area, a depressed northbound connection was adopted instead of an elevated structure. To improve the accessibility of DH-2, NDC is proposing to develop a rotunda type of intersection at the start of the project as presented in Figure 7.5.10.

Figure 7.5.8 New Building Construction Site

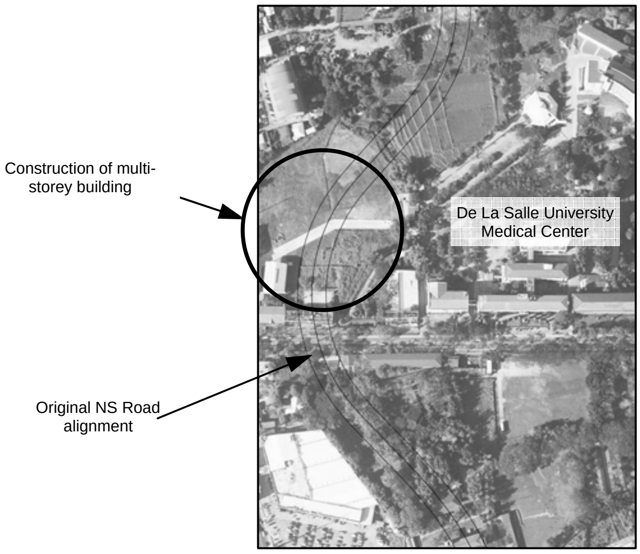


Figure 7.5.9 Final Alignment of North-South Road

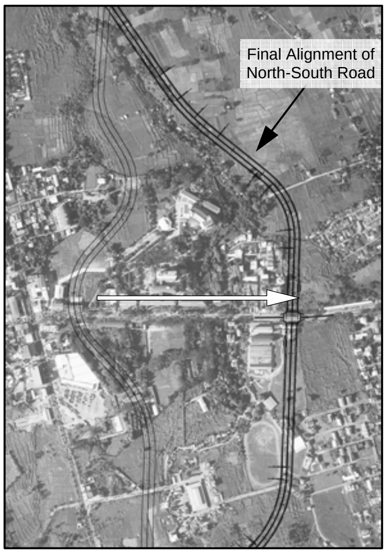
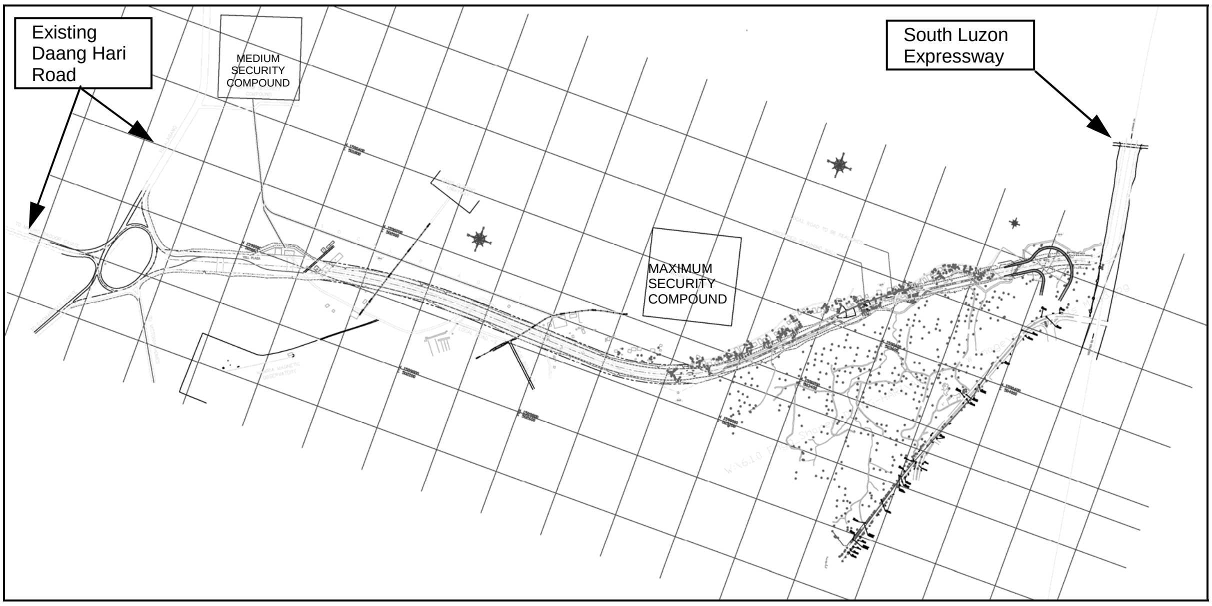


Figure 7.5.10 DH-2 Design Prepared by NDC



<u>Extension to Tanza</u>

The original alignment of the westward extension to Tanza runs along the alignment of the irrigation canal. The Anabu property and Crystal Place requested that to reduce the area affected, the project instead make use of the irrigation canal by covering the irrigation canal to form as roadway of the Daang Hari. The request was accommodated when the coordination work with the National Irrigation Administration post no objection to the covering of the canal provided that manholes be provided for maintenance purposes. The latest request from

Crystal Place is for the reduction of the ROW width to 20 meters including the covered canal that would reduce the level of service of Daang Hari to only four (4) lanes. Agreeing to this request would not be good to the land owners affected during the construction of the existing section along DH-3 and the land owners for the extension to Tanza using a road ROW width of 30 meters to accommodate six (6) lanes.

Figure 7.5.11 DH-4 Alignment at Crystal Place Area

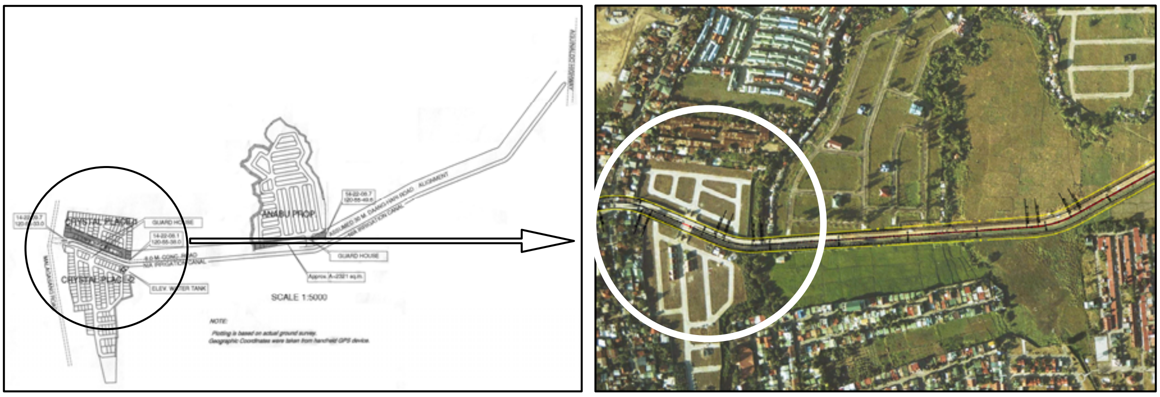
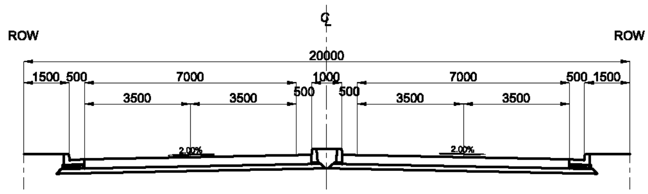


Figure 7.5.12 Reduced Typical Cross Section of 10 m ROW



3) CALA Expressway (CE)

For the southernmost sections of the proposed CALA Expressway, the ideal alignment from a technical standpoint needs to be adjusted, as follows:

<u>Ayala Westgrove Heights</u>

The original scheme would traverse and split a planned residential area which has completed its site development works. A feasible alternative is to shift the alignment slightly south, as the land there is still open and undeveloped (Figure 7.5.13). However, further investigation maybe required due to the steep topography. The additional construction cost has to be offset against higher ROW price.

<u>Intersection with the Sta. Rosa-Tagaytay Road</u>

The CE segment of the proposed CALA Expressway will intersect the existing Sta. Rosa-Tagaytay Road and Brittany Roads at an acute angle. Ayala Land Incorporated (ALI) representative informed the Study Team of their planned Spine Road connecting Greenfield and Laguna Technopark running close to the intersection of CE and the Sta. Rosa-Tagaytay Road. ALI requested that the exact alignment be established including the configuration of the interchange to be adopted in order that the needed area could be reserved in their property. Because of the configuration of the intersection involving four (4) major roads, a complicated and multi-level type of grade separation might be necessary which shall affect the area owned by different land owners. To avoid future problems in the implementation of CE, the original alignment was slightly moved southward and a simple roundabout type of intersection is recommended (see Figure 7.5.14) in view of the following: (i) the area affected will be owned by ALI; (ii) this satisfies all movement of the intersecting road and (iii) it could serve traffic for the next 25 years. The scheme, however, will also necessitate the adjustment of the Sta. Rosa-Tagaytay Raod as it approaches the rotunda still within the property of ALI. This design scheme allows CE-1 to be built initially at-grade, and for a flyover to be built later, on top of the roundabout, when traffic volume increases.

Figure 7.5.13 Alignment Adjustment at Westgrove Area to be developed by Ayala Land

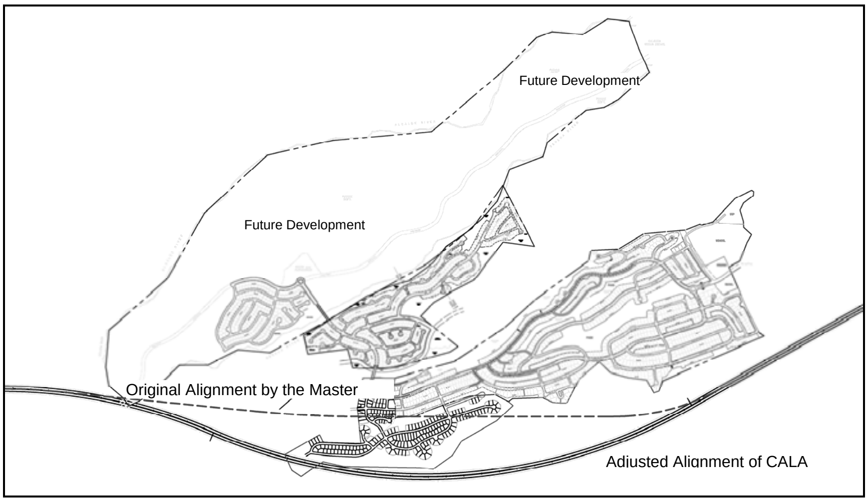
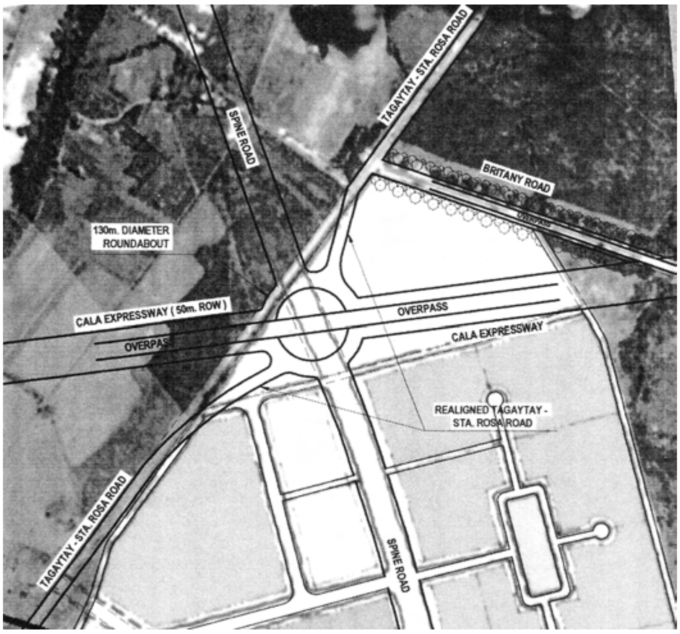


Figure 7.5.14 Roundabout with Flyover Option



Connection to SLEX

From a network standpoint and CALA region development, the CALA Expressway should connect to the SLEX via an upgraded interchange at ABI-Greenfield (Malitlit interchange) in Sta. Rosa, Laguna (Figure 7.5.15). This will enable greater integration of the economy of the two provinces.

The alignment of CE from the intersection with Sta. Rosa-Tagaytay Road to SLEX would traverse several properties (Greenfield Development, Greenfield Heights, Brittany, Tirol, UST) in various stages of development. This alignment is still under study as the various landowners and developers, together with their respective consultants/planners are not cooperative in providing their plans and meet with the Study Team. It is at this section of the project roads that the property owners are aggressive in initiating the implementation of necessary road infrastructures to support their development plans. So far, the property owners in close coordination with concerned government agencies have undertaken the following:

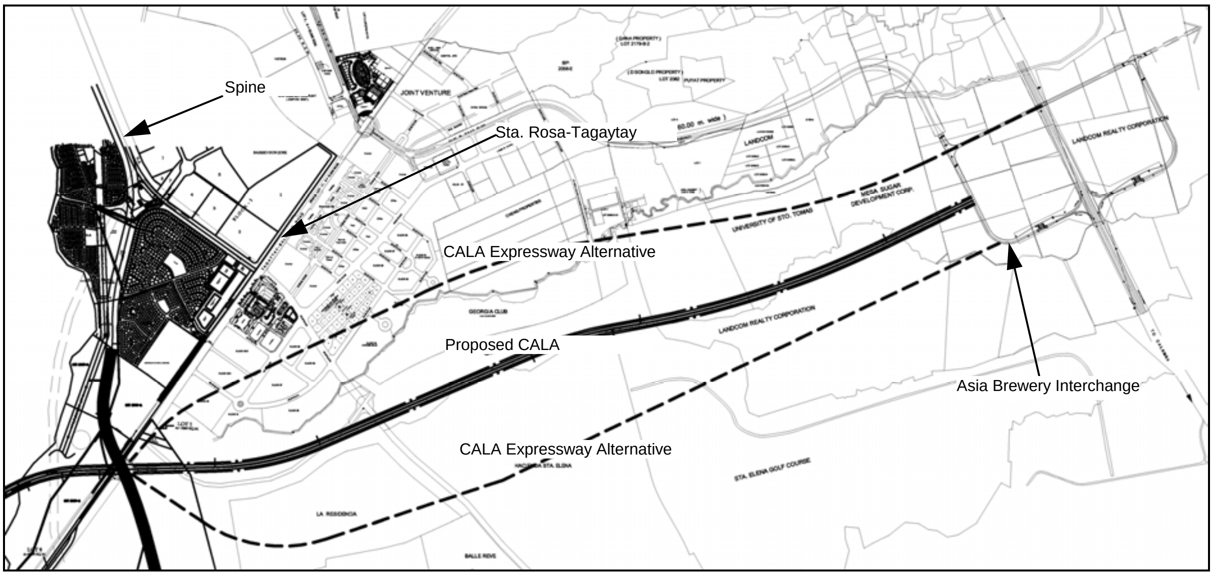
- provide the necessary road ROW of the construction of the Sta. Rosa-Tagaytay Road (no official turnover yet);
- design and finance of the construction of the Mamplasan and Asia Brewery Interchange with SLEX;
- plan a wide spine road with a 50 meter ROW from Mamplasan and Asia Brewery Interchange to the Sta. Rosa-Tagaytay Road;
- finance the construction of the Spine Roads undertaken by the DPWH; and
- Spine Roads will be the backbone of their road network for the development of their property.

Based on the above, the development of their property was well planned with good connections to SLEX. The defects of their plans, however, are the following:

- The spine roads were constructed using the old standard;
- The increase of axial loads allowed for trucks would result to early deterioration of the pavement structure;
- The property owners don’t have the capability to properly maintain the roads;
- Too much dependence on SLEX as connection to Metro Manila;
- Critical problems of SLEX sections between Bicutan and Alabang;
- No good alternative roads towards Metro Manila in the event that SLEX is congested.

In view of the above, the development of the CALA Expressway will provide relief and reduction to the above cited effects. This issue, however, remains unsolved so far. Further discussions are needed to reach consensus among stakeholders.

Figure 7.5.15 Proposed Alternative Alignment of CE-1 Section



7.6 Structural Design

Bridges and culverts should be planned at separate grade intersections, river, stream, and any water crossings in the preliminary design of the study. Standard structures in the country such as AASHTO girders and standard structures of DPWH will be preferentially applied for their economic advantage.

7.6.1 Applicable Design Standards

DPWH Standard Specification for Highway Bridges 16th Edition, 1996 are adopted in the preliminary design of project roads. In addition, the DPWH Advisory for Seismic Design of Bridges, Department Order No.75 specifying for earthquake analysis and AASHTO Guide Specification for Seismic Design will be considered.

Loading conditions to be applied in the preliminary design such as dead load, live load, wind, thermal forces, seismic force and stream current are established and explained in below.

Loading Conditions

1) Dead Load

The following unit weights shall be used in computing dead load:

Material	Unit Weights
Steel or Cast Steel	76.91 kN/m^3
Cast Iron	70.63 kN/m^3
Aluminum alloys	27.47 kN/m^3
Plain or Reinforced Concrete	24.00 kN/m^3
Compacted sand, earth, gravel	18.00 kN/m^3
Saturated Earth or Water	9.81 kN/m^3

2) Live Load

The standard live load applicable for bridge design in trunk highway in the Philippines is HS20-44 in accordance with AASHTO Specification.

3) Wind Load

The design storm frequency considered desirable for application in the Philippines is 50 years for bridge design. The table below applicable in the Study shows the wind loads based on the design wind velocity of 160.9 km/h (44.7 m/sec).

Wind Loads for Superstructure Design

Combination of Loads	Group II & V	Group III & VI	
Direction	Lateral (kN/m^2)	Lateral (kN/m^2)	Lateral (KN/m)
	2.39	1.68	1.46

4) Thermal Forces

The following range of temperatures which was determined based on thermal records of the maximum, minimum and mean temperatures in the Project area obtained from PAGASA (Philippine Atmospheric, Geophysical and Astronomical Service Administration) shall be applied in this Study. It is identified that basic temperature range for thermal force for superstructure design will be 21°C to 35°C.

5) Seismic Load

In principal, Division I-A Seismic Design in Standard Specifications for Highway Bridges, 16th Edition, 1996 shall be applied with DPWH Department Order No.75 regarding seismic design of the bridges. Basic parameters in Seismic Design are as follows:

Seismic Load for Superstructure Design

Items	Basic Parameters
Acceleration Coefficient	0.40
Importance Classification	I
Seismic Performance Category	D

The other factors such as Site Coefficient and Response Modification Factors shall be followed in accordance with Articles 3.5 and 3.6 in the Specifications.

It is noted that Highway Bridge Design Specification Vol. IV: Seismic Design by Japan Road Association (JRA) shall be applied for Liquefaction Study in foundation design.

6) Stream Current

Force due to stream current and buoyancy shall be calculated in accordance with Articles 3.156 and 3.157 DPWH Design Guidelines, Criteria and Standard, and AASHTO Division I, Articles 3.18 & 3.19.

7) Impact

The amount of this allowance or increment of load is expressed as a fraction of live load stress, and shall be determined by the formula in accordance with DPWH Design Guidelines:

a. For HS20-44 Loading, the impact requirement is as follows:

$$\frac{15.24}{L+38} = \frac{15.24}{L+38} \quad \text{(maximum 30 percent)}$$

where: I = impact fraction
L = length in m of the portion of the span which is loaded to produce the maximum stress in the member.

b. For LRT System, the impact requirement is expressed as:

$$I = 100L/(L+D)$$

where: L = total live load on the member for which the computations are being made
D = dead load applicable for the member for which computations are being made.

7.6.2 Applicable Structure Types

(1) Bridge Length and Span Length

A total bridge length and minimum span length for river crossings determined by using several empirical formulae as stipulated below will be one of the reference values as well as the existing length.

a) Desirable Total Bridge Length (Water Surface Width)

$Lt = 3.3^{※1} \sim 4.9^{※2} \cdot Q^{1/2}$

Where: Q = Flood Peak Discharge with 50 year return period (m^3/sec)
Lt = Desirable bridge length in linear meter
※1: For streams with relatively scour-resistant banks
※2: For shifting alluvial channels

b) Minimum Span Length

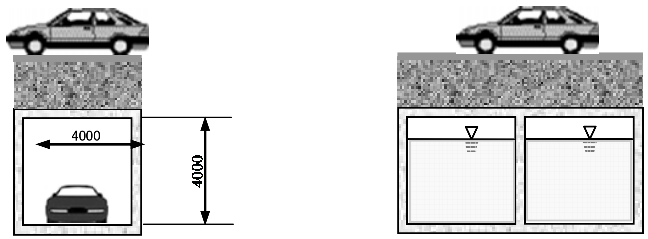
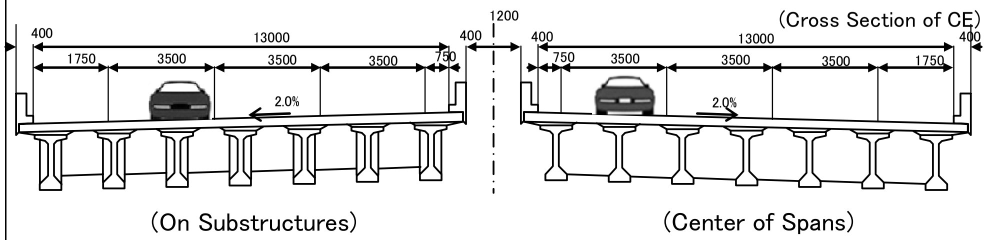
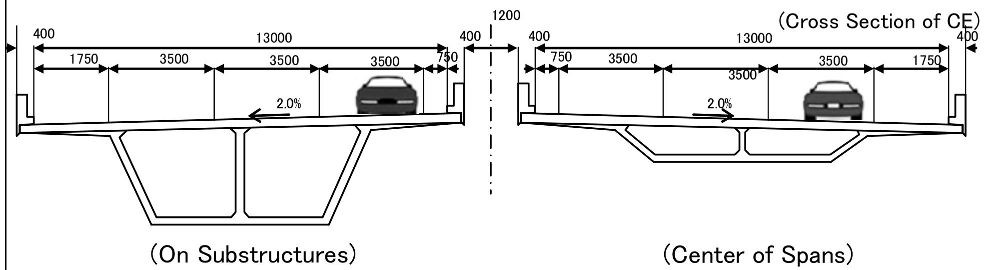
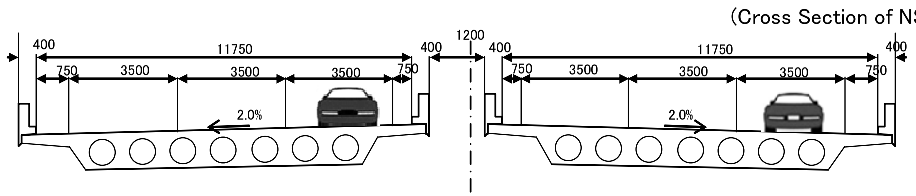
$Ls = 20 + 0.005\,Q$

Where: Ls = minimum span length in linear meter
Q = peak discharge (m^3/sec)

(2) Bridge Superstructure

Major structure types for river crossings and flyovers to be considered in the preliminary design are summarized in Table 7.6.1. Box culvert, AASHTO girder (post tensioned pre-stressed girder), PC box girder or PC hollow slab are to be basically applied in accordance with required span length, horizontal curve radius, vertical clearance, flood discharge, topography and others conditions.

Table 7.6.1 Basic Applicable Structure Type and Typical Cross Section

Structure Type	Purpose	Applicable Span/Size	Typical Cross Section
RC Box Culvert (Single, Double and Triple Cell)	Small waterways, stream, overpass	1.5 m < H < 5.0 m (Height) 1.5 m < W < 5.0 m (Width, Single-Cell)	
PC Deck Girder (PCDG)	Rivers, Flyover	10m < L < 45 m	
PC Box Girder (PCBG)	Rivers, Flyover	50 m < L < 100 m	
PC Hollow Girder (PCHG)	Flyover, Rivers	20 m < L < 30 m	

AASHTO Girder (PC pre-cast girder)

The AASHTO standard types of PC girders are considered first and foremost for the major river crossing and flyover structures with the following advantages:

- Familiar type of superstructure in the Philippines
- Easy fabrication at site
- Possibility of girder erection during daytime and nighttime
- Comparatively cheaper

These AASHTO girders are applied to the bridge spans from 20 m to 45 m. However, it is commonly known in the past studies that the total bridge construction cost will be minimal at applying span of around 30m for continuous spans.

PC Box Girder

PC Box girder was employed for long spanned structures as a result of geometric alignment. This type of super-structure has been adapted in various highway projects of the Government with similar local site conditions.

PC Hollow Girder

Cast in situ PC hollow type girders were employed for flyovers where the horizontal curve doesn’t allow applying the straight PC pre-cast girders.

(3) Substructures and Foundations

Substructures are planned as reinforced concrete structures, and their shapes are arranged and categorized according to the alignment of expressways and the widening schemes of at-grade national highways.

For planning the foundations, boring survey has been conducted. For the type of pile foundations, bored hole pile (Φ1.0 m to Φ1.0 m) is adopted for instead of driven pile for the following reasons:

Driven pile has less resistance against lateral forces caused by seismic forces because of the weak connecting structure of pile.

The possibility of liquefaction in seashore areas including the expressway alignment was pointed out by PHILVOCS. In this area, bored hole piles with higher resistance against lateral forces are preferable to driven piles.

During the construction of driven piles, the driving hammer creates noise and vibration. Because of this, the DPWH generally recommends the use of bored hole piles in Metro Manila.

(4) Box Culvert

Box culverts were planned for waterway with relatively small discharge and underpass for existing minor road at embankment road section.

(5) Descriptions on Particular Crossing Facilities

The crossing facilities of the study are tabulated on in Table 7.6.2 followed by descriptions on major structures.

Table 7.6.2 Structure Schedule

(1) Bridges and Flyovers

Road No.	Structure ID.	Station No.		Bridge Length	Span Arrangement	Type of Superstructure	Remarks
		Start	End	(m)	(m)		
NS-1	NB-1	0+755	1+210	455	13@35	PCDG	Junction Ramp at R-1
	NB-2	1+593	2+300	707	7@30+45+8@31.5+50+5@30	PCDG	Aguinaldo Hwy Flyover
NS-3	NB-3	8+500	9+145	645	12@25+45+12@25	PCHS, PCDG	Citta Italia Subdivision Viaduct
	NB-4	9+380	9+420	40	40	PCDG	Creek
NS-4	NB-5	12+810	13+095	285	5@30+45+3@30	PCDG	Daang Hari Flyover
	NB-6	14+615	14+945	330	11@30	PCDG	Orchard Club Flyover+River
	NB-7	15+210	15+500	290	3@30+2@25+5@30	PCDG	Creek+Barangay Rd. Flyover
	NB-8	15+935	16+235	300	10@30	PCDG	Salitran-Salawag Rd. Flyover
	NB-9	19+830	20+360	530	10@30+45+35+5@30	PCDG	Aguinaldo Hwy Flyover
NS-5	NB-10	20+525	20+615	90	3@30	PCDG	Dasmarinas River Viaduct
	NB-11	21+410	21+500	90	3@30	PCDG	Dasmarinas River Viaduct
	NB-12	21+590	21+740	150	5@30	PCDG	Dasmarinas River Viaduct
	NB-13(a)	22+105	22+600	495	11@25+2@30+40+4@30	PCHS, PCDG	Dasmarinas River, Governors Drv. Flyover
	NB-13(b)	22+105	22+330	225	9@25	PCHS	Rampway to Governors Drv.
	NB-14	26+525	26+635	110	25+2@30+25	PCDG	Creek
CE-1	CB-1	3+356	4+966	1610	54@25+4@35+4@30	PCHS, PCDG	Brittani Subdivision Viaduct, Sta.Rosa-Tagaytay Rd. Flyov
CE-2	CB-2	5+320	5+360	40	40	PCDG	Creek
	CB-3	6+700	6+760	60	2@30	PCDG	Creek
	CB-4	7+225	7+540	315	2@30+34+7@30	PCDG	Creek
	CB-5	7+785	7+925	140	35+70+35	PCBG	Creek
	CB-6	7+970	7+250	280	8@35	PCDG	Creek
	CB-7	8+600	8+728	128	4@32	PCDG	Creek
	CB-8	9+035	9+130	95	30+35+30	PCDG	Creek
	CB-9	9+145	9+385	240	3@35+45+3@30	PCDG	Creek
	CB-10	10+455	10+500	45	45	PCDG	Creek
	CB-11	10+610	10+730	120	4@30	PCDG	Creek
	CB-12	12+850	12+925	75	30+45	PCDG	Creek
	CB-13	13+733	13+778	45	45	PCDG	Creek
	CB-14	14+050	14+547	497	4@30+3@35+2@43+2@33+4@30	PCDG	Aguinaldo Hwy. Flyover, River
CE-3	CB-15	14+787	15+117	330	11@30	PCDG	Creek
	CB-16	16+405	16+555	150	5@30	PCDG	Creek
CE-4	CB-17	18+710	18+870	160	4@40	PCDG	Creek
DH-3	DB-1	4+840	4+865	25	25	PCDG	Creek
	DB-2	5+225	5+250	25	25	PCDG	Creek
	DB-3	5+625	5+655	30	30	PCDG	Creek
	DB-4	6+030	6+055	25	25	PCDG	Creek
	DB-5	8+790	8+830	40	40	PCDG	Creek
DH-4	DB-6	11+972	12+012	40	40	PCDG	Creek
	DB-7	14+025	14+055	30	30	PCDG	Creek
	DB-8	15+777	15+827	50	20+50	PCDG	Creek
	DB-9	16+323	16+563	240	8@30	PCDG	Creek

(2) Minor Waterways and Under/Overpass

Road No.	Structure ID.	Station No.	Type of Structure	Size of Structure (m)	Remarks
NS-1	NM-1	1+240	RCBC	4x4	Underpass
NS-3	NM-2	12+210	RCBC	3x3 2-Cell	Waterway
	NM-3	12+680	RCBC	3x3 2-Cell	Waterway
NS-4	NM-4	13+195	RCBC	4.5x2.75	Waterway
	NM-5	13+750	RCBC	5x5 2-Cell	Waterway
NS-5	NM-6	22+830	RCBC	3x3 2-Cell	Waterway
CE-2	CM-1	6+015	RCBC	4x4	Underpass
	CM-2	7+675	RCBC	4x4	Underpass
	CM-3	8+380	PCDG	2@20 2-Span	Ovepass Bridge
	CM-4	9+710	PCDG	2@20 2-Span	Ovepass Bridge
	CM-5	10+180	PCDG	2@20 2-Span	Ovepass Bridge
	CM-6	10+540	RCBC	3x3 2-Cell	Waterway
	CM-7	11+940	RCBC	3x3 2-Cell	Waterway
	CM-8	12+240	RCBC	3x3 2-Cell	Waterway
	CM-9	12+520	PCDG	2@20 2-Span	Ovepass Bridge
	CM-10	13+080	RCBC	4x4	Underpass
	CM-11	13+470	RCBC	4x4	Underpass
	CM-12	15+500	RCBC	4x4	Underpass
	CM-13	15+850	RCBC	1.5x1.5 2-Cell	Waterway
	CM-14	16+700	RCBC	5x5 2-Cell	Waterway
	CM-15	17+120	RCBC	4x4	Underpass
	CM-16	17+405	RCBC	3x3 2-Cell	Waterway
CE-3	CM-17	17+960	RCBC	4x4	Underpass
CE-4	CM-18	19+300	RCBC	4x4	Underpass
DH-2	DM-1	8+180	RCBC	5x5 2-Cell	Waterway
DH-3	DM-2	9+420	RCBC	1.5x1.5 2-Cell	Waterway
	DM-3	9+750	RCBC	1.5x1.5 2-Cell	Waterway
	DM-4	10+130	RCBC	3x3 2-Cell	Waterway
	DM-5	10+410	RCBC	5x5 2-Cell	Waterway
	DM-6	10+865	RCBC	1.5x1.5 2-Cell	Waterway
	DM-7	11+485	RCBC	1.5x1.5 2-Cell	Waterway
	DM-8	12+135	RCBC	3x3 2-Cell	Waterway
	DM-9	12+920	RCBC	3x3 2-Cell	Waterway
	DM-10	13+680	RCBC	1.5x1.5 2-Cell	Waterway
	DM-11	13+915	RCBC	1.5x1.5 2-Cell	Waterway
	DM-12	15+305	RCBC	3x3 2-Cell	Waterway
	DM-13	16+670	RCBC	1.5x1.5 2-Cell	Waterway
	DM-14	17+635	RCBC	1.5x1.5 2-Cell	Waterway
	DM-15	18+165	RCBC	1.5x1.5 2-Cell	Waterway
	DM-16	19+400	RCBC	1.5x1.5 2-Cell	Waterway
	DM-17	19+510	RCBC	1.5x1.5 2-Cell	Waterway
	DM-18	20+235	RCBC	1.5x1.5 2-Cell	Waterway

Note: PCDG:PC Deck Girder
PCHS:PC Hollow Slab
PCBG:PC Box Girder
RCBC:RC Box Culvert

<u>North-South Road</u>

- Talaba Flyover

Talaba Flyover is 20 spans PCDG bridge .The total length of the bridge section is 642 m. The flyover crossing Gen. Evangelista Road and Aguinaldo Highway then landing on Molino Boulevard which is presently under construction. The flyover runs through above the existing four lane road connecting aforesaid two roads. The structure shall keep vertical clearance of 5.1 m for those three roads.

- Citta Italia Flyover

The flyover crosses three existing roads and a river within and vicinity of Citta Italia subdivision. This flyover is planned to be PCHS with 25 m span for whole stretch except for the one span that across over the existing bridge by 45 m span PCDG.

- Daang Hari Flyover

The flyover with at-grade intersection was planned to provide an access to Daang Hari. Total length of the bridge section is 312 m.

- Salitran Flyover

The flyover crosses Salitran-Salawag Road. A combination of PCHS for smaller horizontal curve section on access section and PCDG for straight section including crossing point is applied.

- San Agustin Flyover

The flyover crosses Aguinaldo Highway at the existing intersection with Don P. Campos Avenue. PCDG type superstructure is applied for the bridge section.

- Dasmariñas Viaduct

To keep a road surface elevation considering the flood water level of Dasmariñas River and a smooth driving, viaduct structure is provided for the section along the river.

- Governors Drive Flyover

This flyover crosses Dasmariñas River and Governors Drive. Due to a sharp horizontal curve applied on this section, PCHS is employed for the superstructure together with PCDG for straight section. The flyover with at-grade intersection was planned to provide an access to Governors Drive. Total length of the bridge section is 520 m.

- Dasmariñas Bridge I, II and III

These bridges are provided on the section from Governors Drive to the end of NS where the topography is rolling and deep creek is running along the project road. PCDG is applied for the bridges.

Daang Hari

- Bridges on the Section DH-3

There is an existing road on entire section of DH-3. The eastern section from Molino Boulevard has been serviced as four lane road already but the western section is still two lane, which the existing bridges on the road shall be upgraded to four lanes. Additional two lanes for those bridges will be constructed on the one side of the existing.

- River Bridges on the Section DH-4

River bridges on Daang Hari were planned with PCDG with 20 m to 40 m span.

CALA Expressway

- Bridges on the Section CE

The topography of CE-2 is rolling and several deep and wide creeks are traversing the project road. The total length of the bridges is relatively long, that some bridges are longer than 300 m. The bridges on CE-2 are designed mainly adopting PCDG. PC Box girder was applied to Malanding Bridge across Malanding River which has approximately 30 m deep creek that makes difficult to construct a pre-cast PCDG bridge.

- Silang Exit

CE traverses Aguinaldo Highway at near the Silang town proper. The diamond shaped highway interchange is planned on this junction and flyover will be provided for the through-way traffic.

- South Dasmariñas Exit

Trumpet type intersection is provided at the junction with the south end of NS.

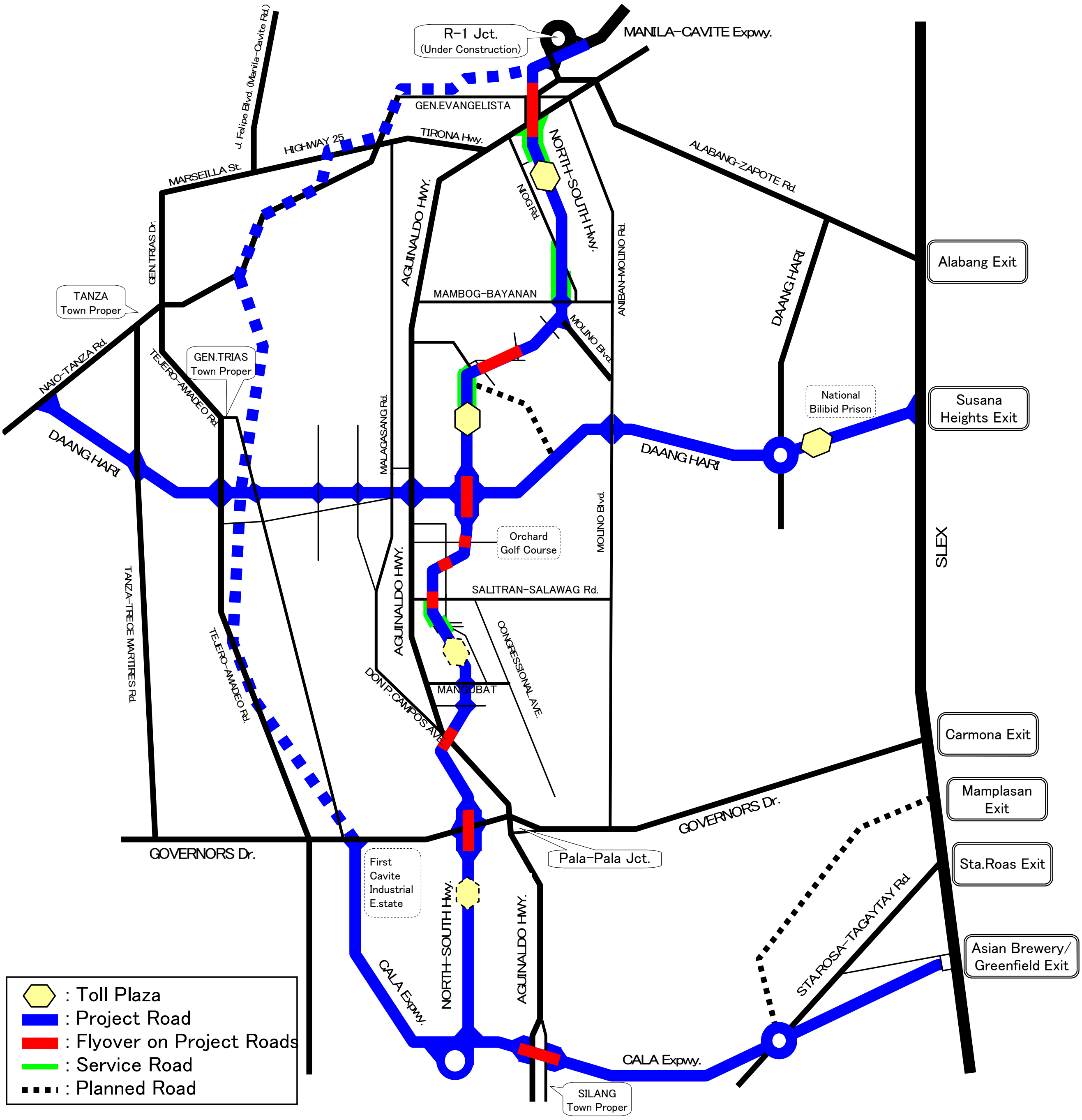
- Grade Separated Crossings on CE

There are many existing road traversed by CE.

7.7 Description of the Project Roads

Main features of the project roads and network of related existing roads are summarized in Figure 7.7.1.

Figure 7.7.1 Outline of the Project Road and Related Existing Road Network



7.7.1 North-South Road (NS)

The North-South Road (NS Road) will be linked with the existing Manila-Cavite Coastal Road at the right-angle curve, where the Coastal Road is separating from the costal line at Barangay Talaba, Municipality of Bacoor. And after running south, it will be connected with the proposed CALA Expressway (CE) at the southern end of Dasmariñas. Total length is 27.8 km, which is the longest among the proposed three routes. The design speed is established at 60 km/hr.

It shall cross over the fishpond area developed in Barangay Talaba II. In the next 8.0 km length, the NS Road will run in the most urbanized residential area among the proposed road section in the Study. The proposed alignment is located to pass by the Citta Italia Estate in between Sta.8+000 and Sta. 9+000. In addition, several new subdivision housing developments is ongoing in the vicinity. NS Road is also expected to cross over several creeks.

In terms of risk of inundation in the Study Area, as far as along the proposed road network, this section will be most susceptible considering rapid land reclamation and insufficient drainage system in the lowly lying area. Further, according to the interview to the villagers residing nearby the newly development area connected with Citta Italia Estate, his house located at Sta.9+350 is threatening by flood flow overtopping parapet wall almost every rainy season. In the channel area beside his residence, an old irrigation weir with spillway gate exists. Since the gate seems closed permanently due to lack of maintenance, the water stagnated at upstream will rise by inflow and overtop occasionally.

The DPWH, as well as the concerned LGUs, are aware of the inundation problem along the coastal area, particularly in the municipalities of Bacoor, Imus, Kawit, Noveleta, and Rasario, where the population and industries has been concentrated. The improvement of drainage system cannot catch up with the rapid land use changes that will cause acute rising of flood peak discharge and serious inundation. Comprehensive master plan for flood control of three principal rivers of Imus, San Juan and Canas is indispensable. In fact, most of all municipalities located at the lowland areas were inundated for 8 hours when the typhoon Reming has hit the area on October 28, 2000. The situation in the area becomes worse after then as such urbanization is remarkably progressive.

At Sta.12+980, the NS road crosses the Daang Hari Road (DH Road) and crosses the Aguinaldo Highway at Sta.20+160 where the elevation is approximately EL.100 m. Then, the NS runs almost in parallel with the Dasmariñas River, a tributary of the San Juan River system. It will cross near Bucal Bridge at Dasmariñas town proper, Sta.22+460. The shape of river is formed by deep valley and steep slope with a height of 30 to 50 m from riverbed and risk of flood damage will be limited as long as the present land use is enforced. Figure 7.7.2 shows the typical conditions as described above.

Figure 7.7.2 Photos showing Particular Issues along North-South Road