covers all relevant items except for those at the exact location of the An Phu interchange. However, it was accepted that geological investigation can be carried out after the type of interchange is decided. A translation of the 2009 FS report to English is necessary.

(c) **Hydrological Survey:** The 2009 FS report on the results of the hydrological survey was not provided by VEC. Therefore, the 2007 FS report was reviewed. The purpose of the hydrological survey is two-fold: (i) to determine the design flood level (DFL) for road construction, and (ii) to determine the design water volume for hydraulic structures/facilities. With the nature of hydrology in the project area, the design parameters could be similar with those used for the East–West Highway and Ho Chi Minh–Dau Giay Expressway.

9.5 Engineering Work

1) Highway Design

(1) Design Standards

The latest technical standards listed in the table below were used to review the existing FS reports for 2009. "TCXDVN104-2007: Urban Road Specifications for Design" was issued through Decision No. 22/2007/QD-BXD dated 30 June 2007. For the 2007 FS report, "TCXD104-1983: Specifications for Urban Road, Square" was used since it was the latest standards at the time the FS was carried out.

Table 9.5.1 Design Standards Used in the Review

Design Standard	Applied to:
TCXDVN104-2007	Km0+000–Km4+000
TCVN5729-2007	RR2 Interchange

Source: VITRANSS 2 Study Team

(2) Road Classification

The FS 2007 report described that An Phu–Ring Road 2 (RR2) section is urban road – Main Road Grade I, calculated velocity 100km/h, and agreed by MOT by the letter No. 4997/BGTVT-KHÑT dated 21/8/2006.

In TCXDVN104-2007, road classification and hierarchy have been further developed and specified. Considering the expected function and the location, in accordance with Article 6 of TCXDVN, it is proposed that section between An Phu and RR2 should be classified as "Urban Expressway", with full access control, without interruption by traffic signal, connecting the HCMC-Long Thanh–Dau Giay Expressway (HLD Expressway) which would carry the largest traffic in the country.

(3) Number of Lanes Required between An Phu Interchange and RR2 Interchange

TCXDVN104-2007 stipulated the method of determining number of lane as follows:

Box 9.5.1 TCXDVN104-2007 Article 8.2.2

Number of lanes on the cross-section is integral, number of lane is determined by type of planned road and use the formula as follow:

$$n_{lx} = \frac{N_{yc}}{Z.P_{tt}}$$

to calculate the construction phase and check traffic possibility.

In which:

- *nlx: required lanes*
- *Nyc: designed volume of vehicle by hour in accounted year according to the article 5.2.3*
- *Z: Traffic possibility factor, Article 6.2.3*
- *Ptt: Calculated traffic possibility of one lane (vehicle/h, PCU/h) in article 5.4.1*

Note:

- *Z.Ptt: service volume: means vehicle volume matching with given level of service while designing.*
- *As for accommodation lanes, for example lane for bus, vehicle volume and traffic possibility are identified by bus.*

Source: TCXDVN104-2007 Article 8.2.2

Design Annual Vehicle Volume (Nan) between An Phu Interchange and RR2 Interchange for 2020-2030 is forecasted.

Design Hourly Vehicle Volume (Nyc) is calculated with the ration of 0.12–0.14 of Nan, in accordance with Article 5.2.3.

Traffic Possibility Factor (Z) is 0.70–0.80 in accordance with Article 6.2.3.

(iv) Highest Traffic Possibility (Ptt) is 1800 pcu/hour/lane in accordance with Article 5.4.1.

Number of lanes required was calculated as shown in Table 9.5.2.

Table 9.5.2 Number of Lanes Required on Throughway between An Phu Interchange and RR2 Interchange

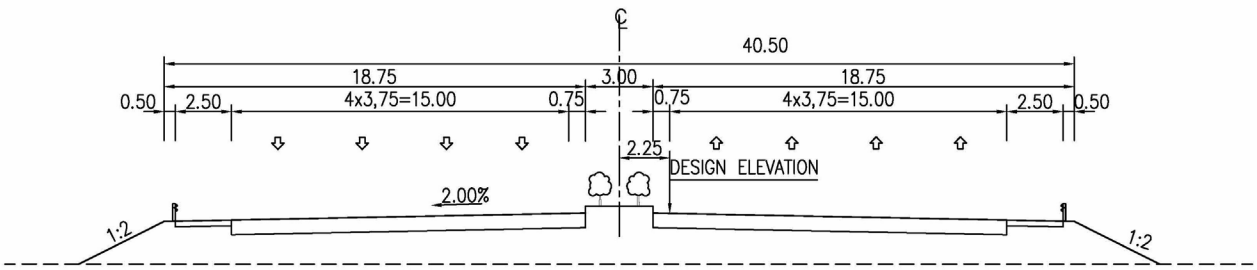
Year		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
NAN		58,200	60,200	62,100	64,200	66,300	68,500	70,800	73,100	75,500	78,000	80,600
NYC(1)	0.12	7,000	7,200	7,500	7,700	8,000	8,200	8,500	8,800	9,100	9,400	9,700
NYC(2)	0.14	8,100	8,400	8,700	9,000	9,300	9,600	9,900	10,200	10,600	10,900	11,300
Z(1)	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Z(2)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
PTT	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800	1,800
NLX-0.12-0.7		6	6	6	6	6	7	7	7	7	7	8
NLX-0.12-0.8		5	5	5	5	6	6	6	6	6	7	7
NLX-0.14-0.7		6	7	7	7	7	8	8	8	8	9	9
NLX-0.14-0.8		6	6	6	6	6	7	7	7	7	8	8

Source: VITRANSS 2 Study Team

In terms of traffic demand, it is proposed to build dual 3-lane, total 6-lane, expressway for the throughway between An Phu Interchange and RR2 Interchange in Phase 1.However, the distance of the throughway is 3.3km only, and it is two (2) minutes to pass the section when the travelling speed is 100km/hr.

Considering An Phu Interchange and RR2 Interchange are developed for 8-lane throughway interchanges, it is strongly recommended to develop this 3.3 km section as dual 4-lane, total 8-lane road in Phase 1.

Figure 9.5.1 Proposed Typical Cross-section between An Phu and RR2



Source: VITRANSS 2 Study Team

2) Intersection Design

There are two (2) major intersections in the project, which is An Phu intersection and RR2 junction. Those intersections are the first class ones located, along the East gateway of HCMC in the country.

Smooth traffic operations of those intersections are significantly important for national socio-economic development in general, and for the SFEZ in particular, so that long-term investment plan will be appropriately developed with step-wise approach.

In accordance with TCXDVN104-2007 Article 12.5, “grade-separated intersection” should be applied to those intersections.

(1) Design of An Phu Intersection

(a) **Design Standards**: “TCXDVN104-2007: Urban Road Specifications for Design”, issued by Decision No. 22/2007/QD-BXD dated 30 June 2007, is the basic design standards.

For design of the grade-separated intersection, said interchange, “TCVN5729-2007: Expressway Specifications for Design” was referred practically where stipulation of “12.8 Grade-separated intersection” of TCXDVN104 is not sufficiently applicable.

(b) **Classification of Crossing Roads**: As described in TCXDVN104-2007, the section between An Phu and RR2 of the HLD Expressway is classified as Urban Expressway, and the East-West Highway is classified as Urban Main Road.

In accordance with TCXDVN104-2007 Article 12.5.1, the An Phu Interchange shall be a combination of at-grade intersection and grade-separated intersection.

(c) **Design Traffic Volume:** In accordance with TCXDVN104-2007 Article 5.2.1, traffic volume in 2030 should be referred for the traffic planning of the urban expressway

In accordance with TCXDVN104-2007 Article 5.2.3, Design Hourly Vehicle Volume is calculated with the ration of 0.12–0.14 of Design Annual Vehicle.

Roughly, 1,000 pcu/hour is capacity of at-grade intersection; the following major traffic direction of the An Phu Interchange should be studied.

Table 9.5.3 Major Traffic Direction at An Phu Interchange (2030)

Direction		TTB - LTB	TTT - LTB	HNR - LTB	LTB - TTB	LTB - TTT	LTB - HNR	TTB - HNR	TTB - TTT	TTT - HNR	TTT - TTB	HNR - TTT	HNR - TTB
(Ramp Name)		(A) Thruway	(B)	(C) Thruway	(D)	(E)	(F)			Thruway		Thruway	
NAN		11,400	15,500	11,900	13,800	18,800	9,300	5,500	1,500	11,200	1,300	12,600	5,700
NYC(1)	0.12	1,368	1,860	1,428	1,656	2,256	1,116	660	180	1,344	156	1,512	684
NYC(2)	0.14	1,596	2,170	1,666	1,932	2,632	1,302	770	210	1,568	182	1,764	798
Major Intersection (>1,000 PCU/hr)		Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	No

TTB: Thu Thiem Bridge, LTB: Long Thanh Bridge, TTT: Thu Thiem Tunnel, HNR: Hanoi Road,
NAN: Design Annual Daily Traffic Volume (PCU/day),
NYC: Design Hourly Traffic Volume (PCU/hr)

Source: VITRANSS 2 Study Team

(d) **Alternatives of Intersection Type:** Six (6) types of intersection, including five (5) types of grade-separated intersection, and one at-grade intersection, were prepared for the alternative study.

Table 9.5.4 Six (6) Types of Intersection at An Phu Interchange

No.	Code	Type	Level	Description
1	FO-1	Flyover	1	Ground level
			2	HLDE over EWH
2	FO-2	Flyover	1	Ground level
			2	EWH over HLDE
3	FO-3	Flyover	1	Ground level
			2	EWH over ground traffic
			3	HLDE over EWH
4	JCT-1	Junction	1	Ground level
			2	TTB-LTB(A), TTT-LTB(B), LTB-TTB(D)
			3	LTB – TTT(E)
5	JCT-2	Junction	1	Ground level
			2	TTB-LTB(A), TTT-LTB(B), HNR-LTB(C), LTB-HNR(F)
			3	LTB-TTB(D), LTB-TTT(E)
6	AG	At-grade	1	At-grade

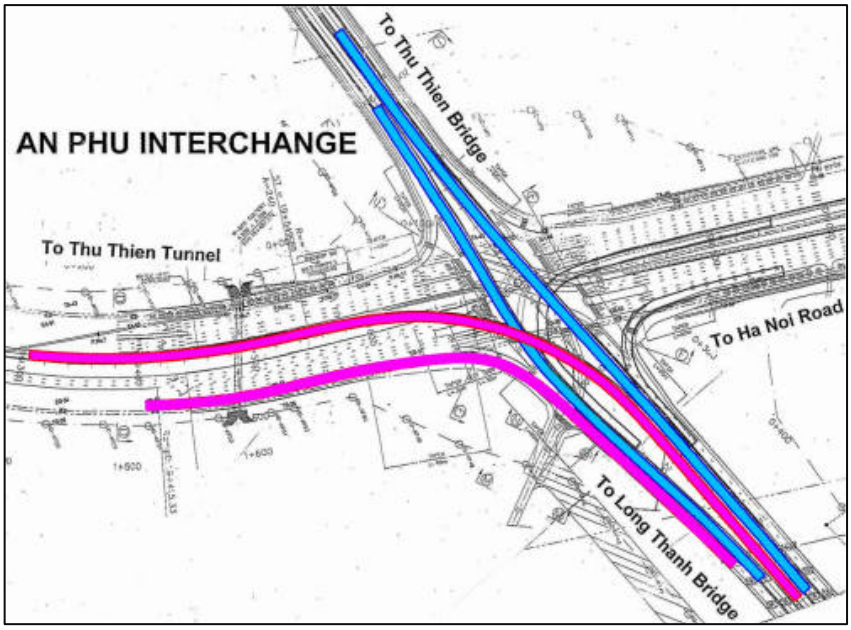
TTB: Thu Thiem Bridge (Luong Dinh Cua Street)
TTT: Thu Thiem Tunnel (EW Highway-South)
HNR: Ha Noi Road (EW Highway-North)
LTB: Long Thanh Bridge (HLD Expressway)
HLD: Luong Dinh Cua Street – HLD Expressway
EWH: East-West Highway

Source: VITRANSS 2 Study Team

(e) **Preliminary Comparison Study of Intersection Type:** Preliminary comparison study of the intersection type was carried out as shown in Table 9.5.5.

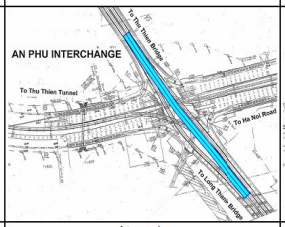
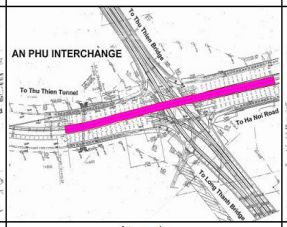
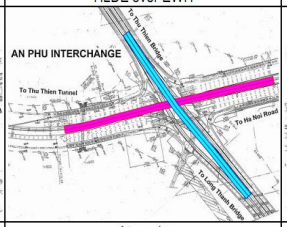
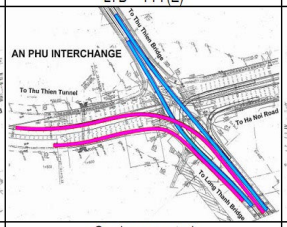
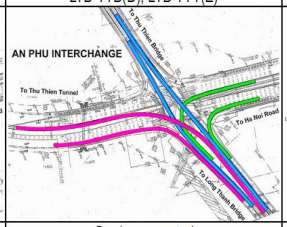
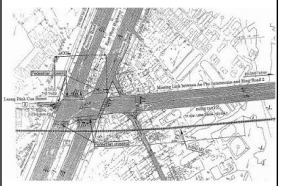
(f) **Selected Intersection Type at An Phu Intersection:** Considering balance of traffic service and scale of initial investment, JCT-1 is the most recommended option for An Phu Interchange. Alignment, horizontal and vertical, should consider the future development plan of said rampways between Long Thanh Bridge and Hanoi Road.

Figure 9.5.2 Proposed Interchange Type at AN Phu



Source: VITRANSS 2 Study Team

Table 9.5.5 Preliminary Comparison Study of Intersection Type at An Phu Interchange (2030)

No.	Item		FO-1	FO-2	FO-3	JCT-1	JCT-2	AG
1	Structure Type		Flyover	Flyover	Flyover	Junction	Junction	At-grade
2	Level Arrangement	1	Ground level	Ground level	Ground level	Ground level	Ground level	Ground level
		2	HLDE over EWH	EWH over HLDE	EWH over ground traffic	TTB-LTB(A), TTT-LTB(B), LTB-TTB(D),	TTB-LTB(A), TTT-LTB(B), HNR-LTB(C), LTB-HNR(F)	---
		3	---	---	HLDE over EWH	LTB – TTT(E)	LTB-TTB(D), LTB-TTT(E)	---
3	Layout							
4	Traffic Flow	LTB-TTT (18,800)	At-grade	At-grade	At-grade	Grade-separated	Grade-separated	At-grade
		TTT-LTB (15,500)	At-grade	At-grade	At-grade	Grade-separated	Grade-separated	At-grade
		LTB-TTB (13,800)	Grade-separated	At-grade	Grade-separated	Grade-separated	Grade-separated	At-grade
		HNR-TTT (12,600)	At-grade	Grade-separated	Grade-separated	At-grade	At-grade	At-grade
		HNR-LTB (11,900)	At-grade	At-grade	At-grade	At-grade	Grade-separated	At-grade
		TTB-LTB (11,400)	Grade-separated	At-grade	Grade-separated	Grade-separated	Grade-separated	At-grade
		TTT-HNR (11,200)	At-grade	Grade-separated	Grade-separated	At-grade	At-grade	At-grade
		LTB-HNR (9,300)	At-grade	At-grade	At-grade	At-grade	Grade-separated	At-grade
5	Major Structures		Ramp-B Bridge: L=617m Ramp-C Bridge: 592m	East-West Highway Bridge: L=500m	Ramp-B Bridge: L=617m Ramp-C Bridge: L=592m EWH Bridge: L=500m	Ramp-A Bridge: L=1282m Ramp-B Bridge: L=617m Ramp-D Bridge: L=200m Ramp-E Bridge: L=500m	Ramp-A Bridge: L=592m Ramp-B Bridge: L=1282m Ramp-C Bridge: L=300m Ramp-D Bridge: L=617m Ramp-E Bridge: L=1282m Ramp-F Bridge: L=200m	None
6	Construction Cost		1,700 MJPY (100)	1,000 MJPY (59)	3,500 MJPY (206)	3,500 MJPY (206)	5,500 JPY (324)	200 MJPY (12)
7	Construction Period		20 Months	20 Months	30 Months	30Months	30 Months	10 Months
8	Constructability		Good	Good	Good	Normal	Normal	Good
9	Required Land Acquisition		Small or no additional from At-grade option.	Small or no additional from At-grade option.	Small or no additional from At-grade option.	Further survey needed.	Further survey needed.	Baseline.
10	Merit		Traffic of TTB-LTB is much improved.	Traffic of TTT-HNR is much improved.	Traffic of TTB-LTB is much improved. Traffic of TTT-HNR is much improved.	Major traffic demand(TTT-LTB) are grade-separated.	Major traffic demand(TTT-LTB, LTB-HNR) are grade-separated.	Cheap and simple construction.
11	Demerit		Major traffic demand(TTT-LTB) are not grade-separated.	Major traffic demand(TTT-LTB) are not grade-separated.	Major traffic demand(TTT-LTB) are not grade-separated.	Three (3) layer structure is costly and require long construction period.	Three (3) layer structure is costly and require long construction period.	Would cause much traffic congestion.
12	Other Considerations		Difficult for future development.	Difficult for future development.	Difficult for future development.	Future development can be considered.	Too much investment at initial stage.	Future development is possible.
13	Recommendation		Recommended when future development is considered.	Not recommended.	Not recommended.	Most recommended	Recommended if budget is available.	If no budget, this option can be recommended.
Rank			**4**	**5**	**6**	**1**	**2**	**3**

Source: VITRANSS 2 Study Team

(2) Design of RR2 Intersection

(a) **Design Standards:** "TCVN5729-2007: Expressway Specifications for Design" is the basic design standards.

(b) **Classification of Crossing Roads:** This is an intersection of the HLD Expressway (classified as Urban Expressway) and the RR2 (classified as Urban Expressway and Urban Main Road). In accordance with TCXDVN104-2007 Article 12.5.1, the intersection between HLDE and RR2 Interchange shall be full grade-separated.

(c) **Design Traffic Volume** As shown in Table 9.5.6, turning traffic between RR2 and HLD is major flow direction other than traffic on throughway. This turning path should be shorter for better services.

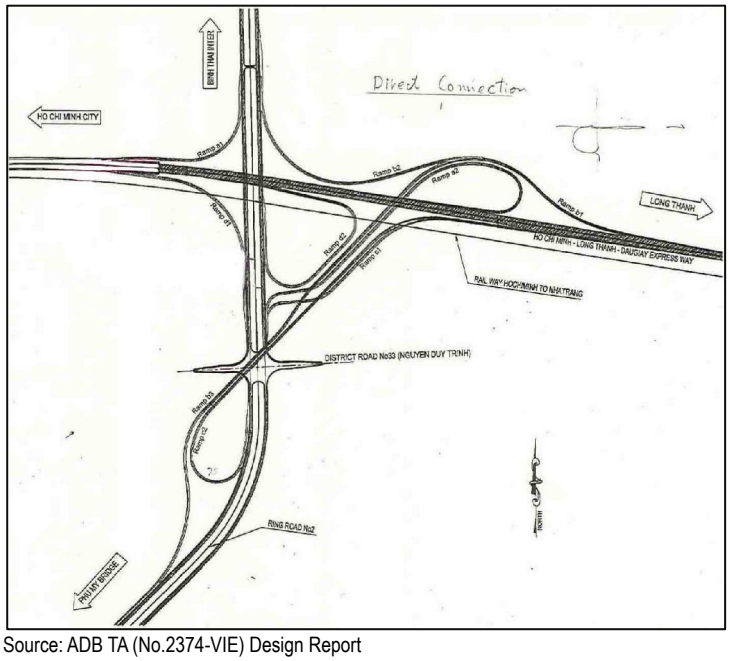
Table 9.5.6 Major Traffic Direction at RR2 Interchange (2030)

Direction		LTB - TTB	HNR - TTB	PMB - TTB	TTB - LTB	HNR - LTB	PMB - LTB	HNR - PMB	TTB - PMB	LTB - PMB	PMB - HNR	TTB - HNR	LTB - PMB
(Ramp Name)		Thruway	(A1)	(A2)	Thruway	(B1)	(B2)	Thruway	(C1)	(C2)	Thruway	(D1)	(D2)
NAN		35,700	1,000	5,200	32,000	5,100	9,500	9,100	5,800	10,500	8,400	1,000	4,700
NYC(1)	0.12	4,284	120	624	3,840	612	1,140	1,092	696	1,260	1,008	120	564
NYC(2)	0.14	4,998	140	728	4,480	714	1,330	1,274	812	1,470	1,176	140	658
Major Intersection (>1,000 PCU/hr)		Yes	No	No	Yes	No	Yes	Yes	No	Yes	Yes	No	No

Source: VITRANSS 2 Study Team
Note: PMB: Phu My Bridge, LTB: Long Thanh Bridge, HNR: Hanoi Road. TTB: Thu Thiem Bridge

(d) **Review of Previous Studies:** There are some real-estate developments at the neighbouring areas; it might be strict design constraint for the interchange planning. In the previous studies, interchange layout avoiding the land development was prepared as shown in Figure 9.5.3.

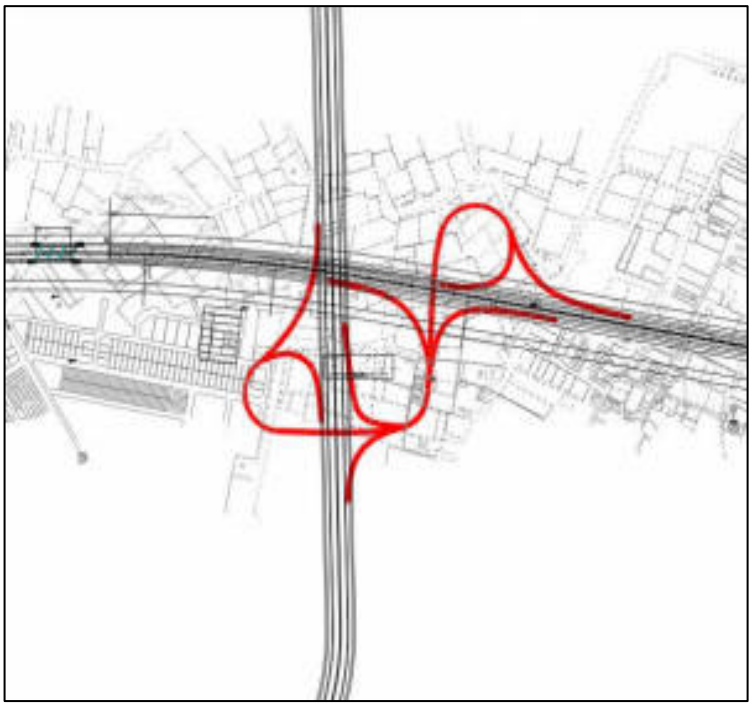
Figure 9.5.3 Interchange Layout (Modified Double Trumpet Type) in Previous Stage for RR2 Interchange



Source: ADB TA (No.2374-VIE) Design Report

It is proposed that "Standard Double Trumpet Type" has very much advantage, not only for the construction cost in short time but also VOC[1] and VTT[2] saving for long term, if some land is available for the construction works.

Figure 9.5.4 Land Development Plan near RR2 Interchange



Source: VITRANSS 2 Study Team

(e) **Alternatives of Intersection Type:** Five (5) types of intersection, including four (4) types of grade-separated, and one temporary at-grade, direct connection were compared in terms of traffic operation aspect.

Table 9.5.7 Five (5) Types of Intersection at RR2 Interchange

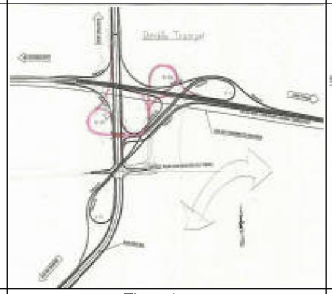
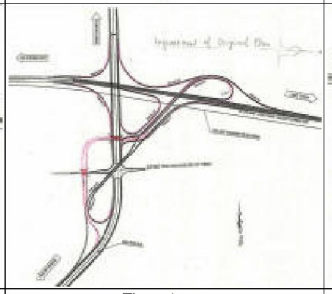
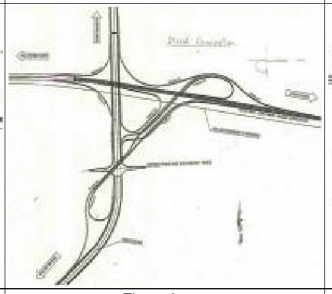
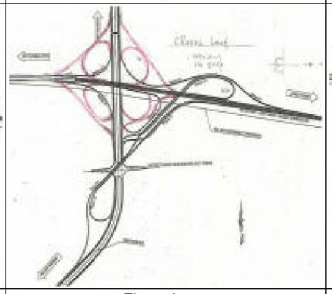
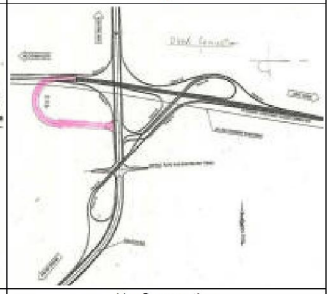
No.	Code	Type	Description
1	DT-1	Double Trumpet	Typical layout of double trumpet interchange.
2	DT-2	Double Trumpet	Layout with shorter bridge length of the loop on RR2.
3	DT-3	Double Trumpet	Layout with consideration on land-use constraint.
4	FC-1	Full Clover	Reference only
5	AG	At-grade	Temporary direct connection

Source: VITRANSS 2 Study Team

(f) **Preliminary Comparison Study of Intersection Type:** Preliminary comparisons of the RR2 Interchange in 2030, was carried out as shown in Table 9.5.8.

[1] VOC: Vehicle Operation Cost
[2] VTT: Vehicle Traveling Time

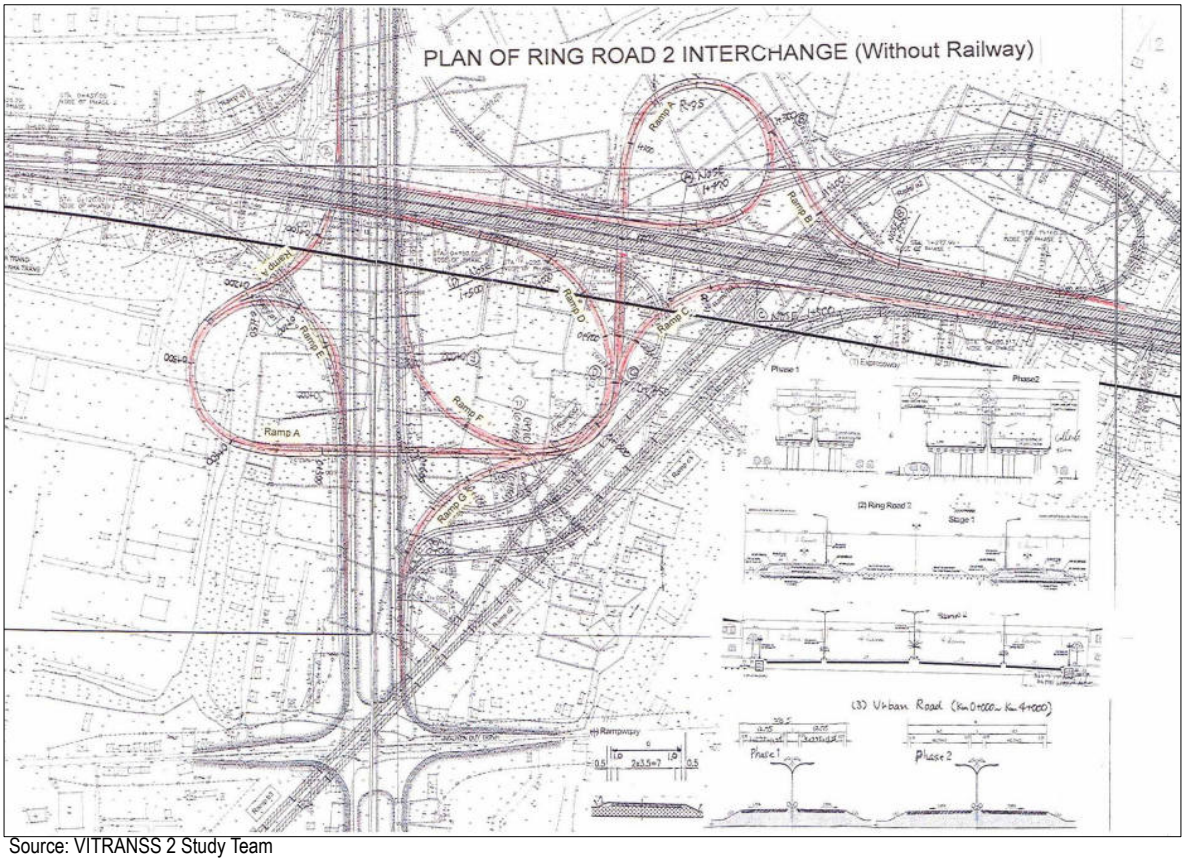
Table 9.5.8 Preliminary Overall Comparison of Five (5) Types of Intersection at RR2 Interchange

No.	Item		DT-1	DT-2	DT-3	FC-1	Direct
1	IC Type		Standard Double Trumpet	Modified Double Trumpet (1)	Modified Double Trumpet (2)	Full Cloverleaf	Direct Connection (Tentative)
2	Level Arrangement		2	2	2	2	1
3	Layout						
4	Traffic Flow	LTB-TTB (35,700)	Throughway	Throughway	Throughway	Throughway	No Connection
		TTB-LTB (32,000)	Throughway	Throughway	Throughway	Throughway	No Connection
		LTB-PMB (10,500)	Short	Long	Long	Short (Weaving)	Short
		PMB-LTB (9,500)	Short	Short	Short	Short	Short
		HNR-PMB(9,100)	Throughway	Throughway	Throughway	Throughway	Throughway
		PMB-HNR (8,400)	Throughway	Throughway	Throughway	Throughway	Throughway
5	Major Structures		Ramp-A1 Bridge: L=580m Ramp-A2 Bridge: L=330m Ramp-B Bridge: L=200m Ramp-C Bridge: L=110m Ramp-D Bridge: L=110m	Ramp-a2 Bridge: L=207+80m Ramp-b1 Bridge: L=275m Ramp-b3-revised Bridge: L=120m Ramp-c1-revised Bridge: L=320+120+120m Ramp-c2-revised Bridge: L=120+120+120m Ramp-d2 Bridge: L= 160+46m	Ramp-a2 Bridge: L=207+80m Ramp-b1 Bridge: L=275m Ramp-b3 Bridge: L=380+130+150m Ramp-c1 Bridge: L=320m Ramp-c2 Bridge: L=150+130+350+120m Ramp-d2 Bridge: L=160+46m	Ramp-1 Loop Bridge: L=160m x4 Ramp-2 Widening Bridge: L=200m x4 Ramp-3 Outer Bridge: L=160m x4	None
6	Construction Cost		3,000 MJPY (100)	3,600 MJPY (120)	6,600 MJPY (2,200)	3,000 MJPY (100)	200 MJPY (7)
7	Construction Period		24 Months	24 Months	24 Months	24 Months	12 Months
8	Constructability		Speed change lanes to HLDE are elevated structure. Considerable construction coordination is required with ongoing PK1A works. All brides can be concrete ones.	All brides can be concrete ones.	Some bridges should be steel superstructures because of long-span structures are required.	All brides can be concrete ones.	Good
9	Required Land Acquisition		Loop on RR2 occupies residential development area.	Loop on RR2 should further study the land requirement.	Avoid the land development area.	Loop on RR2 occupies residential development area.	Direct connection route should be further studied.
10	Merit		Simple and compact	Rather economic solution	No adverse effect to land development	(Reference only)	Temporary works
11	Demerit		Adverse effect to land development			Dangerous traffic operation	
12	Other Considerations					Traffic "weaving on viaduct" is dangerous for heavy traffic road and not recommendable.	This is not permanent solution.
13	Recommendation		If land is negotiable, this option is the most recommendable.	If land is negotiable some parts only, this option is the most recommendable.	If land is NOT negotiable, this option is the most recommendable.		
Rank			**1**	**2**	**3**	**5**	**4**

Source: VITRANSS 2 Study Team

(g) **Selected Intersection Type at RR2 Intersection:** If land developer could accept the DT-1 layout, this is the most recommendable. Availability of the land should be confirmed before selection of the interchange type.

Figure 9.5.5 Proposed Interchange Type at RR2



Source: VITRANSS 2 Study Team

3) Design of Connecting Roads

There are two (2) major linking roads between An Phu and RR2 as follows:

(a) **Interprovincial No.25 (LTL25):** At present An Phu intersection, there are five (5) legs including Inter Provincial No. 25 (LTL25). For the improvement of the An Phu intersection, LTL25 should be relocated not adversely effect to the stagnation traffic at the intersection. It is proposed to relocate LTL east wards about 200m, then connect to the frontage road of the HLD Expressway.

(b) **Don Xuan Hop Street:** Don Xuan Hop Street cross the HLD Expressway at KM3+200. In FS2007, a simple thruway flyover bridge was planned, on the other hand, in FS2009, roundabout intersection was planned under the flyover. In order to provide U-turn location for the traffic on the frontage road, the roundabout intersection is reasonable.

4) Bridge Design

Designed bridge types in FS2007 and FS2009 were standard type in Vietnam except some long span bridges at the An Phu and RR2 intersections.

Attention should be paid to the following:

(i) Construction method of An Phu Interchange. The work should be carried out under the traffic-running on the East-West Highway.

(ii) Addition to the above, three (3) layer rampway requires construction works with highly elevated condition, more than 20m above the ground level.

(iii) All speed change lanes of the RR2 Interchange are located at the viaduct section. Appropriate coordination should be made timely with ongoing projects.

As the results, temporary erection method at the intersections should be much paid attention for construction work planning.

5) Drainage Design

FS2007 has good drainage design. However, the design should be updated in accordance with the above.

6) Utilities Relocation Plan

Utilities relocation plan is not covered in FS2007. The design should be updated in accordance with the above.

Utilities relocation has several stakeholders and the coordination would take much time. “Stakeholder list” should be prepared in the detailed design stage.

7) Design of Electrical Facilities

FS2007 has good electrical design. However, the design should be updated in accordance with the above.

8) ITS Design

There is no ITS facilities design for the section between An Phu and RR2. Traffic management for this section would belong to HCMC traffic management governance. Appropriate coordination should be made in the detailed design stage.

9) Construction Plan

Construction planning of FS2007 is simple one, not covering the elevated structure as mentioned above.

Grade-separated intersection should be applied as described above. Careful construction planning should be carried out in the detailed design, especially (i) elevated structures, and (ii) traffic regulation of the East-West Highway and RR2, those have heavy traffic day and night, during the construction.

9.6 Environmental Considerations

The Environmental Impact Assessment (EIA) Report for the Eastern Missing Link (the Connection Road Project between East-West Highway and HCMC–Long Thanh–Dau Giay Expressway) was reviewed by VITRANSS 2 Study Team. The result of EIA review is as follows:

1) Contents of Draft EIA Report

The EIA report was submitted in August 2008 by the project implementing body (HCMC and PMU East–West Highway Project), and approved in October 2008 by Department of Natural Resources and Environment in HCMC (DONRE–HCMC).

The EIA report described and discussed the following contents.

(i) Chapter 1: Project Description
(ii) Chapter 2: Natural Environment, Socio-economic Conditions of the Project Area
(iii) Chapter 3: Environmental Impact Assessment
(iv) Chapter 4: Countermeasures for Reducing Negative Impacts, preventing Environmental Incidents
(v) Chapter 5: Environmental Safety Method Commitment
(vi) Chapter 6: Environmental Processing Works, Environmental Management and Supervision Program
(vii) Chapter 7: Estimated Cost for Environment Works
(viii) Chapter 8: Consult Public Opinion
(ix) Chapter 9 Data and Assessment Method Sources
(x) Conclusion and Comments

The EIA report was adequately prepared in accordance with Vietnamese laws and regulations on EIA.

2) Relevant Vietnamese Laws and Regulations

The VITRANSS 2 Study Team is of the opinion that the draft EIA report, which was reviewed by the My Thuan PMU, was adequately done in accordance with Vietnamese laws and regulations on EIA, as follows:

(i) Case A: For a new project that has not made EIA yet, it is compulsory to make a new EIA report. EIA report must be approved by DONRE-HCMC before a project is implemented.
(ii) Case B: For a project that was already approved the EIA report, if that project has not been implemented for two (2) years after the EIA approval date, it is necessary to prepare an additional EIA report and re-monitor the baseline environment.
(iii) Case C: For a project that was already approved the EIA report but changes its design, it is necessary to send an explanation document to DONRE-HCMC to obtain their direction about the procedures to register environmental permission. If such design has a major modification, an additional EIA report it must be prepared.

The project can be classified under Case B or C. In Case C, the necessary procedure should be implemented. However, the proposed change, like the modification proposed by the VITRANSS 2 Study Team, is deemed small and has minimal impact

on the environment. Thus, it is not necessary to notify DONRE-HCMC to prepare an additional EIA.

In Case B, data for the EIA report were collected around May or April 2008. It is necessary to prepare an additional EIA report and re-monitor the baseline environment. It seems that the GOV intends to immediately implement the project, hence, it may be classified under Case C. It is not necessary have an additional EIA report in accordance with Vietnamese laws/ regulations on EIA.

3) JICA's Environmental Guidelines

In March 2004, JICA issued environmental and social guidelines (http://www.jica.go.jp/english/publications/jbic_archive/environmental_guidelines/pdf/guide.pdf).

JICA implements cooperation activities in accordance with these guidelines, and JICA encourages recipient governments by conducting cooperation activities to implement appropriate measures in view of environmental and social considerations. At the same time, JICA supports the examination of its guidelines. If GOV wishes to obtain Japanese assistance to implement the western missing link project, it has to follow these guidelines.

4) Comments on the Draft EIA Report

Following the modifications done by the VITRANSS 2 Study Team on traffic demand forecast and project design, especially the design of crossing connection system with East–West Highway at An Phu interchange, the Team recommends the following:

(a) **Submission and Approval of Final EIA Report:** As mentioned above, an additional EIA report is not required by Vietnamese laws and regulations. However, it is better to submit one to DONRE–HCMC and to obtain their approval.

(b) Explanation of the Illustrative List of Sensitive Areas: Areas in and around the project area sensitive to development or use and designated by national or related local government units as critical areas, such as below, should be clearly shown. The expected environmental impacts from the project, necessary countermeasures, and a monitoring plan should also be discussed.

(i) Wetlands;
(ii) Areas for indigenous peoples;
(iii) Cultural heritage sites;
(iv) Areas for consideration as national parks or protected areas; and,
(v) Other areas deemed requiring careful consideration.

(c) **Detailed Explanation of Natural and Social Environment:** The following sensitive natural and social environment should also be illustrated:

(i) Primary forests or natural forests in tropical areas;
(ii) Habitats with important ecological value, such as wetlands and tidal flats;
(iii) Habitats of rare species requiring protection under domestic legislation and/or international treaties;
(iv) Areas in danger of large-scale salt accumulation or soil erosion;
(v) Areas with unique archeological, historical or cultural value; and,
(vi) Areas inhabited by indigenous peoples or nomadic societies with traditional ways

of life and other areas with special social value.

(d) **Preparation of the Resettlement Action Plan (RAP):** One of the most significant impacts caused by the implementation of the project is resettlement. A proper implementation of the compensation to affected people will minimize such impact. Up to the end of December 2009, the detailed planning is not exhibited. The RAP is indispensable to obtain Japanese assistance; therefore, the GOV should prepare it as soon as possible.

(e) **Discussion of Alternatives:** JICA guidelines require a discussion of alternatives; therefore, the Vietnamese government should compare three or four alternatives relating to route and design. A justification for the selected alternative for the project should also be done.

(f) **Conduct of public consultation on the modified project design:** The VITRANSS 2 Study Team modified the project in terms of traffic volume forecast and transport design. With the modifications, meetings with related stakeholders, such as administrative bodies, local residents, NGOs, etc., should be held, and the results of meetings should be reported in the final EIA.

(g) **Detailed Explanation of Air Pollution Forecast and Countermeasures:** In the existing draft EIA report, air pollution is forecast following Vietnamese standards, but includes some uncertain factors. The following should therefore be shown in accordance with JICA guidelines:

(i) Applied forecast formula;

(ii) Applied forecast conditions;

(iii) Forecast for the project area and its vicinity;

(iv) Forecast values in sensitive points, such as residents nearest to the project boundary, as well as schools, hospitals, places of worship, public facilities, and cultural heritage sites in the project area;

(v) Detailed countermeasures for areas that do not meet environmental standards and the cost of such countermeasures; and,

(vi) List and layout of monitoring stations during construction and operating stages.

(h) **Detailed Explanation of Noise/ Vibration Forecast and Countermeasures:** The followings should be illustrated in accordance with JICA guidelines:

(i) Forecast for the project area and its vicinity;

(ii) Forecast values and distance from project boundary at sensitive points, such as residents nearest to the project boundary, as well as schools, hospitals, places of worship, public facilities, and cultural heritage sites in the project area;

(iii) Detailed countermeasures for areas that do not meet environmental standards and the cost of such countermeasures; and,

(iv) List and layout of monitoring stations during construction and operating stages.

(i) **Additional Environmental Items for Forecast:** Since the global warming issue was not discussed in the existing EIA, the revised EIA should tackle it.

(j) **Implementation of Additional Investigations on Existing Natural Conditions:** The existing EIA describes the results of investigations on the existing natural conditions, such as air quality, noise/ vibration, and soil, in the rainy season only and excludes the

investigation on flora and fauna biodiversity. Therefore, the following investigations should be undertaken:

(i) Air quality, noise/ vibration, and soil condition in the dry season, and

(ii) Flora and fauna in both rainy and dry seasons.

(k) **Planning of the Detailed Construction Plan and Environmental Management Plan (EMP):** The significant impacts to be expected from project implementation are resettlement, air pollution, and noise/ vibration, which can be resolved by the implementation of a proper EMP. The following should therefore be explained:

(i) Types and number of (total, at peak day/ hour) construction materials and vehicles;

(ii) Entry route to the site by construction vehicles;

(iii) Location and entry route to borrow pits, quarry sites, and disposal areas, if any;

(iv) Existing and future capacity of the public final disposal area, if used;

(v) Location of temporary road and stockyards for construction materials; and,

(vi) Location of, number of laborers in, and ways to dispose of wastewater/ solid waste generated from labor quarters.

(l) **Institutional Arrangements:** The implementing body of the project was Peoples Committee of HCMC (HCMC-PC), so the existing EIA was prepared by HCMC-PC. After that, the implementation functions were transferred to the Vietnam Expressway Cooperation (VEC). Therefore, the existing institutional setting for implementation, especially for EMP, should be rewritten.

9.7 O&M Plan

1) Traffic Management Plan

There was no study on traffic management between An Phu Interchange and RR2 Interchange. Traffic control especially for motorcycles (less than 175 cc) at the An Phu Interchange should be carefully carried out in order to guide those vehicles that are not allowed to enter the expressway.

2) O&M Plan

As of March 2010, only draft Operation and Maintenance Guidelines exist for the expressway in Vietnam.

During the detailed design, the institutional arramgents for operation and maintenance should be studied.

It seems that the section between An Phu and RR2 belong to HCMC traffic management. This is different from the HLD Expressway which is under VEC. Coordination of traffic operation between HCMC and VEC should be planned during the detailed design.

9.8 Cost Estimates

1) Proposed Contract Packaging

It is proposed to divide the section as follows:

Table 9.8.1 Proposed Contract Packaging

No.	Contract Package	Location	Description
1	7A	KM0+000–KM0+700 (700 m)	An Phu IC and connection to thruway section.
2	7B	KM0+700–KM4+000 (3,300 m)	Thruway Section
3	7C	KM4+000–KM5+300 (1,300 m)	RR2 IC with speed-change lanes.

Source: VITRANSS 2 Study Team

2) Rough Cost Estimate

Rough cost estimate for the above contract package, in accordance with the above recommended options, is as follows:

Table 9.8.2 Rough Cost Estimate of the Project

No.	Contract Package	Location	Rough Cost (Million JPY)	Remarks
1	7A	KM0+000–KM0+700 (700 m)	3,500	
2	7B	KM0+700–KM4+000 (3,300 m)	5,000	1,500 MJYP/km
3	7C	KM4+000–KM5+300 (1,300 m)	3,000	
		Total	11,500	

Source: VITRANSS 2 Study Team

It should be noted that the above is rough estimate level without clear planning and design. Land acquisition cost is NOT considered.

9.9 Implementation Plan

1) Application of Stage Construction

"Stage Construction Method" is an option of infrastructure development. This option minimizes initial cost in order to meet available budget, and subsequently continues development on a phase-wise basis in accordance with actual demand. This development is widely applied worldwide. The investors, including the governmental can optimize the investment priority by using this method.

2) Stage Construction in Previous Studies

In FS2007, which was approved by Decision No. 334/QD-BGTVT dated 13 February 2007, there were two (2) phases as follows:

(1) Phase 1:

- An Phu Intersection should be at-grade structure.
- Throughway between An Phu and RR2 Intersection should be dual 2-lane, total 4-lane.
- RR2 Intersection should not connect to the HLD Expressway.

(2) Phase 2:

- An Phu Intersection should be grade-separated structure considering the structure of High Speed Railways (HSR) and Light Rail Transit (LRT).
- Throughway between An Phu and RR2 Intersection should be dual 4-lane, total 8-lane.
- RR2 Intersection should connect to the HLD Expressway by grade-separated structure. Proposed interchange layout is skewed with long rampway by considering the land development plan around the areas.

In FS2009, the stage construction method was not applied. Phase 2 of FS2007 is envisaged to realize as one large construction activity.

3) Proposed Stage Construction Method

Considering the results of the updated traffic demand forecast, the following stage construction method is proposed:

(1) Phase 1:

- Build An Phu Interchange without considering the HSR and LRT.
- Rampway alignments should consider the future development in Phase 2.
- Complete dual 4-lane, total 8-lane throughway between An Phu Interchange and RR2 Interchange.
- Complete RR2 Interchange as ultimate development.

(2) Phase 2:

- Build rampways between Long Thanh Bridge and Hanoi Road, for both directions.
- LTL25B Intersection will be built as grade-separated structure.

Table 9.9.1 Proposed Stage Construction Method

	FS2007		FS2009	VITRANSS 2 Review	
	Phase 1	Phase 2		Phase 1	Phase 2
An Phu Intersection	At-grade	Grade-separated	Grade-separated	Grade-separated	Complete LTB-HNR rampways
HSR	---	Considered	Considered	Not Considered	
LRT	---	Considered	Considered	Not Considered	
Nos of lane of Rampway	---	2	2	2	
Nos of lane of Thruway	4	8	8	8	
Thruway Tapered Section	---	---	---	200m to 6-lane	
LTL25 Intersection	Present location	Present location	Present location	To be relocated	
Luong Dinh Cua Street	Not Considered	Urban Arterial	Urban Arterial	Urban Arterial	
LTL25B Intersection	Not Considered	Grade-separated	Grade-separated	Not Considered	Grade-separated
Nos of lane of Thruway (KM0+700-KM4+000)	4	8	8	8	Frontage roads
HSR	Not Considered	Considered	Considered	Not Considered	Considered
LRT	Not Considered	Considered	Considered	Not Considered	Considered
Frontage Road	Not Considered	Considered	Considered	Not Considered	Considered
RR2 Intersection	At-grade	Grade-separated	Not Considered	Grade-separated	Completed in Phase 1

Source: VITRANSS 2 Study Team

4) Proposed Implementation Plan

Implementation program for this section can be as follows:

Table 9.9.2 Implementation Plan

No.	Task	Duration (Month)	Period
1	Detailed Design	9	Apr 2010–Dec 2010
2	Bidding	12	Jan 2011–Dec 2011
3	Construction	36	Jan 2012–Dec 2014
4	Expressway Open	-	Jan 2015

Source: VITRANSS 2 Study Team

As of March 2010, ongoing HLDE section is scheduled to open to the public early 2014.

However, considering the above possible implementation program, it is strongly recommended:

- Suspend some parts of ongoing PK1A work for the section related to RR2 Interchange section,
- Complete design of RR2 Interchange as soon as possible,
- Issue variation order to PK1A Contractor for appropriate deduction of works for the section of RR2 Interchange,
- Procure contractor for the contract package PK7C: RR2 Interchange Works,
- Design and construction of contract packages PK7A and PK7B.

9.10 Economic and Financial Analysis

1) Analysis by TEDI South

In the study by TEDI South, the socio-economic benefits of the project were only qualitatively discussed. A quantitative economic evaluation was seemingly not conducted. With regard to financial evaluation, an FIRR on equity was calculated at 9.8%. This assumes low-interest loan from ADB at 53% and government subsidy of 40%. Although there is a statement that a separate document "Financial Analysis" has been prepared, this document was not provided to the VITRANSS 2 Study Team.

2) Analysis by VITRANSS 2

(1) Economic Evaluation

Economic evaluation was carried out under the following assumptions:

(i) The project would be open for service in 2015;
(ii) Evaluation period is 20 years from 2015 to 2034. Residual value of road facilities was taken into account;
(iii) Project cost was newly estimated by the VITRANSS 2 Study Team using the latest cost information, and assumed to be reimbursed 10% in 2010, 20% in 2011, 20% in 2012, 20% in 2013, and 30% in 2014;
(iv) Annual operating cost would be 5% of project cost;
(v) Toll was assumed at US 5 cents/pcu/km after comparison with selected overseas countries;

Economic benefits were generated from the savings from VOC and passenger time cost under three scenarios mentioned in Chapter 9.3

Results are presented in Table 9.10.1. The project was evaluated as economically feasible.

Table 9.10.1 EIRRs of the Project by Case

Case	Time of Opening		EIRR (%)
	An Phu IC	An Phu IC	
1	2015 - 2020	2015 - 2020	26
2	2015 - 2020	2015 - 2020	23
3	2020 - 2030	2020 - 2030	25

Source: VITRANSS 2 Study Team

(2) Financial Evaluation

Based on the same assumptions made in the economic evaluation, a financial analysis was conducted for the candidate expressway projects. The assumed toll rate was US$5 cents per PCU-km.

The results are presented in Table 9.10.2. The calculated FIRRs were very low due to the high investment requirements. The project is apparently not financially viable.

Table 9.10.2 FIRRs of the Project by Case

Case	Time of Opening		FIRR (%)
	An Phu IC	An Phu IC	
1	2015 - 2020	2015 - 2020	1
2	2015 - 2020	2015 - 2020	4
3	2020 - 2030	2020 - 2030	Cannot calculate

Source: VITRANSS 2 Study Team

9.11 Conclusion and Recommendations

The review concludes that the 2007 FS report was prepared with high quality. The contents were generally well prepared except for the following:

(i) Traffic demand forecast

(ii) Utilities relocation planning

(iii) Electrical facilities planning

(iv) ITS facilities planning

(v) Operation and maintenance planning

On the other hand, the feasibility study carried out in 2009 has not been completed yet. No design report is available. The planning policy in 2009 seems different from that of FS2007. There is no firm ground of the planning, i.e., type of An Phu Interchange, typical cross-section of the expressway, stage construction method.

1) Recommendations

The recommendations of the VITRANSS 2 Study Team are as follows:

(a) **FS Report of 2007 should be Used as for the Project Implementation:** For the smooth implementation of the construction of the missing link section, the approved FS2007, which is comprehensively studied and prepared in good quality, should be used as the basic FS report, with some modifications described below.

(b) **Construct RR2 Interchange in Phase 1:** In the FS report of 2007, it was concluded that RR2 Interchange should be built in Phase 2. However, RR2 Interchange should be built in Phase 1 because the following reasons:

  (i) Construction of the RR2 is proceeding well. The Phu My Bridge has already opened to the public, and now the South Saigon (District 7) to An Phu (District 9) was directly connected.

  (ii) As shown in the updated directional traffic demand forecast, majority of the traffic from the Southwest Vietnam (Mekong Region) use RR2 detouring the HCMC center and then divert eastwards to Long Thanh.

  (iii) Construction of KM0–KM4 will take around three (3) years, and it would be one year later than present ongoing HLDE section. It is strongly recommended RR2 should connect to the HLDE when the HLDE open to the public.

  (iv) Traffic capacity of RR2 Interchange should be verified in the detailed design stage against the updated design traffic volume.

(c) **Apply Stage Construction Method:** In the FS report of 2007, 4-lane construction in Phase 1 is concluded. This stage construction method is reasonable to realize the expressway open to the public timely. Timing of Phase 2 should be studied in the detailed design stage. Considering the results of the updated traffic demand forecast, the revised stage construction method is proposed by VITRANSS 2 (See Chap 9.9).

(d) **Include some Items in the Detailed Design:** The following should be included in the scope of the detailed design:

  (i) Study and selection of the type of An Phu Interchange based on the updated traffic demand forecast,

(ii) Update of the project cost with latest market price, including the cost of the following items:

- Utilities relocation cost
- Electrical facilities cost
- ITS facilities cost
- O&M cost

(iii) Update of the overall implementation program for the HLDE, and preparation of a separate implementation program of the fastest construction of this section.

(iv) Preparation of land acquisition should be given sufficient attention, in order to prevent unnecessary delay in implementation.

10 CONCLUSION AND RECOMMENDATIONS

The major conclusion of this study includes the followings:

(i) In the current expressway planning, different methodologies of different levels are used in Vietnam;

(ii) Planning standard was developed for the route selection, facility planning and cost estimate in order to apply a consistent planning methodology for the North-South Expressway development;

(iii) Planning controls were identified on the scale of 1/50,000 UTM based digital map, from Ninh Binh to Da Nang and Quang Ngai to Phan Thiet with consideration of the above planning standard;

(iv) Route alignment was developed in accordance with the planning standard;

(v) Interchange planning was carried out in accordance with its planning standard;

(vi) All expressway sections were evaluated comprehensively from various perspectives and implementation strategies were identified; and

(vii) The feasibility studies of two missing links around HCMC were reviewed and the future orientation was indicated.

The recommendations are summarized as follows:

(i) Apply the planning standard in order to reduce overall life-cycle cost of the North-South Expressway for the national benefit of Vietnam;

(ii) Establish official planning standard and use it widely and consistently in expressway planning in Vietnam;

(iii) Incorporate lessons learned from design and construction practice in the subsequent process of the development of expressway development;

(iv) Conduct further studies for the implementation strategies are necessary, especially regarding funding and institutions for the sustainable implementation of North-South Expressway; and

(v) Implement the missing links based on the recommendations of the reviews for ensuring fine network connectivity of North-South Expressway.