

**REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

**PREPARATORY SURVEY
FOR EXPRESSWAY PROJECTS
IN
MEGA MANILA REGION**

NAIA EXPRESSWAY PROJECT (Phase II)

**FINAL REPORT
APPENDIX-III NAIA EXPRESSWAY CORRIDR ALTERNATIVE STUDY**

NOVEMBER 2012

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CTI ENGINEERING INTERNATIONAL CO., LTD

MITSUBISHI RESEARCH INSTITUTE, INC.

ORIENTAL CONSULTANTS CO., LTD

METROPOLITAN EXPRESSWAY CO., LTD

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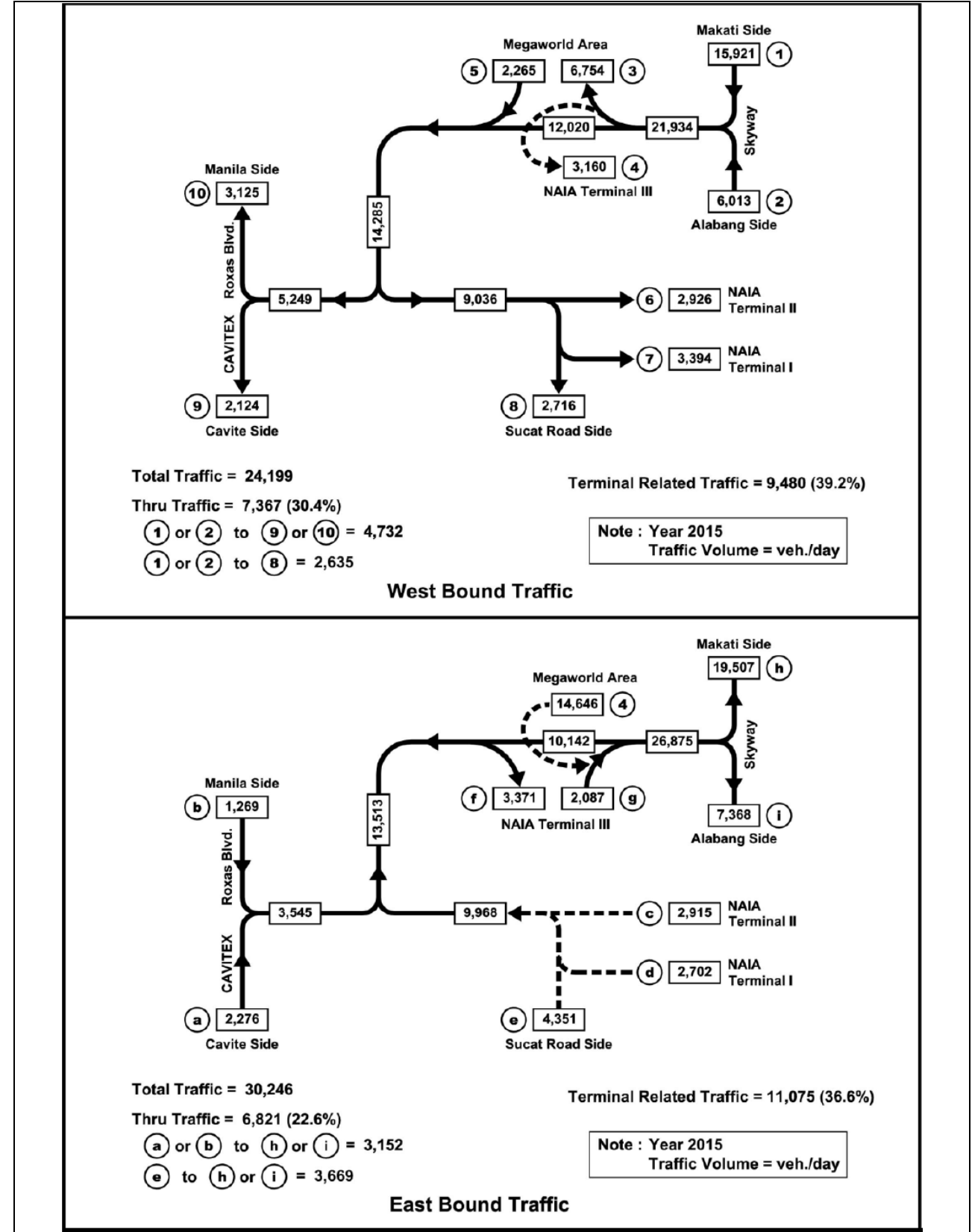
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NAIAX CONFIGURATION

1. How NAIAX Will Be Used?



EAST + WEST Bound Total	
Total Traffic Volume	: 54,445 (100%)
Through Traffic Volume	: 14,188 (26.1%)
Terminal Related Traffic	: 20,555 (37.8%)
Megaworld and other related Traffic	: 19,702 (36.5%)

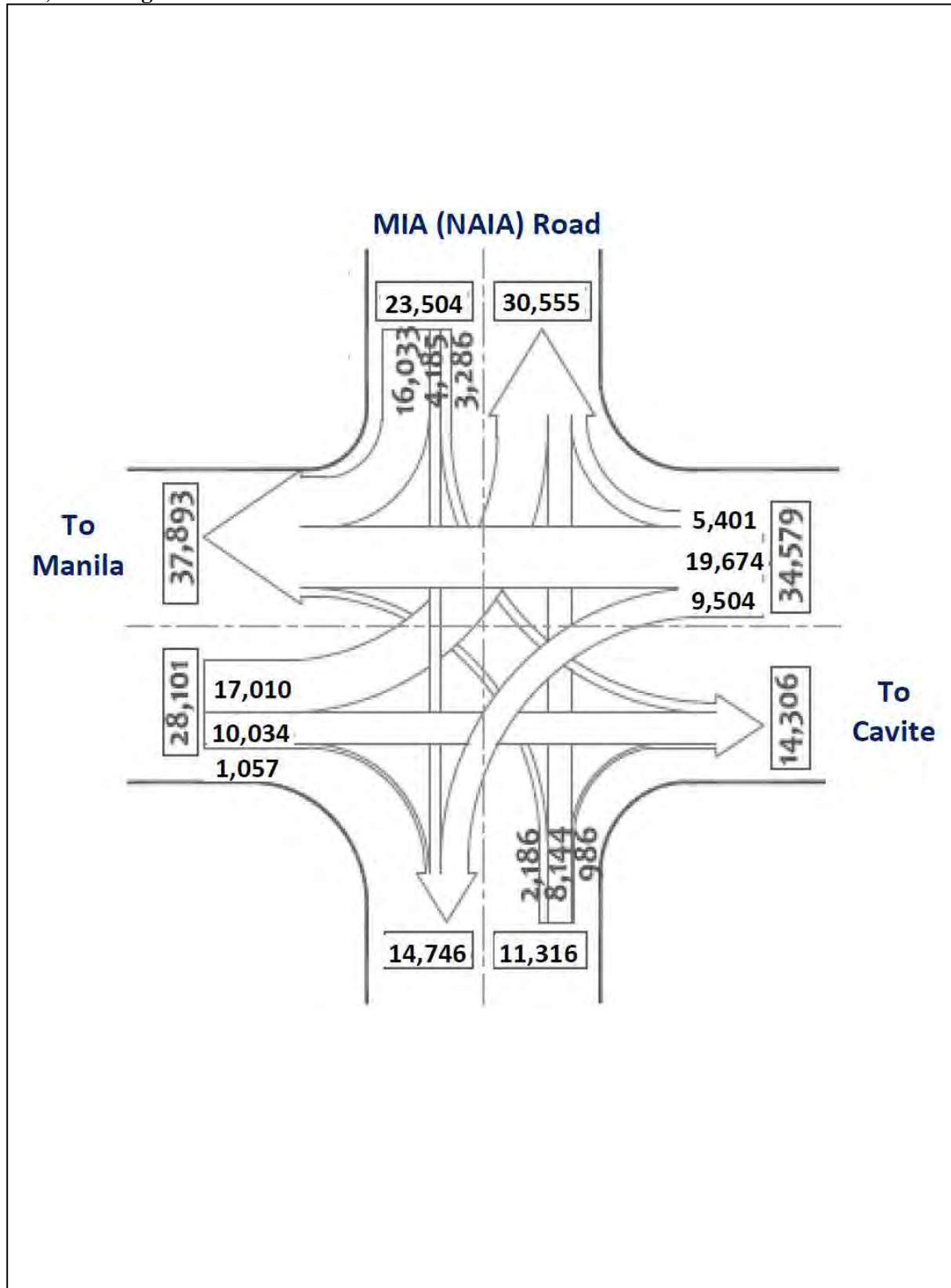
TRAFFIC ON NAIAX

2. Other Alternatives for NAIAX Corridor

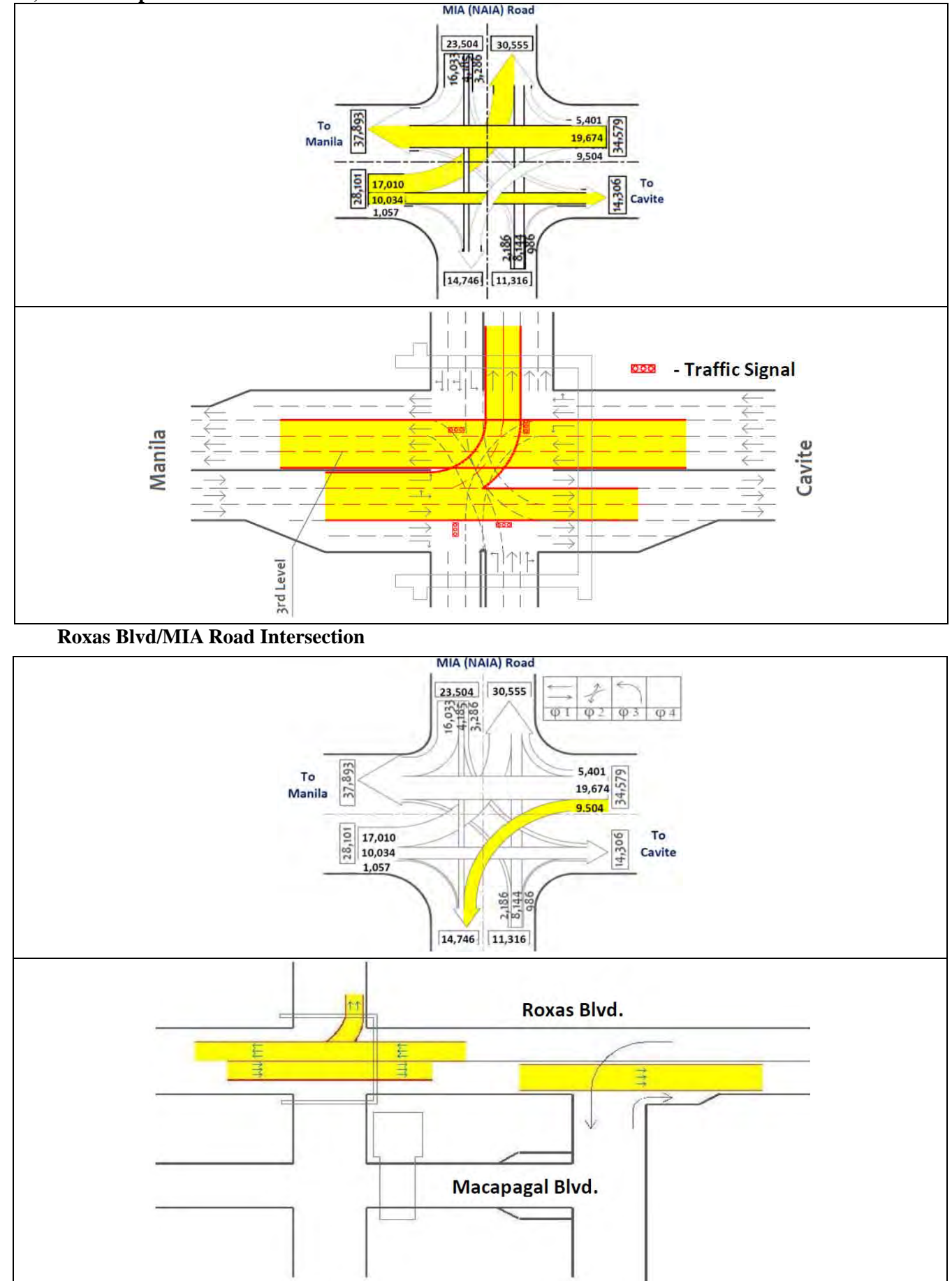
2.1. Scheme-1: Grade Separation (or Flyover) Scheme of Critical Intersection

2.1.1. Roxas Blvd./MIA (NAIA) Road Intersection

1) Existing Intersection Traffic



2) Grade Separation Scheme



For Diverting Traffic to Macapagal Road



Roxas Blvd / MIA Road Intersection Plan in Satellite Photo



For Diverting Traffic to Macapagal Blvd. Plan Shown in Satellite Photo

- Some Issues
 - The end of approach of left-turn ramp is located on the existing bridge.
 - The vertical grade of 7% for left-turn ramp is adopted to provide necessary weaving section between this flyover and adjacent Domestic - MIAA road flyover as long as possible.

• Effect of Grade Separation

	Without Grade Separation	With Grade Separation
Level of Service (LOS)	F	D
Delay Time (sec/veh)	1,008.0	41.1
V/C	1.70	0.71

- ROW Acquisition : 775.3 sq.m.

- Number of Structure Affected : 1

• Roughly Estimated Cost

Civil Work Cost	:	1,032 Million Pesos
ROW Acquisition Cost	:	24 Million Pesos
Total		1,056 Million Pesos

Note: ROW Acquisition Cost does not include compensation cost of structures.

- Some Issues
 - This flyover can be implemented later, when at-grade intersection becomes congested after construction of Roxas Blvd./MIA Road Flyover.

• Effect of Grade Separation

	Without Grade Separation	With Grade Separation
Level of Service (LOS)	N.A.	N.A.
Delay Time (sec/veh)	N.A.	N.A.
V/C	N. A	N. A

- ROW Acquisition : 105.2 sq.m.

- Number of Structure Affected : 0

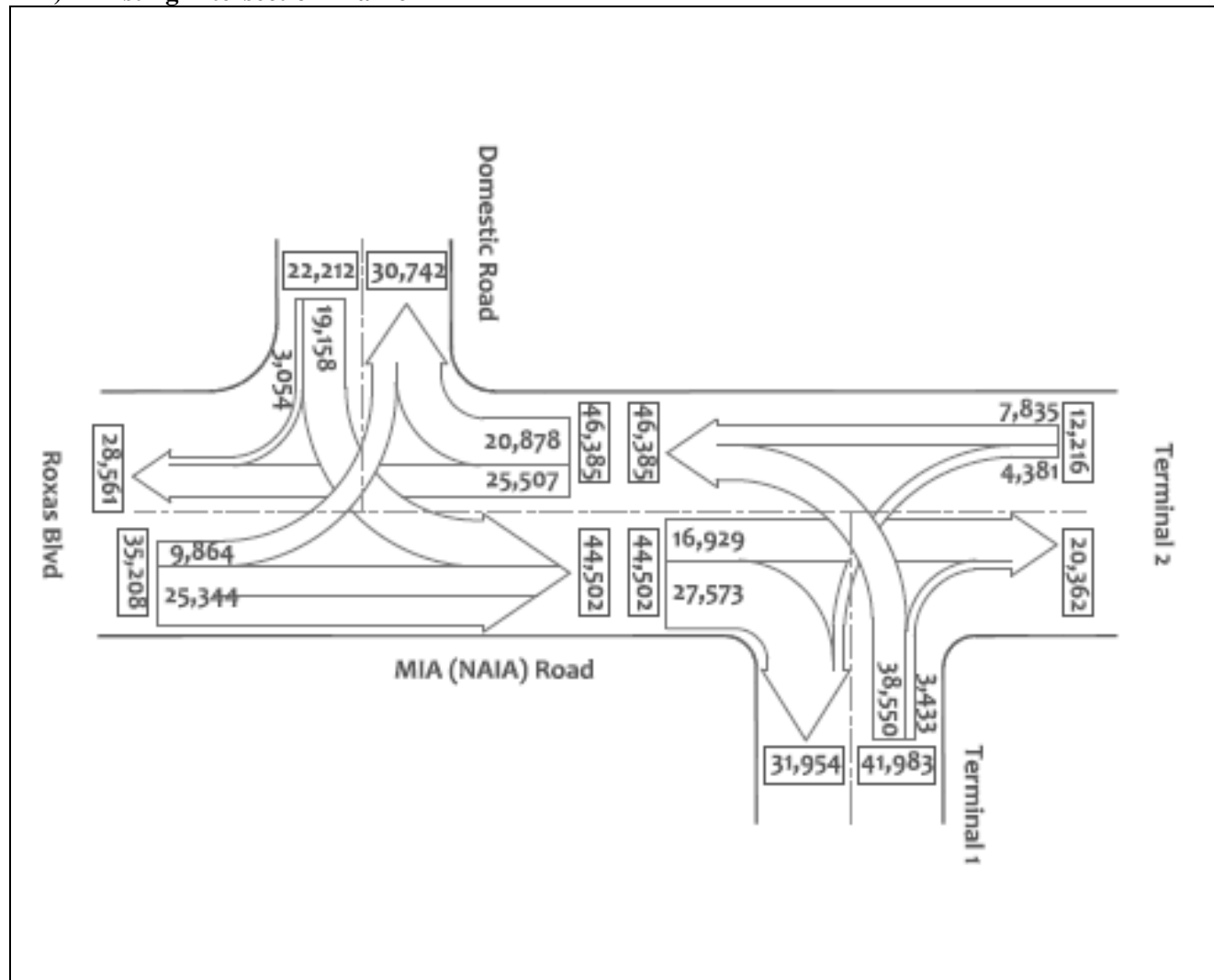
• Roughly Estimated Cost

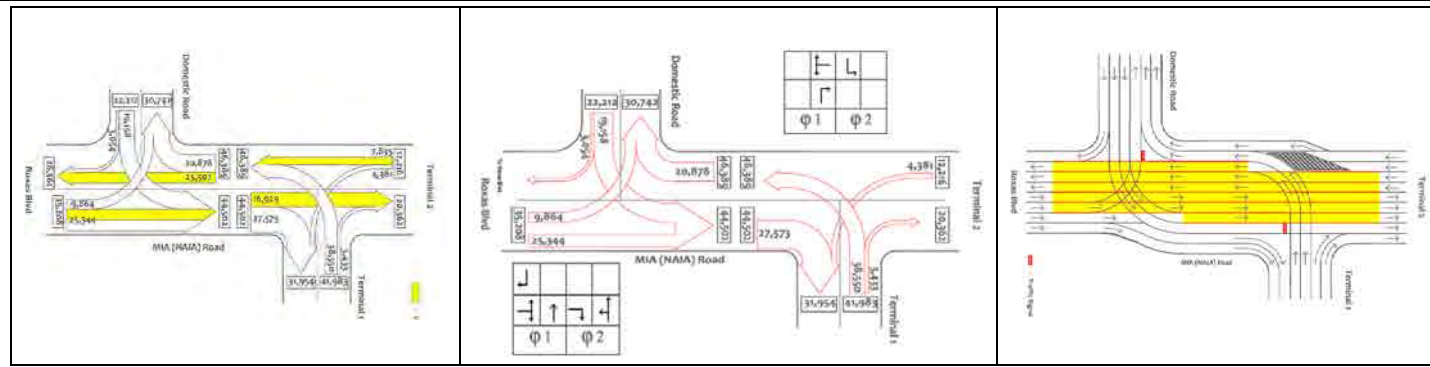
Civil Work Cost	:	279 Million Pesos
ROW Acquisition Cost	:	5 Million Pesos
Total		284 Million Pesos

Note: ROW Acquisition Cost does not include compensation cost of structures.

2.1.2 MIA Road/Domestic Road/Sucat Road Intersection

1) Existing Intersection Traffic





• Effect of Grade Separation

	Without Grade Separation		With Grade Separation	
	Domestic	Ninoy Aquino	Domestic	Ninoy Aquino
Level of Service (LOS)	F	F	C	C
Delay Time (sec/veh)	541.0	479.5	34.4	31.4
V/C	1.41	1.32	0.85	0.89

• ROW Acquisition: 1,460.0 sq.m.

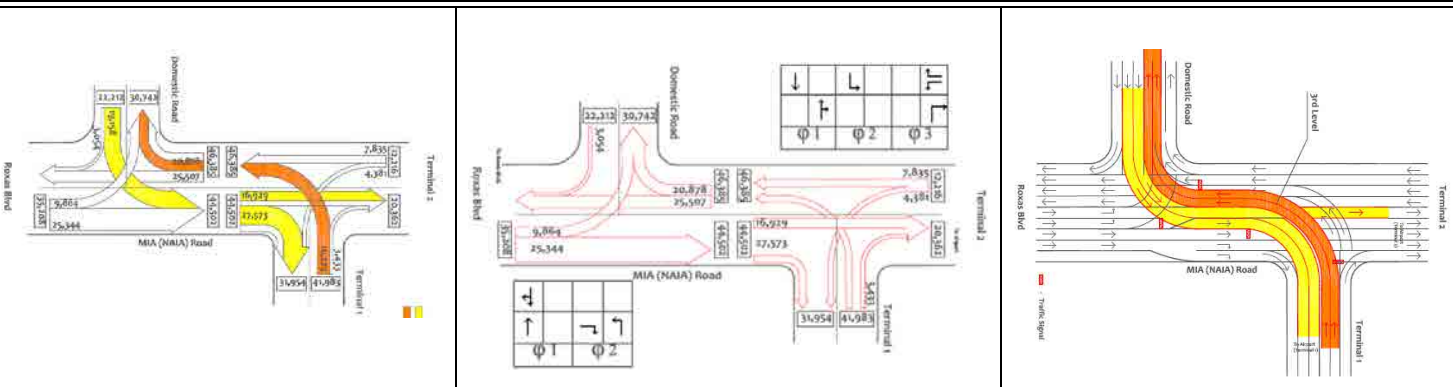
• Number of Structure Affected : 10

• Roughly Estimated Cost

Civil Work Cost	:	965 Million Pesos
ROW Acquisition Cost	:	5 Million Pesos
Total		970 Million Pesos

Note: ROW Acquisition Cost does not include compensation cost of structures

Alternative-1



• Effect of Grade Separation

	Without Grade Separation		With Grade Separation	
	Domestic	Ninoy Aquino	Domestic	Ninoy Aquino
Level of Service (LOS)	F	F	D	D
Delay Time (sec/veh)	541.0	479.5	49.3	50.9
V/C	1.41	1.32	0.87	0.82

• ROW Acquisition: 53,750.0 sq.m.

• Number of Structure Affected : 1

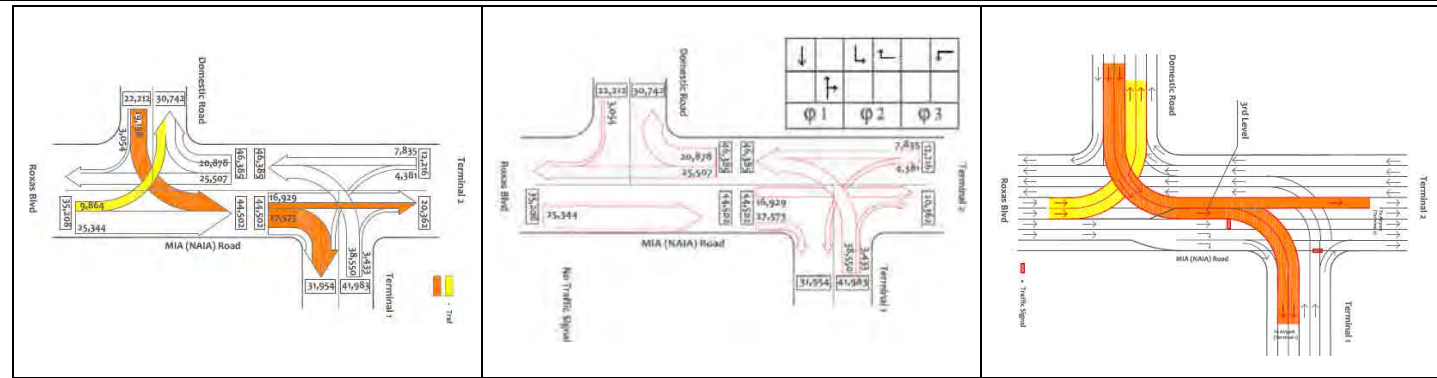
• Roughly Estimated Cost

Civil Work Cost	:	1,157 Million Pesos
ROW Acquisition Cost	:	76 Million Pesos
Total		1,233 Million Pesos

Note: ROW Acquisition Cost does not include compensation cost of structures

Alternative-2





• Effect of Grade Separation

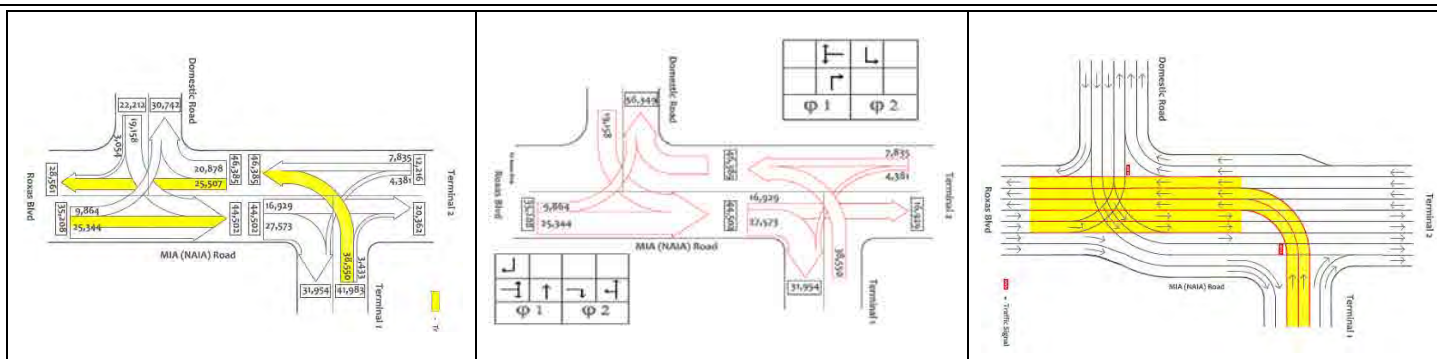
	Without Grade Separation		With Grade Separation	
	Domestic	Ninoy Aquino	Domestic	Ninoy Aquino
Level of Service (LOS)	F	F	A	F
Delay Time (sec/veh)	541.0	479.5	0.0	122.5
V/C	1.41	1.32	0.00	1.02

- ROW Acquisition : 315.1 sq.m.
- Number of Structure Affected : 10
- Roughly Estimated Cost

Civil Work Cost	:	802 Million Pesos
ROW Acquisition Cost	:	9 Million Pesos
Total		811 Million Pesos

Note: ROW Acquisition Cost does not include compensation cost of structures.

Alternative-3



• Effect of Grade Separation

	Without Grade Separation		With Grade Separation	
	Domestic	Ninoy Aquino	Domestic	Ninoy Aquino
Level of Service (LOS)	F	F	C	F
Delay Time (sec/veh)	541.0	479.5	34.2	111.9
V/C	1.41	1.32	0.83	0.94

- ROW Acquisition : 633.4 sq.m.
- Number of Structure Affected : 10
- Roughly Estimated Cost

Civil Work Cost	:	726 Million Pesos
ROW Acquisition Cost	:	17 Million Pesos
Total		743 Million Pesos

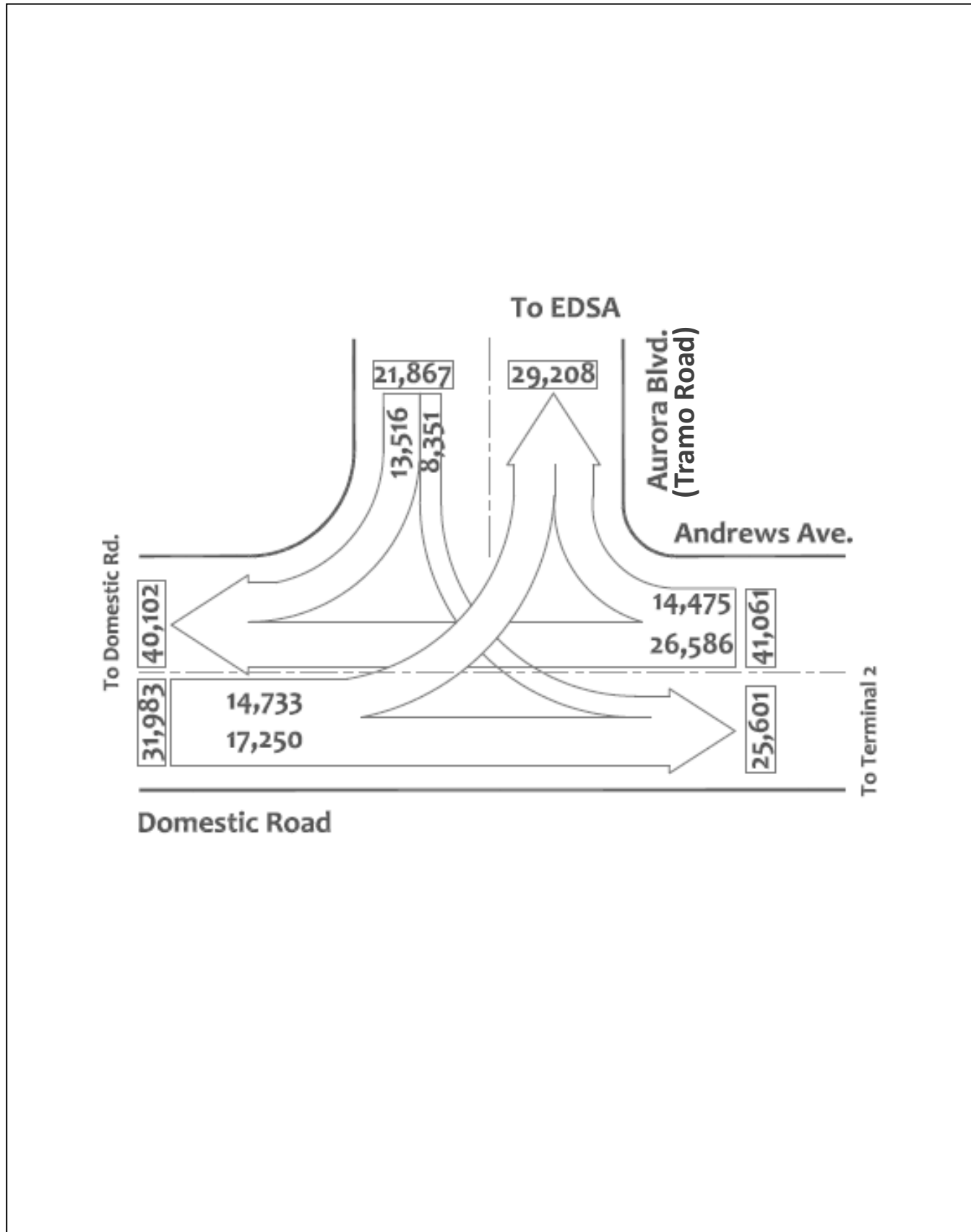
Note: ROW Acquisition Cost does not include compensation cost of structures.

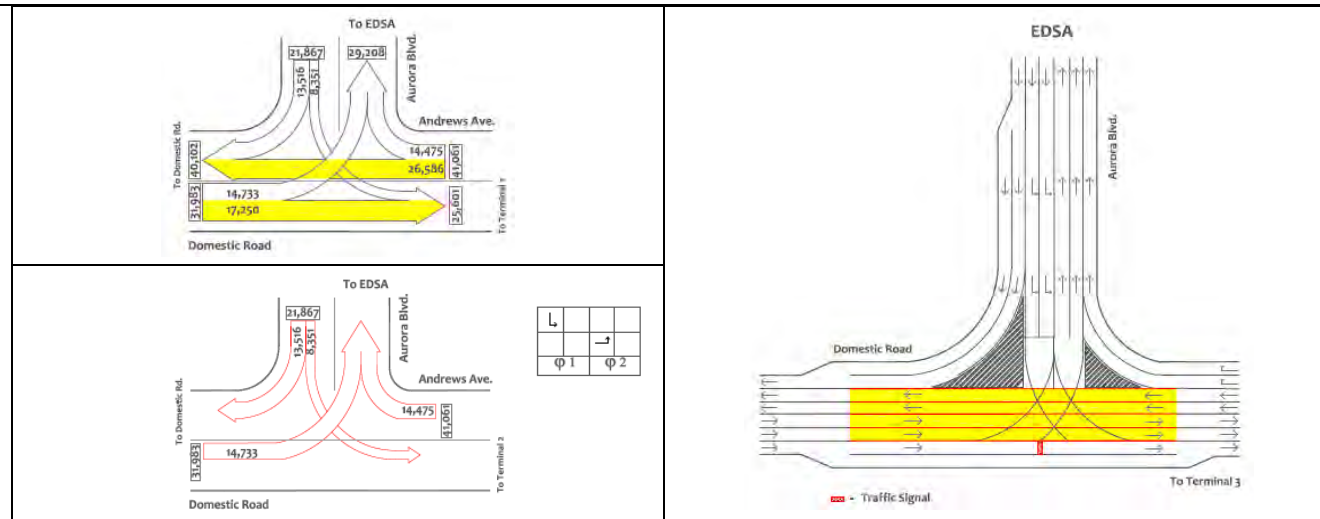
Alternative-4



2.1.3. Andrews Ave./Tramo Road (Aurora Blvd.) Intersection

1) Existing Intersection Traffic





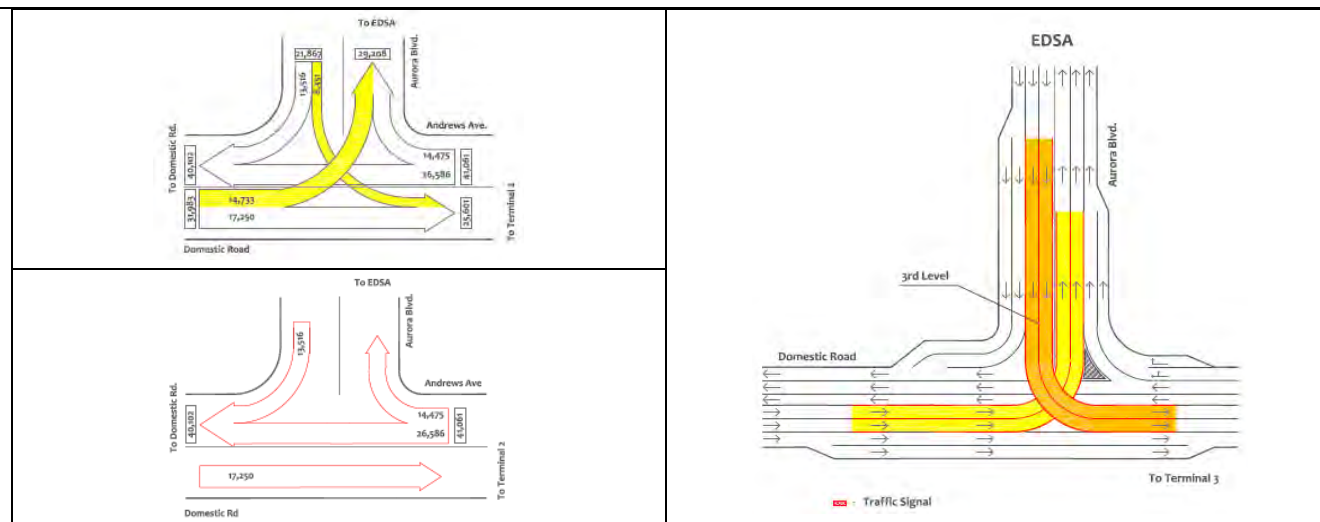
- **Issues:** All of right and left turn traffic must pass through the at grade intersection with signal control.
- **Effect of Grade Separation**

	Without Grade Separation	With Grade Separation
Level of Service (LOS)	F	C
Delay Time (sec/veh)	404.3	29.2
V/C	1.14	0.74

- **ROW Acquisition :** 5,479.0 sq.m.
 - **Number of Structure Affected :** 9
 - **Roughly Estimated Cost**
- Note: ROW Acquisition Cost does not include compensation cost of structures.

Civil Work Cost	:	297 Million Pesos
ROW Acquisition Cost	:	103 Million Pesos
Total		400 Million Pesos

Alternative-1



- **Issues:** Straight traffic of Domestic road must pass through the at grade intersection with signal control.
- **Effect of Grade Separation**

	Without Grade Separation	With Grade Separation
Level of Service (LOS)	F	A
Delay Time (sec/veh)	404.3	0.0
V/C	1.14	0.00

- **ROW Acquisition :** 3,858.0 sq.m.
 - **Number of Structure Affected :** 6
 - **Roughly Estimated Cost**
- Note: ROW Acquisition Cost does not include compensation cost of structures.

Civil Work Cost	:	542 Million Pesos
ROW Acquisition Cost	:	72 Million Pesos
Total		614 Million Pesos

Alternative-2



2.1.4. SUMMARY

		Roxas / MIA road Flyover	MIA Road / Domestic Road / Sucat Road Flyover								Andrews Ave. / Tramo Road Flyover	
			Alt-1		Alt-2		Alt-3		Alt-4		Alt-1	Alt-2
Traffic Efficiency	LOS	D	C	C	D	D	A	F	C	F	C	A
	Delay Time	41.1	34.4	31.4	49.3	50.9	-	122.5	34.2	111.9	29.2	-
	Volume/Capacity Ratio	0.71	0.85	0.89	0.87	0.82	-	1.02	0.83	0.94	0.74	-
Civil Work Cost		1,032	965		1,157		802		726		297	542
ROW Cost		24	5		76		9		17		103	72
Total (in Million Php)		1,056	970		1,233		811		745		400	614
Recommendation		○	○		△		×		×		○	×

Total Cost of Grade Separation Scheme

Roxas/MIA Road Flyover	1,056 Million Pesos
MIA Road/Domestic Road/Sucate Road Flyover	970 Million Pesos
Andrews Ave./Tramo Road Flyover	400 Million Pesos
Total	2,426 Million Pesos

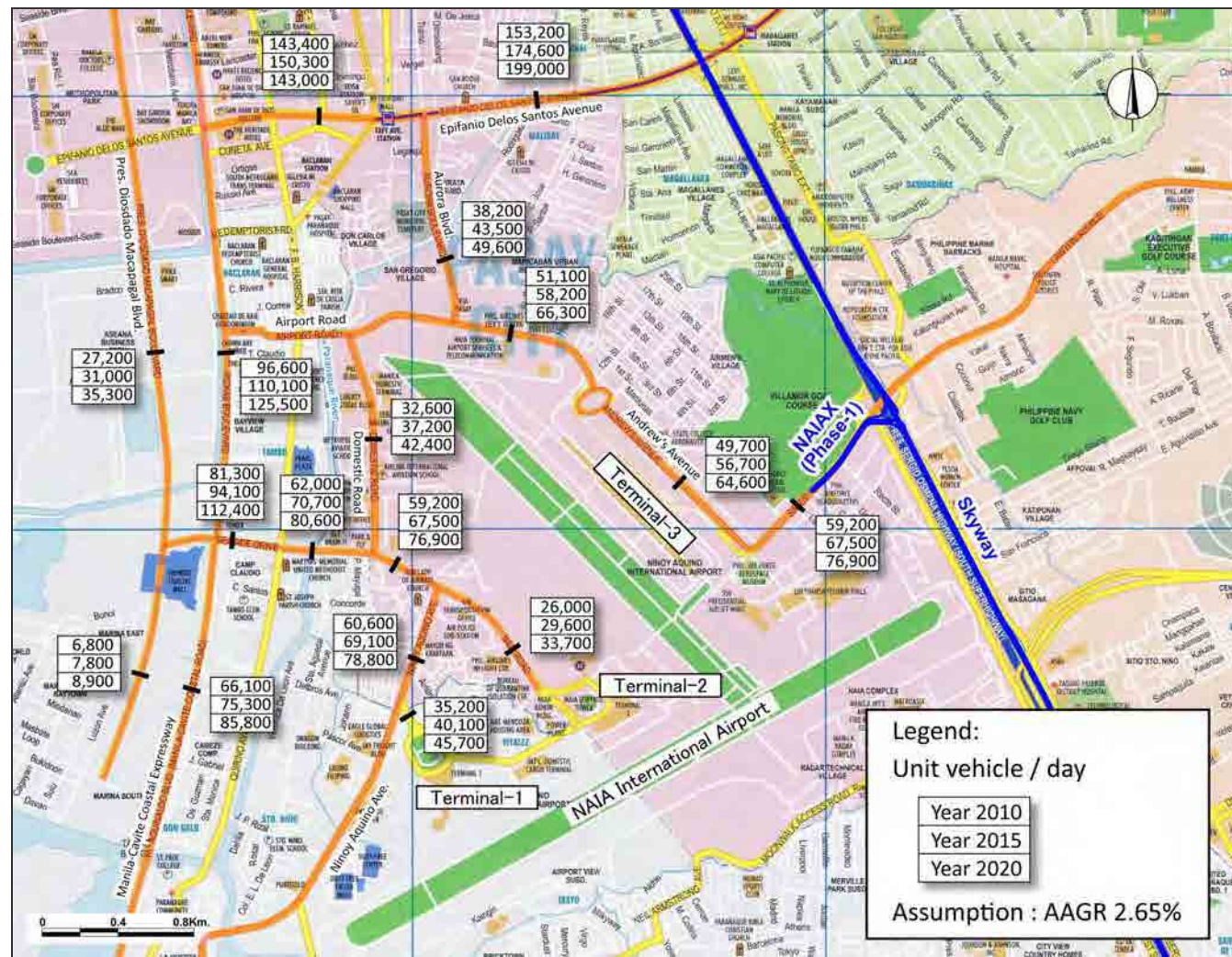
Level of Service Criteria for Signalized Intersections

LOS	Control Delay
A	≤ 10
B	➤ 10 - 20
C	➤ 20 - 35
D	➤ 35 - 55
E	➤ 55 - 80
F	>80

Source: Highway Capacity Manual

2.2 TRAFFIC CONDITION COMPARISON NAIAX VS. GRADE SEPRATION

2.2.1. Traffic Volume of NAIAX Corridor At-grade Road without NAIAX



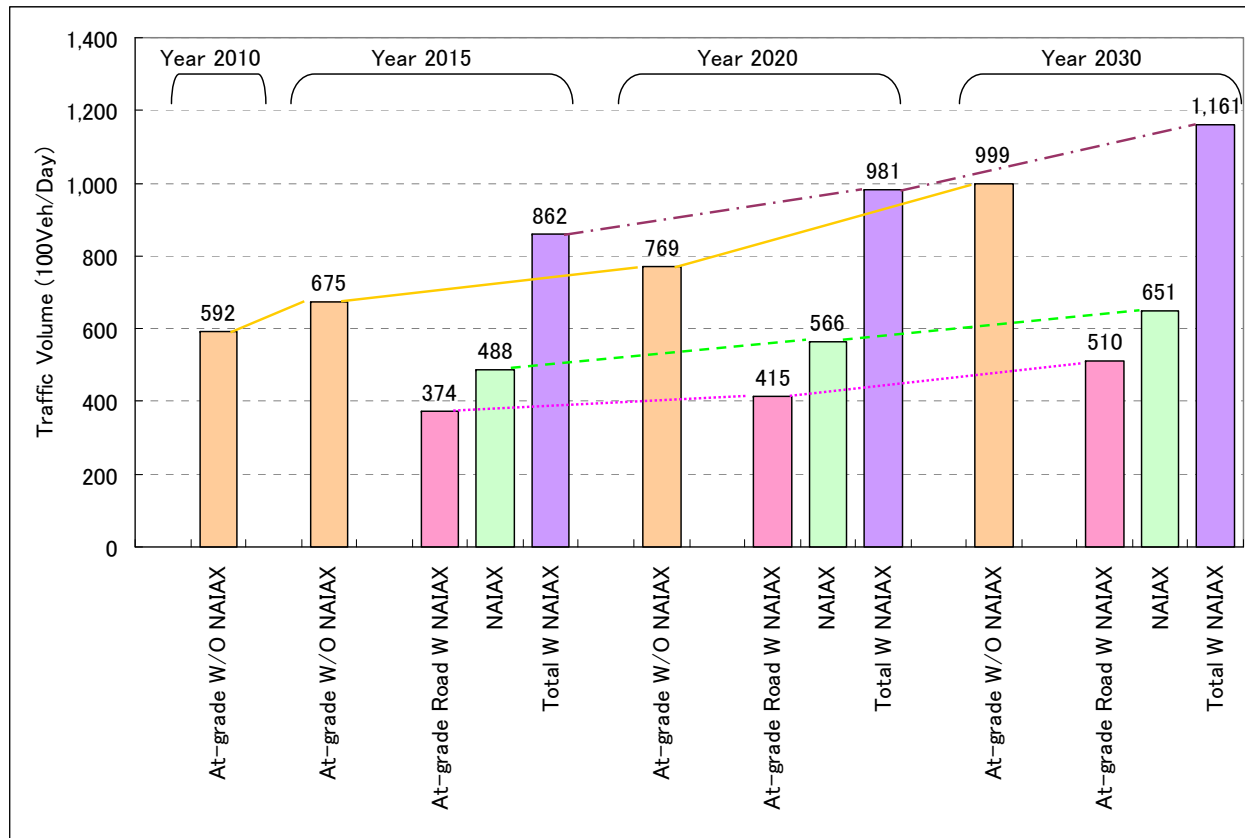
2.2.2. NAIAX Corridor Traffic Volume: With/Without NAIAX

Year	Case	Section							
		Sales Rd	Andrews Ave. (Sales - Circle)	Andrews Ave. (Circle - Domestic)	Domesic Road	NAIA (MIA) Road (Domesic - Quirino)	NAIA (MIA) Road (Quirino - Roxas)		
2010	(Present at-grade Road)	59,200 (V/C=0.62)	49,700 (V/C=0.70)	51,100 (V/C=0.95)	32,600 (V/C=0.61)	62,000 (V/C=0.84)	81,300 (V/C=1.13)		
	A At-grade Road Without NAIAX	67,500 (V/C=0.70)	56,700 (V/C=0.80)	58,200 (V/C=1.09)	37,200 (V/C=.69)	70,700 (V/C=0.96)	94,100 (V/C=1.30)		
2015	B NAIAX	48,800 (V/C=0.51)	22,100 (V/C=0.23)	27,800 (V/C=0.29)	27,800 (V/C=0.29)	8,700 (V/C=0.09)	8,700 (V/C=0.09)		
	C At-grade Road With NAIAX	37,400 (V/C=0.39)	46,500 (V/C=0.65)	46,600 (V/C=0.87)	35,400 (V/C=0.66)	62,100 (V/C=0.85)	92,600 (V/C=1.28)		
	D Total With NAIAX	86,200	68,600	74,400	63,200	70,800	101,300		
	C-A (A/C)	(30,100) 45%	(10,200) 18%	(11,600) 20%	(1,800) 5%	(8,600) 12%	(1,500) 2%		
	D-A (D/A)	18,700 128%	11,900 121%	16,200 128%	26,000 170%	100 100%	7,200 108%		
	A At-grade Road Without NAIAX	76,900 (V/C=0.80)	64,600 (V/C=0.91)	66,300 (V/C=1.24)	42,400 (V/C=0.79)	80,600 (V/C=1.10)	112,400 (V/C=1.56)		
2020	B NAIAX	56,600 (V/C=0.59)	30,700 (V/C=0.32)	40,100 (V/C=0.42)	40,100 (V/C=0.42)	9,900 (V/C=0.10)	9,900 (V/C=0.10)		
	C At-grade Road With NAIAX	41,500 (V/C=0.43)	47,500 (V/C=0.67)	51,600 (V/C=0.96)	35,900 (V/C=0.67)	76,500 (V/C=1.04)	106,700 (V/C=1.48)		
	D Total With NAIAX	98,100	78,200	91,700	76,000	86,400	116,600		
	C-A (A/C)	(35,400) 46%	(17,100) 26%	(14,700) 22%	(6,500) 15%	(4,100) 5%	(5,700) 5%		
	D-A (D/A)	21,200 128%	13,600 121%	25,400 138%	33,600 179%	5,800 107%	4,200 104%		
	A At-grade Road Without NAIAX	99,900 (V/C=1.04)	89,300 (V/C=1.26)	86,100 (V/C=1.61)	55,100 (V/C=1.03)	104,700 (V/C=1.43)	153,200 (V/C=2.12)		
2030	B NAIAX	65,100 (V/C=0.68)	39,800 (V/C=0.42)	53,800 (V/C=0.56)	53,800 (V/C=0.56)	25,500 (V/C=0.27)	25,500 (V/C=0.27)		
	C At-grade Road With NAIAX	51,000 (V/C=0.53)	57,400 (V/C=0.81)	63,000 (V/C=1.18)	36,900 (V/C=0.69)	93,800 (V/C=1.28)	137,300 (V/C=1.90)		
	D Total With NAIAX	116,100	97,200	116,800	90,700	119,300	162,800		
	C-A (A/C)	(48,900) 49%	(31,900) 36%	(23,100) 27%	(18,200) 33%	(10,900) 10%	(15,900) 10%		
	D-A (D/A)	16,200 116%	7,900 109%	30,700 136%	35,600 165%	14,600 114%	9,600 106%		

* Traffic Volume: Vehicle/Day

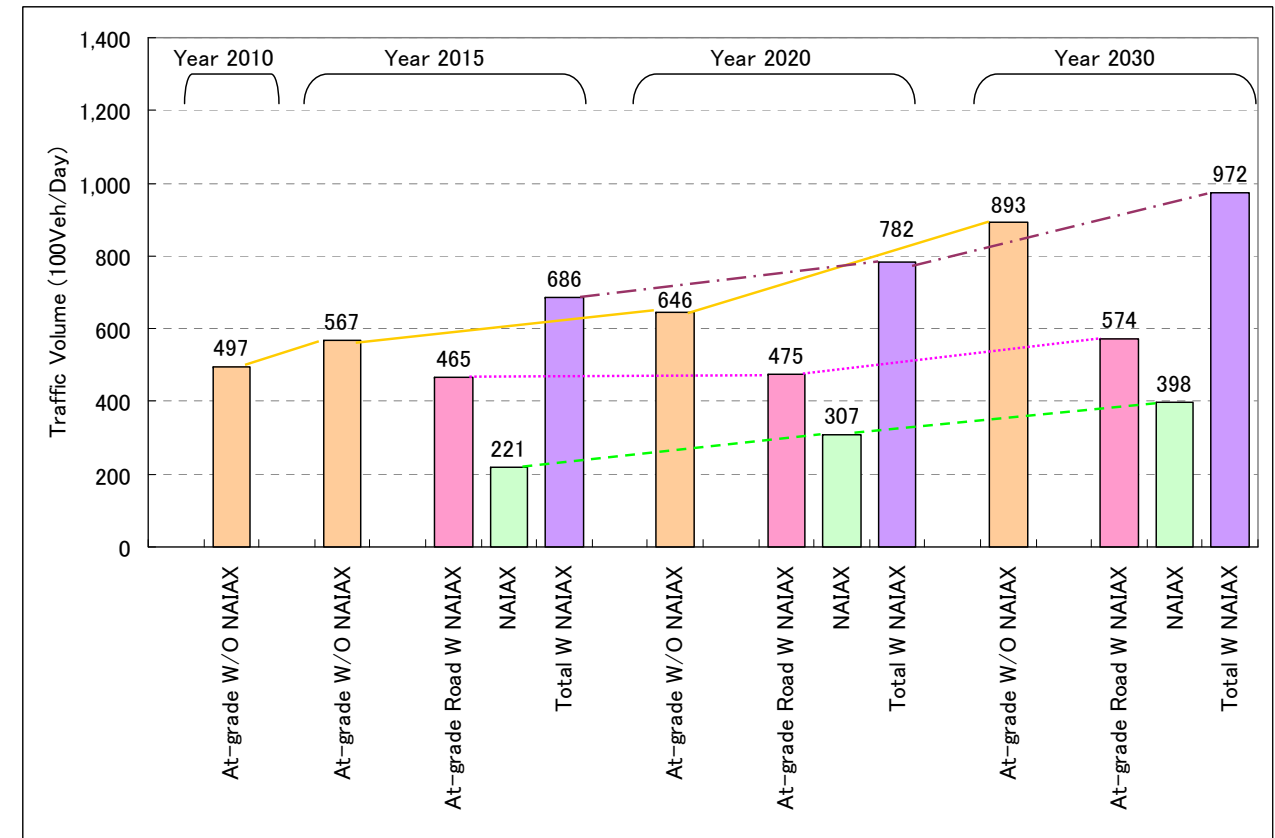
SALES ROAD

Traffic Volume

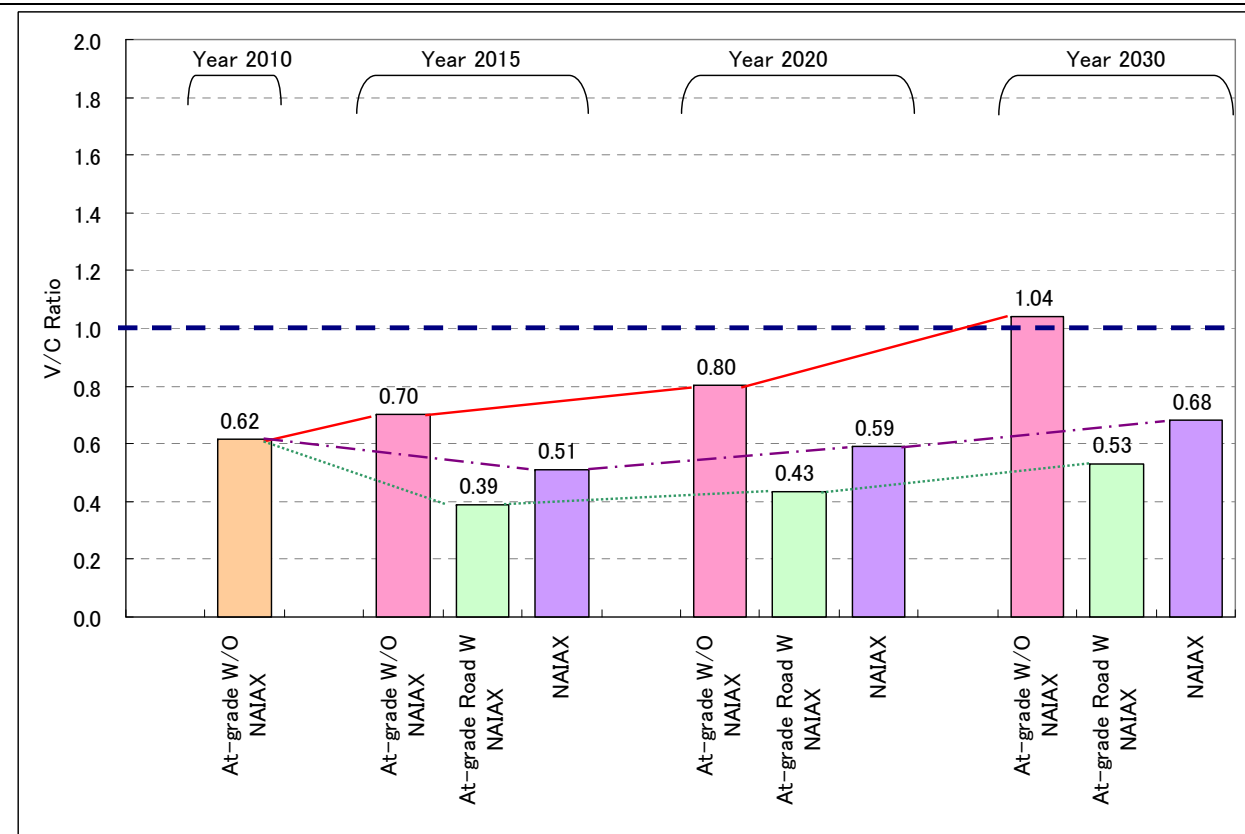


ANDREWS AVE. (SALES – ROTONDA SECTION)

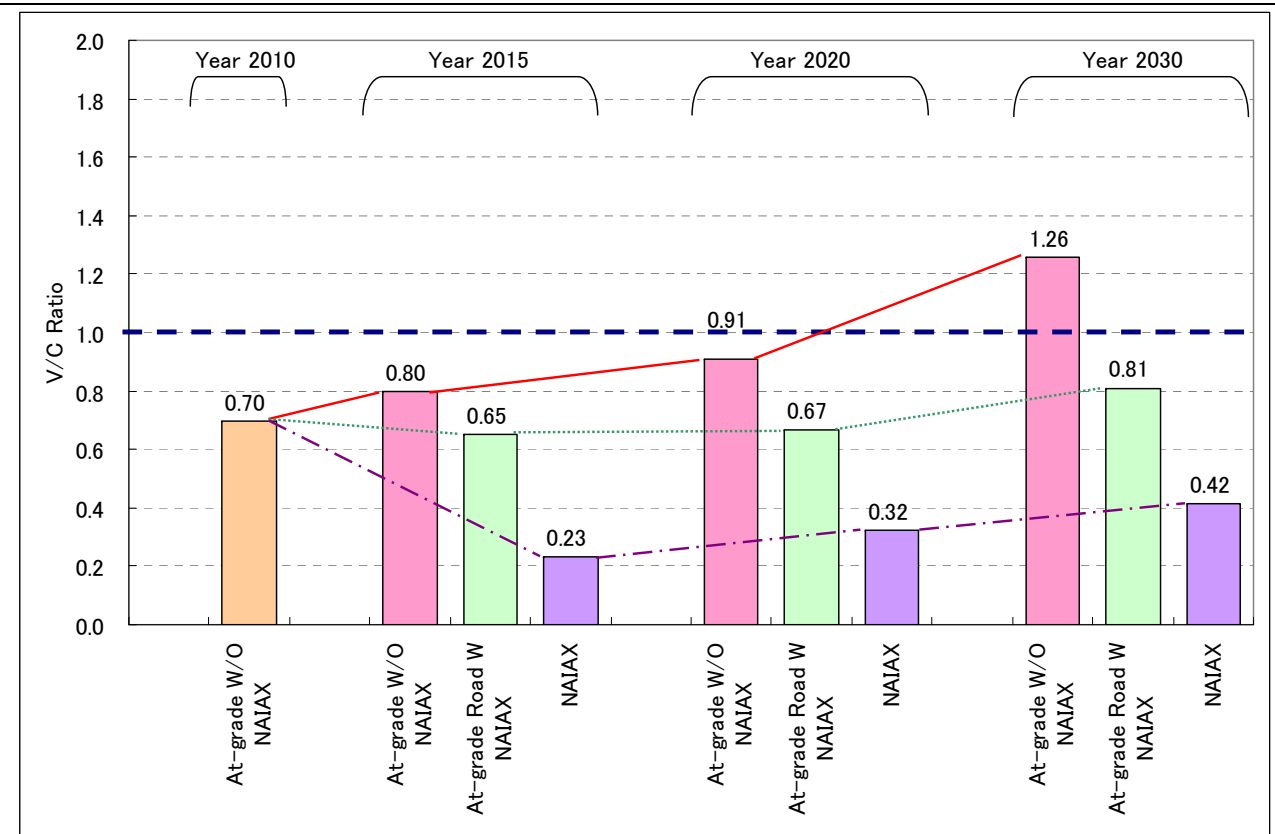
Traffic Volume



V/C Ratio

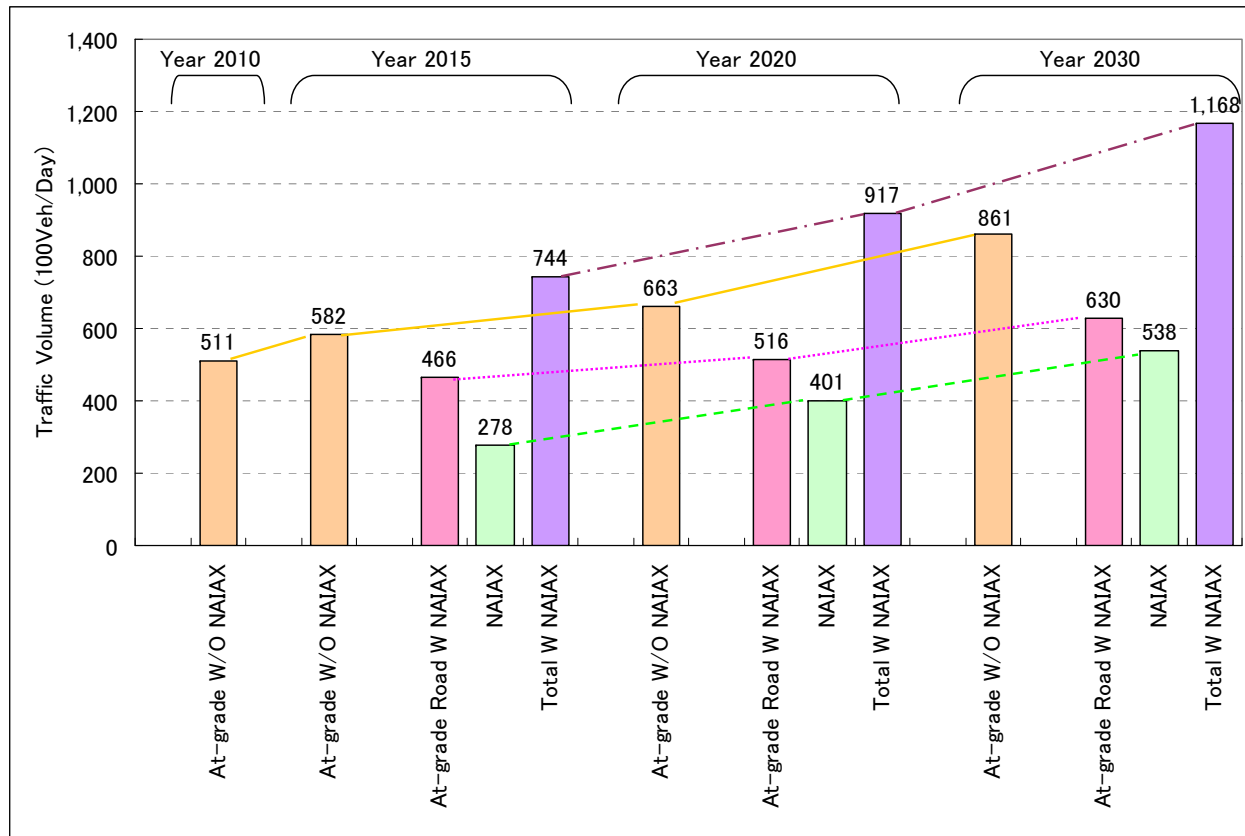


V/C Ratio

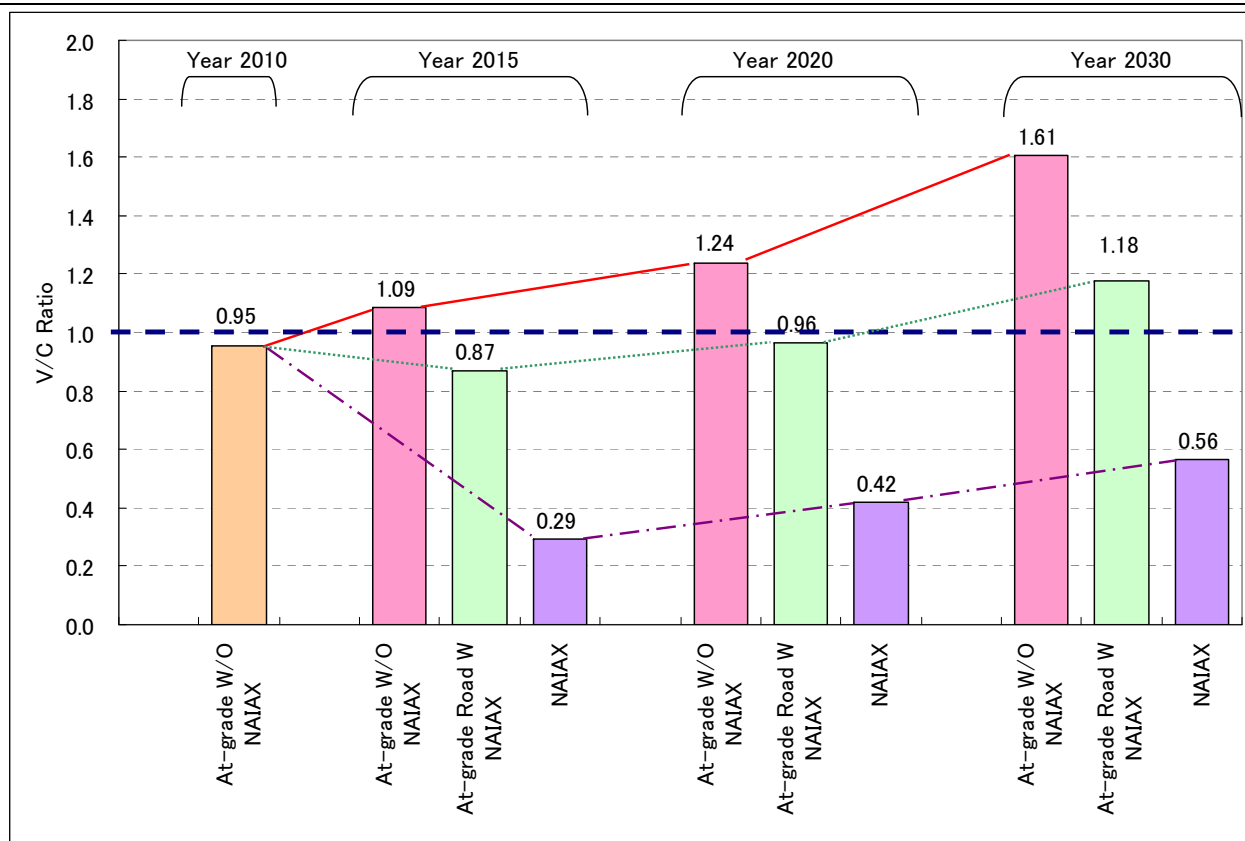


ANDREWS AVENUE (ROTONDA – DOMESTIC ROAD SECTION)

Traffic Volume

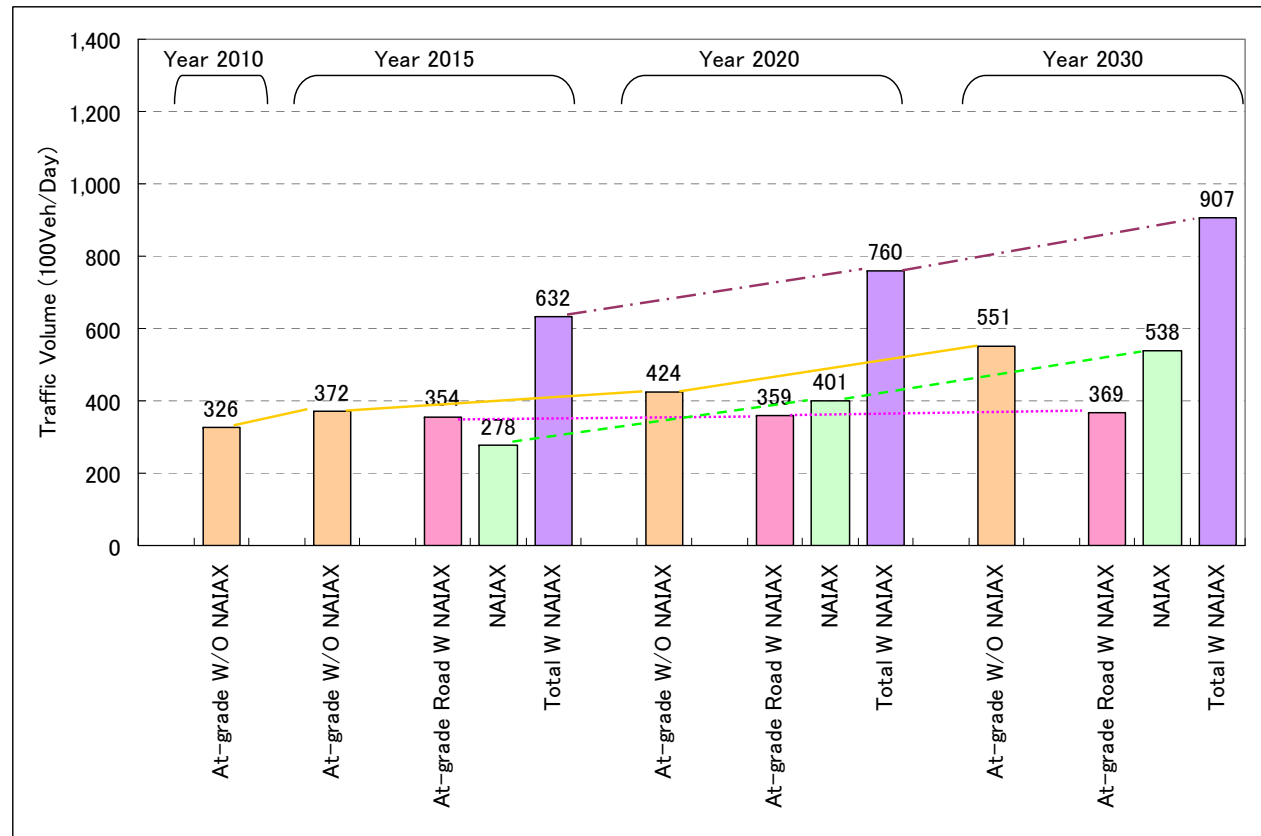


V/C Ratio

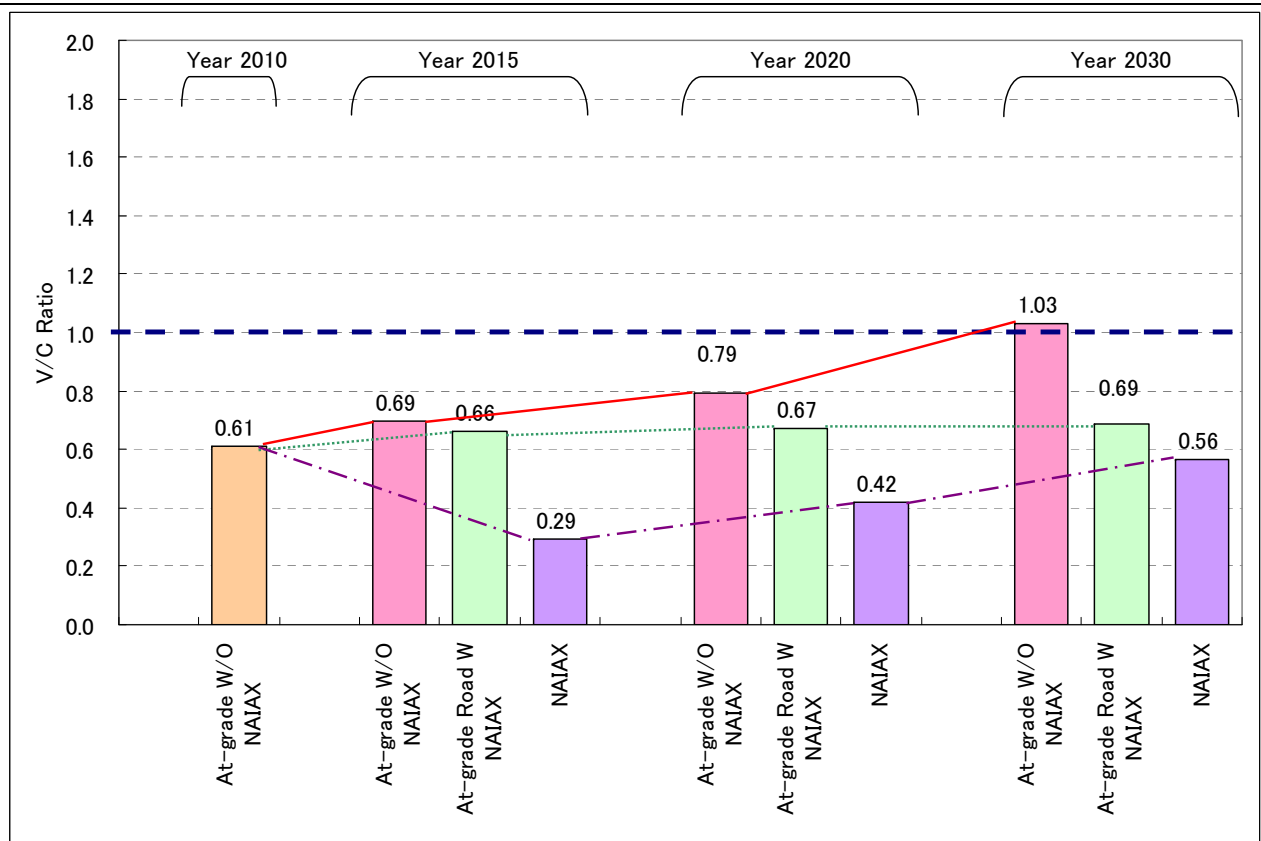


DOMESTIC ROAD

Traffic Volume

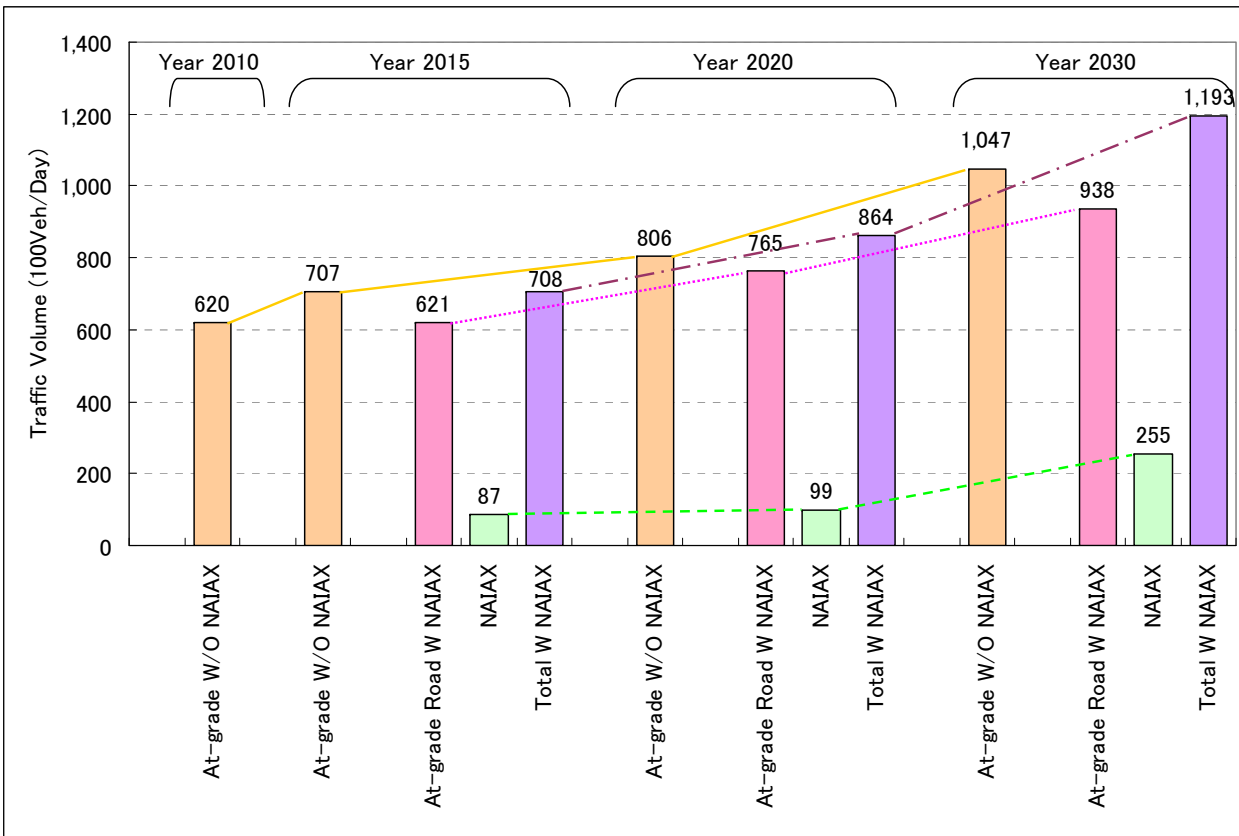


V/C Ratio



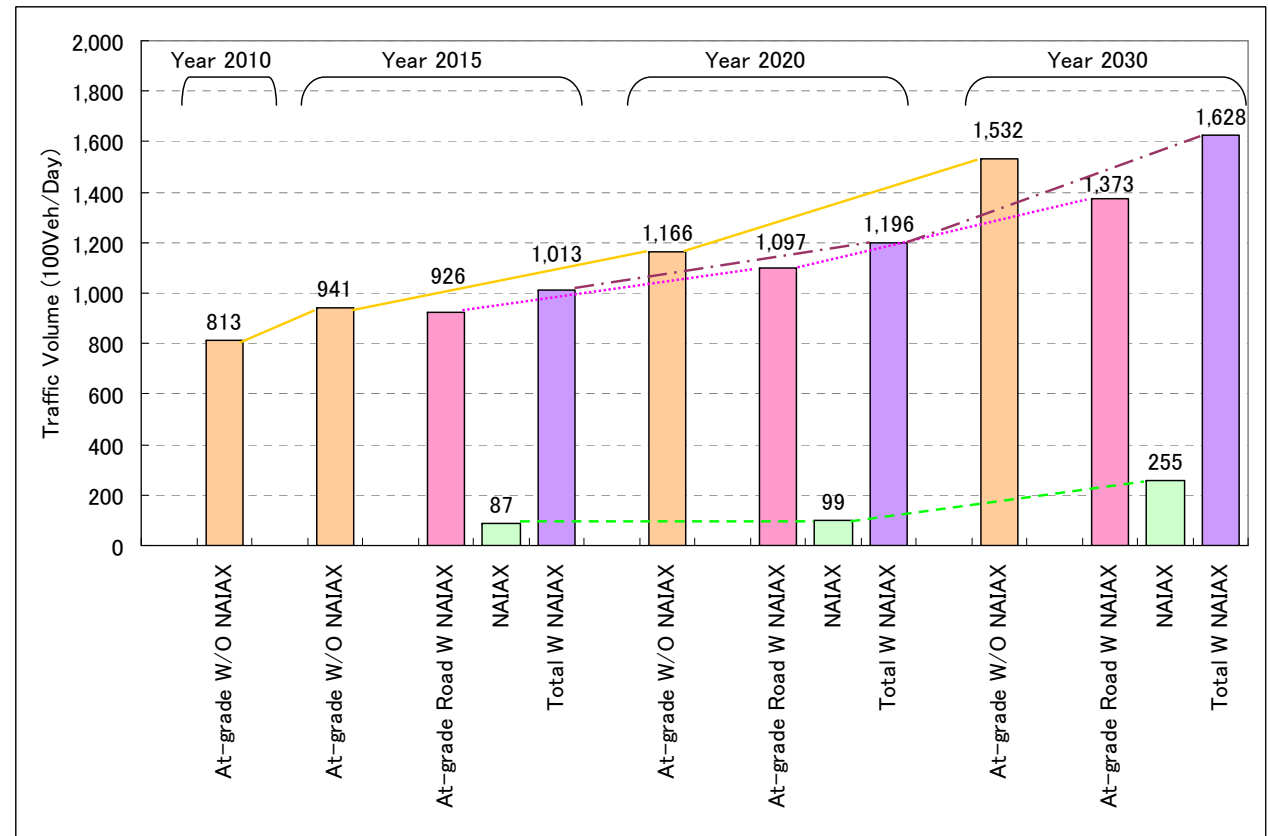
MIA (NAIA) ROAD (DOMESTIC ROAD – QUIRINO AVE. SECTION)

Traffic Volume

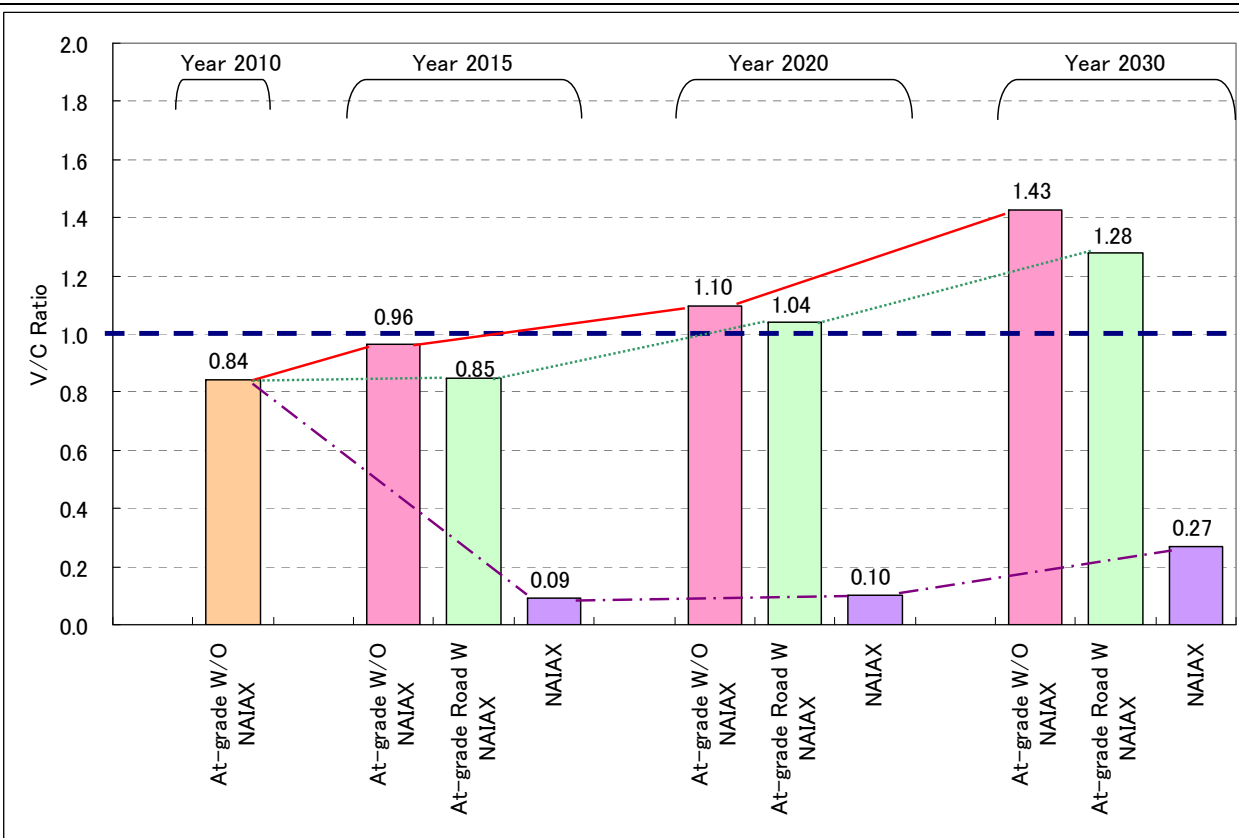


MIA (NAIA) ROAD (QUIRINO AVE. – ROXAS BLVD. SECTION)

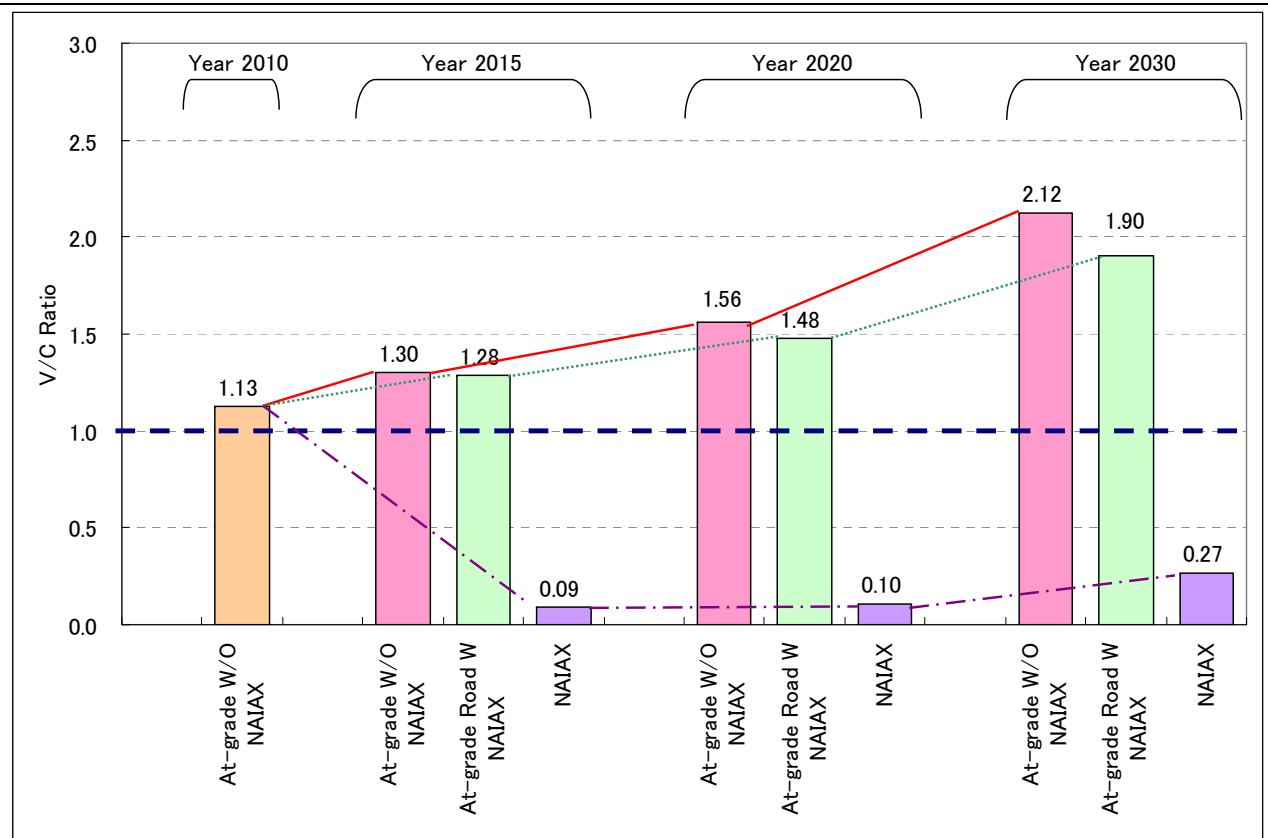
Traffic Volume



V/C Ratio



V/C Ratio



2.2.3 Travel Time, Travel Speed, and Travel Time Saving: Year 2015



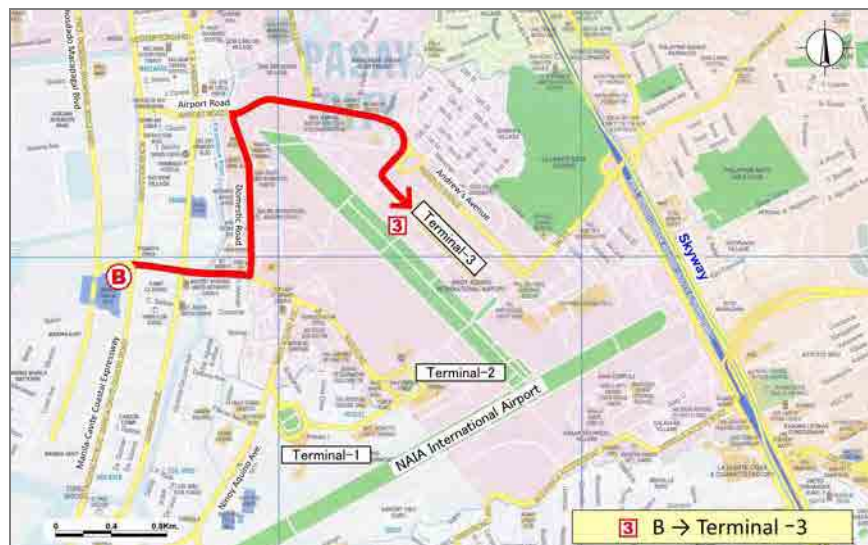
Distance = 6.47 km.

	Travel Speed (km/h)	Difference	Travel Time (min)	Difference
W/O Case	16.0	-	24.3	-
Flyover	26.0	10.1	14.9	-9.4
NAIAX (At-Grade)	25.7	9.8	15.1	-9.2
(Expressway)	47.1	31.1	8.2	-16.0



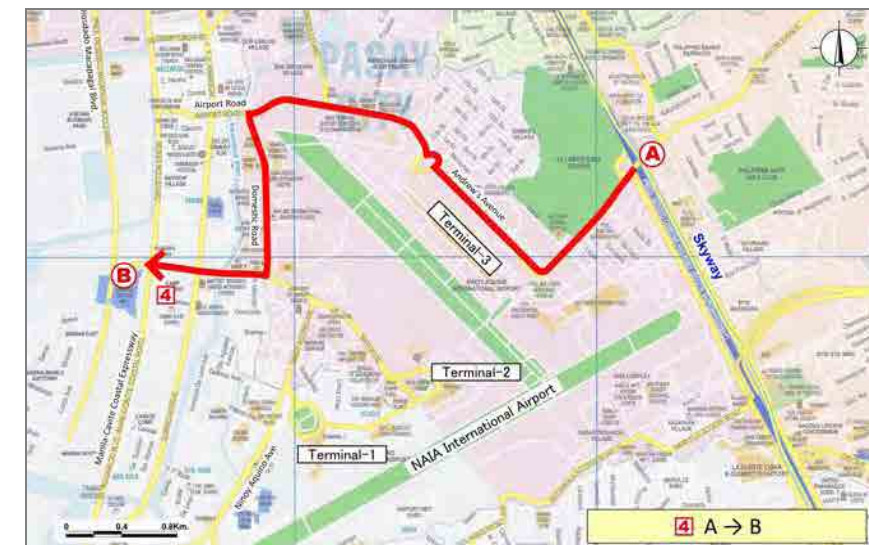
Distance = 6.43 km.

	Travel Speed (km/h)	Difference	Travel Time (min)	Difference
W/O Case	14.8	-	26.0	-
Flyover	25.2	10.4	15.3	-10.7
NAIAX (At-Grade)	23.6	8.7	16.4	-9.7
(Expressway)	47.5	32.7	8.1	-17.9



Distance = 3.42 km.

	Travel Speed (km/h)	Difference	Travel Time (min)	Difference
W/O Case	18.4	-	16.9	-
Flyover	22.0	3.6	14.1	-2.8
NAIAX (At-Grade)	26.0	7.6	11.9	-4.9
(Expressway)	50.0	31.6	6.2	-10.7

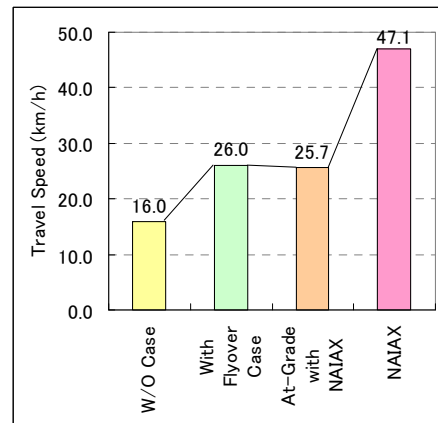


Distance = 5.89 km.

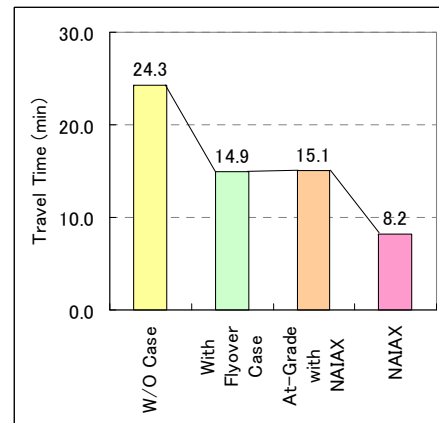
	Travel Speed (km/h)	Difference	Travel Time (min)	Difference
W/O Case	19.5	-	22.1	-
Flyover	24.1	4.6	17.8	-4.3
NAIAX (At-Grade)	24.7	5.3	17.4	-4.7
(Expressway)	50.0	30.5	8.6	-13.5

Traffic Efficiency Improvement by NAIAX

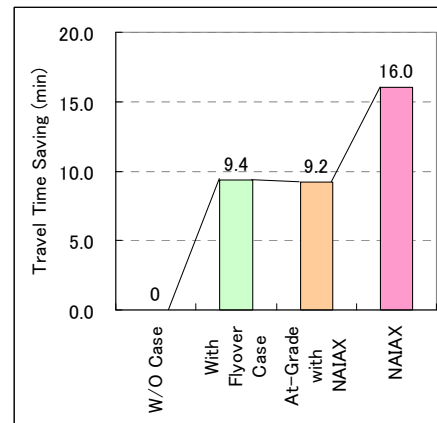
[Skyway – Terminal I Route]



Travel Speed

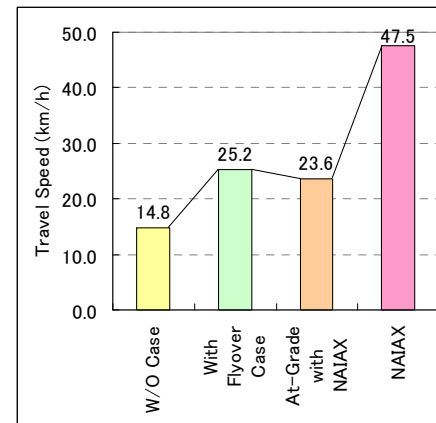


Travel Time

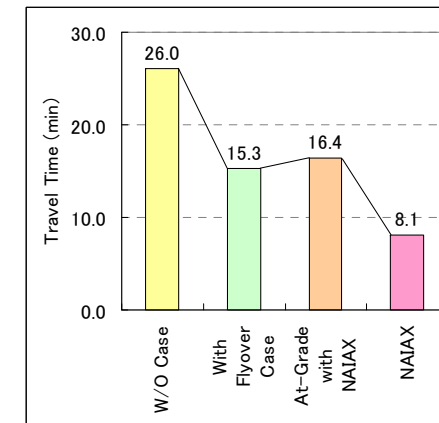


Travel Time Saving

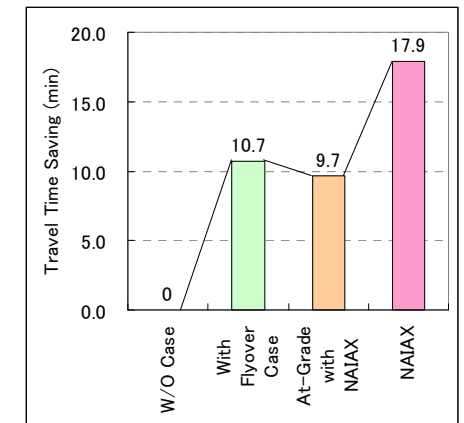
[Skyway – Terminal II Route]



Travel Speed

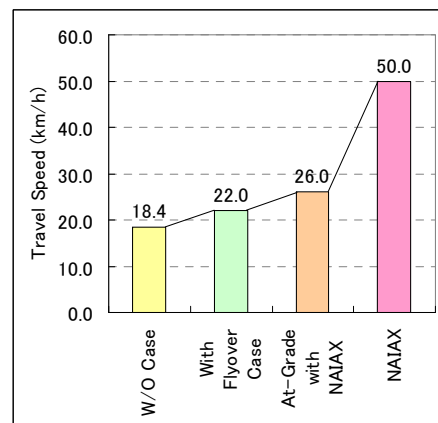


Travel Time

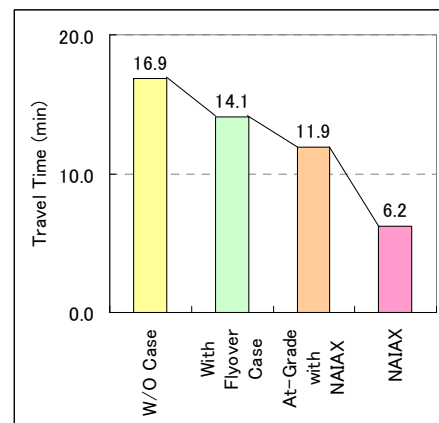


Travel Time Saving

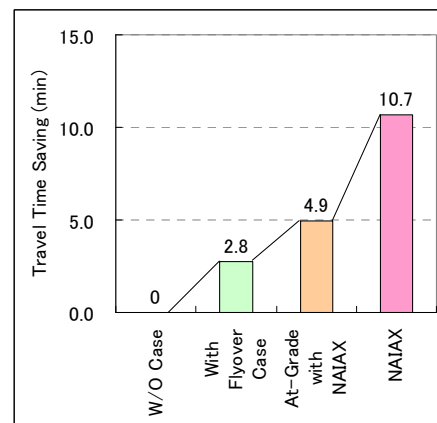
[Roxas Blvd. – Terminal III Route]



Travel Speed

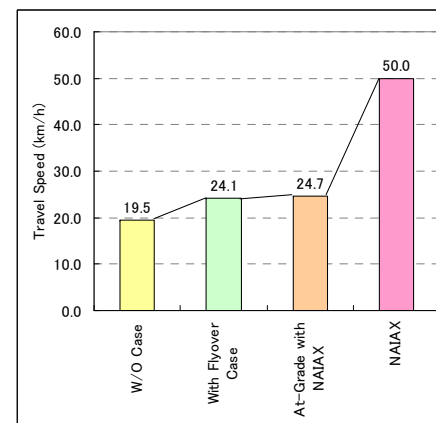


Travel Time

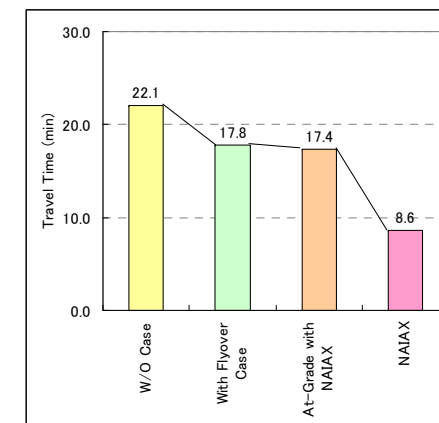


Travel Time Saving

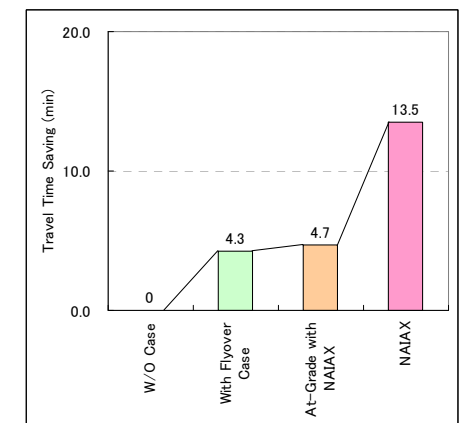
[Skyway – Roxas Blvd. Route]



Travel Speed



Travel Time



Travel Time Saving




Summary of Traffic Impact of NAIAX to At-grade Road

		Sales Road	Andrews Ave.		Domestic Road	MIA Road		
			Sales – Circle	Circle – Domestic		Domestic – Quirino	Quirino – Roxas	
Reduction of At-grade Traffic with NAIAX		Year 2015	30,100	10,200	11,600	1,800	8,600	1,500
		Year 2020	35,400	17,100	14,900	6,500	4,100	5,700
		Year 2030	48,900	31,900	23,100	18,200	10,900	15,900
Volume/Capacity Ratio of At-grade Road	Year 2020	W/O NAIAX	0.80	0.91	1.24	0.79	1.10	1.56
		W/ NAIAX	0.43	0.67	0.96	0.67	1.04	1.48
	Year 2030	W/O NAIAX	1.04	1.26	1.61	1.03	1.43	2.12
		W/ NAIAX	0.53	0.81	1.18	0.69	1.28	1.90

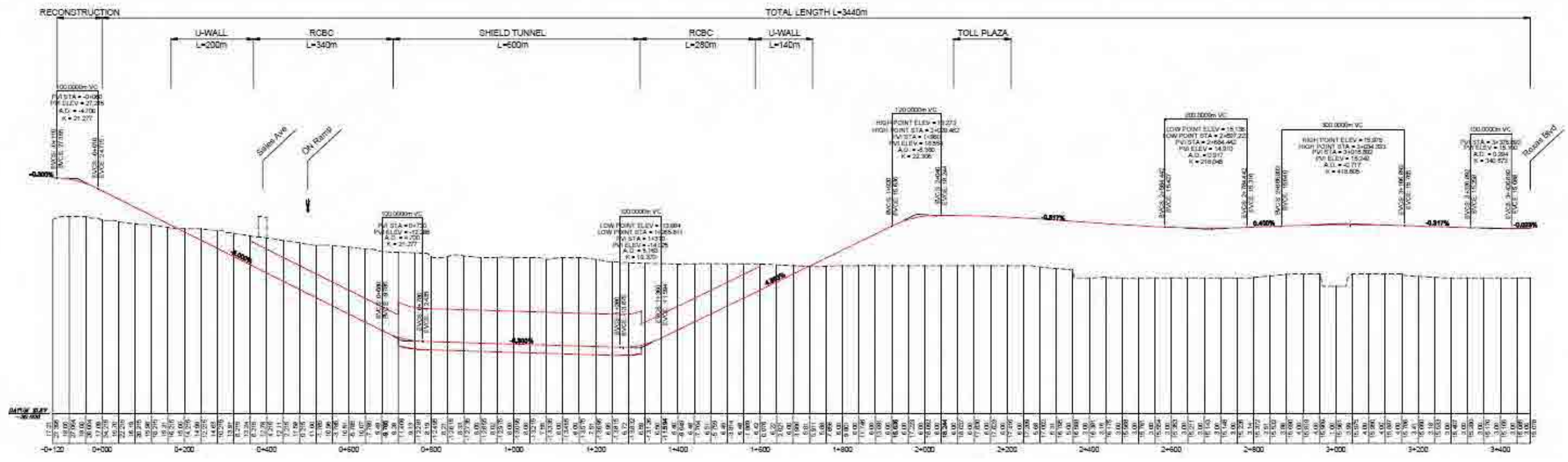
Travel Speed, Travel Time and Travel Time Saving (Year 2015)

Route	Travel Speed(Km/hr)				Travel Time (Min)				Travel Time Savings (Min) Compare to Do Nothing Case		
	W/O NAIAX	W/O NAIAX W/Flyover	W/NAIAX At-Grade	NAIAX	W/O NAIAX	W/O NAIAX W/Flyover	W/NAIAX At-Grade	NAIAX	W/O NAIAX W/Flyover	W/NAIAX At-Grade	NAIAX
Skyway to Terminal I	16.0	26.0	25.7	47.1	24.3	14.9	15.1	8.2	9.4	9.2	16.0
Roxas/MIA Rd Intersection to terminal III	18.4	22.0	26.0	50.0	16.9	14.1	11.9	6.2	2.8	4.9	10.7
Skyway to terminal II	14.8	25.2	23.6	47.5	26.0	15.3	16.4	8.1	10.7	9.7	17.9
Skyway to Roxas Blvd	19.5	24.1	24.7	50.0	22.1	17.8	17.4	8.6	4.3	4.7	13.5

2.3 Other NAIAX Alignment Alternatives
 2.3.1 Paranaque River and Airport Road Scheme

Plan						
		Scheme 1	Scheme 2	Scheme 3		
Concept		Alignment along Paranaque River		Alignment along Domestic Road	Alignment along Airport Road	
Road length(Main) (From end of Phase I to Roxas Blvd)		1742m (4.47km) (0.97)		1820m (4.60km) (1.00)	915m (3.65km) (0.79)	
Road length (Ramp)		2514m		1984m	414m	
Construction Cost (including ROW) From LRT Depot to Roxas Blvd	Construction	5.7B(PHP) (1.2) *include river improvement of 1.0km		4.8B(PHP)(1.0)	2.3B(PHP)(0.5)	
	ROW	0.6 (PHP) (0.7)		0.75B(PHP)(1.0)	2.2BB(PHP)(2.9)	
	Total	6.3B (PHP) (1.9)		5.6B(PHP) (1.0)	5.2B(PHP) (0.9)	
Geometric Condition	Fair	Rmin =150m (main)	Fair	Rmin= 190 (main)	Fair	Rmin =123m(main)
Traffic flow	Poor	Accessibility to Terminal 1 and 2 is low due to long ramp	Good	Accessibility to terminal 1 and 2 is better	Poor	No direct access to Terminal 1 and Terminal 2 * It is not possible to construct ramp to Terminal 1 and 2 due to navigational clearance
Social Impact	Fair	Relocation and compensation of squatters along Paranaque River(assumed 200 houses).	Fair	Needs land acquisition along Domestic Road but large building remains without demolition. Access to facilities along road remains the same	Poor	Number of existing commercial building (approx 40 bulds.) is required to accommodate alignment in narrow road width.
Environmental Impact	Poor	Due to construction of bridge piers (50nos) in the Paranaque river, risk of inundation increases(impediment ratio 11%). <u>River widening and protection is required.</u> Influence to upper and down stream needs to investigate.	Good	No negative impact to the Paranaque river.	Good	No negative impact to the Paranaque river.
Constructability	Poor	Dredging, temporary pier bridge are required.	Good	The highway can be constructed by familiar construction method.	Poor	Require many demotion and relocation
Maintenance	Poor	Difficult due to piers in river	Good	Easy	Good	Easy
Evaluation			Good	This scheme is recommended		

2.3.2 Crossing MIAA Compound Scheme



Roughly Estimated Civil Work Cost = 9.6 Billion Pesos (without Physical Contingency)

Issues: (1) Airport Security Problem

(2) Existing toll booth needs to be relocated

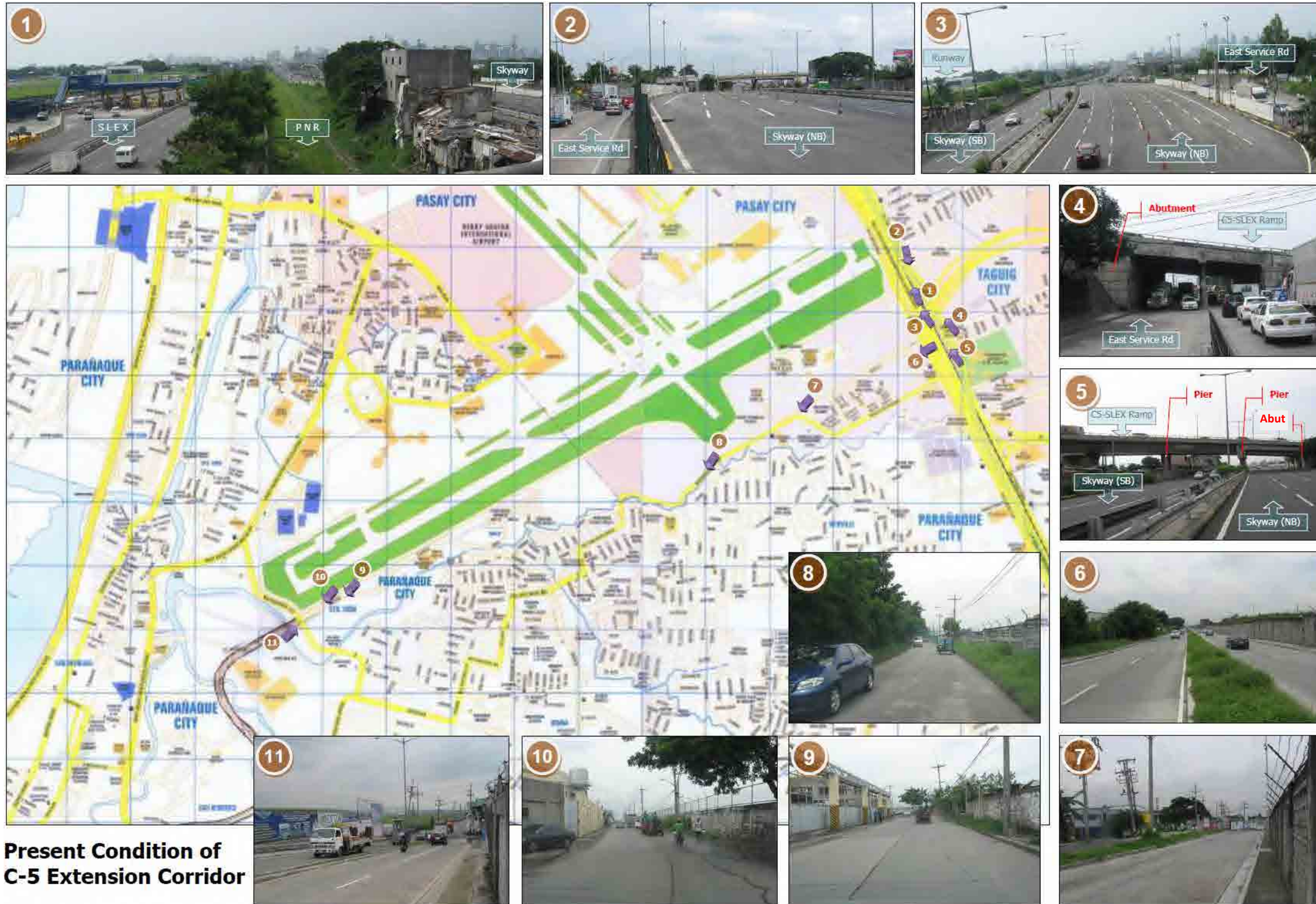
(5) From Roxas Blvd. side, no access to Terminal III.

(6) Vertical grade of 5% is required (standard is 4%)

(3) Additional ROW acquisition of 19.5 m. in width along Villamor Air Base is required.

3. NAIAX VS. C-5 EXTENSION

3.1 Present Condition of C-5 Extension Corridor



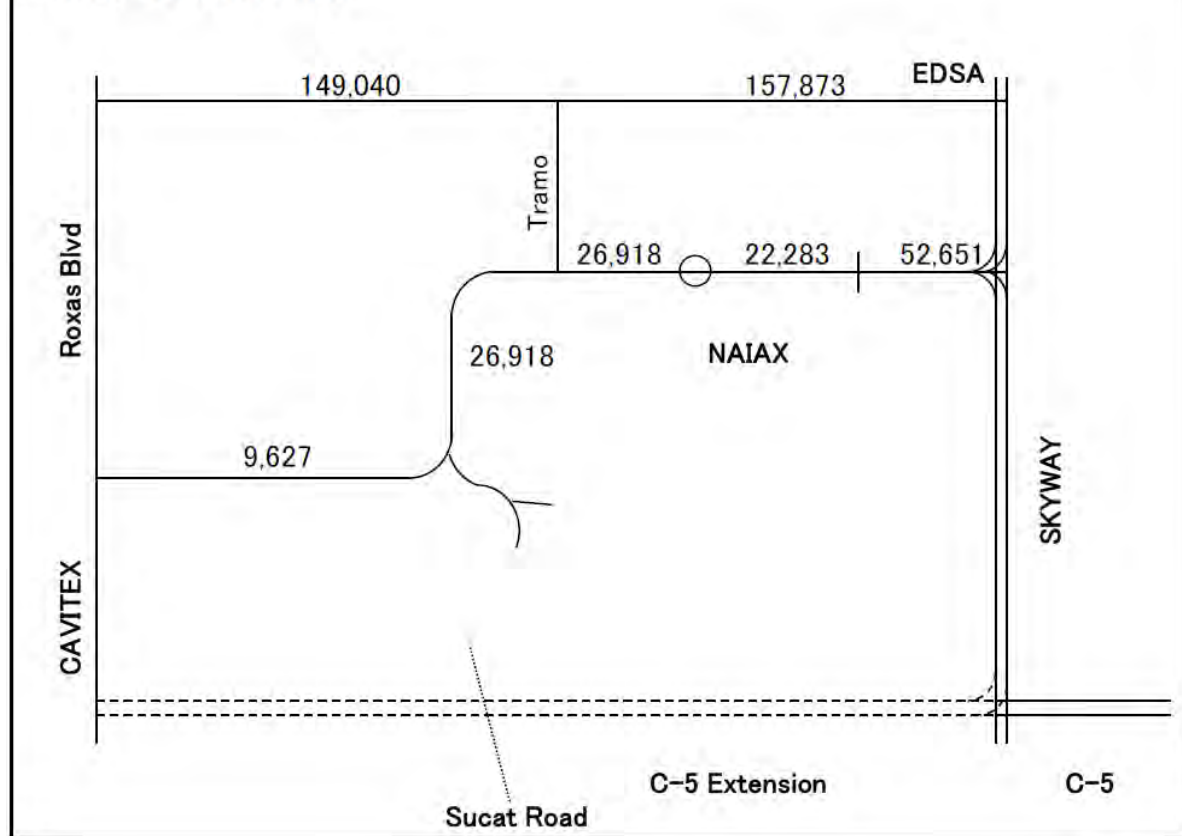
Present Condition of C-5 Extension Corridor

3.2 Traffic Impacts of C-5 Extension to NAIAX or Vis-à-vis

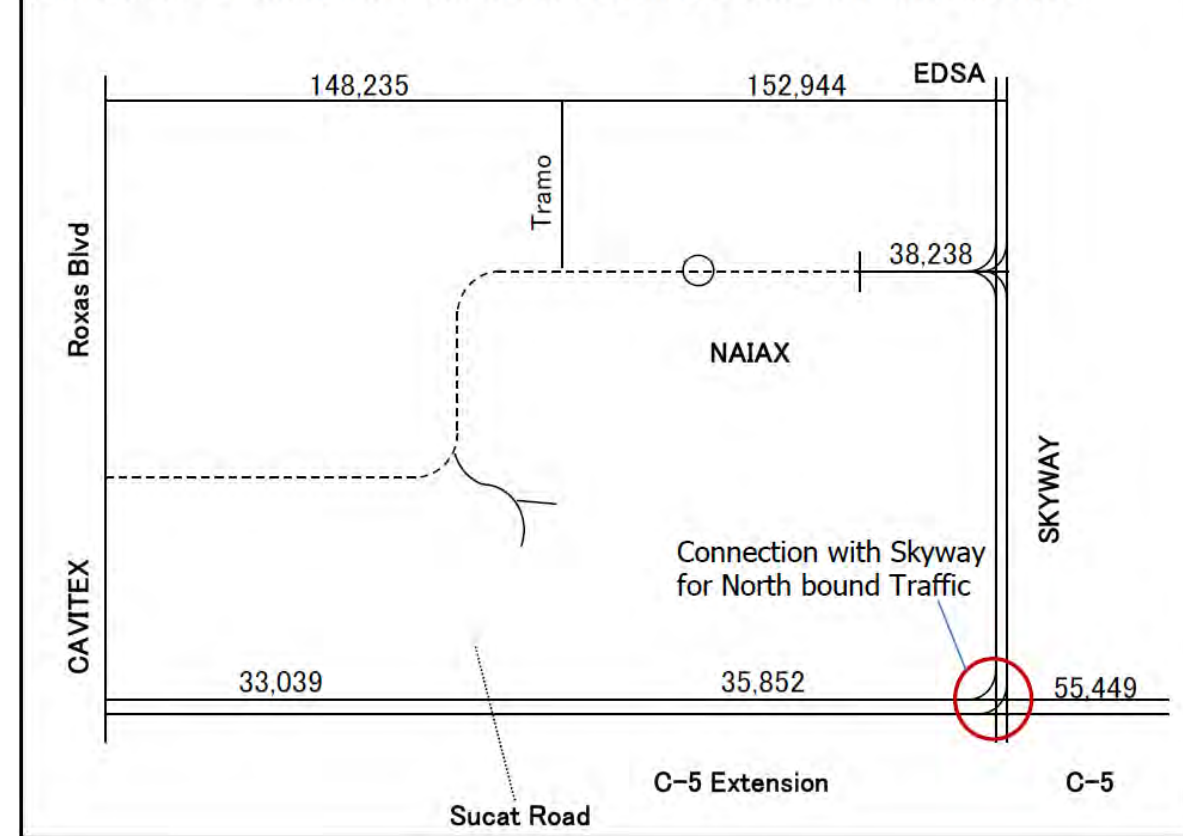
	NAIAX					C-5 Extension			EDSA		
	Over Sales Road	Over Andrews Ave. (Circle - Sales)	Over Andrews Ave. (Domestic - Circle)	Over Domestic Road	Over MIA Road	CAVITEX - Sucat	Sucac - SKYWAY	SKYWAY - C-5	Roxas Blvd - Tramo	Tramo - SLEX	
Estimated Traffic Volume (Year 2015)	Pattern-I NAIAX: Phase-1 + Phase-2 No C-5 Extension	52,651 (1.00)	22,283 (1.00)	26,918 (1.00)	26,918 (1.00)	9,627 (1.00)	-	-	-	149,040 (1.00)	157,873 (1.00)
	Pattern-II: C-5 Extension (National Road Only) NAIAX: Phase-1 only C-5 Extension (National Road)	41,182 (0.78)	-	-	-	-	29,463 (1.00)	31,663 (1.00)	54,940 (1.00)	148,662 (1.00)	153,160 (0.97)
	Pattern-III: C-5 Extension (National Road Only), Connection with SKYWAY NAIAX: Phase-1 only C-5 Extension (National Road)	38,238 (0.73)	-	-	-	-	33,039 (1.12)	35,852 (1.13)	55,449 (1.01)	148,235 (0.99)	152,944 (0.97)
	Pattern-IV: C-5 Extension (Toll Road Only) NAIAX: Phase-1 only C-5 Extension (Toll Road)	33,136 (0.63)	-	-	-	-	35,822 (1.22)	37,917 (1.20)	77,156 (1.40)	150,041 (1.01)	155,629 (0.99)
	Pattern-V: NAIAX + C-5 Extension (National Road) NAIAX: Phase-1 + Phase-2 C-5 Extension (National Road)	51,641 (0.98)	21,128 (0.95)	26,242 (0.97)	26,242 (0.97)	9,441 (0.98)	28,352 (0.96)	30,599 (0.97)	53,892 (0.98)	143,846 (0.97)	152,797 (0.97)
	Pattern-VI: NAIAX + C-5 Extension (National Road), Connection with SKYWAY NAIAX: Phase-1 + Phase-2 C-5 Extension (National Road)	50,258 (0.95)	21,601 (0.97)	25,324 (0.94)	25,324 (0.94)	8,940 (0.93)	30,648 (1.04)	32,584 (1.03)	55,853 (1.02)	142,816 (0.96)	152,778 (0.97)
	Pattern-VII: NAIAX + C-5 Extension (Toll Road) NAIAX: Phase-1 + Phase-2 C-5 Extension (Toll Road)	44,362 (0.84)	17,209 (0.77)	22,067 (0.82)	22,067 (0.82)	6,014 (0.62)	31,962 (1.08)	35,360 (1.12)	74,012 (1.35)	145,879 (0.98)	154,764 (0.98)
	Effect of C-5 (National Road) to NAIAX (Phase 1+2) Pattern-I -Pattern-V	-1,010	-1,155	-676	-676	-186	-	-	-	-5,194	-5,076
	Effect of C-5 (National Road, Connection with SKYWAY) to NAIAX (Phase 1+2) Pattern-I -Pattern-VI	-2,393	-682	-1,594	-1,594	-687	-	-	-	-6,224	-5,095
	Effect of C-5 (Toll Road) to NAIAX (Phase 1+2) Pattern-I -Pattern-VII	-8,289	-5,074	-4,851	-4,851	-3,613	-	-	-	-3,161	-3,109
Effect of NAIAX (Phase 1+2) to C-5 Extension (National road) Pattern-II -Pattern-V	10,459	-	-	-	-	-1,111	-1,064	-1,048	-4,816	-363	
Effect of NAIAX (Phase 1+2) to C-5 Extension (National road, Connection with SKYWAY) Pattern-III -Pattern-V	13,403	-	-	-	-	-4,687	-5,253	-1,557	-4,389	-147	
Effect of NAIAX (Phase 1+2) to C-5 Extension (Toll road) Pattern-IV -Pattern-VII	11,226	-	-	-	-	-3,860	-2,557	-3,144	-4,162	-865	

3.2.1 Estimated Traffic Volume (Year 2015)

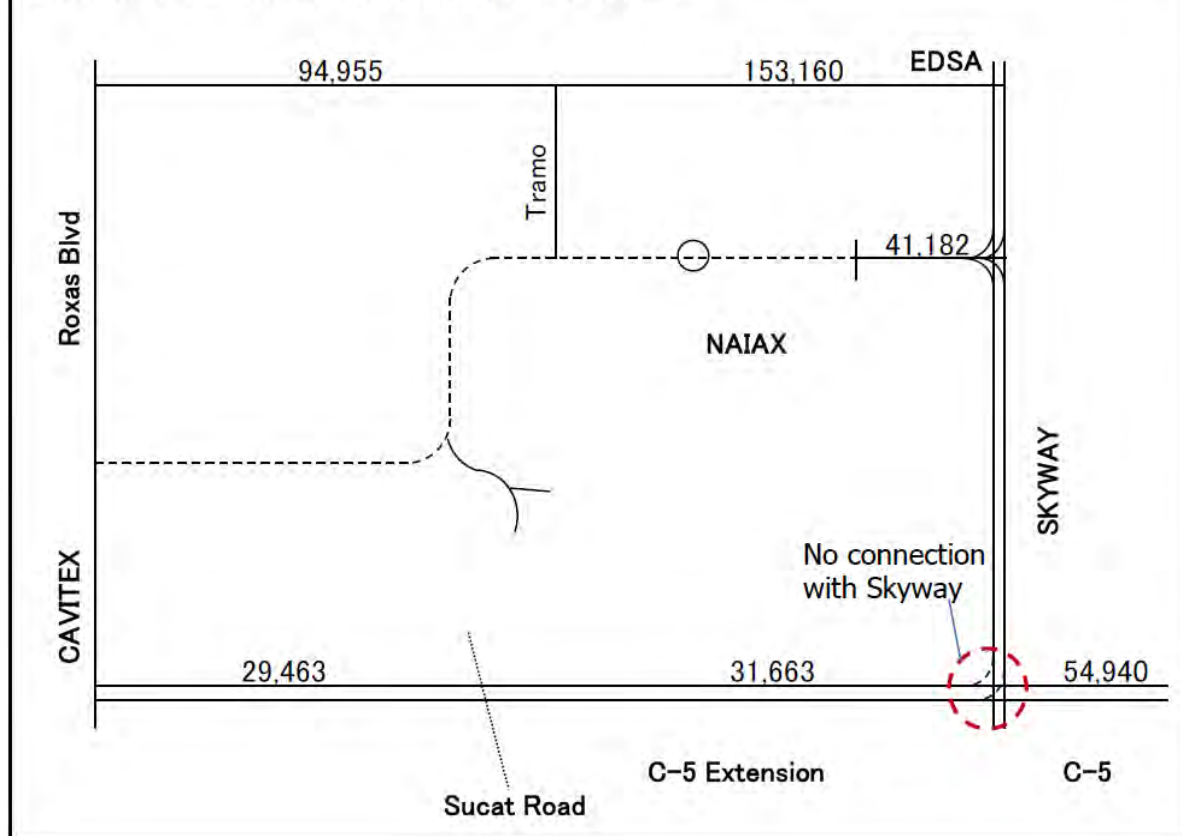
Pattern-1: NAIAX only



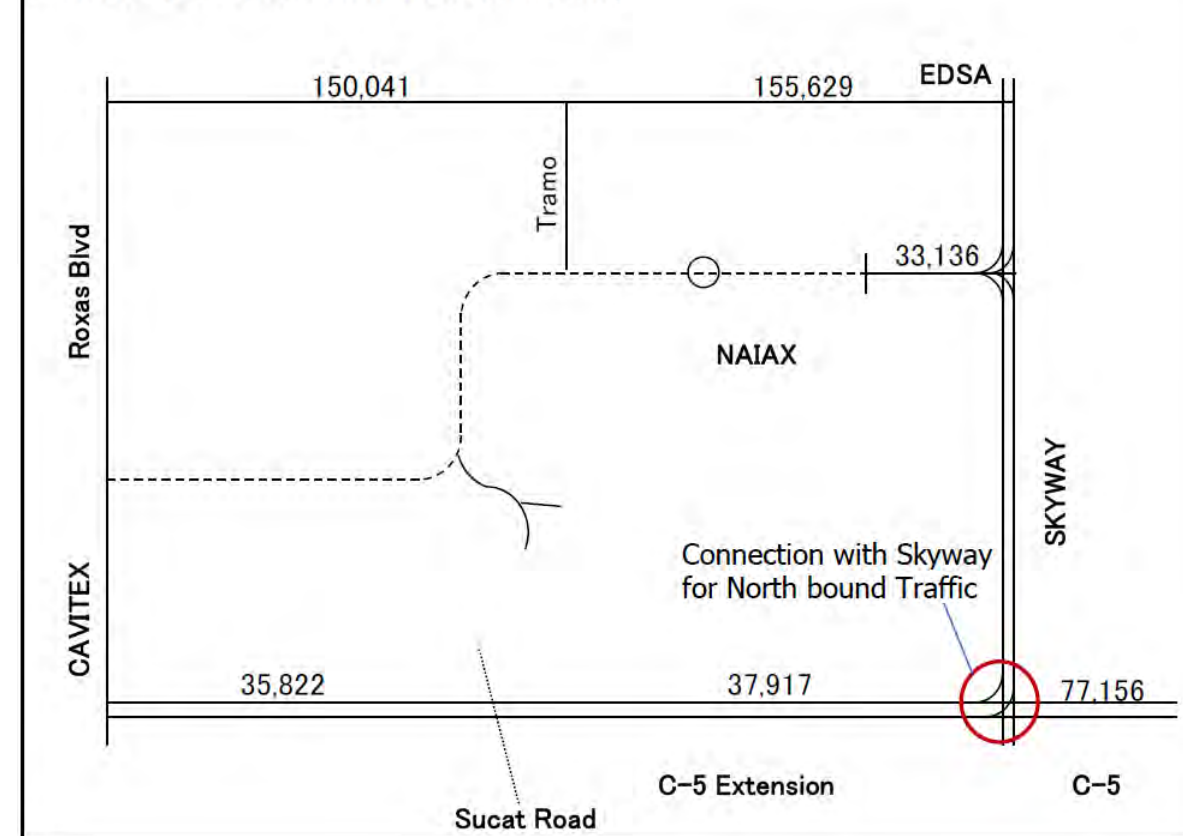
Pattern-3: C-5 Extension (National Road) only, Connection with SKYWAY



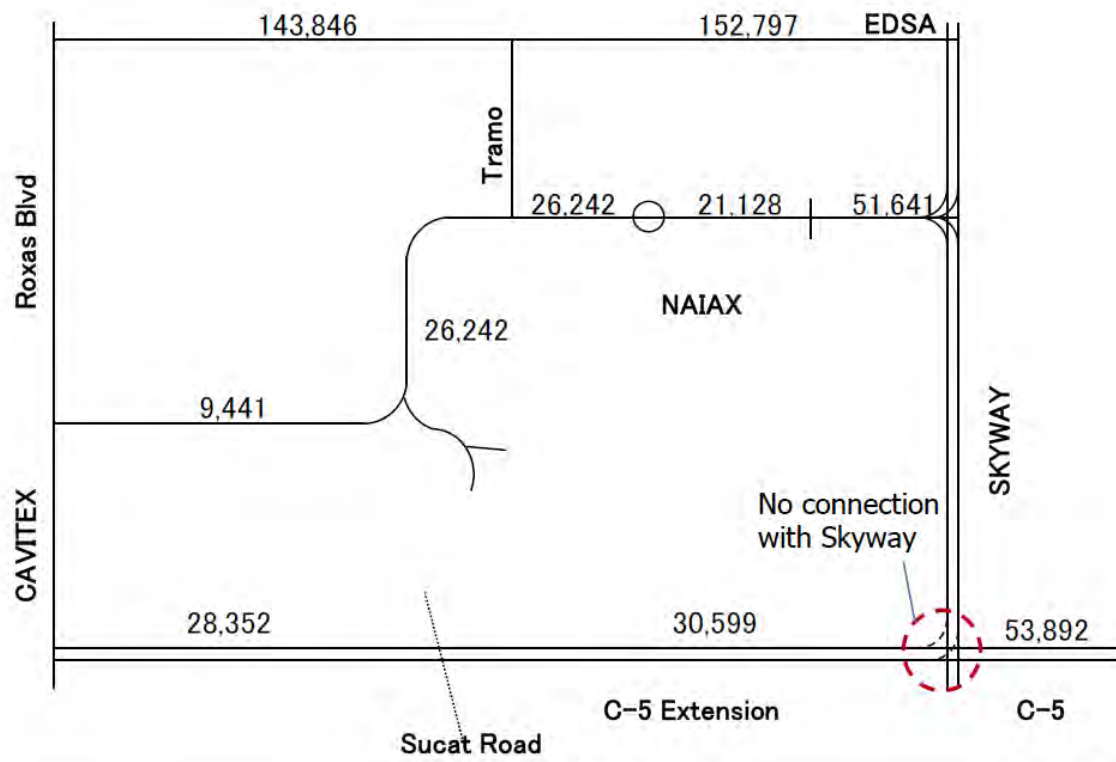
Pattern-2: C-5 Extension (National Road) only, no connection with Skyway



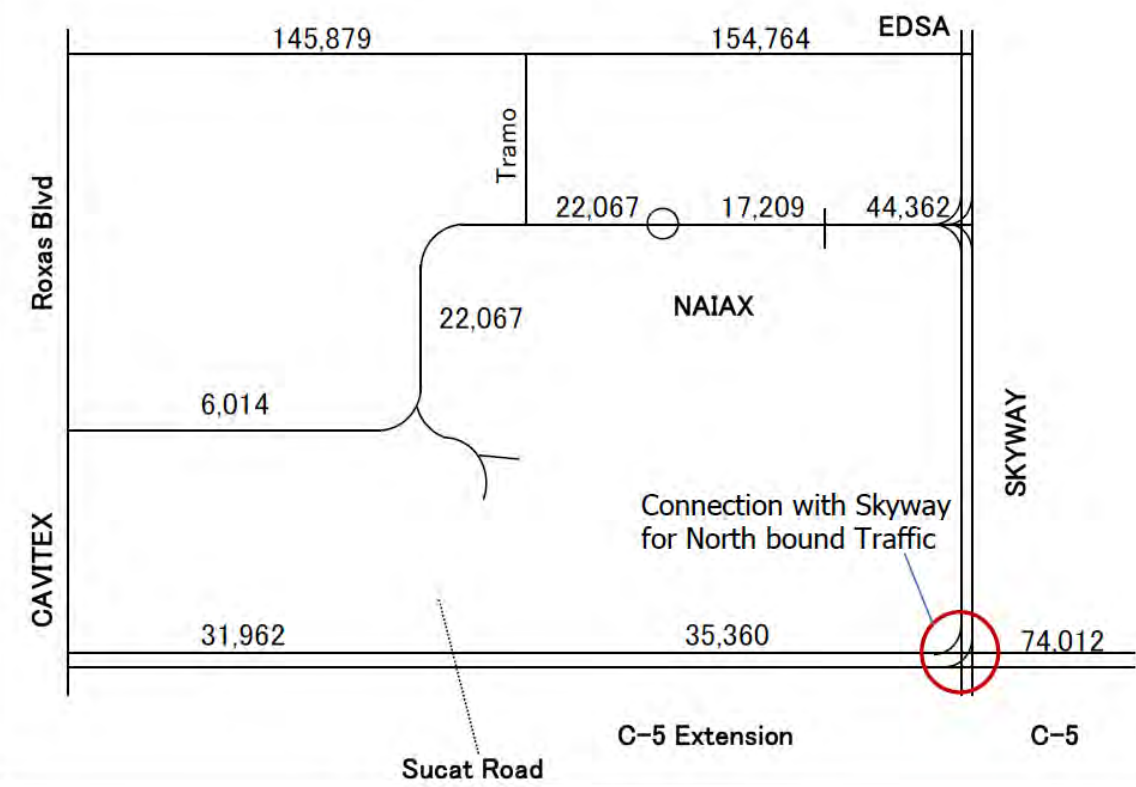
Pattern-4: C-5 Extension (Toll Road) only, connection with Skyway



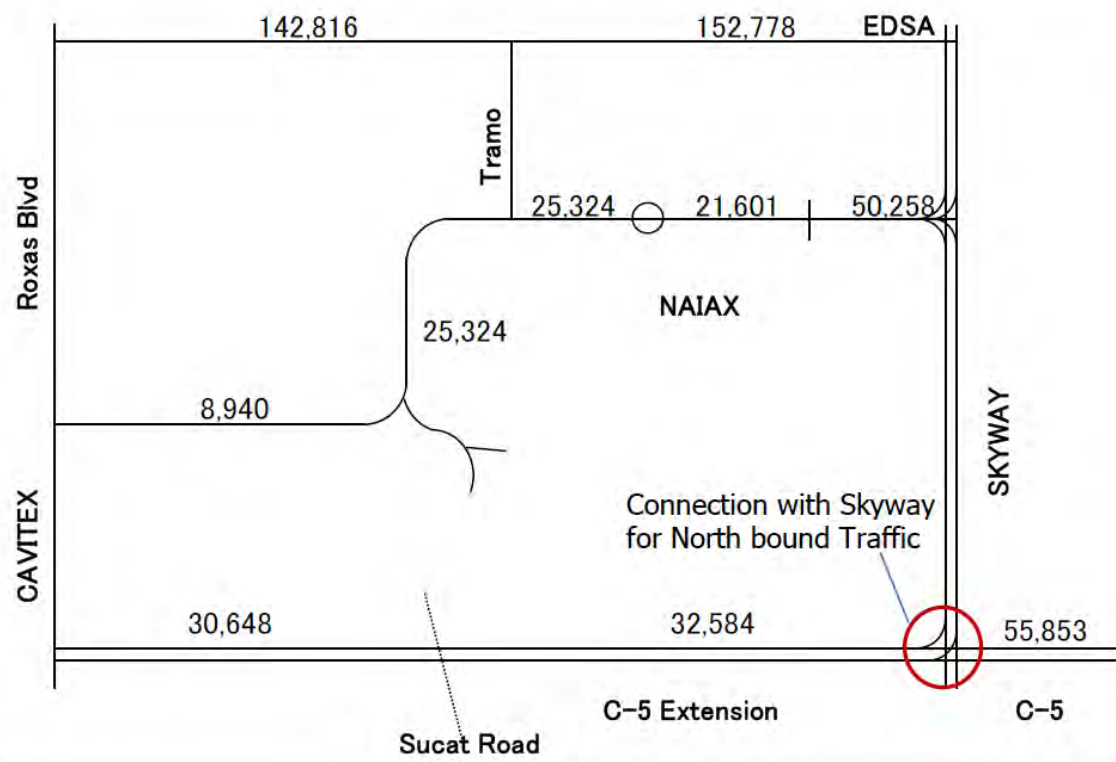
Pattern-5: NAIAX + C-5 Extension (National Road)



Pattern-7: NAIAX + C-5 Extension (Toll Road)

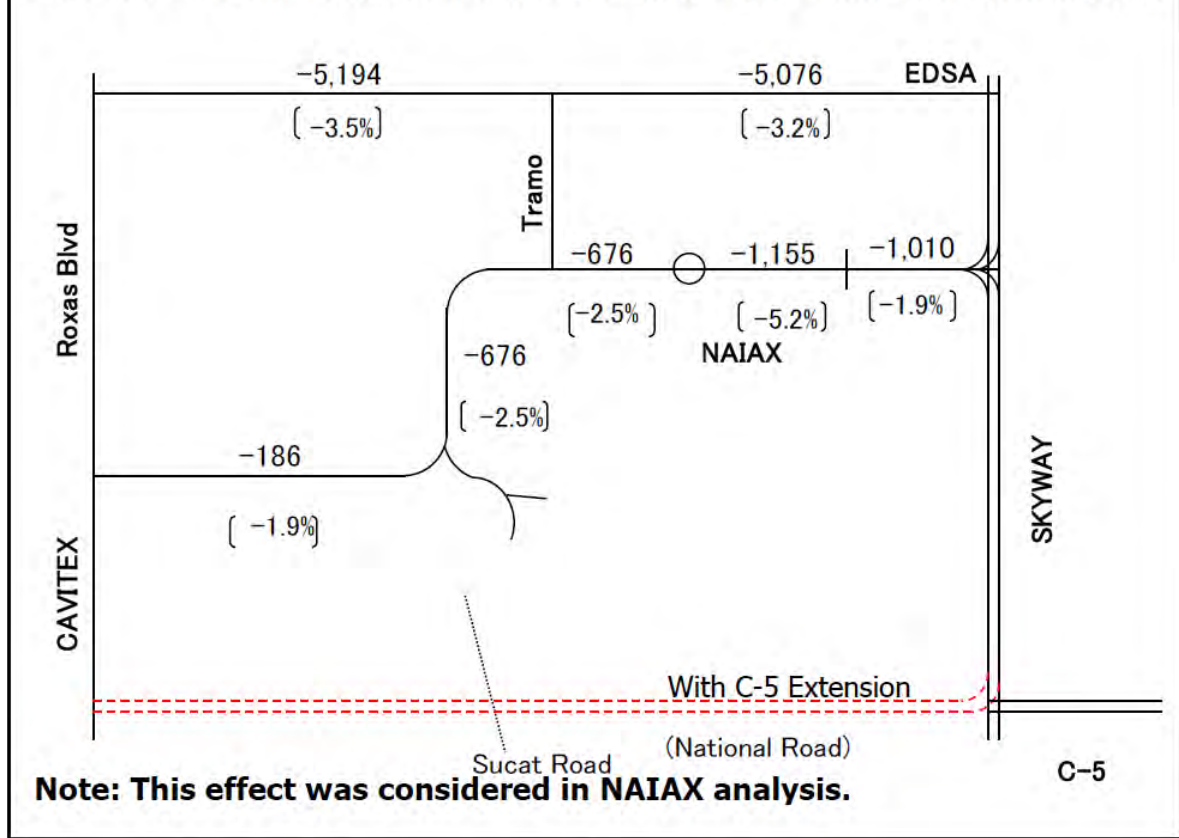


Pattern-6: NAIAX + C-5 Extension (National Road), Connection with SKYWAY

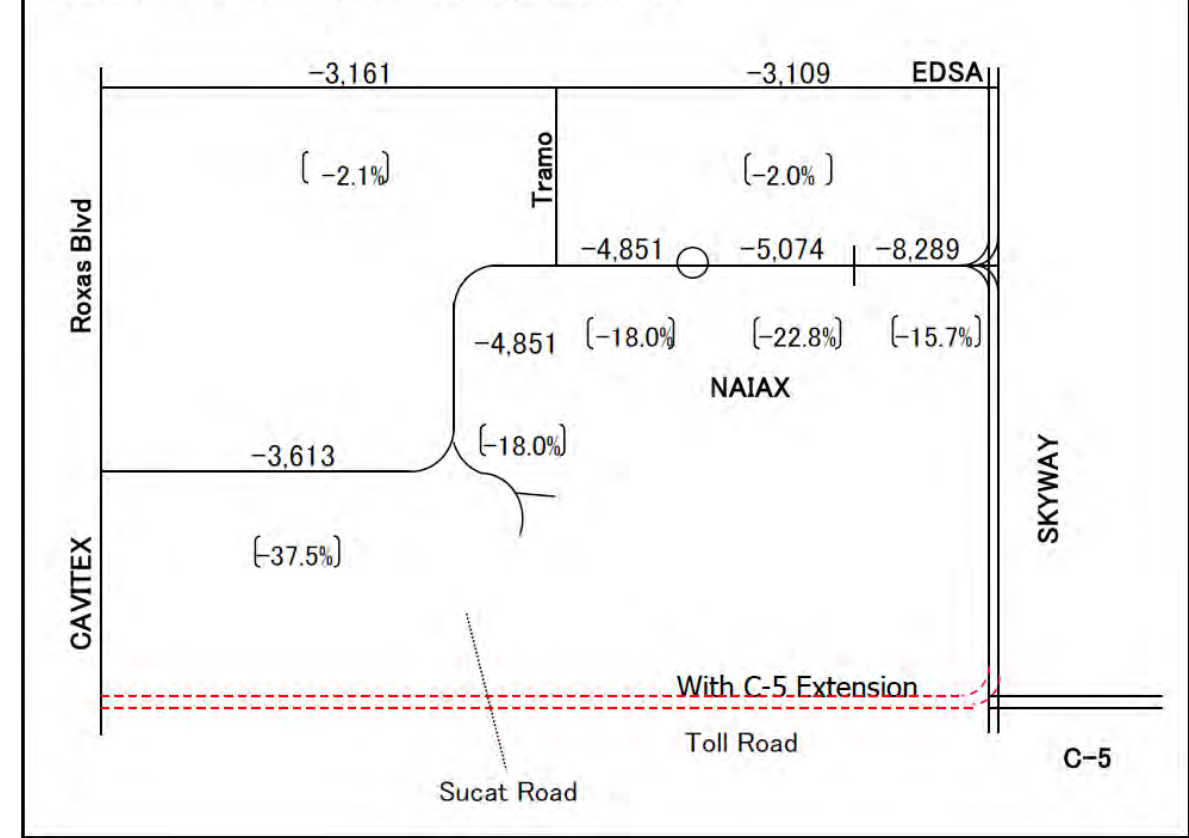


3.3.2 Traffic Impact of C-5 Extension to NAIAX or Vis-a-Vis

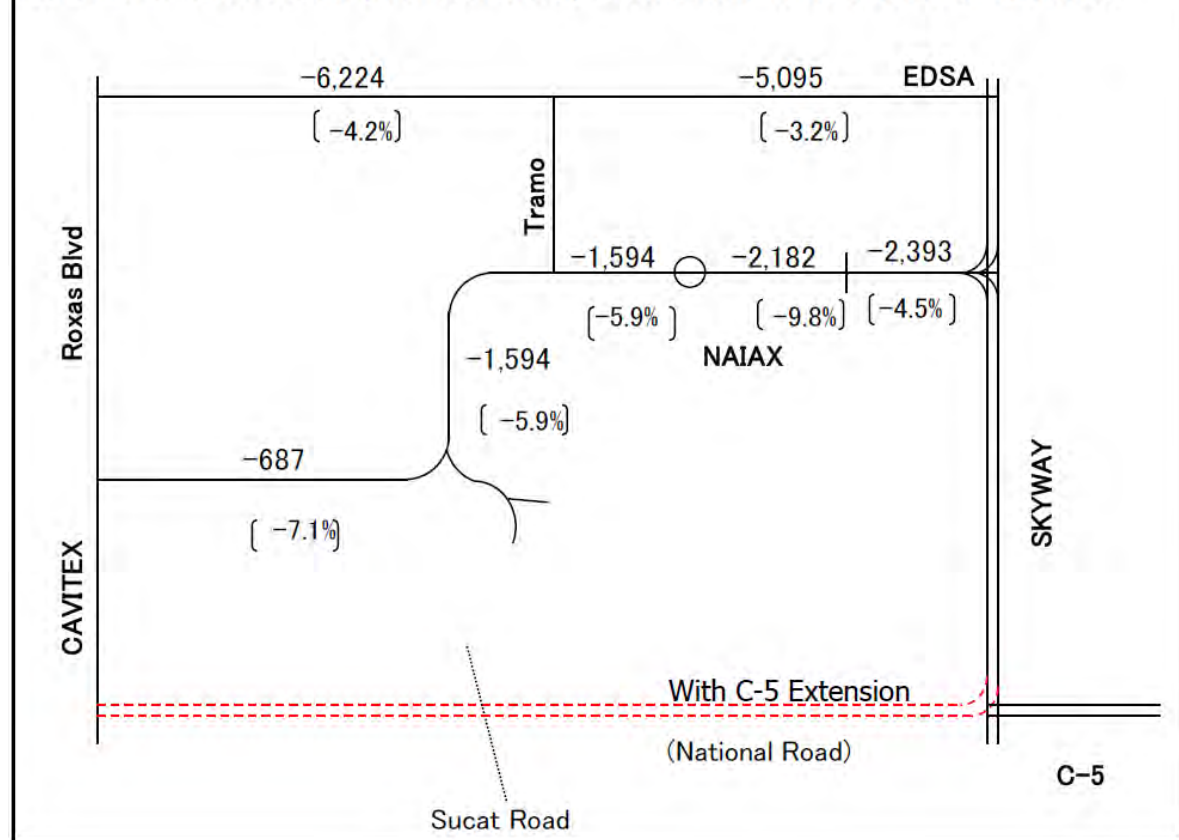
Effect of C-5 Extension (National Road) to NAIAX (No Connection with Skyway)



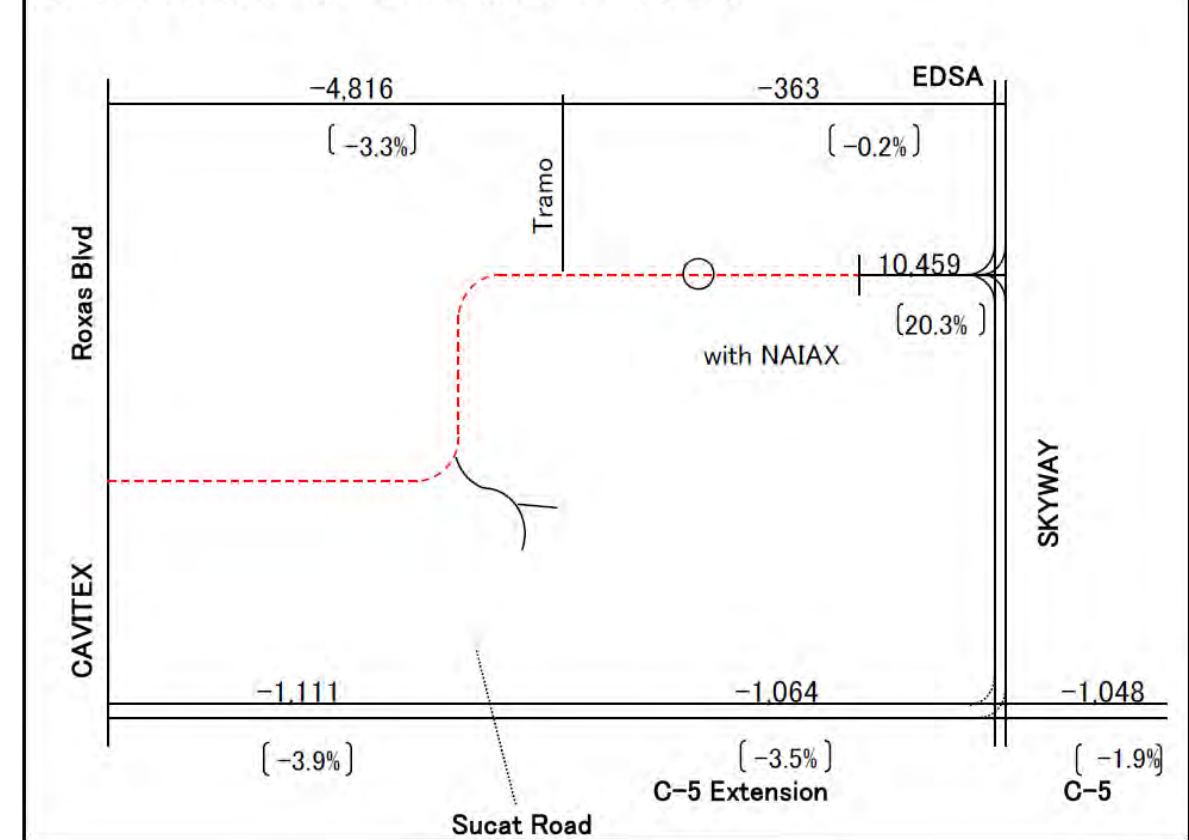
Effect of C-5 Extension (Toll Road) to NAIAX



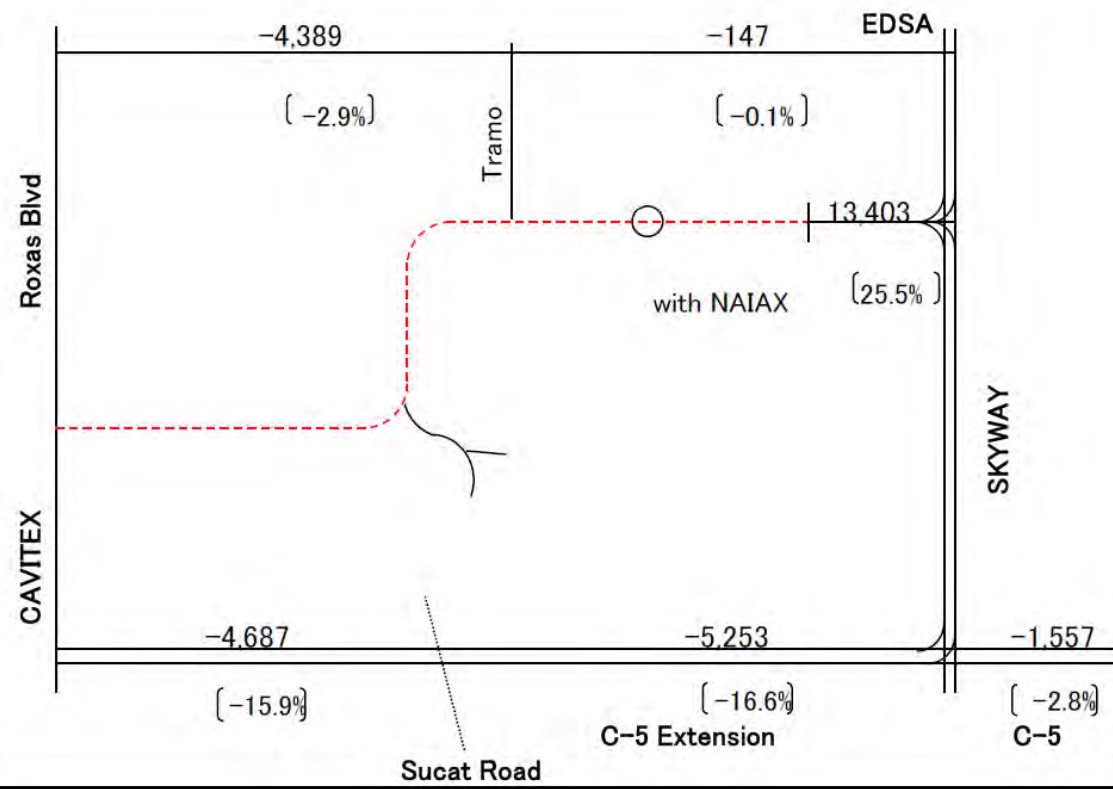
Effect of C-5 Extension (National Road, Connection with SKYWAY) to NAIAX



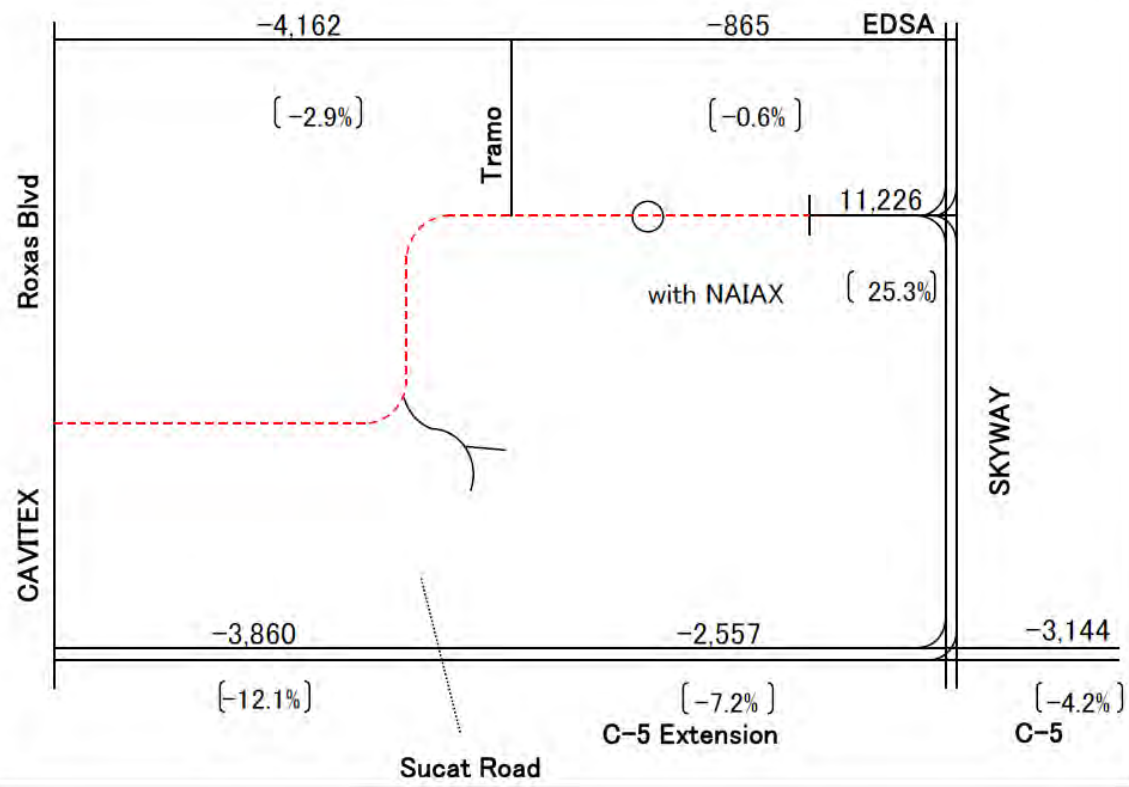
Effect of NAIAX to C-5 Extension (National Road)



Effect of NAIAX to C-5 Extension (National Road, Connection with SKYWAY)

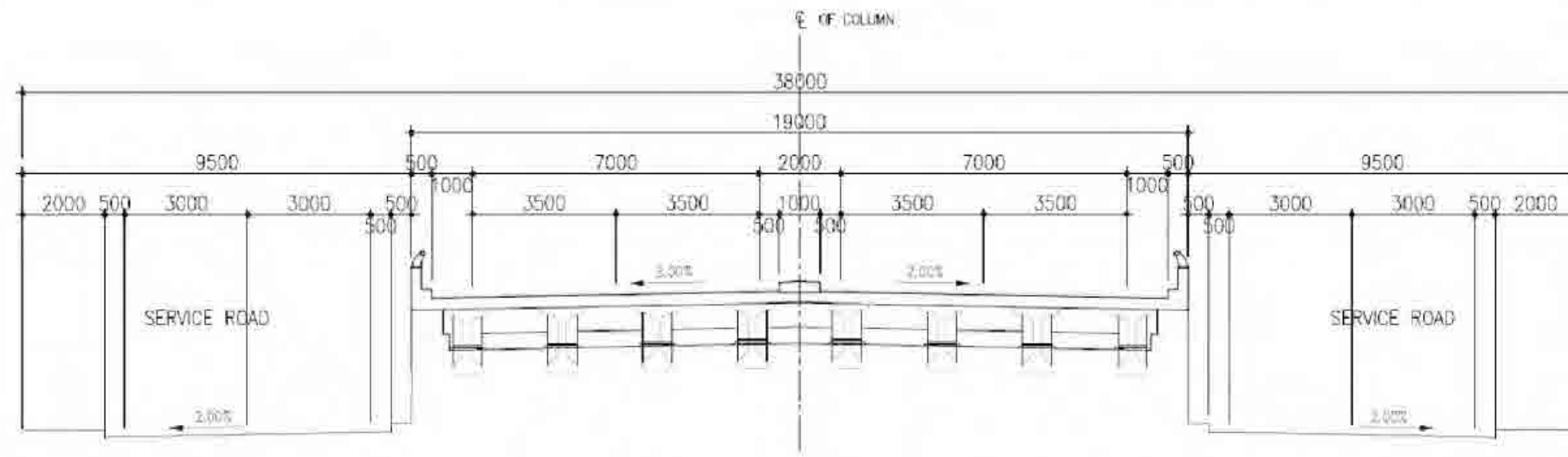


Effect of NAIAX to C-5 Extension (Toll Road)



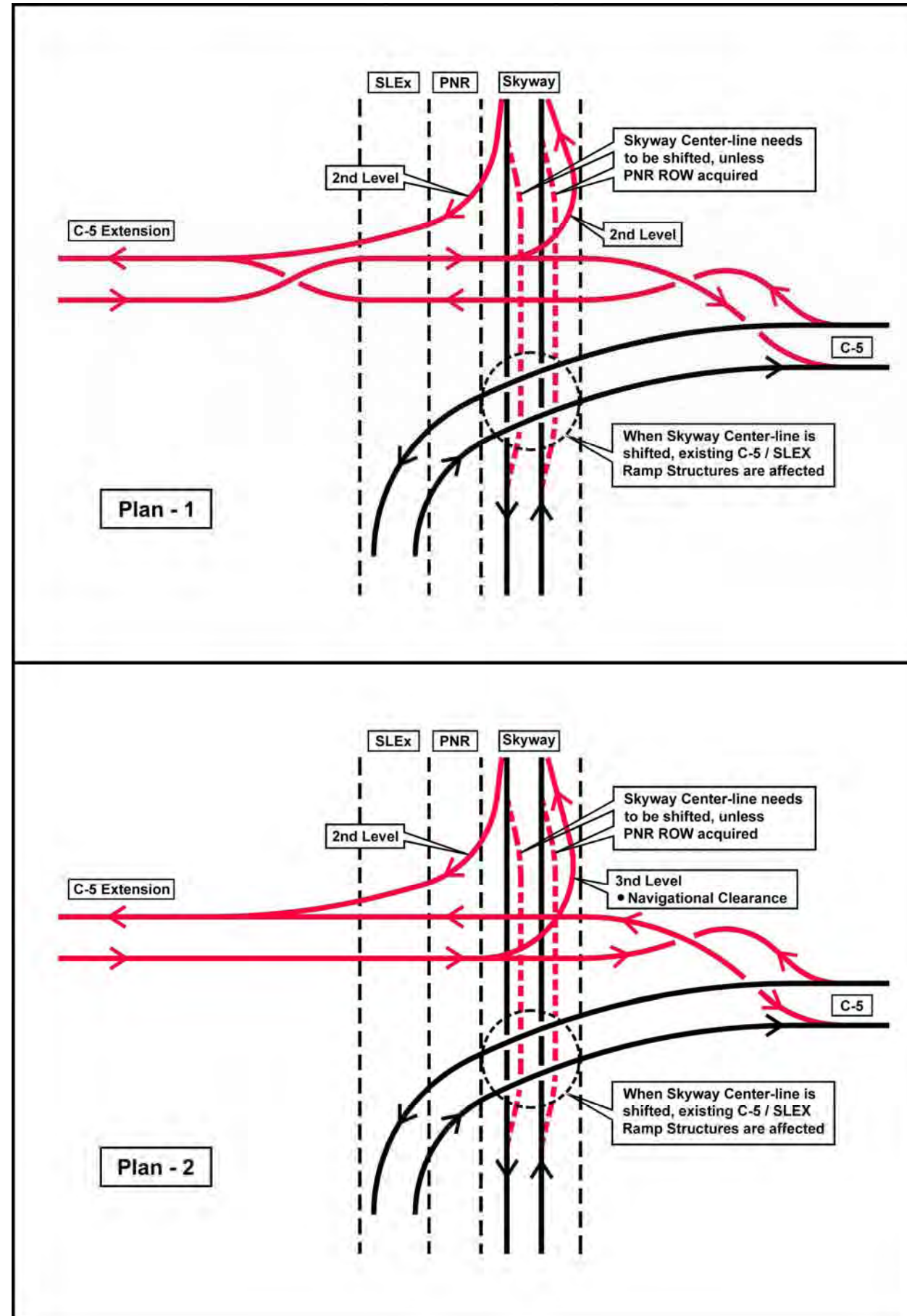
3.3 C-5 Extension as Toll Road

3.3.1 C-5 Extension Alternative Alignments (Toll Road)

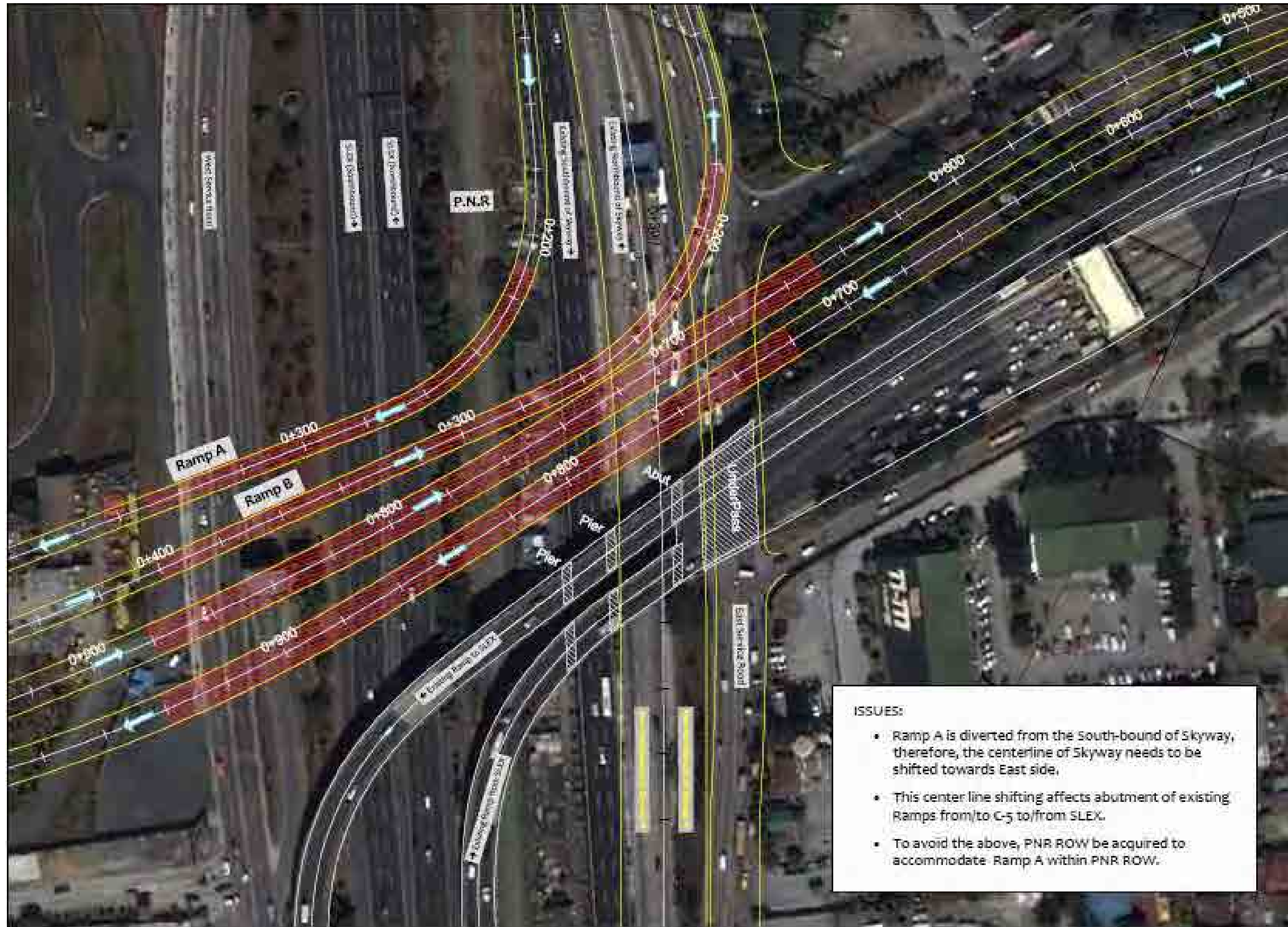


TYPICAL CROSS SECTION FOR 4 LANES (TOLL ROAD WITH SERVICE ROAD)

3.3.2 Connection with Skyway

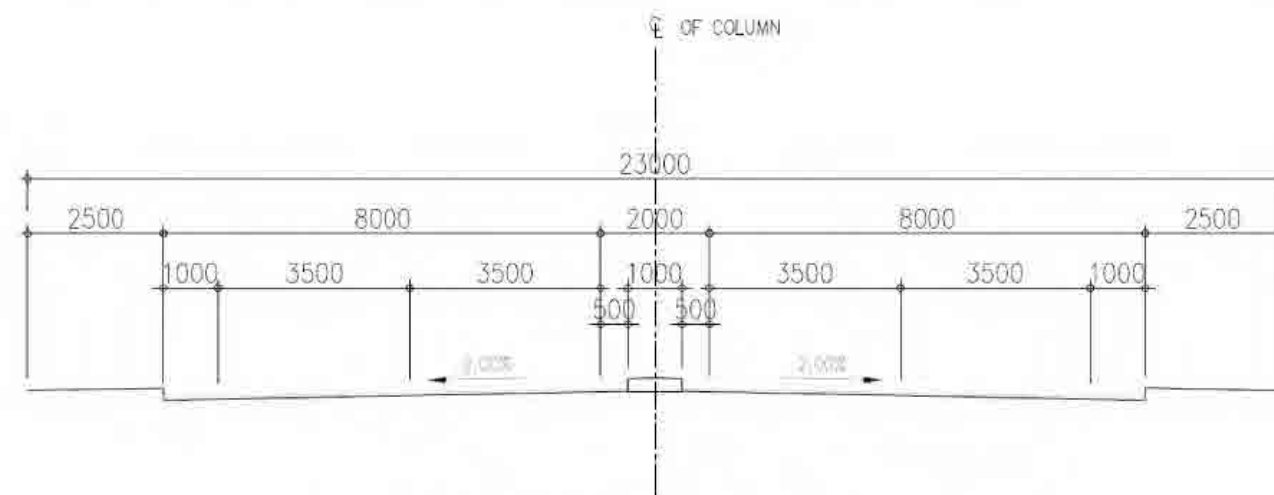


3.3.3 Issues at the Connection Between C-5 Extension and Skyway



3.4 C-5 Extension as National Road

C-5 Extension Alternative Alignment (National Road)



TYPICAL CROSS SECTION FOR 4 LANES (National Road)

3.5 Comparison of Three Alternatives

Item		Expressway			National Road		
		Alternative-1	Alternative-2	Alternative-3	Alternative-A	Alternative-B	Alternative-C
Expressway/Road Length (km)		7.02	6.52	6.29	7.02	6.52	6.29
ROW Acquisition	Land Area Affected (Ha)	32.32	21.31	20.45	19.92 (20.44)	16.01 (16.53)	15.20 (15.72)
	No. of Structure Affected (No.)	900	890	850	550 (560)	520 (530)	500 (510)
Cost	Civil Work Cost (Billion Pesos)	5.27	4.63	4.34	2.57 (2.90)	2.94 (3.27)	2.42 (2.75)
	Land Acquisition Cost (Billion Pesos)	4.50	2.99	2.87	2.74 (2.81)	2.20 (2.27)	2.09 (2.16)
	Resettlement Cost (Billion Pesos)	1.97	1.95	1.86	1.19 (1.21)	1.14 (1.16)	1.10 (1.12)
	Total (Billion Pesos)	11.74	9.57	9.07	6.50 (6.92)	6.28 (6.70)	5.61 (6.03)

* (): With SKYWAY Connection

4. Summary and Recommendation

4.1 How NAIAX will be used?

Year 2015

Total Traffic Volume	: 54,445 (100%)
Through Traffic	: 14,188 (26.1%)
Terminal Related Traffic	: 20,555 (37.8%)
Mega Manila & Other Traffic	: 19,702 (36.1%)

4.2 Grade Separation of Major Intersections Along NAIAX Corridor

Unit: Million Pesos			
	Cost of Civil Work	ROW Acquisition Cost	Total
Roxas Blvd./MIA Intersection	1,032	24	1,056
MIA Road/Domestic Road/Sucat Road Intersection	965	5	970
Andrews Ave./Tramo Road Intersection	297	103	400
Sub-total	2,294	132	2,426
CAVITEx/Macapagal (Note-1)	279	5	284
Total	2,573	137	2,710

Note-1: This grade separation can be implemented later.

4.3 Traffic Efficiency (Grade Separation vs. NAIAX)

1) At-grade Traffic Volume Reduction

In case of With NAIAX Case, at-grade traffic volume will be reduced by 35,400 to 5,700 veh./day (or 46% - 5% in 2020 depending on road section.

2) Total Traffic Volume Carried (in 2020)

w/o NAIAX	: 76,900 ~ 112,400 veh/day
	(1.00) (1.00)
w/ NAIAX	: 98,100 ~ 116,600 veh/day
	(1.28) (1.04)

With NAIAX Case, about 1.28 to 1.04 times of traffic is attracted to the NAIAX corridor.

3) Year At-grade Road Traffic Volume Exceeds Traffic Capacity

NAIAX Corridor Section	W/O NAIAX	W/ NAIAX
	W/ Grade Separation	
Sales Road	Between 2020 – 2030	After 2030
Andrews Ave. (Sales Road – Circle)	Between 2020 – 2030	After 2030
Andrews Ave. (Circle – Domestic Road)	2015	Between 2020 - 2030
Domestic Road	Between 2020 – 2030	After 2030
MIA Road (Domestic Road – Quirino Ave.)	Between 2015 – 2020	Between 2015 - 2020
MIA Road (Quirino Ave. – Roxas Road)	2015	2015

NAIAX V/C Ratio will be 0.3 to 0.6 in Year 2030, thus there is possibility that more traffic will be attracted to NAIAX to avoid congested at-grade road.

4) Travel Speed & Travel Time Improvement and Travel Time Saving

Travel Speed (km/hr)

		Skyway – Terminal I Route	Roxas Blvd – Terminal III Route	Skyway – Roxas Blvd Route
At-grade Road w/o NAIAX	w/o Grade Separation	16.0 (1.00)	18.4 (1.00)	19.5 (1.00)
	w/ Grade Separation	26.0 (1.63)	22.0 (1.20)	24.1 (1.24)
w/ NAIAX	At-grade Road	25.7 (1.60)	26.0 (1.40)	24.7 (1.27)
	NAIAX	47.1 (2.94)	50.0 (27.2)	50.0 (2.56)

- At-grade Road w/o NAIAX and w/Grade Separation
 - Travel speed will be improved by about 1.2 times.
- At-grade Road w/ NAIAX
 - Travel speed of at-grade road will be almost the same as at-grade road with Grade Separation Case.
 - High travel speed will be enjoyed on NAIAX and travel time to NAIA Terminals will be greatly saved
- With the increase of travel speed, travel time will be reduced and travel time saving will be increased accordingly with grade separation case and with NAIAX Case.

4.4 C-5 Extension

1) Three Alignment Alternatives and Expressway Standard or National Road Standard

Standard	Alternative	Distance	No. of	Width
Expressway Standard	Alternative -1	L = 7.02 km.	4 - lane	W = 38.0 m (Service Road on both sides) W = 28.5 m (Service Road on 1 side) W = 19.0 m (No Service Road)
	Alternative -2	L = 6.29 km.		
	Alternative -3	L = 6.52 km.		
National Road Standard	Alternative - A	L = 7.02 km.	4 - lane	W = 23.0 m (with Sidewalk)
	Alternative - B	L = 6.29 km.		
	Alternative - C	L = 6.52 km.		

2) Connection with Skyway

- For north-bound traffic: possible, provided that PNR ROW will be acquired, otherwise existing C-5/SLEx ramps need to be reconstructed.
- For south-bound traffic: difficult due to existing C-5/SLEx Ramps unless huge investment is made.

3) Cost of Recommended Alternative

	C-5 Extension	
	Expressway Standard (Alternative-3)	National Road Standard (Alternative-C) (Note-1)
	Unit: Billion Pesos	
Civil Work	4.34	2.75
ROW Acquisition/Relocation Cost	4.73	3.28
Total	9.07	6.03

Note-1: with Skyway connection

4) Traffic Impact of C-5 Extension to NAIAX or vis-à-vis

- NAIAX will not affect C-5 Extension traffic.
 - C-5 Extension Expressway Standard
C-5 Extension traffic will be reduced by 3,860 veh/day to 2,557 veh/day (or 2% to 7%) : Minor Impact
 - C-5 Extension National Road Standard with Skyway Connection
C-5 Extension traffic will be reduced by 4,687 veh./day to 5,253 veh./day (or 15.9% to 16.6%) : Minor Impact
- Rather, C-5 Extension will affect NAIAX traffic.
 - When C-5 Extension is built by expressway standard, NAIAX traffic will be reduced by 8,289 veh/day to 3,613 veh/day (or 37.5 to 15.7%): High Impact

- When C-5 Extension is built by national road standard with Skyway connection, NAIAX traffic will be reduced by 2,393 veh./day to 687 veh./day (or 9.8% to 4.5%) :

Minor Impact

4.5 Comparison of Cost and Implementation Schedule

1) Cost

		NAIAX	Grade Separation	C-5 Extension	
				Expressway Standard	National Road Standard
Distance/Location		4.6 km (6.5 km) <i>Note-1</i>	4 Intersections	6.52 km	6.52 km
Cost (Billion Pesos)	Civil Work	9.66	2.29	4.34	2.75
	ROW/Relocation	0.95	0.13	4.73	3.28
	Total	10.61	2.42	9.07	6.03
Government Funding (Billion Pesos)	GFS (Max)	5.00	2.42	ROW: 4.73	6.03
	ROW	0.95			
	Total (Max)	5.95			

Note: Max means maximum limit. Concessionaire may propose lower GFS.

2) Implementation Schedule

		2011	2012	2013	2014	2015	2016	2017
NAIAX	Selection of Concessionaire	ICC Board						
	Detailed Design (D/D)							
	ROW Acquisition							
	Construction							
Grade Separation	Feasibility Study (F/S)							
	Detailed Design (D/D)							
	ROW Acquisition							
	Construction							
C-5 Extension (Toll Road)	Feasibility Study (F/S)							
	ROW Acquisition							
	Selection of Concessionaire							
	Detailed Design (D/D)							
C-5 Extension (National Road)	Feasibility Study (F/S)							
	Detailed Design (D/D)							
	ROW Acquisition							
	Construction							

Note: ●●● : Bid Document Preparation

■■■ : Tendering

Major Issues of C-5 Extension Implementation

(1) Franchise Issue

- UEM –MARA has a franchise for the R-1 (Manila-Cavite Coastal Expressway) to R-3 (Skyway/SLEX) section.
- Citra Metro Manila Tollways Corp. has a franchise of Skyway/SLEX.
- Proposed C-5 Extension will connect Manila –Cavite Coastal Expressway with Skyway.
- When C-5 Extension is planned to be implemented under PPP Scheme, will open bidding be done, or the present franchise holder be granted the right for construction and O & M?
- When C-5 Extension is planned to be implemented by DPWH under conventional public work project, what would be the reaction of the franchise holder.
- It may take time to conclude what to do for the above issues, since it involves legal interpretation. Implementation of the project may be delayed.

(2) ROW Acquisition and Relocation of Project Affected Persons (PAPs)

- Quite high “negative social impact”
 - In case of Expressway standard, about 850 houses (or over 5,000 people) will be affected.
 - In case of National Road Standard, about 510 houses (or over 3,000 people) will be affected.
- Quite high RPW acquisition cost which is higher than civil work cost.

(3) Uncertainty of Implementation Schedule

Above two (2) big issues, franchise issue and ROW acquisition/resettlement issues will cause unexpected delay in project implementation.

Recommendation

- NAIAX is recommended to be implemented;
 - NAIAX is a long-term solution for drastic increase of traffic carrying capacity along NAIAX Corridor.
 - It mainly serves for NAIA Terminals related traffic.
 - NAIA is the gateway of international/domestic investors, businessmen, and tourists.
 - With NAIAX, image of the country will be improved and more investors will be attracted for investment, which will contribute to improvement of international competitiveness.
 - NAIAX will reduce traffic congestion of at-grade roads.
 - The project is ready for tendering as soon as NEDA Board approval is made.
- Grade-separation Alternative
 - Although this alternative is efficient solution at congested intersection, but does not improve the traffic condition at the sections before and after the intersection, it will not be a long-term solution.
 - Once grade-separation structures will be built, construction of an expressway later on will be practically impossible.
- C-5 Extension
 - Franchise issue should be firstly concluded.
 - Assuming that above franchise issues are solved at an appropriate timing, completion of C-5 Extension will be middle of 2017 at the earliest (or 2 years later of NAIAX completion).
 - All kinds of efforts should be made to reduce “negative social impact.”