CHAPTER 9

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

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9.1 DESCRIPTION OF THE PROJECT

9.1.1 Background and Purpose

The proposed Cavite Laguna Expressway or CALAX (Laguna Section) has and extension of 18.1 kilometer, 4-lane, access controlled expressway that is designed to provide fast, safe, comfortable and reliable means of transport in Cavite and Laguna Provinces. The project also aims to improve access to the economic/industrial zones in CALABARZON and to boost the developmental of the area traversed.

The CALAX Project aims in the meeting the following specific objectives:

- Provide a free-flowing alternative route for the heavily congested Aguinaldo Highway, Governor's Drive and Sta. Rosa-Tagaytay Road. Serving the province of Cavite and Laguna;
- Support economic development by providing better transport access to economic/industrial zones in the area, this contributes improvement of local/foreign investments in the area;
- Support sound urbanization in the area;
- Provide a highway of international standards access controlled facility.

9.1.2 Necessity of Project

CALAX is needed from the following viewpoints;

(1) Traffic Congestion of National Roads in Cavite and Laguna Provinces

Both Cavite and Laguna Provinces are neighboring provinces of Metro Manila. The two provinces are rapidly urbanizing to accommodate spilled over population from Metro Manila. Population growth rates of the two provinces are quite high (4.76% per annum in the Cavite Province and 3.34% per annum in the Laguna Province from 2000 to 2007. Economic activities, particularly manufacturing industry, are also quite active. Thus, two provinces are within socio-economic activities of Metro Manila.

In spite of rapid urbanization, the road network development was not so significant, only widening of Aguinaldo Highway and Governor's Drive to a 4-lane road was made and a portion of Daang Hari Road was constructed in the last 20 years. Road network development was lagged behind the rapid urbanization. There are several Provincial Roads, however, that are still 2-lane roads.

Insufficient road network development is now resulting in traffic congestions of national roads and most of provincial roads.

High capacity roads which allows fast, safe, comfortable and reliable means of transport is highly needed in the areas to reduce traffic congestions in Cavite and Laguna Provinces.

(2) Economic and Social Activities in the Two Provinces

Many economic zones/industrial estates have already been operated and will be further developed in two provinces by making advantages of proximity to Metro Manila. The two provinces are now the center of manufacturing industry in the Philippines contributing to economic development of the country and generation of a lot of job opportunities.

Many universities and high schools have been transferred or established in the area, such as the Technological University of the Philippines and De La Salle in Dasmariñas, Cavite; Adventist University of the Philippines in Silang, Cavite; University of Sto. Tomas in Sta. Rosa, Laguna, etc.

Various real estate companies (land developers) are developing commercial areas and residential areas in the project areas. They have already acquired lands and some areas have been developed and have been sold out or are selling lands/lots they developed. It is expected that their lands will be sold out within 10 to 15 years and will be fully urbanized.

Above development will stimulate economic and social activities in the two provinces, thus transport network to support such economic and social activities is definitely needed.

(3) Urbanization

As mentioned in (2) above, urbanization of the area is lead by the private sector, particularly by land developers. With the lack of land development master plan by the Government, and developers only plan within their own properties and transport access to/from their properties is only made to the existing roads and/or existing expressway.

Sound urbanization should be guided/lead by the proper road network. National road network in the area of Laguna section is quite scarce, thus CALAX is needed to be planned to guide/lead sound urbanization of the area.

(4) Lack of Public Roads

The area of Laguna section lacks public roads which are only Aguinaldo Highway, Governor’s Drive and Sta. Rosa – Tagaytay Road. Instead, there are many private roads developed by land developers, most of which are not open to the general public and only these cars allowed by the land owners can pass. Thus, the development of public roads which can be used by the general public is needed.

(5) Expressway Network

There are two expressways in Cavite and Laguna Provinces, namely SLEX and CAVITEX, however they are functioning individually and the expressway network is not formed yet. If something happens and traffic of an expressway becomes interrupted, travelers have no other choice but to select/use the congested road.

9.1.3 Project Component

The proposed CALAX (Laguna Section) is to be constructed in the provinces of Cavite and Laguna, which are part of Region IV-A. The starting point of the expressway is at Aguinaldo highway, Silang Municipality and ends at Mamplasan Interchange of SLEX, Biñan City. The proposed Project has a ROW of 50~60 meters in width, and a length of 18.1 kilometers.

TABLE 9.1.3-1 PROJECT PROFILE

Project Name	Cavite Laguna Expressway Project: Laguna Section
Project Proponent	Department of Public Works and Highways (DPWH)
Project Contents	Expressway construction through Silang,Sta. Rosa City and Biñan City
Road Length	18.1 km
Number of Lane	4-lane
ROW (width)	50~60m
Total Cost (Peso)	18.8 Billion Pesos

Source: JICA Study Team (2012)

FIGURE 9.1.3-1 ROUTE OF PROPOSED ROAD

9.1.4 Project Rational

(1) PHILIPPINE DEVELOPMENT PLAN (2011 – 2016)

Philippine Development Plan (PDP), 2011-2016 was announced in 2011. Development policies of infrastructure are as follows;

DEVELOPMENT POLICIES OF INFRASTRUCTURE

"**Accelerating Infrastructure Development"**

(1) To optimize resources and investment
- Improve project preparation, development and implementation
- Synchronize planning and budgeting
- Coordinate and integrate infrastructure initiative

(2) To attract investments in infrastructure
- Improve the institutional and regulatory environment of the infrastructure sector
- Encourage PPPs

(3) To foster transparency and accountability in infrastructure development
- Encourage stakeholder participation

(4) To adopt to climate change and mitigate the impacts of natural disasters
- Institutionalize Climate Change Act (CCA) and Disaster Risk Reduction Management (DRRM)

(5) To provide productive employment opportunities
- Adopt a labor-intensive scheme where applicable.

With regards to the transport sector, issues and challenges are established as follows;

TRANSPORT SECTOR ISSUES AND CHALLENGES

(a) Assessment and Issues
- Lack of integrated and coordinated transport network
- Overlapping and conflicting functions of transport and other concerned agencies
- Transport safety and security concerns

(b) Strategic Plan and Focus
- Adopt a comprehensive long-term National Transport Policy (NTP)
- Develop strategic transport infrastructure assets
  - Prioritize asset preservation
  - Provide access to major and strategic tourism destinations and production areas
  - Promote environmentally sustainable and people-oriented transport

(c) Develop an Integrated Multi-modal Logistics and Transport System
- Identify and develop strategic logistics corridors based on a National Logistics Master Plan
- Improve Roll-on/roll-off ship (RORO) terminal system
- Explore ASEAN connectivity through sea linkages

(d) Separate the Regulatory and Operation Functions of Transport and Other Concerned Agencies. To address the overlapping and conflicting functions of transport and other concerned agencies.

(e) Comply with Safety and Security Standards. To ensure transport safety and standards.

(f) Provide Linkages to Bring Communities into the Mainstream of Progress and Development. To promote conflict-affected and highly impoverished areas.

(2) ROAD DEVELOPMENT GOALS

Public Investment Program (PIP) (2011 - 2016) was formulated by DPWH in 2011. Goals were set as follows;

DEVELOPMENT GOALS UNDER PIP

1. Provide safe environment through quality infrastructure facilities;
2. Increase mobility and total connectivity of people through quality infrastructure resulting to improved quality of life;
3. Strengthen national unity, family bonds and tourism by making the movement of people faster, cheaper and safer;
4. Facilitate the decongestion of Metro Manila via a transport logistics system that would ensure efficient linkages between its business centers and nearby provinces;
5. Implement more Public-Private Partnership (PPP) projects for much needed infrastructure and level playing field for investment;
6. Study the mechanism for longer maintenance period for roads and bridges; and
7. Generate more transport infrastructure with minimal budget cover or contingent liabilities.

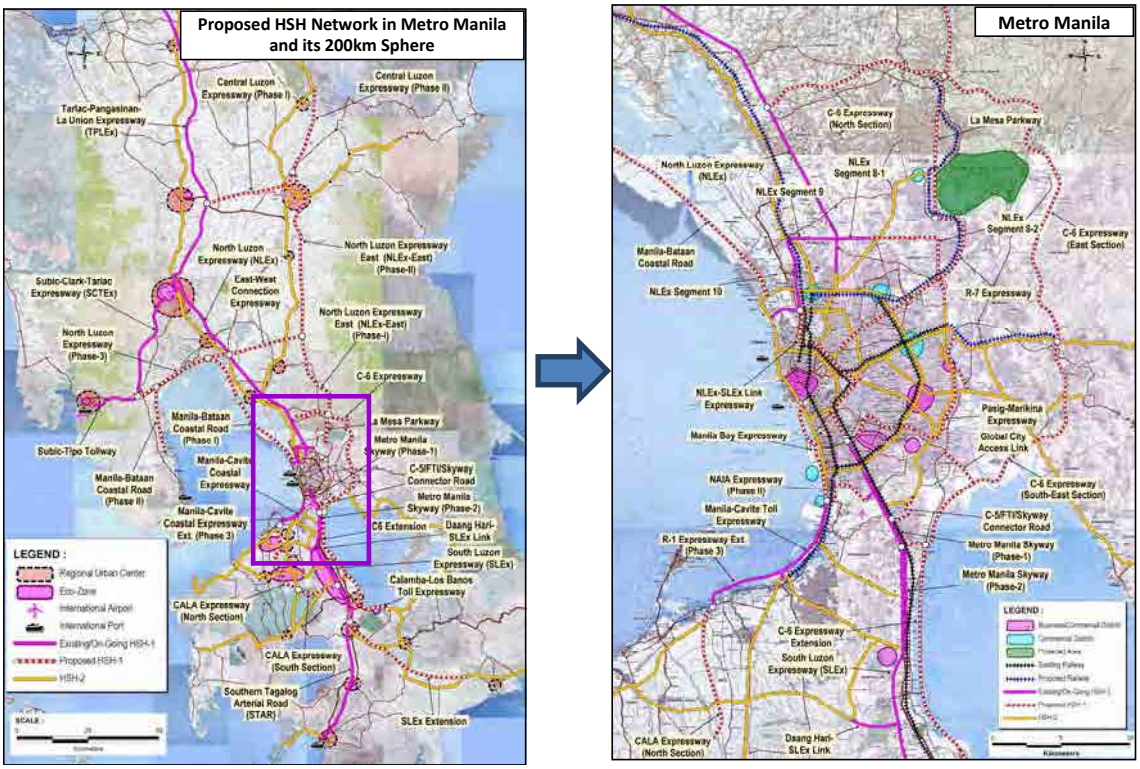
Strategic focuses were set as follows;

STRATEGIC FOCUS

- Implement activities in the following order of priorities:
  a. Maintenance or asset preservation – to preserve existing roads in good condition
  b. Rehabilitation – to restore damaged roads to their original designed condition
  c. Improvement – to upgrade road features so that they efficiently meet traffic demands; and
  d. New Construction
- Prioritize upgrading of the national road network, as to quality and safety standards
- Prioritize national roads to address traffic congestion and safety in urban centers and designated strategic tourism destinations
- Completion of on-going bridges along national roads
- Develop more Public-Private Partnership (PPP) projects for much needed infrastructure and level playing field for investments
- Study the mechanism for a longer maintenance period (5 – 10 years) in road and bridges construction contract provision
- Prioritize flood control projects in major and principal river basins to address climate change based on master plan and adopting new technologies in flood control and slope management
- Prioritize adequate flood control and upgraded drainage design standards and facilities in flood-disaster prone areas to mitigate loss of river and damage to properties
- Promote innovative technology such as geo-textiles and coco-netting in slope protection and soil erosion control
- Promote retarding basin and rain water harvesting for non-domestic use
- Prioritize water supply in designated strategic tourist destinations/centers

(3) Master Plan on High Standard Highway Network

The study of master plan on High Standard Highway (HSH) Network Development was conducted in Year 2010. **Figure 9.1.4-1** shows the proposed HSH network in Metro Manila and 200 km sphere. Based on this master plan, Public Investment Program (2011-2016) for expressway projects was formulated.



Source: The Study of Masterplan on High Standard Highway Network Development, 2010, JICA

FIGURE 9.1.4-1 PROPOSED HSH NETWORK

CALA Expressway is one of the1st priority projects in this Master plan shown in **Table 9.1.4-1**.

TABLE 9.1.4-1 PROPOSED HSH PROJECTS PRIORITY

	Name of HSH	Length (km)	Cost (billion pesos)
1st Priority Group	NLEx–SLEx Link Expressway	13.4	31.14
	CALA Expressway	41.8	19.67
	C-5/FTI/SKYWAY Connector Rd.	3.0	4.76
	NAIA Expressway (Phase 2)	4.9	12.18
	C-6 Expressway/Global City Link	66.5	54.29
	Central Luzon Expressway(CLLEX)	63.9	29.23
	SLEx Extension (to Lucena)	47.8	16.45
	Calamba-Los Banos Expressway	15.5	5.23
	Sub-total	256.8	172.95
2nd Priority Group	R-7 Expressway	16.1	25.81
	NLEX East / La Mesa Parkway	103.0	38.94
	Manila – Bataan Coastal Road	70.3	72.94
	NLEX (Phase 3)	36.2	28.42
	East-West Con. Expressway	26.6	16.48
	C-6 Extension	43.6	18.61
	Manila Bay Expressway	8.0	46.54
	Pasig Marikina Expressway	15.7	49.58
	Sub-total	319.5	297.32
TOTAL		576.3	470.27

Source: The Study of Master Plan on High Standard Highways 2010, JICA

9.2 PHILIPPINES' LEGAL / POLICY FRAMEWORK ON ENVIRONMENTAL AND SOCIAL CONSIDERATION

9.2.1 Governing Laws and Regulations

Environmental related laws in the Philippines are composed of under the Presidential Decree (PD) No.1151 as environmental policy and PD No. 1152 as environmental regulation in relation to the national policy and regulation (**Table 9.2.1-1**).

TABLE 9.2.1-1 THE GOVERNED LAW ON ENVIRONMENTAL RELATED LAWS

Governed Law and Decree	Remarks
Presidential Decree (PD)No.1151	Environmental policy
Presidential Code (PD)No. 1152	Environmental regulation

Major environmental laws are made for natural resources, protection of wild life and bio-diversity, forest resources, mining, coastal and marine, ambient air, water quality, waste and disposal, land use and resettlement, conservation of historical and cultural assets, environmental assessment, and national integrated protected area system. Major environmental related laws and decrees are summarized in the table below.

TABLE 9.2.1-2 LIST OF ENVIRONMENTAL RELATED LAWS AND DECREE

Category	Law, Decree, Act	Remarks
Natural resources	Constitution Article 12. Clause 2.	Investigation of natural resources, development use
	Presidential Decree (PD) No.1198	Protection of natural environment
Protection of wild life , bio-diversity	Republic Decree No. 826	Preservation of Natural parks and establishment of wildlife protection committee
	Republic Decree No. 1086 (1954)	Prohibition of capture of Mindoro buffalo (Tamaraw)
	Republic Decree No. 6147	Preservation of Monkey Eating Eagle
	Statement No. 2141	Preservation of wilderness region
	Administrative order No.243 (1970)	Prohibition of slaughter for buffalo
Forest resources	Presidential Decree (PD) No.209	Encourage of common forest project
	Presidential Decree (PD) No. 277	Encourage of report on offender against forest law
	Presidential Decree (PD) No. 278	Procedural regulation on development application for forest resources and forest land development use
	Presidential Decree (PD) No. 331 (1973)	Sustainable forest development
	Presidential Decree (PD) No. 389	Regulation on forest recovery
	Presidential Decree (PD) No. 705 (1975)	Amendment of regulation on forest recovery
	Presidential Decree (PD) No. 865	Export of lumber (selective deforestation)
	Presidential Decree (PD) No. 953	Request of forestation
	Presidential Decree (PD) No. 1153	Decree of forestation

Category	Law, Decree, Act	Remarks
	DNR DecreeNo.78 (1987)	Regulation on permission range for felling and collection of oak, other hard wood
	DNR Decree No.79 (1987)	Establishment of foundation of forest regeneration
	DNR memorandum No.8 (1986)	Full prohibition of log export
	Notification No. 818	Diminution of forest
	Forest development bureau circular No. 13 (1986)	Full prohibition of land possession within mangrove area, river area, preservation area, wilderness area, National park, wildlife reserve, experimental forest and etc.
Mining	Presidential Decree (PD) No.1251	Prospect mining
	Presidential Decree (PD) No.463 (1974)	Mining resource development Decree
	Presidential Decree (PD) No.1189 (1979)	Land use of ex-mining site for compensation of the land owner
Coastal, marine	Presidential Decree (PD) No.600 (1974)	Prevention of marine pollution
	Presidential Decree (PD) No. 602 (1974)	Establishment for oil pollution management center
	Presidential Decree (PD) No. 979	Prevention of ocean pollution
Ambient air	Republic law No. 3931	Establishment of National air, water pollution control committee , definition of pollution and penalty
	Presidential Decree (PD) No.1181	Air pollution regulation on incidence origin of travelling
	Presidential Decree (PD) No.1160	Barangay captain Community leader on implementation of law on prevention of public nuisance
	Circulation No. 247	Appointment of highway patrol guard
	Circulation No 551	Equipment of prevention devices of motor vehicles
Water quality	Republic law No.4850	Establishment of Laguna Lake development Bureau
	Republic law No.3931	Establishment of National committee for ambient air pollution management
	Presidential Decree (PD) No.600	Establishment of Philippine coastal guard, measure for marine pollution
	Presidential Decree (PD) No.1252	Establishment of foundation for treatment of mining discharge water
	Presidential Decree (PD) No.602	Establishment of National oil pollution management center
	Republic law No.274	Pasig river pollution measures
	Republic law No. 361	Establishment of Pasig river development council
	Circulation No.712	Discharge water regulation for Manila bay and Laguna lake
	DENR Decree No. 34	Classification of water and use
	DENR Decree No. 35	Regulation on discharge water for Industrial and urban drainage
Waste disposal	Presidential Decree (PD) No. 825 (1975)	Penalty regulation on illegal dump of disposal, dirt and other wastes
	Presidential Decree (PD) No. 826 (1975)	Regulation on treatment responsibility of solid and liquid wastes by local government
	Presidential Decree (PD) No.1152 (1977)	Regulation on treatment method and treatment management for wastes
	Republic Act (RA) 6969 (1990)	An Act to Control Toxic Substances and Hazardous and Nuclear Wastes, Providing

Category	Law, Decree, Act	Remarks
		Penalties for Violations thereof , and for their Purposes
	DAO 36 Series of 2004 (DAO 04-36)	DAO 04-36 is a procedural manual of DAO 92-29, a comprehensive documentation on the legal and technical requirements of hazardous waste management
	DAO 98-50	Adopting the Landfill Site Identification and Screening Criteria for Municipal Solid Waste Disposal Facilities
	DAO 98-49	Technical Guidelines for Municipal Solid Waste Management
	RA 9003	Ecological and Solid Waste Management Act
	DAO 01-34	Implementing Rules and Regulations (IRR) of RA 9003
	AO 93-90	Creating a Project Management Office on Solid Waste Management (PTWFM) under the Presidential Task Force on Waste Management
Land use, resettlement	Constitution Article 13	Establishment of human protective committee and their responsibility
	DPWH Decree No.65	Land use procedure for public project and expressway project
	DPWH Decree No.120 (1988)	Compensation of private land for DPWH project
	DPWH Decree No.234 (1990)	Amendment of compensation of private land for DPWH project
	Revised administrative code No. 64	Competence of house of justice on private land acquisition by the government
	DPWH Decree No.65 (1983)	Guideline for land use and right of way
	Presidential Decree (PD) No. 1517	Designation of reserve area at reorganization of urban land use
	Senate article No. 328	Decree of temporally prohibition for removal of displaced persons
	Republic Act 7279 (Urban Development and Housing Act of 1992)	An act to provide doe a comprehensive and continuing urban development and housing program, establish the mechanism for its implementation, and for other purpose; Procedure for removal of habituated peoples
Land Acquisition	Republic Act 6389 (1971): The Agricultural Land Reform Code,	The agricultural lessee shall be entitled to disturbance compensation equivalent to five times the average of the gross harvests on his landholding during the last five preceding calendar years
	Executive Order (1985)	Providing the procedures and guidelines for the expeditions acquisition by the government of private real properties or rights thereon for infrastructure and other government development projects
	Republic Act 8974 (2000)	An act to facilitate the acquisition of right-of-way, site or location for national government infrastructure project and for other purposes
Human rights	Executive Order NO.153 (2002);	Instituting the national drive to suppress and eradicate professional squatting and squatting syndicates; Amending E.O.178 (1999) and E.O. 128 (1993)
	Indigenous People's Rights Act (IPRA) of 1997	sets the conditions, requirements, and safeguards for plans, programs and projects affecting Indigenous Peoples (IPs)
	NCIP Administrative Order No. 1, Series of 2006	the procedure for obtaining the "Free and Prior Informed Consent" (FPIC) for affected

Category	Law, Decree, Act	Remarks
		communities
Conservation of historical, cultural assets	Republic Decree No. 4365	Responsibility of National historic committee on authorization , restoration and maintenance for historical assets
	Republic Decree No.4346	Responsibility of protection and propulsion of maintenance for cultural assets within National museum
Environmental assessment	Presidential Decree (PD) No. 1586	Environmental assessment system and administrative organization
	Presidential Proclamation No. 2146	3 Industrial sectors with large environmental impacts and 12 environmentally critical regions
National integrated protected area system	National integrated protected area system act (1992)	Review of National integrated protected area

Source: Countries' environmental information maintenance study report; the Philippines (JICA), 1997 et al

The government of Philippine has been ratified international treaties, agreements, and protocols in relation to environmental and social consideration which are listed below.

- Washington Treaty: Convention on the international trade in endangered species of wild flora and fauna (1981)
- International tropical timber agreement (1983)
- United Nations convention on the law of the sea (1984)
- World heritage convention concerning the protection of the world cultural and natural heritage (1985)
- Montreal Protocol on substances that deplete the Ozone layer (1991)
- Vienna convention for the protection of the ozone layer (1991)
- Convention on biological diversity (1993)
- Basel convention on the control of trans-boundary movement of hazardous wastes and their disposal (1993)
- Ramsar convention on wetlands of international importance, especially as waterfowl habitat (1994)
- Framework convention on climate change (1994)
- Kyoto protocol (1998)
- Cartagena protocol on bio-safety to the convention on biological diversity (2000)
- Stockholm convention on persistent organic pollutants (2001)

9.2.2 Philippines Environmental Impact Statement System (PEISS)

In the Philippines, all private or public projects or activities which are envisaged to potentially have a negative impact on the environment are subject to environmental impact assessment (EIA) by Philippine Environmental Impact Statement System (PEISS). EIA is the preliminary analysis of the potential impacts of the project on the environment. Aware of the possible negative effects of the implementation of industrial and other activities, the Philippine

government has instituted measures to encourage the use of EIA as a planning and decision making tool.

PEISS is a set of laws, regulations, administrative orders and guidelines concerned with Environmental Impact Assessment (EIA). The following are some of the most important of these laws and guidelines:

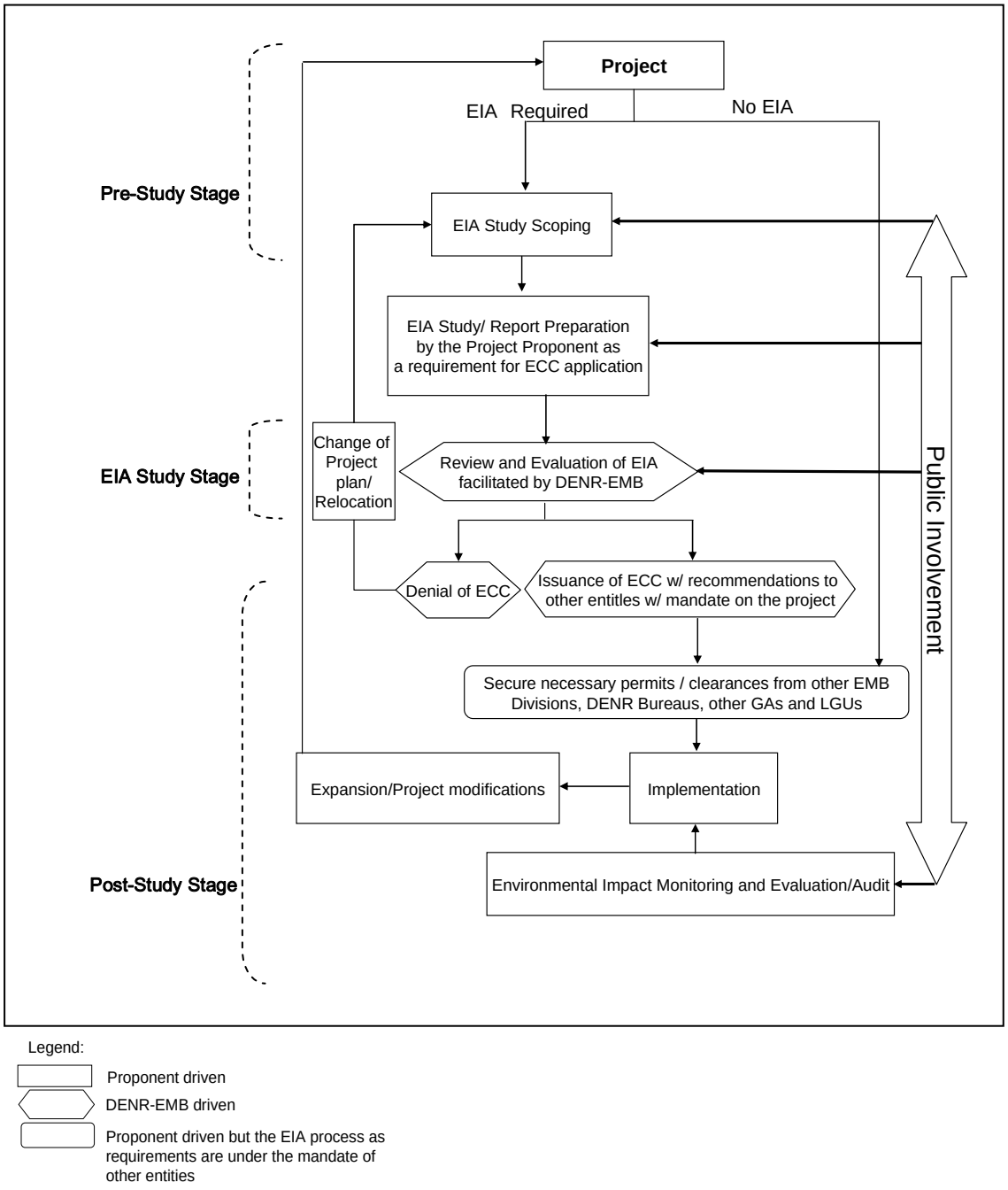
Environmental Impact Statement System (EISS), Presidential Decree No. 1586 (1978): An act establishing and centralizing the Environmental Impact Statement (EIS) System under the National Environmental Protection Council (NEPC), which merged with the National Pollution Control Commission (NPCC) in June 1987 to become the Environmental Management Bureau (EMB).

Presidential Proclamation No. 2146 (1981) and No. 803 (1996): It proclaims Environmentally Critical Projects (ECPs) to have significant impact on the quality of environment and Environmentally Critical Areas (ECAs) as environmentally fragile areas within the scope of the EIS System.

DAO 96-37 revised to become DAO 92-21 (Devolved responsibility for EIS to the EMB-Regional Office and further strengthened the PEISS. Placed emphasis on promoting maximum public participation in EIA process to validate the social acceptability of the Project.

DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2007): Provides for implementation of rules and regulations of Presidential Decree No. 1586, establishing PEISS. Also, provided detailed definitions of technical terms and detailed information regarding procedures, related laws and regulations.

The procedures of EIA can be grouped into; the following stages (as shown in the following diagram): (1) pre-study stage (screening and scoping), (2) EIA study stage and (3) post-study stage (review, decision-making and monitoring).



Source: Revised Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)(2007)

FIGURE 9.2.2-1 EIA PROCESS FLOW

9.2.3 Involuntary Resettlement and Land Acquisitions

9.2.3.1Republic Act 8974 and its implementation (IRR)

In November 2000, another law was passed by the Philippine congress to avoid delays in the implementation of development projects due to ROW acquisition-related problems. Republic Act 8974, otherwise known as "An Act to Facilitate the Acquisition of Right-of-Way, Site or

Location for National Government Infrastructure Projects and For Other Purposes" prescribed new standards for assessment of the value of the land subject of negotiated sale or expropriation proceedings, namely:

- The classification and use for which the property is suited shall be based "on the approved land use plan and/or zoning ordinance, if any, of the city concerned";
- The size, shape or location, tax declaration and zonal valuation of the land;
- The price of the land as manifested in the ocular findings, oral, as well as documentary evidence presented;
- The reasonable disturbance compensation for the removal and/or demolition of certain improvement on the land and for the value of improvements thereon;
- The development costs for improving the land (this shall be based on the records and estimates of the City or Municipal Assessor concerned);
- The value declared by the owners (as shown in their latest Tax Declaration Certificates or Sworn Statements);
- The current price of similar lands in the vicinity (This shall be based on the records on the Deeds of Sale in the Office of the Register of Deeds Concerned); and
- Such facts and events as to enable the affected property owners to have sufficient funds to acquire similarly-situated lands of approximate area as those required from them by the government, and thereby rehabilitate themselves as early as possible.

Another feature of R.A. 8974's IRR that makes ROW acquisition more acceptable to property owners is Section 10 which prescribes valuation of affected improvements and/or structures to be computed based on replacement cost method. The replacement cost of improvements/structures is defined as "the amount necessary to replace the improvements/structures, based on the current market prices for materials, equipment, labor, contractor's profit and overhead, and all other attendant cost associated with the acquisition and installation in place of the affected improvement/structures".

Compared to the previous statues, valuation of land and improvements using this legislation is by far the most equitable and practical. Adherence to these provisions would also close the gap between Philippine legislation and compliance to WB O.P. 4.12 smaller.

Shown below are other important and applicable provisions of the IRR:

- Section 4 states that any Implementing Agency which requires acquisition of ROW for its projects may explore donation as the first option;
- Sets the 1st offer for negotiated sale of land (just compensation) as the price indicated in the current zonal valuation issued by the BIR for the area where the property is located;

- Provides for the engagement of government financing institutions or private appraisers as an option to undertake appraisal of the land and/or improvements/structures, to determine its fair market value (if PAFs refused the first two offers);
- Tasked the National Housing Authority (NHA) to establish and develop informal settlers (squatter) relocation sites, including provision of adequate utilities and services

9.2.3.2Executive Order 152 (2002)

- Designated the Presidential commission for the Urban Poor (PCUP) as the sole clearing house for the conduct of demolition and eviction activities involving the homeless and underprivileged citizens.
- Mandated the PCUP to ensure strict compliance to the requirements of just and humane demolition and eviction under the UDHA of 1992 and the implementing Rules and Regulations of Section 28.

9.2.3.3DPWH Department Order No. 5, Series of 2003

- Created the Infrastructure Right of Way and Resettlement Project Management Office (IROW-PMO) and the Implementation of the Improved IROW Process;
- Implementing Office (IO) shall ensure that IROW costs are always included in project budgets;
- The IO shall provide an estimated cost breakdown of each project to the IROW-PMO and the CFMS prior to any disbursement of funds. The first priority of the budget for a project shall be all costs prior to construction (note that this includes ROW acquisition);
- If ROW costs differ from the approved ROW budget after detailed design has been finalized, a budget adjustment shall be approved;
- A Land Acquisition Plan and Resettlement Action Plan (LAPRAP) shall be prepared for all projects, whether local of foreign funded, that will require ROW acquisitions, using a standardized compensation package;
- Determination of Affected Persons (AP) and improvements shall be based on the cut-off date, which is the start of the census of APs and tagging for improvements; and
- The IO shall prepare the final as-built ROW Plan upon completion of the project, for submission to the IROW and Resettlement PMO.

9.2.3.4Land Acquisition, Resettlement, Rehabilitation, and Indigenous People's (LARRIP) Policy, 3rd Edition, (2007)

- The Land Acquisition Plan and Resettlement Action Plan (LAPRAP) document shall describe the project, expected impacts and mitigation measures, socio-economic profile of the APs, compensation package, timetable of implementation, institutional arrangements, participation, consultation, and grievance procedures;

- LAPRAP shall be prepared using inputs from the IROW Action Plan, the census and socio-economic survey conducted, detailed engineering study, and parcellary survey results;
- LAPRAP shall be the basis for qualifying and compensating APs for lands, structures and/or improvements, that are partially or fully affected by the Department's infrastructure projects; and
- Provision of resettlement sites shall be the responsibility of the Local Government Units (LGUs) concerned, with assistance from the concerned government agencies tasked with providing housing.

9.2.3.5Execuive Order 708 (2008)

EO 708 (2008) has been devolved the clearing house functions of the PCUP to the respective cities and municipalities in whose territorial jurisdiction the proposed demolition and eviction activities of government agencies are to be undertaken.

9.2.3.6Civil Code of the Philippines, Chapter 3, Prescription of Actions, Article 1141

This Article specifies the prescription of thirty (30) years for real actions over immovable objects. All lands which shall have been used by the public as a highway, airport, etc. for a period of thirty (30) years or more, shall be a highway, airport, etc. with the same force and effect as if it had been duly laid out and recorded as a highway, airport, etc. in the cadastral map.

9.2.3.7DPWH Department Order No. 187 (Series of 2002)

DO 187 requires all offices to include the cost of ROW acquisition, informal settler (squatter) relocation, and the development of a resettlement site in the total construction cost of any proposed projects.

9.2.3.8Republic Act 7160 (1991): "Local Government Code"

RA 7160 allows the local government units (LGU) to exercise the power of eminent domain for public use. The law also empowers the concerned LGU to open or close roads within its territorial jurisdiction.

9.2.3.9Republic Act 8371: "Indigenous People's Rights Act" (IPRA law)

A "certification precondition" (consent) is required from affected indigenous peoples before any land taking and/or relocation from their ancestral domain by the project. The process will be closely followed by representatives of the National Commission on Indigenous Peoples

(NCIP). The IPRA together with the "Free and Prior Informed Consent" (FPIC) guidelines of 2006, will serve as the guiding framework on addressing IP issues.

9.2.3.10 Republic Act 7279 (Urban Development and Housing Act of 1992) and its IRR

Section 5 of the Act, and Sections 3.1 and 6.6 of its Annex (Guidelines for the inventory and identification of Lands and Sites for Socialized Housing) states that lands or portions thereof, set aside by government offices, facilities, and other installations, whether owned by the National Government, its agencies and instrumentalities, including government-owned and controlled corporations, or by the Local Governments Units, but which have not been used for the purpose for which they have been reserved or set aside for the past 10 years from the effective of the Act (i.e. as of 2002) shall be covered. As such, these areas, when identified as suitable for socialized housing, shall immediately be transferred to the NHA, subject to the approval of the President of the Philippines, or by the LGU concerned, as the case may be, for proper disposition with the Act;

- Section 8 of the Act and its Annex "A" mandated all local government units in coordination with the NHA HLURB, NAMRIA, and the DENR land Management Bureau (LMB) to identify lands for socialized housing and resettlement areas for the immediate and future needs of the underprivileged and homeless in the urban areas;
- Section 6.3 of the Act's Annex sets the following criteria to be used for evaluating the suitability of sites for socialized housing:
- To the extent feasible, socialized housing and resettlement projects shall be located in new areas where employment opportunities are available;
- Priority shall be given to areas where basic services and facilities are already existing or where they can be introduced within a short time;
- Transportation costs to work places and other services should be affordable considering that the target beneficiaries are the homeless and underprivileged;
- The site shall not require excessive leveling, cutting and filling. Sites requiring excessive engineering works shall be avoided. Likewise, sites on steep slopes and/or week soil foundation shall not be considered;
- Environmentally critical areas like those that are flood prone or earthquake zones or areas near rivers and canal shall be avoided;
- Compatibility with existing zoning; and
- Financial feasibility and viability where land valuation offer is low; and
- Tenurial status.
- Section 16 of the Act provides the eligibility criteria for program beneficiaries as follows:
- Must be a Filipino citizen;
- Must be an underprivileged and homeless citizen i.e. as defined in Section 3 of the same Act, refers to beneficiaries of the Act and to individuals or families residing in urban and

urbanizing areas whose income or combined household income falls within the poverty threshold as defined by the NEDA and who do not own housing facilities, including those who live in makeshift dwelling units and do not enjoy security of tenure;

- Must not own any other real property whether in the urban or rural area; and
- Must not be a professional squatter or a member of squatting syndicates.
- Section 28 of the Act stipulates that eviction or demolition as a practice shall be discouraged; however it may be allowed under the following conditions;
- When persons or entities occupy danger areas such as esteros, railroad tracks, garbage dumps, riverbanks, shorelines, waterways, and other public places such as sidewalks, roads, parks and playgrounds;
- When government infrastructure projects with available funding are about to be implemented; or
- When there is a court order for eviction and demolition.
- In the execution of the above Section 28, the following shall be mandatory:
- Notice upon the affected persons or entities at least thirty (30) days prior to date of eviction and demolition;
- Adequate consultations on the matter of resettlement with the duly designated representatives of the families to be resettled and the affected communities in the areas where they are to be relocated;
- Presence of local government officials or their representatives during eviction or demolitions;
- Proper identification of all persons taking part in the demolition;
- Execution of eviction or demolition only during regular office hours from Mondays to Fridays and during good weather unless the affected families consent otherwise;
- No use of heavy equipment for demolition except for structures that are permanent and others of concrete materials;
- Proper uniforms for members of the Philippine National Police who shall occupy the first line of law enforcement and observe proper disturbance control procedures; and
- Adequate relocation, whether temporary or permanent; provided however, that in cases of eviction and demolition pursuant to a court order involving underprivileged and homeless citizens, relocation shall be undertaken by the LGU concerned and the NHA with assistance of other government agencies within 45 days from service of notice of final judgment by the court, after which period the said order shall be executed; provided further that should relocation not be possible within the said period, financial assistance in the amount equivalent to the prevailing minimum daily wage multiplied by 60 days shall be extended to the affected families by the LGU concerned.

9.3 RESPONSIBLE ORGANIZATIONS

9.3.1 Proponent of the Project

The proponent of the Project is the **Department of Public Works and Highways (DPWH)**.

After a long process of evolution by virtue of Executive Order No. 124, dated January 30, 1987, the Department of Public Works and Highways (DPWH) was organized with five (5) bureaus, six (6) services, sixteen (16) regional offices, twenty-four (24) project management offices, sixteen (16) regional equipment services and one-hundred eighteen (118) district engineering offices. Organization chart of DPWH is shown in **Source: JICA** *Study Team (2012)*

Figure 9.3.1-1 and the function and responsibilities pertaining to be development and management of PPP expressway projects at DPWH are presently distributed among several offices. Major players on PPP are listed below.

PMO-BOT: This Office is the project implementing office in DPWH and will be upgraded to PPP Service. It is tasked to identify and initiate projects for BOT/PPP implementation; prepare/review feasibility studies (FS) and proposals for BOT/PPP projects for approval of the NEDA-Investment Coordinating Committee (ICC); prepare bidding documents; participate in negotiations and finalization of BOT/PPP contracts; and monitor/supervise the implementation of BOT/PPP projects. Organizational chart is shown in **Source: JICA** *Study Team (2012)*

Figure 9.3.1-2**,** and **Source: JICA** *Study Team (2012)*

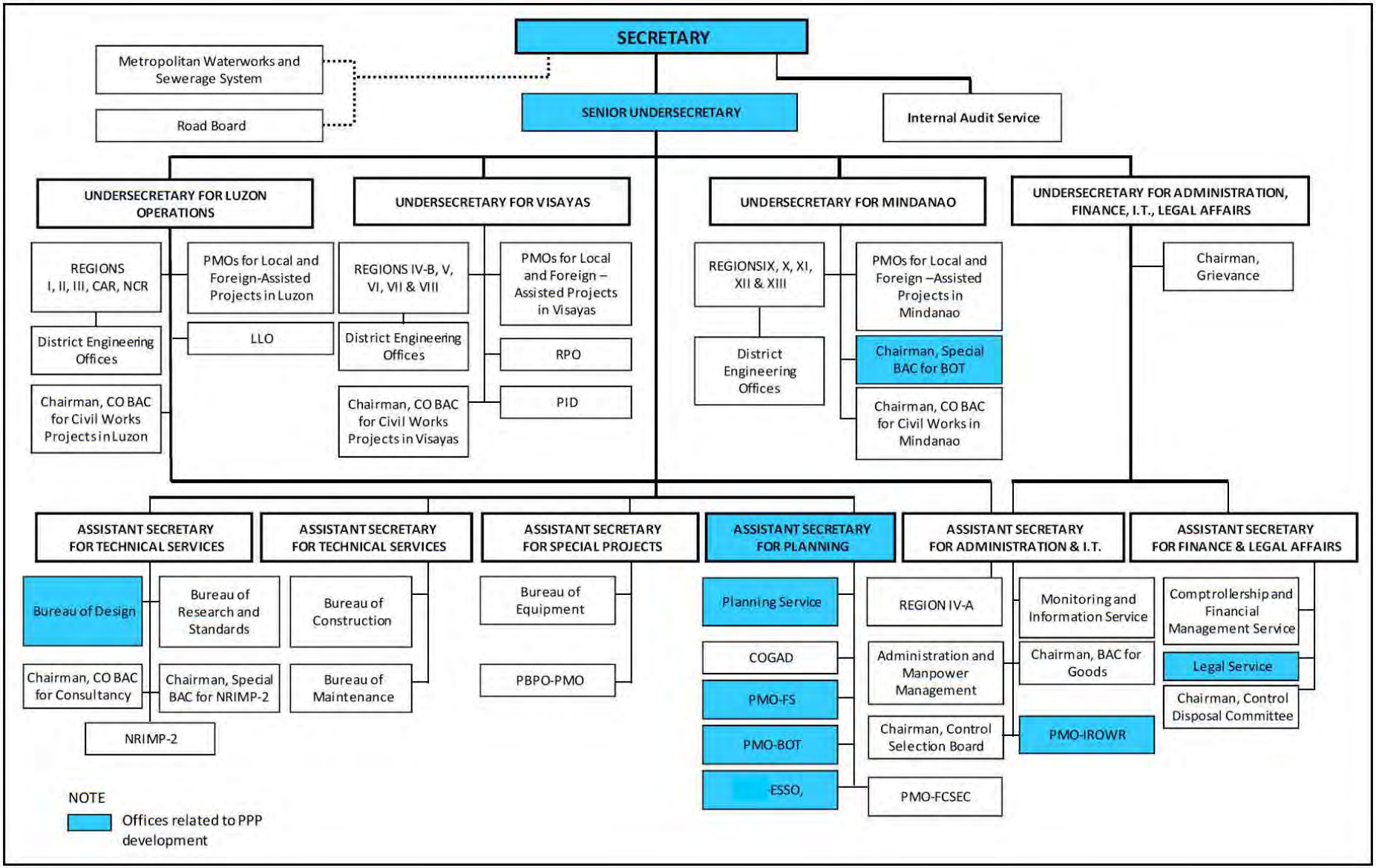
Figure 9.3.1-3 respectively.

Planning Service (PS): This Service is assigned to formulate policies, plans and programs for the development of the national road network, which includes expressways; conduct/review FS of road/expressway projects; prepare PPP proposals for ODA financing; maintain a national road database; and prepare multi-year and annual budgets for the construction (including right-of-way and engineering) and maintenance of national roads.

PMO-Feasibility Studies: This office is assigned to conduct/supervise FS of major foreign-assisted and locally-funded road and expressway projects; and assist the PS and PMO-BOT in preparing project proposals for ODA financing.

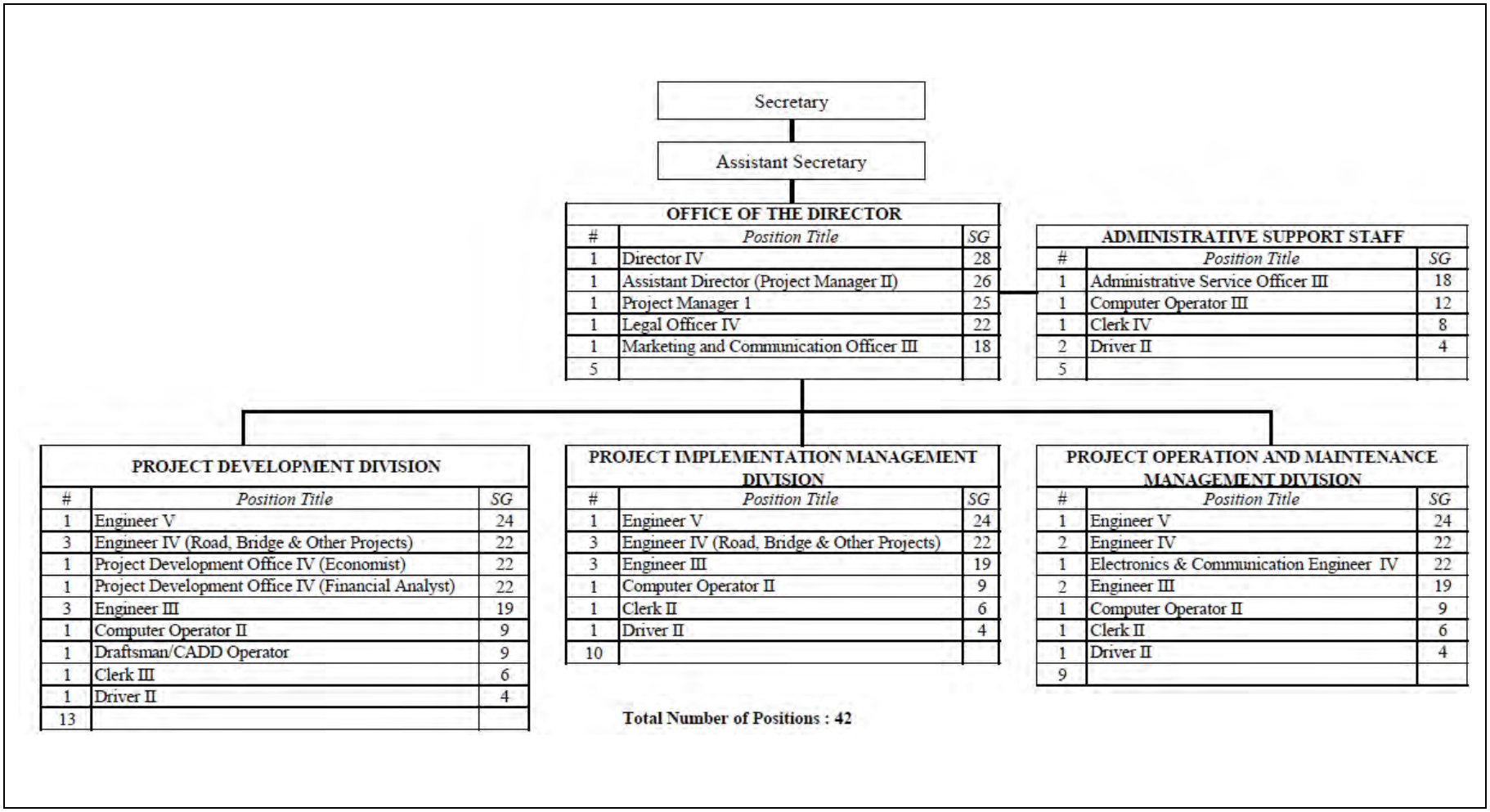
Bureau of Design (BOD): This Bureau is mandated to set engineering design standards; conduct/supervise/review/approve engineering surveys, designs and construction plans of roads/ expressways, including specifications, quantity estimates and tender documents for roads and expressways.

Environmental and Social Services Office (ESSO) and **PMO-Infrastructure Right-of-Way and Resettlement (PMO-IROWR)** are responsible on social and environmental consideration and relocation respectively. Detail of these functions is discussed in the next section. Organization chart of ESSO and its function is shown in **Figure 9.3.1-4** and **Table 9.3.1-1**, respectively. Organization chart and function of PMO-IROWR is shown in **Figure 9.3.1-5**, and **Table 9.3.1-2**.



Source: JICA Study Team (2012)

FIGURE 9.3.1-1 DPWH ORGANOGRAM



OFFICE OF THE DIRECTOR

#	*Position Title*	*SG*
1	Director IV	28
1	Assistant Director (Project Manager II)	26
1	Project Manager 1	25
1	Legal Officer IV	22
1	Marketing and Communication Officer III	18
5		

ADMINISTRATIVE SUPPORT STAFF

#	*Position Title*	*SG*
1	Administrative Service Officer III	18
1	Computer Operator III	12
1	Clerk IV	8
2	Driver II	4
5		

PROJECT DEVELOPMENT DIVISION

#	*Position Title*	*SG*
1	Engineer V	24
3	Engineer IV (Road, Bridge & Other Projects)	22
1	Project Development Office IV (Economist)	22
1	Project Development Office IV (Financial Analyst)	22
3	Engineer III	19
1	Computer Operator II	9
1	Draftsman/CADD Operator	9
1	Clerk III	6
1	Driver II	4
13		

PROJECT IMPLEMENTATION MANAGEMENT DIVISION

#	*Position Title*	*SG*
1	Engineer V	24
3	Engineer IV (Road, Bridge & Other Projects)	22
3	Engineer III	19
1	Computer Operator II	9
1	Clerk II	6
1	Driver II	4
10		

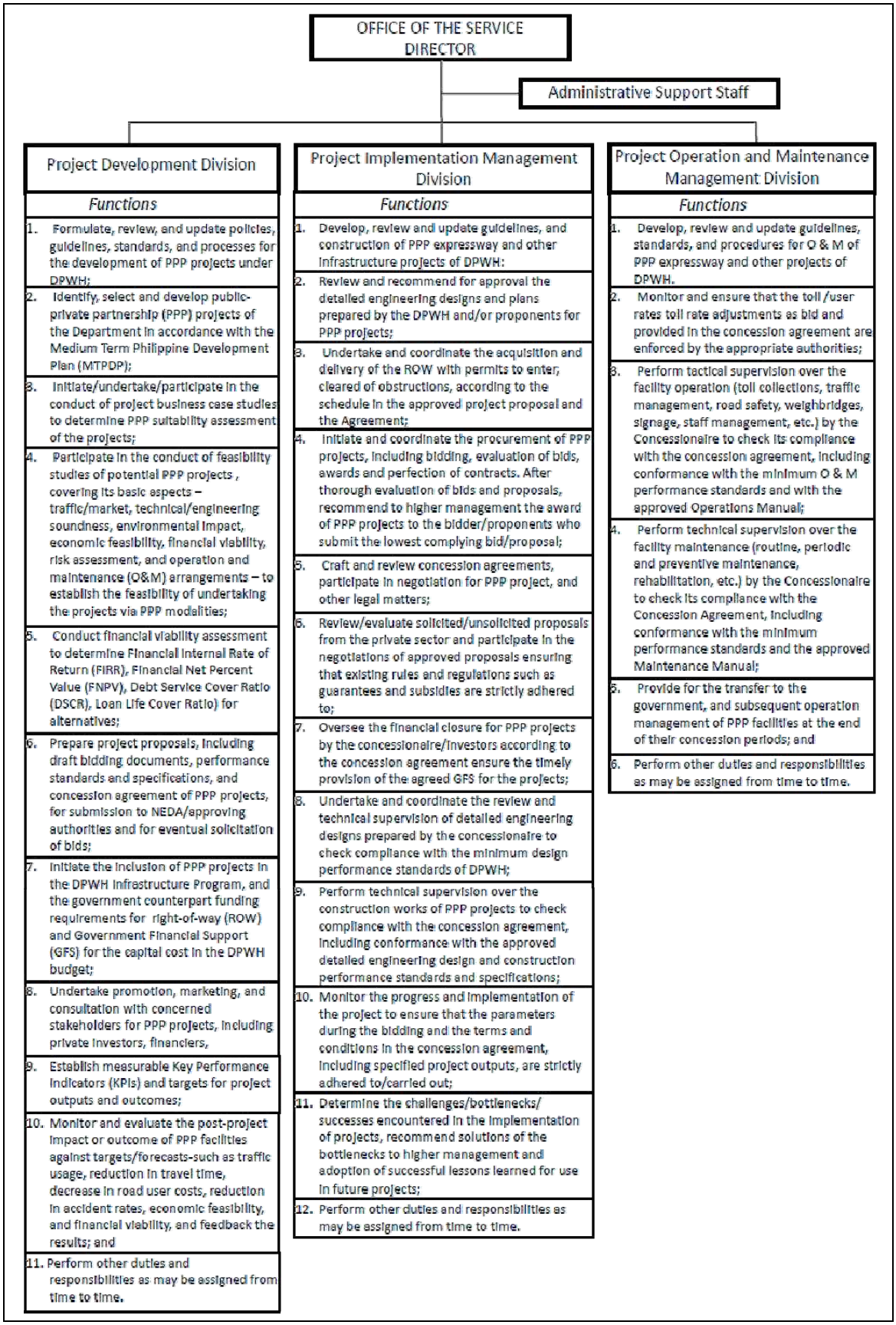
PROJECT OPERATION AND MAINTENANCE MANAGEMENT DIVISION

#	*Position Title*	*SG*
1	Engineer V	24
2	Engineer IV	22
1	Electronics & Communication Engineer IV	22
2	Engineer III	19
1	Computer Operator II	9
1	Clerk II	6
1	Driver II	4
9		

Total Number of Positions : 42

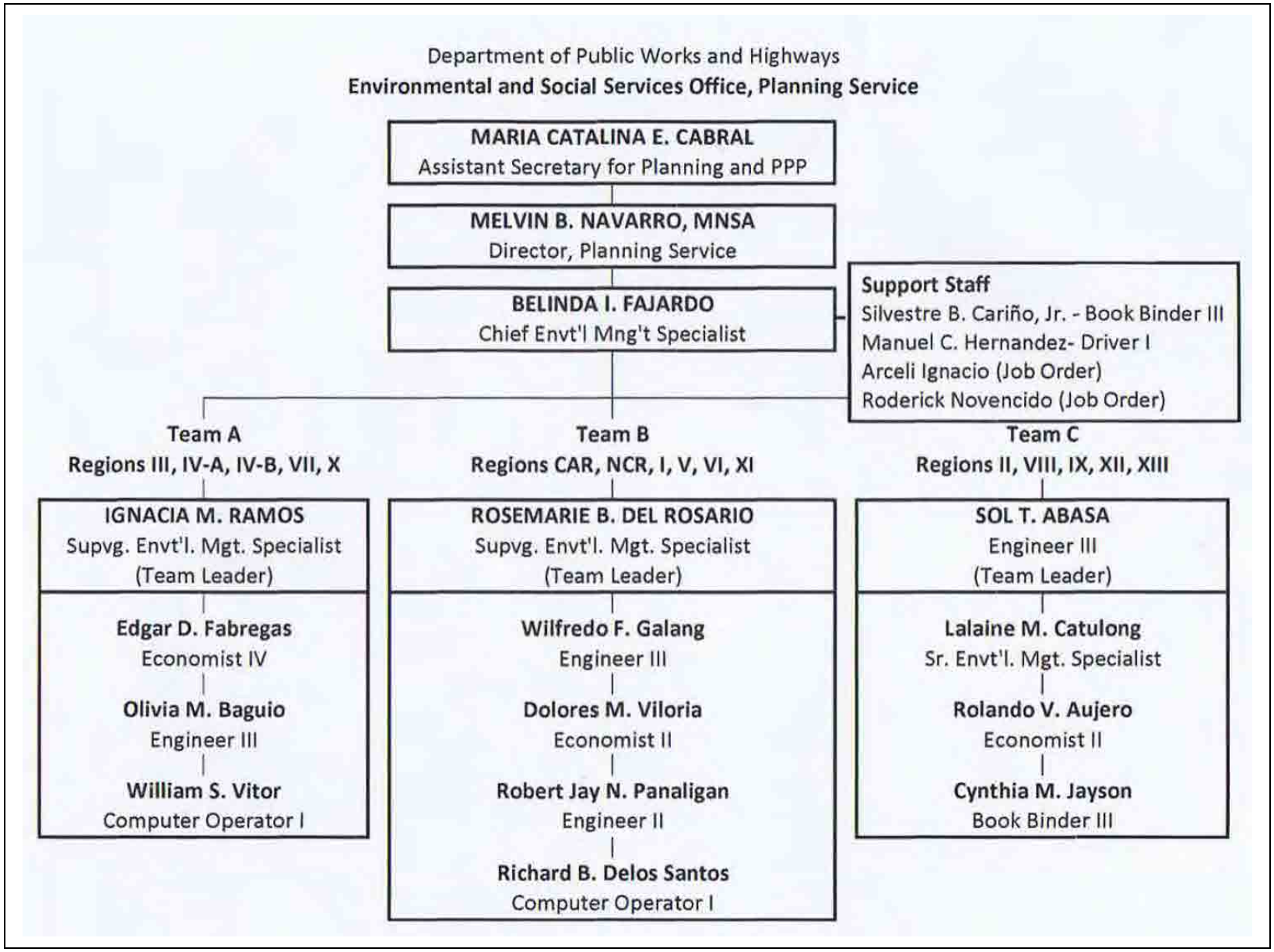
Source: JICA Study Team (2012)

FIGURE 9.3.1-2 ORGANIZATION CHART OF PMO-BOT (PPP SERVICE)



Source: JICA Study Team (2012)

FIGURE 9.3.1-3 FUNCTIONAL CHART OF PMO-BOT (PPP SERVICE)



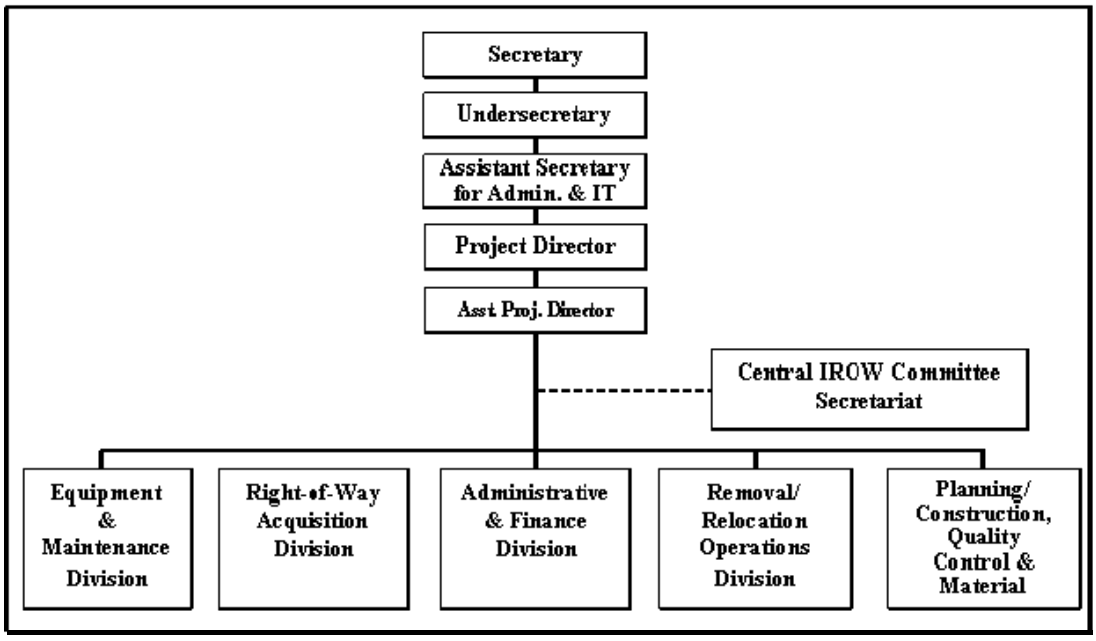
Source: JICA Study Team (2012)

FIGURE 9.3.1-4 ORGANIZATION CHART OF ESSO

TABLE 9.3.1-1 FUNCTION OF ESSO

Conduct assessments for environmental, social impact and land acquisition;
Prepare relevant report such as Initial Environment Examination (IEE), Environmental Impact Statement (EIS), Environmental Management Plans (EMP), Resettlement Action Plan (RAP) and other necessary documents;
Facilitate consultation and information dissemination to project affected persons and other relevant stakeholders;
Conduct environmental monitoring; Monitoring RAP implementation and conduct post implementation evaluation;
Provide guidance to regional and district level DPWH staff and local authorities in carrying out the above studies, preparation of documents and RAP implementation;
Providing training at regional, district and local level for consultation/participation, RAP implementation, environmental management planning, environmental monitoring, EIA tools and other new techniques;
Maintain and update the existing data bank and Geographical Information System (GIS); and
Coordinate environmental concerns with other DPWH offices, Government Agencies, Local Government Units and Non Government Organizations.

Per Department Order Number 220, Series of 1999; as amended by Department Order Number 58, Series of 2004.



Source: DPWH-ESSO

FIGURE 9.3.1-5 ORGANIZATION CHART OF PMO-IROWR

TABLE 9.3.1-2 FUNCTION OF PMO-IROWR

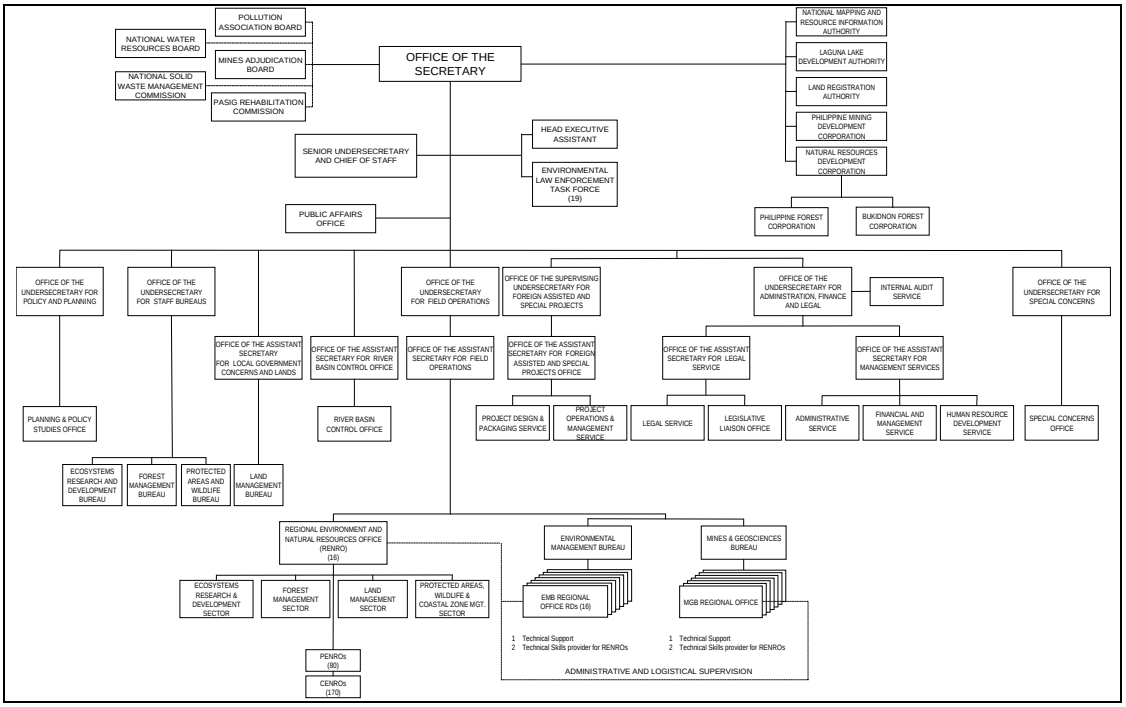
- Prepare the Action Plan and monitor the process of implementation of the new Infrastructure Right of Way (IROW) process;
- Continue with the existing functions of PMO-Action Office for Resettlement of Squatter Families (PMO-AORSF) and PMO-Manggahan Floodway;
- Assist all Implementing Office (IO) in the implementation of the improved ROW policies, processes, and procedures;
- Supervise the improved ROW process in all IO;
- Coordinate with the BIR, Appraisal Committees, and other appropriate agencies for upgrading of valuations;
- Coordinate with appropriate government agencies and the private sector, particularly the utility companies, among others, to ensure the successful implementation of the improved ROW process;
- Consolidate and validate the monthly ROW monitoring reports for submission to the Secretary;
- Consolidate and validate the summaries of payment made by the IO and submit a report to the Secretary;
- Prepare other guidelines needed to clarify issues that may arise from the implementation of the improved process;
- Implement the computerization of ROW Management System once it has been developed or purchased;
- Ensure the proper record keeping of all relevant documents and the archiving of titles with the National Archives;
- Prepare Quarterly Reports for submission to the Secretary; and
- Perform other duties as may be assigned by the Secretary.

Per Department Order Number 5, Series of 2003, the functions and responsibilities of PMO-IROW.

9.3.2 EIA and ECC

New road project of which length is 10 km or more is classified as an Environmentally Critical Project (ECP). Thus, the Project is required of EIA and to secure ECC.

Review and supervision of PEISS are conducted by the Environmental Management Bureau (EMB) and the Department of Environment and Natural Resources (DENR). The respective organization charts of DENR and EMB are shown below.



Source: JICA Study Team (2012)

FIGURE 9.3.2-1 DENR ORGANOGRAM

DENR is the government entity which is designated to handle issues related to the following five tasks as described in pertinent legislation:

Assure the availability and sustainability of the country's natural resources through judicious use and systematic restoration or replacement, whenever possible;

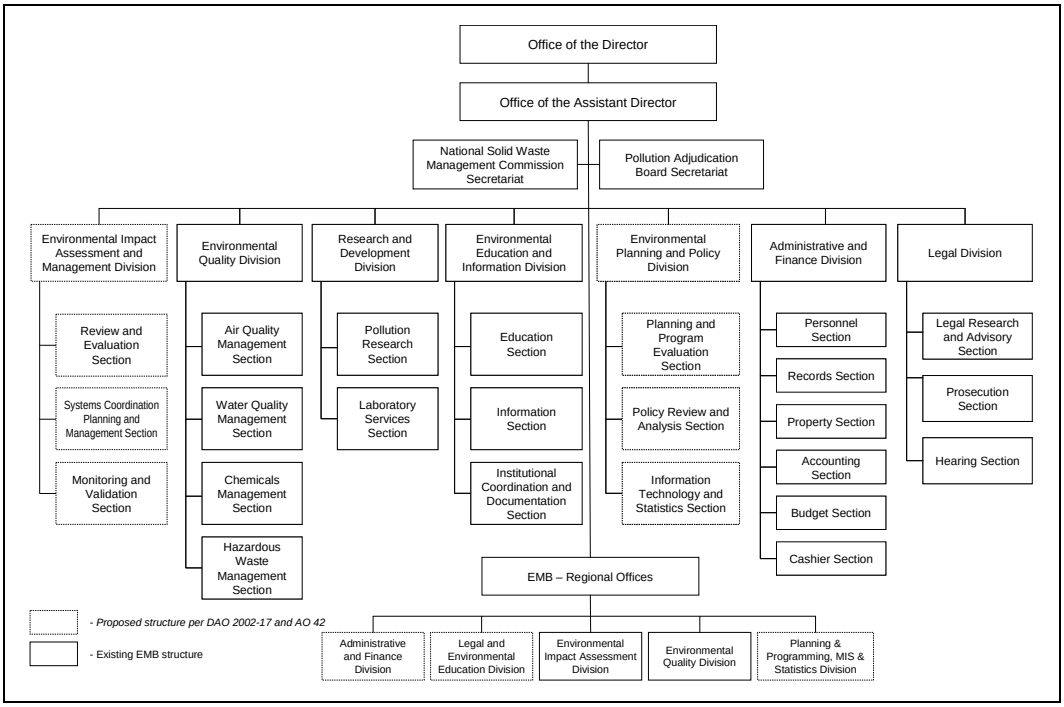
Increase the productivity of natural resources in order to meet the demands for forest, mineral, and land resources of a growing population;

Enhance the contribution of natural resources for achieving national economic and social development;

Promote equitable access to natural resources by the different sectors of the population; and

Conserve specific terrestrial and marine areas representative of the Philippine natural and cultural heritage for present and future generations.

Under the framework of PEISS, EMB is responsible for the issuance of decision making documents such as Environmental Compliance Certificate (ECC), Certificate of Non-Coverage (CNC) and Denial Letter. Also, EMB Regional Offices in respective regions are primarily responsible for the supervision of development projects and conducting consultation related to such projects.



Source: JICA Study Team (2012)

FIGURE 9.3.2-2 DENR-EMB ORGANOGRAM

9.3.2.1EIA Proponent

The proponent agency of this Project is the Department of Public Works and Highways (DPWH). The DPWH has the responsibility for preparation and submission of the PEISS. Project Management Office–F/S (PMO-F/S) is responsible for feasibility studies and prepares the PEISS. Once the project execution starts, PMOs, such as PMO-BOT, PMO-PJHL for Yen Loan Projects, PMO-IBRD for IBRD Projects, etc. have responsibilities for implementation of environmental and social considerations such as land acquisition and resettlement in cooperation with local government units. The Environmental Social Services Office (ESSO), is responsible for supporting and supervising preparation of PEISS. Environmental and Social Services Office (ESSO) is involved in preliminary planning activities related to Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Rapid Social Assessment, Resettlement Action Plan (RAP); conduct public consultations on PPP projects; conduct Information, Education and Communication (IEC) on environment-related concerns; and compliance and effects monitoring of ECC conditions and Environmental Management Plan (EMP).

9.3.2.2Environmental Compliance Certificate (ECC)

A certificate issued to which the Proponent conforms with, after DENR-EMB explains the *ECC conditions*. The ECC is signed by the Proponent to signify full responsibility over

implementation of specified measures which are necessary to comply with existing environmental regulations.

(1) Decision Timeline

Decisions of applications are made within the prescribed timelines within the control of DENR. Otherwise, the application shall be deemed automatically approved, with the issuance of the approval document within five (5) working days from the time the prescribed period lapsed.

(2) Validity and Expiry

Once a project is implemented, the ECC remains valid and active for the lifetime of the project. ECC conditions and commitments are permanently relieved from compliance only upon validation of the EMB of the successful implementation of the Abandonment/ Rehabilitation/ Decommissioning Plan.

The ECC automatically expires if a project has not been implemented within five (5) years from ECC issuance, or if the ECC was not requested for for extension within three (3) months from the expiration of its validity

(3) Amendment of ECC for Minor Change Only

Amendment of ECC can be processed for minor alternation of the project only due to:

- Typographical error
- Extension of deadlines for submittal of post-ECC requirements
- Extension of ECC validity
- Change in company name/ ownership
- Decrease in land/project area or production capacity

Other amendments deemed “minor” at the discretion of the EMB CO/RO Director

The following steps are taken to process the request of amendment.

- Within three (3) days from ECC issuance (for projects not started) OR at any time during project implementation, the Proponent prepares and submits to the ECC-endorsing DENR-EMB Office a LETTER-REQUEST for ECC amendment, including data, information, reports or documents to substantiate the requested revisions
- The ECC-endorsing EMB office assigns a Case Handler to evaluate the request
- ECC-endorsing Authority decides on the Letter-Request, based on Case Handler recommendation.

Maximum Processing Time for Issuance of Decision is 7 workdays for both central and regional offices of EMB.

9.3.2.3Certificate of Non-Coverage (CNC)

Certifies that based on the submitted Project Description report, the project is NOT covered by the EIS System and is not required to secure an ECC. The CNC advises the Proponent on coverage to other requirements by other DENR offices, LGUs, or other government agencies.

9.3.2.4Denial Letter

Contains the explanation for the disapproval of the application and guidance on how the application can be improved to a level of acceptability in the next EIA process. Denial is based on unsatisfactory evaluation by the EIARC (EIA Review Committee) or EMB of the Proponent's submitted Additional Information (AI) at the end of the review process.

9.3.3 Involuntary Resettlement and Land Acquisitions

The provision of resettlement site shall be the responsibility of the local government units (LGUs) concerned, with assistance from the concerned government agencies tasked with providing housing.

DPWH-PMO-Infrastructure Right-of-Way and Resettlement (PMO-IROWR) is tasked to consult with LGUs, local communities, project affected persons, and the designer/contractor for PPP projects; coordinate with the Presidential Commission for the Urban Poor (PCUP) and the National Housing Authority (NHA) on the relocation of squatter families; conduct census and tagging of affected lots and improvements; coordinate with the Bureau of Internal Revenue or BIR (for zonal valuation), Registry of Deeds (for titles), Assessor's Office, and Department of Agrarian Reform or DAR (for land conversion); coordinate and negotiate with affected property owners on the sale of their properties; coordinate with the Office of the Solicitor General (OSG) for filing of expropriation proceedings; and effect payment of affected properties.

It appears that the functions and activities of the abovementioned offices pertaining to PPP overlap, and it is difficult to bring together and coordinate their activities. There is no designated single focal point or one-stop shop for PPP transactions at DPWH.

The PMO-BOT, which is supposed to handle or coordinate all PPP related activities of DPWH, from planning to implementation and operation, does not have sufficient authority and staff to fully execute its mandated functions. The preparation of PPP proposals has often been done on an ad hoc project-to-project basis with many players participating.

To streamline acquisition of needed R-O-W and at the same time be compliant with international (WB, ADB, JICA) policies on involuntary resettlement together with the DPWH's own resettlement policy, roles, responsibilities, and efforts of key players and major

stakeholders must be well coordinated. In order to achieve this, it is strongly recommended that, a Lead Inter-Agency Committee (LIAC) be organized.

The LIAC will help ensure that a common direction is being followed to achieve the ultimate goal of providing a service infrastructure that will spark development in Mega Manila. Provided below is a list of said key players and major stakeholders and their corresponding responsibilities.

9.4 JICA GUIDELINES AND PHILIPPINES' SOCIAL AND ENVIRONMENTAL CONSIDERATION

9.4.1 Compliance with JICA Guidelines

9.4.1.1EIA Report Outlines

Outlines of EIA reports for JICA and the Philippines are compared in **Table 9.4.1-1**. EIA report (EIS in the Philippines). Legal/Policy Frame work is not stated in EIS while social development, emergency response policy and guidelines, and abandonment/decommissioning/rehabilitation policies and guidelines sections are included in JICA's EIA outline. Since EMB suggested to send an official letter requesting amendment of existing ECC and the said letter should show differences or changes made, thus a new set of EIS is not required by Philippine government, it is sufficient to satisfy JICA guidelines' requirement for this Study's purpose.

TABLE 9.4.1-1 COMPARISON OF EIA REPORT OUTLINES

Category	LATEST DENR/EMB OUTLINE	JICA OUTLINE
Executive Summary	Executive Summary	Executive Summary
	Project Fact Sheet	Significant findings
	Process Documentation	Recommendations
	Summary of Baseline Conditions	
Legal/Policy Framework	(Legal/policy framework is not required under the latest EMB EIA outline).	Legal/Policy Framework
Project Description	Project Description	Project Description
	Project Location and Area	Project location map including areas affected Description of project in terms of its geographical, ecological and temporal context.
	Environment Study Area Map	
	Geographic coordinates of Project Site	
	Rationale for selection of primary & secondary impact areas.	
	Project Rationale	
	Project Alternatives	
	Project Components	
	Major Components	
	Other Supporting Facilities	Off-site investments (i.e. access roads, pipelines, power plants, housing, raw materials, etc.)
	Pollution control devices and facilities these are serving	
	Footprint of proposed project layout	
	Process/Technology Options	
	Production Process/ construction method	
	Power generation and water supply system	
	Waste Management System	
	Project Size	
	Total project size	
	Annual Production rate & working days/hrs if process industry	
	Development plan, Description of Project Phases and Corresponding Time frame.	
	Pre-construction	
	Construction	
	Operations & Maintenance	
	Abandonment	
	Manpower	
	Manpower requirements	
	Expertise/skills required	
	Nature & Estimated number of positions for men/women/ethnic minorities	
	Indicative Project Investment Cost	
Baseline Data	Discussed in Project Description and Analysis of Environmental Impact section	Baseline Data
		Description and Assessment of environmental study area in terms of:
		Physical conditions
		Biological conditions
		Socio-economic conditions
		Cumulative impact (takes into account impact with other projects in the area not related to the project.
		Citation of information sources
Environmental Impacts and Mitigation Measures	Analysis of Environmental Impacts	Environmental Impacts
	Land	Prediction and Assessment of the project's likely:
	Land Use and Classification	Positive Impacts
	Discussion on inconsistencies and possible conflicts of project with existing land use zoning ordinance	Negative Impacts
	Discussion on potential change due to project implementation	Identifies Mitigation Measures for negative environmental impacts including those that

Category	LATEST DENR/EMB OUTLINE	JICA OUTLINE
		cannot be mitigated.
	Geology/ Geomorphology	
	Discussion on Projected change as a result of project implementation which includes:	Explores possible enhancement measures for positive impacts
	Change in surface topography	Identified and quantified the extent and quantity of available data, essential data gaps, and uncertainties associated with predictions
	Change in subsurface/ underground geomorphology	
	Inducement of subsidence/ collapse	
	Inducement of landslides or other hazards.	
		Essential gaps;
		Uncertainties with predictions
		Specifies topics that do not require further attention
	Pedology	All the environmentally and socially concerned elements are discussed in the previous Baseline data section
	Analyze project impact and provide mitigation measures for:	
	Erodability Potential	
	Bank Stability	
	Change in Soil Quantity/fertility	
	Terrestrial Biology	
	Analyze project impact and provide management measures for the following:	
	Vegetation removal and loss of habitat	
	Threat to existence of important species	
	Threat to abundance, frequency and distribution of important species.	
	Hindrance to wildlife species	
	Water	
	Hydrology/Hydrogeology	
	Analyze project's impact and provide management measures for:	
	Change in drainage morphology	
	Change in stream, lake water depth	
	Reduction in stream volumetric flow	
	Inducement of flooding	
	Water resources use and completion	
	Reduction/depletion of groundwater flow	
	Oceanography	
	Analyze project's impact and provide a management measure for:	
	Change in circulation pattern	
	Change in stream, lake water depth	
	Change in bathymetry	
	Water Quality	
	Identify specific source of pollution load	
	Discuss assimilative capacity of receiving water body	
	Include as part of Environmental Management Plan and Monitoring Plan.	
	Sampling Map	
	Freshwater or Marine Ecology	
	Identify source of threat to ecology and discuss assimilative capacity of receiving ecosystem	
	Threat to abundance, frequency and distribution of species	
	Loss of important species	
	Loss of habitat	
	Air	
	Meteorology/Climatology	
	Discuss project's possible effect on local climate	
	Discuss project's contribution to global greenhouse gas	
	Air Quality & Noise	
	Identified specific source of pollution load	
	Discussion on Assimilative capacity considering ambient air quality/noise levels in the area.	
	People	

Category	LATEST DENR/EMB OUTLINE	JICA OUTLINE
	Discussion on Project Displaced Persons	
	Discussion on migration patterns resulting from project implementation	
	Discussion on IPs and culture/ lifestyle	
	Discussion on public health issues relating to project implementation	
	Discussion on benefits of local people from the project.	
	Discussion on project impact on deliver of basic service to local people and resource completion in the area.	
	Discussion on project impact on local traffic conditions.	
	Institutional Arrangements (accountable persons/ office) for project.	
	Discussion on involuntary resettlement impacts such as:	
	Identify affected properties	
	Relocation of Displaced Persons	
	Devaluation of affected properties	
Analysis of Alternatives	Discussed in Project Description section	Analysis of Alternatives
		Comparison of alternatives to the proposed project including the "No Project" scenario in terms of:
		Potential environmental impacts
		Mitigation measures
		Cost (capital & recurring)
		Suitability
		Institutional, training and monitoring requirements
		Economic and Financial feasibility
		Basis for selection of project alignment
		Justification for recommended emission level and approaches to pollution prevention and abatement
Risk Assessment	Environment and Ecological Risk Assessment	Discussed in Environmental Impacts and Mitigation Measures section
	Identify and provide management measures for:	
	Chronic risks	
	Acute risks/ Worst case scenario	
Environmental Management Plan	Impact Management Plan	Environmental Management Plan
Public Participation	Social Development Plan and IEC	Consultation
Social Development Plan	Discussed in Environmental Management Plan	Not required
Environmental Monitoring	Environmental Compliance Monitoring	Discussed in Environmental Management Plan
Emergency Response Plan	Emergency Response Policy and Generic Guidelines	Not required
Abandonment/ Decommissioning	Abandonment / Decommissioning/ Rehabilitation Policies and Generic Guidelines	Not required
Institutional Arrangements for Project Implementation	Institutional Plan for EMP Implementation	Discussed in environmental Impacts and Mitigation Measure section

9.4.1.2Resettlement Action Plan (RAP) Outlines

Since both countries follow the World Bank Safeguard Policy, OP 4.12-Annex A, there is no difference in the outline of Resettlement Action Plan. A typical RAP outline is shown in **Table 9.4.1-2.**

TABLE 9.4.1-2 RAP OUTLINE

Description of the project
Potential impacts
Objectives
Socioeconomic studies
Legal framework
Eligibility
Valuation of and compensation for losses
Resettlement measures
Site selection, site preparation, and relocation
Housing, infrastructure, and social services
Environmental protection and management
Integration with host populations
Community participation
Grievance procedures
Organizational responsibilities
Implementation schedule
Costs and budget
Monitoring and evaluation

9.4.2 Means to Bridge the Gaps

9.4.2.1Resettlement and Land Acquisition Policy Framework

Since DPWH's resettlement policy has been improved to satisfy World Bank's OP4.12, which is also JICA's requirement, employing the policy frame work is appropriate for the Project. (*Land Acquisition, Resettlement, Rehabilitation, and Indigenous Peoples (LARRIP) Policy, 3rd Edition, (2007)*). If it is found necessary, DPWH-ESSO will have to amend the LARRIP to meet a specific needs and characteristic of CLLEX (Phase I) Project. Table 9.4.2-1 shows analysis of and means to fill the gap. Detailed Relocation Policy for CALAX (Laguna Section) is discussed in Section 9.6.

TABLE 9.4.2-1 SUMMARY OF GAP ANALYSIS ON RELOCATION POLICY

JICA Guidelines	Laws and Guidelines of the Philippines	Gap relative to JICA GL	Project Policy
Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	Land Acquisition, Resettlement, Rehabilitation and Indigenous Peoples' Policy, 2007 (LARRIP), (=WB OP4.12)	None	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	LARRIP	None	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)
People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	LARRIP	None	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL
Compensation must be based on the full replacement cost as much as possible. (JICA GL)	LARRIP	Two inconsistent statements in LARRIP	Compensation must be based on the full replacement cost. <u>Compensation for Land</u> There are inconsistent statements in LARRIP. The initial offer to the PAF is the indicated price in the current zonal valuation issued by BIR for the locality where the property is located. If the offered price is not acceptable to the PAF, the second offer will be the current market value at the time of taking", based on the standards prescribed in Sections 5 and 6 of RA8974 (page 12 of LARRIP. The other is Entitlement Matrix (page 14 of LARRIP) for Land and it specifies that "PAF will be entitled to Cash Compensation for loss of land at 100% replacement cost at the informed request of PAFs". During the detailed design stage, the independent assessor should be employed to determine the replacement cost of land and 100% replacement cost shall be paid to those who lost lands.
Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	DO#5 (2003): unless ROW is purchased project notice of award to contractor cannot be issued, i.e. all kind of compensation is paid before project is commenced	None	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)

JICA Guidelines	Laws and Guidelines of the Philippines	Gap relative to JICA GL	Project Policy
For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	LARRIP	None	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)
In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	LARRIP	None	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)
When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	LARRIP	None	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)
Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	LARRIP	None	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)
Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	LARRIP	None	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)
Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP 4.12 Para. 6)	LARRIP states the cut-off date as the date of commencement of the census. Resettlement project conducted by LGUs nationwide notifies to public the last day of the census work, and use the date as the cut-off date, so that no eligible PAFs are left uncounted.	None	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. The cut-off date for this RAP is the date of commencement of the census. For those who are eligible for compensation but absent during the census work shall be encouraged to communicate with barangay captains and to attend community consultation meetings to be validated by DPWH.
Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP 4.12 Para. 15)	Professional Squatters (as defined by Republic Act 7279) applies to persons who have previously been awarded home lots or housing units by the government but who sold, leased or transferred the same to settle illegally in the same place or in another urban area, and non bona fide occupants and	Professional Squatters and Squatting Syndicates are not eligible for compensation. They may salvage the structure materials by themselves if demolition is carried out by him/herself.	All affected people (except professional squatters) will be eligible for compensation and rehabilitation assistance, regardless of tenure status, social or economic standing and any such factors that may discriminate against achievement of the objectives of JICA Guidelines. However, those who have previously been awarded home lots or housing units by the government but who sold, leased or transferred the same to settle illegally in the same place or in another urban area, and non bona

JICA Guidelines	Laws and Guidelines of the Philippines	Gap relative to JICA GL	Project Policy
	intruders of lands reserved for socialized housing. Squatting Syndicates (as defined by Republic Act 7279) refers to groups of persons who are engaged in the business of squatter housing for profit or gain. Those persons are ineligible for structure compensation, relocation, and rehabilitation/ inconvenience/ income-loss assistance in case their structures are to be demolished in resettlement project according to Republic Act 7279. This definition excludes individuals or groups who simply rent land and housing from professional squatters or squatting syndicates.		fide occupants and intruders of lands reserved for socialized housing will not be eligible for compensation.
Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP 4.12 Para. 11)	If feasible, land for land will be provided in terms of a new parcel of land of equivalent productivity, at a location acceptable to PAFs. (LARRIP)	None	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (In this project, no PAFs are farmers, agricultural lesser, or fishers.)
Provide support for the transition period (between displacement and livelihood restoration). (WB OP 4. 12, para.6)	* Income Loss. For loss of business/income, the PAF will be entitled to an income rehabilitation assistance to be based on the latest copy of the PAFs' Tax record for 3 months, or not to exceed P 15,000 for severely affected structures. *Inconvenience Allowance The amount of P 10,000 shall be given to PAFs with severely affected structures, which require relocation and new construction. *Rehabilitation assistance Skills training and other development activities	Upper limit of cash disturbance compensation is limited to Php15,000 according to Philippine laws. The amount of planned Financial assistance and eligibility are explained in the community consultation, Only objection given to the Study Team was to change alignment and not to cause loss of farming lands.	Disturbance and other compensation should be assessed and determined by the Independent Assessor and incorporated in the Final RAP which shall be approved by the Secretary of DPWH. DPWH will target all PAFs for Livelihood Rehabilitation Assistance. DPWH will conduct quarterly monitoring about the change of living standard of the PAFs before and after the resettlement. When the PAF are found that their living standard worsen, or whose present means of livelihood became not-viable, DPWH, in coordination with other appropriate institutions, will provide assistances, such as skills and livelihood trainings

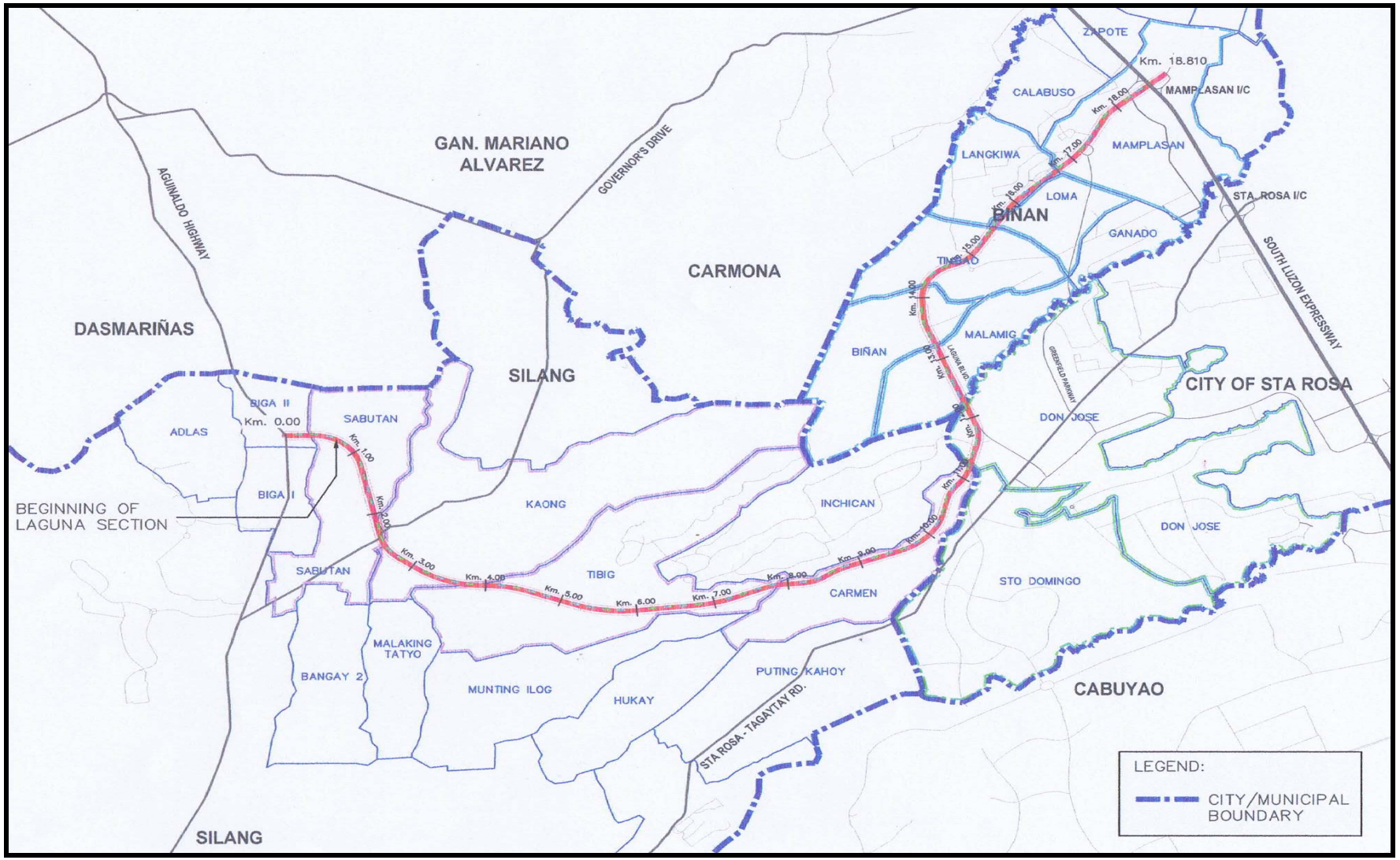
JICA Guidelines	Laws and Guidelines of the Philippines	Gap relative to JICA GL	Project Policy
	equivalent to P 15,000 per family will be provided in coordination with other government agencies, if the present means of livelihood is no longer viable and the PAF will have to engage in a new income activity. *Transportation allowance or assistance. If relocating, PAFs to be provided free transportation. Also, informal settlers in urban centers who opt to go back to their place of origin in the province or be shifted to government relocation sites will be provided free transportation. (LARRIP (April, 2007, p. 18, 19)		
Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP 4.12 Para. 8)	LARRIP	None	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP 4.12 Para. 8)

Source: JICA Guidelines for Environmental and Social Considerations (2010), World Bank Operational Policy 4.12 (2001), Land Acquisition, Department of Public Works and Highways Resettlement, Rehabilitation and Indigenous Peoples' Policy (2007), Republic of the Philippines

9.5 ENVIRONMENTAL IMPACT ASSESSMENT

9.5.1 EIA Study Area

CALAX alignment and administrative boundary map is shown in **Figure 9.5.1-1**.



Source: JICA Study Team (2012)

FIGURE 9.5.1-1 PROJECT AREA AND LOCATION

9.5.2 Analysis of Alternatives

9.5.2.1Procedure of Alternative Alignment Study

Alignment Study was undertaken in acctrdance with the following steps;

Step-1 : Selection of beginning point of Laguna Section (Connection point of Cavite and Laguna sections).

Step-2 : Selection of the end point of SLEx

Possible connection point at SLEx
- Existing Manplasan I/C
- Existing Greenfield Eton I/C
- Between Calamba I/C and Simsiman Toll Barrier
- At Calamba Toll Barrier whitch was removed at present

Step-3 : Selection of the alignment to connect the beginning point at end point. Various alternative alignments were studied.

9.5.2.2Selection of the Beginning Point of Laguna Section (Connection Point of Cavite and Laguna Sections)

Three (3) alternative alignments were developed focusing on minimization of social impact (or dislocation of people) as shown in **Figure 9.5.2-1**.

Alternative-1 : Alignment Recommended by the 2006 FS

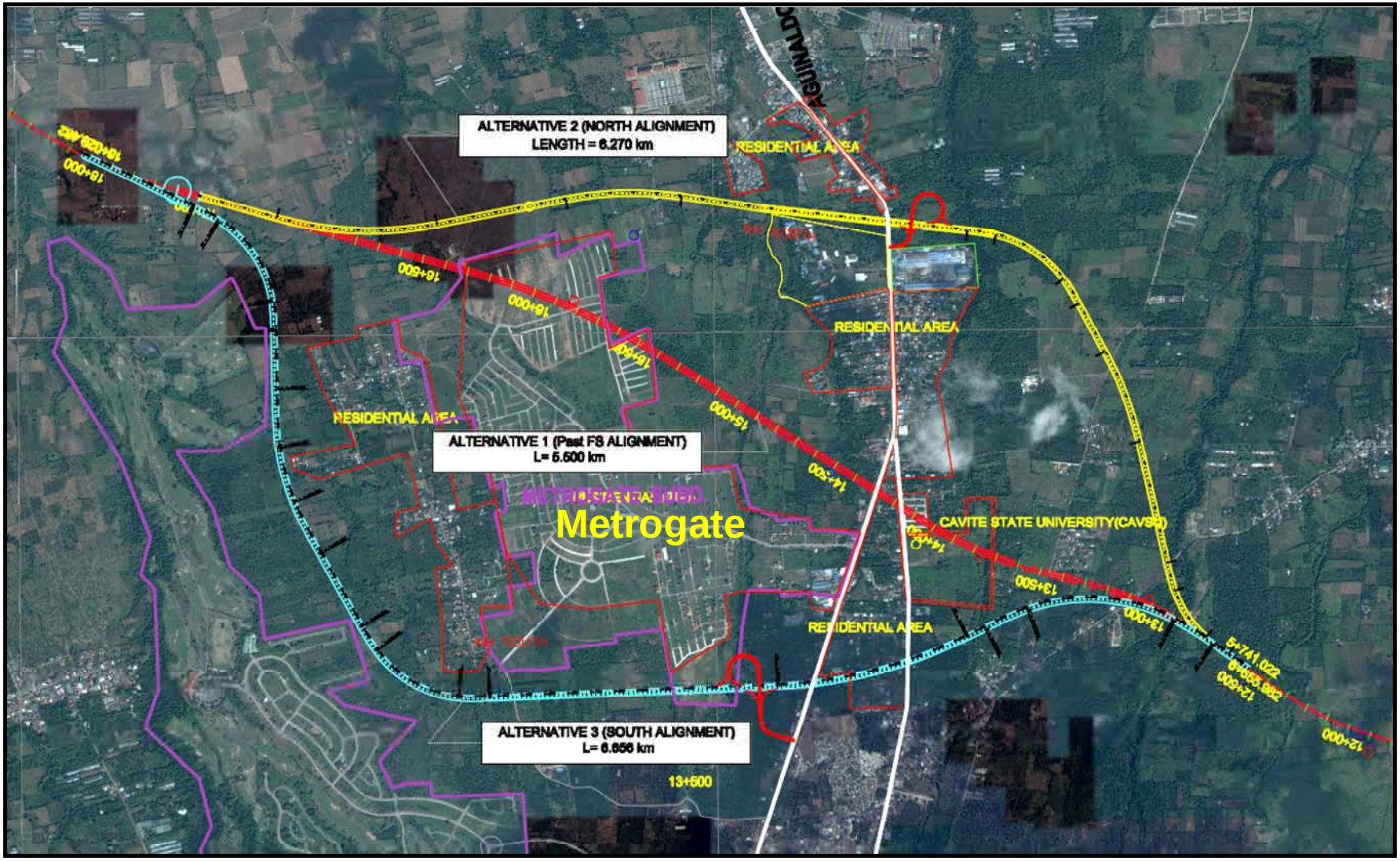
Alternative-2 : North Alignment to minimize social impact in the northern area of Silang Municipality town proper.

Alternative-3 : South Alignment to minimize social impact in the southern area of Silang Municipality town proper.

Three (3) alternative alignments were evaluated as shown in **Table 9.5.2-1** and **Alternative-2** was recommended due to the following reasons:

- Alternative-2 achieves minimum social impact; and
- Alternative-2 achieves minimum cost

As reference, **Table 9.5.2-2** shows the evaluation criteria.



Source: JICA Study Team (2012)

FIGURE 9.5.2-1 ALTERNATIVE ALIGNMENTS OF BEGINNING POINT OF CALA EXPRESSWAY LAGUNA SECTION

TABLE 9.5.2-1 EVALUATION OF ALTERNATIVE ALIGNMENTS AT BEGINNING POINT

(Confidential)

TABLE 9.5.2-2 EVALUATION CRITERIA

Evaluation Iteins and Description		Relative Superity
a) Cost (Civil Work Cost + ROW Acquisition Cost) Smallen cost is better for the project. When the smallest cost is set as 1.00, increase rate of other Alternative was evaluatedas follows:		Cost Ratio 1.0 to 1.05 ..... ○ 1.05 to 1.10 ..... △ Over 1.10 ..... ×
b) Connection to Aquinaldo Highway		• Easy to connect by interchange ..... ○ • Difficult due to appropriate space ..... ×
c) Social Impact	Evaluation by the number of houses to be affected	20 or less houres ..... ○ 20 to 40 houres ..... △ Over 40 houres ..... ×
	Evaluation by the number of large buildings to be affected	0 (Zero) ..... ○ Over 1 ..... ×
d) Natural Environment Major natural environmental impact of this section will be soil erosion loss of greenery and noise air pollution in residential area	<u>Soil Erosion</u> The project area is prone from slight to moderatie soil erosion, depending on the gradient of land slope. Since step cutting will affect soil erosion, this evaluation indication used is the volume of slop cutting.	A large scale of lope cut required ..... × Medium ..... △ Small ..... ○
	<u>Loss of Greenery</u> Loss of greenery is evaluated as the quantity of cut trees.	A large number of trees are cut ..... × Medium ..... △ Small ..... ○
	<u>Noise, air pollution</u> If alignment pass the residential area, noise and air pollution will be affected the people.	Agriculture Vacount Space .. ○ Commercial Area ..... △ Residential Area ..... ×

Source: JICA Study Team (2012)

9.5.2.3Alternative Alignments

Six (**6**) alternatives were developed as shown in **Figure 9.5.2-2**.

Alternative-1

- This is the revised alignment of the 2006 FS and connected with the existing Eton/Greenfield Interchange;
- This route is the second shortest alignment among the alternatives; and
- Intended to capture generated traffic from the on-going and future development areas

Alternative-2

- End point is Mamplasan Interchange;
- Intended to utilize the existing private road of Greenfield Parkway (ROW width is 40 m.); and
- Intended to capture generated traffic from the existing, on-going and future development areas

Alternative-3

- Same concept as Alternative-2 above; and
- Intended to utilize the existing private road of Laguna Blvd. (ROW width is 60 m.)

Alternative-4

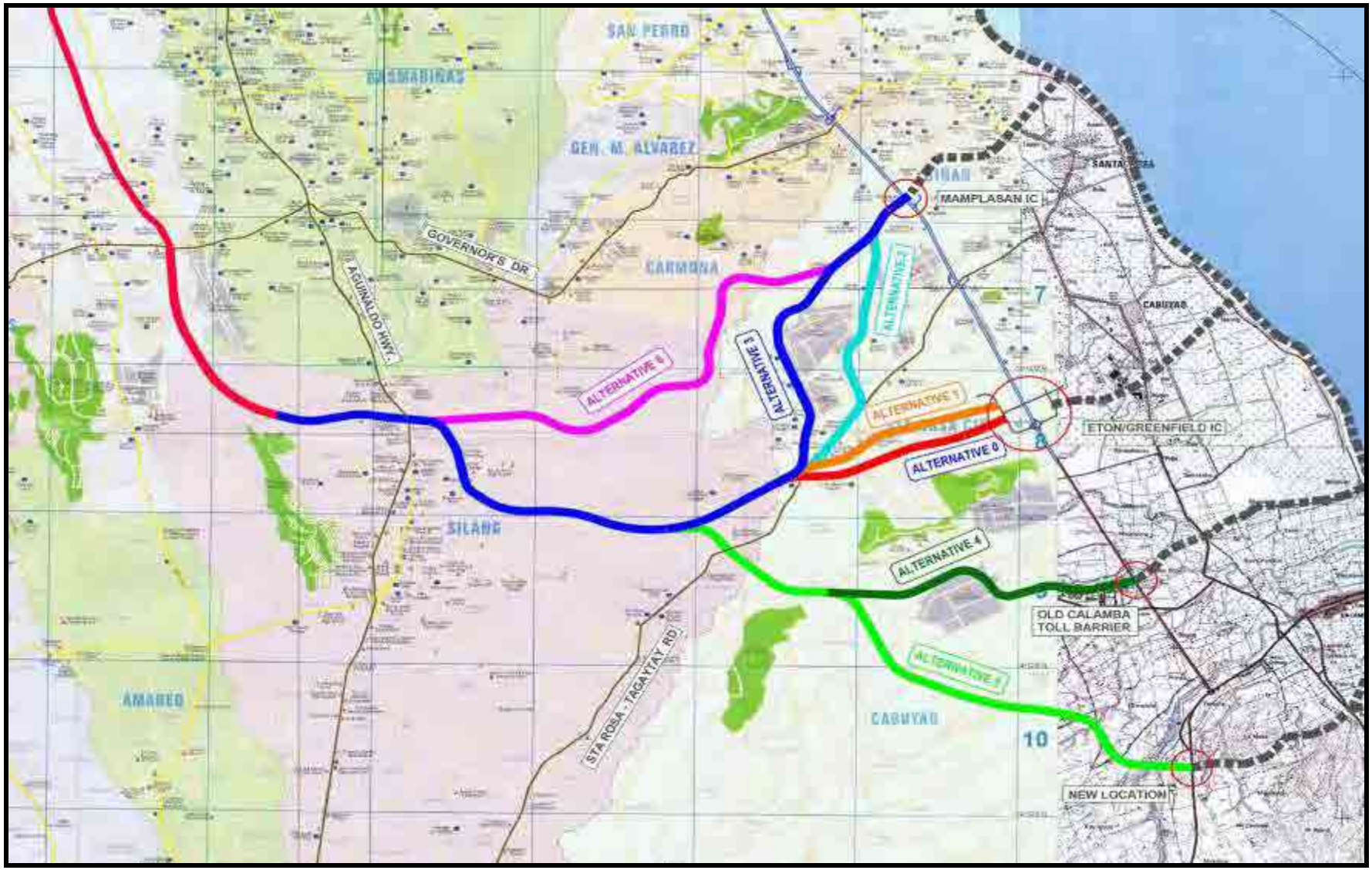
- End point is Calamba Toll Barrier which was shifted to Simsiman Toll Barrier of SLEx Extension, and new interchange is constructed; and
- Intended to capture generated traffic from the existing, on-going and future development areas.

Alternative-5

- End point is located at about the middle point between Calamba Interchange and Simsiman Toll Barrier and new interchange is constructed;
- This is the longest route among the alternatives;
- Intended to capture traffic from the existing, on-going and future development areas; and
- Generated traffic from the developing areas can utilize both CALAX and SLEX

Alternative-6

- This is the shortest route among the alternatives. However, it has to pass through steep slope areas; and
- This route functions as a bypass route of Governor's Drive



Source: JICA Study Team (2012)

FIGURE 9.5.2-2 ALTERNATIVE ALIGNMENTS

Six (6) alternative alignments were evaluated as shown in **Table 9.5.2-3** and Alternative-3 was recommended due to the following reasons:

- Cost is within 10% increase compared to the minimum cost alternative (Alternative-6). (Alternative-6 attracts least traffic). Second lowest alternative (Alternative-1) and Alternative-3 is almost the same cost.
- High traffic volume is attracted. Alternative-3 attracts the 2nd highest traffic. Highest is Alternative-4 and difference is 900 vehicle per day (or 1.6% difference).
- Social impact in terms of dislocation of people is the smallest.
- Since this alternative utilizes the 60m ROW of existing private road (for about 1/3) of the total expressway length), implementation in terms of ROW acquisition is the easiest and the fastest.
- Other alternatives affect people who have newly acquired a lot from the private land developers. When they bought their lots, they were not informed that their lots will be affected in the future by this project. Therefore, their life plan will have a drastric change. On the part of DPWH, ROW acquisition negotiation will take time.

As reference, **Table 9.5.2-4** shows the evaluation criteria and characteristics of alternatives are summarized in **Table 9.5.2-5**.

Each alignment of alternatives is shown in **Figure 9.5.2-3**.

TABLE 9.5.2-3 EVALUATION OF ALTERNATIVES

(Confidential)

TABLE 9.5.2-4 EVALUATION CRITERIA

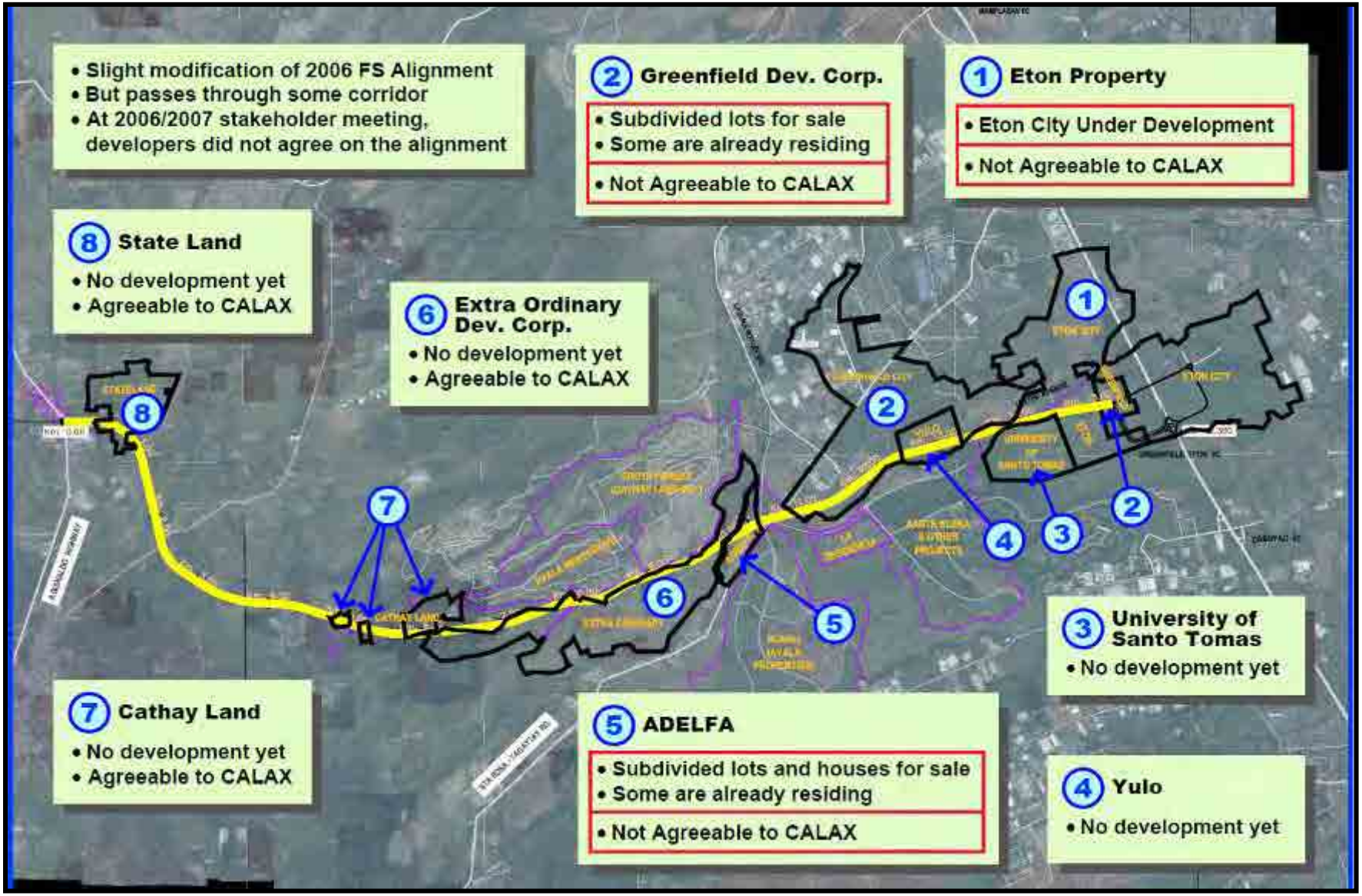
Evaluation Item and Description		Relative Superity
a) Contribution to improvement of accessibility to the Project Area and Area Development Whether CALAX passes through an existing, on-going or proposed development area;		More than 70% of section.....○ 50% to 70% .....△ Less than 50%..... ×
b) Connection with SLEX		• Direct Connection.....○ • Direct Connection is possible, but quite expensive .....△
c) Traffic Volume Attracted When higher traffic is attracted, it contributes more to reduce traffic congestion of public roads and the project is economically and financially feasible, thus an alternative which attract higher traffic is evaluated better than other alternatives.		• More than 50,000 veh./day .....○ • 40,000 to 50,000 veh/day.....△ • Less than 40,000 veh/day..... ×
d) Cost (Civil Work Cost + ROW Acquisition Cost) Smaller cost is better for the project. When the smallest cost is set as 1.00, increase rate of other Alternative was evaluated as follows:		Cost Ratio 1.0 to 1.10 .....○ 1.10 to 1.20 .....△ Over 1.20 ..... ×
e) Impact on Natural Environment Major natural environmental impact of this project will be soil erosion and loss of greenery.	e-1) Soil Erosion The project area is prone from slight to moderate soil erosion, depending on the gradient of land slope. Since slope cutting will affect soil erosion, thus evaluation indicator used is the volume of slope cutting.	Large scale of slope cut (over 500,000 m3) required..... × Medium scale of slope cut (200,000 to 500,000 m3) required △ Small scale of slope cut (less than 200,000 m3) required.....○
	e-2) Loss of Greenery Loss of greenery is evaluated as the quantity of cut trees.	A large number of trees are cut..... × Medium number of trees are cut ...△ Small number of trees are cut .....○
	e-3) Noise and Air Pollusion The project area is prone from noise and air pollusion by expressway passing vehicles.	Residencial area ..... × Commercial area / industrial area .△ Agriculture area .....○
f) Social Impact Evaluation by the number of houses to be affected.		10 or less houses .....○ 10 to 30 houses .....△ Over 30 houses ..... ×
g) Cost Performance Cost performance = veh.km/cost in Million Php		High Efficiency over 35.....○ Medium Efficiency 30 to 35 .....△ Low Efficiency less than 30..... ×
h) Easiness of Implementation (ROW Acquisition) Development status of properties of land development companies is different and can be classified as follows: (a) Lots were sold out and some people are already residing; (b) Lots are being sold; and (c) No development is made yet Those who bought a lot sold by the land development companies were not informed that an expressway will be built and their properties may be affected by the project. Therefore, it will take a longer time to negotiate with these people, and DPWH will have a hard time to acquire the road right-of-way. Evaluation was made as follows:		• Lots are not affected or land development has not started yet....○ • Some lots are being sold .....△ • Many lots have been sold out or are being sold and some people are already residing..... ×
i) Easiness of Construction This was evaluated as follows:		• Wide construction space is available, existing traffic is not disturbed, access road for construction needed, but its construction is easy.....○ • Above conditions become rather severe.....△ • Construction of access road itself is difficult due to terrain, and construction can start only at the beginning side and end side..... ×

Source: JICA Study Team (2012)

TABLE 9.5.2-5 CHARACTERISTICS OF ALTERNATIVES

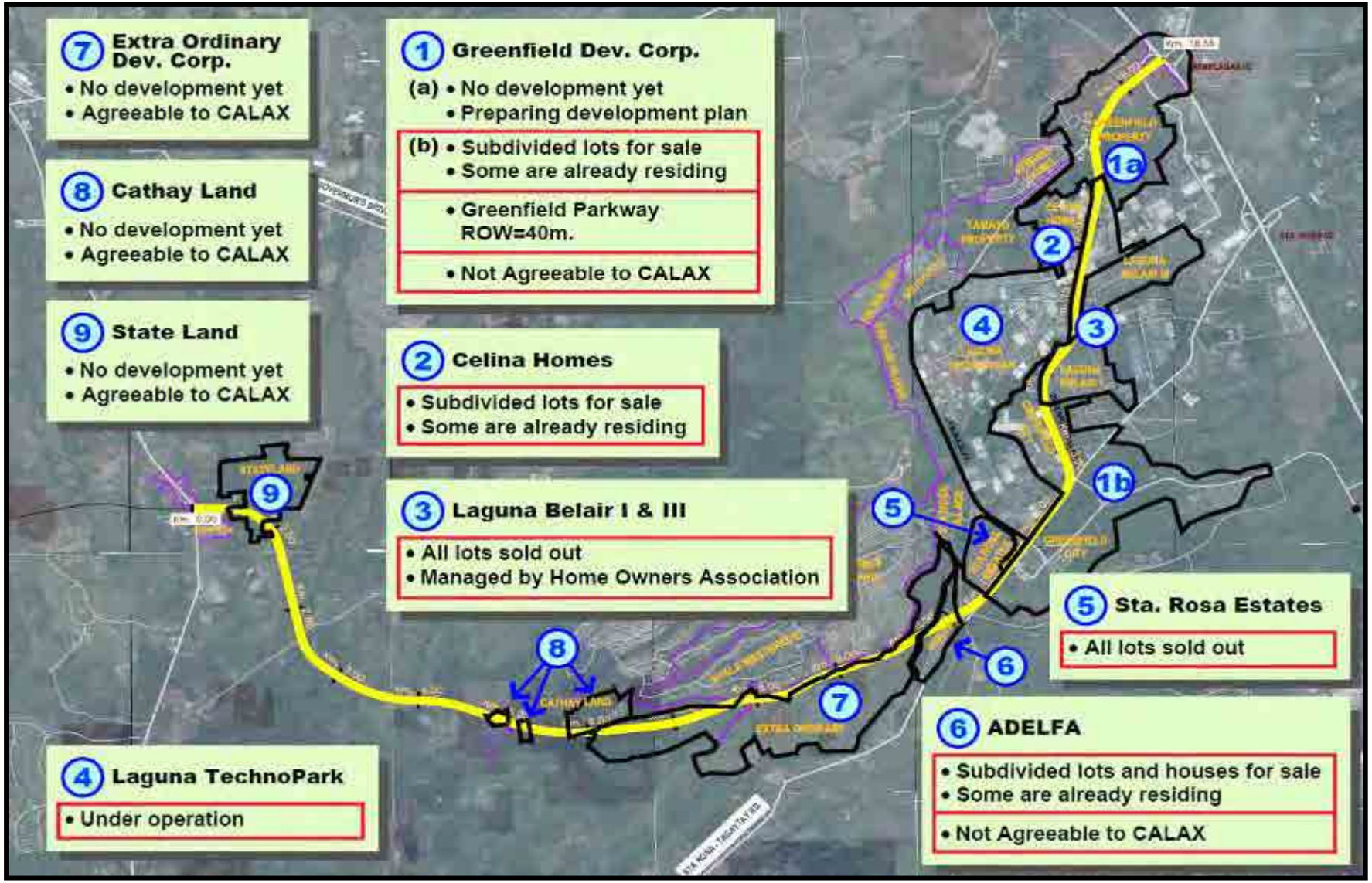
(Confidential)

(Confidential)



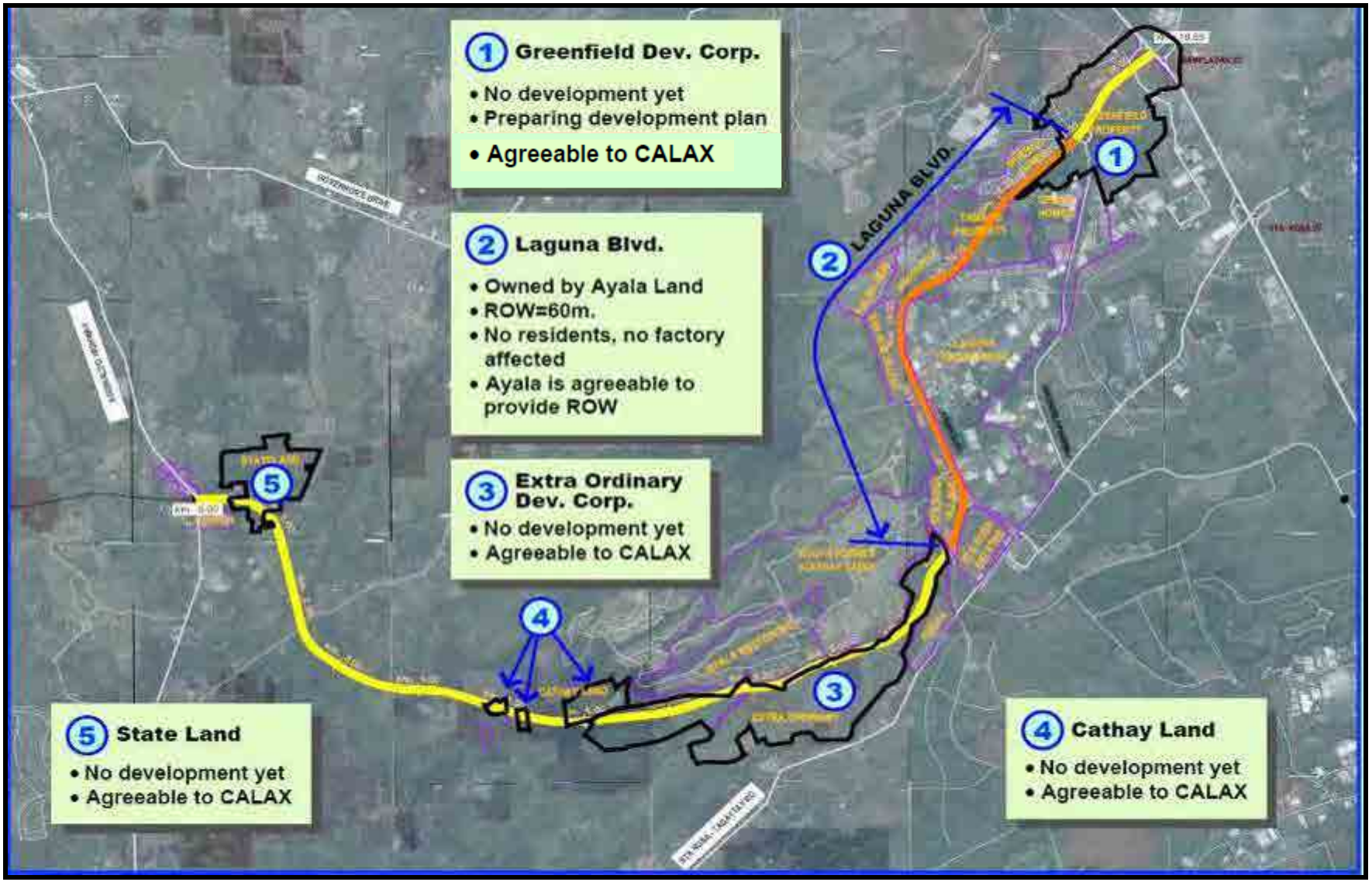
Source: JICA Study Team (2012)

FIGURE 9.5.2-3 (1) ALTERNATIVE ALIGNMENT 1



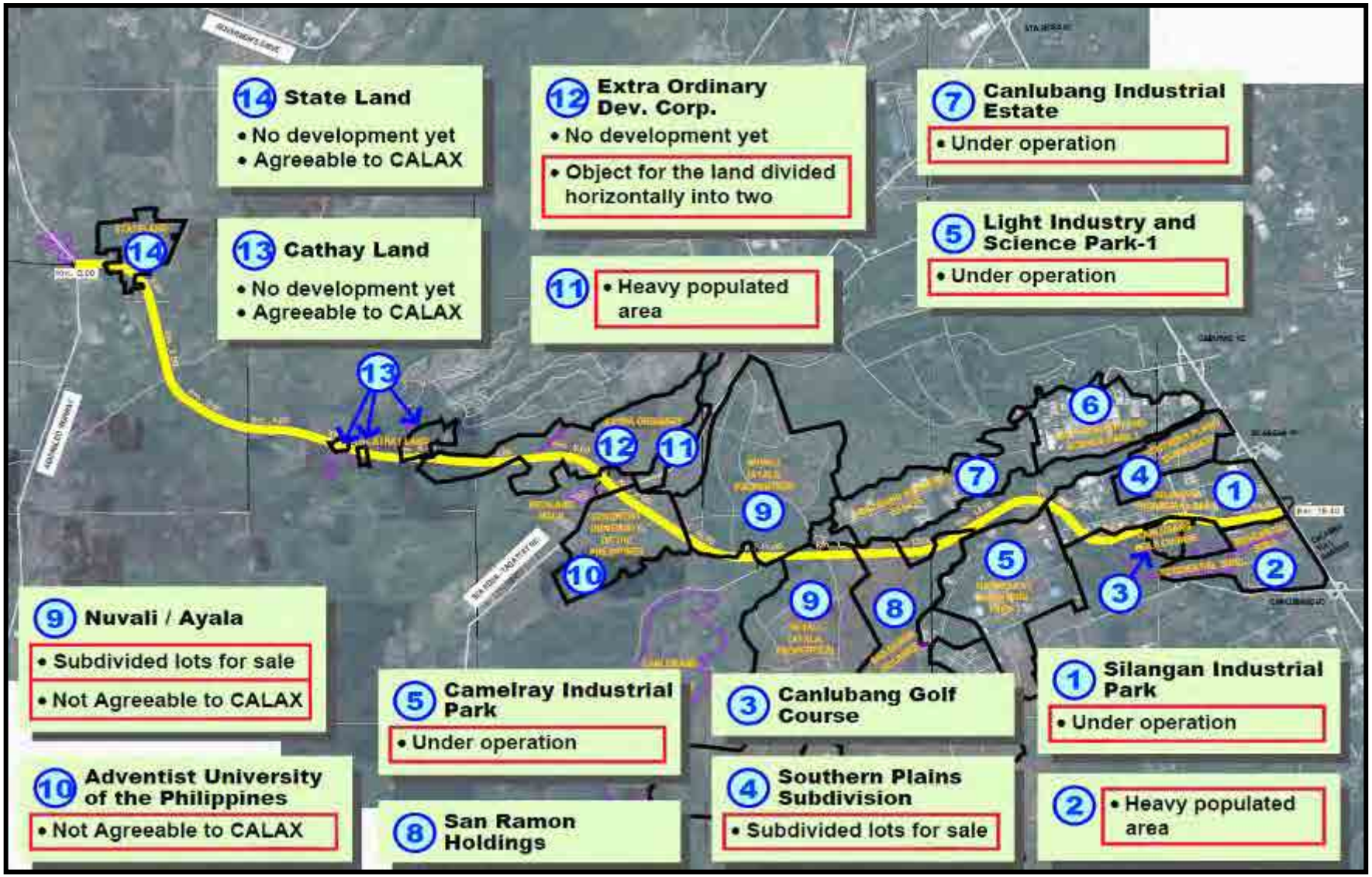
Source: JICA Study Team (2012)

FIGURE 9.5.2-3 (2) ALTERNATIVE ALIGNMENT 2



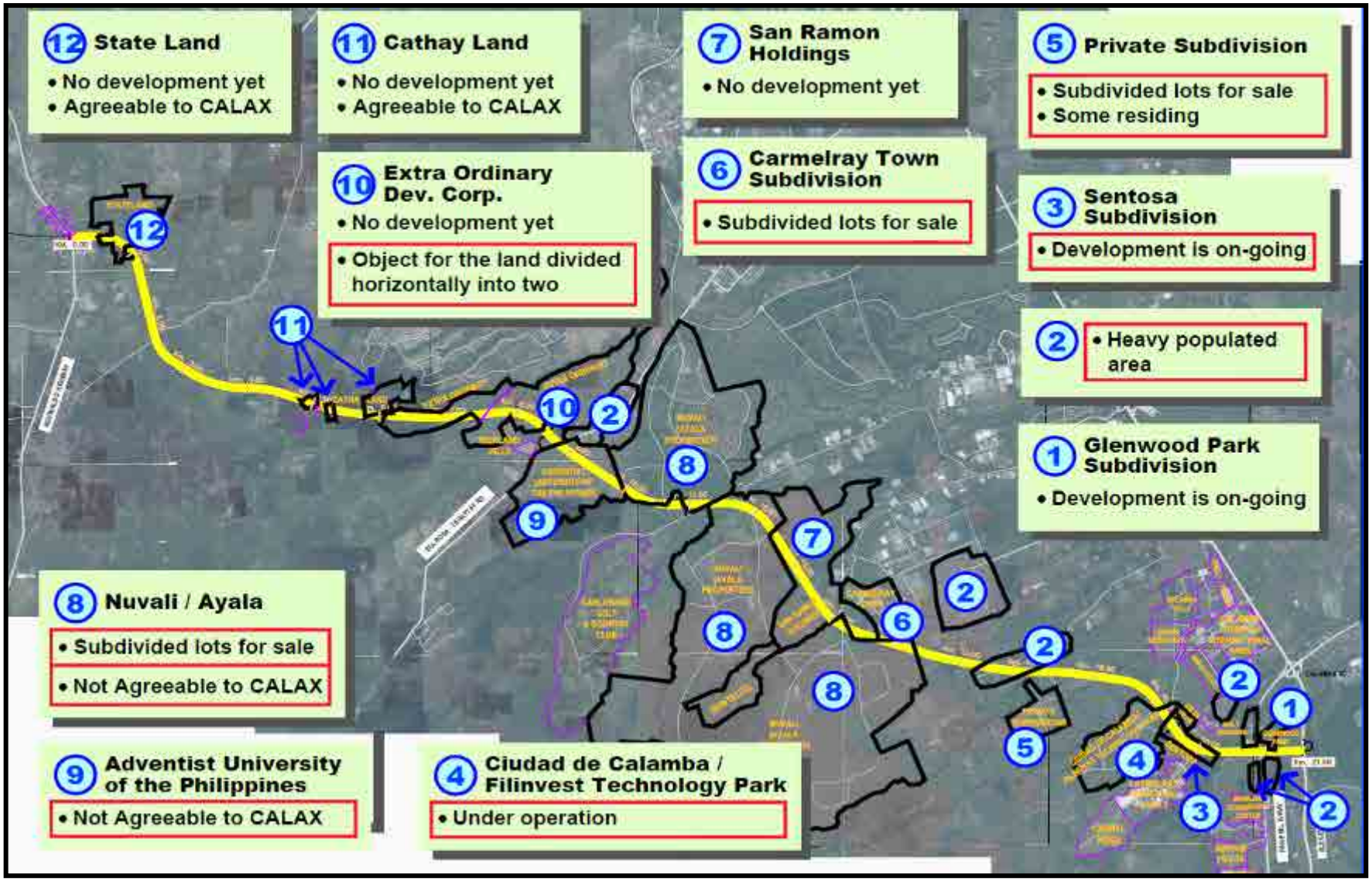
Source: JICA Study Team (2012)

FIGURE 9.5.2-3 (3) ALTERNATIVE ALIGNMENT 3



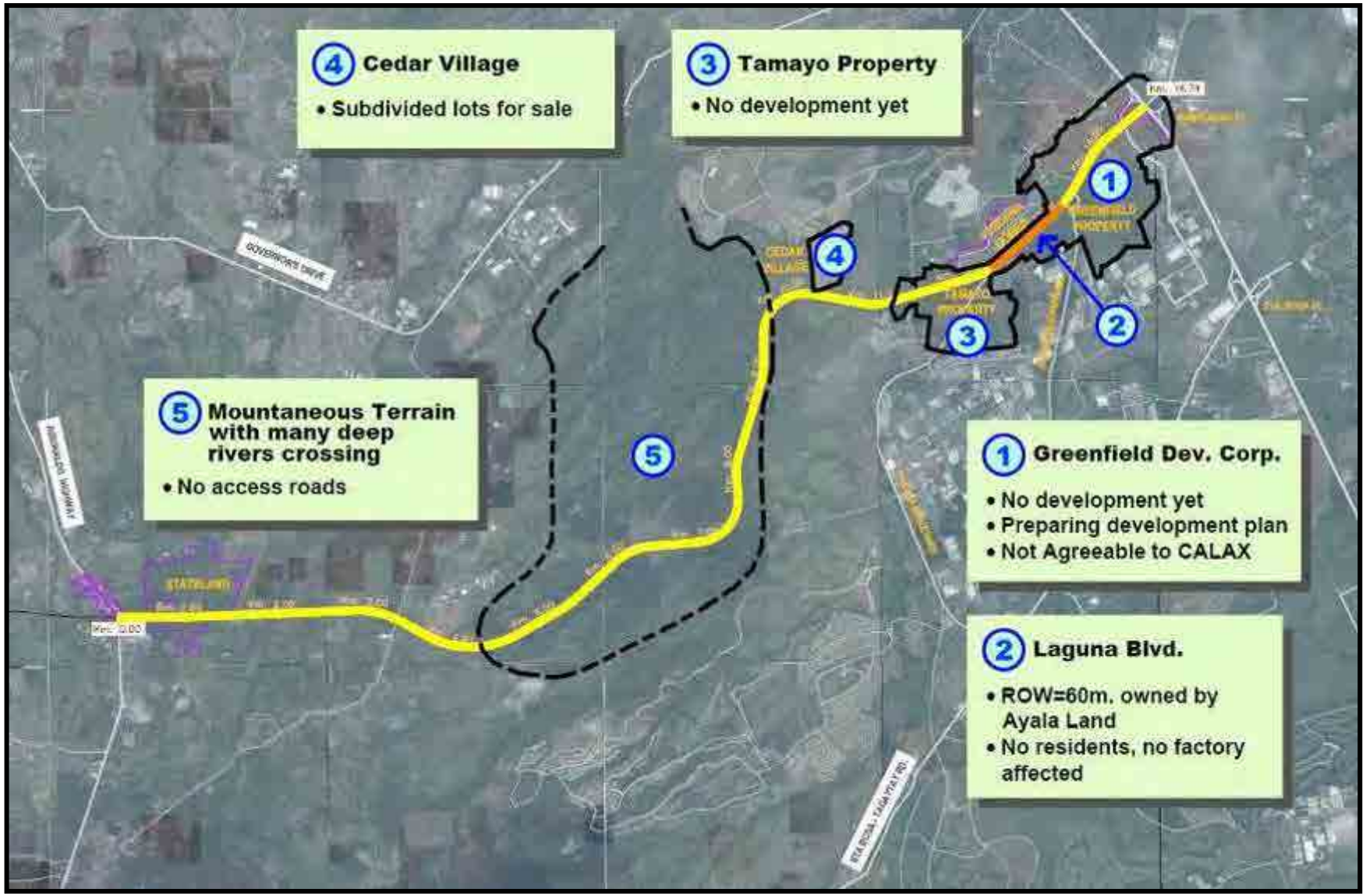
Source: JICA Study Team (2012)

FIGURE 9.5.2-3 (4) ALTERNATIVE ALIGNMENT 4



Source: JICA Study Team (2012)

FIGURE 9.5.2-3 (5) ALTERNATIVE ALIGNMENT 5



Source: JICA Study Team (2012)

FIGURE 9.5.2-3 (6) ALTERNATIVE ALIGNMENT 6

9.5.2.4Zero Option

Table 9.5.3-5 shows the evaluation of with project and without project.

Though Project will affect the pollution, natural environment and social environment, traffic will be drastically improved in this Area.

TABLE 9.5.2-6 EVALUATION OF WITH/WITHOUT PROJECT

Evaluation Item	Parameter	With Project (alternative-3)	Without Project	Remarks
Traffic	Total Travel Time (Y2020)	1,088,081(veh*hrs/day) O	1,180,872(veh*hrs/day) X	92,791veh*hr. saving in Cavite & Laguna Area
Pollution	Air,Noise	Air pollution and noise will occur during construction X	None O	Along CALAX area
	CO_2 (Y2020)	4,076198(ton/year) O	4,197,951(ton/year) X	121,753ton/year decrease during operation.
Natural Environment		Tree Cutting Slop cutting may occur during construction X	None O	
Social Environment		Resettlement necessary (36 structure, 50 households) X	None O	

9.5.3 Scoping Matrix

A Scoping Matrix is prepared taking into account JICA's environmental and social considerations guidelines of 2010 and WB O.P. 4.0.1- Annex B.

TABLE 9.5.3-1 SCOPING MATRIX

No.	Item	CALAX Construction	CALAX in Service	Description
1	Involuntary Relocation/ Resettlement	－A	－B	***Planning and Pre-construction Stage:*** According to the latest road alignment plan, 50 HHs (197 people) are the PAPs. RAP should be drawn up based on the discussion between agencies and PAPs. Also, the design should consider the alignment that will minimize the affected people as much as possible. 80% of target land to be acquired is owned by the land developers, where scattered farming is engaged by licensees and tenants under contract with the landowners. Once developers commence sub-division process, tenants and licensees are forced to abandon cultivation. However, in case project construction precedes developers' subdivision

No.	Item	CALAX Construction	CALAX in Service	Description
				plan, tenants/licensees/occupiers will be obliged to be displaced due to loss of means of subsistence and loss of cultivable plot. ***CALAX In Service:*** Chances of PAFs' degraded quality of livelihood after relocation.
2	Local Economy/ Employment and Livelihood	±B	±B	***During Construction:*** (-)Negative impacts on commercial farms (if any), subsistence farmers, temporal shop keepers, temporal workers, relocated residents, which activities obstructed due to construction in progress. Decrease in the number of holiday makers. (+) Increase in job opportunities for construction workers. Increased demand for local supplies of materials and goods. ***CALAX In Service:*** (+) Increased mobility and improved access to services will contribute to increased level of local people' economic activity and increase in LGU's revenue. (-) Changed way of life and loss of livelihood of tenant/subsistence farmers due to landuse conversion by the developers/landowners.
3	Land Use	−B	+A	***Land Use map*** • *The Western Section (Brgys. Sabutan, Kaong, Tibig, Hukay and Carmen, fall under Silang Municipal jurisdiction)* **(Present) Agricultural → (Proposed) Agricultural + Built-up** • *The Eastern Section (Cities of Sta. Rosa, Biñan, Cabuyao, and Calamba)* **(Present) Residential/ Industrial/ Commercial → (Proposed) Residential + Industrial +Commercial** ***During Construction:*** (-) Land use conversion at several IC sites and alignments (farming/natural vegetation to public infrastructure space) compelling existing small-scale business holders to change location. Tenant and subsistence farmers to lose means of livelihood. ***CALAX In Service:*** (+) Increase in land price.
	Utilization of Local Resources	−B	D	***During Construction:*** (-) Negative impacts from volume of soil and gravel taken from borrow sites and quarry mines.
	Farm Land	−B	−B	***During Construction:*** (-) Farm Land acquisition and conversion to expressway to take place in the Western Section (Brgys. Kaong, Tibig, Hukay and Carmen) of the proposed alignment. Loss of agricultural production is anticipated. ***CALAX In Service:*** (-) Loss in agricultural production and loss of job by small-holders due to land use conversion.
4	Social Institutions, Social Infrastructure and Local Decision-making	−B	+B	***During Construction:*** (-) Hindered access to market, access to job (-) Segregated transport routes to community infrastructure and services, drainage, and stream water course ***CALAX In Service:*** (+) Improved access to social infrastructure and social services – regional hospitals, welfare facilities, and other regional public facilities.
5	Means of livelihood (Considerations for the Poor and Socially	−B	±B	***During Construction:*** (-) Loss of business (stalls, sari-sari store, street vendor) due to construction work and/or relocation ***CALAX In Service:*** (+) With highway-driven local economy, economic spill over will

No.	Item	CALAX Construction	CALAX in Service	Description
	Vulnerable)			eventually benefit the poor. (-) Resettled PAFs needs time to recover same level of livelihood.
	Indigenous People	D	D	It has not been confirmed that indigenous people live at project area.
6	Misdistribution of benefit and damage	D	D	***CALAX In Service:*** (+) It is felt/perceived that new opportunities created by CALAX in operation is going to be distributed fairly. (-) It is felt/perceived that while some stakeholders (one of the interest group) will assume a good part of newly generated business opportunities from CALAX in operation, some other stakeholders seem to be losing existing business. Benefit misdistribution may occur among LGUs benefiting from an IC within its jurisdictional territory and those LGUs without an IC.
7	Cultural Heritages	D	D	Historical monuments (such as old churches, classic architecture) and/or cultural heritages do not exist in the project area.
8	Local Conflict of Interests	D	D	It is generally understood that collusive actions may take place, motivated by a pursuit of private interest, among project decision-makers (purchasers) and the goods/service providers. This may also happen more indirectly through potential linkages of service/goods suppliers' chain under the influence of kinship connection.
9	Water Usage and Water Rights	－B	D	***During Construction:*** (-)Proposed alignment affect twelve (12) households' well sites. No irrigation system along proposed alignment.
10	Sanitation	－B	D	***CALAX during construction*** (-) Health issue of construction workers on-site, Care for occupational health issue of construction workers (-) Proper handling and disposal of wastes generated by construction work (-) Health issue of residents along the construction sites
11	Risk, HIV/AIDS, Infectious disease	－B	D	***CALAX during construction*** (-) Proliferation of HIV/AIDS diseases among construction workers
12	Accidents	－B	－B	***CALAX during construction*** (-) Chances of human casualties/accidents due to construction activities, such as those caused by traffic of construction equipment, vehicles, and accidentally-fell objects. (-) Accidents by quarrying operation ***CALAX in operation*** (-) Accidents caused by human beings/animals trespassing the highway
13	Topography and Geographical Feature	－B	D	***CALAX during construction*** (-) Alteration of landform, esp. cutting hilly terrain, bridging the deep streams, in particular at Brgys. Tibig, and Carmen, which will clear land cover and removing surface soils, leading to potential soil erosion and sedimentation. (-) Increased chances of landslide and soil creep where load cuts are made at gently rolling terrain of Brgys. Hukay and Carmen.
14	Soil Erosion	－B	D	***CALAX during construction*** (-) The project area is prone to moderate-to-slight erosion, depending on the gradient of land slope. Land clearance by cut will form uncovered slopes, which are prone to trigger erosion and surface run-off.
15	Groundwater	－B	D	***CALAX during construction*** (-) Piling and excavation works for expressway foundation works do not interfere with the aquifers. Geological survey result is to be looked into to check if such incidences may occur.

No.	Item	CALAX Construction	CALAX in Service	Description
				CALAX in operation (+/-) No impact is anticipated.
16	Hydrology	D	D	Construction of expressway will not alter nor modify surface water runoff characteristics of the project area. The project area has a natural slope gradient that drains intense rain water and the area is free from floods.
17	Flora, Fauna and Biodiversity	－B	－B	Occurrences of rare, threatened and endangered faunal and floral species in the vicinity of the proposed alignment in the Municipalities of Silang, Santa Rosa, Biñan, and Cabuyao are not reported. The common vegetation consists of a mixture of grassland and second-growth forest in the rural section of Silang municipality, i.e. Brgys. of Kaong, Tibig, Hukay and Carmen. Removal of trees within ROW along the alignment is expected during construction. In operation, natural ecosystems will recover in adjusting of expressway alignment, which are once cleared by construction activities. However faural mitigation behavior will be disturbed. Neither IBAs (important bird area) nor KDAs (key biodiversity area) are designated in this area. Rare/threatened/ endangered avifauna species are not observed.
18	Natural Reserve, Protected Area	D	D	No protected areas exist along the proposed alignment nor its vicinity. DENR - designated IBAs, KBAs, nor any registered wetlands are found in its vicinity.
19	Landscape	－B	－B	Region IV-A has seven “Protected Landscape”, none of which appear in the area for the proposed alignment. However elevated objects, due to expressway construction, may produce visual effect against the present landscape. ***CALAX during construction*** (-) Constructing an elevated structure (a flyover) may have visual impact on present landscape. ***CALAX in operation*** (-) An elevated structure (a flyover) may alter existing residential town landscape and may have a permanent visual impact.
20	Global Warming	－B	－B	***CALAX during construction*** (-) Construction heavy vehicle traffic emits more volume of GHGs. CALAX in operation (-) Increased traffic over the CALA expressway emits more GHGs.
21	Air Pollution	－B	－B	***CALAX during construction*** (-) Deployment of heavy-duty construction machinery/equipment/ vehicles at the construction site causes pollutant gas emissions. ***CALAX in operation*** (-) Potentially degraded ambient air quality is expected along the expressway due to increased traffic.
22	**Water Pollution**	－B	－B	***CALAX during construction*** (-) Residual soil, cement, machine oil, vehicle motor oil, paints, other hazardous materials, generated/wasted by construction work, eventually find their way into adjacent surface water bodies. Eroded soil will also flow into nearby surface water bodies. (-) There will be no adverse effect to pollution of underground water. ***CALAX in operation*** (-) Heavy metals of exhaust gas origin, spill oil, asphalt debris may be drained from expressway surface to reach any ambient water bodies and contaminate them. (-) There will be no adverse effect to pollution of underground water.
23	Soil Contamination	－B	D	***CALAX during construction*** (-) Construction-site soil is going to be contaminated by the above-mentioned on-site polluted water.

No.	Item	CALAX Construction	CALAX in Service	Description
				Incidence of lubricant oil spills from soil-properties test boring, and deployed construction vehicles will affect the contamination state of surface soil.
24	Solid Waste	－B	D	***CALAX during construction*** (-) Residue soil from cut, debris from construction work, solid and liquid wastes from construction workers' camps are generated.
25	Noise and Vibration	－B	－B	***CALAX during construction*** (-) Deployment of heavy-duty equipment and machinery on-the-site, incoming/outgoing transport vehicles, earth-moving, piling will cause elevated level of noise and vibration effects perceived by residents adjacent to the construction site. ***CALAX in operation*** (-) Noise and vibration generated by through traffic are perceived to be annoying by adjacent residents.
26	Ground Subsidence	D	D	***CALAX during construction*** (-) Geological survey reveal potential occurrence of the soft ground along the proposed alignment. The survey reveal chance of incidence of localized and temporal land subsidence during piling operation using heavy-duty equipment. According to this geological survey by 2012, no soft grounds are identified. ***CALAX in operation*** (-/+) No impacts anticipated.
27	Offensive Odor	－B	D	***CALAX during construction*** (-) Temporal sources of offensive odors – outdoor toilets, garbage collection site of the construction camp and so on.
28	River-bed Sedimentation	D	D	***CALAX during construction*** There are least possiblities of bottom sediment deterioration due to in flow of contaminants and soil from construction site. ***CALAX in operation*** No impact
29	Traffic Congestion	－B	＋B	***CALAX during construction*** (-) Traffic jams may occur at towns due to usage of existing roads for construction purposes. ***CALAX in operation*** (+) Traffic will be streamlined and congestion alleviated.
30	Flood	D	D	The proposed alignment runs through well-drained upland slopes (Silang municipality), while the Eastern section of the alignment runs more-or-less urbanized residential/commercial/industrial area, where occurrences of flood is not observed with slope gradient above 1.0%. Interviews with local residents show that there have been no flood incidences. ***CALAX during construction*** (-) No impact. ***CALAX in operation*** (-) No impact

Remarks:
+ : Positive, - : Negative
A : Serious impact is expected, B: Some impact is expected, C: Extent of impact is unknown. (Examination is needed. Impact may become clear as study progresses. D : No impact is expected, IEE or EIA is not necessary.

Source: JICA Study Team (2012)

9.5.4 Analysis of Key Environmental Aspect

Current state of natural and social environments are studied based on existing credited data and statistics, government reports, direct measurement, interview, and visual observation.

9.5.4.1The Land

(1) Land Use and Classification

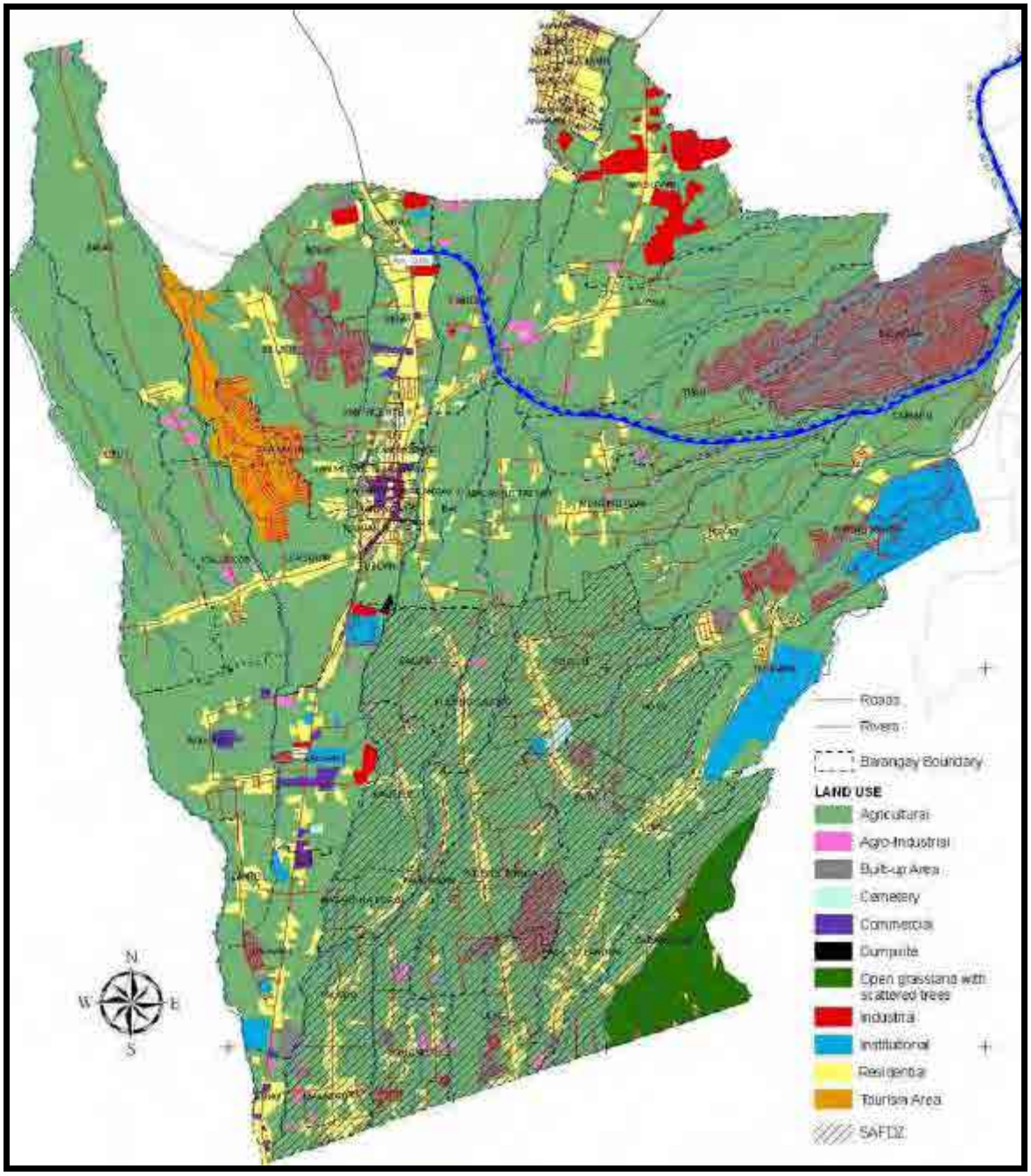
1) Silang, Cavite

The Present Land Use Map of Silang, Cavite presented in **Figure 9.5.4-1**, shows that there are **11** land use classifications identified in the Municipality of Silang, Cavite. Most recent data (Year 2009) from the Provincial Agriculturist Office (PAO) indicated that about **60.3%** or **9,431.83 ha** of Silang's total land area of **15,641 ha** are primarily intended for agricultural purposes. Being the major crops of the town, pineapple and coffee are predominantly planted to approximately **7,014.66 ha** or **74.37%** of the municipality's agricultural lands.

The remaining **6,209.17 ha** (**25.63%**) in Silang's land area is almost evenly distributed to other purposes such as residential, industrial, built-up, institutional, agro-industrial, commercial, tourism area, cemetery, open grassland with scattered trees, and dump site.

In Silang, the proposed CALA Expressway alignment will generally traverse **agricultural areas**. However, actual survey conducted revealed that most of these areas are unproductive agricultural lands which appear to have transformed into **open grassland land/wasteland** (see **Plate No. 1**) due to unavailability of irrigation system. Patches of marginal pineapple plantations and corn fields are observed in Brgy. Sabutan and Tibig (**see Plate Nos. 3** and **4**). Farther down southeast, the alignment will traverse through some coffee, banana, and coconut plantations in Brgy. Tibig.

The alignment will also cut across some residential properties of **Stateland** in Brgy. Sabutan, and **Extra Ordinary** in Brgy. Carmen. On the southeast, it will also pass along prime residential areas such as the **Ayala West Grove Heights** and **South Forbes** in Brgy. Inchican.



Source: WWF Philippines

FIGURE 9.5.4-1 PRESENT LAND USE MAP OF SILANG, CAVITE

Plate No. 1 Vast unproductive and non-irrigated agricultural land to be traversed by the CALA Expressway alignment (red line) between **Km 3+900–4+300** in Brgy. Tibig, which has evidently transformed into a open grassland/wasteland.

Plate No. 2 Patches of corn fields (encircled) in the middle of grassland areas observed in Brgy. Sabutan, Silang, Cavite between **Km 1+000–2+000**.

Plate No. 3 Marginal pineapple plantation on the southeast side of Sabutan Road, in Brgy. Sabutan, Silang, Cavite (Km 1+000–2+000).

Plate No. 4 Photo of the orchard planted to coffee, banana, and coconut owned by the Mercados between Km 4+200–4+800 in Brgy. Tibig, Silang, Cavite. The proposed CALA Expressway alignment will pass through the middle of the plantation, effectively splitting the property into two (2).

2) Santa Rosa, Laguna

Santa Rosa City's total land area of approximately **54.13 km^2** (**5,413 ha**) is divided into **11** land use classifications that includes residential, agricultural, industrial, built-up, agro-industrial, commercial, tourism area, institutional, cemetery, mud/sand, and open grasslands. Among these classifications, large portions of the City's land area are almost equally subdivided to residential, industrial, and agricultural purposes.

The extensive industrial estates of the Santa Rosa City as shown in the Present Land Use Map presented in **Figure 9.5.4-2** are virtually concentrated on the western sector of the City. It accommodates the Laguna Techno Park, the largest bottling plant of Coca Cola Company in

the Philippines, the assembly plant of Isuzu Philippines Corporation, Toyota Motors Corporation Philippines manufacturing plant, Nissan Motors Philippines, and other recognized industries such as Common Image Generator Interface (CIGI) and Filsyn. Food giant Monde Nissin Corporation's **14-hectare** manufacturing plant (Lucky Me noodles and Monde biscuits) is also located in the City's industrial zone. The western sector of Santa Rosa is likewise characterized by the presence of prime residential subdivisions, Paseo Mall, hotel establishments, as well as the eco zone areas of Nuvali.

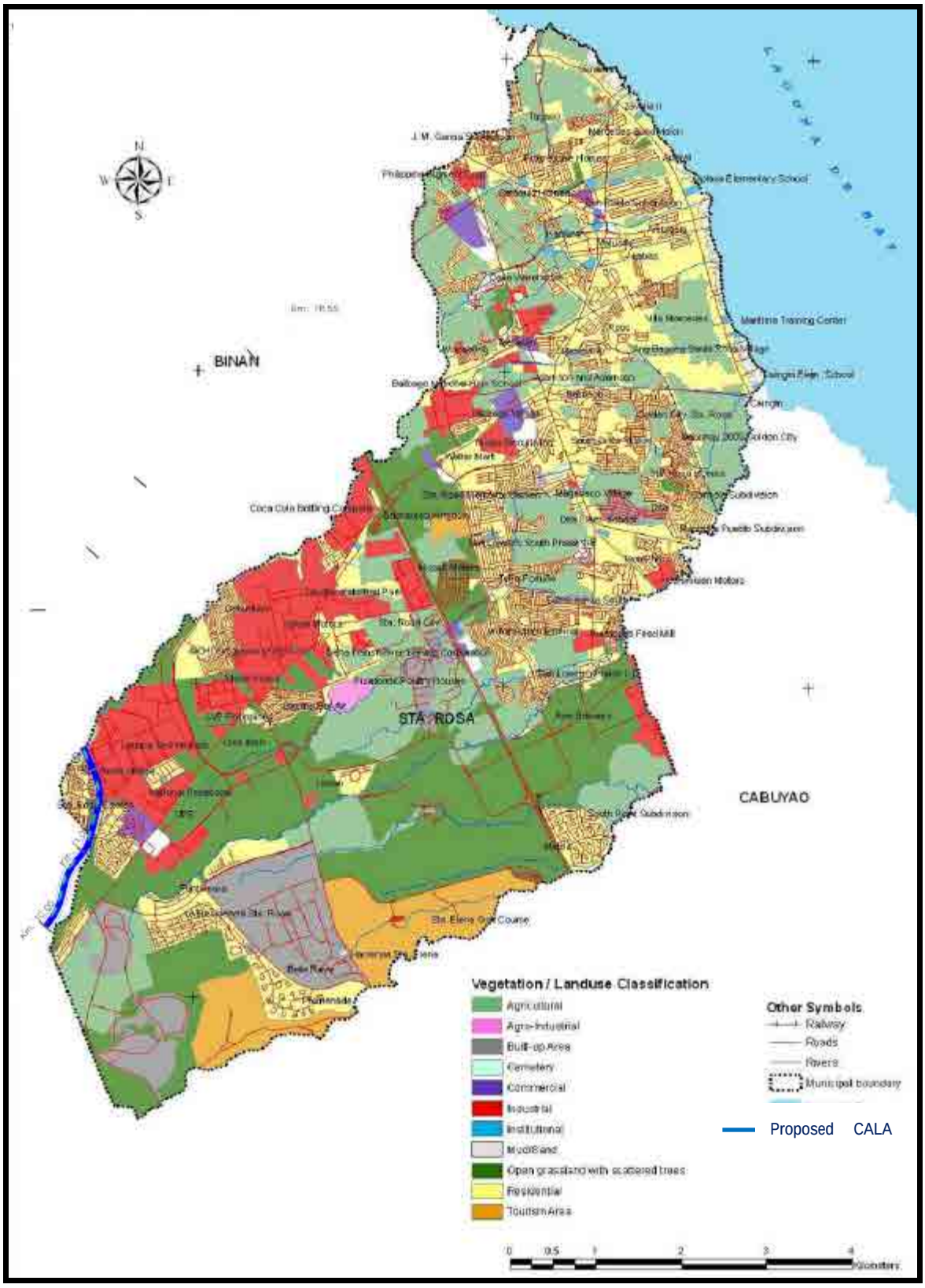
From Brgy. Carmen, Silang Cavite, the alignment will enter Sta. Rosa City through Brgy. Don Jose. The alignment will connect to the existing Nuvali Spine Road and will pass by the residential developments of **Sta. Rosa Village** on the northeast and the Sta. Rosa Estates on the southeast. To the east of the proposed alignment is the Laguna Techno Park, Sta. Rosa City side.

3) Biñan City, Laguna

Biñan City has a total land area of 4,350 ha, which represents 2.5% of the entire Laguna area. Of the 11 land use classifications illustrated in **Figure 9.5.4-3**, a large portion of the City's land area is dedicated for residential purposes. Open grasslands with scattered trees also represent a substantial space in the City. The built-up, agricultural, and industrial uses nearly secure equal shares of Biñan's land areas. The remaining portions of the City are subdivided to other utilizations such as agro-industrial, commercial, institutional, cemetery, mud/sand, and tourism area

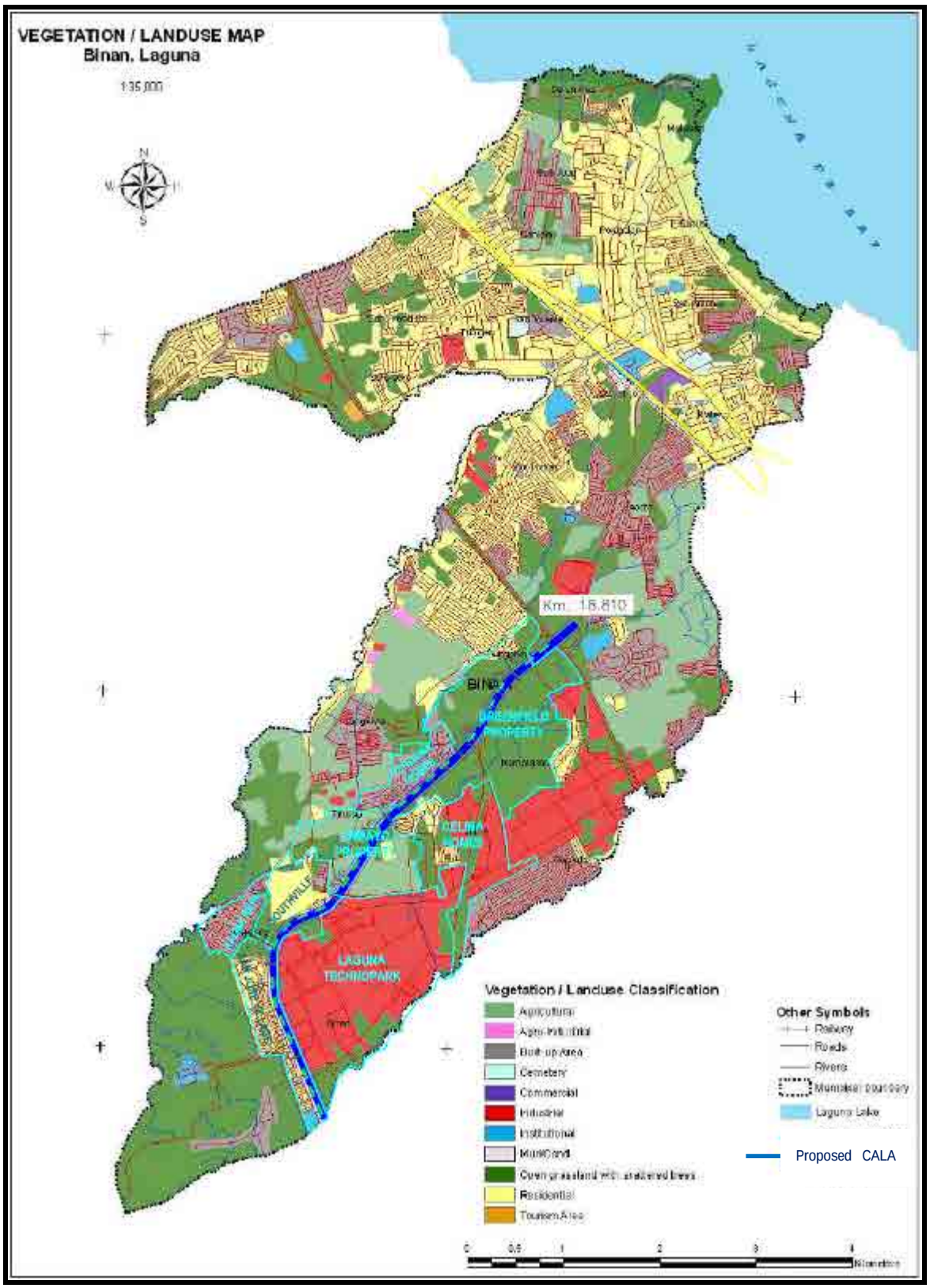
The alignment from the Nuvali Spine Road in Brgy. Don Jose, Santa Rosa City, will then follow the existing Laguna Boulevard in Brgy. Biñan, Biñan City, passing by the Laguna Techno Park on the east, and Sta. Rosa Village and San Jose Village on the west. As the alignment continues to follow the existing road towards northeast, it will pass by Southvillle in Brgy. Malamig before cutting across the Tamayo Property in Brgy. Timbao.

It will then follow the existing Nuvali passing by the Verdana Homes on the northwest and Celina Homes on the east. Towards its terminus, the alignment immediately after Celina Homes will pass along the Greenfields Property at Km 16+150. The proposed CALA Expressway will eventually cut across the Greenfields Property approximately at Km 16+950 and will continue to traverse the said property until it reaches its end section at Km 18+010 in Brgy. Mamplasan.



Source: Sta. Rosa City, Planning Division

FIGURE 9.5.4-2 PRESENT LAND USE MAP OF STA. ROSA CITY, LAGUNA



Source: Binan City, Planning Division

FIGURE 9.5.4-3 PRESENT LAND USE MAP OF BIÑAN CITY, LAGUNA

Plate No. 5 Photo taken along the Greenfield Parkway- Mamplasan Overpass Road inside the Greenfields property between Km 17+000–18+000. Both sides of the road are open grassland areas with patches of trees.

Plate No. 6 Photo taken along the Nuvali Road. The properties on both sides of the road are owned by the Greenfields.

Plate No. 7 Photo of the existing Nuvali Road, Brgy. Malamig, section. On the southeast side of the road is the Laguna Techno Park, Biñan side.

Plate No. 8 Photo taken at the northwest side of the roundabout in Brgy. Mamplasan, Biñan City.

(2) Geomorphology

Out of **four** (**4**) major landscapes in the Cavite-Laguna area, only **two** (**2**) of these are found in the Project area. These are: (i) alluvial lowlands, and (ii) hills and mountains. The study area is characterized by alluvial lowlands, piedmont plains and foothills, and hills and mountains.

1) Alluvial Lowlands

The alluvial lowlands are those nearly flat to gently sloping alluvial plains formed from lateral erosion or soil deposition of running streams or rivers. In Cavite, broad and minor alluvial plains form the transition area between the strip of coastal landscapes and the piedmont plains and foothills. These have slopes ranging from 0% to 5%. Approximately 75% are flat, 20% are gently sloping and 5% are levee.

In Laguna, the alluvial lowland is basically an extension of the minor alluvial plain in Taguig and Muntinlupa. It covers the low depressed areas of the towns bordering the western and southern shores of Laguna de Bay. Slope ranges from 0% to 3%. These are mostly found in the eastern portions of the alignment (Biñan and Sta. Rosa)

2) Hills and Mountains

These are the areas at very high elevations with slopes over 18% and include higher hills and mountains. In the Project area, these are mostly found in the western portions (Silang).

(3) Geology

1) Geological Faults in the Philippines

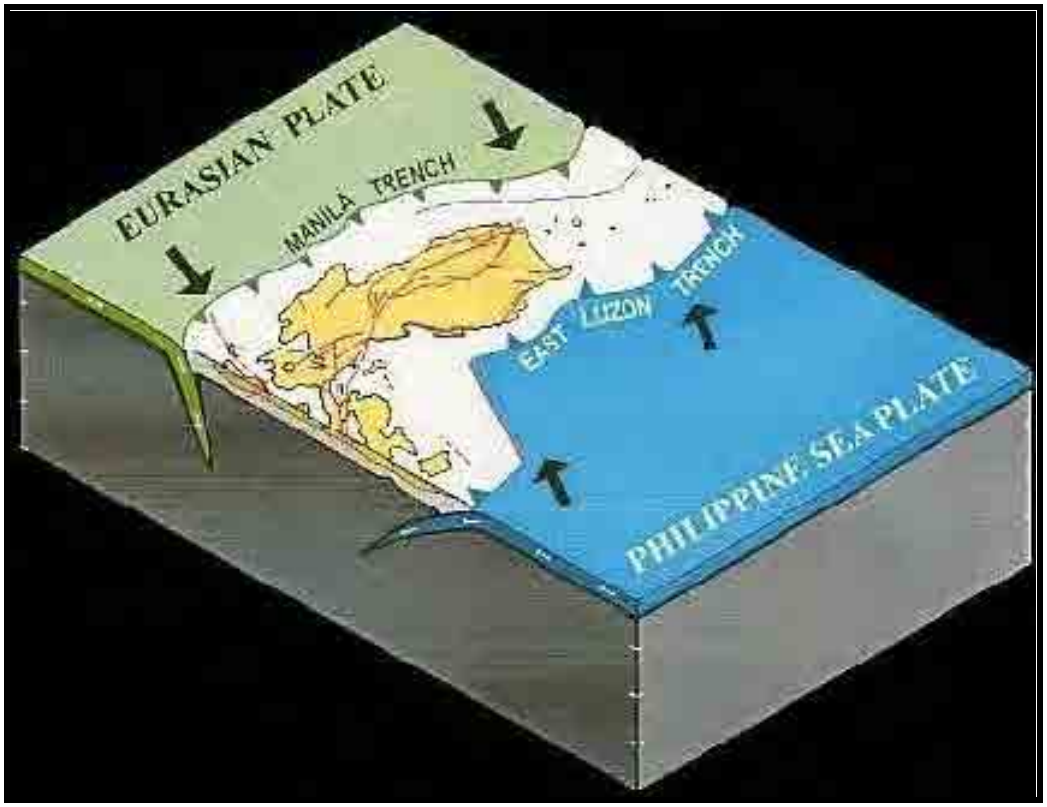
The Philippines is located in latitude 5° to 19°45' N and longitude 116° to 128° E. The Cavite-Laguna area is located in southern Luzon Island, bounded by Manila Bay on the west, which extends to the South China Sea, and Laguna de Bay on the east. Many earthquake generators are distributed all over the country as shown in **Figure 9.5.4-4**.

Source: JICA, MMDA, PHIVOLCS, Earthquake Impact Reduction Study, Metro Manila, Republic of the Philippines, 2004

FIGURE 9.5.4-4 GEOLOGICAL FAULTS IN THE PHILIPPINES

2) Earthquake Generators

The Eurasian Plate (or South China Plate) subducts eastward beneath Luzon Island along the Manila Trench, and the Philippine Sea Plate subducts westward along the East Luzon Trench simultaneously as shown in **Figure 9.5.4-5**.



Source: JICA, MMDA, PHIVOLCS, Earthquake Impact Reduction Study, Metro Manila, Republic of the Philippines. 2004)

FIGURE 9.5.4-5 SUBDUCTING PLATES UNDER LUZON ISLAND

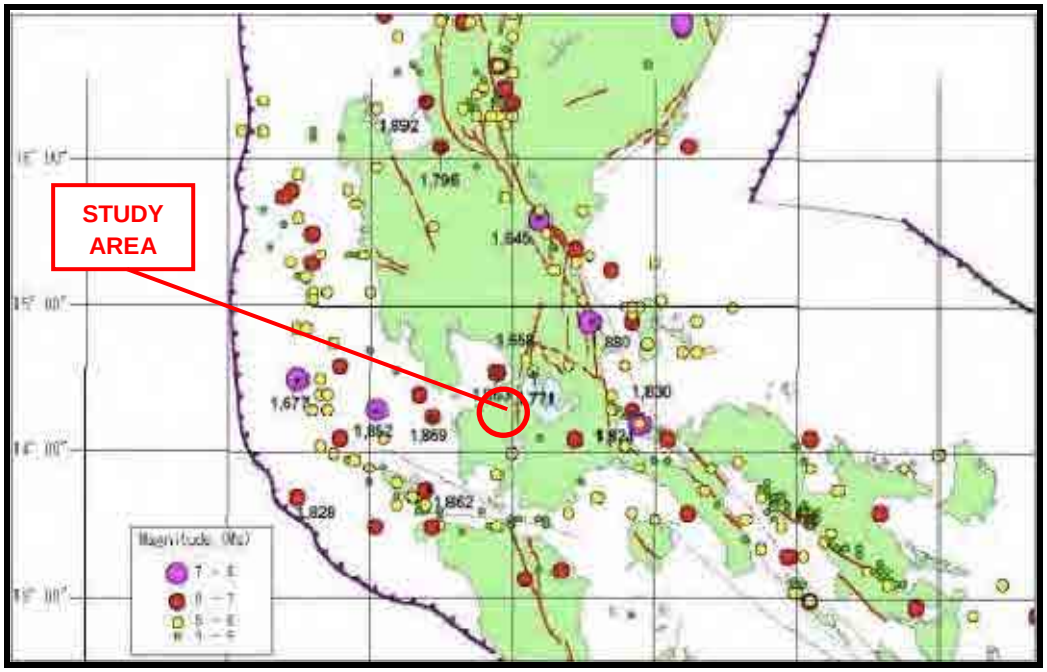
Because of this complex tectonic setting, Luzon Island shows high seismic activity. The Philippine Islands are sandwiched between two (2) opposite subduction zones. A long inland Philippine Fault Zone (PFZ) lies parallel to the subduction trenches. The PFZ is assumed to release the shear stress caused by the oblique subduction of the ocean plates. Many faults are identified around the project area. The West Valley Fault (WVF) and the East Valley Fault (EVF) which run north to south along the west and east edge of the Marikina Valley are considered to pose the greatest threat to the National Capital Region (NCR) and other parts of Southern Luzon due to their proximity.

Results of several trenching excavation surveys at WVF and EVF indicate that at least two or perhaps four large surface-rupturing events have occurred since AD 600. Therefore, the recurrence interval of the earthquakes generated is less than 500 years. Bautista (*2000*) has suggested that the 1658 and 1771 earthquakes could be candidate events for the EVF. However, no event along the WVF is known. If no earthquake had occurred at the WVF

after the 16th century, then the earthquake occurrence along the WVF becomes a serious threat.

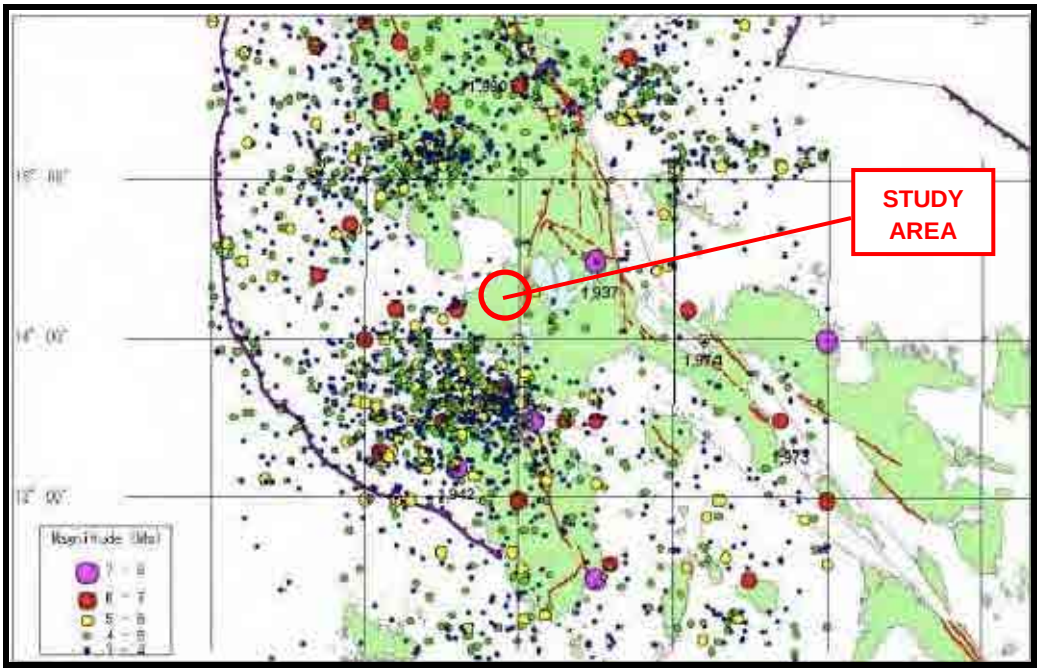
Historical Earthquakes

The earthquakes that occurred before the start of instrumental seismic observation are called historical earthquakes. As interpreted in the distribution of collected historical earthquakes presented as **Figure 9.5.4-6**, the highest magnitude for historical earthquake recorded in sites nearest to the study area is **6-7**. On the other hand, the instrumentally recorded earthquakes after 20th century depicted in **Figure 9.5.4-7** shows a **5-6 magnitude** earthquake occurrence for areas southeast of the project area.



Source: JICA Study Team (2012)

FIGURE 9.5.4-6 DISTRIBUTION OF HISTORICAL EARTHQUAKES FROM 1608 TO 1895



Source: M. L. P. Bautista and Oike K. 2000

FIGURE 9.5.4-7 DISTRIBUTION OF INSTRUMENTALLY RECORDED EARTHQUAKES FROM 1907 TO 2002

3) Regional Geology

The Cavite-Laguna area is situated in a volcanic region referred to as the Southwest Luzon Uplands. It is bounded by three (3) major offshore and two (2) major onshore structures. The offshore structures include the eastward-dipping Manila trench on the west, the westward-dipping east Luzon trench along the east and the active Lubang Fault to the southwest. On shore structures include the West Marikina Valley Fault System to the east and the 1,300 km-long Philippine Fault farther east.

The project area is characterized by a gently sloping terrain, which grades towards Manila Bay and dissected by a sub parallel network of streams emanating from the northern edge of the Tagaytay highlands. It is bounded to the east by the Laguna- de-Bay and to the south by the Tagaytay escarpment and farther south by Taal Lake.

The underlying geologic materials include weathered pyroclastics, which have adequate capacity to support the proposed road structures. The project area is subjected to the natural processes of erosion, siltation, mass movement, flooding, volcanic and seismic related hazards. With the exception of ground shaking generated by the seismic activities of the major geologic structures in the region, most of these processes are local and do not significantly affect the project area.

Geologic Condition Along the CALA Expressway Alignment

The study area is underlain by rocks of various origins and characteristics consisting primarily of QAL and Tuff as described in **Table 9.5.4-1**.

TABLE 9.5.4-1 GEOLOGIC CONDITION IN THE STUDY AREA

Symbols	Description	Area (Ha)	Percentage %
QAL	Quaternary Alluvium: Unconsolidated deposits of silt, sand and gravel along valleys and coastal plains	16,758	21%
Tuff	Taal Tuff: Thin to medium- bedded, fine grained vitric tuffs, welded volcanic breccias with conglomerate, tuffaceous sandstone and shale.	62, 995	79%
	TOTAL	79,753	100%

Source: Bureau of Soils and Water Management, Department of Agriculture, 2011

(4) Pedology

Summarized in **Table 9.5.4-2** are the soil characteristics in the study area.

TABLE 9.5.4-2 SOIL CHARACTERISTICS IN THE STUDY AREA

Feature	Coastal Landscapes	Alluvial Lowlands	Piedmont Plains and Foothills	Hills and Mountains
Effective Soil Depth	Shallow to moderately deep	Shallow moderately deep	Shallow to Deep	Hills and Mountains
Composition	Organic	Organic	Non-organic	Non-organic
Soil plasticity	Very high	Very high	Low	Low
Soil drainage	moderate	moderate	good	good
Note: Color-shaded columns are the type of soils found in the study area				

Source: Bureau of Soils and Water Management, Department of Agriculture

1) Alluvial Lowlands

In Cavite, parent soil material is largely fine clay that is poorly drained in flat to nearly flat areas and moderately drained in gently sloping areas. Fine loam is found in the levee areas. As such, soil varies from sandy to silty clay loam to clay and is somewhat poorly drained.

The area possesses potentials for high yielding wells.

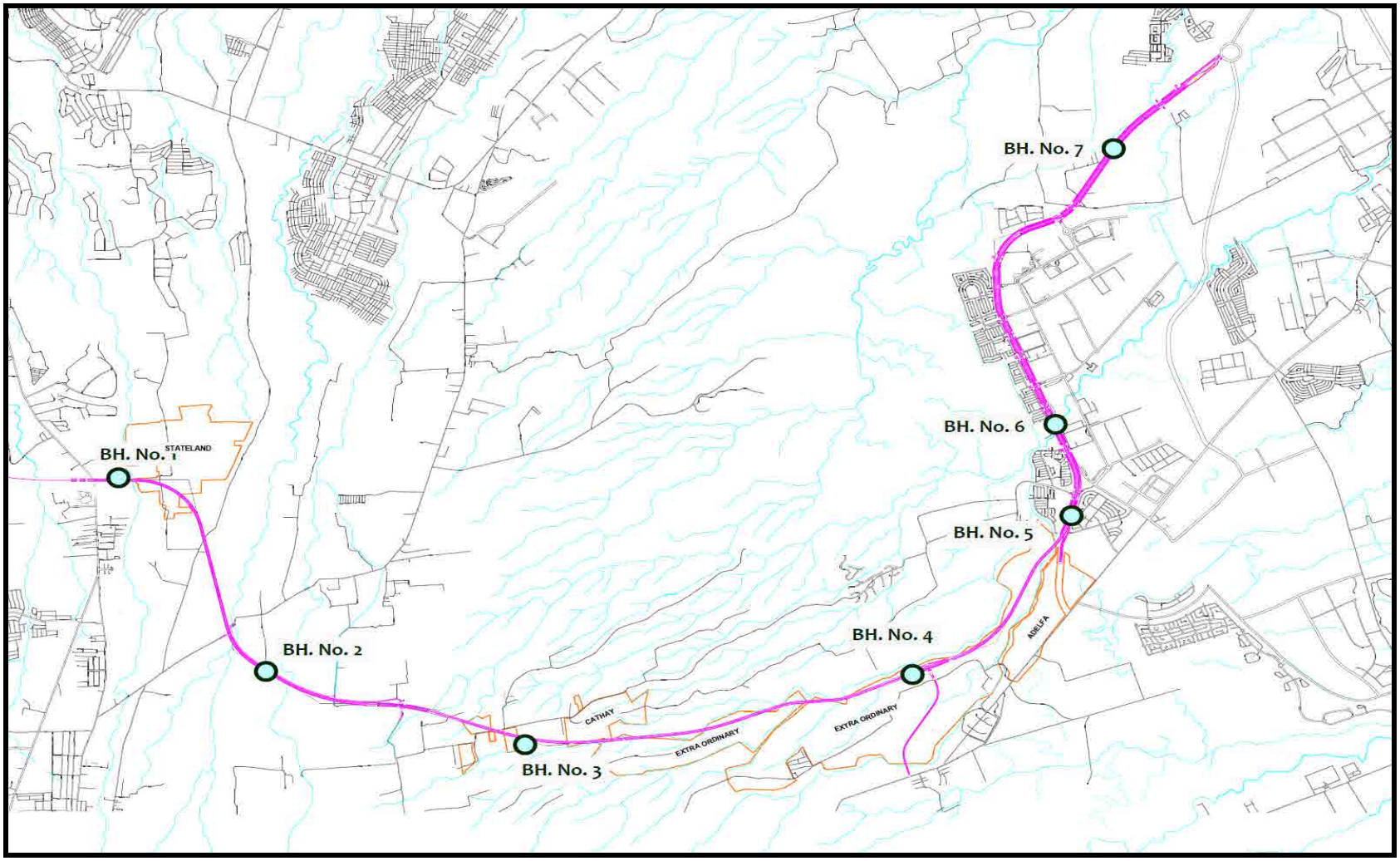
2) Hills and Mountains

Parent soil material is sandy loam or loam that is drained well. Effective soil depth varies from very shallow to deep.

3) Borehole Data

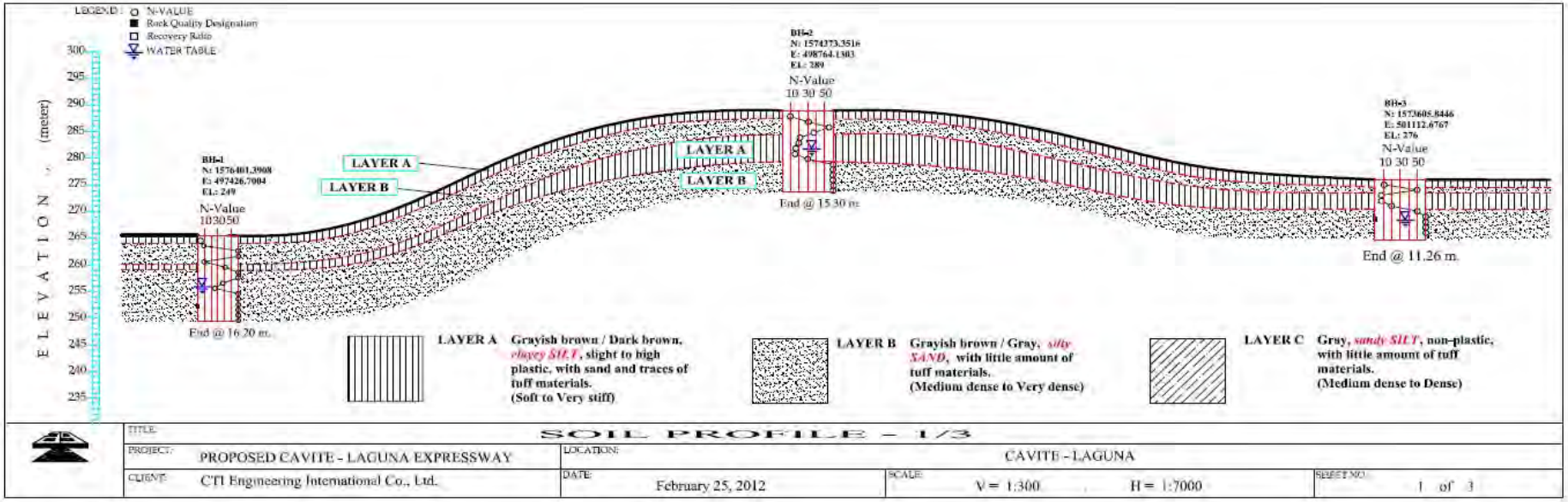
Figure 9.5.4-8 presents the location of bore hole tested along the recommended CALA Expressway alignment. As can be discerned from the soil profile illustrated in **Figure 9.5.4-9. Layer A** corresponds to soil materials that are characteristic of coastal landscapes and **alluvial plains**, being slightly to highly plastic, due to considerable amount of clay materials.

Layer B, which is described as grayish brown/gray silty sand with little amount of tuff materials, and **Layer C**, which are non-plastic sandy silts are characteristic of soils found in **hilly and mountainous landscapes**, as presented in the previous section.



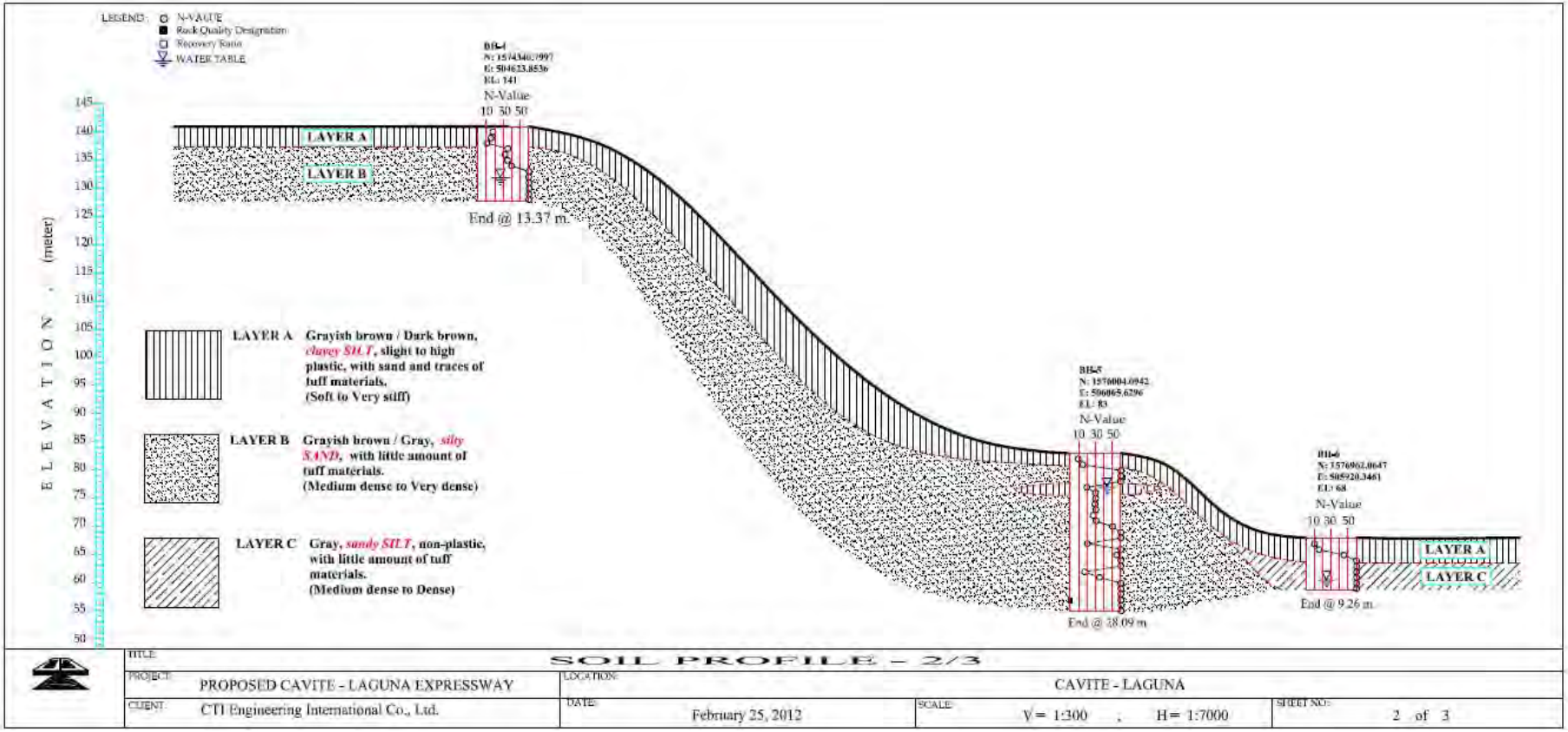
Source: JICA Study Team (2012)

FIGURE 9.5.4-8 LOCATION OF BOREHOLES ALONG THE CALA EXPRESSWAY ALIGNMENT



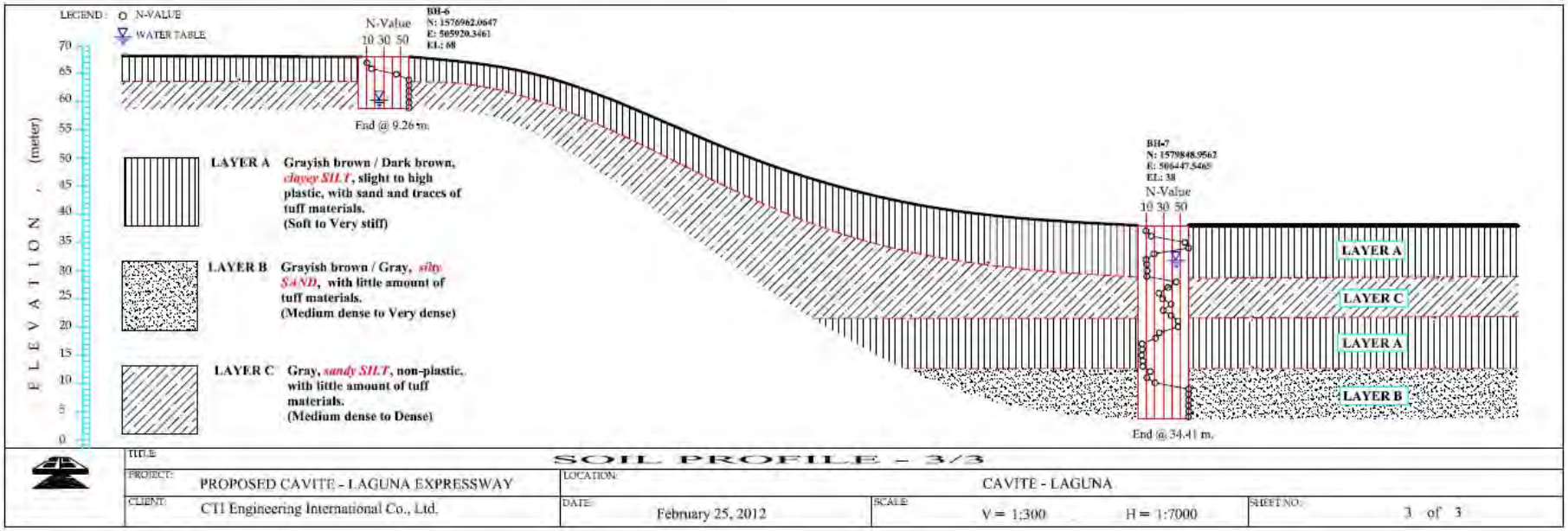
Source: JICA Study Team (2012)

FIGURE 9.5.4-9 (1) SOIL PROFILE – 1/3



Source: JICA Study Team (2012)

FIGURE 9.5.4-9 (2) SOIL PROFILE – 2/3



Source: JICA Study Team (2012)

FIGURE 9.5.4-9 (3) SOIL PROFILE – 3/3

(5) Terrestrial Biology

1) Terrestrial Flora

The vegetation cover along the areas traversed by the proposed CALA Expressway alignment can be classified into **two** (**2**) major types, the **Natural Vegetation**, and the **Cultivated Vegetation**. The **Natural Type** primarily consists of Secondary Growth and Lowland Grassland/Wasteland, while the **Cultivated Type** on the other hand is subdivided into Agricultural and Built-Up.

Natural Vegetation Type

Secondary Growth

In some cases, the formation of varied vegetative patterns in certain areas is controlled by edaphic (i.e. related to soils) factor, as is the salty muds where mangroves thrive. Climatic condition also pose a big influence in vegetation formations in misty mountains where elfin forest type is found or areas where seasonally wet and dry monsoon forests occur.

In the study area, there is no primary forest growth observed. The sparsely vegetated landscape serves as a reminder of the past human activities that have dictated the formation of a distinct flora community. Regenerations of tree species typical of a *secondary forest* are very evident along gullies and edges of rivers and creeks. Mixed growths of mature and juvenile *Ficus nota* (tibig), *Macaranga tanarius* (binunga), *Anthocephalus cadamba* (kaatoang bangkal), *Trema orientalis* (anabiong), *Antidesma bunius* (bignai) is common. It is balanced well by the growths of associated species like *Mallotus multiglandosus* (alim), *Vitex negundo* (lagundi), *Ficus odorata* (pakiling), *Macaranga grandifolia* (takip-asin), and *Artocarpus communis* (rimas/kamansi). Proliferations of *Leucaena leucocephala* (ipil-ipil) strongly indicate previous slash and burn farming activities in the study area.

It is important to note that endangered and/or rare flora species were not encountered in the study area. Given in **Table 9.5.4-3** is the list of tree species identified in the study area.

TABLE 9.5.4-3 LIST OF SECONDARY FOREST PLANT SPECIES FOUND IN THE STUDY AREA

Common Name	*Scientific Name*	Family Name
Achuete	*Bixa Orellana*	Bixaceae
Alibangbang	*Bauhinia monandra*	Leguminosae
Alim	*Mallotus multiglandosus*	Euphorbiaceae
Anabiong	*Trema orientalis*	Ulmaceae
Anahaw	*Livistona rotundifolia*	Palmae/Arecaceae
Antipolo	*Artocarpus blancoi*	Moraceae
Balanti	*Homallanthus sp*	Euphorbiaceae
Banaba	*Lagerstroema speciosa*	Lythraceae
Banato	*Mallotus philipensis*	Euphorbiaceae
Bangkal	*Nauclea sp.*	Rubiaceae
Bignai	*Antidesma bunius*	Euphorbiaceae
Binayuyu	*Antidesma ghaesembilla*	Euphorbiaceae
Binunga	*Macanranga tanarius*	Euphorbiaceae
Bunga	*Areca Catechu*	Palmaceae
Buri	*Corypha elata*	Palmae
Dao	*Dracontomelon dao*	Anacardiaceae
Dita	*Alstonia scholaris*	Apocynaceae
Hamindang	*Macaranga bicolor*	Euphorbiaceae
Hauili	*Ficus septica*	Moraceae
Hinlaumo	*Mallotus ricinoides*	Euphorbiaceae
Igot	*Syzygium escritorii*	*Myrtaceae*
Ilang ilang	*Cananga odorata*	Annonaceae
Ipil-ipil	*Leucaena leucocephala*	Leguminosae
Kaatoang-bangkal	*Anthocephalus cadamba*	Rubiaceae
Kalios	*Streblus asper*	Moraceae
Kamagong/mabolo	*Diospyros philipensis*	Ebenaceae
Kapok	*Ceiba pentandra*	Bombacaceae
Kauayan	*Bambusa sp.*	Gramineae
Lagundi	*Vitex negundo*	Verbenaceae
Libas	*Spondias pinnata*	Anacardiaceae
Lumbang	*Aleurites moluccana*	Euphorbiaceae
Madre cacao	*Gliricida sepium*	Leguminosae
Malapapaya	*Polyscias nodosa*	Araliaceae
Molave	*Vitex parviflora*	Verbenaceae
Pakiling	*Ficus odorata*	Moraceae
Rimas	*Artocarphus communis*	Moraceae
Takipan	*Caryota Rumphiana*	Palmaceae
Talisay	*Terminalia catappa*	Combretaceae
Tanglin	*Adenanthera intermedia*	Leguminosae
Tibig	*Ficus nota*	Moraceae
Tubang-bakod	*Jatropha curcas*	Euphorbiaceae

Source: As Observed by the EIA Study Team during Field Survey

Plate No. 9 Mixed stands of secondary forest tree species such as F. nota, T. orientalis, A. cadamba, M. philipinensis, M. tanarius, and A. bunius observed along the gullies bordering Malaking Ilog River in Bgry. Sabutan.

Plate No. 10 Scattered trees observed at the beginning section of the alignment in Brgy. Biga II, Silang, Cavite.

Lowland Grassland and Wasteland

"Kaingin" or slash and burn farming is the oldest method of agricultural practice known to man since the early years of the 20th century. Undeniably, it has greatly influenced the formation of vegetative cover not only in the study area, but in the entire country as well. Due to the enormity of the converted forest areas, farmers are unable to till every corner of the expanse, which leads to the evolution of another vegetation community, called the *Lowland Grassland*.

Similar to other grassland, vegetation growth in the study area is dictated mainly by **two** (**2**) grass species – *Saccharum spontaneum* (talahib) and *Imperata cylindrica* (cogon). Although *I. cylindrica* is the more aggressive species of the two, grassland areas traversed by the alignment are dominated by the much taller and coarser *S. spontaneum*. Mixed growths of various grass, shrub, and herb species such as *Axonopus compressus* (carabao grass), *Lantana camara* (coronitas), *Amaranthus spinosus* (colitis), *Chromolaena odorata* (hagonoy), *Clitorea ternatea* (pukinggan), *Peperomia pellucida* (pansit-pansitan/olasiman-ihalas), *Eclipta alba* (tinta-tintahan), *Paspalum conjugatum* (laau-laau/T-grass) are also common.

Densely covering the wastelands are *Murdannia nudiflora* (alikbangon-lalaki), *Mimosa pudica* (makahiya), *Urena lobata* (kulut-kulutan), *Aneilema malabaricus* (bangal), *Alocasia macrorhiza* (biga/elephant's ear), *Chloris barbata* (koroskorosan), and *Hyptis capital* (botonesan).

Enumerated in **Table 9.5.4-4** are the various grass, weeds, shrubs, and herbs species encountered in the study area.

TABLE 9.5.4-4 LIST OF SHRUB, HERB, GRASS, AND SEDGE SPECIES IDENTIFIED IN THE STUDY AREA

Common Name	Scientific Name	Family Name	Habit
Alikbangon-lalaki	*Murdannia nudiflora*	Commelinaceae	Herb
Alinang	*Cyperus iria*	Cyperaceae	Sedge
Apuy-apuyan	*Cleome gynandra*	Capparidaceae	Herb
Baki-Baki	*Cyperus difflormis*	Cyperaceae	Sedge
Bakwit	*Eriochloa procera*	Gramineae	Grass
Bangal	*Aneilema malabaricum*	Commelinaceae	Herb
Botonesan	*Hyptis capitana*	Labiatae	Herb
Botonsilyo or Borobotones	*Cyperus kyllingia*	Cyperaceae	Sedge
Botonsilyong Gapang	*Gomphrena celosioides*	Amaranthaceae	Herb
Bulang	*Echinochloa colonum*	Gramineae	Grass
Buntot pusa	*Pennisetum polystachyon*	Gramineae	Grass
Coronitas	*Lantana camara*	Verbenaceae	Shrub
Dampalit	*Sesuvium portulacastrum*	Aizoaceae	Herb
Dawa-Dawa	*Dawa-Dawa*	Gramineae	Grass
Golasiman	*Portulaca oleracea*	Portulacaceae	Herb
Hagonoy	*Chromolaena odorata*	Asteraceae	Shrub
Hangod	*Achyranthes aspera*	Amaranthaceae	Herb
Kalog-Kalog	*Crotalaria retusa*	Leguminasae	Shrub
Kastuli	*Abelmoschus moschatus*	Malvaceae	Herb
Kogon	*Imperata cylindrica*	Gramineae	Grass
Korokorosan	*Chloris barbata*	Gramineae	Grass
Kulut-kulutan	*Triumfetta bartramia*	Tiliaceae	Herb
Laau-Laau	*Paspalum conjugatum*	Gramineae	Grass
Lapnis	*Malachra capitata*	Malvaceae	Shrub
Makahiya	*Mimosa pudica*	Leguminosae	Herb
Makahiyang lalake	*Aeschynomene amerikana*	Leguminosae	Herb
Malbas	*Abutilon indicum*	Malvaceae	Shrub
Maraotong	*Acalypha indica*	Euphorbiaceae	Herb
Mutha	*Cyperus rotunda*	Cyperaceae	Sedge
Olasiman-Ihalas	*Peperomia pellucida*	Piperaceae	Herb
Nguad	*Bidens pilosa*	Compositae	Herb
Olasiman-Ihalas	*Peperomia pellucida*	Piperaceae	Herb
Polytrias	*Polytrias praemorsa*	Gramineae	Grass
Pukinggan	*Clitorea ternatea*	FAbaceae	Vine
Putokan	*Crotalaria quinquefolia*	Leguminosae	Herb
Sabilaw	*Cyanotis axillaris*	Commelinaceae	Herb
Sambong	*Blumea balsamifera*	Compositae	Shrub
Sampa-sampalukan	*Phyllanthus niruri*	Euphorbiaceae	Herb

Common Name	Scientific Name	Family Name	Habit
Seru walai	*Cleome rutidusperma*	Capparidaceae	Herb
Talahib	*Saccharum spontaneum*	Gramineae	Grass
Tayum	*Indigofera suffruticosa*	Leguminosae	Herb
Tayuman	*Indigofera hirsuta*	Leguminosae	Herb
Tikog	*Fimbrystilis globulosa*	Cyperaceae	Sedge
Tintatintahan	*Eclipta alba*	Compositae	Herb
Titonia or Tithonia	*Tithonia diversifolia*	Compositae	Shrub
Uray	*Amaranthus spinosus*	Amaranthaceae	Herb
Walis-walisan	*Sida acuta*	Malvaceae	Shrub

Source: As Observed by the EIA Study Team during Field Survey

Plate No. 11 An extensive grassland area to be traversed by the CALA Expressway alignment between Km 3+600–4+200 in Brgy. Tibig, Silang, Cavite.

Plate No. 12 Grasslands predominated by S. spontaneum (talahib) observed on both sides of Nuvali Road, Brgy. Timbao, Biñan City.

Cultivated Vegetation Type

Agricultural Type

Among the affected areas, Silang, Cavite represents the biggest agricultural expanse. The town is famous for producing the very sweet medium-sized **pineapple** (*Ananas comosus*) and the best tasting **robusta coffee** (*Coffea canephora*) in the whole Province of Cavite. Yellow and green corn (*Zea mays*) varieties are extensively cultivated in Silang, while palay (*Oryza sativa*) is planted merely in upland areas due to unavailability of irrigated farmlands. Yellow corn variety is the main raw material for animal feeds.

Commercial fruit trees such as papaya (*Carica papaya*), mango (*Mangifera indica*), banana (*Musa sapientum/Musa paradisiaca*), lanzones (*Lansium domesticum*), jackfruit (*Arthocarpus heterophylla*), rambutan (*Nephelium lappaceum*), and coconut (*Cocos nucifera*) are widely

grown in the study area. C. papaya is widely grown in backyards and broader farmlands as it is considered as a profitable enterprise used in cosmetics and food preparation.

Root crops such as kamote/sweet potato (*Ipomea batatas*), kamoteng kahoy (*Manihot esculenta*), patatas (*Solanum tuberosum*), and peanut (*Atachis hypogaea*) are also cultivated in Silang. According to local accounts, *A. hypogaea* is planted in between cropping seasons to recover soil fertility.

Vegetables grown include okra (*Abelmoschus esculentus*), lettuce (*Lactuca sativa*), eggplant (*Solamun melongena*), tomato (*Lycopersicon esculentum*), and black pepper (*Piper nigrum*).

Cutflowers and ornamentals are generally grown throughout the Silang aside from agricultural produce. Anthurium (*Anthurium andraeanum*) and orchids (*Dendrobium sp.*) are the main cutflowers propagated.

Presented in **Table 9.5.4-5** is the list of fruit bearing trees identified in the study area.

TABLE 9.5.4-5 LIST OF FRUIT BEARING TREES IDENTIFIED IN THE STUDY AREA

Common Name	*Scientific Name*	Family Name
Anonang	*Cordia dichotoma*	Ehretiaceae
Aratiles	*Muntingia calabura*	Tiliaceae
Atis	*Annona squamosa*	Annonaceae
Avocado	*Persea americana*	Lauraceae
Balimbing	*Averrhoa caranbola*	Oxalidaceae
Bayabas	*Psidium Guajaba*	Myrtaceae
Cacao	*Theobroma cacao*	Sterculiaceae
Calamansi	*Citrus microcarpa*	Rutaceae
Camachile	*Pithecellobium dulce*	Leguminosae
Chestnut	*Castanea sp.*	Fagaceae
Chico	*Manilkara sapota*	Sapotaceae
Coconut/niyog	*Cocos nucifera*	Palmae
Dalandan	*Citrus aurantium*	Rutaceae
Duhat	*Sizigium Cumini*	Myrtaceae
Durian	*Durio zibethinus*	Malvaceae
Granda	*Punica granatum*	Punicaceae
Guyabano	*Annona muricata*	Annonaceae
Jackfruit	*Arthocarpus heterophylla*	Moraceae
Kaimito	*Chrysophyllum cainito*	Sapotaceae
Kamias	*Averrhoa bilimbi*	Oxalidaceae
Kasoi	*Anacardium occidantale*	Anacardiaceae
Lansones	*Lansium domesticum*	Meliaceae
Makopa	*Sizigium Samarangense*	Myrtaceae
Mandarin	*Citrus reticulata*	Rutaceae
Manga	*Mangiferia indica*	Anacardiaceae
Papaya	*Carica papaya*	Caricaceae

Common Name	*Scientific Name*	Family Name
Pomelo	*Citrus aurantium*	Rutaceae
Rambutan	*Nephelium lappaceum*	Rutaceae
Saging	*Musa coccinea*	Musaceae
Sampalok	*Tamarindus indica*	Leguminosae
Santol	*Sandoricum koetjape*	Meliaceae
Sineguelas	*Spondias purpurea*	Anacardiaceae
Tiesa	*Pouteria campechiana*	Sapotaceae

Source: As Observed by the EIA Study Team during Field Survey

Built-Up Type

Essentially, built-up vegetation as the term suggests is comprised mainly of ornamental plant species propagated in urban and settlement areas. Ornamental plants largely correspond to "garden plants" which are usually cultivated in gardens, front yards and backyards, and landscaping areas. Most commonly, ornamental garden plants are grown for the display of aesthetic features enjoyed by visitors and the public.

Characteristic of the built up vegetation in the study area is described by a wide variety of ornamental plants species. The landscaped frontages and periphery of the exclusive residential subdivisions along the proposed alignment augments the myriad of plants species present.

Vitex parviflora (molave) is fast becoming a popular ornamental tree. It is abundantly cultivated at the landscaped area of Verdana Homes alongside *Plumeria rubra* (white calachuchi) and *Jatropha pandurifolia* (Shanghai beauty). Accentuating the frontage area are *Sanseviera cylindrica* (spear plant), *Sanseviera trifasciata* (bow string hemp), *Cracaena reflex* (Song of India), and *Dracaena reflex* (Song Thailand). Well-trimmed *Cynodon dactylon* (bermuda grass) covers the ground like a carpet.

Mature stands of *Samanea saman* (acacia) lining the Nuvali Road in Brgy. Malamig, provide shade and relief from the scorching heat of the sun to the walking public in front of the Laguna Techno Park. Mixed stands of *Swietenia macrophylla* (large-leaved mahogany), *Swietenia mahogani* (common mahogany), and *Pterocarpus indicus subsp. indicus* (narra) were also observed.

Table 9.5.4-6 shows the list of ornamental plants observed in built up areas traversed by the alignment, while **Table 9.5.4-7** enumerates the ornamental trees identified.

TABLE 9.5.4-6 LIST OF ORNAMENTAL PLANTS SPECIES IDENTIFIED IN THE STUDY AREA (1/2)

Common Name	*Scientific Name*	Family Name	Habit
Adelfa	*Nerium oleander*	Apocynaceae	Shrub
Agave	*Agave franzosinii*	Agavaceae	Herb
Alocasia	*Alocasia sp.*	Araceae	Herb
Asparagus plant	*Asparagus densiflorus*	Liliaceae	Herb
Bandera Española	*Cannax generalis*	Cannaceae	Herb
Baston de San Jose	*Cordyline fruticosa*	Agavaceae	Shrub
Begonia	*Begonia coccinea*	Begoniaceae	Herb
Bignonia	*Tecoma stans*	Bignoniaceae	Shrub
Blood leaf	*Iresine herbstii*	Amaranthaceae	Herb
Blood lily	*Haemanthus multiflorus*	Amaryllidaceae	Herb
Bougainvillea	*Boungainvillea spectabilis*	Nyctaginaceae	Vine
Buntot tigre	*Sanseviera trifasciata*	Agavaceae	Herb
Calico plant	*Althernanthera ficoidea*	Amaranthaceae	Herb
Common dischidia	*Dischidia oiantha*	Asclepiadaceae	Shrub
Common spear plant	*Sanseviera cylindrica*	Agavaceae	Shrub
Corazon de Maria	*Caladium bicolor*	Araceae	Herb
Cucharita	*Althernanthera ficoidea*	Amaranthaceae	Herb
Dama de noche	*Cestrum nocturnun*	Solanaceae	Shrub
Dama de noche	*Cestrum nocturnun*	Solanaceae	Shrub
Dieffenbachia	*Dieffenbachia maculata*	Araceae	Herb
Doña Aurora	*Mussaenda Doña Aurora*	Rubiaceae	Shrub
Episcia	*Episcia cupreata*	Gesneriaceae	Shrub
False birds of paradise	*Heliconia bihai*	Heliconiaceae	Herb
False sisal	*Agave decipiens*	Agavaceae	Herb
Five fingers	*Schefflera odorata*	Araliaceae	Vine
Fortune plant	*Dracaena fragrans*	Agavaceae	Shrub
Gumamela	*Hibiscus rosa-sinensis*	Malvaceae	Shrub
Lobster claw	*Vriessea carinata*	Bromeliaceae	Herb
Lollipop plant	*Pachystachys lutea*	Acanthaceae	Shrub
Mauritius hemp	*Furcrarea foetida*	Agavaceae	Shrub
Mayana	*Coleus Blumei*	Labiatae/Lamiaceae	Herb
Monstera	*Monstera deliciosa*	Araceae	Vine
Moradong dilaw	*Pseuderanthemum reticulatom*	Acanthaceae	Shrub

Source: As Observed by the EIA Study Team during Field Survey

TABLE 9.5.4-6 LIST OF ORNAMENTAL PLANTS SPECIES IDENTIFIED IN THE STUDY AREA (2/2)

Common Name	*Scientific Name*	Family Name	Habit
Orchids	*Dendrobium sp.*	Orchidaceae	Herb
Painted drop-tongue	*Aglaonema crispum*	Araceae	Herb
Palawan	*Cyrtosperma merkusli*	Araceae	Herb
Panama hat plant	*Carludovica palmata*	Cyclanthaceae	Shrub
Pigeon berry/golden bush	*Duranta repens*	Verbenaceae	Shrub
Purple false eranthemum	*Pseuderanthemum atropurpureun*	Acanthaceae	Shrub
Rose	*Rosa*	Rosaceae	Herb
Sampaguita	*Jasmimum bifarium*	Oleaceae	Vine
San Francisco sp.	*Codiaeum variegatum*	Euphorbiaceae	Herb
Sanchezia	*Sanchezia speciosa*	Acanthaceae	Shrub
Santan	*Ixora chinensis*	Rubiaceae	Shrub
Sedang dahon	*Aglaonema commutatum*	Araceae	Shrub
Shrimp plant	*Justicia brandegeana*	Acanthaceae	Shrub
Song of India	*Cracaena reflex*	Agavaceae	Herb
Song of Jamaica	*Dracaena reflexa*	Agavaceae	Herb
Song of Thailand	*Dracaena reflexa*	Agavaceae	Herb
Spanish bayonet	*Yucca aloifolia*	Agavaceae	Shrub
Spider lily	*Crinum amabile*	Amaryllidaceae	Herb
Toothed philodendron	*Philodendron lacerum*	Araceae	Vine
Umbrella plant	*Cyperus alternifolius*	Cyperaceae	Shrub
Yellow-margined century plant	*Agave americana*	Agavaceae	Herb

Source: As Observed by the EIA Study Team during Field Survey

TABLE 9.5.4-7 LIST OF ORNAMENTAL TREES OBSERVED

Common Name	Scientific Name	Family Name
Acacia	*Samanea saman*	Leguminosae
Adelfa	*Nerium oleander*	Apocynaceae
African tulip	*Spathodea campanulata*	Bignoniacea
Agoho	*Casuarina equisetifolia*	Casuarinaceae
Banyan tree	*Ficus retusa*	Moraceae
Baobab	*Adansonia digitata*	Bombacaceae
Beach pandan	*Pandanus tectorius*	Pandanaceae
Begonia	*Begonia coccinea*	Begoniaceae
Benjamin's fig	*Ficus benjamin*	Moraceae
Bignonia	*Tecoma stans*	Bignoniaceae
Bo tree	*Ficus religiosa*	Moraceae
Bunga de China sp.	*Veitchia merrillii*	Palmae/Arecaceae
Caballero	*Caesalpinia pulcherrima*	Leguminosae
Campanilla	*Allamandra cathartica*	Apocynaceae
Caña fistula	*Cassia fistula*	Leguminosae
Common mahogany	*Swietenia mahogani*	Meliaceae
Dapdap	*Erythrina variegata*	Leguminosae
Dracaena	*Dracaena multiflora*	Agavaceae
Eucalyptus/blue gum tree	*Eucalyptus Blobulus*	Myrtaceae
Fire tree	*Delonix regia*	Leguminosae
Giant dracaena	*Cordyline australis*	Agavaceae
Indian tree	*Polyalthia longifolia*	Annonaceae
Japanese acacia	*Acacia auriculiformis*	Leguminosae
Juniper	*Junniperus communis*	Cuppressaceae
Kalatsutsing-puti	*Plumeria obtusa*	Apocynaceae
Karmay	*Phyllanthus acidus*	Euphorbiaceae
Large-leaved mahogany	*Swietenia macrophylla*	Meliaceae
Licuala	*Licuala spinosa*	Palmae
Lipstick palm	*Cyrtostachys renda*	Palmae/Arecaceae
Mac Arthurs' palm	*Ptychosperma macarthur*	Palmae/Arecaceae
Maluko	*Pisonia alba*	Nyctaginaceae
Mangium	*Acacia mangium*	Leguminosae
Narra	*Pterocarpus indicus subsp. indicus*	Leguminosae
Neem tree	*Azidarachta indica*	Meliaceae
Octopus tree	*Brassaia actinophylla*	Araliaceae
Oliva	*Cycas revoluta*	Cycacaceae
Panama rubber tree	*Castilla elastica*	Moraceae
Pitogo	*Cycas circinalis*	Cycadaceae
Rainbow tree	*Dracaena margarita*	Agavaceae
Shanghai beauty	*Jatropha pandurifolia*	Euphorbiaceae
Thailand shower/Siamese acacia	*Cassia siamea*	Leguminoseae
Traveler's tree	*Ravenala madagascariensis*	Sterculiaceae
Yellow bell	*Allamanda cathartica*	Apocynaceae

Source: As Observed by the EIA Study Team during Field Survey

2) Terrestrial Wildlife Fauna (Animals)

The existing terrestrial fauna in the area is classified into **two** (**2**) major groups, **Avifauna** (birds) and **domesticated animals**. Further discussion on the fauna groups is presented in the succeeding section.

Avifauna (Birds)

The study area is typical of a disturbed wildlife habitat. Forest areas that will provide habitat to fauna species no longer exist. As discussed previously, species diversity of the remaining vegetation covers which are commonly converged on ravines and edges of rivers and creeks or in scattered patches is poor.

This being the case, comprehensive study on the existing terrestrial fauna was not undertaken. Instead, documentation of the wildlife fauna was based primarily on actual sightings, focusing mainly on avifauna (birds), since this is the only fauna group most likely to be affected by the project. Species encountered were identified and validated using descriptive and photographic handbook guide on Philippine birds.

Majority of the birds encountered are species commonly found in urban, agricultural, and grassland areas, the most common of which is the Eurasian tree sparrow (*Passer montanus*). This species is believed to have been introduced to the country from China during the 1930s. Species associated with *P. montanus* that were identified in the area include yellow-vented bulbul (*Pycnonotus goiavier*), long-tailed shrike (*Lanius schach*), glossy swiftlet (*Collocalia esculenta*), and pied fantail (*Rhipidura javanica*).

Other birds species observed are zebra dove (*Geopelia striata*), barred-button quail (*Turnix suscitator*), barred rail (*Gallirallus torquatus*), lesser coucal (*Centropus bengalensis*), brown shrike (*Lanius cristatus*), chestnut munia (*Lonchura malacca*), white-breasted wood swallow (*Artamus leucorynchus*), cattle egret (*Bubulcus ibis*), and striated grassbird (*Megalurus palustris*).

Sighting of olive-backed sunbird (*Cinnyris jugularis*), crested myna (*Acridotheres cristatellus*), white-collared kingfisher (*Halcyon chloris*), black-naped oriole (*Oriolus chinensis*), large-billed crow (*Corvus macrorhychos*) were likewise documented.
Interview with the locals revealed that **two** (**2**) species of owls are present in the study area. These are the Philippine endemic scops owl (*Otus megalotis*) and grass owl (*Tyto longimembris*).

It was not established if significant bird activities such as mating, roosting, and nesting are performed in the study area. Evidently, the existing flora species do not offer sufficient food value to the birds keeping the diversity range at the minimum. Thus, bird species from nearby protected forest areas like the Mt. Makiling National Park is

not expected to migrate in the study area.

During the field survey, there are no threatened, endangered, and/or vulnerable species encountered.

Domesticated Animals

Perhaps, dog (*Canis lupus familiaris*) is the first animal to be domesticated and has been the most widely kept working, hunting, and companion animal in human history. It is also considered to be the most popular pet in the world. Like the dog, domestic cats or house cats (*Felis silvestris catus*) are highly valued by humans for companionship. Its ability to hunt vermin such as rats, mice, and cockroaches make these small furry felines a more beneficial household pet.

Cattles or more popularly known as cows (*Bos primigenus*) are merely left to graze in open wastelands and are not bred for its commercial livestock value and dairy products but to assist farmers in agricultural works. Carabao (*Bubalus bubalis carabanesis*) which is one of the popular members of the farm animals is a great help to farmers in pulling both a plow and the cart used to haul produce.

Chicken (*Gallus gallus domesticus*) is one of the common and widespread domestic animals raised in the area aside from pig/hog (*Sus domesticus*). Small scale poultry farming is seen in Brgy. Sabutan and Tibig in Silang, Cavite. Chickens are raised not only as a source of meat but also of eggs. Backyard gamecocks or fighting cocks breeding is also observed.

Roosters and hens (*Gallus gallus*) are often seen wandering around scrabbling for food even after the owners have just fed them. As a member of farm animals, native hens (female) in the area are bred for sustenance, whose meat has been known to be tastier than the commercial breed.

Domestic goat (*Capra aegagrus hircus*) is a subspecies of goat domesticated from the wild goat of southwest Asia and Eastern Europe. It is a member of the family Bovidae and is closely related to the sheep as both are in the goat-antelope subfamily Caprinae. In the project area, goats are usually kept for sustenance or up to some extent for commercial purposes.

Pigeon fanciers in the area keep domestic pigeons simply for recreation. Though pigeon flying is not a popular sport, breeding of pigeons (*Columba livia f. domestica*) merely provide the breeders with some form of enjoyment. Trained domestic pigeons which are common in the study area are able to return to their home loft if released at a location that they have never visited before and that may be up to 1,000 km away.

(6) Loss of Green (Planting Trees to Offset GHG Emissions from the CALAX Expressway Construction)

Baseline and the assumptions employed

Proposed alignment has a length of 17km, and traverses an area of mixed land use - agricultural ecosystems, industrial commercial/residential development and underdeveloped barren land. In view of standing stocks (biomass) and associated carbon-sequestration capacities, the alignment's environment is characterized by four unique sections as shown below **Table 9.5.4-8**.

TABLE 9.5.4-8 A BASELINE BIOMASS STOCK AND GHG (CO2) REMOVAL BY SECTIONS

Section (Distance from Silang) West-to-east	A. Types of Vegetation - Biomass Stock	B. Average Above-ground Existing Carbon Stock		C. Average Annual GHG (CO2) Removal Capacity (ton-dry matter/ha/Year)
		ton-dry matter/ha	ton-Carbon/ ha	
0 km -6 km	Agricultural Ecosystems – Cultivating Crops	32	14	3.0
6 km- 11 km	Shrubs along the banks of steep-slope creeks	65	29	3.0
11 km- 15 km	Built-up Area	0	0	0.0
15 km -17 km	Shrubs and grassland	29	13	1.0

Source: Lasco, R.D. and F.B. Pulhin, 2003: Philippine forest ecosystems and climate change: Carbon stocks, rate of sequestration and the Kyoto Protocol. Annals of Tropical Research, 25(2), 37-51.

Since this exercise is not intended to pursue rigorous A/R – CDM type of carbon credit, but to obtain a rudimentary assessment to see necessary acreages of planting trees to offset carbon sequestration loss due to CALAX expressway construction. For the sake of simplicity in obtaining first-hand assessment, the carbon stock of below-ground nor leakage effects are not counted.

For the purpose of estimating the spatial extent of natural green cover lost permanently by CALAX construction, it is assumed that only a space of 17km length by 20 m width is to be occupied by the structure of expressway and its peripheral supporting facilities including pavement surface, viaducts and drains. Therefore, a strip of 34 ha (20 m x 17,000 m) along the whole length of the alignment is assumed to lose its green cover, including the existing above-ground biomass of standing stock (column B in the above **Table 9.5.4-8**), and expected annual photo synthesis capacity (column C in the above **Table 9.5.4-8**), over the assessment period.

The carbon-offset assessment was conducted upto the 14th year since initial seedling, when net cumulative GHG removal more than offsets the cumulative annual loss in GHG

sequestration. In our case, it is supposed to be the 8th year since initial seedling is planted.

Firstly, the loss of standing stock (biomass), above-the-ground, is estimated by applying section-wise carbon stock (column B) by identified types of land cover (column A), multiplied by the length of section (leftmost column) in the above table. The one-time loss of biomass is estimated to be 510 t-Carbon or 1,866 t-CO2 for the entire strip of 34 ha, due to construction and occupation by expressway and its peripheral supporting infrastructure.

Secondly, it is estimated that the loss of carbon absorption capacity, or GHG removal, to be expected if photosynthesis plants are alive, amounts to 115 t-CO2 annually, derived from carbon sequestration capacity (column C) of respective vegetation types of the **Table 9.5.4-8**.

In sum, the annual carbon sequestration loss thus estimated is shown in the columns B1 and B2 in the **Table 9.5.4-9**. These data serves as the baseline in assessing net GHG removal by compensation planting.

Necessary Years and Required Planting Area for Carbon Offset

In choosing most relevant and trustworthy data of carbon sequestration by plant species, indigenous to the Southern Luzon, a reference is made to the Laguna Lake Development Authority (LLDA)'s pilot small-scale carbon-shed scheme (a type of "A/R CDM"), experimented to recover forest at degraded grasslands in the Laguna lake Basin. The scheme is implemented in compliance with the "Revised Simplified Baseline and Monitoring Methodologies for Selected Small-Scale Afforestation and Reforestation Project Activities under the Clean Development Mechanism. AR-AMS0001/Version 04" of IPCC GPG for LULUCF.

The above LLDA's carbonshed experiment gives a relationship of plant growth rate versus elapsed years since initial planting seedlings, showing Mean Annual Increments (MAI) over the years in terms of t-CO2/ha. The figures in the column A of **Table 9.5.4-9** are adopted from the above LLDA carbonshed experiment. They represent a composite of carbon sequestration capacity of various Luzon indigenous species – counting more than 30 such species, including Narra (Pterocarpus indicus), Dao (Dracontomelon dao), and Ipil (Instia bijuga) - deployed by the scheme implemented by LLDA at the Laguna Province.

Two cases of different acreage of planting trees – 34ha (C: the Base case) and 20 ha (D: Reduced Planting Area Case) - respectively are selected to see relative efficacy of planting trees in offsetting lost amount of carbon sequestration. The results are shown in the columns C and D of **Table 9.5.4-9.** It is observed, while the Base case C gives a shorter period of 4 years to offset, the **Case D with a narrower planting area** gives longer years of 8 years to achieve similar amount of GHG removal.

TABLE 9.5.4-9 ESTIMATED NET GHG (CO_2) REMOVALS BY PLANTING FAST-GROWING LUZON-ENDEMIC SPECIES

Years lapsed since planting seedlings	**A.** Trend of Mean Annual Increments (tonnes of CO2/ha) by planting a mix of indigenous plant species over a period of seedling to maturity Source: Annual estimation of net anthropogenic GHG removals by sinks, the Laguna de Bay Community Carbon Finance Project (LCCFP), an initiative by LLDA, Philippines (CDM-SSC-AR-PDD) Version 4- in effect as of 2007 (t-CO2/ha)	**B1.** Loss of the above-ground Biomass by the expressway and peripheral infrastructure. In equivalent of t-CO2	**B2.** Loss of potential CO2 absorption capacity due to lost green cover of 34 ha by constructing an expressway and peripheral infrastructure, transforming an area of 17km x 20m into an non-vegetated space (t-CO2 /year)	**C.** Base Case (Planting Trees: 34 ha)			**D.** Case (Planting Trees: 20 ha)	
				C1 = A x 34	**C2** = C1 - B	**C3 = ∑C2**	**D2**	**D3 = ∑C2**
				C1. CO2 Absorption by planting trees over an area of 34ha (t-CO2/Year)	**C2.** Net Annual CO2 Removal (t-CO2/Year)	**C3.** Cumulative CO2 Absorption (t-CO2)	**D2.** Net Annual CO2 Absorption (t-CO2/Year)	**D3.** Cumulative Net CO2 Absorption (t-CO2)
The 1st year	0	1,866	115	0	-1,866	-1,866	-1,866	-1,866
The 2nd year	11.2	0	115	381	266	-1,600	109	-1,757
The 3rd year	21.3	0	115	724	609	-991	311	-1,446
The 4th year	21.3	0	115	724	609	-382	311	-1,135
The 5th year	21.3	0	115	724	609	227	311	-824
The 6th year	21.3	0	115	724	609	837	311	-513
The 7th year	21.3	0	115	724	609	1,446	311	-202
The 8th year	21.3	0	115	724	609	2,055	311	109
The 9th year	21.3	0	115	724	609	2,664	311	420
The 10th year	21.3	0	115	724	609	3,273	311	731
The 11th year	21.3	0	115	724	609	3,883	311	1,042
The 12th year	21.3	0	115	724	609	4,492	311	1,353
The 13th year	21.3	0	115	724	609	5,101	311	1,664
The 14th year	21.3	0	115	724	609	5,710	311	1,975

Note: Green shade indicates commencing years when net cumulative GHG (CO2) removal turns positive.

9.5.4.2The Water

(1) River Systems

There are three (3) main river systems draining the area traversed by the alignment. These are the: (i) *Malaking Ilog River*, (ii) *Lumbia River*, and (iii) *Malindig River*. Malaking Ilog is an almost N-S trending, steeply incised river with upstream portions draining the Tagaytay highlands, into the downstream catchment areas in GMA, Cavite. Lumbia and Malindig are being fed by numerous tributaries, and drain the hilly areas of Silang from the southwest, into the lowland areas of Sta. Rosa and Biñan, on the northeast.

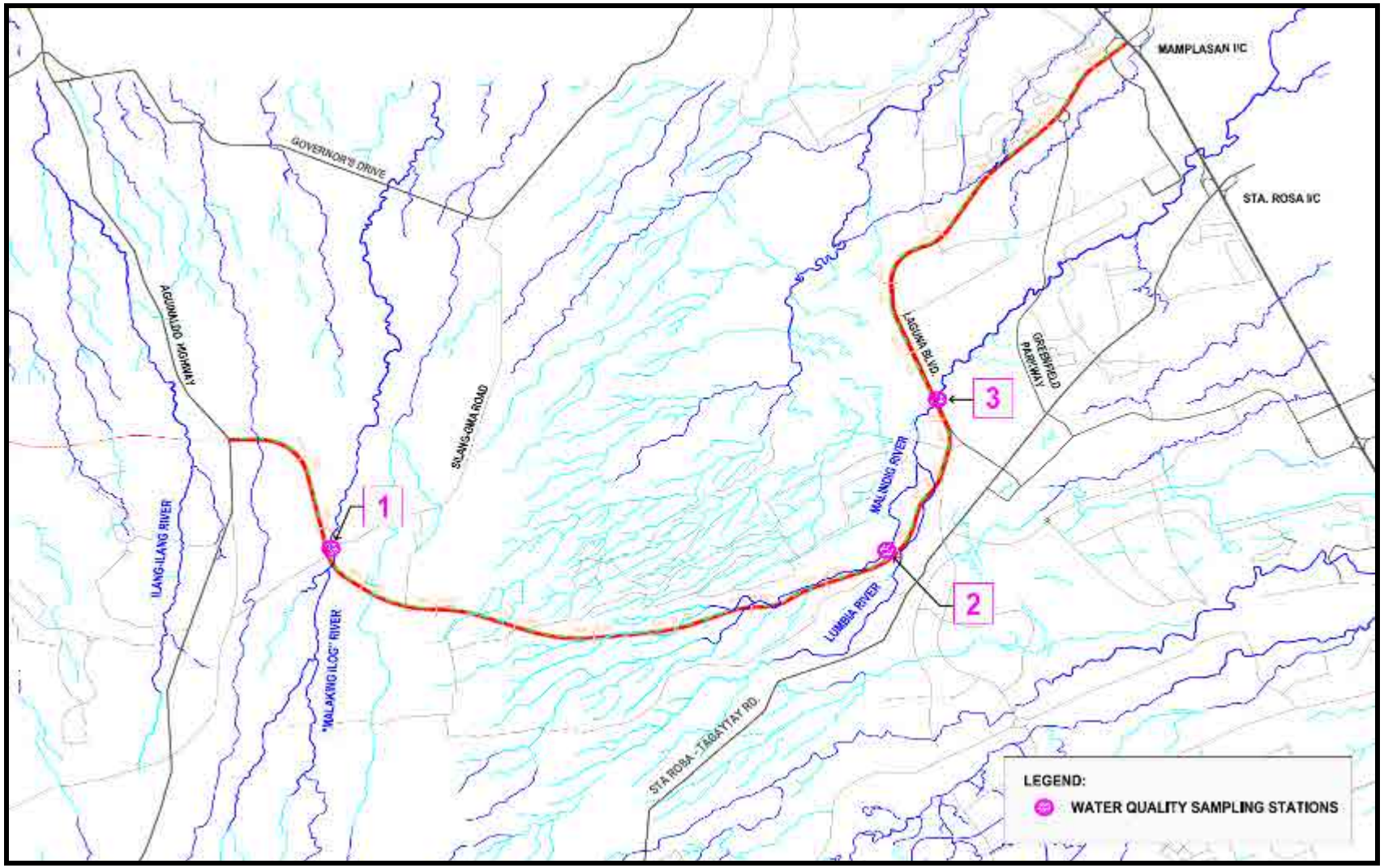
(2) Water Quality

Baseline water quality sampling was undertaken at **three** (**3**) selected rivers crossed by the proposed CALA Expressway alignment to establish the physico- chemical properties of the waterways that may be affected by the project. Water sampling Sta. 1, Malaking Ilog River is located in Brgy. Sabutan, silang, Cavite. Sampling Sta. 2, Lumbia River is located in Santo Domingo, Santa Rosa City, Laguna, and the third sampling station, Sta. 3 Malindig River is sited in under the bridge along Laguna Blvd. separating the Cities of Santa Rosa and Biñan. **Figure 9.5.4-10** shows the location of the water sampling sites.

Laboratory results showed in **Table 9.5.4-10** that the detected Total Coliform content from **all water samples exceeded** the DENR Standard of **5,000 MPN/100 ml**. Among the samples, the one obtained from the Malindig River exhibits the highest coliform content of **160,000 MPN/100 ml**. This followed by the sample from Lumbia River with **24, 000 MPN/100 ml**. The least amount was measured from the sample collected from Malaking Ilog River (**17, 000 MPN/100 ml**). Some of the known sources of coliform bacteria include agricultural run-off, effluent from septic systems sewage discharge, and infiltration of domestic animal fecal matter.

All water samples contain the same amount of lead. The value detected is **less than 0.01 mg/L**, and is well within standard limit of **not more than 0.05 mg/L**. Dissolved oxygen (DO) levels measured ranged from **6.2-7.7 mg/L**. These values are within the required DENR Standard of not less than **5.0 mg/L**. The observed total suspended solids (TSS) levels of the samples is between **4.5-10.2 mg/L**, while the 5-day day BOD range is **1.1-2.2 mg/L**. Conductivity at 25°C varies between **314 µ/cm** to **370 µ/cm**.

Physically, the rivers are clear and water is freely flowing. The pH level range is between **6.9-8.0**, which is within the desirable limit to provide protection for the life of freshwater fish and bottom dwelling invertebrates. Water temperature of Lumbia River (**28°C**) is relatively warmer compared to the Malaking Ilog and Lumbia Rivers (**23°C** and **24°C**, respectively). The disparity is probably due to the difference in the time of sampling.



Source: JICA Study Team (2012)

FIGURE 9.5.4-10 WATER QUALITY SAMPLING SITES ALONG THE PROPOSED CALA EXPRESSWAY ALIGNMENT

TABLE 9.5.4-10 PHYSICO-CHEMICAL PROPERTIES OF SELECTED WATERWAYS ALONG THE PROPOSED CALA EXPRESSWAY

Sampling Station & Location	Date & Time of Sampling	Geographic Coordinates	Parameters								
			pH	Temp (°C)	Turbidity	TSS (mg/L)	Lead (mg/L)	Total Coliform	Dissolved Oxygen	5-Day 20°C BOD	Conductivity @ 25°C
Sta.1 Malaking Ilog River, (Brgy. Kaong, Silang, Cavite)	19 Jan. 2012 11:58	N 14°14'35" E120°59'09.5"	8.0	23	Clear	4.5	< 0.01	**17,000 MPN/ 100 mL**	7.7 mg/L	1.1 mg/L	314 µs/cm
Sta. 2 Lumbia River (Brgy. Sto. Domingo, Sta. Rosa City, Laguna)	19 Jan. 2012 13:49	N 14°14'20.3" E120°02'59.9"	7.6	28	Clear	10.2	< 0.01	**24,000 MPN/ 100 mL**	7.3 mg/L	1.3 mg/L	356 µ/cm
Sta.3 Malindig River (Bridge along Laguna Blvd. Boundary of Biñan & Sta. Rosa Cities)	27 Jan. 2012 10:40	N 14°15'45.6" E121°03'17.2"	6.9	24	Clear	9.8	< 0.01	**160,000 MPN/ 100 mL**	6.2 mg/L	2.2 mg/L	370 µ/cm
DENR Standards for Class "C" Waters			**6.5 - 8.5**	**Max. 3°C increase**		**Not more than 30 mg/L increase**	**0.05**	**5,000 MPN/ 100 mL**	**Not less than 5.0 mg/L**	**Not more than 20 mg/L increase**	**–**

Exceeds DENR Standard (DAO 34)

(3) River Resort Areas Along the Project Area

There are three (3) river resort areas and one hotel along the project area as shown in **Figure 9.5.4-11** and **Figure 9.5.4-13**.

Impact of CALAX construction can be summarized as follows;

1) Malaking Ilog Resort

This resort is operated during dry (summer)seasons. Access to the site is made through gravel road which branches off from Silang-GMA/Carmona Road and a foot path. Eventhough CALAX is constructed, access is still maintained as is at present.

Construction of CALAX should be carefully done to minimize excavated soils and other materials to fall into the river and not to aggravate water quality.

2) Fresh Water Resort

This resort is operated during dry (summer) seasons. Access to the site is made through a foot path from Silang-GMA/Carmona Road. Eventhough CALAX is constructed, access is still maintained as is at present.

Construction of CALAX should be carefully done to minimize excavated soils and other materials to fall into the river and not to aggravate water quality.

3) Carmen Resort

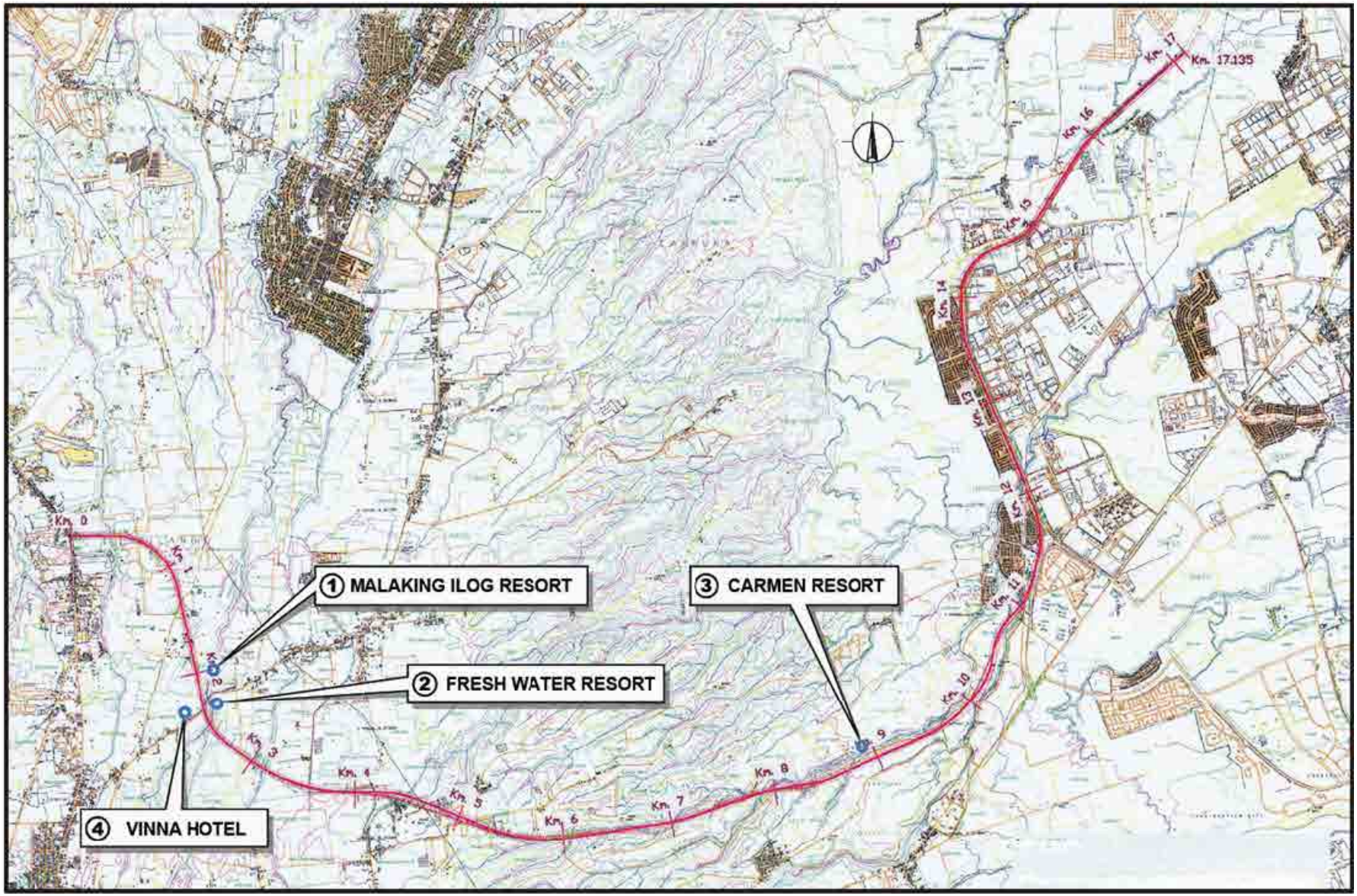
This resort is operated during dry (summer) seasons. Access is made from the existing gravel barangay road by walking on the corn field.

To maintain the same level of accessibility as today, Box Culvert should be constructed under CALAX.

Although the location is far from the expressway, construction of CALAX should be carefully done to minimize excavated soils and other materials to fall into the river and not to aggravatewater quality.

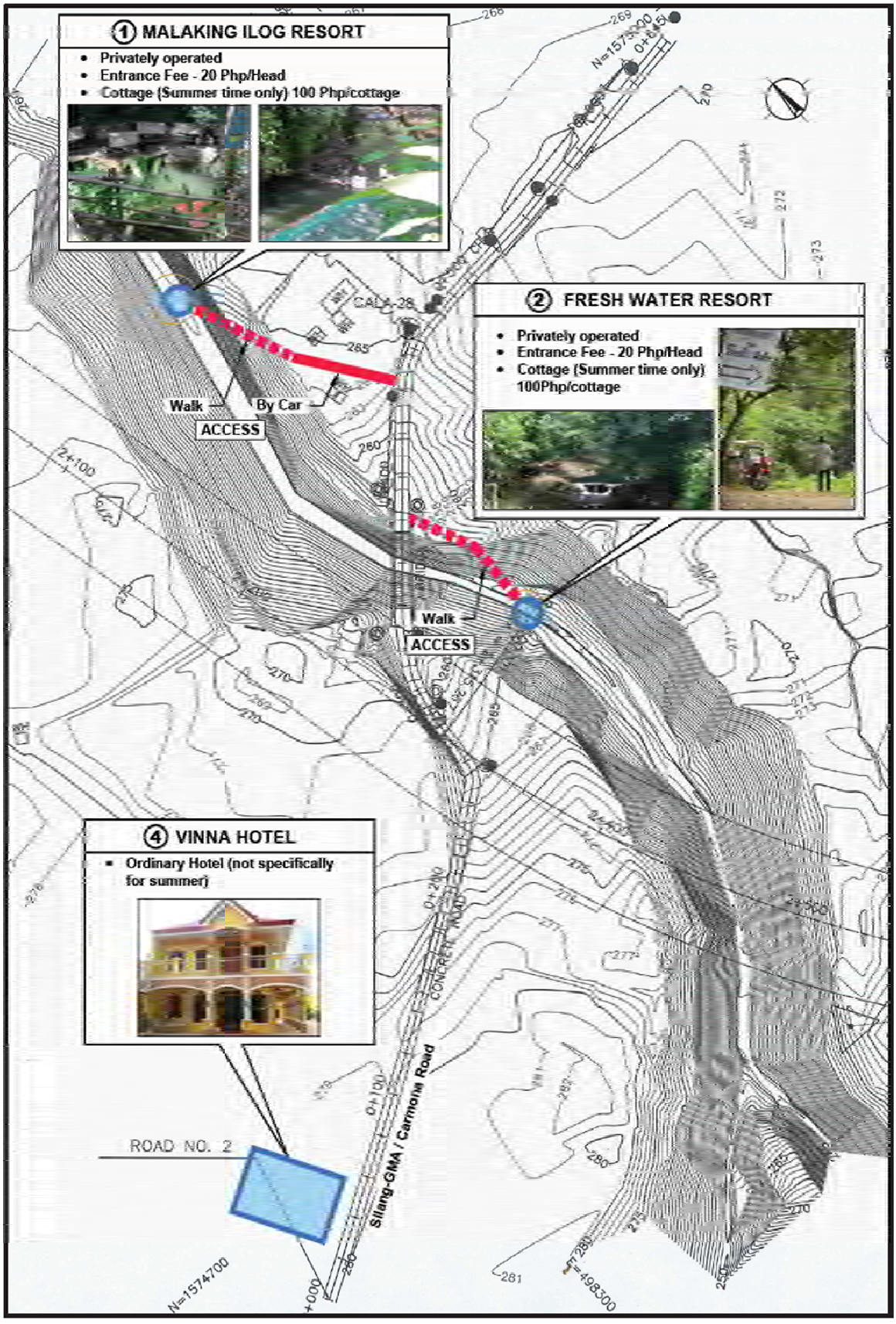
4) Vinna Hotel

This is an ordinary hotel and not specifically used for summer resort. It is located along Silang-GMA/Carmona Road and about 250 meters away from CALAX.



Source: JICA Study Team (2012)

FIGURE 9.5.4-11 LOCATION OF RIVER RESORT AREAS



Source: JICA Study Team (2012)

FIGURE 9.5.4-12 DETAILED LOCATION OF RIVER RESORT AREA