CAVITE-LAGUNA EXPRESSWAY PROJECT

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Department of Public Works and Highways

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1 Project Fact Sheet

Name of Project: **CAVITE-LAGUNA EXPRESSWAY (CALAX) CAVITE SECTION**

Location: Municipalities of Kawit and General Trias and Cities of Imus and Dasmarinas, Province of Cavite

Project Proponent: Department of Public Works and Highways

Business Address: DPWH Central Office, Bonifacio Drive, Manila

Type of Project: Expressway project

Objectives: To reduce travel time from CAVITEX to SLEX by approximately 45 minutes;

To solve current traffic congestion on the existing road network, particularly at Governor's Drive, Aguinaldo Highway, and at the Sta. Rosa-Tagaytay Road;

To support economic development and contribute to the improvement of local/foreign investments in the area.

Project Components: 4 lane tolled expressway from CAVITEX to Silang Interchange with total length of 30.42 km
Toll plazas
Toll operating equipment and safety facilities
Grade-separated interchanges at the following locations: (i) Kawit IC (CAVITEX); (ii) Open Canal IC; (iii) Governor's Drive IC; (iv) Silang IC
Viaducts, bridges, overpasses and underpasses

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Pacific Rim Innovation and Management Exponents, Inc. (PRIMEX) (EIS updating)
Manila Luxury Condominium, 30 Pearl Drive, Ortigas Center, Pasig City

Project Cost: Php32,548.2 Million

2 Executive Summary

2.1 BRIEF PROJECT DESCRIPTION

The Cavite section of the Cavite-Laguna Expressway (CALAX) is a 4-lane 30.42 km closed-system tolled expressway that will connect the Cavite Expressway (CAVITEX) and the South Luzon Expressway (SLEX). The project will start form the CAVITEX in Kawit, Cavite and end at the SLEX-Mamplasan Interchange in Binan, Laguna.

The project will have interchanges (IC) in eight locations, namely: (i) Kawit, (ii) Open Canal, (iii) Governor's Drive, (iv) Silang, (v) Silang East, (vi) Sta. Rosa-Tagaytay, (vii) Laguna Boulevard, and (viii) Technopark. It will have one toll barrier before SLEX. Figure 1 presents the location map.

The Cavite Section of CALAX involves the following components:

a) 30.42 km – 4 lane tollex expressway from CAVITEX to SLEX
b) toll plazas
c) toll operating equipment and safety facilities
d) 8 grade-separated interchanges.

The entire project shall be operated and maintained as a tolled expressway by the private sector under a concession agreement of 35 years including period of design and construction. The winning bidder shall finance, design, construct, operate and maintain the entire expressway under the Build-Transfer-Operate (BOT) scheme.

This EIS covers the Cavite Section of CALAX starting from the CAVITEX connection up to Silang Interchange. An Environmental Compliance Certificate (ECC) was already issued for the Laguna section of CALAX starting from Silang Interchange up to SLEX connection.

2.2 PROCESS DOCUMENTATION IN THE CONDUCT OF EIA

The preparation of the Environmental Impact Statement (EIS) is guided by the requirements prescribed during the Technical Scoping at the DENR-EMB, the Implementing Rules and Regulations of Presidential Decree No. 1586 which is embodied in DENR Administrative Order No. 30, series of 2003 and DENR Administrative Order 2010-14. Annex A presents the Technical Scoping checklist.

This EIS report followed the annotated outline for EIA projects as prescribed in DENR Memorandum Circular 2010-14. The report includes information and data on the following:

- Project Description including the location, area, rationale, alternatives, components, technology, size, project phases, manpower requirements, and project investment cost.
- General description of the environment of the project area and analysis of key environmental impacts
- Environmental management plan (EMP)
- Environmental monitoring plan (EMoP)
- Social development framework and IEC framework

- Environmental compliance monitoring
- Emergency response policy
- Institutional plan for EMP implementation.

Figure 1. Location Map of CALAX (Cavite Section)

2.2.1 EIA TEAM

The DPWH commissioned in November 2012 the preparation of the feasibility study and environmental impact statement (EIS) of the Cavite section of CALAX through SMEC Philippines. In view of another contract for the Transaction Advisory services and conduct of due diligence review of the project, the previous EIS was updated for submission to DENR-EMB

in compliance with the requirements of Presidential Decree 1586 and as required in securing the Environmental Compliance Certificate (ECC) of the proposed project. The Transaction Advisory consortium of KPMG-Manabat SanAgustin & Co. and PRIMEX prepared the updated EIS.

The EIS team is composed of the following:

FS and EIS Preparation	**Specialization**
Emmanuel Bate	Environment Specialist
Roscela Pamela Poyatos	IEC Specialist
Krishna Buenaventura	Socio-economy
Jose Alan Castillo	Terrestrial Ecology
Perfecto Evangelista	Soils
Reynar Rollan	Environmental geology
Charlon Gonzales	Air and noise
Transaction Advisory (EIS Updating)	
Cherry Rivera	Environmental Engineering
Michael Alcazaren	Resettlement
Hiyas Dechitan	Land acquisition and resettlement survey
Florentino Cimatu	Land use and terrestrial survey
James Alexis Arado	Land use mapping

2.2.2 EIA STUDY SCHEDULE & AREA

The CALAX project was conceptualized in 2006 through a feasibility study on the East-West National Road project. With the development of the Manila-Cavite Expressway (CAVITEX), a new alignment was proposed from which the CALAX would extend from the SLEX to the Aguinaldo Highway.

The preparation of the EIS was undertaken over a period of four months in 2012. Following the screening of the draft EIS and receipt of comments from DENR-EMB, the EIS was updated with additional surveys and sampling activities for a period of four months in 2014. Activities that were conducted included the baseline sampling on ambient air quality, noise, and water quality at major rivers traversed by the expressway, and survey/interviews with settlers at the site. Secondary data on population, socio-economic profile of the affected municipalities and cities, geology and geohazards, and climate were also gathered.

The study area encompassed the three municipalities of Kawit, General Trias, and SIlang and the two cities of Imus and Dasmarinas, in the province of Cavite. The EIA study area comprises of the project site as primary impact area. The primary impact area is defined as the immediate vicinity to the perimeter up to a radius of 100 meters. This includes part of the adjoining establishments in the vicinity. The primary impact area was identified based on the potential impacts that may be generated by the project particularly during the construction phase. These environmental impacts include generation of dust, noise, soil runoff, and traffic that may cause nuisance and hazards to the environment and adjacent communities.

The secondary impact area is defined as the area within 500-m radius of the proposed project site. The secondary impact area is projected to experience impacts associated with traffic congestion, flooding, traffic and other socio-economic effects of the road development project.

2.2.3 EIA METHODOLOGY

The conduct of the Environmental Impact Assessment (EIA) study was guided by the Implementing Rules and Regulations of Presidential Decree No. 1586 which is contained under DENR Administrative Order No. 30 Series of 2003 (DAO 2003-30). The Revised Procedural Manual for DAO 2003-30 prescribes the environmental assessment requirements and procedures applicable for the proposed project. Based on the revised guidelines for coverage screening and standardized requirements of the Philippine EIS System as embodied in EMB Memorandum Circular 2014-005, the proposed project falls under the Category A of Environmentally Critical Projects as a National Road with length of more than 20 km.

This EIS includes information and data on the following:

- General description of the environment in the project area
- Project goals and objectives
- Project scope
- Environmental concerns.

This report presents the primary and secondary data gathered during surveys held from 2012 to 2015. Project information was provided by DPWH in association with the designers and consultants of KPMG/Manabat SanAgustin and PRIMEX. Secondary data on the project areas were gathered from various national and local agencies including:

- LGUs (Cavite Province, Cities of Dasmarinas and Imus, municipalities of Kawit, General Trias, and Silang);
- National Statistics Office (NSO);
- Mines and Geosciences Bureau (MGB);
- Philippine Atmospheric, Geophysical and Astronomical Services, Administration (PAGASA);
- Philippine Institute for Volcanology and Seismology (PHIVOLCS).

Table 1. Generic EIA Approach and Data Sources

EIA Module	Approach and Data Sources
Land use	Field investigation and survey, Land use maps
Soil	Soil mapping and survey, soil analysis at Bureau of Soils and Water Management (BSWM), NAMRIA topographic maps
Geology	Secondary data, MGB, EGGAR
Tectonic setting	Phivolcs, previous researches/studies
Hydrology	Site survey, observation, interviews with stakeholders regarding flooding
Air quality	Ambient air quality sampling and analysis of TSP, SO_2, and NO_2 at eight sampling stations.
Noise	Noise level monitoring using standard noise meter in eight sampling stations.
Surface water	Water sampling at San Juan River, Pasong Camachile, Rio Grande, and Ylang-Ylang Rivers and laboratory analysis of dissolved oxygen (DO), total dissolved solids (TDS), total suspended solids (TSS), oil and grease, nitrates, phosphates, and heavy metals. In-situ measures of pH and temperature.

EIA Module	Approach and Data Sources
Flora	Field survey, Quadrat sampling technique
Fauna	Field survey, informal interviews with local people
Climate	PAGASA
Demographics	Secondary data from socio-economic profiles of host LGUs and National Statistics Office (NSO)
Public Participation	Key informant interviews with LGU representatives, stakeholders, homeowners associations; public consultation meetings.

Land Use

The study on land use covered the review of existing and proposed land use plans of the cities and municipalities traversed by the proposed expressway. This was followed by site visits conducted on October 26 – 27, 2011, November 11, 2011, and on March 10 – 20, 2014. A 200 meter width from both sides of the alignment centerline was referred to during the site survey.

Existing land uses including agriculture and vegetation were identified, described and represented on a map. The identification of the different vegetation/land uses was undertaken with the aid of Google earth and satellite imagery provided by Digital Globe Interpretation.

Soil

Soil characterization to determine the soil mapping units of the different soil types within the project was undertaken via soil auger borings from representative sites. Site selection was made with the use of the project location and alignment map and the NAMRIA topographic map with a 1:50,000 scale. Geographic position of each observation/sampling location was recorded using GPS.

Soil profiles were described following the Food and Agriculture Organization (FAO) guidelines for soil profile descriptions, while soil color was determined using the Munsell Color Chart. Slope gradient was also determined using an Abney Hand Level. Soil samples were collected for physicochemical analyses (texture, pH, OM, P, K, and CEC). The analysis was done at the soils laboratory of the Bureau of Soils and Water Management (BSWM) in Quezon City. Heavy metal analysis (As, Cd, Cr, Hg, Zn, Pb) was undertaken at the Laboratory of the CRL Environmental Corporation, an accredited laboratory by the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR).

Geology and Tectonic Setting

Information on the regional and site geology were taken from existing literature and maps of the project area and vicinity. Reports and studies from the Philippine Institute of Volcanology and Seismology (PHIVOLCS) and the Mines and Geosciences Bureau (MGB) were referred to in describing the geological setting at the affected sites.

Hydrology

Information on the hydrological profile and waterbodies affected by the proposed project were taken from site surveys and review of literature and maps. Informal interviews with

residents were undertaken to gather information about the flood conditions in the area and the condition of the waterbodies.

Air Quality

The air quality parameters considered during the sampling were sulfur dioxide (SO_2), nitrogen dioxide (NO_2) and total suspended particulates (TSP). The monitoring was based on a one hour sampling period. The methods of analyses of air samples were the Pararosaniline Method for SO_2 and the Griess Saltzman Method for NO_2. For TSP, the Gravimeter Method using a Staplex high volume sampler was adopted. Sampling was undertaken in conformity with the Ambient Air Monitoring Manual of the DENR-EMB and the US EPA "Quality Assurance Handbook for Air Pollution Systems.

Noise

Daytime noise level was monitored in eight stations on January 12 – 13, 2012 and on May 16 – 17, 2014. Noise sampling was conducted following the 1978 Rules and Regulations of the National Pollution Control Commission. Noise was measured in "A" weighting network and "slow response". Readings in each measuring station pointed at the north, east, south and west to check noise levels in all directions per station.

Surface Water Quality

Water samples were collected from the San Juan, Pasong Camachile, Rio Grande and Ylang-Ylang Rivers and tributaries to be traversed by the alignment. Standard water sample preparation procedures were followed. Samples were brought to the laboratory for analysis of the Total Dissolved Solids (TDS), Total Suspended Solids (TSS), oil and grease nitrates, phosphates and heavy metals. In-situ measurements of Dissolved Oxygen (DO), pH and temperature were also conducted.

Flora

The Quadrat Sampling Technique discussed in *Mueller–Dombois and Ellenberg (1971)* and *Kent and Coker (1992)* was used in sampling the vegetation and constituent flora in the study site. Starting from within km 1 of the proposed road alignment in Kawit, Cavite, past the Manila-Cavite Expressway (CAVITEX) exit, up to km 27 near Eurotiles in Aguinaldo Highway of Silang, Cavite, a series of sampling points were established at random using 20m x 20m quadrats, passing mostly through lowland irrigated rice fields in Barangays' under the towns of Kawit, Imus and General Trias; and sugarcane, corn and pineapple plantations and pastureland in the hilly Barangays' of General Trias, Dasmarinas and Silang. Opportunistic recording of plants encountered from one station to another were also undertaken to record every plant species encountered and supplement the list of plants from the quadrat sampling.

The collected data was summarized in a checklist of species with corresponding scientific, common and family names and life/growth forms. Quantitative Structure Analysis was performed to determine Importance Value, cover and frequency of occurrence of each species surveyed. The conservation status of each recorded species was determined based on the 2007 National Red List of Threatened Philippine Plants (DENR DAO 2007-01) and the International Union for Conservation of Nature (IUCN) Red List of Threatened Species.

Fauna

Wild fauna in the study area was characterized using standard survey techniques in combination with informal interviews with the local people. Avifaunal community in the area were described using the Time Area Count Method, where the number and species of birds were recorded for a 30-minute period of observation in selected observation posts. Observation posts were situated and replicated in each agroecosystem type (i.e. lowland agricultural areas covered with irrigated ricefields and hilly/upland agricultural areas dominated by sugarcane, pineapple and corn plantations). Using a Nikon 10 x 25 binocular and book guide on Philippine birds, birds were identified through sightings either perched or in-flight and through bird calls. Individual birds were counted.

Opportunistic recording in assessment of flora was used only to record plants in between sampled quadrats for reference only and not included in data analysis. This was done to know if there might some species present in the project site but might not be covered by sampling. Nevertheless, the term “Opportunistic recording” which is only used for fauna inventory is rephrased in assessment of flora. Hence, this section was revised as follow:

Quadrat Sampling Technique discussed in Mueller-Dombois and Ellenberg (1971) and Kent and Coker (1992) was used in sampling the vegetation and constituent flora in the project site. Series of sampling plots, measuring 20 meters by 20 meters quadrat, were established in random starting from within Kilometer 1 of the proposed road alignment project in Kawit, Cavite, passing the CAVITEX exit, up to Kilometer 27 near Eurotiles in Aguinaldo Highway of Silang, Cavite. The established sampling plots passed through the lowland irrigated rice fields in barangays under the towns of Kawit, Imus and General Trias, as well as the sugarcane, corn and pineapple plantations, and pastureland in the hilly bearings of General Trias, Dasmariñas, and Silang. Trees, agricultural crops and other plants present in the quadrats were identified and recorded. For reference purpose, plant species that was encountered from one quadrat to another were also recorded which aim to cover other important species that might not be covered by sampling.

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The Updated National List of Threatened Philippine Plants and Their Categories based on DAO 2017-11 is used instead of DENR DAO 2007-01 to know the conservation status of each recorded species. Hence, this section is revised as follow:

Data were summarized in a checklist of species with corresponding scientific name, common name and family name. Species were also categorized into tree, herb or shrub. Quantitative Structure Analysis was performed to determine the Importance Value, Relative Cover and Relative Frequency of Occurrence of each species surveyed. Moreover, the conservation status of the recorded species was determined based on the 2017 Updated National List of Threatened Philippine Plants and Their Categories as specified in the DENR Administrative Order 2017-11 and 2006 IUCN Red List of Threatened Species.

Socio-Economic

Socio-economic data was gathered from the different *Comprehensive Land Use Plans* of the CALAX (Cavite Section) host LGUs. A participatory approach was used to gather social awareness, perception and issues from stakeholders. Key Informant interviews with

representatives of concerned Local Government Units (LGUs) and other stakeholders were conducted.

2.2.4 PUBLIC PARTICIPATION

DPWH conducted various public consultation meetings about the proposed project. Initial project presentations were conducted for the LGUs of the province, municipalities, cities and barangays to be traversed by the road alignment. The consultations were conducted in the five impact areas of the project, namely, municipalities of Kawit, Silang, General Trias, and cities of Imus and Dasmarinas in Cavite Province. Consultations were also held with the stakeholders such as business sector whose interests will be affected by the project, barangay, municipal, city and provincial representatives, and land developers. The land developers have been identified to be among the key stakeholders that need to be consulted and informed by the project due to the prevalence of land developments along the project corridor which may be directly affected by the project. Follow-up consultation meeting was conducted in December 2013 at the Stateland Hills relative to the design of the proposed CALAX section which will traverse the subdivision. In addition, the proposed project was also presented to the Regional Development Council in February and June 2014. Annex B presents the Public Scoping report while Annex C presents the documentation of the public consultation meetings.

Major issues raised during the consultation meetings are summarized as follows:

Table 2. Summary of Major Issues and Concerns from Stakeholders

Issues and Concerns	Proponent/Consultant Response
KAWIT (November 17, 2011)	
Clarify the Kawit alignment. It will traverse Tuklong – Tabon Road not Advincula.	CALAX will commence at Marulas in Kawit to cross the Open Canal, Amaia Scapes, then to farmlands to avoid affecting many houses. At Governor's Drive, there will be an interchange and the alignment will end in Aguinaldo Highway in Silang. Km 27 will connect to SLEX.
Up to where is the viaduct portion in Kawit?	All major roads will be provided with interchange, viaduct will be used to lessen the effect to environment. The design is still being studied and will be bided out to concessionaires.
How many hectares of agricultural/farmland will be affected in Kawit?	This is still subject to final desin but rest assured that the project ill abide by agricultural laws and regulations.
Can an exit point be in Kawit?	This will be addressed in the final design.
Based on the map, the river going to Tuklong will be affected by the road. If affected, will it be rehabilitated?	CALAX alignmen will not affect or block the stream/river. Government projects should avoid such situation. DPWH will see to it that the issue will be addressed in the final design.
Road enhancement will mean more vehicles and there will be high rate of road accidents. How will this be addressed?	If the expressway will traverse a community, there will be noise and air pollution which needs to be addressed to avoid adverse effects to health of the people. With regards to

Issues and Concerns	Proponent/Consultant Response
	accidents, there will be limited access by the people because it is not open to pedestrians since it is a toll road where vehicles have to pay to pass the road. Mitigation measures will be provided to address traffic accidents.
Since the toll gate is within the municipality, will the municipality have a share in the taxes?	This will be included in the bid documents.
DPWH should closely coordinate with the Municipal Planning and Development Council (MPDC) during the planning of the project. An exit point near Advincula Road is proposed.	One technical required to be considered in putting up interchanges is the level of vehicular flow. One interchange is very expensive, hence, we cannot put many interchanges to limit the cost and avoid giving high toll to recover the investment. Suggest that the Council to issue a Resolution proposing for an interchange for study of DPWH.
Before approval of right of way, the property owner should get clearance first from the municipality to be able to pay tax deficiencies.	DPWH is coordinating with the Municipal Assessor's Office to determine the owners of properties. Once the lot is identified, DPWH will proceed to the Treasurer's Office to get the name of the owner for them to be informed about the tax deficiencies. Informal settlers are no longer required to secure tax clearance (special case) except for agricultural land and legitimate owners.
In the Assessor's Office, there are many properties acquired by DPWH in Kawit that are not yet subdivided to owners. Who will be accountable for the payment of tax?	Before the properties are subdivided, there is a need for Special Power of Attorney (SPA). Due to the urgency of project, we cannot wait for the subdivision of the properties. What is being done is to have a pledge of undertaking, get the permit to enter, then later on discuss the subdivision of properties and have it forwarded to the Assessor's Office. Parcellary survey will be conducted to distinguish property lot and the properties belonging to the State.
For informal settlers that will be affected, is there a resettlement program?	The team will coordinate with NHA to look for a resettlement area. NHA will coordinate also with the LGUs for the resettlement site. Also road line interview for informal or real estate developer will be conducted to address this matter. If there is a resettlement site in the municipality that is identified in the CLUP, DPWH can assist in the development of the site but the purchase of the lot will be shouldered by the concerned LGU.
In case the affected lot was planted by the caretaker with many trees, are these going to be paid?	This will be included in the Resettlement Action Plan (RAP). All structures, irrigation canal, electric post, etc. have corresponding

Issues and Concerns	Proponent/Consultant Response
	payments.
IMUS (November 17, 2011; December 2, 2011)	
How many kilometers of road will be in Imus?	It is almost 6 kms long starting at Km. 1 (right side) Estella Homes, Borromeo up to the Open Canal.
Based on the alignment map, there are several houses to be affected. Many of the areas to be covered by CALAX are owned by developers. What should he SB of Imus do if CALAX is not yet very certain? Do we wait for 3 to 5 years before we proceed with our ow development plans?	CALAX project started 10 years ago because we are not yet certain on R1. Several studies were undertaken by JICA and DPWH proposing several alignments. The latest alignment shown is the final version for Cavite side and this has lesser impact compared to the other alignment options. Most of the affected land are rice land or farmland and not much houses. DPWH has been coordinating with the MPDO of Imus for the past five years regarding the proposed alignment of CALAX.
DPWH should be strict in regulating proliferation of establishments and informal settlers on the road side once the expressway is established.	There will only be 2 exit points – in Open Canal and at Governor's Drive. The expressway design will be fenced and elevated so outside edges of the road are fully secured and protected.
In Imus, the only exit at the moment is in Daang Hari. If there is heavy traffic in Bacoor and Kawit up to Coastal area, it will add up to the heavy traffic congestion in Imus. Full support for the proposed CALAX is affirmed to alleviate the present traffic problem.	DPWH is thankful for the support. There is a need to immediately reserve the affected area through a resolution.
There are many excavation activities of MWSS along Cavite highway. What is the liability of MWSS with the government to restore the constructed roads? Why not do the excavation during Saturday or Sunday or summer time so as not to affect schools and offices?	DPWH has a MOA with Maynilad. Maynilad will restore the roads that they have excavated. Official complaint letter may be forwarded to the local ditrict of DPWH.
Will it charge higher toll fee which ordinary citizen may not be able to pay?	R1 or CAVITEX entailed high cost because of the reclamation work done in the sea, thus, toll fee is quite high. In the case of CALAX, the toll fee will be probably P60 or less than P100.
How do you define environmental concern in relation to this development project?	An EIS is now being done to be submitted to DENR by SMEC. The study covers all environmental concern from land, water, air, etc. The consultants are studying and identifying the impacts that may be brought about by the construction of CALAX and will be coming up with various environmental and social management plans to mitigate adverse impacts. All concerns will be included in the project design.
Will a flyover be situated in the existing NIA road?	In Kawit, the plan is to put a viaduct. In the Open Canal, there will be an interchange (bridge) and farm crossing for animals like

Issues and Concerns	Proponent/Consultant Response
	carabaos.
Will there be relocation schemes for residents who will be affected?	Resettlement consultants will evaluate all areas that will be affected to determine the resettlement action plan including compensation package. Livelihood and skills training will be assessed in case of relocation. In the CLUP, there is a reserve area for resettlement and DPWH can assist in the development together with partner agencies like NHA and DSWD.
CAVITEX is not maximized by commuters per observation because of high cost of toll fee. CALAX might face the same predicament.	Access road is narrow that why very few use it. If there is a connection already through the CALAX, people will start to appreciate it. Only P60 will be imposed unlike in R1 which has a high cost of investment.
If there are disagreements on the purchase of the right of way between the government and the property owner, will you change your plan/alignment? Will you still negotiate with other affected lot owners?	It will undergo process. The concerned municipality will provide the resettlement area, then DPWH will be responsible for the development of the area while the NHA will be on housing. The negotiated ale will be based on the the zonal valuation and current fair market value. If there are no agreements reached, it will undergo expropriation proceedings. The Court will issue permit to enter where they like it or not.
The survey team should coordinate first with the concerned barangay captains so that they can jointly explain the project to the affected property owners.	Yes the RAP team will be coordinating with all concerned barangay captains.
Will Pag-Asa 1 be affected also by the road?	No, it is very far.
Will there be enclosures in the road?	Yes, there will be road enclosures but road crossings will be provided.
Where is the entrance of the tollway?	There will be entrance at the Open Canal.
Will there be a flyover and an exit near 7-11?	At end of CAVITEX, there is viaduct, it is elevated. There is no exit but the road is open because it has existing toad (up to 1 km). At Governor's Drive, it is elevated also.
SILANG (November 21, 2011)	
How long is the road traversing Silang?	Silang starts from Km 25.4 to 27 and covers 4 barangays, namely: Batas, Adlas, Biluso, and Biga II. Originally, alignment was near the school but later was changed near Eurotiles where the project ends.
What will happen to the private properties to be affected by the project?	We have to evaluate on the ground if there are structures to be affected to undertake valuation and compensation. If the owner is not amenable to the payment, zonal valuation will be used as basis. If there is till no agreement on the pricing, then there will be expropriation proceedings. A Municipal Resettlement Action

Issues and Concerns	Proponent/Consultant Response
	Plan Committee will be created composed of the MPDO, Sangguniang Bayan members, Municipal Agricultural Officer (MAO), concerned stakeholders, and affected individuals.
When will the project start?	CALAX' timeline is projected to be completed by 2016. There will be detailed engineering design then an invitation for investors to bid for the project.
How much is the value of lot near Eurotiles area considering there will be an exit to be located near Km 27?	This will be assessed. There will be interchange in Governor's Drive and Auinaldo Highway and 2 exits only.
Will there be widening of road if there is an exit near Aguinaldo Highway?	The project will have minimal impact on existing structures and will pass through open fields.
In the last Barangay meeting, most of the residents were mad since their lots will be affected by the road and this is their only source of livelihood. The proposed payment is only based on fair market value.	The buying value of affected lots is based on present fair market value, thus, affected residents will not be at a disadvantage.
Can we stop the survey and find other routes for the road?	We cannot just simply locate to other routes. The road alignments were chosen based on several considerations such as safety, speed limit, no sudden curves, etc.
How wide is the road?	60 meter wide with 4 lanes but intended also for 6 lanes.
If the project will push through, where will the funds come from?	The tollway project will be under a Public Private Partnership (PPP) arrangement.
DPWH should also take note of people's sentiments on high toll fee being imposed including VAT which at present is almost 300% increase.	Noted
There is parcel of land which will be affected by the road project which has an on-going negotiation to sell the lot. What will happen with the deal? How much will be the asking price of the government to the affected lots?	Determination of payment will be based on zonal valuation. If there is expropriation proceedings, the Court will determine the real value of land but will be based first on zonal valuation.
Hw much is the value of lot if property is near a subdivision?	The value of lot is higher if near a subdivision. The classification of the land is also important as it commands higher value, e.g. commercial, subdivision, etc.
What is the BIR zonal value?	The BIR zonal valuation is based on current fair market value.
If the Cavite alignment is alright already but the Laguna side still has a problem, will the projects till push through.	The Cavite side will not start without the Laguna side.
GENERAL TRIAS (November 25, 2011)	
How far is Mary Cris complex in Km 11 from the road. Are you going to pay also the farmland that will be affected?	Approximately 100+ meters is the distance from the complex. About 60 meters of the farmland will be affected. Yes there wil be payments but if you are not paying taxes to the municipality, the taxes will be deducted from the payment.

Issues and Concerns	Proponent/Consultant Response
In the open canal area, will an elevated road be constructed?	Yes it is elevated. There will be crossing at the Open Canal.
Will there be crossing in the existing NIA road?	In all existing roads, there will be flyover crossing.
Will there be interchange in all intersection.	Interchanges will be situated at the Open Canal and Governor's Drive only.
Is there a connection from Open Canal to Daang Hari? It is suggested that an exit be aso situated in the Daang Hari area.	At Km 9 and 10, there will be an intersection that will connect to Daang Hari. In all interchanges there will be exitss. The connection in Daang Hari will be further studied whether elevated or not.
It is suggested that drainage system be drained directly to the river and not in the creeks to avoid flooding.	To be considered in the detailed design
Request to have a toll exit in the provincial road near Amai in Barangay Santiago. If the exit is not feasible in Amaia, how about in Buenavista? To create a new road connecting the area of Velagio, what is the spacing?	At least 5 km is the spacing. Suggestions will take into consideration several factors mentioned earlier.
In the San Francisco area eastside of Purefoods, within the yellow line at Km 20, that is the aea where the new General Trias Municipal Office is proposed. The area was donated covering 3 hectares.	In the San Miguel area, there is a proposed elevated interchange.
Will the road pass through Barangay Javelera near Gateway?	No. that is Silang portion already.
Will the LRT housing from the Amaia, near the Open Canal be affected by the road?	All subdivisions will be avoided, except Casa de Biga. The small red line in the alignment is the 60 m right of way while the bid red line is the center road.
When will the project start? Since 2007, we were already being consulted about this project and we have been waiting for this to materialize. We hope that this will not be another DPWH project that has more negative impacts than benefits to the locals.	We are still in the study phase and aims to complete this by 2016. DPWH intends to enhance the consultation process for the CALAX project to win-win situation and to ensure that the project will be cost-effective and beneficial to the locals and economy of Cavite. Lessons learned from past projects have been taken into consideration by the consultants and DPWH. We request a municipal resolution will be issued by the LGU of Silang in support of the CALAX project.
Suggest that DPWH install notices such as billboards so that developers will know that there is a proper CALAX tollway project in the area.	Noted.
Most of the affected area is in Barangay Biclatan where there are properties of San Miguel Corporation.	There will be a stakeholder's consultation in Quezon City and San Miguel Corp. has been invited.
At Mary Cris complex, there are farmlands to be affected but the owners have not been notified yet.	In the forthcoming consultations, the RAP team will consult with specific lot owners.
DASMARINAS (December 2, 2011)	
Where is the coverage of the road in Dasmarinas?	Between Km 24 and 26, near the boundary of Silang, there is a V curve and in the center of

Issues and Concerns	Proponent/Consultant Response
	that curve is the area covered by Dasmarinas. It is about 600 to 800 meters only. Most of the affected area are farm lots planted with corn and sugarcane.
Is the map based on table map or ground survey?	The map shown is satellite image map. The details will be worked out once the survey starts. Initially, we are doing the assess of the magnitude of project impacts, how much will be paid for the right of way, and processes are being undertaken to secure the Environmental Compliance Certificate (ECC). Detailed engineering design will follow after we have completed the studies needed under the feasibility study phase of the project.
We are now aware that you have already started the survey activities for this project.	Actual surveys will be done after we have secured your permission through consultation process. We will be coordinating with the barangays for all survey activities to be conducted.
Do we have an exit and tolloway to be situated in Dasmarinas? How much is the toll fee?	Estimated fee is about P60.00 to P80.00
Where will the exits points be? How many exits in General Trias?	We target to have four exit points – In Kawit, Open Canal connecting Daang Hari, in Governor's Drive, and at Silang. One exit will be situated in Open Canal.
If the national government will pay the cost of road right of way, will the local government provide for any countyerpart payment to those residents that will be affected?	Only the national government will pay. There is no counterpart from the local government.
Will the project be subjected to environmental assessment?	This activity is for compliance in securing the ECC. It considers the level of social and environmental impact of the project.
Is there a limitation as to the distance between exits? We have an industrial zone if possible to have access for big trucks. Can we have another exit for industrial zone?	At least 5 kms for interchange. Putting exits are expensive, we need to purchase big areas and that will entail higher investment cost which may result to higher toll fee rates also. Filinvest donated a land for their own purpose. High-end subdivisions usually donate areas for exits.
If our industrial zone can afford to donate an area, is it possible to have another exit?	Just submit your proposal to DPWH. All proposed exits are outcomes of studies such as traffic flow and congestion.
Is there a possibility that traffic will worsen in next few years starting at the entrance of CAVITEX from Coastal Road?	That is why we proposed CALAX. After CAVITEX, we will put a viaduct. The elevated road will complement CAVITEX and decongest vehicular flow in that area.
CONSULTATION WITH DEVELOPERS (November 29, 2011)	
Our property is in Mary Cris between Km 10 and Km 11. Can you do a new alignment near Km 10 because we have no access	Suggestion will be noted. So far, the present alignment has the best access to local

Issues and Concerns	Proponent/Consultant Response
to the expressway.	road network and with the least social and environmental impact.
Where is the existing Arnaldo Highway within Km 16? Our project site is Sunny Brooke.	It is located near Purefoods area. It is not affected by the road alignment.
Will the alignment go as far as McDonalds's and Amadello?	Said areas are not affected by the road alignment.
In Km 2 in Kawit area withtin Vereneo cluster near a creek rill the road affect an open space which is still part of our subdivision? Is it possible to move the alignment to the right so it will not affect our project?	We are trying to minimize impact of the alignment. It will cross over the road so it will not affect your project.
Will there be an exit in Kms 17, 18 and 19?	None. An exit will be located between Kms 19 and 20 at Governor's Drive. Next exit will be at the Open Canal at Daang Hari.
In Km 12 is Amaia Scapes project. Can you provide a copy of the parcellary survey of CALAX to our company?	The present and approved alignment shown to you took into consideration all the pertinent data provided by DPWH and LGUs, specifically the MPDOs. In your case, DPWH informed us that there were no developments yet in the area. DPWH district office also advised to offset 100 meters up from our former alignment in consideration of said development in your area. Thus this alignment is basically based on what has been recommended by the authorities to complement the technical considerations for the project. We will secure approval of the DPWH regarding request for copy of the survey.
Is the width of the proposed road right of way of Cavite the same with Laguna side?	60 m road right of way is proposed for the Cavite alignment. However, area with small impact could be avoided by reducing the road right of way.
Will there be an overpass at Km 19?	That part of the interchange is elevated, however, it is still a proposal and currently being studied. As far as the project is concerned, the government sector and the local government units have already approved it in principle. But still much of the area that will be affected is from private lands. As long as the traffic warrants we can provide access subject to further assessments and evaluation.
In the Laguna side, will there be more developers affected by the project?	It will only affect Ayala Land, Inc. and Greenhills.

2.3 SUMMARY OF BASELINE CHARACTERIZATION

Table 3. Summary of Baseline Characterization

ECOSYSTEM	BASELINE ENVIRONMENTAL CONDITIONS

ECOSYSTEM	BASELINE ENVIRONMENTAL CONDITIONS
LAND	
Land Use	Based on the Socio-Economic Profile of the Province of Cavite (2013), agricultural land use dominates in the Province with 50.33% of the total provincial land area devoted to agriculture. The direct impact of the CALAX (Cavite Section) on land use change along its corridor is considered to be limited but a more significant cumulative impact on land use change may ensue with the implementation of CALAX. The improved accessibility that will come with the completion of CALAX will make the corridor more attractive for land development, hence, increasing urban sprawl. Although the planning of the alignment has minimized the fragmentation of community, the eastern fringe of the Stateland Hills Subdivision at Km 18+00 will be traversed by the road project. This impact will however be minimal as it borders the western banks of the Rio Grande River. This alignment was also selected as the one with the least impact on settlements since Stateland Hills is relatively less densely developed than other subdivisions. Much of the residential areas in the corridor have been avoided.
Soils	Three soil types, six soil mapping units, and one miscellaneous land type were identified, characterized and mapped along the alignment of the proposed CALAX (Cavite section). The three soil types are the Guadalupe clay, Magallanes clay loam, and the Tagaytay clay. The Guadalupe clay is a poorly drained, moderately deep clay soil. The Magallenes clay loam is moderately well drained clay loam soil. The Tagaytay clay is moderately well drained deep clay soil. During the construction phase, the topsoil along the alignment will be scrapped prior to compaction. The scrapped topsoil materials may be carried away by runoff water during rainfall events and may cause sedimentation of the rivers. Earth movement and excavation will be undertaken for the foundation of bridges and viaducts and construction of culverts. Erosion and landslide may occur during rainfall events with subsequent sedimentation of the rivers downstream. Increased storm water runoff may also result in road structure collapse.
Topography	The proposed CALAX (Cavite Section) transects the northern half of the Province of Cavite which is characterized by flat to gently sloping terrain. The northern half of Cavite where CALAX has been sited is drained by a network of sub-parallel streams belonging to the Ylang-Ylang River which originates from the Tagaytay Ridge in the south flowing northward towards Manila Bay. Natural scouring of the stream beds and banks in these waterways particularly during heavy rains and storms takes place. There is also potential increased erosion with the removal of soil and rock in areas designated for the road alignment, bridges, construction facilities, batching plants, and sources of construction materials. This condition will prevail throughout most of the proposed road alignment although rates will be greater in the sections from Km 17+00 to Km 27+00 where more excavation will be needed to attain the desired grade. Stockpiles of

ECOSYSTEM	BASELINE ENVIRONMENTAL CONDITIONS
	excavated and construction materials will also be subjected to erosion unless properly sited and managed.
Tectonic Setting	There are no major faults traversing the proposed road alignment. Geological structures are essentially limited to local joints of generally vertical orientation. The major earthquake generators which influence the Island of Luzon and the Province of Cavite include the Manila Trench to the west, Lubang Fault to the south, the West Marikina Valley Fault to the east, and the segment of the Philippine Fault farther east. The Manila Trench is located approximately 195 km west of Km 0+00 of the CALAX. The Lubang Verde Passage Fault system is located about 75 km to the south of the project area. It runs along a northwest – southeast direction between the Island of Mindoro and the Batangas Peninsula of Luzon. The southern trace of the West Marikina Valley Fault is about 10 km east of Km 27+00 of the CALAX. The segment of the Philippine Fault is about 90 km east of Km 27+00 of the proposed expressway.
Geology	The Province of Cavite is underlain by two major geologic formations, namely, the Quaternary Allluvium (QAI) and the Guadalupe Formation (GF). These formations respectively correspond to the Quaternary Holocene (Qh) and the underlying Quaternary Volcanic Pyroclastics (QVP) of the 2010 edition of the Geologic and Tectonic Map of the Philippines. Potential hazards to be considered in the detailed engineering design are susceptibility to ground shaking, liquefaction, settlement, flooding and tsunamis.
Terrestrial Flora	Two agro-ecosysten community tyoes are present in the project site, namely, the lowland irrigated rice agro-ecosystem and the sugarcane/corn/pineapple agro-ecosystem. The proposed road alignment will pass through essentially lowland irrigated ricefields from its entrance past the exit of CAVITEX Kawit, all the way to Imus and the lowland portion of General Trias. At about Km 19+00 of the proposed expressway, the dominant crop is replaced by plantations of sugarcane, pineapple, and corn in the hilly barangays of General Trias, Dasmarinas, and Silang up to the exit in Aguinaldo Highway where few mango and coconuts are present in residential areas. From the total number of species recorded, a total of 20 plant species are considered economically important. A total of 18 out of 20 species are agricultural crops. There is also a very small patch of highly degraded mangrove made up of a few stunted individuals near the proposed entry to the CALAX, adjoining the CAVITEX. The mangrove individuals are barely growing in a creek surrounded by very dense residential houses and commercial establishments in the road going to the Imus-General Trias area. The remnant mangrove are not diverse and composed practically of only one species. There are no threatened species listed in the National Red List of Threatened Philippine Plants (DENR DAO 2007-01) and 2006 IUCN Red List of Threatened Species in the study area. The recorded species are common and wide in distribution.
Terrestrial Fauna	Direct observation shows a very low number of vertebrates in the study area. Only a handful of other vertebrates from other animal groups were

ECOSYSTEM	BASELINE ENVIRONMENTAL CONDITIONS
	observed out of opportunistic observation in the vicinity and informal inquiries from the local residents. These includes the *Rattus argentiventer*, *R. tenezumiand R. norvegicus, Suncus sp.* (house shrew), bats like the *Ptenochirus jagori*, *Cynopterus brachyotis*, and *Bufo marinus* and *Rana* species, reptiles like *Mabuya sp*. and snakes. (No threatened species as listed in the IUCN Red List and CITES List were recorded in the study area. The recorded species are common and wide in distribution.
WATER	
Hydrology	The San Juan, Pasong Camachile, Ylang-Ylang and Dasmariñas Rivers are the major rivers that will be traversed by the proposed CALAX (Cavite Section). The Pasong Camachile River Basin has a catchment of 10.22 sqkm while San Juan Main Stream Basin is 65.56 sqkm. Panamitan Drainage, Pasong Camachile and San Juan Main Stream form the San Juan River Basin. The San Juan River Basin has a total of 88.2 sqkm of catchment area. The Dasmariñas River Basin (15.09 sqkm) and Ylang-Ylang River Main Stream Basin (43.47 sqkm) form the Ylang-Ylang River Basin which totals 58.56 sqkm. The total of all the catchment areas is 146.76 sqkm.
Surface Water Quality	The major rivers traversed by the project are classified as Class C surface waters. Based on the water quality sampling conducted on May 22, 2014, the Dissolved Oxygen (DO) levels in all stations is still within the minimum standard set of 5 mg/l for Class C. The rivers receive the discharges of organic matter, nutrients and suspended solids through drainage canals and creeks. These are considered as the major sources of pollution load.
AIR	
Climate	The climate in the area is classified as Type I under the PAGASA's Coronas Classification of Philippine Climate. This climate type is relatively dry from May to October and relatively wet for the rest of the year.
Air Quality	The air quality in the area is generally good in all eight ambient air quality sampling stations. The ground level concentration of total suspended particulates (TSP) did not exceed the 300 ug/Ncm DENR standard. Considered as major sources of air pollution in the area are the movement of motor vehicles along the adjacent roads and some open burning practices of households to dispose of garbage.
PEOPLE	
Population	The project site is located within Cavite Province which has a recorded population of 3,091,691 persons as of May 1, 2010. This is an increase of 1,027,530 persons over its total population of 2,063,161 persons in the 2000 Census of Population and Housing. The increase in the population count from 2000 to 2010 translated to an average annual population growth rate of 4.12 percent. This is lower than 5.99 percent annual population growth rate of the province between census years 1990 and 2000. If the average annual growth rate recorded at 4.12 percent during the period 2000 to 2010 continues, the population of Cavite would double in 17 years. Fifty years ago, the population of Cavite was only 378,138 persons. The population size is less than one eighth of the population of the province in 2010 census.

ECOSYSTEM	BASELINE ENVIRONMENTAL CONDITIONS
	Among the six cities and 17 municipalities comprising the province of Cavite, the City of Dasmarinas was the most populous with a population size making up 18.6 percent of the total provincial population. The City of Bacoor was second with 16.8 percent share, followed by the City of Imus with 9.8 percent and the municipality of General Trias with 7.9 percent. The rest of cities/municipalities contributed less than 7.0 percent each. The least populated area was the municipality of General Emilio Aguinaldo with 0.6 percent share to the total population of the province. It was also the least population area in 2000.[1]
Economy	The province's economic activities are centered on industry, agriculture and commercial trade. There are a total of 46 industrial estates in Cavite Province. Out of these, there will be a total of twenty-nine (29) industrial estates which are located within the host cities and municipalities of the CALAX (Cavite Section). The products produced by these industrial estates include food and beverage, textile, wearing apparel and leather, wood and wood products, paper and paper products, chemical and chemical products, non-metallic mineral products, basic metal products, fabricated metal products, machinery and equipment, electronic and electrical equipment, parts and telecommunications, agri-business, livestock and poultry, toys, games and sporting goods, and services. A total of 99,445 jobs were made available by the industrial establisments in Cavite. Agriculture is one of the key economic activities in the Province of Cavite due to the volcanic soil and relatively mild climate which makes it suitable for cultivation. The usual mix of crops planted in Cavite are rice, coconut, corn, papaya, coffee, pineapple, ad vegetables. The host LGUs of CALAX (Cavite Section) contribute about 40% of the Province's rice production from a combination of irrigated and rainfed Riceland. Commercial sector businesses, which includes malls, shopping center, supermarket, personal, education, recreational, health, and other forms of commercial business endeavors develops faster than the agricultural sector. This is primarily brought about by the growing population in the province.
Health	The reported leading cause of diseases in the province in the last five years per 10,000 population was bronchitis, bronchial asthma, wounds (all forms), tuberculosis respiratory and urinary tract infection. The top five causes of mortality per 10,000 population are acute myocardial infraction, cerebrovascular accident, multiple organ failure, cancer (all forms), and hypertension.
Water Supply	The Maynilad Water Services Inc. (MWSI) is serving the area. The MWSI has water supply expansion programs to serve Cavite.
Power Supply	The power requirement of the city is supplied by the MERALCO. There is no problem on power supply of the community and the proposed project.

[1] Source: National Statistics Office (NSO), http://psa.gov.ph

2.3.1 KEY ENVIRONMENTAL IMPACTS AND MANAGEMENT AND MONITORING PLAN

The construction of the CALAX (Cavite Section) will potentially result to adverse impacts to the environment, as follows:

(a) Permanent loss of agricultural land and impacts on agriculture that will require land acquisition, relocation and resettlement and compensation of affected persons
(b) Impacts on soil (loss of top soil, compaction of soil, and contamination of soil)
(c) Runoff of soil/sediments, mud and cement-containing materials may cause the clogging of existing drainage canals and sedimentation of waterbodies.
(d) Destabilization of slopes
(e) Airborne dust from excavation, construction, vehicle movement and materials handling, may affect populated areas.
(f) Air pollution will be caused by emissions from construction vehicles and machinery.
(g) Noise caused by construction equipment and vehicular movement may potentially affect the nearby establishments.
(h) Impacts due to disposal of solid wastes and other construction materials
(i) Temporary employment opportunities
(j) Occupational and community health and safety
(k) Traffic congestion during construction
(l) Generation of wastewater and solid wastes from construction camps. The discharge of wastewater from construction camps could cause water pollution.

During the operational phase, the impacts of the project include:

(a) Risks to public safety due to better access and road improvements
(b) Impacts of rehabilitation and maintenance works

Other concerns that need to be considered in the planning of the project are:

(a) Geologic hazards such as potential liquefaction, settlement, and flooding should be considered in the design to ensure the integrity of the structures.
(b) Emergency response and risk mitigation plan for disasters such as earthquakes, etc. should be integrated in the design and operation of the project to ensure the safety of passersbys and the community.

The detailed Environmental Management Plan (EMP) is shown in Table 25 while the Environmental Monitoring Plan is presented in Table 28.

2.3.2 ENVIRONMENTAL MANAGEMENT FUND AND ENVIRONMENTAL GUARANTEE FUND

Funds shall be allocated for the implementation of the Environmental Management Plan and Environmental Monitoring Action Plan. The estimated budget of the EMF and EGF is outlined in the EMP and EMoP.

3 Project Description

3.1 PROJECT INFORMATION

Name of Project: **CAVITE-LAGUNA EXPRESSWAY (CALAX) (CAVITE SECTION)**

Location: Municipalities of Kawit and General Trias and Cities of Imus and Dasmarinas, Province of Cavite

Nature of Project: Expressway

3.2 PROPONENT PROFILE

Name: Department of Public Works and Highways

Business Address: DPWH Central Office, Bonifacio Drive, Manila

Authorized Representative: Maria Catalina E. Cabral, Ph.D.
Assistant Secretary for Planning and PPP
Telephone: +63(2) 304-3148
Fax: + 63(2) 304-3140

3.3 PROJECT LOCATION AND AREA

The Cavite section of the Cavite-Laguna Expressway (CALAX) is a 4-lane 30.42 km closed-system tolled expressway that will connect the Cavite Expressway (CAVITEX) in the north through the Provinces of Cavite and Laguna to join the Aguinaldo Highway at Silang, Cavite and then eastward to connect with the South Luzon Expressway (SLEX). The project will start form the CAVITEX in Kawit, Cavite and end at the SLEX-Mamplasan Interchange in Binan, Laguna. The CALAX project is divided into two sections, i.e.: (i) Cavite Section in the north known as the CALAX (Cavite Section) and the (ii) Laguna Section in the south which continues the CALAX from Silang in an easterly direction over 14.27 kilometers with four-lane tolled expressway to connect with SLEX. Figure 2 provides a diagrammatical representation of the alignment.

The project will have interchanges (IC) in eight locations, namely: (i) Kawit, (ii) Open Canal, (iii) Governor's Drive, (iv) Silang, (v) Silang East, (vi) Sta. Rosa-Tagaytay, (vii) Laguna Boulevard, and (viii) Technopark. It will have one toll barrier before SLEX.

The CALAX (Cavite Section) will have a length of 30.42 km and will commence at Km 0+720 which is the end of CAVITEX. There will be a common pier at Km 0+720 that will be designed and constructed by the winning concessionaire of the CALAX.

In order to physically connect to the CAVITEX in accordance with design standards and due to the elevated viaduct, there is an identified requirement to take the construction limits into the CAVITEX by 518m (km -0+518). This section will not however form an official part of the CALAX during the operational phase as it is officially a section of the CAVITEX.

From km 0+00 to km 0+50 the CALAX alignment is offset to one side of the Kawit-Noveleta Highway to avoid conflict between the two road centerlines and to facilitate easier

construction of the proposed new expressway which is planned as an elevated multispan viaduct through to km 1+140.

At km 0+60 the CALAX alignment passes over the Kawit-Noveleta Highway and proceeds due southwards through a developed area of commercial buildings and residential properties up to km 1+00 where it emerges into more open space and ricefields through which the expressway construction will be lowered to a nominal two meter embankment.

At km 1+20 a proposed Kawit Interchange will be constructed to connect residents of Kawit to the CALAX. A proposed service road will be used to give way to residents traversing Advincula Road which will be affected by the expressway and the interchange.

From km 1+00 to km 5+00 the CALAX alignment was recently offset to the west to avoid impacts on residents of Barangay Alapan 1B. The alignment passes through flat open terrain mainly utilized currently as ricefields. It bisects two local roads that will be diverted above the expressway (as overpasses) with no other apparent significant impacts or conflicts with residential or commercial properties. The alignment passes to the east of the adjacent Estrella Homes Residential Development and Magdalo Development and to the west of Lakersfield Homes Development.

At km 5+00 to km 11+00 the CALAX alignment bisects four local roads which will be diverted over the expressway. This is also part of the area which was recently offset to the west as advised by DPWH to make way for future developments. This section continues through more flat open terrain mainly utilized currently as ricefields, with no other apparent significant impacts or conflicts with residential or commercial properties up to km 11+900. Various local roads and tracks are cut by the expressway, requiring appropriate diversion treatments (refer to the *PED drawings* for further details).

At km 11+90 the CALAX alignment passes over a major local road and impacts some roadside properties before returning into more flat open terrain with no other apparent significant impacts or conflicts with residential or commercial properties up to km 14+30 where roadside properties are impacted and a local road will need diversion over the expressway.

From km 14+30 to km 17+00 the CALAX alignment continues through more flat open terrain mainly utilized currently as ricefields, with no other apparent significant impacts or conflicts with residential or commercial properties.

From km 17+00 to km 18+00, the CALAX cuts through a developed area which is assessed initially as minimal completed development, including mainly warehouses and few residential houses, with only informal settlers and therefore what may be a relatively low level of displacement/resettlement.

From km 18+00 to km 22+00 the CALAX alignment continues through the optimum available open corridor, avoiding restraints to the west such as the Stateland Inc. subdivision, San Miguel, Magnolia Incorporated, Lyceum of the Philippines University and Japan Aviation Electronics Constraints avoided to the east include Maravilla, Yeonho Electronics Inc., First Cavite Industrial Estate, etc. The alignment at 19+30 does however need to traverse a corner of an under-development San Miguel holding. The expressway alignment through this area would include bridges over a major river at km 18+50 and over one local road at km 19+20, plus a major crossing over Governor's Drive at km 19+75. Otherwise the expressway profile is expected to generally be at-grade on a nominal two meter embankment.

From south of Governor's Drive at km 19+80 moving further southwards, there are currently minimal building structures of any kind observed along the actual alignment corridor and land use is mainly open sugarcane fields. The CALAX alignment continues at-grade, crossing over rivers at km 23+50, km 25+70 and km 26+45.

From km 27+00 to km 28+20 the CALAX alignment is an elevated multi-span viaduct with a "Y" interchange to connect to the Aguinaldo Highway to the north of Silang. Due to recent realignments in this area as a result of consultations with Stateland, Inc. the CALAX (Cavite Section) design has now extended up to km 29+28 in order to incorporate a new revised horizontal curve. It is now at this point that the CALAX (Cavite Section) ends and the CALAX (Laguna Section) begins, continuing eastwards towards a connection with the SLEX Highway. JICA Consultants CTi Engineering International Co, Ltd have conducted all such similar preliminary studies for the CALAX (Laguna Section).

Figure 2: CALAX Alignment showing the Cavite and Laguna Sections

3.3.1 IMPACT AREA

The study area encompassed the three municipalities of Kawit, General Trias, and SIlang and the two cities of Imus and Dasmarinas, in the province of Cavite. The EIA study area comprises of the project site as primary impact area. The primary impact area is defined as the immediate vicinity to the perimeter up to a radius of 100 meters. This includes part of the adjoining establishments in the vicinity. The primary impact area was identified based on the potential impacts that may be generated by the project particularly during the construction phase. These environmental impacts include generation of dust, noise, soil runoff, and traffic that may cause nuisance and hazards to the environment and adjacent communities.

The secondary impact area is defined as the area within 500-m radius of the proposed project site. The secondary impact area is projected to experience impacts associated with traffic congestion, flooding, traffic and other socio-economic effects of the road development project. The secondary impact area will consist of the CALA region, particularly the residential and industrial areas.

3.3.2 GEOGRAPHIC COORDINATES

The following outlines the geographic coordinates of the road alignment through each of the road interchanges:

Road Interchange	Latitude	Longitude
Kawit	14°25'47.67"N	120°54'44.36" E
Open Canal	14°22'12.98"N	120°56'00.53" E
Governor's Drive	14°17'22.1"N	120°55'37.45" E
Silang	14°25'47.67"N	120°54'44.36"
Silang East	14°13'53.18"N	120°59'58.15"
Sta. Rosa – Tagaytay	14°14'07.52"N	120°02'50.46"

Figure 3 presents the map showing the geographic coordinates along the alignment, specifically at the interchanges.

3.3.3 ACCESSIBILITY OF THE PROJECT SITE/AREA

The road corridors and linkages of CALAX (Cavite Section) are with SLEX and C-6 as well as with CAVITEX which was completed and opened to traffic in 2011. The predominantly four lane CALAX is envisioned as an alternative north-south artery to the CALA region that would reduce congestion along Aguinaldo Highway.

3.4 PROJECT RATIONALE

The Cavite-Laguna Expressway (CALAX) Project is the result of the Japan International Cooperation Agency (JICA)-initiated Feasibility Study and Implementation Support on the CALA East-West National Road Project, in collaboration with the Philippine Department of Public Works and Highways (DPWH), which was completed in November 2006. The conduct of this study was triggered by the results and recommendations of two earlier studies, namely:

- Metro Manila Urban Transportation Integration Study (MMUTIS) conducted by JICA (1996 – 1999)
- CALA Transport Strategy and Short-Term Programs and Policies which is a component of the Cavite-Laguna (CALA) Urban Development and Environmental Management Project of the World Bank (WB) (1999).

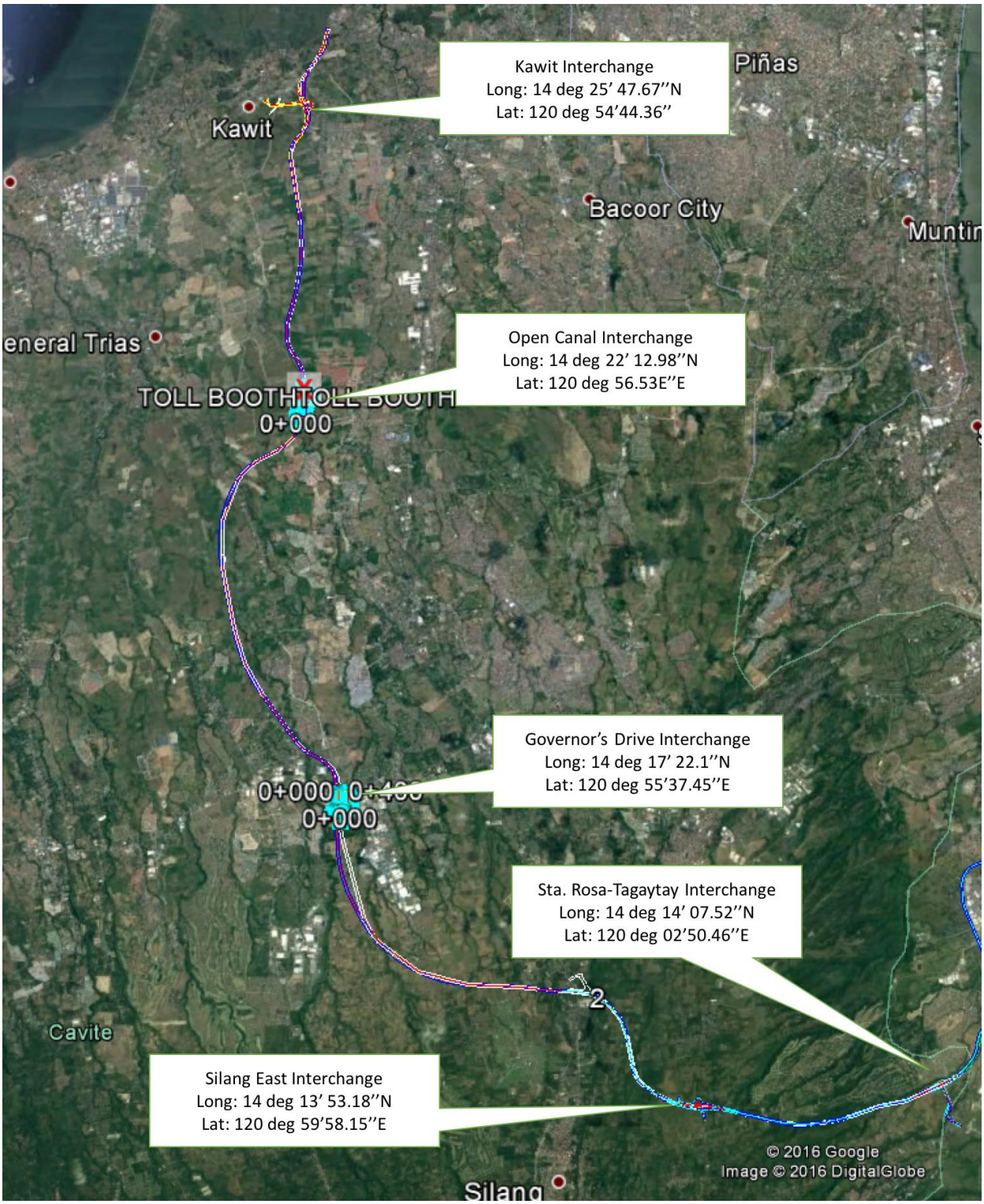


Figure 3: Map of Alignment showing the Geographic Coordinates

The CALAX is a major component of the country's Urban Expressway Network with the objective of providing a high-standard expressway that would facilitate the efficient flow of existing and future traffic to and from Metro Manila and CALABARZON. With the completion and operation of the Manila-Cavite Expressway (CAVITEX), which is the extension of the Coastal Road from Longos, Bacoor, Cavite to Binakayan, Kawit, Cavite, the need to implement the CALAX Project is then justified.

In general, the transportation network in the areas south of Manila has not kept pace with the region's rapid growth and as a result the traffic congestion on the existing roads has become chronic. In the specific area of the Cavite-Laguna region, public transport is a dominant transport mode and the population depends heavily on road based public transport modes such as jeepneys, FXs and buses.

The general objectives of the project are:

a. Support national development policy and provide efficient transport facilities for the economic zones in Cavite and Laguna;
b. Reduce traffic congestion particularly in Governor's Drive, Aguinaldo Highway, and Sta. Rosa-Tagaytay Road, which experience heavy congested during peak hours;
c. Reduce travel time from CAVITEX to SLEX by about 45 minutes;
d. Improve the competitiveness of Region IVA (CALABARZON) as an investment destination.

3.5 PROJECT ALTERNATIVES

3.5.1 ALTERNATIVE ALIGNMENT

Alternative alignments have been examined to achieve the required route for the expressway. Discussions and consultations with DPWH, LGUs, the communities, and other stakeholder representatives have been an ongoing process throughout the course of this assignment. Table 4 below provides a summary of all alignment changes to date, including a couple of potentially hanging alignment changes still yet to resolve.

It must be noted that this EIS is written particularly towards the latest alignment version, given the status of the alignment at the time most environmental fieldwork, consultation and desktop study was undertaken. As most commentary of this report is not so specific to the detail of where exactly the alignment itself is, this will have minimal impact on the relevance of the content within.

Alignment from km 3+00 to km 5+00 was adjusted further to the east, in accordance with the advice from DPWH, to completely avoid impact with the Estrella Homes Development in the area of km 3+50.

Alignment from km 11+00 to km 16+00 was adjusted to the east, in accordance with the advice from DPWH, to completely avoid impact with the new planned Amaia Scapes Development by Avida in the area of km 12+50. In addition, a further minor adjustment to the alignment was requested by consultants CTi and agreed in the area from km 26+000 onwards, to match the precise alignment coordinates of the CALAX (Cavite Section) with their latest alignment design for the CALAX (Laguna Section).

On December 16, 2011, SMEC received a plan from DPWH showing the areas of stakeholder interests impacted by the version 3 alignment with suggestions added for new alignment option concepts in the area from km 0+00 to km 6+00 for review and consideration in order to mitigate or avoid the identified impacts on future development plans. A concluding meeting between DPWH, SMEC and stakeholder representatives was held in DPWH on January 12, 2012, at which DPWH concluded the review of new alignment options and identified the selected preferred alignment solution for which the agreement of all parties present was confirmed. The end-product of the inclusive consultation and evaluation process was alignment version 4 as of January 16, 2012 (which as stated above, this EIS report is based on).

On July 30, 2012 alignment version 5 was adopted due to strong resistance to version 4 from the community of [mainly] Barangay Alapan 1B, Kawit. DPWH and SMEC re-engaged with the previous stakeholders who requested and agreed to version 4, subsequently agreeing to this resultant comprised alignment (version 5 from km 0+00 to km 6+00). At the same time, SMEC also made minor adjustments to this alignment version to minimise impacts as much as possible on three ancestral buildings in Barangay Pag-asa III, Kawit. These ancestral buildings are not however official historically registered buildings.

Alignment version 6 was adopted September 06, 2012 as a result of further stakeholder requests to relocate the alignment further westwards from km 6+00 to km 11+00 to provide sufficient room for planned future development including a planned community heritage park.

Alignment version 7 was adopted following objection to the proposed alignment from Stateland, Inc who are planning a residential subdivision east of the Aguinaldo Highway. This resulted in a design realignment from approximately km 27+50 to km 29+28, which consequently resulted in realignment of part of the CALAX (Laguna Section) as well (km 28+40 to 29+28). Several modified alignment and interchange options were investigated, which at time of writing is now substantially resolved with Stateland, but still yet to be confirmed. During the public scoping and presentation of the alignment October 4, 2012, two alignment concerns were raised as follows:

Km 12+00 area – Engineer Cubillo of the General Trias Municipal Planning and Development Office (MPDO) queried whether it was possible to move the alignment eastwards so that the Amaia Subdivision (by Ayala) would be avoided (currently under construction but unoccupied), and instead targeting a narrow corridor of less dense but existing dwellings. SMEC & DPWH replied that consultation with LGUs for this section had already taken place and that the alignment had at one stage actually been in the general area he was indicating preference towards but was moved to the current location due to previous community objections, thus were not inclined to move the alignment once again. To affect this change, an approximate 4km realignment would be required from km 10+00 to km 14+00, also resulting in substantial redesign work

Km 20+00 area – Mr Mike Sevilla of San Miguel Properties, Inc raised concern over the location of the alignment relative to their subdivision to the north of the Governor's Drive Interchange as this traverses their holding. The alignment traverses the south-eastern corner of their holding and given the extent of existing development in this general area, is considered the most optimum alignment choice as it currently stands. There are therefore no other suitable alignment alternatives. This had also been previously advised to San Miguel with no formal objection received

Common to both concerns raised above, DPWH stated that there were currently no social impacts as there are currently no residences occupying either subdivision.

At time of writing, the SMEC study team are unaware of any further developments with regards to both these issues. These are notated as alignment versions 8 & 9 respectively in the table below given that they both have the potential to change the alignment once again. As they were raised at the public scoping, it is highly recommended that DPWH further consult so that a final alignment with maximum support can progress.

Finally, whilst further alignment changes are always possible, the SMEC study team believe that the alignment as it stands at present (version 7) is the most likely "path of least resistance" to progress towards the Detailed Engineering Design (DED) and as such, should be progressed towards this end, subject to closing out the hanging concerns raised above, and addressing as maybe required any further objections that may arise.

3.5.2 RESOURCES ALTERNATIVES

The requirements for water, power, construction materials and other resources were considered during the conceptual design and planning of the project. Considering that the proposed project is located within Cavite, water supply and power supply are not foreseen as a concern of the project due to the accessibility and availability of supply. In terms of construction materials, the supply is also readily available because the site is located in close proximity to Metro Manila, Batangas, and Bulacan which are major hubs/sources of the country for various trading and commercial activities.

3.5.3 REASON FOR SELECTING THE PREFERRED OPTION

The alignment of the Cavite section of CALAX was selected based on technical feasibility study, engineering studies, topographic surveys, parcellary mapping, and cost estimates. Several meetings and consultations with stakeholders and local government units were undertaken to present the alignment options. The Cavite section alignment revision was made to address stakeholder requests.

3.5.4 COMPARATIVE ENVIRONMENTAL AND SOCIAL IMPACTS OF EACH ALTERNATIVE

The following presents the comparative evaluation of each alternative:

Alternative	Description	Environmental and Social Impacts
Alignment from km3+00 to km 5+00	Adjustment further to the east	Avoided impacts to Estralla Homes Development in the area of km 3+50
Alignment from km 11+00 to km 16+00	Adjustment to the east	Avoided impacts with the Amaia Scapes Development by Avida in the area of km 12+50
Alignment at km 26+00	Adjustment to match alignment coordinates of CALAX Laguna Section	Minor adjustment only
Alignment at km 0+00 to km 6+00	Adjustment of alignment	Avoided impacts on future development plans in Barangay Alapan 1B, Kawit and on three ancestral buildings in Barangay Pag-asa III, Kawit. The three ancestral buildings are not registered as historical buildings.
Alignment from km 6+00 to km 11+00	Adjustment of alignment further westwards	Avoided impacts on planned future development including a planned community heritage park
Alignment from km 27+50 to km 29+28	Adjustment of alignment	Avoided impacts to development of Stateland Inc.
Alignment at km 12+00 area	Adjustment of alignment eastward	Avoided impact to Amaia Subdivision
Alignment at km 20+00 area	Adjustment of alignment	Avoided impacts to communities

3.6 PROJECT COMPONENTS

3.6.1 MAJOR COMPONENTS

The CALAX shall have the eight interchanges and one toll barrier. The entire expressway shall have the following subsections:

Table 4: Subsections of CALAX

Section	Subsection	Length (km)
CAVITE	**CAVITEX Connection – Open Canal**	**7.96**
	Open Canal – Governor's Drive	**11.09**
	Governor's Drive – Silang	**7.74**
	Silang – Silang East	**3.63**
LAGUNA	**Silang East – Sta. Rosa-Tagaytay Road**	**5.21**
	Sta. Rosa-Tagaytay Road-Laguna Boulevard	**2.76**
	Laguna Boulevard – Laguna Technopark	**2.64**
	Laguna Technopark - Mamplasan	**3.66**
	TOTAL	**44.70**

This application for ECC covers the Cavite Section of the CALAX. A separate ECC has been issued for the Laguna Section.

The CALAX (Cavite Setion) will include various proposed structures which are outlined in Table 5.

Table 5: Bridge Structures of CALAX Project (Cavite Segment)

VIADUCT			
1	Km – 0.042	Km 1.118	VIADUCT 29 spans x 40 meters = 1160 m
RAMP BRIDGES, RB (RAMP BRIDGES OVER LOCAL ROAD AND EXPESSWAY)			
1	Km 1.200	RB1	Ramp Bridge Over Expressway 7 spans @ 32 meters = 224 m
			RB 1(a) Two lanes ramp (@ level a) from Kawit Interchange
			RB 1(b) Two lanes ramp (@ level b) from Kawit Interchange
2	KM 0.308	RB2	Ramp Bridge Over Advincula Road (1 span: L=40m)
			RB 2(a) Two lanes ramp (@level a) from Kawit Interchange
			RB 2(b) Two lanes ramp (@level b) from Kawit Interchange
3	Km 0.177	RB3	Ramp bridge over local road 6 spans @ 40 meters = 240 m
			RB 3(a) Two lanes ramp (@level a) from Kawit Interchange
			RB 3(b) Two lanes ramp (@level b) from Kawit Interchange
4	Km 8.959	RB4	Ramp bridge over expressway 2 spans @ 40 meters = 80 meters
			RB 4(a) Two lanes ramp (@level a) from Open Canal Interchange
			RB 4(b) Two lanes ramp (@level b) from Open Canal Interchange
5	Km 20.246	RB5	Ramp bridge over expressway (7 spans @ 40 meters = 280 meters)
			RB 5(a) Two lanes ramp (@level a) from Governor's Drive Interchange
			RB 5(b) Two lanes ramp (@level b) from Governor's Drive Interchange
6	Km 27.986	RB6	Ramp bridge over expressway (2 spans @ 30 meters = 60 meters
			RB 6(a) Two lanes ramp (@level a) from Aguinaldo Highway Interchange
			RB 6(b) Two lanes ramp (@level b) from Aguinaldo Highway Interchange
WATERWAY BRIDGES, WB (BRIDGES OVER WATERWAY)			
1	Km 9.90 – Km 9.940	WB1	Waterway bridge (one span: 40 m)
2	Km 10.96 – Km 11.280	WB2	Waterway bridge (eight spans @ 40m = 320 meters)
3	Km 11.460 – Km 11.50	WB3	Waterway bridge (one span: 40 m)
4	Km 12.161 – Km 12.201	WB4	Waterway bridge (one span: 40 m)
5	Km 14.767 – Km 14.807	WB5	Waterway bridge (one span: 40 m)

6	Km 16.98 – Km 17.020	WB6	Waterway bridge (one span: 40 m)
7	Km 18.18 – Km 18.66	WB7	Waterway bridge (twelve spans @ 40m = 480 m)
8	Km 23.220 – Km 23.460	WB8	Waterway bridge (six spans @ 40m = 240 m)
9	Km 24.660 – Km 24.780	WB9	Waterway bridge (three spans @ 40m = 120 m)
10	Km 25.525 – Km 25.565	WB10	Waterway bridge (one span @ 40m)
11	Km 25.642 – Km 25.682	WB11	Waterway bridge (one span @40m)
12	Km 26.440 – Km 26.480	WB12	Waterway bridge (one span @ 40m)
13	Km 27.072 – Km 27.312	WB13	Waterway bridge (six spans @ 40m = 240m)
14	Km 27.963 – Km 28.143	WB14	Waterway bridge (five spans @ 40m = 180m)
OVERPASS BRIDGES, OB (LOCAL ROAD BRIDGES OVER EXPRESSWAY			
1	Km 2.655	OB1	Overpass bridge/local road expressway (two spans @ 30m = 60m)
2	Km 2.936	OB2	Overpass bridge/local road expressway (two spans @ 30m = 60m)
3	Km 4.968	OB3	Overpass bridge/local road expressway (two spans @ 30m = 60m)
4	Km 7.522	OB4	Overpass bridge/local road expressway (two spans @ 30m = 60m)
5	Km 10.894	OB5	Overpass bridge/local road expressway (two spans @ 30m = 60m)
6	Km 10.894	OB6	Overpass bridge/local road expressway (two spans @ 30m = 60m)
7	Km 11.262	OB7	Overpass bridge/local road expressway (two spans @ 30m = 60m)
8	Km 14.302	OB8	Overpass bridge/local road expressway (two spans @ 30m = 60m)
9	Km 17.061	OB9	Overpass bridge/local road expressway (two spans @ 30m = 60m)
10	Km 22.313	OB10	Overpass bridge/local road expressway (two spans @ 30m = 60m)
11	Km 24.081	OB11	Overpass bridge/local road expressway (two spans @ 30m = 60m)
12	Km 25.986	OB12	Overpass bridge/local road expressway (two spans @ 30m = 60m)
13	Km 27.710	OB13	Overpass bridge/local road expressway (four spans @ 30m = 120m)
14	Km 28.318	OB14	Overpass bridge/local road expressway (two spans @ 30m = 60m)
EXPRESSWAY BRIDGES, EB (EXPRESSWAY OVER LOCAL ROAD)			
1	Km 9.590 – Km 9.670	EB1	Expressway over local road (two spans NB @ 40m = 80m ; two spans SB @ 40m = 80m)
2	Km 19.185 – Km 19.225	EB2	Expressway over local road (one span NB @ 40m; one span SB @ 40m)
3	Km 19.736 – Km 19.776	EB3	Expressway over local road (one span NB @ 40m, three lanes; one span SB @ 40m, two lanes)
PROPOSED EXPRESSWAY PROFILE			
Km 1.20	Km 9.59	2M ~ 8 M	Embankment (both sides)
Km 9.67	Km 9.90	3M ~ 7 M	Embankment (both sides)
Km 9.94	Km 10.96	2M	Embankment (both sides)
Km 11.28	Km 11.46	4M	Embankment (both sides)
Km 11.50	Km 12.16	5M ~ 7M	Embankment (both sides)
Km 12.20	Km 14.76	4M ~ 8M	Embankment (both sides)
Km 14.81	Km 16.98	2M ~ 8M	Embankment (both sides)
Km 17.02	Km 18.18	2M ~ 9M	Embankment (both sides)

Km 18.66	Km 19.18	2M ~ 10M	Embankment (both sides)
Km 19.22	Km 19.73	8M ~ 9M	Embankment (both sides)
Km 19.77	Km 23.22	0.5M ~ 6M	Embankment (both sides)
Km 23.46	Km 24.66	0,5M ~ 5M	Embankment (both sides)
Km 24.78	Km 25.52	2M ~ 4M	Embankment (both sides)
Km 25.56	Km 25.64	2M ~ 4M	Embankment (both sides)
Km 25.68	Km 26.44	3M ~ 8M	Embankment (both sides)
26.48	27.07	2M ~ 7M	Embankment (both sides)
		1M	Excavation (both side)
27.31	27.90	2M ~ 6M	Embankment (both sides)
28.14	28.40	1M ~ 5M	Embankment (both sides)
		2M	Embankment (both sides)

3.6.2 TOLLWAY FACILITIES

The toll collection system of the project shall be inter-operable with that of the CAVITEX and SLEX. The expressway shall be open to the following classes of vehicles:

a. Vehicle Class 1 – motors and vehicles with 2 or 2 axlles and an overall height of less than 1.9m. Car, jeep, passenger van/pickup, taxi, mega-taxi, jeepney, mini-bus
b. Vehicle Class 2 – vehicles with 2 axles and a height of more than 1.9m. Aircon and non-aircon bus, goods van/pickup, truck, dump truck, tanker, mixer
c. Vehicle Class 3 – rigid truck with 3 or more axles and a height of more than 1.9m. trailer (articulated).

The established method of payment is “stop and pay”. New methods of toll collection may be adopted where the driver is not required to stop and instead the vehicle is identified by a remote control system as it passes, with or without stopping. The transaction is automatically recorded and the toll is debited from the subscriber’s account.

Automated toll collection systems shall be used at the toll plaza. The level of automation shall be designed based on the type of traffic and volume at the toll plazas. The technology used for automation of the toll plazas shall generally be scalable and adaptable to changing requirements. Figure 4 presents the layout of a typical toll plaza.

The overall dimension of a typical toll plaza platform depends on the number of lanes and type of toll collection equipment. The toll installation of the toll plaza shall include a toll platform, toll islands, a canopy, a toll plaza building, parking areas, cable conduits, approach signal, canopy signaling, drainage, water supply, fences, power supply, access for staff and lighting.

The toll platform shall partly constitute of a concrete slab to support the toll islands, the toll lanes, the canopy and the queuing traffic. The concrete slab shall have a minimum thickness of 0.25 meters and its length shall be 50 meters.

On the toll plaza, the traffic flows in each direction shall be separated on the platform by a mobile guide-rail in order to give the Toll Expressway Operator the flexibility to open more lanes

(Central reversible lanes) in one direction to accommodate traffic flows. Generally, each toll lane shall be 3 meters wide, but on the extremity, the toll lanes shall have a width of 6 meters to add an adjacent service lane and is necessary, to use it as a lane for vehicles carrying extra wide loads and access to the Operator's staff.

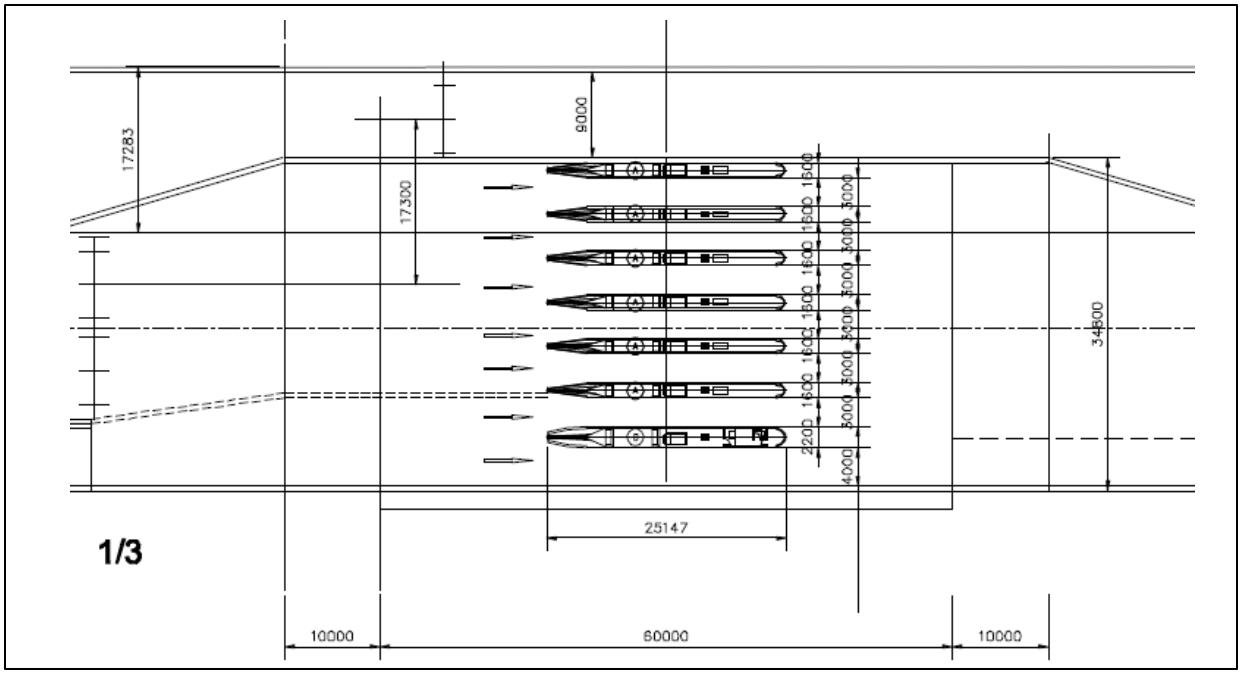


Figure 4: Layout of Typical Toll Plaza

3.6.3 OTHER SUPPORT FACILITIES

3.6.3.1 Drainage System

The vertical alignment of the expressway shall be designed with a minimum gradient of 0.30% to allow the flow of surface runoff towards the elevated expressway drainage system. However, a level grade is permissible in level terrain, uncurbed roadways and at toll facilities. A maximum vertical gradient of 4% shall be adopted for the expressway.

The drainage design shall be carried out in accordances with related chapters of "Part 3 – Highway Desigm, Volume II of the Design Guidelines Criteria and Standards for Public Works and Highways". The design gf frequencies to be adopted shall adhere to the recommendation found in the DPWH Design Guidelines as shown in the following table.

Table 6: Drainage Design Frequencies (Return Period)

Type of Structure	Return Period
Bridge	1 in 50 years
Box culverts	1 in 25 years
Road embankment	1 in 10 years
Drain pipes and pipe culverts	1 in 15 years
Side ditches	1 in 2 years
Surface drainage	1 in 2 years

On toll platforms, slopes and manholes shall be provided to avoid water stagnation. Gutters with bars placed perpendicular to the platform axis shall not be allowed.

3.6.3.2 Sewer System

The sewerage system shall be made eigher through autonomous cleaning by septic tank and bacterial bed, a mini-purifying station or by connection to an existing network. Separate sewerage facilities will be constructed to handle the wastewater discharges from the toll plaza. Fats, oil and grease traps shall be installed at the plaza to remove oily materials before it drains into the sewage treatment facility.

3.7 PROCESS / TECHNOLOGY OPTIONS

The DPWH established the minimum requirements for the design, construction, operation, and maintenance of the CALAX project. Guidelines for environmental management and monitoring during construction has been issued to clarify the conditions on all environmental aspects which should be taken cared of by the Contractor. The environmental guidelines aim to avoid, minimize and mitigate any adverse environmental impacts during the construction stage. The major items for environmental management in the performance specifications are the following:

Type of Conceivable Impact	Environmental items to be Monitored and Managed	Anticipated Rates on Inputs/Wastes
Construction Phase		
1. Noise from construction machinery	Noise and vibration level	72 – 94 dBA
2. Disposal of construction waste	Waste segregation and disposal in an approved landfill site	70 – 150 kg/day
3. Discharge of wastewater	Portable toilets	189 – 290 cum/day
4. Increase of land erosion/excavated material	Silt traps	To be determined in final design
5. Increase of population inflow with workforce mobilization	Public health and safety	1,000 – 1,500 workers
Operational Phase		
1. Noise from movement of vehicles along the highway	Noise and vibration level	72 – 94 dBA
2. Expressway maintenance works	Waste segregation and disposal in an approved landfill site	To be identified; dependent on work order
3. Discharge of wastewater	Interchanges will be provided with toilets with septic tanks	30 – 50 cum capacity

During the preparation of the process method documents, detailed field reconnaissance will be conducted to confirm present social and natural environmental conditions in the vicinity of the project site. In addition, environmental clearances and permits related to construction works will be confirmed and obtained from relevant agencies in cooperation with DPWH prior to the start of construction.

The entire project will be constructed once all the necessary permits are secured from the Government. The Concessionaire shall be allowed to begin construction of any area backeted by interchanges at the moment the right of way is fully delivered for that subsection. These may be operated once completed. Table 7 presents the construction schedule.

Table 7: Project Timeline

	Timing (in years)	Start	End
Concession period	35	2016	2051
Land acquisition	2	2016	2018
Construction	3	2017	2020
Operation	30	2020	2051

During the construction stage, the Contractor shall be required to prepare a Compliance Monitoring Report (CMR) indicating the status of implementation of the Environmental Management Plan (EMP) and the compliance of the project with the approved Environmental Compliance Certificate (ECC). The CMR shall be prepared and submitted on a semi-annual basis to DENR-EMB, copy furnished to DPWH, using the prescribed format of the DENR. A Pollution Control Officer (PCO) during the construction phase shall also be appointed by the Contractor.

3.7.1 CONSTRUCTION WASTE MANAGEMENT

Wastes that will be generated include organic debris, roots, stumps, wooden planks, steel bars, cement bags, and other related materials. The organic debris shall be disposed by the contractor as garbage.

The excavated materials will be temporarily stored at a designated area within the staging area prior to disposal into a permitted disposal site to be identified by the contractor. The general contractor shall be required to ensure that appropriate disposal of the construction spoils is integrated in the contract with the excavation contractor.

3.7.2 POWER AND WATER SUPPLY SYSTEM

3.7.2.1 Water Supply

Water for the proposed project will be provided through the water lines of the Maynilad Water Services, Inc. (MWSI). Water supply shall be provided at each toll plaza, toll plaza building, toll islands, integrated maxi booth and toilets for parking areas. A hydrant shall be installed on every toll island. Water pipes shall be placed either in the technical gallery or in a multicellular sheath.

3.7.2.2 Power Supply

Power requirement of the project is primarily for the lighting of the toll plazas and expressway lighting. The lighting system shall be provided in accordance with the Philippine Electrical Code, 2000, published by the Institute of Integrated Electrical Engineers of the Philippines, Inc. While ensuring that safety and security standards are met at the toll plazas, lighting design shall be focused to prevent adverse impact on neighboring properties and road users. Ligth-emitting diode (LED) lamps shall be used for the toll road lighting.

In the event of normal power failure, generator sets will be utilized as standby power source of the project. The emergency power will be diesel-fueled generator sets.

3.7.3 WASTE MANAGEMENT SYSTEMS

Wastes from the project will be generated during the construction of the expressway consisting of construction spoils, excavated materials, domestic wastes (solid and liquid) from

workers camps, and hazardous wastes such as used oil, spent solvents, empty paint containers, among others.

During the operational phase, wastes from the project will consist of the following:

- Wastewater generated primarily from the toll plazas
- Solid wastes primarily from the toll plazas and expressway maintenance
- Air pollutants from the operation of standby generator sets
- Hazardous waste such as busted lamps and used oil.

3.7.3.1 Wastewater Treatment

Wastewater at the toll plazas shall be channeled into a proposed septic tanks including bacterial bed, a mini-purifying station or by connection to an existing sewer network whenever available.

3.7.3.2 Solid Waste Management

Construction wastes on the CALAX construction sites mainly refer to residual construction materials such as aggregates, sand, cement, steel materials, timber, precast components, among others. The aforesaid construction materials are procured according to the schedule of the construction progress. However, as the expressway project involves huge quantity of materials, therefore, it is expected that residual construction materials may inevitably be left over.

If these materials are stockpiled in work sheds or in open air in a disorderly way, such materials may result in visual pollution and will have an aesthetic impact on the landscape. Permeation of lime or cement into the ground with water will result in soil hardening, higher pH value and ground water pollution and in the end the polluted land will lose productivity and the valuable land resources will be wasted.

In order to reduce and eliminate the environmental impacts of the aforesaid solid wastes, the construction plans and operating instructions will be followed to strictly control and minimize residual materials. In addition, the construction materials should be stockpiled in an orderly manner and any residual wastes may be reused in the rehabilitation of the rural roads or other structures in the neighborhood so as to mitigate the impacts of disposal of construction wastes on the environment.

3.7.3.3 Hazardous Waste Management

Hazardous wastes such as busted lamps will be generated. Used oil shall be generated from the regular change oil of the engines of the generator sets. A separate container for hazardous wastes shall be provided at the MRF. The project shall also register with the DENR as Hazardous Waste Generator in compliance with the requirements of Republic Act 6969.

3.7.3.4 Air Pollution Control

Ambient air quality sampling shall be conducted during the construction phase to determine the condition of the ambient air particularly particulates. During the operational phase, generator sets will be utilized and maintained properly. Emission tests will be performed regularly on the back-up generators. The results of the third party emission testing will be presented to the DENR through the Self-Monitoring Reports (SMR).

3.8 PROJECT SIZE

The entire CALAX (Cavite Section) will have a total length of 30.42 km. The project will require more than 200 ha. This includes provision for all interchanges outside of the standard 60m ROW and the additional ROW required for alteration, widening of existing local roads and drainage.

3.9 DEVELOPMENT PLAN, DESCRIPTION OF PROJECT PHASES AND CORRESPONDING TIMEFRAMES

3.9.1 PRE-CONSTRUCTION

Pre-construction activities will start as soon as ROW acquisition has been settled and a permit to enter the property has been cleared with all parties concerned.

Pre-construction activities generally include the following:

- Mobilization of personnel and equipment
- Temporary fencing and construction of temporary facilities
- Site clearing
- Demolition of existing structures and other obstructions
- Establishment of the Concessionaires site office(s) and yard, batching facilities
- Establishment of all borrow, stockpiling and waste disposal sites
- Establishment of resettlement sites for Project Affected Peoples (PAPs)
- The actual relocation/resettlement of PAPs.

3.9.2 CONSTRUCTION

Construction activities generally include the following:

- Setting out
- Construction of access roads and drainage structures
- Clearing and Grubbing
- Construction of embankment and establishment of temporary drainage measures (bulk earthworks)
- Drainage works proper
- Sub-grade preparation
- Road pavement formation
- Road Surface treatment
- Construction of all structures including viaducts, bridges and culverts
- Construction of all toll facilities (plazas and operation building)
- Construction of rest area(s)
- Drainage and slope protection measures.

3.9.2.1 Staging Area and Temporary Facilities

Temporary field offices for contractors and sub-contractors shall be provided including temporary toilets. There shall also be designated areas for rebar fabrication, raw materials, waste materials, and construction spoils. The general contractor shall be required to provide and maintain adequate temporary office with water, light, telephone, and toilet facilities for the use of the architect, resident engineers, inspectors, contractors, sub-contractors, and workers.

The staging area with facilities for workers shall be maintained in sanitary condition at all times. Curfew policy shall be imposed by the general contractor to avoid workers from loitering in the vicinity and causing peace and order problems in the community.

Temporary toilet facilities shall be provided within the staging area. A first aid station shall also be made available at the site. The staging area shall be provided with temporary barricades and guard lights for the necessary protection, proper prosecution and completion of the construction work. Safety signages shall be posted in strategic locations within the construction site.

3.9.2.2 Excavation

The excavation for the foundation will generate cut soil. In addition, organic debris, roots, and stumps is expected to be produced. The excavation contractor will be required prior to commencement of excavation works to pre-identify a location for the disposal of cut soil. The disposal area should have the appropriate permit from the concerned LGU.

After excavation, soil compaction shall be undertaken for backfilling works to ensure inelastic and firm ground foundation. Measures shall be undertaken, such as the provision of silt traps, ditches, and sump pits, to prevent silt/soil runoff into the street drainage system during earthworks.

3.9.2.3 Construction Equipment

The equipment to be used during the construction period include fork lifts, dump trucks, excavators, pay loader, cranes, back hoe, dozers, compactors, generator sets, bending machine, bar cutting machines, welding machines, post tension equipment, among others.

3.9.2.4 Construction Materials

The construction materials such as aggregate, lumber, sand, gravel, cement, steel bars, etc. will be procured from construction supply companies. Imported equipment which includes elevators, ventilating and air-conditioning units and pumps will be supplied by sub-contractors including installation works.

3.9.3 OPERATION

3.9.3.1 Project Activities

Once authorized to operate the project, the Concessionaire shall keep the expressway open to toll road users continuously and without interruption. The expressway shall not be closed without the prior authorization of the DPWH except during emergency cases. Operation of the expressway shall be in compliance with the DPWH maintenance standards and guidelines. Operational activities shall include the following:

- Supervision of shifts, lanes and toll plazas
- Operation of E-pass and manual toll lanes
- Operation and maintenance of non-operating toll lanes
- Lane closing and opening
- Traffic queue supervision and management
- Vehicle classification
- Transaction receipts operation

- User toll display operation
- Traffic control gate operation including lane status gate operation
- Toll collection system administration
- Toll accounting and reporting
- Traffic safety and control system
- Routine maintenance such as patching of pavement, sealing of cracks in concrete deck, repair of guard rails, replacement of lighting lamps, repair of electrical installation, cleaning of drainage, repair of viaduct, repainting of lane markings, repair of signs, and road cleaning.

3.9.4 ABANDONMENT

The abandonment activities during the post-construction stage include the dismantling of the temporary facilities and structures used by the workers during the actual construction as well as the cleaning up of the site. The project contractor will demolish the temporary structures upon completion of the project. Warranty provisions with the contractors, specialty contractors, and suppliers shall be implemented to provide maintenance support.

Temporary facilities including septic tanks shall also be properly demolished after the completion of the project. Wastewater contents shall be pumped out through the contractor of the portable toilet facilities for appropriate treatment. The emptied tanks shall be covered with appropriate materials.

3.10 MANPOWER

Table 9 presents the typical manpower requirements for the implementation of the expressway.

Table 8. Manpower Requirements

Management	Site Supervisory Staff	Administrative and Support Staff	Site Staff
Construction Phase			
• Project Manager • Construction Manager • Administrative Officer • Project Engineers • Materials Engineer • Safety Engineer • Environment Monitoring Officer • Quality Surveyor • Cost Engineer • Geodetic Engineer • Equipment Engineer • Electrical Engineer	• Concrete Batching Plant Supervisor • Asphalt Batching Plant Supervisor • Earthwork Supervisor • Paving Works Supervisor • Drainage/Slope Protection Supervisor • Quarry Supervisor • Pre-casting works supervisor • Bridge Work	• Accountant • Cashier • Procurement Officer • Secretary • Clerk/Encoder • Utility Man • Warehouseman • Auto CADD Operator • Laboratory Technician • Security Guard • Driver	• Foreman • Surveyor • Chainman • Heavy Equipment Operator • Heavy Equipment Helper • Light Equipment Operator • Light Equipment Helper • Heavy Vehicle Driver • Heavy vehicle helper

Management	Site Supervisory Staff	Administrative and Support Staff	Site Staff
			• Mechanic • Mechanic Aide • Pile Driver • Pile Driver Helper • Carpenter • Mason • Plumber • Steel fixers • Welder • Scaffold erector • Plant operator • Plant helper • Electrician • Rigger • Blaster • Laborers • Carpenter • Mason • Plumber • Steel fixers • Welder • Scaffold erector • Plant operator • Plant helper • Electrician • Rigger • Blaster Common labourers
Operations Phase			
• Project Manager • Administrative Officer • Project Engineers • Safety Engineer • Environment Monitoring Officer • Equipment Engineer • Electrical Engineer	• Supervisor • Toll Facilities Supervisor	• Accountant • Cashier • Procurement Officer • Secretary • Clerk/Encoder • Utility Man • Warehouseman • Auto CADD Operator • Security Guard • Driver	• Toll facilities staff/ticketing • Inspectors • Security personnel • Drivers • Helpers

3.11 INDICATIVE PROJECT INVESTMENT COST

The project cost is estimated at Php32,548.2 Million for the Cavite section of CALAX.

Table 9: Estimated Project Cost

Component	Value (in Php

	Millions)
Detailed engineering design	366.0
Civil works	19,334.1
Fees	929.8
Land acquisition	9,442.7
Value added tax (VAT)	2,475.6
TOTAL	32,548.2

4 Key Environmental Impacts and Management/Monitoring Plan

4.1 LAND

The CALAX (Cavite Section) will traverse the northern section of the province of Cavite. Its northern end will be at the coastline (adjoining the CAVITEX) and the southern end will terminate in the highland area of Silang where it adjoins the CALAX (Laguna Section). The road will traverse three municipalities and two cities in the Province of Cavite. The Municipalities, Cities and respective Barangays along the road alignment are listed in Table 2.

Table 10: Municipalities, Cities and Barangays Along the Alignment

Mun. of Kawit	City of Imus	Mun. of General Trias	Mun. of Silang	City of Dasmarinas
1. Marulas	1. Alapan 2A	1. Pasong Camachile	1. Batas	1. Langkaan
2. Bnakayan	2. Alapan 2B	2. Santiago	2. Biluso	
3. Toclong	3. Malagasang 1G	3. Buenavista 2	3. Adlas	
4. Tabon	4. Malagasang 2A	4. Buenavista 3	4. Biga	
5. Gahak	5. Malagasang 2B	5. Manggahan		
6. San Sebastian	6. Malagasang 2C	6. San Francisco		
	7. Pag-asa 3	7. Biclatan		
		8. Javalera		

The project corridor and the LGUs (Barangay and Municipal / City) traversed by the CALAX (Cavite Section) is shown in the following map (Figure 5).

In terms of land area, the municipality of Kawit covers a land area of 1340 hectares or 0.94% of the total land area of the province. The city of Imus at the 3rd District of Cavite covers 9,701 hectares or 6.80% of the province while the city of Dasmarinas occupies 8,234 hectares or 5.77% of the provincial land area. The municipality of Silang has an area of 15,641 hectares (10.96%) while the municipality of General Trias in the 6th District has an area of 11,768 hectares (8.25%).[2]

Overall, Cavite covers 8.72% of CALABARZON's land area. This is relatively small considering that the region comprises of five provinces. Land area of Cavite is equivalent to only 0,48% of the total land area of the Philippines. Municipalities with the biggest land areas are Maragondon (16,549 hectares) and Silang (15,641 hectares). The municipality with the small land area is Noveleta with 541 hectares or 0.38% of the provincial total land area.

[2] Source: Provincial Development and Physical Framework Plan 2011-2015

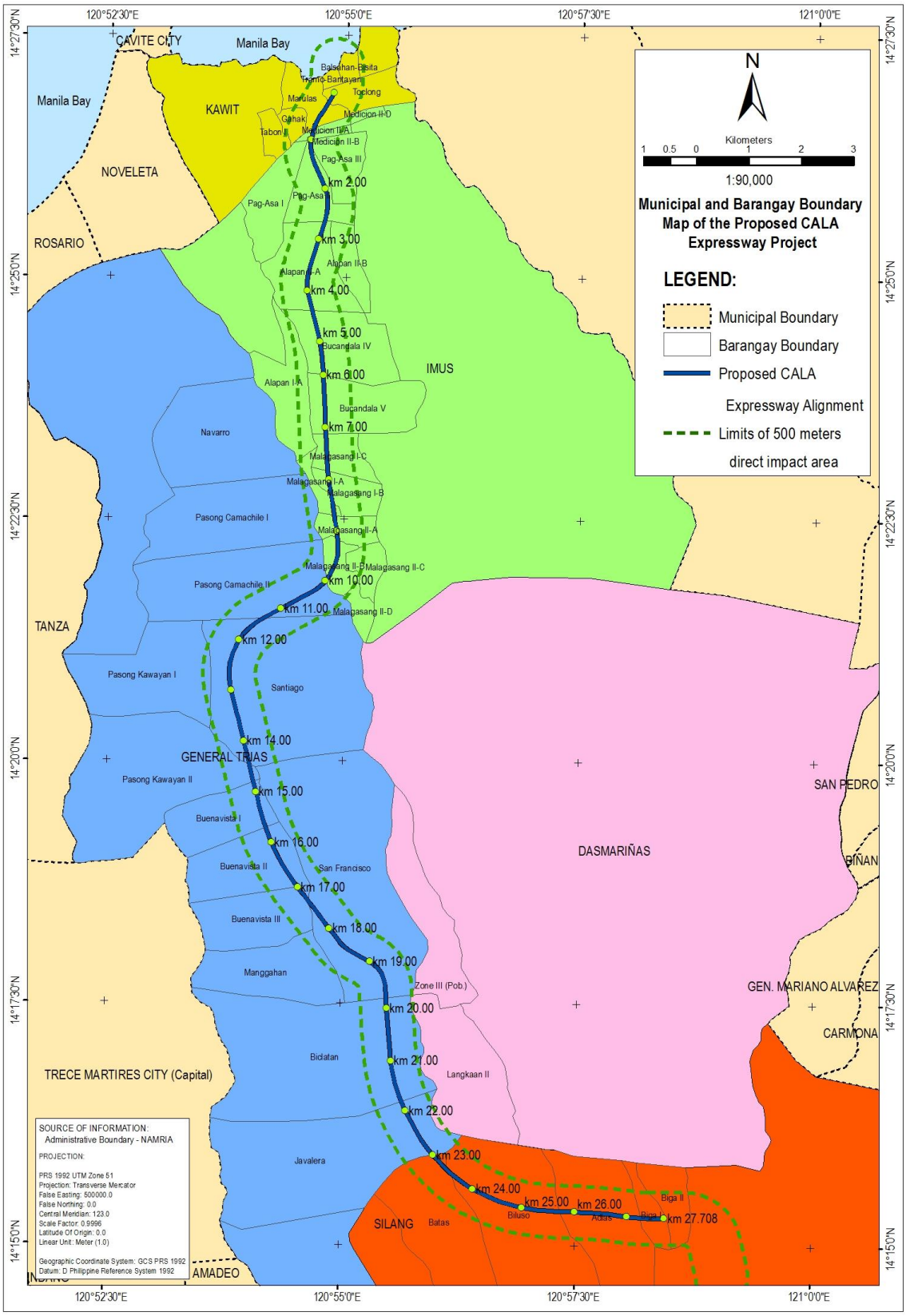


Figure 5: Municipal and Barangay Boundary Map Traversed by the CALAX (Cavite Section)

4.1.1 LAND USE AND CLASSIFICATION

Based on the Provincial Socio-Economic Profile of the Province of Cavite, 2013 and the Cavite Provincial Physical Framework Plan 2010-2015, Cavite's alienable and disposal lands are classified into production lands and built-up areas. Production lands are intended for agriculture, fishery, and mining. Meanwhile, the built-up areas are mainly for residential areas, commercial, industrial and tourism areas.

The production area of the Province accounts for 50.09% of its total land area. This is followed by built-up areas that cover 40.58% of Cavite. Around 8.90% of the Province is considered protected lands such as natural parks and forests and the remaining 0.43% are islands.

The production land of Cavite has a total area of 71,474.91 hectares. The entire production land is being used for agriculture and is therefore classified as agricultural lands. The production land use accounts to 50.09% of the total land area of the province. Despite being a center of countryside industrialization, Cavite Province remains to be an agricultural area. Some of the major crops being produced in the province are rice, corn, coffee, coconut, cutflowers and vegetables.

The built-up areas are intended for settlements and industries. This area also becomes the hub for commercial and business establishments.

Table 11: Land Area Classification by City/Municipality, Province of Cavite, 2013

City/Municipality	Total Area of Production Land (Hectares)	Total Area of Protection Land (Hectares)	Total Built-up Area (Hectares)	Island (Hectares)	Total Area (Hectares)
1st District					
Cavite City			573.63	609.37	1,183.00
Kawit	450.00		888.00	2.00	1,340.00
Noveleta	54.00		487.00		541.00
Rosario	27.00		540.00		567.00
2nd District					
City of Bacoor	604.00		4,636.00		5,240.00
3rd District					
City of Imus	2,057.00		7,644.00		9,701.00
4th District					
City of Dasmarinas	2,556.00		5,678.00		8,234.00
5th District					
Carmona	609.00		2,483.00		3,092.00
Silang	9,789.00		5,852.00		15,641.00
Gen. M. Alvarez	336.00		602.00		938.00
6th District					
Trece Martires City	523.00		3,394.00		3,917.00
Gen. Trias	5,158.00		6,610.00		11,768.00
Tanza	1,897.00		7,733.00		9,630.00
Amadeo	4,382.23		407.77		4,790.00
7th District					
Tagaytay City	1,802.90	2,707.00	2,105.10		6,615.00
Alfonso	5,596.67		863.33		6,460.00
Gen. Emilio Aguinaldo	3,710.00		1,393.00		5,103.00
Indang	7,755.00		1,165.00		8,920.00

City/Municipality	Total Area of Production Land (Hectares)	Total Area of Protection Land (Hectares)	Total Built-up Area (Hectares)	Island (Hectares)	Total Area (Hectares)
Magallanes	5,571.00	1,861.00	428.00		7,860.00
Maragondon	10,266.00	4,831.73	1,451.27		16,549.00
Mendez	768.11		898.89		1,667.00
Naic	7,290.00		1,310.00		8,600.00
Ternate	273.00	3,294.90	773.10	9.00	4,350.00
TOTAL	71,474.91	12,694.63	57,916.09	620.37	142,706.00

Sources: Provincial Planning and Development Office, City/Municipal Planning and Development Offices, Socio-Economic Profile Province of Cavite, 2013

4.1.1.1 Land Uses along Alignment

There are eleven land use/vegetation units which were identified and mapped along the alignment of the proposed CALAX (Cavite Section). The land use/vegetation units are:

- Fishponds/Mangrove
- Paddy rice
- Sugarcane
- Annual Crops (corn, cassava, pineapple, banana)
- Agro-Industrial (piggery/poultry)
- Grassland (with small shrubs which serve as pasture for livestock)
- Shrubland with pioneering trees
- Tree grove (mango/acacia/coconut)
- Industrial Area
- Residential Area
- Built-up Area.

At the Centennial Interchange in Barangay Pag-Asa III, Imus City and Barangay Tabon I, Kawit, Cavite, at an estimated distance of 700 meters from the Imus-end of Manila-Cavitex Road south-westwards along Centennial Road, there are fishponds and mangroves from Km 0+00 to Km 0+50 in the municipality of Kawit. There is a heavy built-up of commercial establishments along Centennial Road of Pag-asa 3 such as convenience store, groceries, hardware and construction supply showrooms, restaurants-eateries and roadside seafood retailers. Buses to and from Metro-Manila stop in this area to load and unload passengers. It is near the main entry to CAVITEX.

The inner portion of the Barangay Pag-asa 3 is a residential area with considerably big houses with large lot areas of urban-like features. A cluster of few compact small houses made up of light and temporary materials are situated along the banks of Gahak Creek and between Advincula Road by the southern tip of the barangay.

Across Gahak Creek is Barangay Tabon I. This area of the alignment is mainly agricultural planted with mangoes, coconuts, chicos, and other fruit-bearing trees. Ricefield comprises the bigger areas but will soon be converted for industrial uses. Accordingly, some of these lots along the proposed alignment running parallel along Tabon-Toclong Road, have been bought by Manila-based companies for industrial use.

Affected structures near the Centennrial Road are billboards (6m x 10m), barangay outpost, Meralco posts, and transmission lines and a proposed water treatment plant of MWSI.

Paddy rice fields exist from Km 1+00 in Kawit to Km 17+00 in Barangay Parang, General Trias. Sugar cane is being cultivated from Km 20+00 , Km 21+00 to Km 22+00 and Km 23+00 to Km 25+50 in Barangay Adlas, Silang. Annual crops such as corn, cassava, pineapple and other vegetables are being grown in small farm lots, with banana planted along farm

boundaries. These exist from km 22+00 to km 23+00 near the General Trias and Silang boundary and from km 26+00 to km 27+00 in Silang. Agro-Industrial areas with poultry/ piggeries exist between km 20+00 and km 21+00, one kilometer south of Governor's Drive and between km 23+00 and km 24+00 in the Municipality of Silang. One of these is the poultry farm of Monterey.

The grassland with small shrubs which serves as pasture for livestock/cattle exist in patches at km 0+50 in Kawit; km 14+50 in General Trias, km 18+50 to km 20+00 in Barangay Mabatang, General Trias; and km 25+00 to km 26+50 in Barangay Adlas, Silang. Plant species are Paspalum, Hagonoy, Verbena and Centrosema.

Centennial Road towards Noveleta, Cavite

Bgy Pag-asa 3 Out Post and a (3) billboard along Centennial Road (4) and MERALCO facilities.

A proposed site for Maynilad Treatment Plant (Tabon I)

MERALCO posts and power lines (Tabon I)

Photo 1: Affected structures near Centennial Road

The shrubland with pioneering trees exist at the steep to very steep river banks/ sideslopes of the rivers and creeks that cut the land surface of the whole alignment. Plant species are Binunga, Ficus (Isis), Ipil-ipil, Trema, Acacia, Bamboo, Talahib, Antipolo. Kakwate, Hagimit, Wild Banana, Gmelina and fruit bearing trees such as Mango, Coconut, Tamarind, Santol, Caimito and Jackfruit.

Treegroves exist in patches along the alignment from km 1+00 in Kawit to the Aguianldo Highway at km 27+70 in Silang. These are the Mango orchards/ plantations, mixture of Mango and Acacia trees and/or mixture of Mango, Coconut and other fruit bearing trees.

Industrial areas are the factories that exist in km 2+00 which is a cement plant, km 17+00 to km 20+00 like the San Miguel Magnolia Inc. and the Purefood Corporation near the Governor's Drive in General Trias.

In Barangay Tibig, Silang, Cavite, the area is primarily agricultural and for agro-industrial use. The vicinity is characterized as animal grazing land, pineapple plantation, poultry, citrus farm, and horse racing stables and training ground. From station 53+440 to 53+820 towards east-south-east direction, the alignment directly traverses an intermittent creek, poultry farm and the Tibig Road.

Poultry buildings (2) owned by Mr. Amado Anahaw located along Tibig Road.

Tibig Road

Warehouse

Horse stables and training ground

Well-fenced and gated property with mango seedlings (seen in side the fence) ready for planting.

Pressure tank near Sta 54+260, inside the coffee plantation owned by SB Imboy Tibayan

Photo 2: Affected structures in Barangay Tibig

Residential areas are houses in the town proper subdivisions, villages and housing projects along the alignment like the residential areas from km 0+00 to km 3+00 in Kawit; km

17+50 to km 18+50 in General Trias; km 27+00 to km 27+70 in Silang; and patches of other residential areas along the alignment.

Built-up areas are the areas with road networks in subdivisions and villages. These exist in km 3+50, km 17+00 to km 18+50, km 19+00 (Maravilla Subdivision) and include the road network/ interchange in the Toll area in Kawit.

Another affected area is the proposed Amaia Subdivision along Arnaldo Highway, Barangay Santiago, General Trias, Cavite. There is a potential growth of mixed-use residential-commercial areas on both sides the highway. Construction of residential houses by Amaia is in progress. Gas stations, construction and hardware supplies and other trading stores are situated along the highway near the proposed CALAX alignment. Per General Trias MPDC, there are pending commercial permits applied to be situated along the area. Approval is on hold due to the realignment of the expressway. Some have been approved by DPWH.

The realigned station of Amaia is marked Stn 33+120. The potentially affected area of the subdivision is by the eastern end. Construction of houses in this portion of the subdivision was put on hold due to notices regarding the realignment of the ROW. Affected structures include Meralco posts and transmission lines, street lamps, MZT Trading Hardware and Lumber and the Arnaldo Highway.

Stn 33+120 is centered right side of this hardware store along Arnaldo Highway in Bgy Santiago, Gen Trias.

The discontinued houses under construction inside Amaia

Photo 3: Structures in the vicinity of Arnaldo Highway

4.1.1.2 Impact on Land Use

The development of project is in congruence with the Regional Dispersal Policy of the national government. Property valuation is also expected to increase further, hence, contributing to the increase in real estate taxes generated for the government.

The direct impact of the CALAX (Cavite Section) on land use change along its corridor is considered to be limited, but a more significant cumulative impact on land use change may ensue with the implementation of CALAX. The improved accessibility that will come with the completion of CALAX will make the corridor more attractive for land development, hence increasing urban sprawl.

Agricultural Land

The majority of production land-use in the Province of Cavite is agriculture. In fact, 50.33% of the total provincial land area is used for agriculture as compared to the total of about 42% agricultural land within the combined land area of the CALAX (Cavite Section) host LGUs.

The direct impact of the CALAX (Cavite Section) on agriculture and land use is the permanent conversion of land into a built-up environment. The CALAX (Cavite Section) will require a total land area of about 180 ha (60m x 30,000m). This represents less than 1% of the agricultural land area within the CALAX (Cavite Section) host LGUs and much lesser when compared with the gross provincial land area devoted to agriculture. The project may affect some agricultural land identified as belonging to the Network of Protected Areas for Agricultural and Agro-Industrial Development (NPAAAD), specifically in Barangays Bacao, Navarro, Santiago, Pasong Kawayan II, Panungyanan, and Alingaro in General Trias, and Barangays' Pasong Camachile I and II in General Trias. These lands are also part of the SAFDZ declared by the Department of Agriculture and are banned from conversion, particularly the irrigated ones.

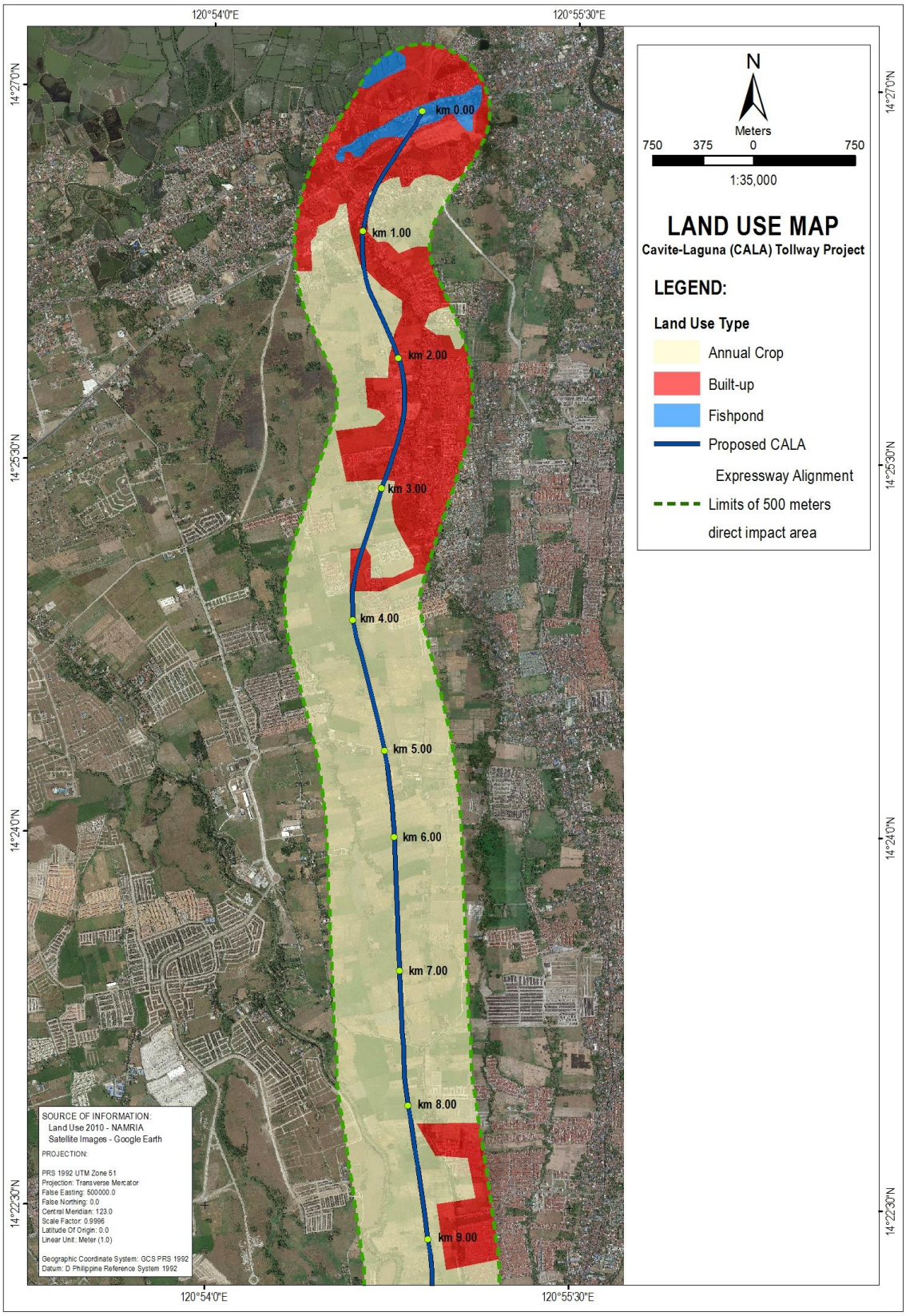


Figure 6: Land uses along the CALAX (Cavite Section) Km 0+518 to Km 9+00

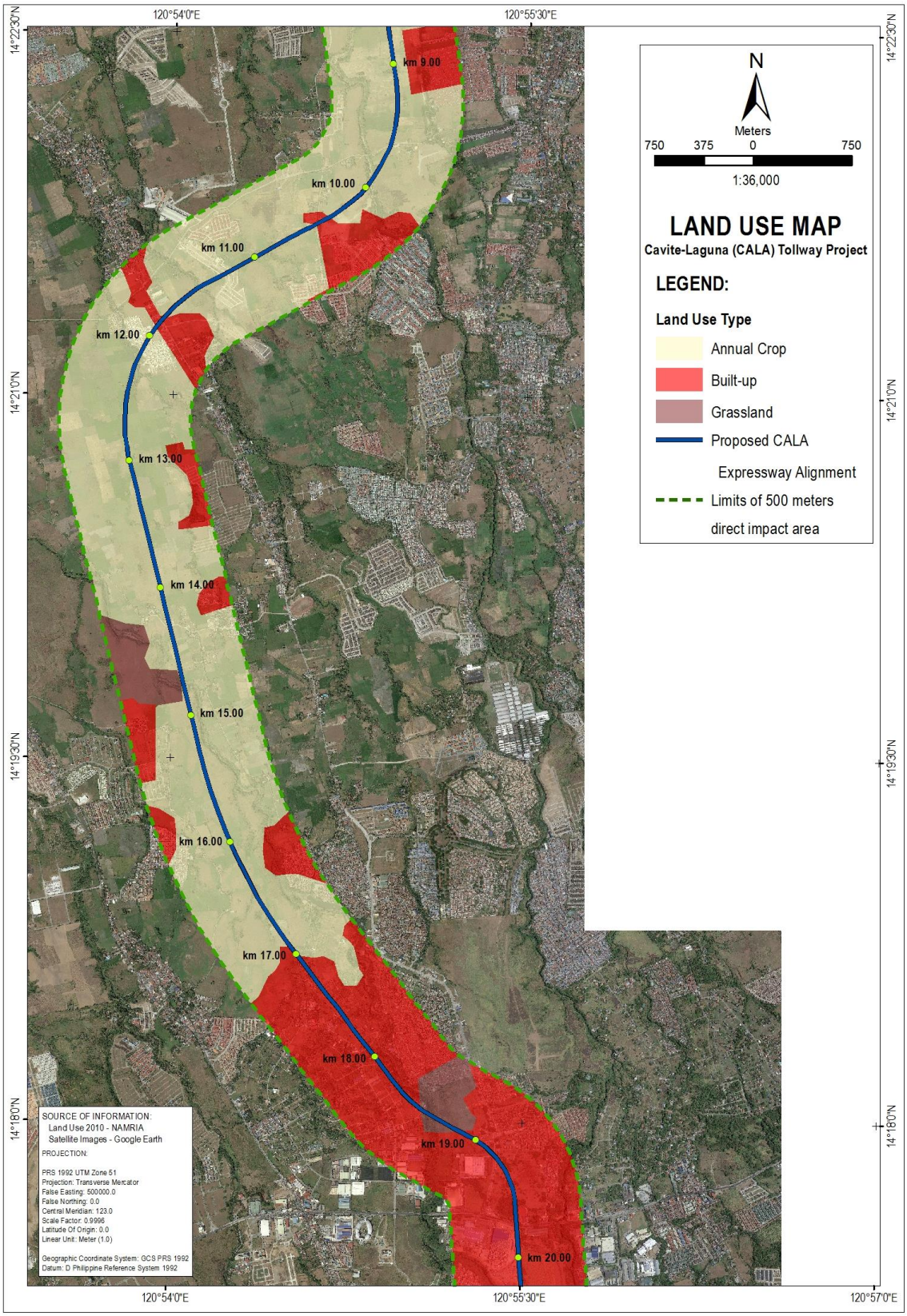


Figure 7: Land use along the CALAX (Cavite Section) Km 9+00 to Km 20+00

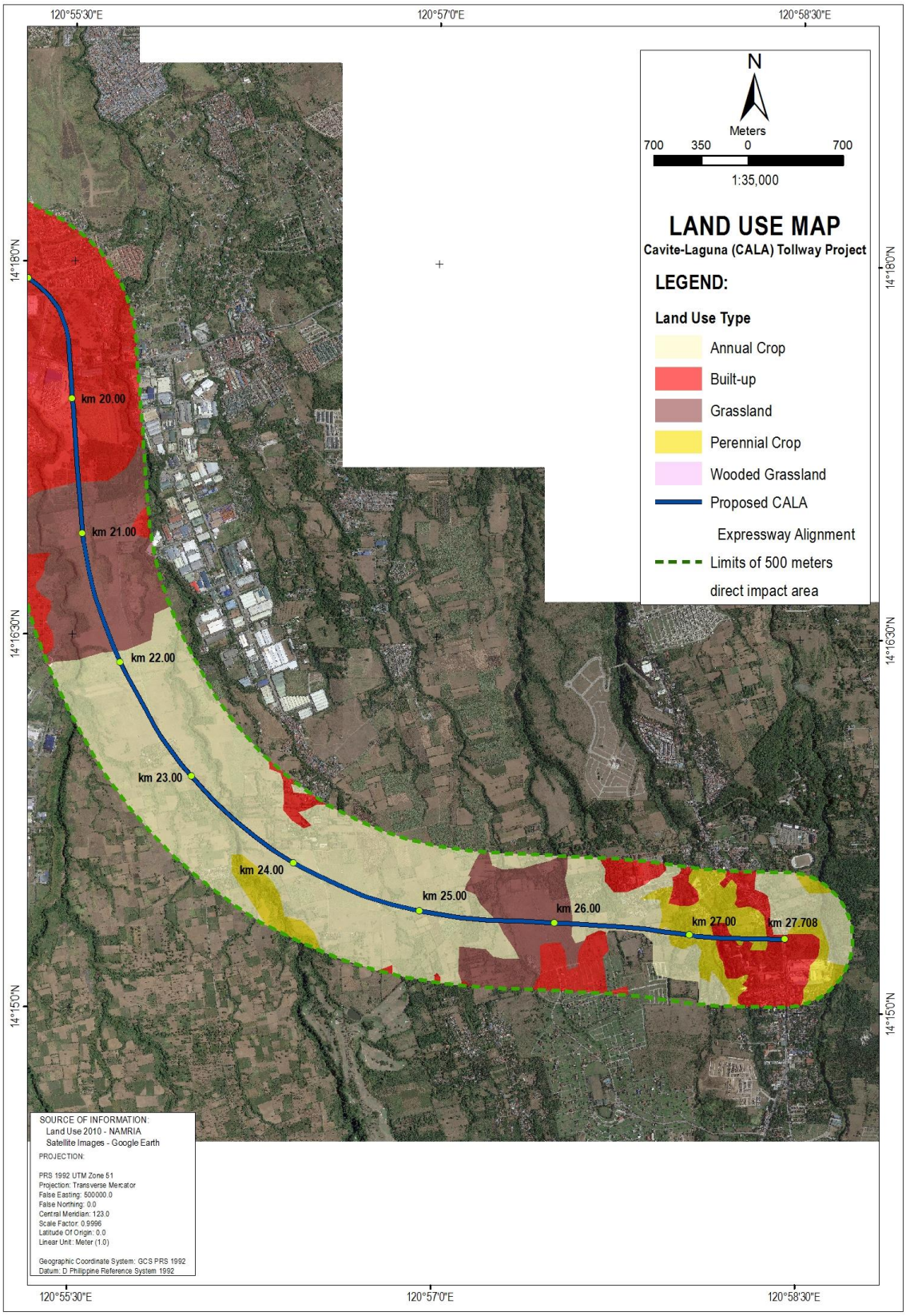


Figure 8: Land use along the CALAX (Cavite Section) Km 20+00 to Km 27+708

Aside from the cultivated land, the CALAX (Cavite Section) will also directly affect the poultry farm of Monterey. A substantial proportion of the poultry farm will be affected by the proposed Governor's Drive Interchange in this location (km 20+00). Because of the sensitivity to noise of poultry farms (e.g. egg production), the project may cause total elimination of this poultry farm.

With the devolution of the function of land conversion to the Local LGUs through the Local Government Code of 1991, the Municipal and City LGUs now have the jurisdiction to approve the conversion of agriculture lands. With the support shown by the Provincial and Municipal LGUs during the public consultation, it is anticipated that the LGUs will adopt the project and approve the conversion.

It is anticipated that the road project will have a cumulative impact on land use. The improved accessibility will induce land development and consequently result in conversion of agricultural lands into other non-productive uses.

Built-up Land

Although the planning of the alignment has minimized the fragmentation of community, the eastern fringe of the Stateland Subdivision at km 18+00 will be traversed by the road project. This impact will however be minimal as it borders the western banks of the Rio Grande River. This alignment was also selected as the one with the least impact on settlements since Stateland is relatively less densely developed than other subdivisions.

Much of the residential areas in the corridor have been effectively avoided. Impacts on industrial and commercial areas are minimal.

4.1.1.3 Encroachment in Environmentally Critical Area (ECA)

The project will not be located in a declared environmentally critical area (ECA) as defined by Presidential Proclamation No. 2146, series of 1981 and Table 1 (Technical Definition of ECA and Corresponding Operationalization Guide) of DENR-EMB MC 2014-005.

There are no declared environmentally critical areas that will be traversed by the CALAX (Cavite Section) alignment. The alignment generally traverses a flat area and that there are no protected areas to be affected.

4.1.1.4 Tenurial / Land Issue

There are land that will be acquired for the development of the project. A separate land acquisition and resettlement plan is now being prepared relative to the tenurial and land issues of the project. An Inventory of Loss (IOL) was conducted.

4.1.2 GEOLOGY / GEOMORPHOLOGY

4.1.2.1 Topography

The Province of Cavite occupies the gently sloping to rolling terrain south of Manila. Its land area extends from the southern shoreline of Manila Bay southwards to the upper slopes of the Tagaytay Highlands. The Provinces of Cavite, as well as Rizal, Batangas, Laguna and parts of Bulacan and Quezon are located in the physiographic region known as the Southwest Luzon Uplands (Figure 9). This regional physiographic unit is the product of the volcanic activities which generated a terrain made up of gentle to moderate slopes with flat to deeply incised

drainage systems bounded by ridges and volcanic centers which include Taal Volcano and Mount Banahaw. The proposed CALAX (Cavite Section) transects the northern half of the Province of Cavite which is characterized by flat to gently sloping terrain.

The proposed road alignment will start at about mean sea level at Kawit and terminate at elevation 260m at Silang, Cavite. Slopes vary from flat at the coastal area to gently sloping in the Dasmarinas and Silang areas. The northern half of Cavite where the CALAX has been sited is drained by a network of sub-parallel streams belonging to the Ylang-Ylang River which originates from the Tagaytay Ridge in the south flowing northward towards Manila Bay. Natural scouring of the stream beds and banks takes place in these waterways, particularly during heavy rains and storms. The consequent deposition of the sediments takes place at the inner bends and lower reaches of the streams.

Erosion prevails mainly on the naturally exposed surfaces, on man-made cuts and excavations along trails and existing roadways. The materials eroded from these surfaces are temporarily deposited on stream channels and eventually on the valley of Ylang-Ylang River.

Mass movements were not observed along the proposed alignment as the steep slopes along the banks of the main Ylang-Ylang River and its tributaries which are made up of nearly horizontal, massive layers of tuff, are essentially stable.

Three terrain units were traversed by the road alignment, namely: the estuary, flat to gently sloping area and sloping area (Figure 10).

The estuary includes the strip of flat land covering the seaward portions of the Municipalities of Tanza, Noveleta, Bacoor and Kawit. The strip, which varies in width from 1.4 to 1.8km, has largely been converted to fishponds or backfilled to accommodate residential as well as commercial establishments. Elevation is estimated to vary from 0m to about 6m above sea level. The estuary is characterized by the presence of submerged sections which correspond to the flat channels of the natural waterways originating from the south. Water level in the estuary fluctuates in response to tidal incursions and water inputs from the upper section of the main river system. The expressway segment from km 0+00 to km 1+00 is located within this terrain unit.

The flat to gently sloping area extends from elevation 6m to elevation 80m in the Dasmarinas Area. It includes the segment from km 1+00 to km 17+00 and has an average slope of 0.5%. The streams draining this terrain unit are deeply incised and have U-shaped valleys with visually stable, steep bank slopes.

The gently sloping area extends from elevation 80m to elevation 260m and includes the segment from km 17+00 to km 27+00. The slope within this terrain unit varies from 1.5% to 2%. The streams draining this terrain unit are likewise deeply incised with U-shaped valleys and visually stable, steep bank slopes.

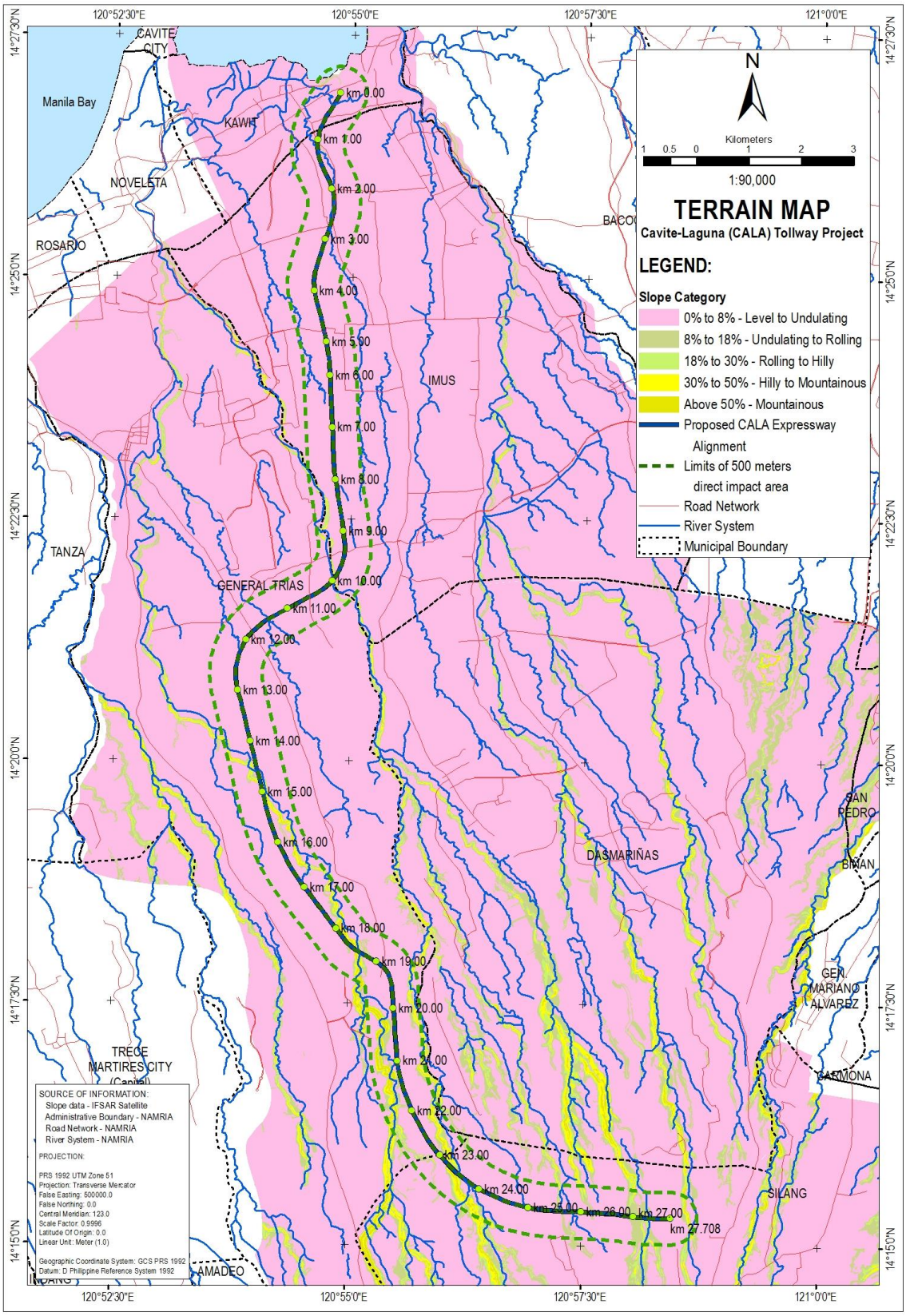


Figure 9: Terrain Map of CALA Expressway Project Area

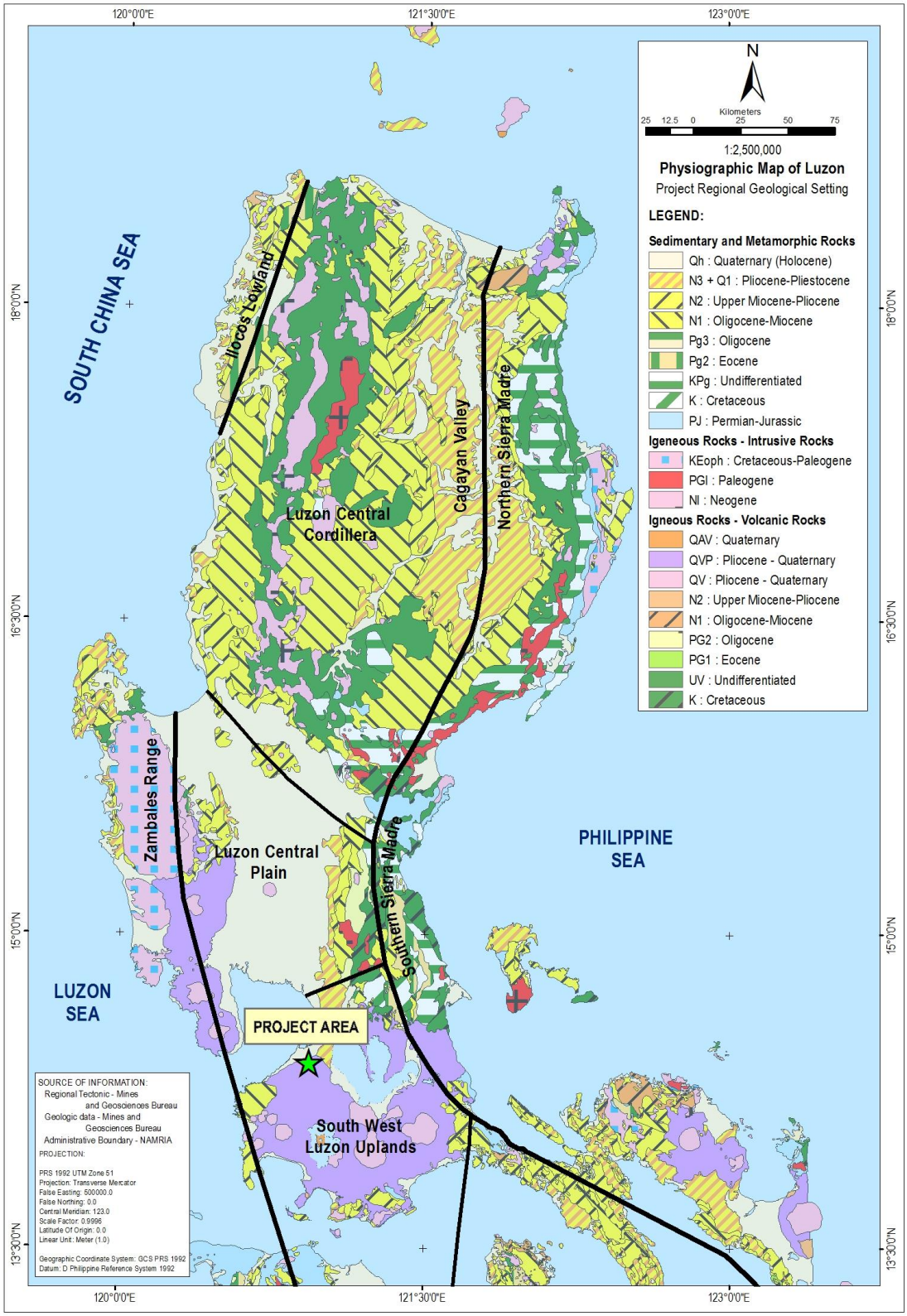


Figure 10: Physiographic Map of Luzon showing the location of the Project Regional Tectonic and Geologic Setting

4.1.2.2 Regional Tectonic Setting

The major earthquake generators which influence the Island of Luzon and the Province of Cavite include the Manila Trench to the west, Lubang Fault to the south, the West Marikina Valley Fault to the east, and the segment of the Philippine Fault farther east. The Island of Luzon is also affected by tectonic activities along the Philippine Fault (Figure 11). The faults have been classified as active by the Philippine Institute of Volcanology and Seismology.

The Manila Trench is a broadly accurate geological structure located west of the Island of Luzon, spanning the length from 13^{o} north to 22^{o} north latitude. It corresponds to the physiographic expression of the subduction of the oceanic crust of the West Philippine Sea beneath the Luzon Arc. This earthquake generator is located approximately 195km west of km 0+00 of the CALAX.

The Lubang Verde Passage Fault System is located about 75km to the south of the project area. It runs along a northwest – southeast direction between the Island of Mindoro and the Batangas Peninsula of Luzon.

West Marikina Valley Fault is a right lateral geological structure which traverses a distance of about 135km from Bulacan in the north to as far south as the Tagaytay area. The southern trace of this fault is about 10km east of km 27+00 of the CALAX. The Philippine Fault is the longest strike slip fault in the Philippines. It is traceable for over 1,200km from northwest Luzon to Davao del Sur. The segment of the fault in Luzon is about 90km east of km 27+00 of the proposed expressway.

The Philippine Trench, whose trace is located about 450km to the east of km 27+00 is the morphological expression of the subduction of the Philippine Sea Plate under the Philippine Arc. Activity along this major geologic structure is correlated by the wide strip of earthquakes along its northwest trace from 4^{o} north to 15^{o} north latitude.

4.1.3 REGIONAL GEOLOGY

The Southwest Luzon Upland is dominated by a sequence of Oligocene to Pliocene marine sediments blanketed by Pio-Pleistocene pyroclastic deposits generated by the volcanoes in the region which includes, among others, Taal Volcano and Mount Banahaw. Figure 12 shows the seven geologic formations which underlie the Southwest Luzon Uplands. The stratigraphic sequence of these formations and their descriptions are presented in Table 4.

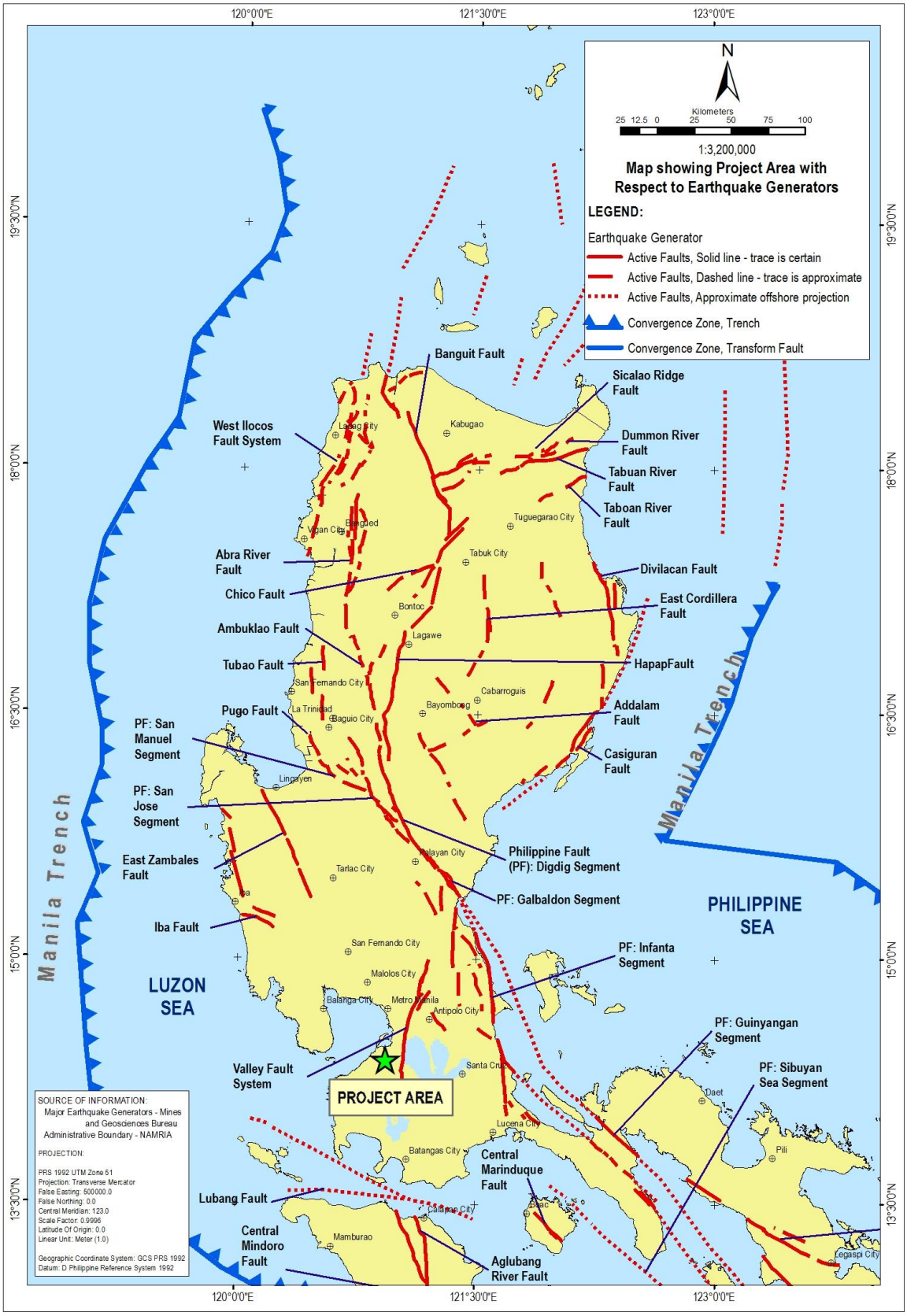


Figure 11: Map showing Project Area with respect to Major Earthquake Generators

Table 7: Regional Geologic Map of Southwest Luzon Uplands

Time Stratigraphic Unit	Age	Description
Qh	Quaternary	Corresponds to the strip of unconsolidated sediments consisting of the aggregate of sands, silts, clays and gravels at the northwestern coast of Cavite, southwestern and southeastern rim of Laguna de Bay and the southwestern shores of Batangas
QAV	Quaternary	Active volcano (Taal Volcano) located about 25km south of the southernmost segment of the CALAX (Cavite Section)
QVP	Pliocene-Quaternary	Pyroclastics and volcanic debris which underlie a large part of the Southwest Luzon Uplands including the Province of Cavite.
QV	Pliocene-Quaternary	Basaltic and andesitic cones of inactive volcanic centers which mark the western boundary of Batangas and Cavite and the northeastern border of Batangas and Laguna. The former includes Mount Batulao and the latter Mount Makiling and Mount Banahaw.
N3 + Q1	Pliocene - Pleistocene	Terrestrial sedimentary rocks of volcanic origin underlying southern Metro Manila
N2	Upper Miocene Pliocene	Marine sedimentary rocks overlain by pyroclastics which underlie the hilly to mountainous western edge of Batangas and Cavite Provinces
N1	Oligocene – Miocene	Marine sedimentary rocks with volcanic flows and pyroclastics which underlie the hilly to mountainous southwestern edge of Batangas Province

The northernmost segment of the CALAX (Cavite Section) has been sited on the Quaternary Holocene sediments. The rest of the proposed road is underlain by the Quaternary Volcanic Pyroclastics.

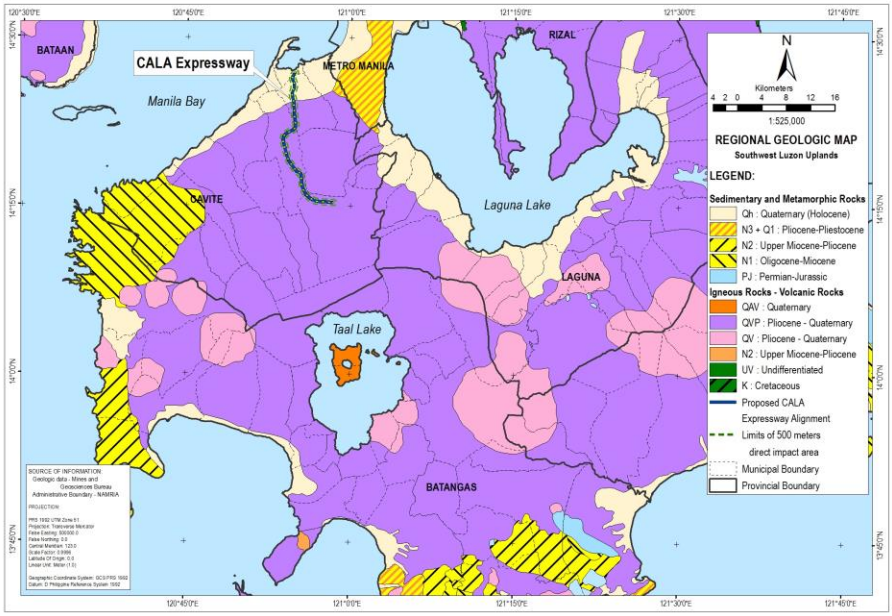


Figure 12: Regional Geologic Map of Southwest Luzon Uplands

4.1.3.1 Seismicity

Given the tectonic setting of the Philippine archipelago, much of the country is prone to seismic activities. Figure 13 shows a plot of the 201 major earthquake events from 1911 to 2014 with magnitudes equivalent to or greater than 5.0 within a radius of 130km from the proposed road project. The strongest recorded event took place in 1942. This was a magnitude 7.7 event located about 132km southwest of the project area.

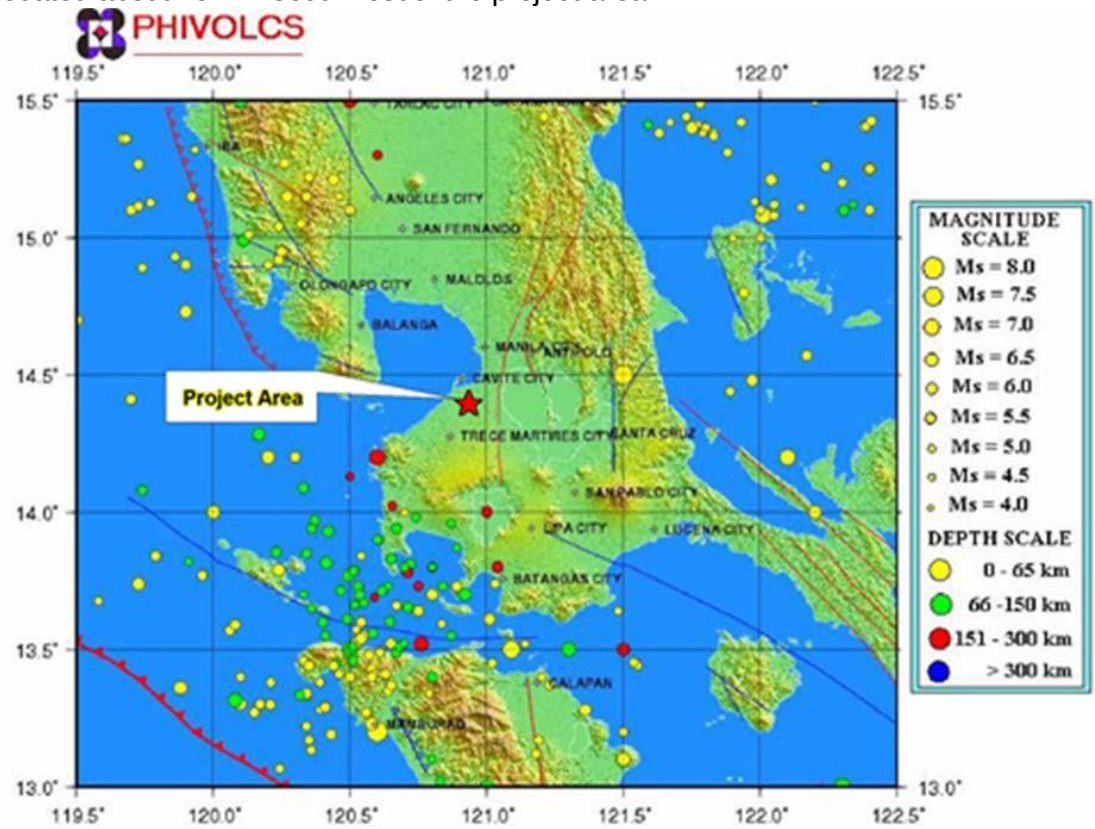


Figure 13: Plot of Earthquakes within 3-15.5ºN Latitude; 119.5-122.5ºE Longitude

4.1.3.2 Geomorphology

The Province of Cavite is underlain by two major geologic formations - namely the Quaternary Alluvium (QAl) and the Guadalupe Formation (GF). These formations respectively correspond to the Quaternary Holocene (Qh) and the underlying Quaternary Volcanic Pyroclastics (QVP) of the 2010 edition of the Geologic and Tectonic Map of the Philippines with a scale of 1:2,000,000 (Figure 13).

The Quaternary Alluvium includes the estuarine deposit which underlies the coastal Municipalities of Noveleta, Kawit and Bacoor. Based on the results of the foundation drilling for the project, this deposit includes soft, water-saturated marine silts, clays and sands with varying thicknesses of 12 to 13.5m between km 0+00 and km 1+00. The thickness of the estuary deposit is inferred to increase towards the shore. The boundary between the Quaternary Alluvium and the Guadalupe Formation coincides with the border between the Estuary Area and the Flat to Gently Sloping Area.

The Guadalupe Formation consists of layered tuffs and volcanic breccias which are intercalated with tuffaceous sandstone. It underlies the flat to gently sloping areas in Silang, Dasmarinas and parts of Imus. Outcrops of this formation at the bridge crossings in km 12+00, km 15+00, between km 18+00 and km 19+00 and km 23+00 of the proposed CALAX alignment correspond to slightly to moderately weathered, massive to thinly layered tuffs with inclinations of less than 10^{o}. Foundation drilling between km 0+00 and km 1+00 intersected a similar tuff within a depth range of 12 to 13.5m. The same gently folded formation is inferred to occur at depths of less than one meter from km 15+00 to km 27+00.

Based on the 1984 Geological Map of Cavite Quadrangle and on traverses made through the CALAX (Cavite Section) alignment, there are no major faults traversing the selected route. Geological structures are essentiallylimited to local joints of generally vertical orientation.

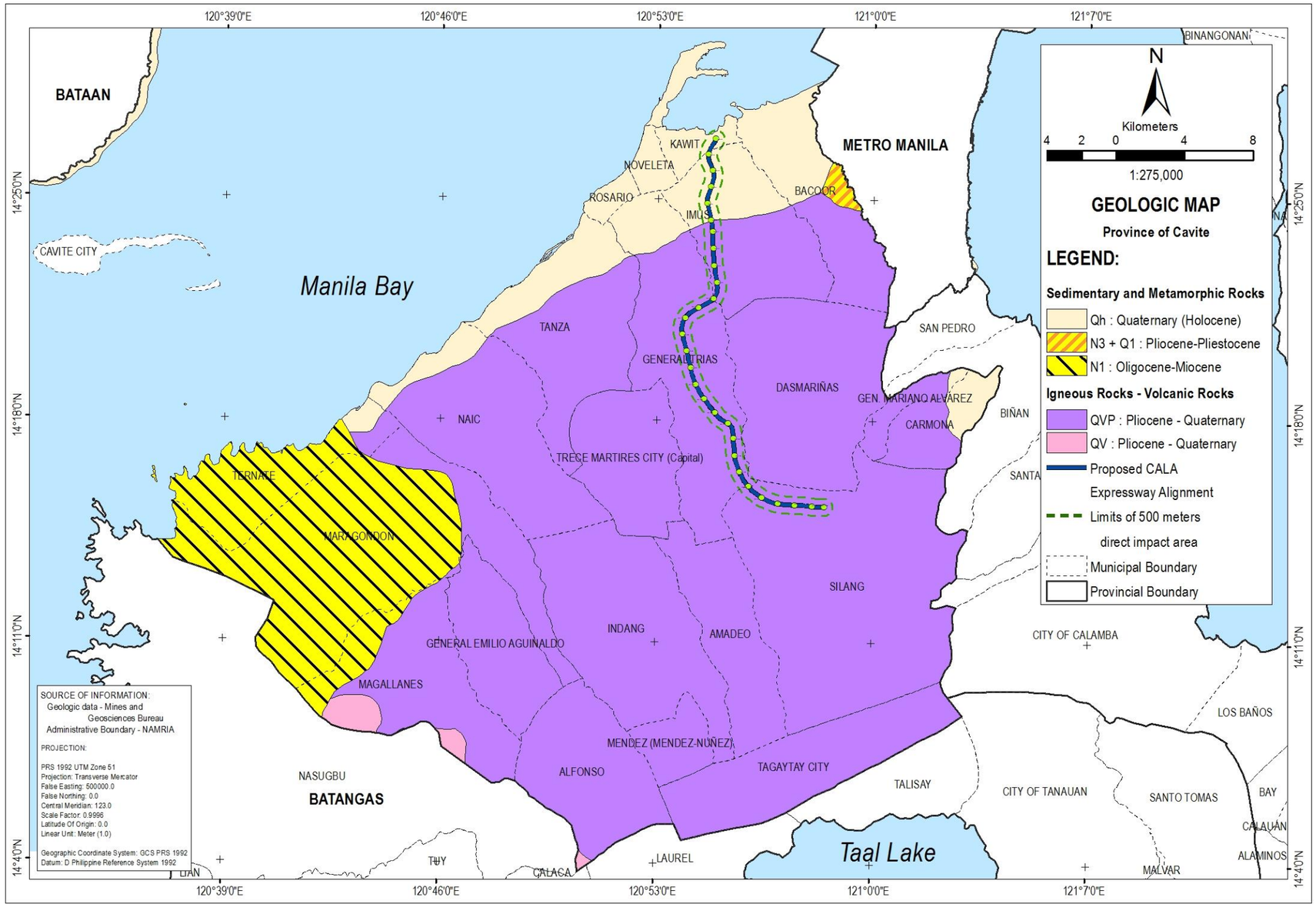


Figure 13. Geologic Map of Cavite Province

Figure 14 shows the schematic section though the CALAX (Cavite Section) alignment and the relationship of the terrain units with the underlying major geologic formations.

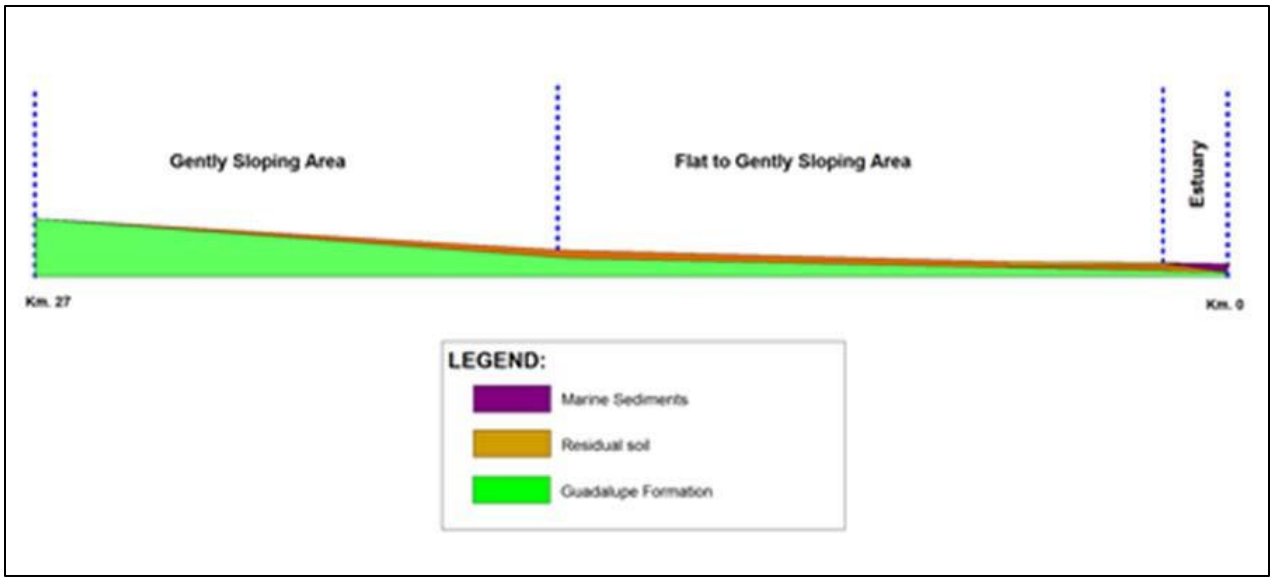


Figure 14: Schematic Section along the CALAX (Cavite Section)

4.1.3.3 Potential Hazards

The Province of Cavite, including the project area, is susceptible to ground shaking, liquefaction, settlement, flooding and tsunamis.

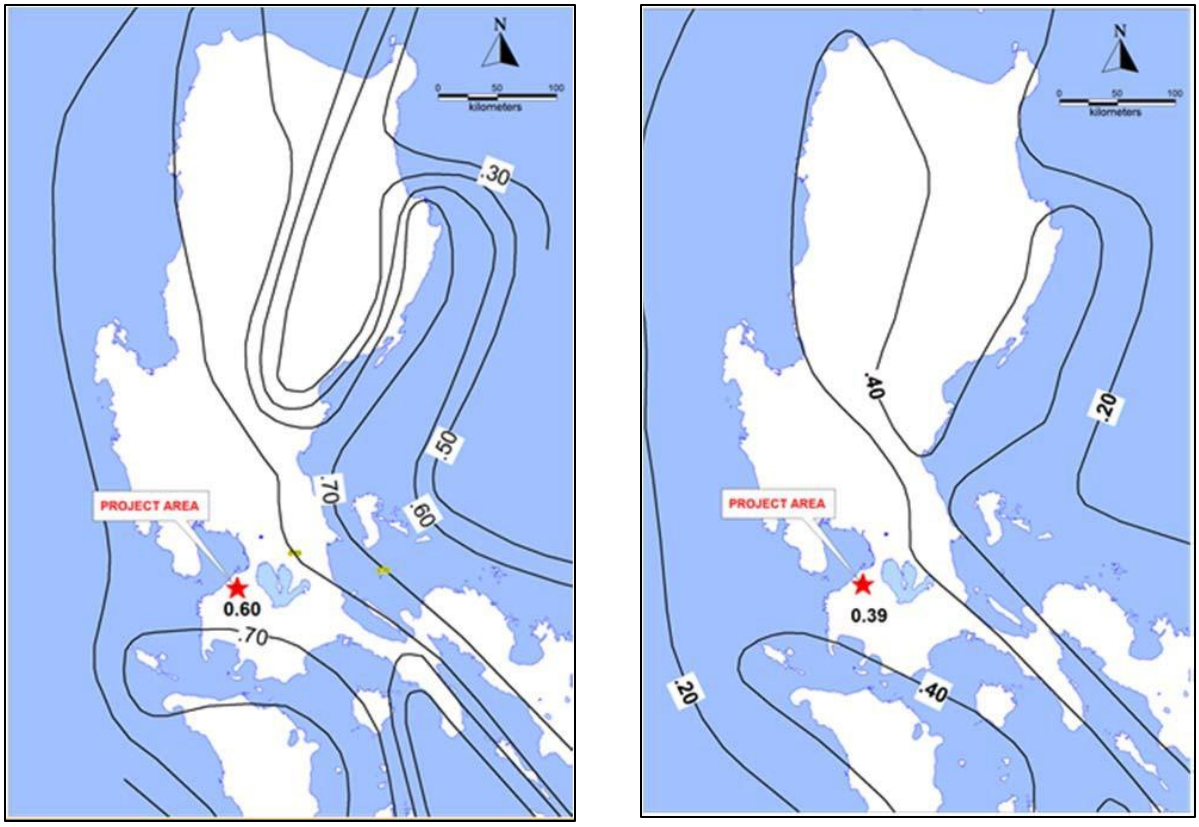
Ground Shaking

The project area is susceptible to ground shaking which can be brought about by earthquakes generated by the major regional faults. Ground shaking could affect the stability of the proposed road embankments, bridges and viaducts. The Regional Peak Ground Acceleration Map of the Philippines prepared by Thenhaus, Hanson and Algermissen of the United States Geological Survey and the Philippine Institute of Volcanology and Seismology (1995) indicate values of 0.60g for the unconsolidated sediments at the estuary (Figure 15a) and 0.39g for the alignment segments within flat to gently sloping and gently sloping terrain units that are underlain by the Guadalupe Formation (Figure 15b). These g values have a 10% probability of being exceeded in 50 years.

The maximum expected seismic ground shaking at the project area based on the 1911 to 2011 Earthquake Data from the Philippine Institute of Volcanology and Seismology (PHIVOLCS) is estimated at 0.169g. For specific materials, the following g values were obtained: Rock: 0.101; Hard: 0.181; Medium: 0.147; and Soft: 0.235. The sediments at the estuary area fall under the soft soil category. The tuffs underlying the rest of the road alignment fall under the medium soil category.

The deterministic and probabilistic g values discussed therein could be considered by the Design Engineers in determining the ground acceleration to be used in the road foundation design.

The proposed expressway project is not susceptible to ground rupture as there are no major faults mapped near or within the immediate vicinity of the alignment.



(a) Soft soils (b) Medium soils

Figure 15: Ground Acceleration Map

Liquefaction

The estuary terrain unit is vulnerable to liquefaction. This condition applies in particular to the segment from km 0+00 to km 1+00 (Figure 16). The flat to gently sloping areas immediately south of the estuary were also assessed as susceptible to liquefaction based on the study Hazard Mapping and Assessment for Effective Community-Based Disaster Risk Management (or READY Project), (National Disaster Coordinating Council (NDCC), 2009). The actual susceptibility of these areas needs to be validated through the conduct of subsurface investigations.

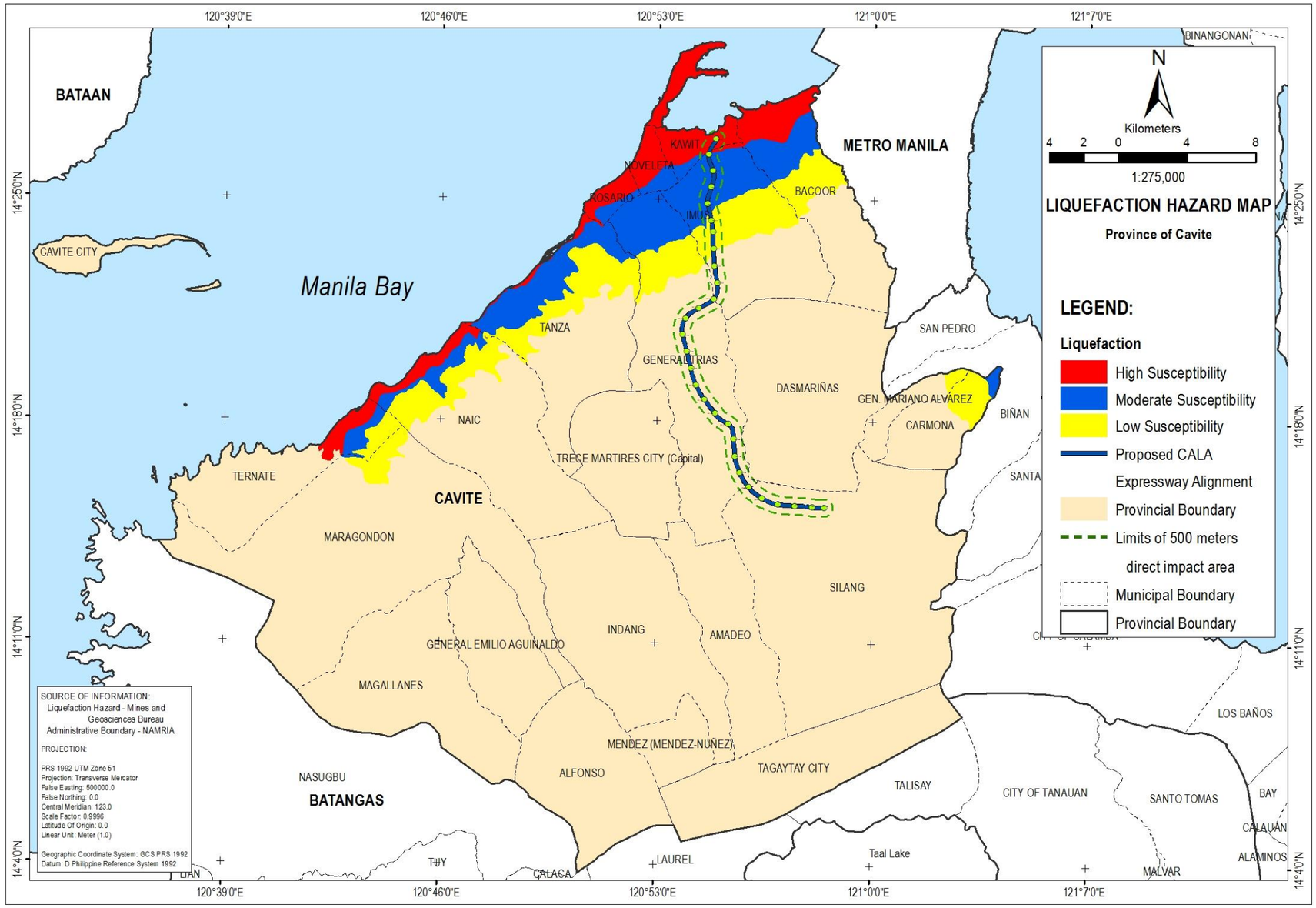


Figure 16. Liquefaction Map of Cavite Province

Settlement

This type of hazard is associated with the potential for long term change in the bearing capacity and the progressive consolidation of a soil layer in response to the structural load or overburden which will be imparted by proposed engineering structures such as viaducts or bridges. The estuary terrain unit is susceptible to settlement.

The flood hazard map of Cavite Province as prepared under the READY Project shows that the northern segment of the CALAX alignment has moderate to high susceptibility to flooding (Figure 17). This applies to the estuary area and likely to the segment up to elevation 10m above sea level. The susceptibility progressively declines southwards as higher elevations are attained. The overall northward ground inclination favors overland flow to the north during heavy rains. This condition is favored by the general imperviousness of the residual soil cover and the underlying tuffs.

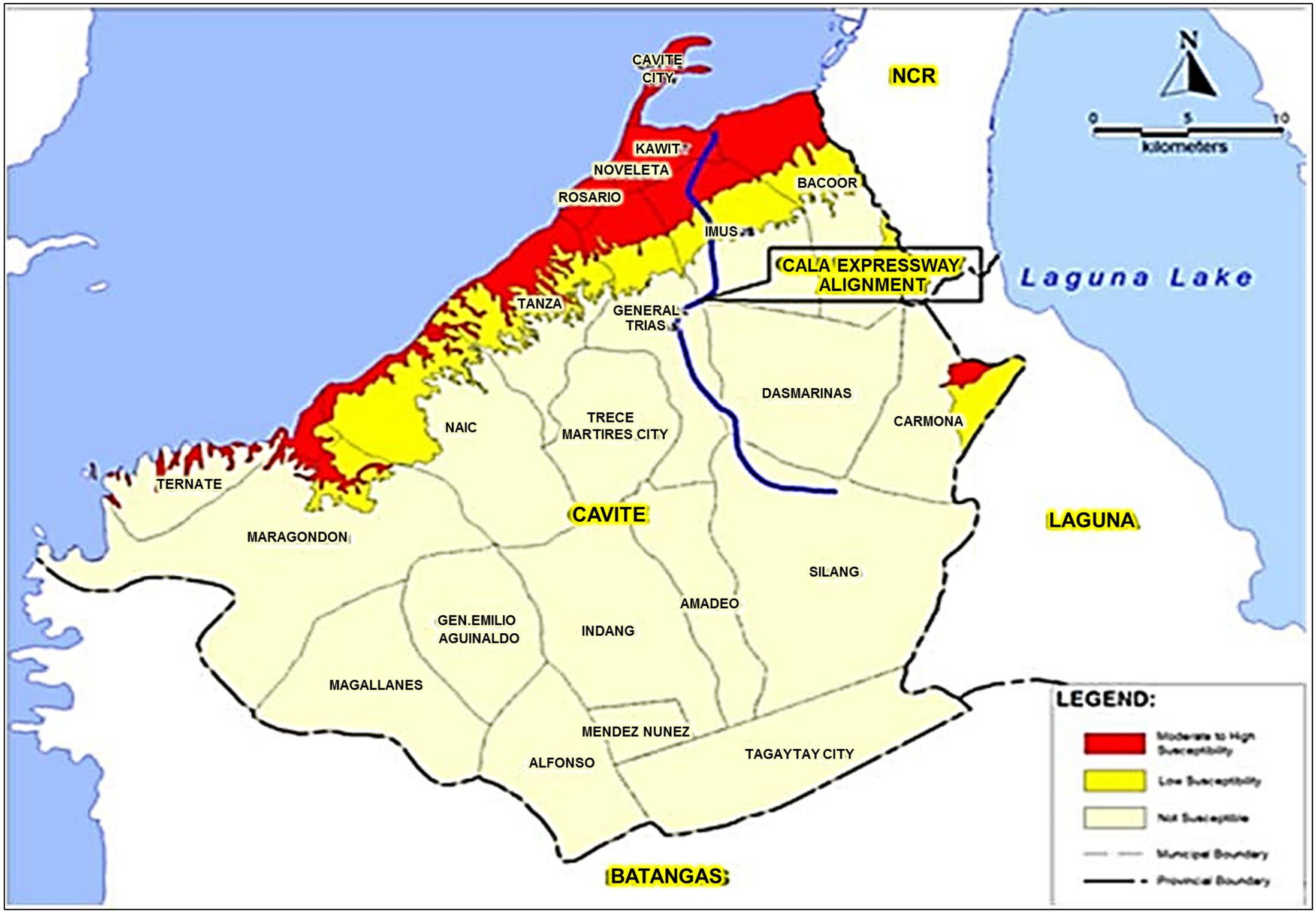


Figure 17: Flood Hazard Map of Cavite Province

Tsunami

The northern coastline of Cavite is susceptible to tsunamis as shown in Figure 18. The northern segment of the CALAX is relatively least prone due to its distance of 1.8km from the actual shoreline.

Volcanic Eruption

Based on the volcanic hazard map prepared by PHIVOLCS, any ash discharged from the active Taal Volcano will essentially be deposited within the Crater Lake itself. Accordingly, the entire CALAX (Cavite Section) is least susceptible to adverse effects of volcanic eruption.

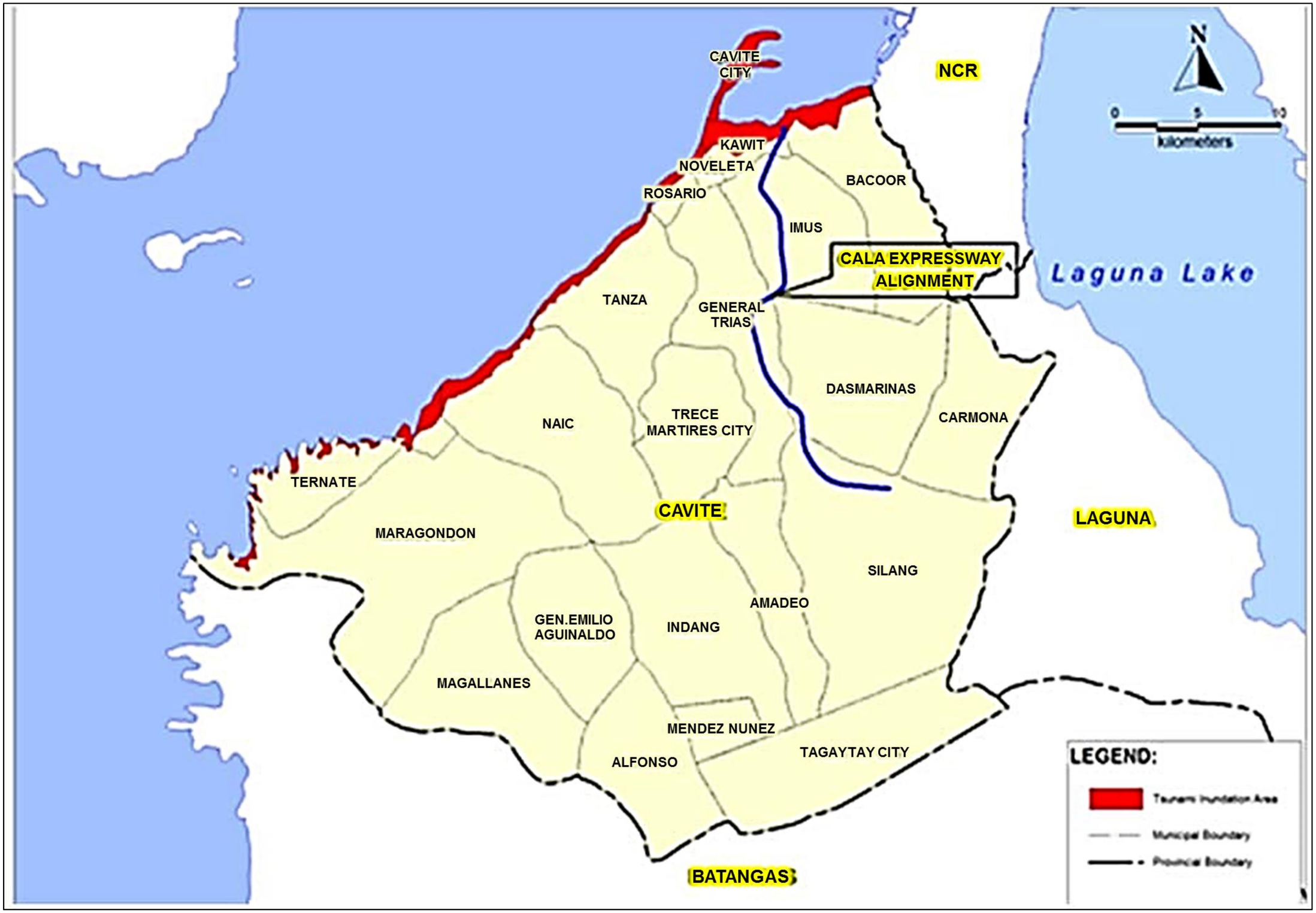


Figure 18: Tsunami Hazard Map of Cavite Province

4.1.3.4 Key Environmental Impacts on Geology

Increased Erosion

Increased erosion will take place with the removal of soil and rock cover in areas designated for the road alignment, bridges, construction facilities, batching plants and sources of construction materials. This condition will prevail throughout most of the proposed road alignment although rates will be greater in the sections from km 17+00 to km 27+00 where more excavation will be needed to attain the desired grade.

Stockpiles of excavated and construction materials will also be subjected to erosion unless properly sited and managed.

Terrain Modification

The construction of the road and related structures will lead to a permanent modification of the terrain within the strip where the pavement and shoulder will be placed.

Destabilization of Steep Slopes

Although the steep banks of the waterways to be traversed by the proposed expressway are currently deemed stable, these may be destabilized during the construction of the bridges, viaducts and culverts.

The project is not expected to have a long-term impact on the erodibility potential, bank stability and change in soil quality within the project site. As discussed in the geology section, soil erosion and bank stability in areas where construction will take place maybe affected by excavation and slope trimming during widening of the road. Increased susceptibility to erosion may occur during the construction period of about one year. However, cut slopes along the road will provide slope protection to prevent slips and landslides. Keeping the roads passable at all times is essential during the operations stage. The impact on soil erosion and bank stability is negative and of short duration since it will only persist during the construction period (about one year). However, once completed, the project will have a positive impact on slope stability because of the slope treatment that will be implemented. Unlike the present condition, the slopes along the road will be stabilized. This impact is moderate magnitude and long-term duration since maintenance will be carried out.

Photo 4: Taken between km 23+00 and km 27+00 which shows the slope as visually stable

4.1.4 PEDOLOGY

4.1.4.1 Soils

Three soil types, six soil mapping units and one miscellaneous land type were identified, characterized and mapped along the alignment/ROW of the proposed CALAX (Cavite Section).

The three soil types are the Guadalupe clay, Magallanes clay loam and the Tagaytay clay. The soil types were subdivided into soil mapping units based on the differences in slope ranges. The soil mapping units are as follows:

- Guadalupe clay, 0-3% slope
- Guadalupe clay, steep phase, >18% slope
- Magallanes clay loam, 0-3% slope
- Magallanes clay loam steep phase, >18% slope
- Tagaytay clay, 0-3% slope
- Tagaytay clay steep phase, >18% slope.

The “steep phase” mapping is the steep to very steep river banks/valley sideslopes.

The physical and chemical properties of these soil types are summarized in Table 6. Their occurrence along the alignment is represented diagrammatically in Figures 19.a-d. Further discussion is presented in the text below.

Guadalupe clay, 0-3% slopes as the biggest soil mapping unit occur from km 1+00 in Kawit to km 15+25 in Barangay Uldugan, General Trias. Guadalupe steep phase, >18% slopes occur in km 10+00, km 11+50, and from km 14+50 to km 15+50 in General Trias. Some parts of the slope are with exposed/ bare volcanic tuff.

Magallanes clay loam, 0-3% slope occurs from km 15+25 in Barangay Uldugan, General Trias to km 23+00 in Barangay Adlas, Silang. Magallanes clay loam, steep phase >18% slopes occur from km 17+75 to km 18+75, km 20+25, and km 21+00 to km 22+00. Some parts of the slope are with exposed/ bare volcanic tuff. Tagaytay clay, 0-3% slope occurs from km 23+00 in Barangay Adlas, Silang to km 27+70 in Barangay Bukal, Silang. Tagaytay clay steep phase, >18% slopes occur from km 22+75 to km 23+50 in Barangay Adlas, Silang; and at km 27+50 in Barangay Bukal, Silang. Some parts of the slope are with exposed/ bare volcanic tuff.

The Guadalupe clay 0-3% slopes at km 3+50 in Barangay San Sebastian, Kawit (Observation 1) is a poorly drained, moderately deep clay soil. Soil reaction is slightly acidic (pH6.5). Organic matter is low (1.4%); Phosphorus is not detected, while Potassium and Cation exchange capacity are high with 0.9cmol/l and 39.04 cmol/kg respectively. Copper is high with 9.4ppm, Zinc is medium with 1.84ppm, while Iron and Manganese are low with 41.14 and 81.95ppm, respectively. The natural fertility of this soil is medium. The heavy metals (Arsenic with 0.33 mg/kg, Cadmium with not detected, Lead with 26 mg/kg, Mercury with not detected, Chromium with not detected, and Zinc with 42 mg/kg) are all below the contamination level as prescribed by the Taiwanese standards for Arsenic (40 mg/kg), Cadmium (5 mg/kg), Lead (500 mg/kg), Mercury (2 mg/kg), Chromium (400 mg/kg) and Zinc (500 mg/kg).

The Guadalupe clay, 0-3% slopes at km 10+00 in Barangay Pasong Kamachile, General Trias is a Barangay Pasong Kamachile, and General Trias is a poorly drained deep clay soil. Soil reaction is medium acid (pH 6.0). Organic matter is low (2.35%), Phosphorus is medium (18.12 mg/kg), Potassium is very high (2.8 cmol/l) while cation exchange capacity is high with 13.29 ppm, while Zinc, Iron and Manganese are medium with 1.57; 93.62; and 93.3 ppm, respectively. The natural fertility of this soil is medium. The heavy materials (Arsenic with 0.27 mg/kg, Cadmium with not detected, Lead with not detected, Mercury with not detected, Chromium with not detected and Zinc with 48 mg/kg) are all below the contamination level as prescribed by the Taiwanese standards.

Magallanes clay loam, 0-3% slopes at km 19+50 in Barangay Mabatang, General Trias is a moderately well drained, deep clay loam soil. Soil reaction is medium acid. Organic matter is very low (1.05%), Phosphorus is not detected, Potassium is very high (1.25 cmol/l), while cation exchange capacity is high with 39.56 cmol/kg. Copper is medium (6.24 ppm), while Zinc, Iron and Manganese are low with 1.27ppm, 38.92ppm and 62.69ppm, respectively. The natural fertility of this soil is medium. The heavy metals (Arsenic with 0.19 mg/kg, Zinc with 46 mg/kg and Cadmium, Lead and Mercury with not detected are all below the contamination level as prescribed by the Taiwanese standards.

Magallanes clay loam, steep phase >18% slopes at km 18+00, General Trias is a moderately well drained clay loam soil. Soil reaction is medium acid (pH6.0). Organic matter and Phosphorus are low with 2.38% and 6.84 mg/kg, respectively. Potassium and cation exchange capacity are high with 0.68 cmol/l and 29.08cmol/kg respectively. Zinc is high (2.38ppm) while Copper, Iron and Manganese are medium with 7.35, 87.31 and 105.88ppm, respectively. The natural fertility of the soil is medium. The heavy metals (Arsenic with 0.17 mg/kg, Zinc with 59 mg/kg and Cadmium, Lead, Mercury and Chromium were not detected) are all below the contamination level as prescribed by the Taiwanese standards.

Tagaytay clay 0-3% slopes at Km.26.25 in barangay Adlas, Silang is a moderately well drained deep clay soil. Soil reaction is medium acid (pH5.8). Organic matter is low (2.05%), Phosphorus and cation exchange capacity are high with 82.9 mg/kg and 31.54 mg/kg respectively. Potassium is very high with 3.83 cmol/l. Copper, Zinc and Iron are high with 10.59, 3.06 and 124.4 ppm, respectively. Manganese is medium with 107.83ppm. The natural fertility of this soil is high. The heavy metals (arsenic with 0.20 mg/kg, Zinc with 55 mg/kg and Cadmium, Lead, Mercury and Chromium with not detected) are all below the contamination level as prescribed by the Taiwanese standards.

The hydrosols as miscellaneous land types are the submerged soils of the fishponds and Mangrove in the Municipality of Kawit.

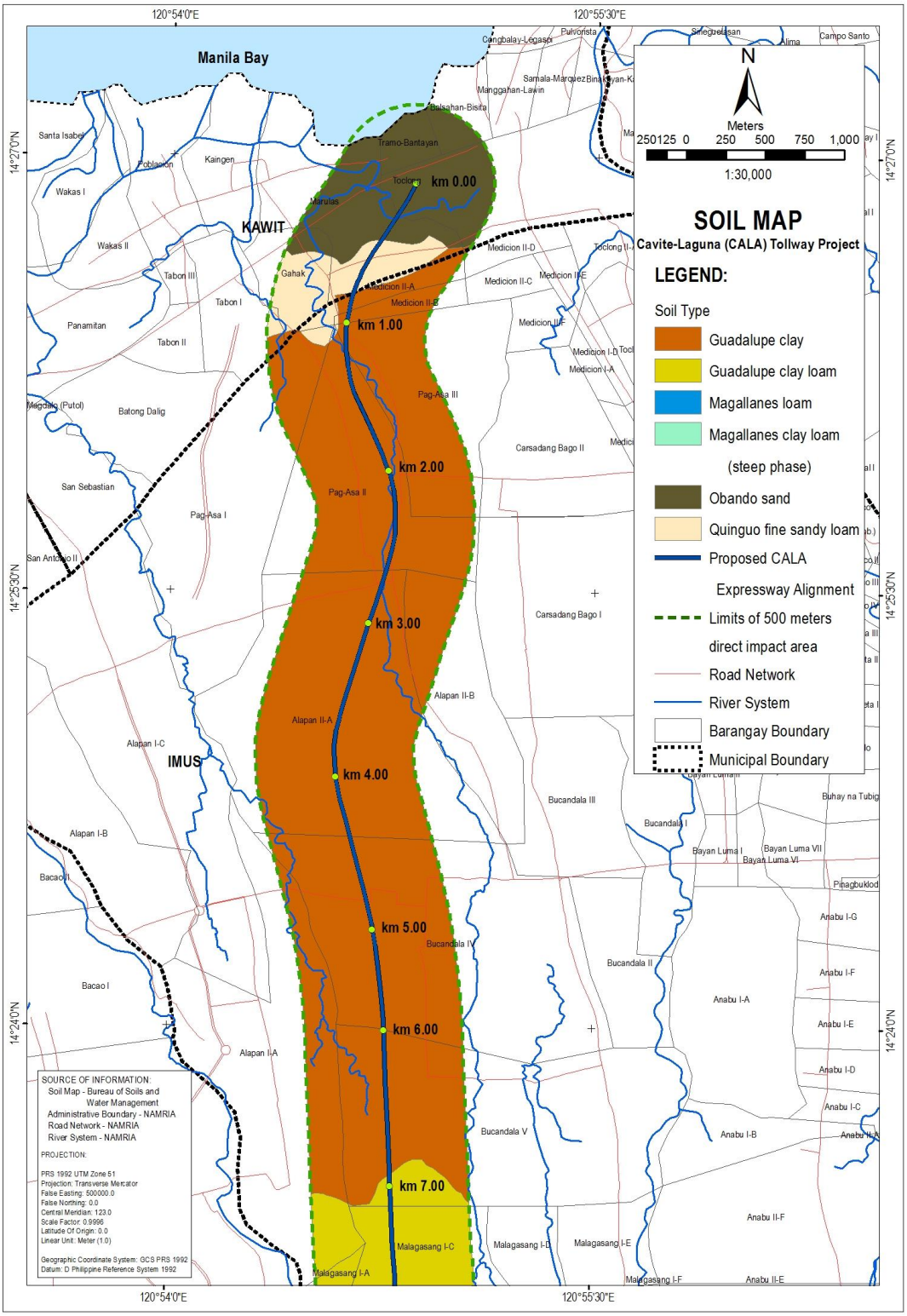
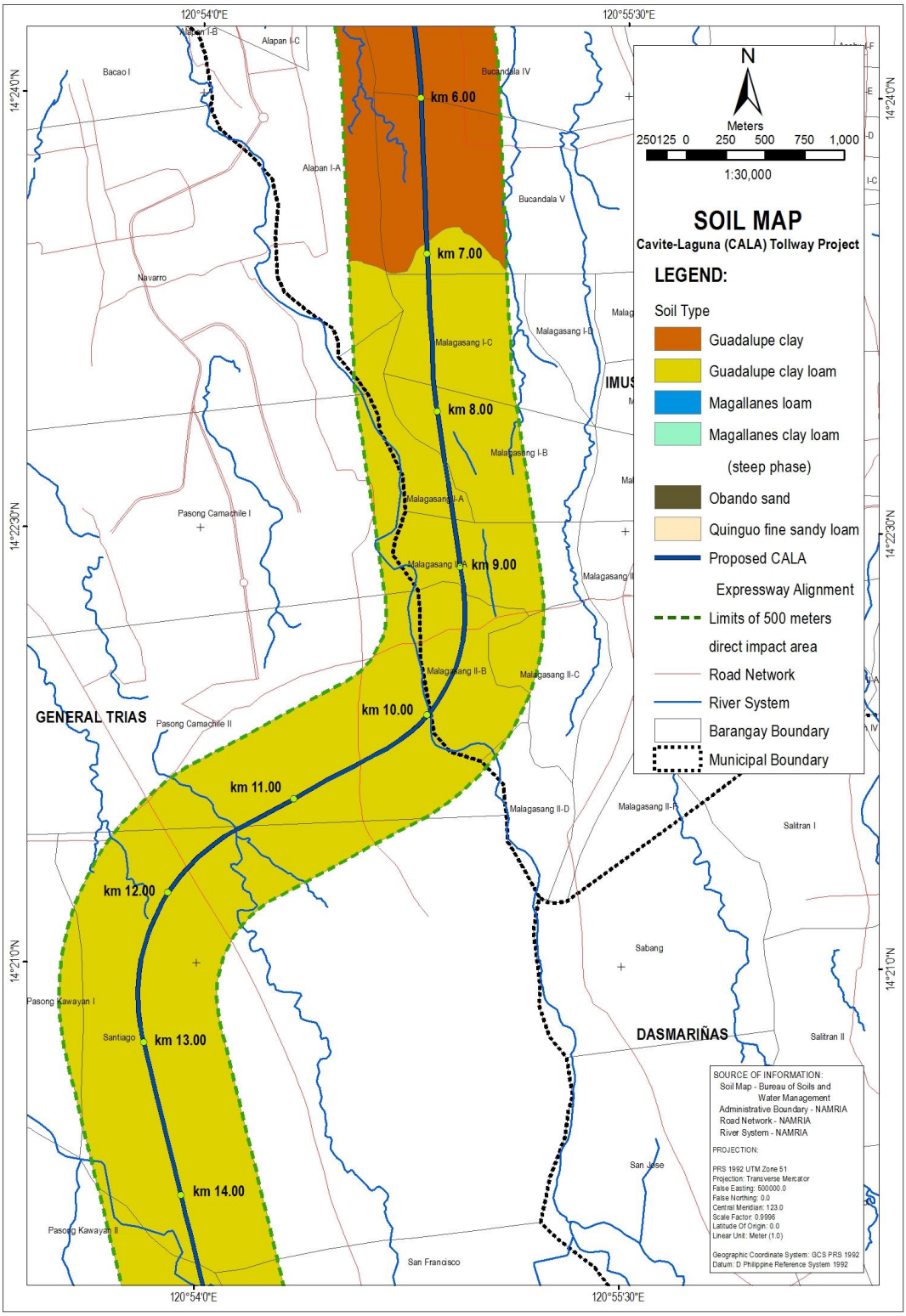
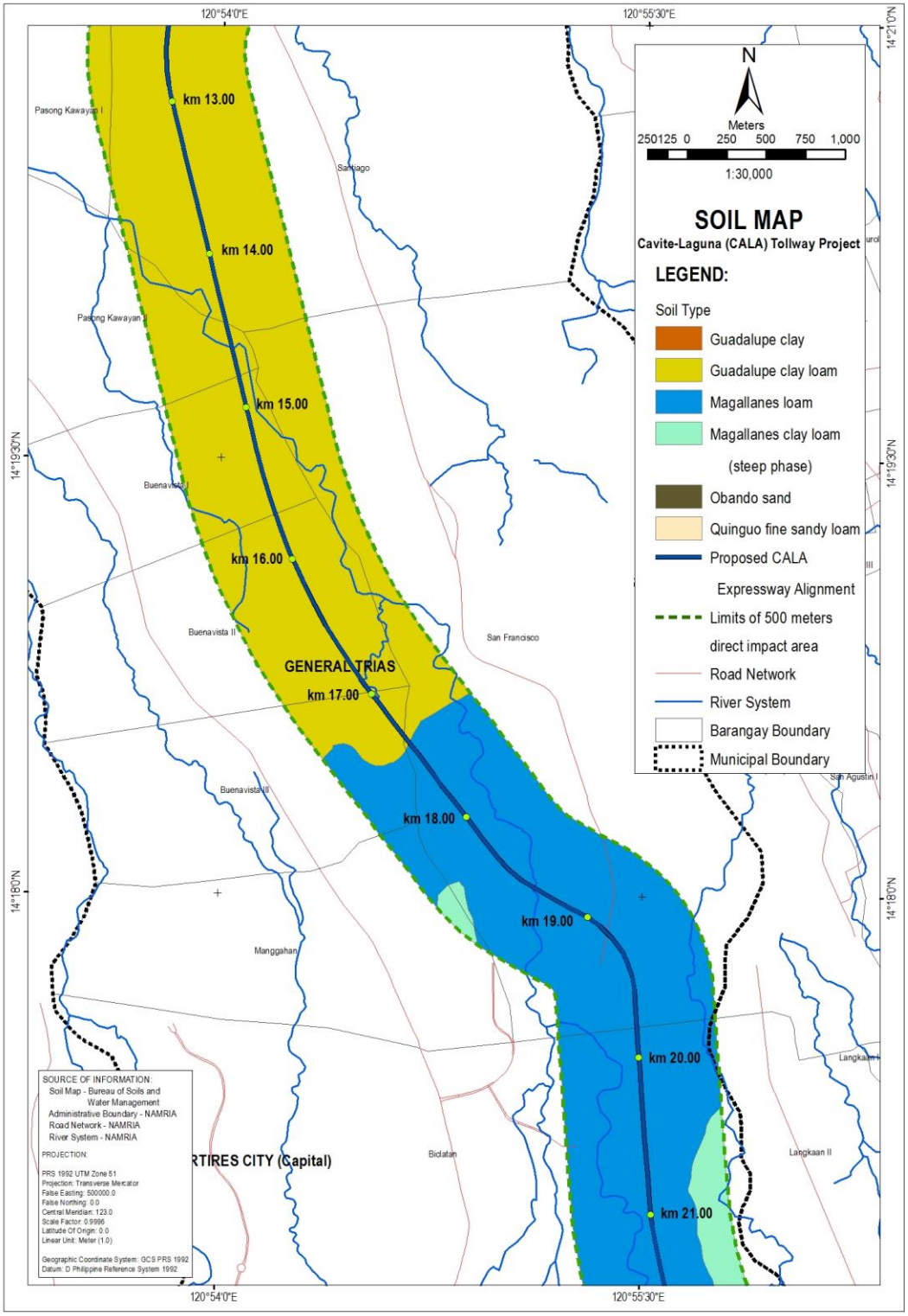


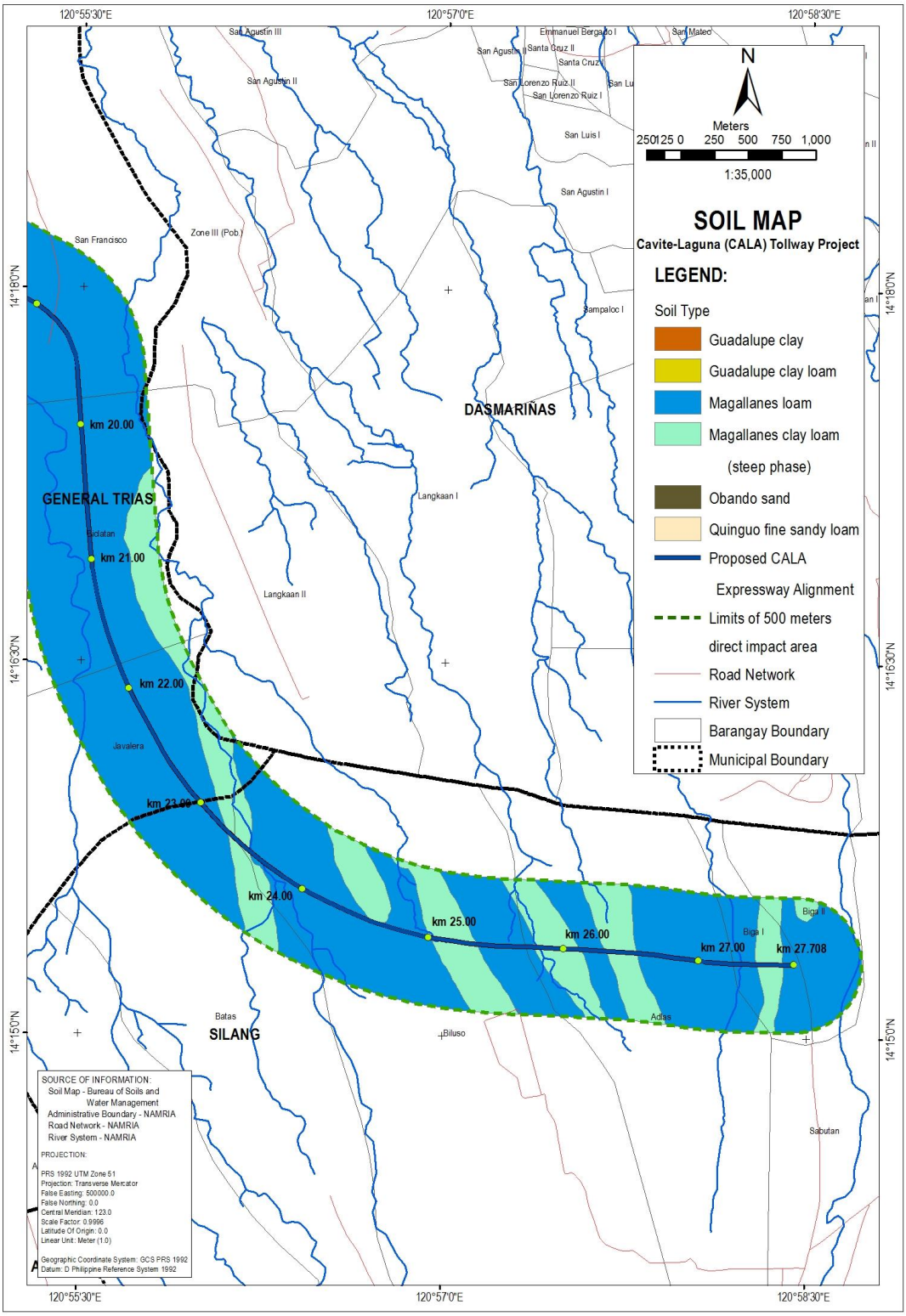
Figure 16: Soil Map of the CALAX (Cavite Section) Project Corridor



(b) Soil Map of the CALAX (Cavite Section) Project Corridor



(c) Soil Map of the CALAX (Cavite Section) Project Corridor



(d) Soil Map of the CALAX (Cavite Section) Project Corridor

Table 8: Physical and Chemical Characteristics of Soil along the CALAX (Cavite Section) Corridor

Soil Properties	Guadalupe clay		Magallanes clay loam		Tagaytay clay, 0-3% slopes (Observation No.5)
	Guadalupe clay, 0-3% slopes (Observation No.1)	Guadalupe clay, 0-3% slopes (Observation No.2)	Magallanes clay loam, 0-3% slopes (Observation No.3)	Magallanes clay loam, Steep Phase >18% slopes (Observation No.4)	
Physical Properties					
Drainage	Poorly drained	Poorly drained	Moderately well drained	Moderately well drained	Moderately well drained
Texture	clay	clay	clay loam	clay loam	clay
Soil Depth (cm)	55 cm	>100 cm	>100 cm	90 cm	>100 cm
Slope (%)	0-3% slopes	0-3% slopes	0-3% slopes	>18% slopes	0-3% slopes
Chemical Properties	*	*	**	**	*
pH	6.5	6.0	6.0	6.0	5.8
Organic Matter (%)	1.4	2.35	1.05	2.38	2.05
Phosphorus (mg/Kg)	ND	18.12	ND	6.84	82.9
Potassium (cmol/L)	0.9	2.8	1.25	0.68	3.83
Cation Exchange					
Capacity (cmol/Kg)	39.04	37.04	39.56	29.08	31.54
Available Micronutrients (ppm)					
Copper	9.4	13.29	6.24	7.35	10.59
Zinc	1.84	1.57	1.27	2.83	3.06
Iron	41.14	93.62	38.92	87.31	124.41
Manganese	81.95	93.32	62.69	105.88	107.83
Heavy Metals					
Arsenic (mg/Kg)	0.33	0.27	0.19	0.17	0.20
Cadmium (mg/Kg)	ND	ND	ND	ND	ND
Lead ((mg/kg)	26	ND	ND	ND	ND
Mercury (mg/Kg)	ND	ND	ND	ND	ND
Chromium	ND	ND	ND	ND	ND
Zinc	42	48	46	59	55

ND- Not Detected
**Weighted average of top two horizons (0-45cm depth)*
*** Weighted average of top two horizons (0-50cm depth)*
Taiwan standards for assessment of soil contaminated with heavy metals (mg/Kg):
Arsenic =40; Cadmium=5; Lead=500; Mercury=2; Chromium=400; Zinc= 50

4.1.4.2 Key Environmental Impacts on Pedology

The CALAX project basically comprises of an embankment road alignment, interchanges and viaducts/bridges/culverts.

The alignment passes through agricultural fields from km 1+00 in Kawit to km 29+280 in Silang. Agricultural fields are paddy rice, sugarcane, annual crops and treegrove/fruit tree orchards. Many agricultural fields along the alignment will be lost with the implementation of the project.

The shrubs and trees on the riverbanks where the alignment will pass will be destroyed and/or removed during the pre-construction phase. During the construction phase the topsoil along the alignment will be scrapped prior to compaction. The scrapped topsoil materials maybe carried away by runoff water during rainfall events, and may cause sedimentation of the rivers.

Earth movement/ excavation will be undertaken for the foundation of bridges and viaducts and construction of culverts. Erosion and landslide may occur with rainfall events, with subsequent sedimentation of the rivers downstream. Increased storm water runoff may also result in road structure collapse.

During the operational phase, soil quality of the agricultural fields adjacent to the CALAX may be contaminated with heavy metals, particularly lead and zinc brought about by the passing of vehicles overtime.

4.1.5 TERRESTRIAL ECOLOGY

4.1.5.1 Flora

The community structure of the remaining vegetation cover in the area was characterized and the degree of disturbance due to human activities was also noted. Two agro-ecosystem community types are present in the project site, the lowland irrigated rice agro-ecosystem and the sugarcane/corn/pineapple agro-ecosystem. The proposed road alignment will pass through essentially lowland irrigated ricefields from its entrance past the exit of CAVITEX in Kawit, all the way to Imus and the lowland portion of General Trias. At about km 19+00 of the proposed highway, the dominant crop is replaced by plantations of sugarcane, pineapple and corn in the hilly Barangays of General Trias, Dasmarinas and Silang up to its exit in Aguinaldo Highway where few individuals of mango and coconuts are present in residential areas.

A total of 75 species of plants under 33 families were recorded. Family Fabaceae (Legume family) is most represented with 15 species, followed by Poaceae (Grass family) with 11 and Asteraceae (weed family), Euphorbiaceae (Tree pioneer family) and Moraceae (Fig family), each with 5 species. This is characteristic of a disturbed ecosystem. Of this number, 18 species are exotics/introduced and 57 species are indigenous, as shown in Table 6 below. No endemic species was recorded.

Table 9: Exotic plant species recorded in CALAX (Cavite Section)

Species	Common name	Family	Life
Achyranthes aspera	Hanggor	Acanthaceae	Herb

Species	Common name	Family	Life
Ageratum conyzoides	Bulak manok	Asteraceae	Herb
Annona muricata	Guyabano	Annonaceae	Tree
Artocarpus heterophyllus	Jackfruit	Moraceae	Tree
Caesalpinia pulcherrima	Caballero	Fabaceae	Shrub
Canna flacida	Bandera	Cannaceae	Herb
Dracaena fragrans	Fortune plant	Convallariac	Shrub
Gliricidia sepium	Kakawate	Fabaceae	Tree
Leucaena leucocephala	Ipil-ipil	Fabaceae	Tree
Manihot esculenta	Cassava	Euphorbiace	Shrub
Muntingia calabura	Aratiles	Malvaceae	Tree
Persea americana	Avocado	Lauraceae	Tree
Pithecellobium dulce	Kamachile	Fabaceae	Tree
Pseudoelephantopus	Dilang baka	Asteraceae	Herb
Ricinus communis	Ricinus	Euphorbiace	Shrub
Samanea saman	Raintree	Fabaceae	Tree
Swietenia macrophylla	Mahogany	Meliaceae	Tree
Zea mays	Corn	Poaceae	Herb

Four growth forms were recorded such as trees (31 species), shrubs (8 species), herbaceous (27 species) and vines (6 species) with specialised life forms such as bamboos and palm. The majority of trees are composed of fruit trees and tree pioneers which are characteristic of the agroecosystem. The bamboos, on the other hand, are represented by two species (*Bambusa blumeana* and *Bambusa vulgaris var. striata)* which are erect bamboos and economically important. The palm is represented by coconuts which is one of the most dominant species in the area.

In the irrigated ricefields, a total of 47 species were recorded while in the sugarcane/pineapple/corn plantations, 56 species were recorded. 28 species are common to both land uses, which are mostly weeds and orchard species. The irrigated ricefields are littered by weed species such as *Ageratum conyzoides, Chromolaena odorata, Pseudoelephantopus spicatus, Stachytarpheta jamaicensis* and *Cyperus rotundus,* among others and bordered by agricultural fruit trees such as mango, banana and coconut.

Sugarcane, pineapple and corn plantations, on the other hand, are also littered with weed species like *Mikania cordata, Ageratum conyzoides, Stachytarpheta jamaicensis, Eleusine indica, Lantana camara, Mimosa pudica, Urena lobata, Sida rhombifolia* and *Chromolaena odorata* in combination with grasses like *Imperata cylindrica* and *Saccharum spontaneum* and bounded by agricultural fruit trees like guava, coconut, avocado and mango, and trees common in farmland like ipil-ipil, *Macaranga tanarius, Gliricidia sepium, Ficus septica and Pithecellobium dulce.*

Economically Important Species

From the total number of species recorded, a total of 20 plant species are considered economically important. As shown in the table below, 18 of the 20 species are agricultural crops. This is expected since the study site is an agroecosystem. Rice, sugarcane, pineapple and corn, all in plantations, are planted along the proposed road alignment and therefore, will be severed during the road construction. The rest are located in the vicinity of the proposed road alignment.

Table 10: Economically important species recorded in CALAX (Cavite Section)

Species	Common	Family	Importanc
Abelmoschus	Okra	Malvaceae	Agri. crop
Ananas comosus	Pineapple	Bromeliacea	Agri. crop
Annona muricata	Guyabano	Annonacea	Agri. crop
Arachis hypogaea	Mani	Fabaceae	Agri. crop
Artocarpus	Jackfruit	Moraceae	Agri. crop
Bambusa blumeana	Kawayan	Poaceae	Cane
Carica papaya	Papaya	Caricaceae	Agri. crop
Chrysophyllum	Caimito	Sapotaceae	Agri. crop
Cocos nucifera	Coconut	Arecaceae	Agri. crop
Mangifera indica	Mangga	Anacardiace	Agri. crop
Manihot esculenta	Cassava	Euphorbiace	Agri. crop
Musa sapientum	Banana	Musaceae	Agri. crop
Orysa sativa	Rice	Poaceae	Agri. crop
Persea americana	Avocado	Lauraceae	Agri. crop
Saccharum	Sugarcane	Poaceae	Agri. crop
Sandoricum koetjapa	Santol	Meliaceae	Agri. crop
Swietenia	Mahogany	Meliaceae	Wood
Vigna sesquipedalis	Sitaw	Fabaceae	Agri. crop
Zea mays	Corn	Poaceae	Agri. crop

Dominant Species

Table 8 presents the list of species that obtained the top ten highest scores of “Importance Value” in the irrigated rice field ecosystem. The table clearly shows the dominance of rice as expressed in combined value (Importance Value) of frequency and cover over other species in the area.

Table 11: Species with highest Importance Value scores in the irrigated rice field ecosystem

Species	Relative Frequency (%)	Relative Cover (%)	Importance Value (%)
Orysa sativa	6.73	77.33	84.06
Bambusa blumeana	6.73	5.79	12.52
Mangifera indica	6.73	5.19	11.93

Species	Relative Frequency (%)	Relative Cover (%)	Importance Value (%)
Musa sapientum	5.77	0.94	6.71
Leucaena	5.77	0.83	6.60
Mimosa pudica	3.85	0.71	4.55
Pithecellobium	3.85	0.59	4.44
Imperata cylindrica	3.85	0.47	4.32
Saccharum	3.85	0.47	4.32
Muntingia calabura	2.88	0.35	3.24
Cocos nucifera	2.	0.	3.
Chromolaena	2.	0.	3.
Centrosema sp.	0.	1.	2.

On the other hand, Table 9 shows the species that registered the ten highest "Importance Value" scores in the sugarcane/corn/pineapple agroecosystem of the study site which also shows the dominance of sugarcane, corn and pineapple both in terms of combined value (Importance Value) of cover and frequency relative to other species in the sugarcane/pineapple/corn plantations.

Table 12: Species with highest Importance Value scores in the sugarcane agro-ecosystem

Species	Relative Frequency (%)	Relative Cover (%)	Importance Value (%)
Saccharum	2.75	32.99	35.74
Zea mays	3.67	24.65	28.32
Ananas comosus	4.59	16.67	21.25
Mangifera indica	2.75	5.21	7.96
Musa sapientum	4.59	2.43	7.02
Cocos nucifera	4.59	1.22	5.80
Gliricidia sepium	3.67	0.69	4.36
Ficus nota	3.67	0.52	4.19
Arachis hypogaea	1.83	1.74	3.57
Leucaena	2.75	0.69	3.45

As expected, the Shannon Diversity Index for rice field agroecosystem (2.21) and Sugarcane/Corn/Pineapple Plantations (2.40) are both considered low based on the Fernando Biodiversity Scale.

Mangrove

There is also a very small patch of highly degraded mangrove made up of a few stunted individuals near the proposed entry to the CALAX (adjoining the CAVITEX). The surviving mangrove individuals are barely growing in a creek surrounded by very dense residential houses and commercial establishments in the road going to the Imus-General Trias area.

The remnant mangrove individuals are not diverse and composed practically of only one species - the mangrove pioneer *Avicennia marina* of family Avicenniaceae, with few stems of mangrove associate *Thespesia populnea* of family Malvaceae and open area tree pioneer exotics *Leucaena leucocephala* of family Fabaceae and *Muntingia calabura* also of family Malvaceae, which are common in waste and open areas.

On average, the height of the remaining mangrove individuals are at most two meters with a Diameter at Breast Height (DBH) of less than 6cm and a density of only 21 - 25 individuals per hectare.

Threatened Species

No threatened species listed in the 2007 National Red List of Threatened Philippine Plants (DENR DAO 2007-01) and 2006 IUCN Red List of Threatened Species was recorded in the study area. The recorded species are common and wide in distribution.

Affected Trees at Realigned Sections

Based on the tree inventory, the affected trees at the realigned sections are the following:

Table 12: Affected Trees at Realigned Sections

	Centennial Intx (Kawit-Imus)	AMAIA (Gen. Trias)	Tibig (Silang)	Sub-Total
Avocado	1		1	2
Acacia		1		1
Anahaw	1			1
Bagtikan (Bakan)			1	1
Balite	2			2
Bamboo (cluster)	12		12	24
Banana	40		200	240
Calamansi			4	4
Camanse			3	3
Camphore			2	
Chico	12		8	20
Citrus			114	114
Coconut	32		44	74
Coffee			13,803	13,803
Dalipaweng			1	1
Duhat	5		2	7
Durian			1	1
Fire tree			3	3
Fortune Plant			862	862
GMilena			9	9
Guyabano			26	26
Ilang Ilang			5	5
Ipil-ipil	10		10	20
Jack Fruit	2		11	13
Kaong			2	2
Lubi-lubi			25	25

	Centennial Intx (Kawit-Imus)	AMAIA (Gen. Trias)	Tibig (Silang)	Sub-Total
Mabolo	1			1
Macopa			17	17
Madre Cacao	13		195	208
Mahogany			21	21
Mango	25		33	58
Narra	3			3
Nymph	1			
Pili			2	2
Pomelo	1		2	3
Samak			800	800
Sampaloc	3		5	8
Santol	2		10	12
Star Apple	7			7
Talisay	1			1
Tibbig			1,045	1,045
Tiesa	1		2	3
Wild Bananas			4	4
TOTAL	175	1	17,285	17,461

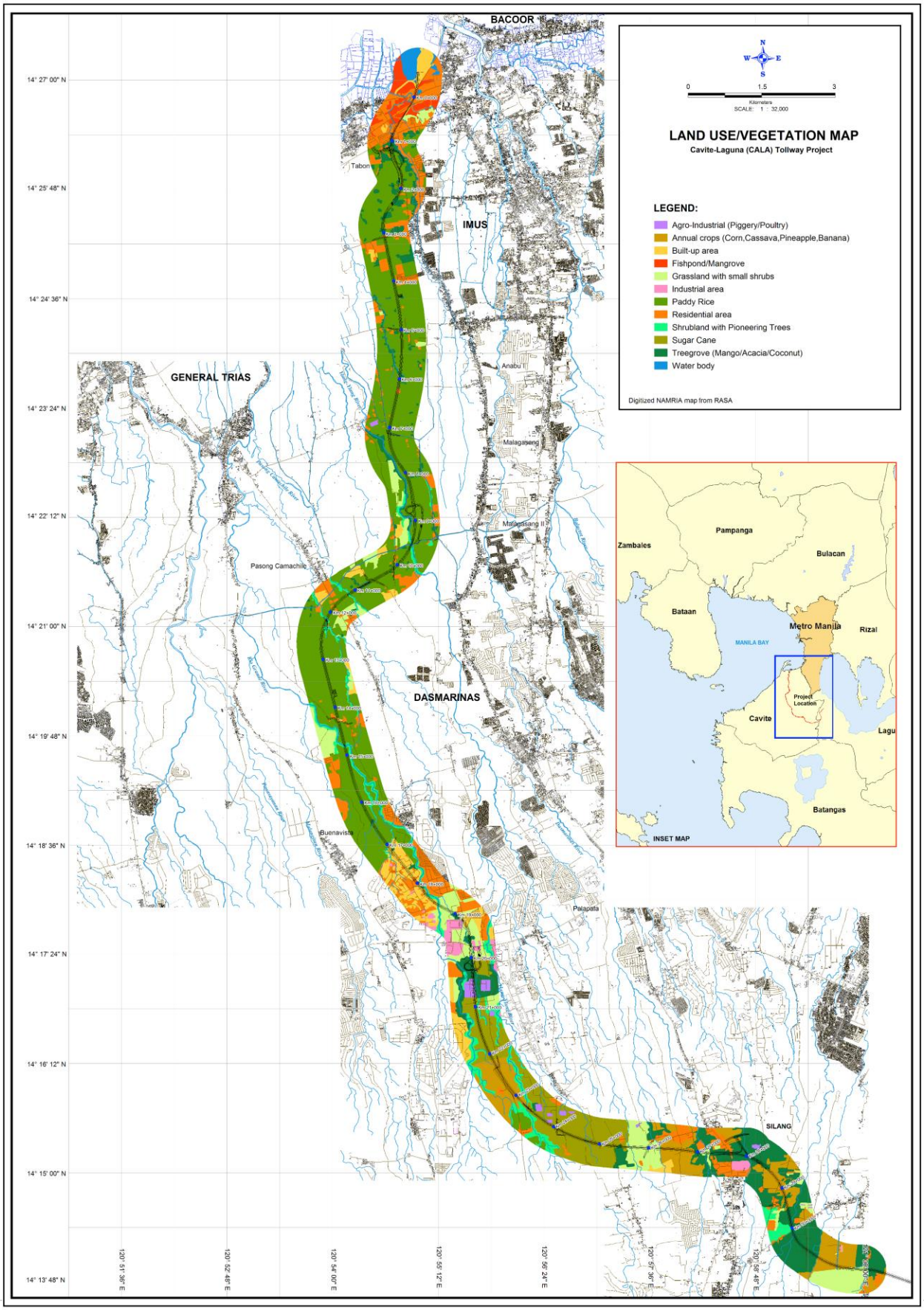

BACOOR
IMUS
GENERAL TRIAS
DASMARINAS
SILANG
Tabon
Anabu I
Malagasang
Malagasang II
Pasong Camachile
Buenavista
Pelapala
14° 27' 00" N
14° 25' 48" N
14° 24' 36" N
14° 23' 24" N
14° 22' 12" N
14° 21' 00" N
14° 19' 48" N
14° 18' 36" N
14° 17' 24" N
14° 16' 12" N
14° 15' 00" N
14° 13' 48" N
120° 51' 36" E
120° 52' 48" E
120° 54' 00" E
120° 55' 12" E
120° 56' 24" E
120° 57' 36" E
120° 58' 48" E
N
W
E
S
0
1.5
3
Kilometers
SCALE: 1 : 32,000
LAND USE/VEGETATION MAP
Cavite-Laguna (CALA) Tollway Project
LEGEND:
Agro-Industrial (Piggery/Poultry)
Annual crops (Corn,Cassava,Pineapple,Banana)
Built-up area
Fishpond/Mangrove
Grassland with small shrubs
Industrial area
Paddy Rice
Residential area
Shrubland with Pioneering Trees
Sugar Cane
Treegrove (Mango/Acacia/Coconut)
Water body
Digitized NAMRIA map from RASA
Pampanga
Zambales
Bulacan
Bataan
Metro Manila
Rizal
MANILA BAY
Project Location
Cavite
Batangas
INSET MAP

Figure 17: Land Use and Vegetation Map

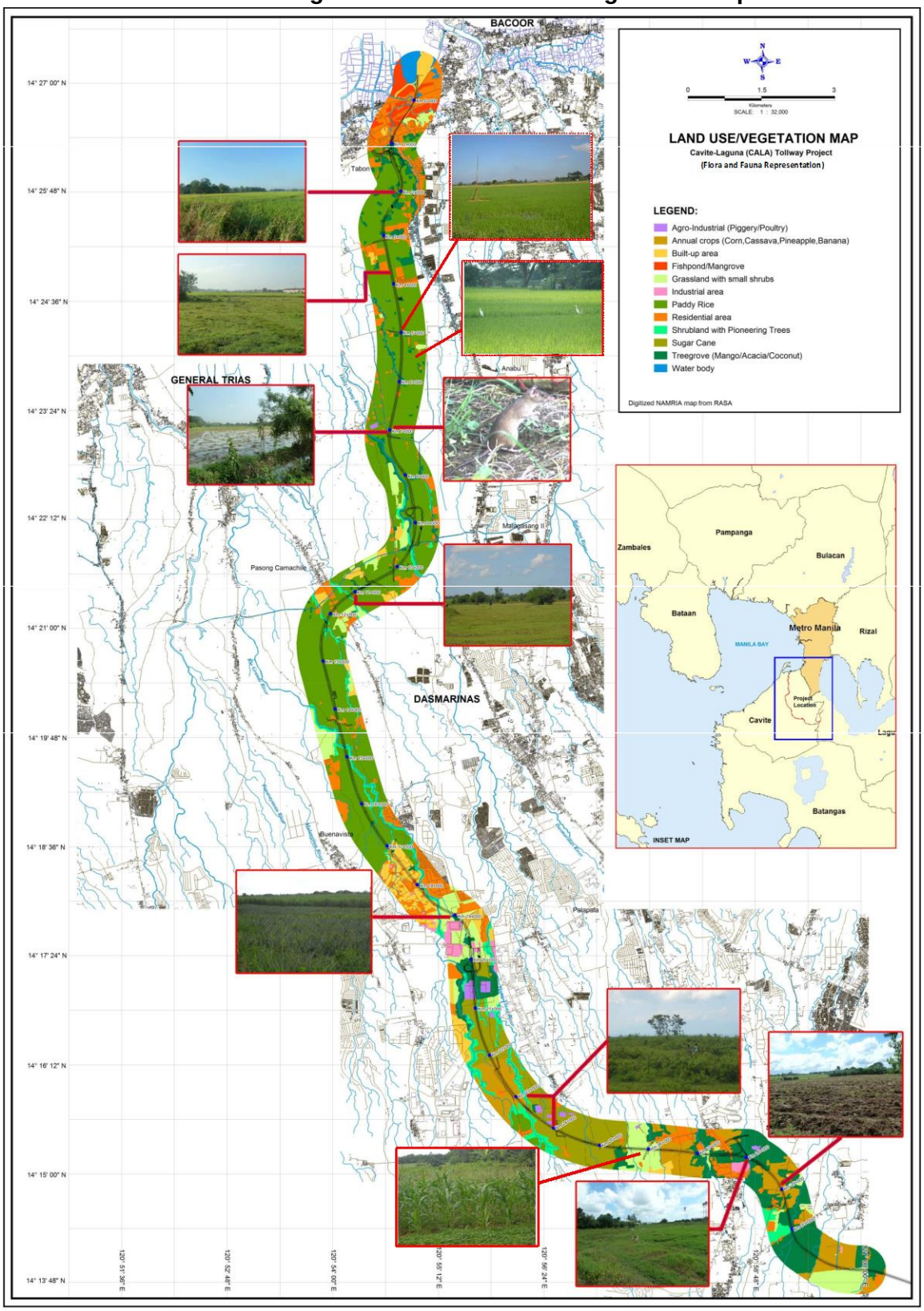


Figure 18: Land Use and Vegetation Map with Photographs

4.1.5.2 Fauna

Avifauna

The type of avifaunal community recorded in the project corridor is typical of agroecosystem and residential areas. The bird composition is dominated by species which are adapted or resilient to human disturbance.

A total of 21 species of birds that belong to 14 families have been recorded in the area (Table 10). Of this number, 17 species were recorded in the irrigated rice field agroecosystem/area and 15 species in the sugarcane/pineapple/corn agroecosystem in the upland/hilly land. 11 species are common to both agroecosystems. Based on the ecological classification based on *Kennedy, et al. (2000),* 18 species are considered resident birds and three are migrants. The three migrant bird species are *H. rustica, B.ibis* and *Lanius cristatus* (Brown shrike).

Table 13: Summary of bird species with their residency status for CALAX (Cavite Section)

Species	Common Name	Family	Distribution
Artamus	White-breasted wood swallow	Artamidae	Resident
Bubulcus ibis	Cattle egret	Ardeidae	Migrant
Centropus	Lesser coucal	Cuculidae	Resident
Cisticola juncidis	Zitting cisticola	Sylviidae	Resident
Corvus	Large-billed crow	Corvidae	Resident
Geopelia striata	Zebra dove	Columbidae	Resident
Gerygone	Golden-bellied flyeater	Muscicapida	Resident
Halcyon chloris	White-collared kingfisher	Alaudinidae	Resident
Halcyon smyrnensis	White-throated kingfisher	Alaudinidae	Resident
Hirundo rustica	Barn swallow	Hirundinidae	Migrant
Ixobrychus sinensis	Yellow bittern	Ardeidae	Resident
Lanius cristatus	Brown shrike	Laniidae	Migrant
Lanius schach	Long-tailed shrike	Laniidae	Resident
Lonchura malaca	Chestnut munia	Estrildidae	Resident
Megalurus palustris	Striated Grassbird	Sylviidae	Resident
Mirafra javanica	Singing bushlark	Alaudinidae	Resident
Passer montanus	Eurasian tree sparrow	Ploceidae	Resident
Porzana cinerea	White-browed crake	Rallidae	Resident
Pycnonotus goiavier	Yellow-vented bulbul	Pycnonotida	Resident
Sterna sumatrana	Black-naped tern	Rallidae	Resident
Streptopelia	Spotted dove	Columbidae	Resident

Dominant Species

By head count, *Passer montanus* has the highest head count of 145, with corresponding count of 86 in rice field and 59 in sugarcane/pineapple/corn plantations. This was followed by *Megalurus palustris* (Striated grassbird) and *Pycnonotus goiavier* (Yellow-vented bulbul) with 31 individuals each. Fourth is the *Bubulcus ibis* (Cattle egret, 29) and *Hirundo rustica* (Barn swallow, 26). These *B. ibis* and *H. rustica* are also classified as migratory birds that visit the Philippines from early September to April. Least species observed are two kingfishers *Halcyon chloris* (White collared kingfisher) and *H. smyrnensis* (White-throated kingfisher) with one head count each.

Tables 11 and 12 present the ecological dominance of the bird species in the community in terms of abundance and frequency and combined score termed as "Importance Value". As expected, *Passer montanus* (tree sparrow) is the most dominant species in both communities based on combined scores of abundance and frequency over other species in the area.

Table 14: Analysis of the avifaunal community recorded in the rice field agroecosystem

Species	Relative Density	Relative Frequency	Importance Value
Passer montanus	39.09	7.69	46.78
Bubulcus ibis	12.73	7.69	20.42
Hirundo rustica	7.27	7.69	14.96
Megalurus palustris	6.82	7.69	14.51
Pycnonotus goiavier	6.82	7.69	14.51
Lanius cristatus	3.64	7.69	11.33
Ixobrychus sinensis	2.73	7.69	10.42
Geopelia striata	2.27	7.69	9.96
Lonchura malaca	3.64	5.13	8.76
Cisticola juncidis	3.18	5.13	8.31
Sterna sumatrana	5.00	2.56	7.56
Lanius schach	1.82	5.13	6.95
Artamus	0.91	5.13	6.04
Centropus	0.91	5.13	6.04
Gerygone	0.91	5.13	6.04
Mirafra javanica	1.82	2.56	4.38
Porzana cinerea	0.45	2.56	3.02

Table 15: Analysis of the avifaunal community recorded in the Sugarcane agroecosystem

Species	Relative Density (%)	Relative Frequency (%)	Importance Value (%)
Passer montanus	41.26	8.33	49.59
Megalurus palustris	11.19	8.33	19.52
Pycnonotus goiavier	11.19	8.33	19.52

Hirundo rustica	6.99	8.33	15.33
Geopelia striata	5.59	8.33	13.93
Lanius cristatus	5.59	8.33	13.93
Artamus	4.20	8.33	12.53
Lanius schach	4.20	8.33	12.53
Cisticola juncidis	2.80	5.56	8.35
Centropus	1.40	5.56	6.95
Corvus	1.40	5.56	6.95
Halcyon chloris	1.40	5.56	6.95
Streptopelia	1.40	5.56	6.95
Bubulcus ibis	0.70	2.78	3.48
Halcyon smyrnensis	0.70	2.78	3.48

The Diversity Index (Shannon-Wiener) of the bird communities observed in both rice fields (2.17) and sugarcane/corn/pineapple (2.04) are both considered low based on the Fernando Biodiversity Scale. This is expected since they are both agroecosystem areas.

Other Faunal Groups

The list of mammalian, reptilian and amphibian fauna is shown in the table below. Only a handful of other vertebrates from other animal groups were observed out of opportunistic observation in the vicinity and informal inquiries from the local residents. Three species of rats were identified. These are *Rattus argentiventer, R. tanezumiand R. norvegicus*. *Suncus sp*. (house shrew) is also present. Bats like *Ptenochirus jagori, Cynopterus brachyotis* and *Macroglossus minimus, as* expected, are also common in the area. Amphibians such as *Bufo marinus* and *Rana* species, reptiles like *Mabuya sp*. and snakes are also found within the project corridor. These are summarized in Table 13.

Table 16: List of other mammals, reptiles and amphibians

Taxa	Species	Common Name
Mammal		
	Rattus tanezumi	Field rat
	Rattus norvegicus	Field rat
	Rattus	Field rat
	Suncus sp	Shrew
	Cynopterus brachyotis *Ptenochirus jagori*	Fruit bat Fruit bat Nectar fruit bat
Reptiles		
	Mabuya sp. Lycodon capucinus	Skink Snake Gecko
Amphibia		
	Rana sp. Kaloula picta	Frog Frog Toad

Threatened Species

No threatened species as listed in the *IUCN Red List* and *CITES List* were recorded in the study area. The recorded species are common and wide in distribution

4.1.5.3 Key Environmental Impacts on Flora and Fauna

During Construction

Loss of Vegetation

Scouring, earth grading and earth movement for the proposed road alignment would mean removal of vegetation which are mostly irrigated rice from Kawit to lowland General Trias and sugarcane/corn/pineapple plantations from Upland General Trias to Silang and their associated weeds. Accordingly, the road alignment width is 60m. This would be minimal as it will only occur along the proposed road alignment with much of the affected plant species mostly being agricultural such as rice, sugarcane, banana, pineapple and corn which are domesticated and quite common.

Loss of vegetation in the project site is minimal and will be confined only along the road alignment. The vegetation along the road alignment is mostly annual agricultural crops and in a few sections, with natural vegetation such as small, non-commercial pioneer trees, a few bamboo stands and ruderal shrub and herbaceous weed species which are typical in an agroecosystem.

It is unlikely that the loss of vegetation in the project site due to the construction of the road project would expose it to greater climate risk and variability because the vegetation that would be cleared is confined only to the road alignment which is presently covered by annual agricultural crops and minimal natural vegetation. After all, the annual agricultural crops including its associated ruderal weeds in the area and some bamboo poles and pioneer trees (for construction and fencing) would still be harvested and cleared even without the project.

Loss of Habitat

The removal of plants could also mean the removal of the animal habitat, feeding plants, perching posts, nesting places and other microhabitat, especially for the avifauna, rats, insects and other invertebrates. The impact is minimal as these animals will just transfer to nearby fields which are out of the proposed alignment.

Disturbance to Wildlife

Actual road construction works including the vibration caused by running, moving and honking vehicles will disturb the wildlife foraging, breeding and nesting in the area. The impact is short term and minimal as wildlife can move to undisturbed portions of the area. These can be mitigated by ensuring that they have fields that they can transfer to in order to continue their feeding, breeding and nesting activities. Revegetation of the surrounding area after construction may be necessary to provide relocation and habitat for displaced wildlife.

During Operation

Hindrance to Wildlife Access

The completion of the new road system will create a physical divider to the otherwise presently interconnected ricefields and fields of sugarcane, pineapple and corn. This may hinder the movement and access of some wildlife species, particularly those crawling and non-flying animals from one side of the road to the other in search of their food, reproduction and shelter. This can be mitigated by provision of culverts and similar structures in the overall design of the road network in order not to block the access of crawling and non-flying wildlife.

Green House Gas (GHG) Removal from Revegetation/Landscaping

During photosynthesis, plants take up CO2 from the atmosphere and store the carbon in their biomass (stems, leaves, roots). Trees take up CO_2 from the atmosphere at a rate of at least 14 kg per year *(ERDB, 2010).*

Based on the number of plants that will be used during the revegetation of the project site, probably through landscaping, the GHG removals (particularly CO2) from atmosphere can then be estimated. If the landscaping/revegetation would use at least 228 seedlings of tree species, then it is estimated that at least 17.5 tonnes of atmospheric CO2 per year would have been removed from the atmosphere by the tree individuals, on the average. At the end of 10 years after planting, it is also estimated that at least 47.6 tonnes of carbon would have been stocked in the tree individuals which is 174.7 tonnes of $C0_2$-equivalent.

4.2 WATER

4.2.1 HYDROLOGY

There are four major rivers that the CALAX (Cavite Section) will intersect. These are the San Juan, Pasong Camachile, Ylang-Ylang and Dasmariñas Rivers. The Pasong Camachile River Basin has a catchment of 10.22 sqkm while San Juan Main Stream Basin is 65.56 sqkm. Panamitan Drainage, Pasong Camachile and San Juan Main Stream form the San Juan River Basin. The San Juan River Basin has a total of 88.2 sqkm of catchment area. The Dasmariñas River Basin (15.09 sqkm) and Ylang-Ylang River Main Stream Basin (43.47 sqkm) form the Ylang-Ylang River Basin which totals 58.56 sqkm. The total of all the catchment areas is 146.76 sqkm.

The CALAX (Cavite Section) will traverse the watersheds on the northern slopes of the Tagaytay-Cavite Highlands. The project corridor specifically, is located in the watershed of San Juan River. San Juan River is an extensive drainage system, the headwater of which originates from the Tagaytay Ridge at elevation of about 650m. These rivers flow northerly towards the coast of Cavite where it forms several distributaries draining into the estuary of Manila Bay. The main tributary of San Juan River is the Ylang-Ylang River. The smaller tributaries of San Juan include Pasong Camachile and Rio Grande River. San Juan River, according to CTi, has a catchment of 146.8 km^2. The watershed map of the project site is shown in Figure 22.

Bridges and structures that will be intersecting San Juan River will be the following. The dimension is taken from the mouth of the river at the shoreline. Hanging Bridge (7.67km), unnamed Bridge (10.03km), Bayan Dam (10.50km) NIA Irrigation Canal (14.40km) Butas Dam (20.70km) Malabon Bridge (23.88km) Pasong Halang Bridge (35.45km).

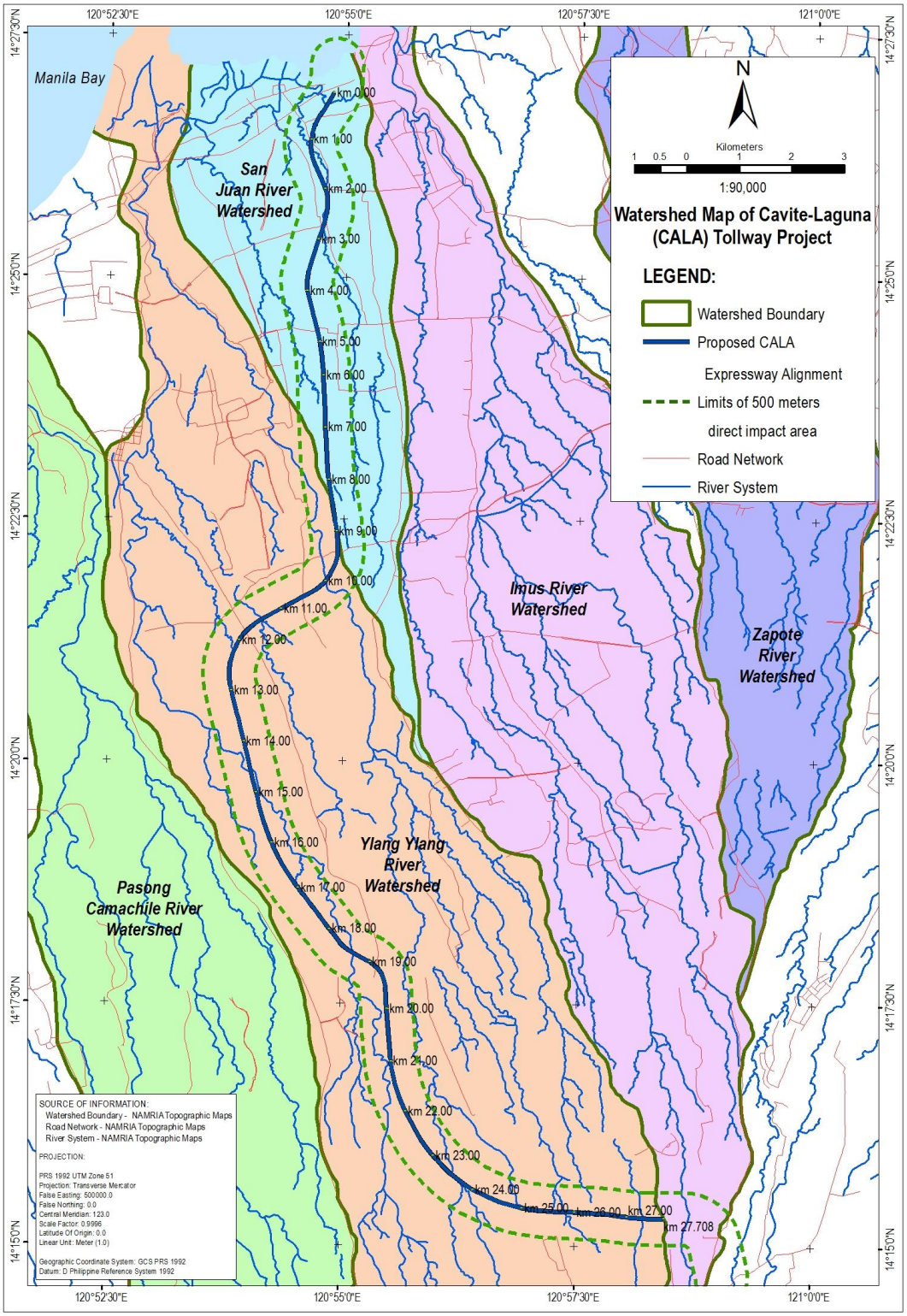


Figure 19: Watershed map

The profile of Ylang-Ylang River shows that there will be a number of bridges traversing this river. The bridges would be Hanging Bridge, which is 5km from the mouth of the river. Sub. Div Bridge (5.86km), Hanging Bridges (6km and 6.25km), Submerged Bridge (7.35km and 9.48 km), NIA Irrigation Canal (11.60km), Pasong Kastilla Dam (12.95km), Confluence with Dasmariñas River (16.90km), Marcelo Dam (17.85km), Ilang-Ilang Bridge (22.6km) and San Agustin Dam (23.85km) and Kalubkob Bridge (34.87km).

Ylang-Ylang River and Pasong Camachile supply water to a number of rural irrigation systems within the CALAX (Cavite Section) host LGUs. These are listed in the following table including the ha of irrigated land being serviced.

Table 19: Rivers and irrigation systems supplied

Source of Irrigation Water	Irrigation System	Service Area in
Ylang-Ylang River	Pasong Kastila Dam, Imus	532
	Butas Marcel Dam, Gen Trias	969
	San Agustin Dam, Dasmarinas	692
	Butas Navarro Dam, Gen Trias	660
Pasong Camachile	Butas Lawang Bato Dam, Gen Trias	632

The other source of irrigation is Imus River which supplies water to irrigation systems in Imus and Dasmarinas, the service areas of which are located away from the project corridor.

The confluence of Ylang-Ylang River with San Juan River will occur at 4.80km. Further downstream the water body will intersect Ilang-Ilang Bridge (4.49km) Noveleta Diversion Bridge (2.96km), National Road Bridge (2.33km) and an unnamed bridge at 1.60km.

The river flows from south to north towards Bacoor Bay. It has a width of 6 to 7 meters and very shallow at less than one meter due to silt, debris and different household wastes. During summer, water flows here mostly from households, commercial establishments, institutions, factories and other sources from the upstream town of Gen. Trias, Imus City and Dasmariñas City.

Photo 5: Creek that separates Barangay Pag-asa 3, Imus City and Barangay Tabon I, Kawit

According to locals and later confirmed by the personnel of CPDO-Imus City, flood level usually rises to more than 1 meter and stays long depending upon the presence and duration of high tide. This is further aggravated by the raging water from Malabon area of Gen. Trias during prolonged heavy downpour. According to residents, flooding problems became worst after the construction of CAVITEX.

4.2.1.1 Peak Discharge

The 100-year peak flow taken from The Study on Comprehensive Flood Mitigation For Cavite Lowland Area in the Republic of the Philippines (CTi Engineering International Co., Ltd, January 2009) for San Juan and Ylang-Ylang at the NIA Canal was estimated to be 633m^3/s and 735m^3/s respectively.

4.2.1.2 Existing Drainage and Flooding

The *CTi Study* conducted in depth analyses on the drainage and flooding on the low lands of Cavite. The flood inundation model created was verified against Typhoon Milenyo in 2006 which was found to have a recurrence interval of 100 years. According to the interviews with the residents that were conducted by CTi, the typhoon inundated about 26.51km^2 of the San Juan watershed.

The *CTi Study* states that the low lying areas of Cavite, particularly that for Kawit, Imus and General Trias were inundated during typhoon Milenyo which is considered as the worst typhoon to hit Cavite. This typhoon also caused the collapse of Butas Dam. Butas Dam is located at 20.7km starting from the mouth of San Juan River, which is also at an offset of 2.67km from km 16+75 of the CALAX (Cavite Section) alignment.

One of the reasons for flooding was that most of the canals and rivers sections are not adequate enough to handle the runoff and are further aggravated by the amount of debris that end up in the waterways.

The *CTi Study* also proposed several options to mitigate flooding in the area. Among the proposal are retarding basins and retention ponds. Engineer Nodoc of the National Irrigation Agency (NIA) was interviewed last November 15, 2011 during which he advised that the flood measures indicated in the CTi study were still not implemented at this time.

The flood modelled the spread of flooding based on future development conditions with and without the flood mitigation structures. The results showed that at the present development condition the extent of inundation for the overall effect of the runoff would be 47.38km^2 for the 50 year and 44.68km^2 for the 30 year rainfall occurrence. The flood water levels generally range from 0.01m to 1.0m. Only a few isolated areas have experienced flooding of more than 1.0m.

The first 4km of the proposed CALAX (Cavite Section) alignment will be passing through the low-lying and flood prone areas of Cavite.

4.2.1.3 Flooding Projections

The document *Climate Change in the Philippines (Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), February 2011)* lists the projected changes in temperature, rainfall intensity and extreme events in the Philippines grouped by region. The table below is specifically for the Cavite Region.

Table 17: Seasonal rainfall change (in %) in 2020 and 2050 under medium-range emission scenario in provinces in Region 4-A

	OBSERVED BASELINE (1971-2000)				CHANGE in 2020 (2006-				CHANGE in 2050 (2036-			
Region 4-A	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
BATANGAS	231.0	280.4	856.5	746.4	-29.9	-24.1	9.1	0.5	-11.1	-23.1	17.2	6.3
CAVITE	124.9	242.8	985.7	579.0	-26.1	-28.2	13.1	0.4	-19.1	-30.5	24.2	5.9
LAGUNA	629.2	386.8	845.0	1066.5	-20.2	-31.5	2.9	2.9	0.1	-34.8	6.8	0.4
QUEZON	827.7	382.7	670.0	1229.3	-6.5	-18.6	2.9	5.2	6.6	-20.6	6.5	0.9
RIZAL	262.4	241.5	1001.3	821.8	-13.1	-30.7	12.4	-0.9	-11.5	-39.8	24.8	-0.8

The climate changes are projected by season, December/January/February (DJF) or northeast monsoon season, March/April/May (MAM) or summer season, June/July/August (JJA) or southwest monsoon season, and September/October/November (SON) or transition from southwest to northeast monsoon season.

There is a decrease in the rainfall projections for DJF and MAM for the 2020 and 2050 rainfall. Increase occurs during the southwest monsoon (JJA) and its transition to the southwest monsoon (SON).

The seasonal rainfall for the Cavite area is projected to increase by 13.1% for the 2020 JJA season and by 0.4% for the 2020 SON season.

The seasonal rainfall for the Cavite area is projected to increase by 24.2% for the 2050 JJA season and by 5.9% for the 2050 SON season.

CTi Engineering also ran simulations of the 2020 flood conditions the results of which are shown in the map below (*CTi Study)*.

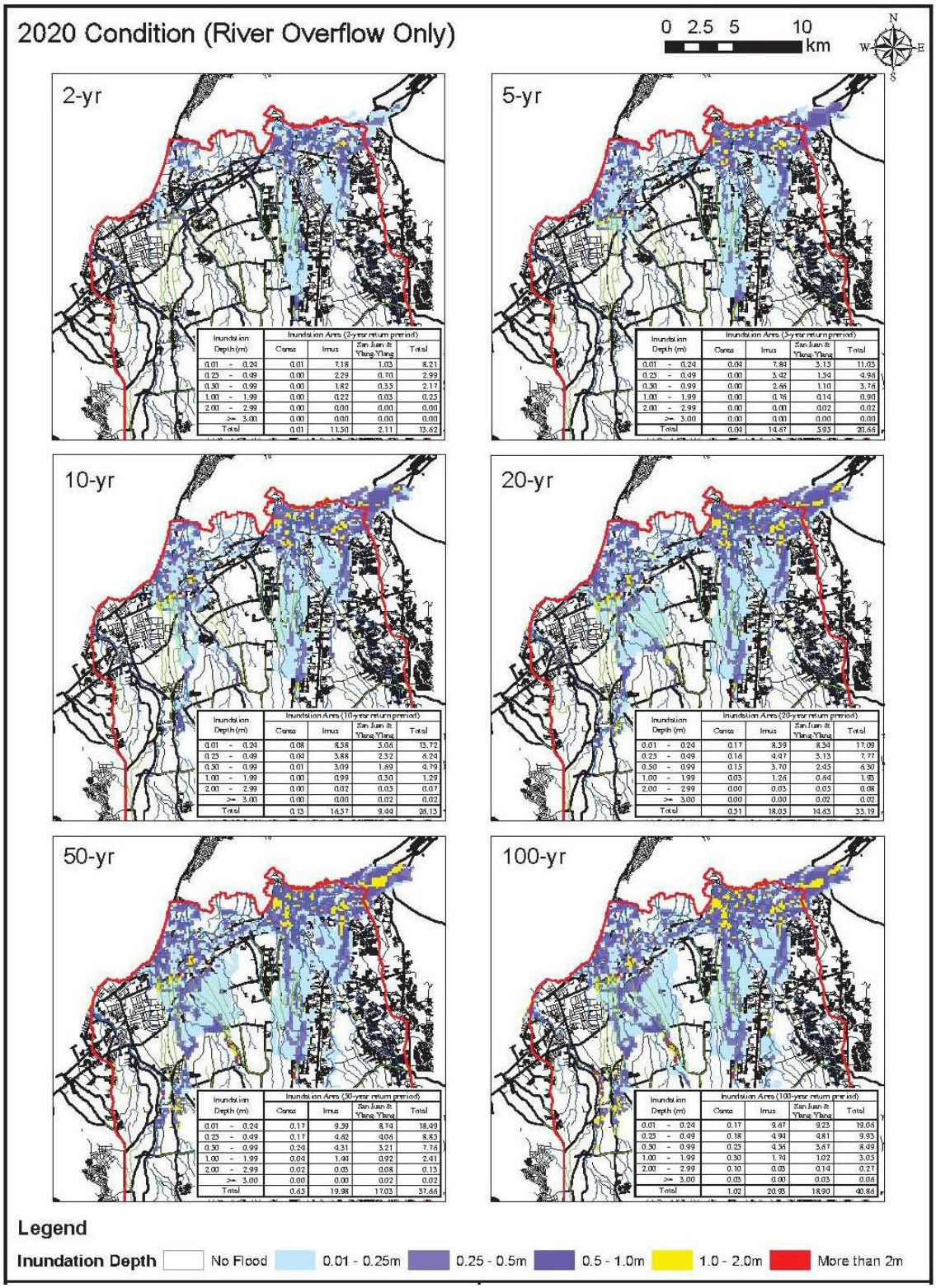


Figure 20: Simulation Result of the Flood Caused by River Overflow (CTi)

The 2020 conditions predicted by the *CTi Study* shows that for the 100 year return period, the flood levels at the location of the CALAX (Cavite Section) would still be under the two

meter level. The CALAX (Cavite Section) will be elevated throughout its alignment with viaducts and bridges in locations where it intersects major rivers and embankment on open fields with provisions for waterway crossings when needed.

4.2.1.4 Depletion of Water Resources / Competition in Water Use

The *Cavite Water Supply Development Study (JICA,1995*), presents a comprehensive study on groundwater and spring data, water supply demands and facilities in the Cavite area.. The CALAX is an elevated highway that will start from CAVITEX and eventually connect to SLEX. The project will not consume large amounts of water during its operation that would deplete the groundwater in the area.

4.2.2 WATER QUALITY

Water samples were collected from the San Juan, Pasong Camachile, Rio Grande and Ylang-Ylang Rivers and tributaries to be traversed by the alignment. Standard water sample preparation procedures were followed. Samples were brought to the laboratory for analysis of the Total Dissolved Solids (TDS), Total Suspended Solids (TSS), oil and grease nitrates, phosphates and heavy metals. In-situ measurements of Dissolved Oxygen (DO), pH and temperature were also conducted. The results were compared with the Class C water quality criteria of DENR Administrative Order 34, series of 1990.

Table 13. Water Quality Sampling Results (taken on May 17, 2015)

Parameter	Unit	Result	Class C Water Criteria	Remarks
A. San Juan River				
Conductivity	microS/cm	13,110	-	
Dissolved oxygen	mg/L	4.60	5 min	Fail
Oil & Grease	mg/l	1.10	2	Pass
Phosphate	mg/l	10.5	0.4	Fail
Temperature	Degree C	27.1	3° inc	
Total dissolved solids	mg/l	6,555	-	
pH		7.35	6.5 – 8.5	Pass
Total suspended solids	mg/l	20	Not more than 30 mg/l increase	
Nitrate	mg/l	19.9	10	Fail
Arsenic	mg/l	<0.03	0.05	Pass
Cadmium	mg/l	0.024	0.01	Fail
Lead	mg/l	0.095	0.05	Fail
Mercury	mg/l	<0.00009	0.002	Pass
Copper	mg/l	0.018	0.05	Pass
Chromium (Total)	mg/l	0.064	0.05	Fail
B. Pasong Camachile River				
Conductivity	microS/cm	3.71	-	
Dissolved oxygen	mg/L	4.60	5 min	Fail
Oil & Grease	mg/l	1.00	2	Pass
Phosphate	mg/l	4.46	0.4	Fail
Temperature	Degree C	26.8	3° inc	
Total dissolved solids	mg/l	249	-	

Parameter	Unit	Result	Class C Water Criteria	Remarks
pH		8.04	6.5 – 8.5	Pass
Total suspended solids	mg/l	28	Not more than 30 mg/l increase	
Nitrate	mg/l	8.32	10	Pass
Arsenic	mg/l	<0.03	0.05	Pass
Cadmium	mg/l	<0.002	0.01	Pass
Lead	mg/l	0.195	0.05	Fail
Mercury	mg/l	<0.00009	0.002	Pass
Copper	mg/l	0.014	0.05	Pass
Chromium (Total)	mg/l	0.01	0.05	Pass
C. Rio Grande River				
Conductivity	microS/cm	201	-	
Dissolved oxygen	mg/L	5.0	5 min	Pass
Oil & Grease	mg/l	1.20	2	Pass
Phosphate	mg/l	4.59	0.4	Fail
Temperature	Degree C	27.0	3° inc	
Total dissolved solids	mg/l	141	-	
pH		7.99	6.5 – 8.5	Pass
Total suspended solids	mg/l	45	Not more than 30 mg/l increase	
Nitrate	mg/l	4.66	10	Pass
Arsenic	mg/l	<0.03	0.05	Pass
Cadmium	mg/l	<0.002	0.01	Pass
Lead	mg/l	0.196	0.05	Fail
Mercury	mg/l	<0.00009	0.002	Pass
Copper	mg/l	0.035	0.05	Pass
Chromium (Total)	mg/l	0.05	0.05	Pass
D. Ylang-Ylang River				
Conductivity	microS/cm	228	-	
Dissolved oxygen	mg/L	4.20	5 min	Fail
Oil & Grease	mg/l	1.70	2	Pass
Phosphate	mg/l	3.81	0.4	Fail
Temperature	Degree C	26.9	3° inc	
Total dissolved solids	mg/l	157	-	
pH		7.65	6.5 – 8.5	Pass
Total suspended solids	mg/l	4	Not more than 30 mg/l increase	
Nitrate	mg/l	11.3	10	Fail
Arsenic	mg/l	<0.03	0.05	Pass
Cadmium	mg/l	<0.002	0.01	Pass
Lead	mg/l	<0.006	0.05	Pass
Mercury	mg/l	<0.00009	0.002	Pass
Copper	mg/l	0.011	0.05	Pass
Chromium (Total)	mg/l	<0.003	0.05	Pass

Notes:

(a) – The allowable temperature increase over the average ambient temperature for each month. This rise shall be based on the average of the maximum daily temperature readings recorded at the site but upstream of the mixing zone over a period of one month.

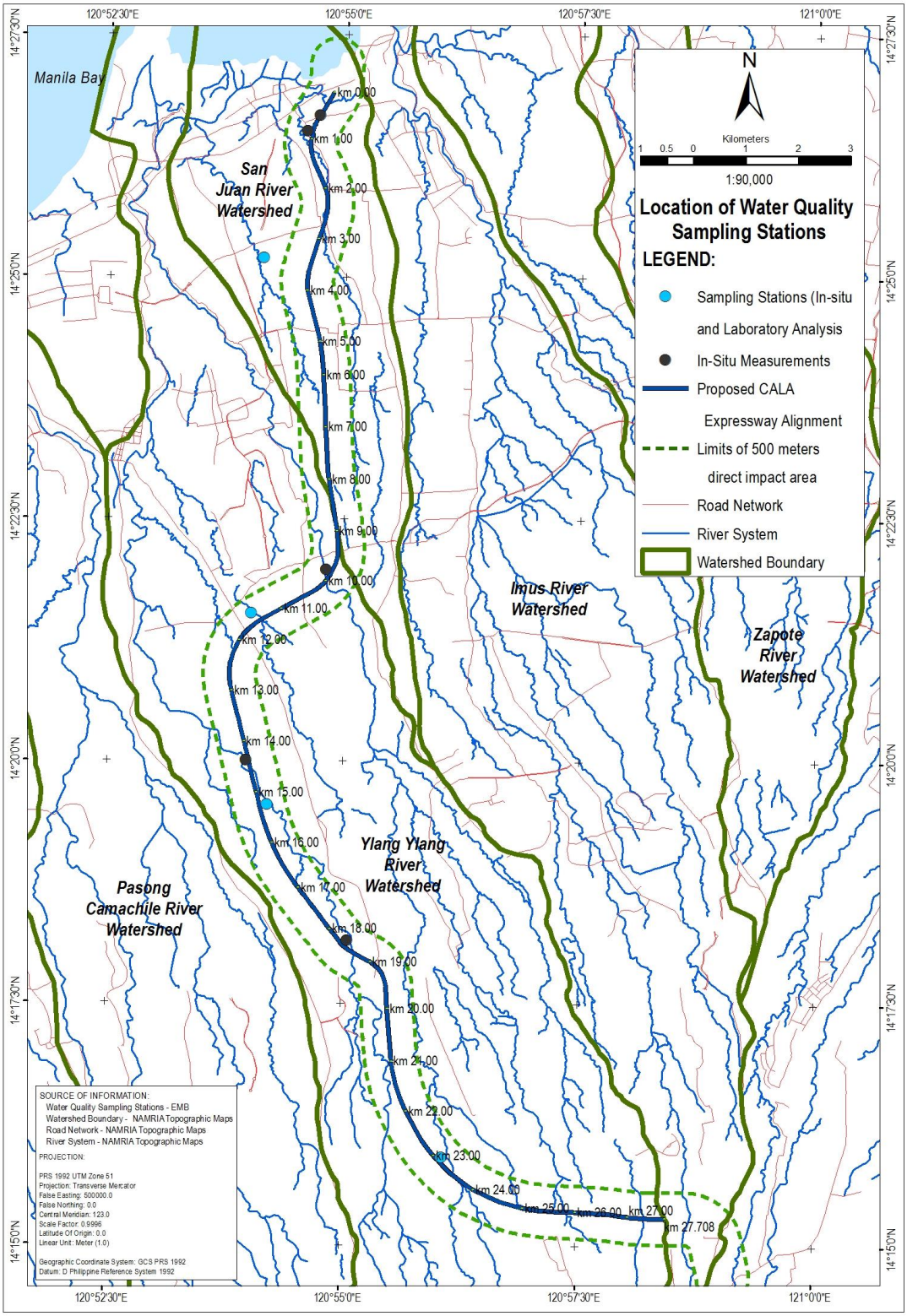


Figure 21: Location of water quality sampling stations

The results indicate that the water quality failed to comply with the water quality criteria for Class C as defined by DENR Administrative Order 34, particularly in terms of phosphate, nitrate, and heavy metals such as cadmium, lead, and chromium (total), particularly at the San Juan River. Phosphate levels at the four rivers were notably above the water quality criteria of 0.4 mg/l for Class C water. Source of phosphate include polyphosphate in detergents, raw sewage and runoff from farms. Nutrients are substances necessary for the growth of all living things. Examples of nutrients include nitrogen, carbon, potassium and phosphorus. However, too much nutrients in water bodies can contribute to algal blooms. The detection of high levels of nitrates and phosphates indicates that water quality in the rivers may be affected by agricultural runoff containing fertilizers and sewage from settlements in the watershed. The rivers also receive the discharges from settlement areas. These organic contaminants affects the water quality of the rivers and is contributing low DO levels which are not compliant with the Class C water quality criteria.

Of the three rivers, the water quality of San Juan River is the worst. Levels of cadmium, lead and chromium were also detected in the water sample from San Juan River. These heavy metals may be contributed by the various industrial and commercial establishments that are operating in the San Juan watershed and which are discharging wastes into the river.

Previous water quality sampling was also conducted by SMEC on the four rivers. The pH values measured from the different stations showed that river water is moderately to slightly acidic. The lowest pH value was obtained from the headwater station in Nabaoy River. However, the downstream station, e.g. Nagatan, Dalamuan and lower reaches of Nabaoy showed increasing pH values. Conductivity measurements obtained in all the sampling stations showed values typical of freshwater.

The DO values are relatively low considering that measurements were done in moving water. It is possible that the relatively low DO is due to an increase of organic load in the river since it was rainy during the time of the field survey. It is notable that the concentrations of total suspended solids in the main river channels of Unidos River, Napaan and Nabaoy are very low, indicating a very low rate of soil erosion in the watersheds.

Very low oil and grease concentrations are detected in the water samples, but these could be due to natural sources since the sampled rivers are remote and there are no obvious anthropogenic sources of pollution.

Secondary data on water quality were also gathered from the DENR. Based on DENR monitoring, the water quality, specifically the Biochemical Oxygen Demand (BOD) concentration of both Imus River and Ylang-Ylang River in the Province of Cavite has a value above the maximum criterion for Class C as stipulated in *DAO No. 34, series of 1990*. As Class C water, its water quality is suitable for the propagation and growth of fish and other aquatic resources, limited recreational use (boating, etc.) and as industrial water supply (Class 1- for manufacturing processes after treatment).

Both rivers are used as floodway and point of waste water discharges from industrial and commercial establishments. Similar to other rivers traversing thickly populated areas, the water quality of the river is observed to be physically deteriorated due to industrial effluents, domestic sewage, garbage disposal and other site development projects *(DENR 2010).*

The outcome of the baseline characterization of the quality of the rivers along the project corridor is summarized in the following table. It can be gleaned from the table that DO is very low compared to the minimum standard set for Class C at 5 mg/l which could be attributed to organic pollution, which depletes oxygen in the water. The DENR's basis for classification of Imus River and Ylang-Ylang River as Class C is the high BOD.

However, it should be noted that there is no indication of industrial pollution as indicated by the non-detection of heavy metals and low oil and grease as well as low TDS values. TDS is a broad indicator of chemical pollution. TSS is relatively high in Station 1 and Station 2, as indicated by the laboratory result and the turbid nature of the river water as observed during the sampling. Finally, the low phosphate and nitrate values are taken to indicate the absence of agricultural pollution.

Table 18: River water quality along the CALAX (Cavite Section) alignment at selected stations

PARAMETERS	Unit	STN 1 San Juan River	STN 2 Pasong Camachile River	STN 3 Rio Grande River	STN 4 Ylang-Ylang River	Class C DENR Standard
DO	mg/l	1.02	1.09	1.9	1.74	5 (minimum)
pH		7.19	7.01	7.27	7.31	6.5 – 8.5
Temperature	°C	28.9	27	28.9	26.7	
Conductivity	µS/m	432.5	436.1	397.1	264.9	
TDS	mg/l	330	293	290	206	-
TSS	mg/l	25	13	4	5	-
Oil and Grease	mg/l	0.61	0.5	0.8	0.92	2
Nitrate	mg/l	0.54	1	0.95	0.96	10
Phosphate	mg/l	0.66	0.82	0.56	0.36	.4
Arsenic	mg/l	<.02	<0.02	<0.02	<0.02	.05
Cadmium	mg/l	<0.002	<0.002	<0.002	<0.002	.01
Total Chromium	mg/l	<0.03	<0.03	<0.03	<0.03	
Copper	mg/l	<0.04	<0.04	<0.04	<0.04	
Lead	mg/l	<0.01	<0.01	<0.01	<0.01	.05
Total Mercury	mg/l	<0.0001	<0.0001	<0.0001	<0.0001	.002

Source: EIS, SMEC

4.2.3 RIVER ECOLOGY

The most common vegetation within the rivers in the Study Area is the common kangkong. There is no rare species of fish in the rivers of the Study Area.

The common fishes found in the rivers are bia or biya (*Glossogobius*), tilapia (Tilapia), dalag (*Ophicephalus spp*.), hito (*Clarias*) and eel (Anguilla). But given the very low concentration of dissolved oxygen, aquatic life in the rivers must be very limited.

4.2.4 GROUNDWATER

The groundwater resources of Metro Manila and southern parts towards Cavite consist of alluvial sediments along the coastal areas of Manila Bay, Laguna de Bay and Marikina Valley and the pyroclastic sequence of the Guadalupe Formation according to *JICA (1992)* and *NHRC (1993).* According to these studies, the aquifer system covers about 1400 to 1800 sq.km and it is made up of the upper water table aquifer up to 30m depth and the lower artesian aquifer of more than 500m thickness, separated by a semi-confining layer with thickness of up to 45m. Figure 1 presents the hydrogeology map of Cavite.

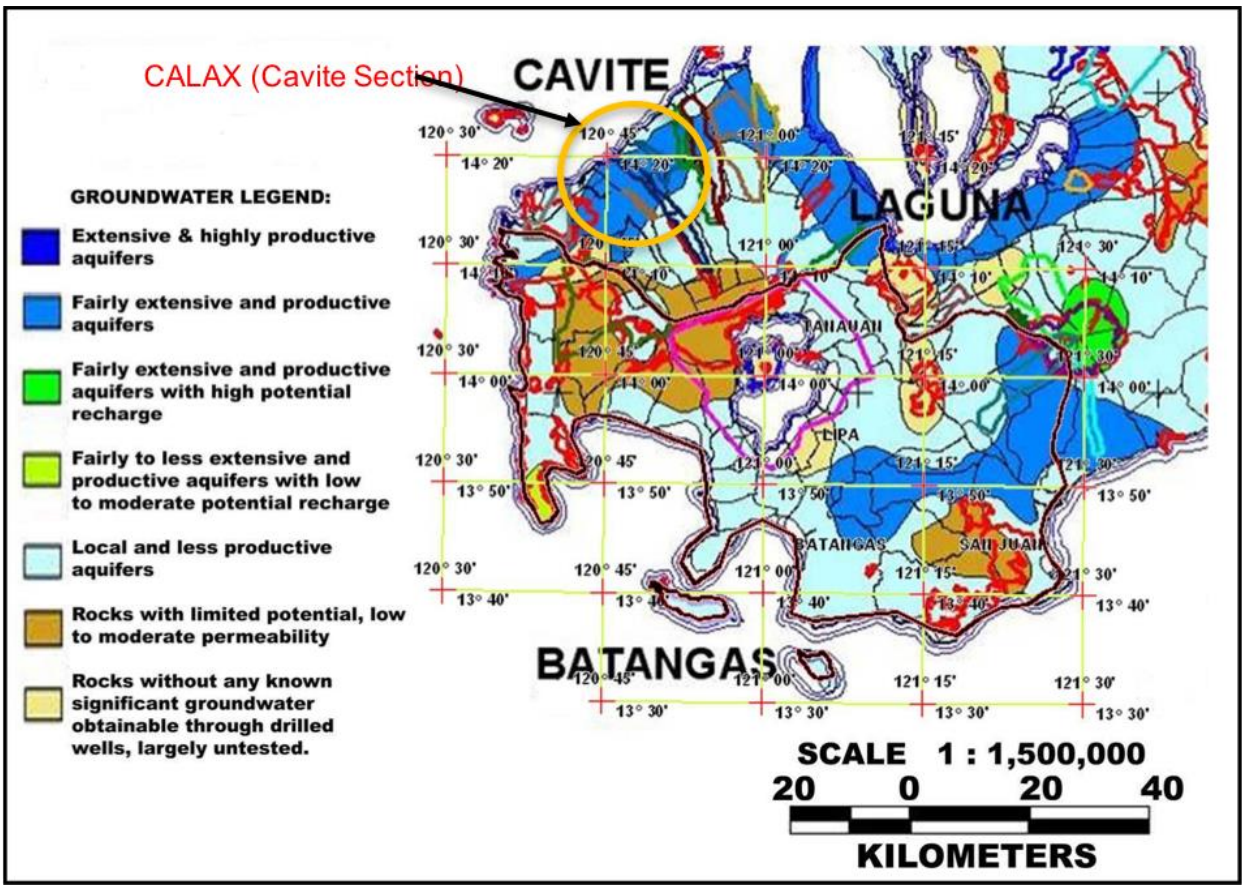
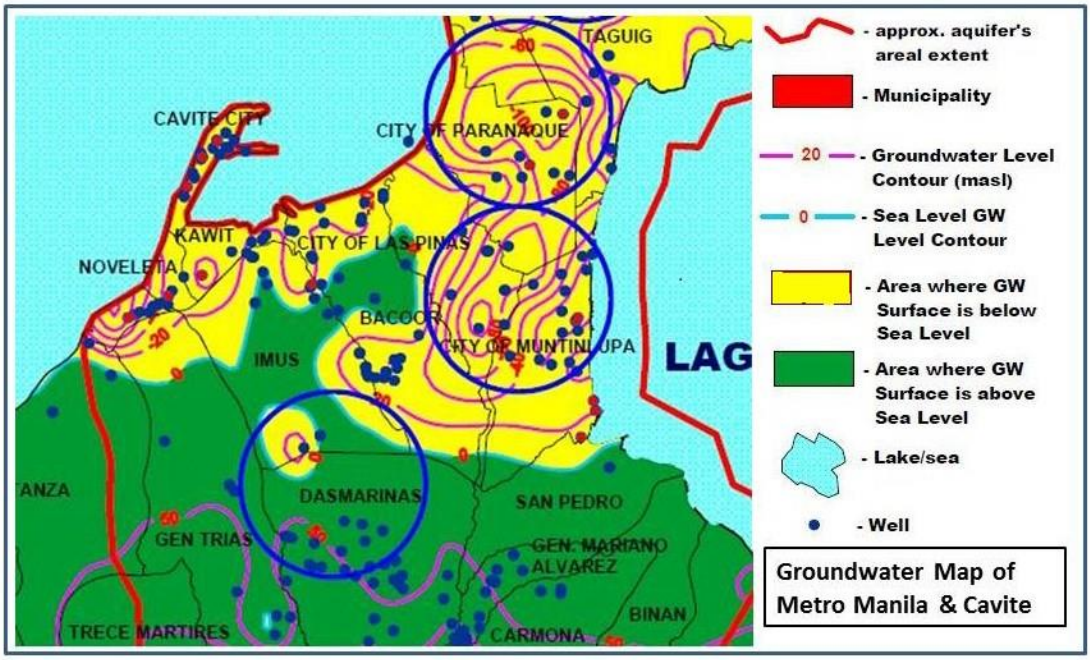


Figure 22: Hydrogeology Map

But groundwater mining has occurred causing the piezometric level to drop severely to more than 100m below sea level *(Clemente et al 2001).* Figure 25 presents the cone of depressions due to heavy groundwater withdrawal. Please note the cone of depression inland in the vicinity of Dasmarinas.



http://cest-inc.com/joomla/images/tech_papers/identification%20of%20groundwater%20critical%20areas(rev).pdf

Figure 23: Cone of depressions due to heavy groundwater withdrawal

The water quality baseline characterization of the major river systems / drainage systems draining the project area is based on physical, chemical parameters and nutrients. Analysis of heavy metals was also undertaken. In-situ measurements were recorded in six stations and laboratory analysis was completed on samples collected from three of these stations.

4.2.5 IMPACTS ON HYDROLOGY AND WATER QUALITY

The project site experiences localized flooding. The drainage lines in the vicinity of the project site are designed with several catch basins and trenches. The pumping stations and drainage systems that were built in the area control flooding.

Silt Runoff from Construction

The land clearing and grading operations will result to the exposure of the soil surface to the forces of weathering. During periods of rainfall, sediments may become eroded and cause surface runoff into the low-lying areas. Dusts and sediments during periods of rainfall may further contribute to overflowing of the drainage system and flooding in the vicinity.

In order to prevent the discharge of surface runoff into the drainage canal, restoration and re-vegetation of easements and buffer zones may be necessary. Sedimentation ponds and silt traps will be necessary within the construction area to avoid the discharge of silt-laden runoff into the drainage canal. As much as possible, construction activities should be timed during the summer months where low precipitation occurs. The mounds of stripped soils should be temporarily covered with impervious materials to minimize erosion and runoff.

Increased Siltation of Rivers

The CALAX (Cavite Section) will have several river crossings (14), with one crossing over a small irrigation water impoundment. Increased erosion rates will translate to more materials that will be transported to the waterways that will be traversed by the proposed road. Current design has indicated that the expressway shall cross the waterways in the project area 22 times.

Flooding due to Embankment

Since the road will be raised (built on embankment) it will have the potential of causing localized flooding. This is of particular concern in the Kawit section (km 0+00 to km 5+00) along the coast which has been identified as flood prone. Figure 26 shows historical data for 100-year floods in this area.

The road project is not expected to cause or exacerbate widespread flooding along its corridor. This is partly due to the natural conditions prevailing in the project site and the design of the proposed road. The factors that lessen the possible impacts of the project on widespread flooding is that the natural lines in the project area are north-south in direction,e.g. natural drainage lines have a parallel pattern, almost linear pattern from its headwater to the coast and the road parallels this general alignment. Also, drainage channels in the upper slopes are deeply incised with higher bankfull capacity. However, overbanking is reported to occur, at the lower slopes. The flood levels summarized below are taken from the *CTi Flood Study*.

Table 20: Flood Levels

Station	100-year Flood levels	50-year Flood levels	30-year Flood levels	20-year Flood levels	10-year Flood levels	Remarks
0+00 to 1+105	0.5 to 1.0	0.5 to 1.0	0.5 to 1.0	0.5 to 1.0	0.5 to 1.0	These are commercial and residential areas. Flooding is until Medicion St.
1+105 to 1+198	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	
1+198 to 1+294	0.5 to 1.0	0.5 to 1.0	0.5 to 1.0	0.5 to 1.0	0.5 to 1.0	
1+294 to 1+395	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	
1+395 to 1+613	0.5 to 1.0	0.5 to 1.0	0.5 to 1.0	0.5 to 1.0	0.5 to 1.0	
1+613 to 1+837	No flooding	No flooding	No flooding	No flooding	No flooding	
1+837 to 1+936	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	
1+936 to 2+953	No flooding	No flooding	No flooding	No flooding	No flooding	These are mostly agricultural areas that are located on higher and steeper elevations.
2+953 to 3+172	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	No flooding	
3+172 to 3+281	0.01 to 0.25	0.01 to 0.25	No flooding	No flooding	No flooding	
3+281 to 3+396	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	No flooding	
3+396 to 3+3491	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	
3+3491 to 3+596	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	0.01 to 0.25	No flooding	
3+596 to 3+707	0.01 to 0.25	0.01 to 0.25	No flooding	No flooding	No flooding	
3+707 to 5+611	No flooding	No flooding	No flooding	No flooding	No flooding	
3+707 to 6+434	0.01 to 0.25	0.01 to 0.25	No flooding	No flooding	No flooding	
6+434 to 28+015	No flooding	No flooding	No flooding	No flooding	No flooding	

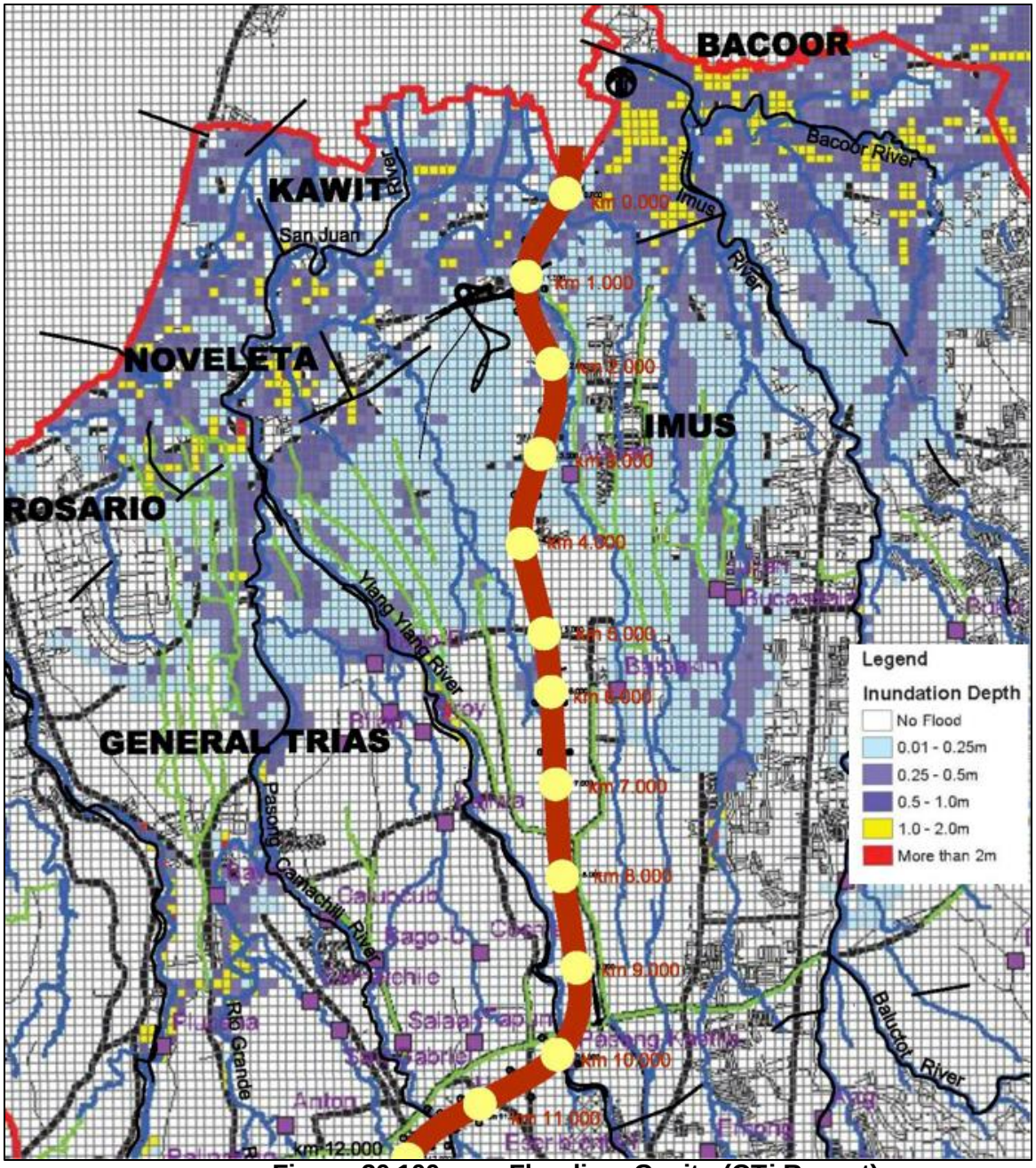


Figure 30:100-year Flooding, Cavite (CTi Report)

Flooding locations were enumerated as follows:

Table 21: Flooding locations

Location	Municipality
Adlas	Silang
Alapan 2-B	Imus
Biga 2, Silang Cavite	Silang
Binakayan	Kawit

Brgy. Batas	Sila
Brgy. Kanluran	Kawit
Brookeside	
Daang Bukid	Bacoor
Ilang Ilang River	
Imus Road	
Kalye 11,Cente	Ka wit
Malagasang, Imus	Im
Noveleta	Noveleta
Pag-Asa 3	Imus
Panamitan Wasak	Ka wit
Sampalocan St.	General Trias
Stateland,	General Trias

A flood map for Kawit was also obtained from the Municipal Government, showing the flood hazard for a five-year flood event. This is shown below at Figure 25.a. Located on the lower left is for the 100-year flood, shown at a larger scale as Figure 25.b.

According to the 100-year flood map of Kawit, flooding in the area of the CALAX (Cavite Section) is until approximately km 1+75. Maximum flood elevation is one meter.

A Flood Prone Area Map obtained from the MPDO of General Trias is shown as Figure 26. The flood prone areas in General Trias are Rio Grande and Barangay Bacao Road, Prinza Dam going to Poblacion Area, Barangay Tapia Road and Barangay Pasong Camachile I Road. The CALAX alignment will not pass through any of these flood prone areas.

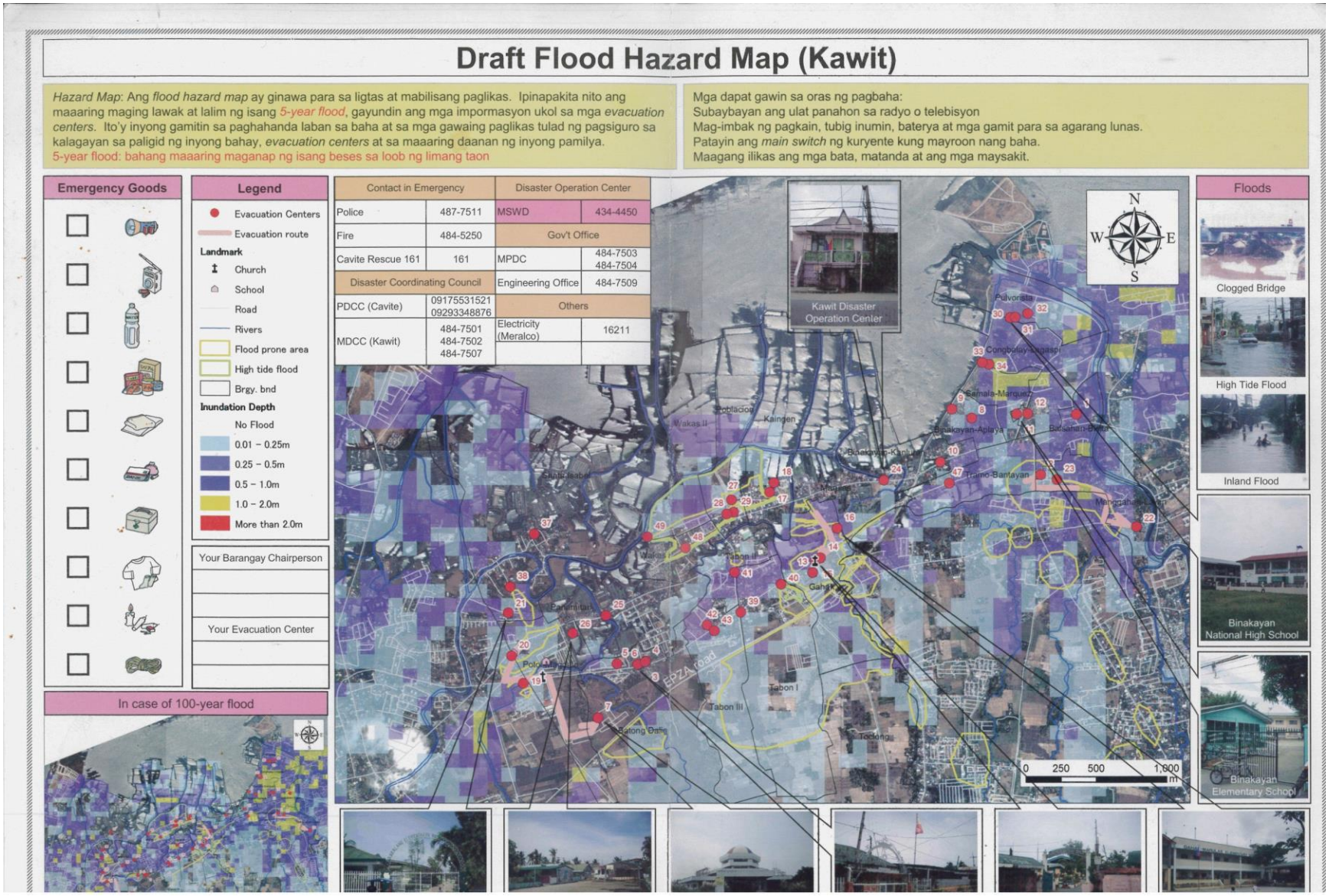


Figure 31.a: Flood Hazard Map, Kawit (5-year)

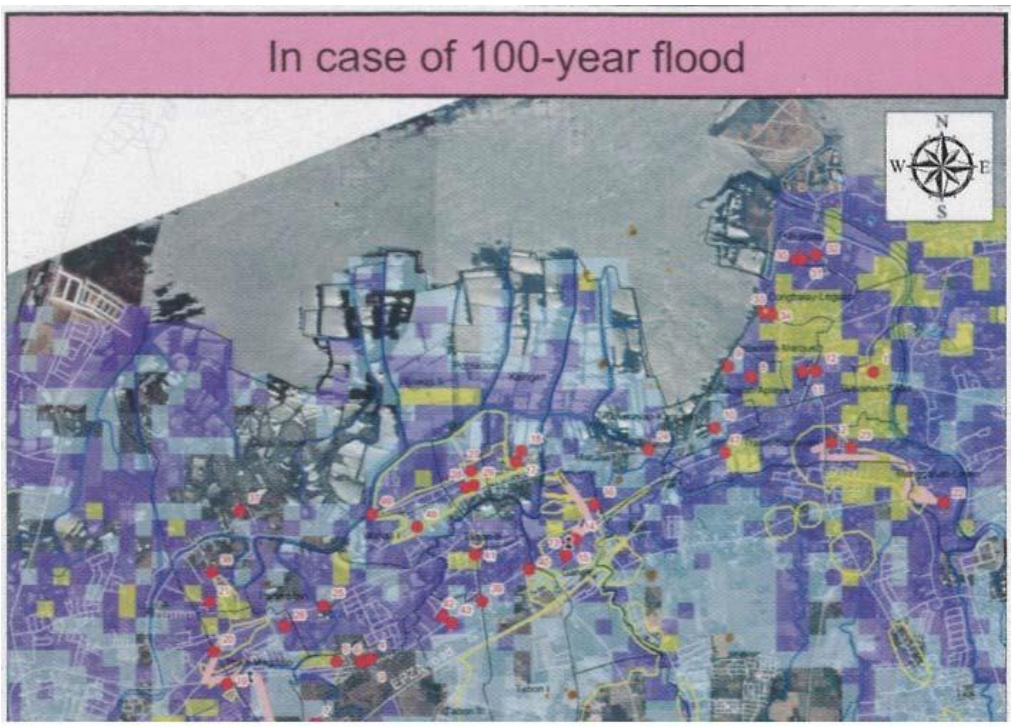


Figure 32.b: Flood Hazard Map, Kawit (100-year)

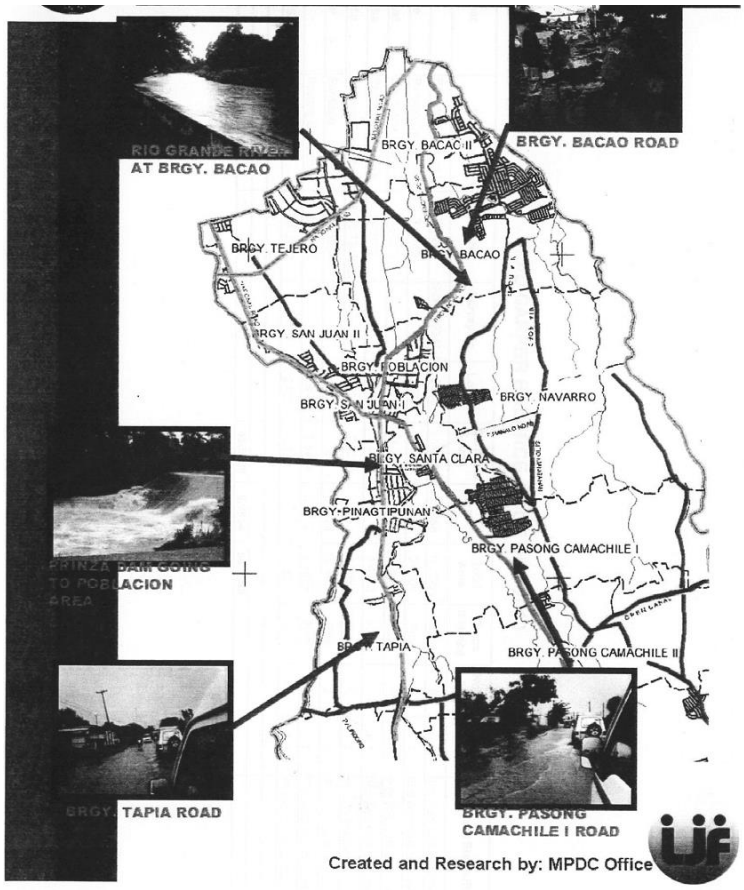


Figure 33: Flood Prone Areas, General Trias

The documents obtained from the Municipality of Silang shows that there are four flood prone areas. These are shown in Figures 33 to 36 below.

The CALAX will not be located in any of the flood prone areas of Silang, however the flood prone area in Adlas, Silang will be approximately 270m from km. 25+00.

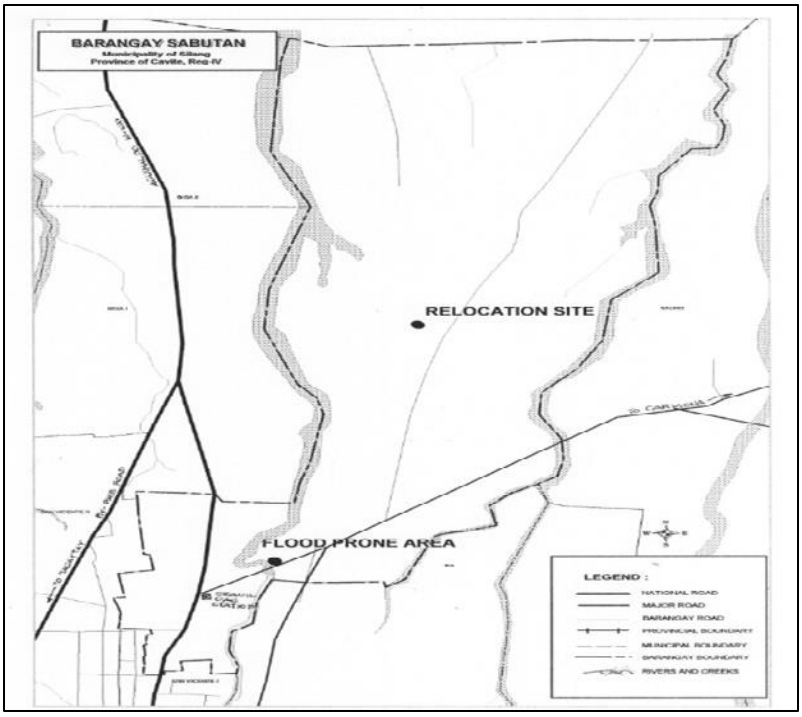


Figure 34.a: Flood Prone Area in Brangay Sabutan, Silang

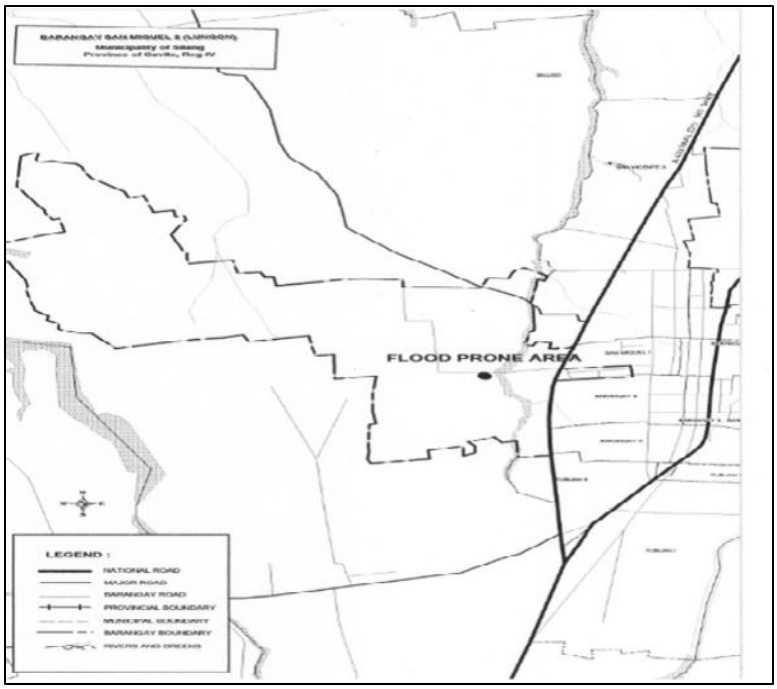


Figure 35.b: Flood Prone Area in Barangay San Miguel II, Silang

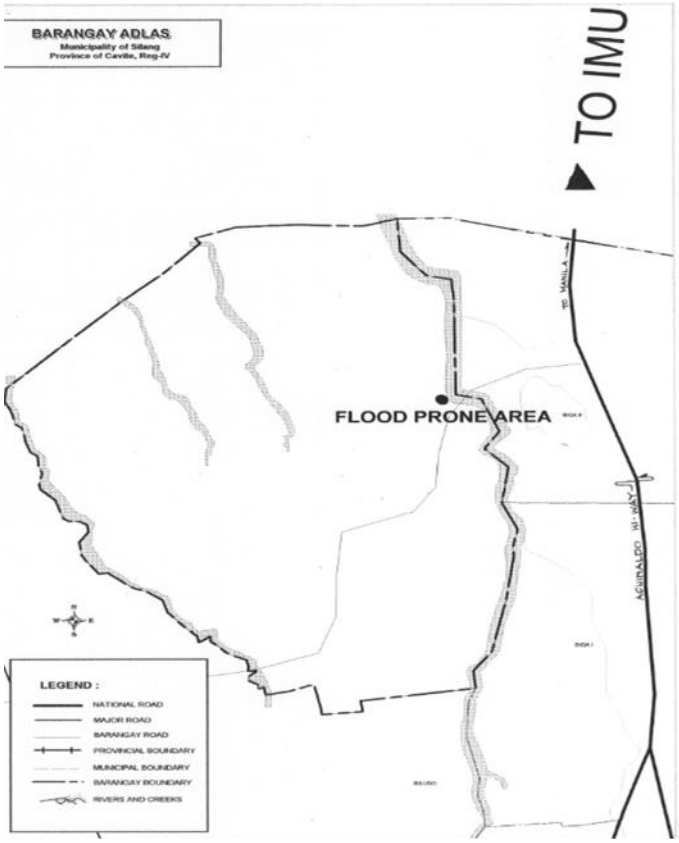


Figure 36.c: Flood Prone Area in Barangay Adlas, Silang

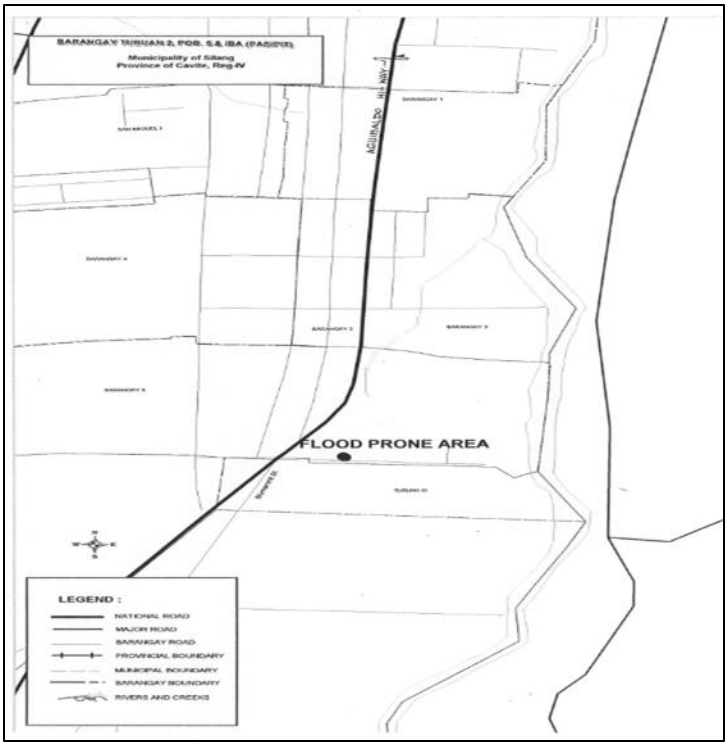


Figure 37: Flood Prone Area in Barangay 5, Silang

km 4+40 to km 9+50 of the CALAX (Cavite Section) will traverse the Municipality of Imus, Cavite. The map below shows the maximum flood level in this area to be one meter.

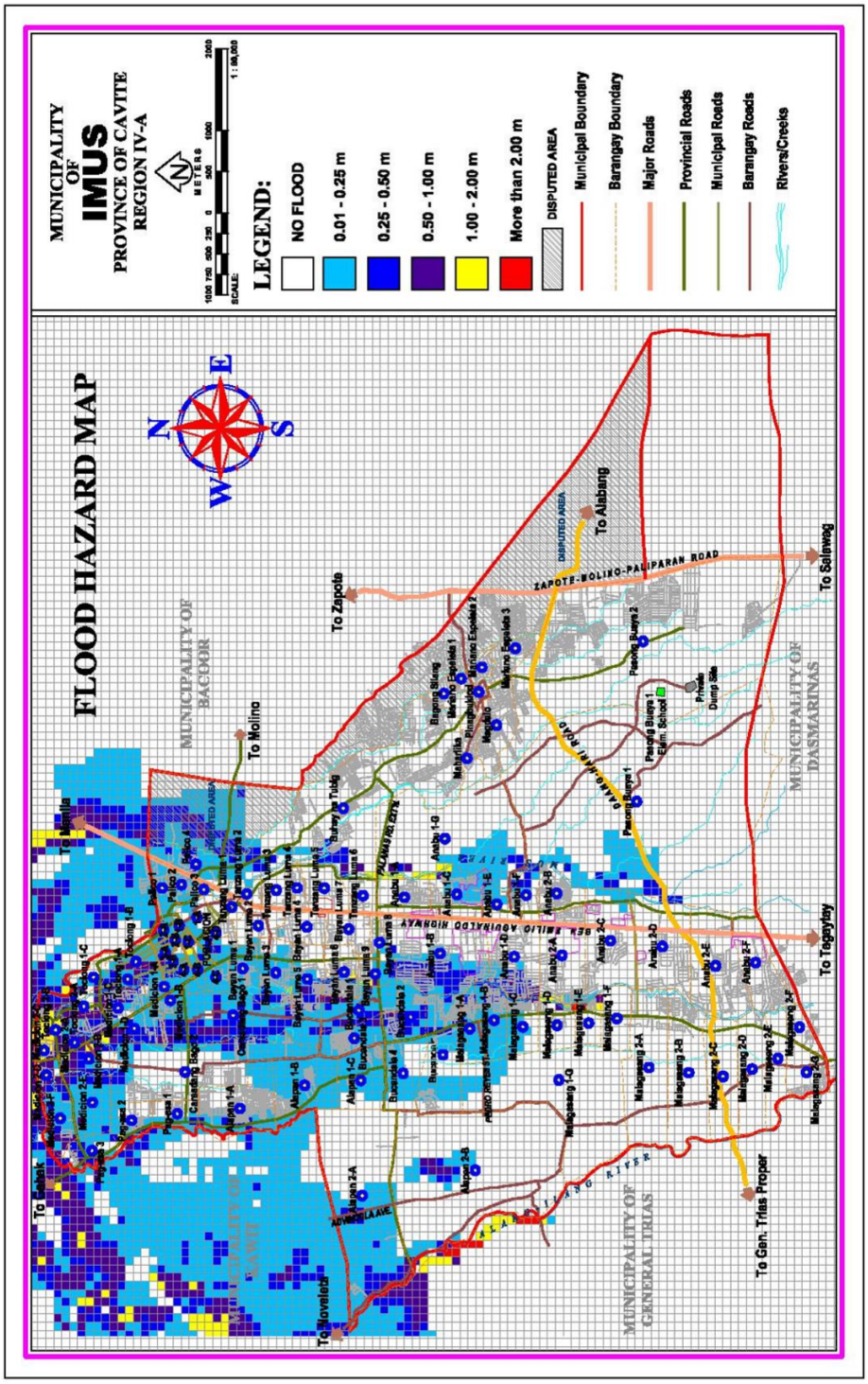


Figure 38: Flood Hazard Map, Imus

Domestic Wastes from Workers' Camp

Another potential source of water pollution during the construction phase is the generation of domestic sewage from the construction camps which include among others, office quarters, sleeping quarters, and toilet facilities.

During the construction stage, domestic wastewater from the sanitation requirements of workers if left untreated could lead to the contamination of surface water and lead to further pollution of the receiving body of water. Therefore, appropriate waste management measures should be instituted during the construction phase to prevent such occurrence. The contractor at the jobsite should install portable toilets or temporary toilets, when appropriate. These toilets should be regularly cleaned to maintain sanitation at the site.

Potential Spill and Leakage of Oil

Potential spill and leakage of fuel, petroleum products, lubricants, solvents, and other pollutants related to vehicle and equipment fuelling, maintenance, and cleaning may cause serious water pollution. The following mitigation measures for reducing such risks are proposed: (i) all vehicles and equipment that regularly enter and leave the construction sites will be fuelled off-site; (ii) Vehicle and equipment wash areas will be properly identified by signs and located away from drainage facilities and watercourses. These will be paved with concrete to contain runoff. All vehicles and equipment that regularly enter and leave the construction sites will be cleaned offsite; and (iii) Storage of construction materials will be away from the drainage canal and retention areas will be provided in order to contain accidental spills of such toxic, hazardous, and harmful construction materials as acidic substances, oil and petroleum products, and asphalt materials.

4.2.6 IMPACTS ON GROUNDWATER

The pumpable water resource in the area is generally controlled by the topography and the westerly flow direction of the groundwater movement and recharge sources.

The project is not foreseen to have an impact on groundwater because there is no plan to abstract from groundwater sources.

4.3 AIR

4.3.1 METEOROLOGY / CLIMATOLOGY

CALAX is located in the region of the Philippines where the prevailing climate type (based on rainfall) is Type 1. This climate type is characterized by a distinct wet and dry season. Dry season is generally from November to April with wet season the rest of the year. The wet season coincides with the southwest monsoon season which is responsible for bringing heavy rainfall to this part of the country. The climate map (Figure 29) of the Philippines below shows the location of the project site relative to the geographic distribution of climate types and frequency of typhoons. Please note that Cavite is located in the region of the country with the highest frequency of typhoon passage (32%).

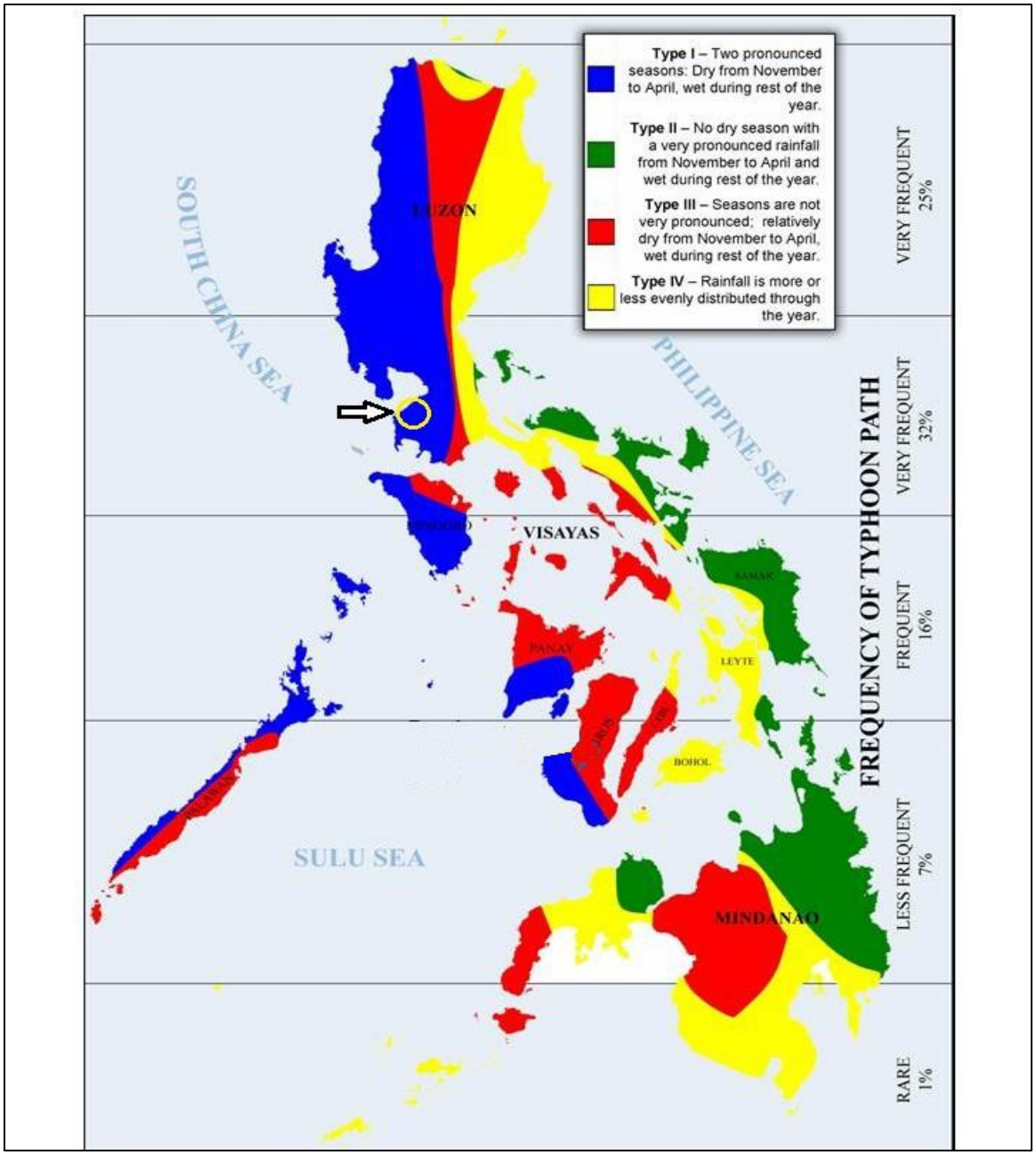


Figure 39: Philippine Climate Map

4.3.1.1 Rainfall

During the period of the dry season, rainfall is less than 50mm per month, while in the rainy season monthly rainfall exceeds 270mm. The annual rainfall significantly increases with elevation, from 2,000mm in the coastal area to 3,800 mm in the uplands.

4.3.1.2 Temperature

Monthly temperature ranges from 20°C to a maximum of 35°C. Mean monthly temperature varies little around a year from 25°C to 30°C. The coldest months are from December to February while the hottest months are from April to May, Mean monthly temperature is 25°C.

4.3.1.3 Relative Humidity

The mean relative humidity is highest from August to September at 85%.

4.3.2 AIR QUALITY AND NOISE

4.3.2.1 Air Quality

Ambient air quality sampling was conducted at the project site on May 16 - 17, 2014 to measure the criteria pollutants namely, SO_2, NO_2, and Total Suspended Particulates (TSP). Figure 12 presents the map of the sampling stations for ambient air quality and noise.

Ambient air quality sampling and analyses in conformity with the DENR standard methods were conducted through Alpine Systems Corporation, as specified in the following table.

Table 14. Ambient Air Sampling Methodology

Parameter	Procedure	Sampling Equipment	Method of Analysis
Total suspended particulates (TSP)	USEPA, 40 CFR 50, Appendix B	Staplex High Volume Sampler	Gravimetric method
Sulfur dioxide (SO_2)	USEPA, 40 CFR 50, Appendix A	SKC Aircheck Sampler	Pararosaniline Method
Nitrogen dioxide (NO_2)	Air Pollution Monitoring Manual, EMB-1994	SKC Aircheck Sampler	Colormetric, Greiss Saltzman

The SO_2 and NO_2 samples were preserved in an icebox while the TSP filters were placed inside a sealed plastic petri dish. The samples were immediately transported to the laboratory for analysis. Analysis was performed at MACH Union Laboratory. Annex D presents the ambient air and noise sampling results.

During the sampling, the weather was cloudy with prevailing light to moderate wind. The following table presents the meteorological conditions during the time of sampling.

Table 15. Meteorological Conditions During the Sampling

Location	Date of Sampling	Average Ambient Temperature (°C)	Average Barometric Pressure (inch Hg)	Average % Relative Humidity	Average Wind Speed (m/s)
Station 1 – Tirona Highway N 14°15'6.23" E 120°32'45.67"	May 17, 2014	33.6	29.62	64.2	1.2
Station 2 – Advincula Road N 14°13'34.03" E 120°33'0.79"	May 17, 2014	35.0	29.68	60.7	1.2
Station 3 – Kalayaan-Toclong Road N 14°13'20.42"	May 17, 2014	35.9	29.65	60.0	1.1

Location	Date of Sampling	Average Ambient Temperature (°C)	Average Barometric Pressure (inch Hg)	Average % Relative Humidity	Average Wind Speed (m/s)
E 120°33'4.21"					
Station 4 Open Canal Road N 14°12'58.43" E 120°32'30.73"	May 17, 2014	34.7	29.62	63.1	1.1
Station 5 – Bonifacio Avenue N 14°13'31.73" E 120°31'56.68"	May 16, 2014	33.5	29.65	62.8	1.3
Station 6 – Casa de Biga Nueva Subd N 14°9'23.11" E 120°31'42.28"	May 16, 2014	35.5	29.74	59.0	1.0
Station 7 – Governor's Drive N 14°10'31.69" E 120°32'47.71"	May 16, 2014	34.9	29.71	60.6	1.1
Station 8 – Aguinaldo Highway N 14°7'40.62" E 120°31'48.50"	May 16, 2014	34.0	29.68	61.5	1.2

Source: Ambient Air and Noise Level Monitoring Report, CALAX, May 16 – 17, 2015

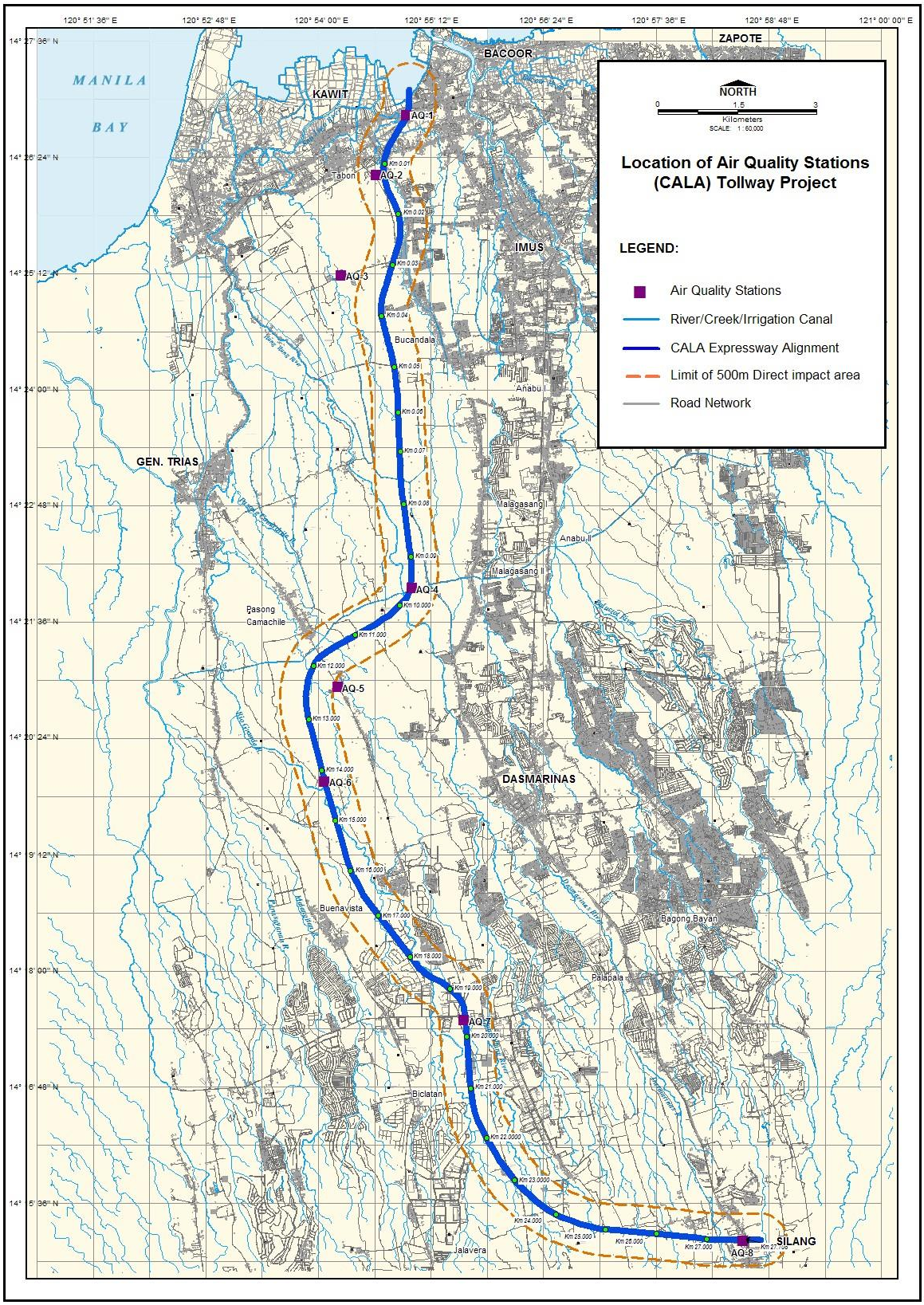


Figure 40: Air and Noise sampling stations

The results of analysis were compared with the National Ambient Air Quality Standards (NAAQS). These standards are specified in the implementing rules and regulations of the Philippine Clean Air Act of 1999. The results indicate that the SO_2, NO_2, TSP and PM_{10} concentrations were within the applicable DENR standards.

Table 16. Measured Air Concentration for One-Hour Monitoring (ug/Ncm)

Location	SO_2	NO_2	TSP
Station 1 – Tirona Highway	14.1	1.9	23.7
Station 2 – Advincula Road	21.0	2.4	25.0
Station 3 – Kalayaan – Toclong Road	15.2	1.8	17.5
Station 4 – Open Canal Road	20.5	2.0	49.9
Station 5 – Bonifacio Avenue	12.5	2.1	12.5
Station 6 – Casa de Biga Nueva Subd	21.2	2.0	33.7
Station 7 – Governor's Drive	27.9	5.2	22.5
Station 8 – Aguinaldo Highway	24.4	2.4	28.7
DENR NAAQ Standards	**180**	**150**	**230**

Source: Ambient Air and Noise Level Monitoring Report, CALAX, March 16-17, 2014

Based on the results of the ambient air quality sampling, TSP, SO_2, and NO_2 concentrations are within the DENR limits. Atmospheric pollution at the project site is due mainly to vehicular emissions because of its proximity to major thoroughfares and wind-blown dusts. There are also settlers who are burning garbage and cooking using firewood inside the property.

Previous ambient air quality sampling was conducted by SMEC in the same eight stations along the proposed CALAX (Cavite Section) alignment. Based on the SMEC sampling, the one-hour ambient ground level concentration of total suspended particulates (TSP) ranges from 34 to 211 µg/Ncm. The DENR standard of 300 µg/Ncm was also not exceeded in all eight sampling stations. The station AQC1(Tirona Highway) recorded the highest TSP level in the selected sampling station for both morning and afternoon sampling of 196 and 211 ug/Ncm, respectively.

For the gaseous pollutants, sulfur dioxide (SO_2) and nitrogen dioxide (NO_2), shows the concentrations level ranging from 15 to 36 µg/Ncm for SO_2 and from 3 to 14 µg/Ncm for NO_2 for the one-hour time averaging sampling. Station AQC1 (Tirona Highway) and AQC8 (Aguinaldo Highway) recorded the highest measured gaseous pollutant concentration for SO_2 and NO_2 for a one-hour time average measurement or one hour sampling period. The one-hour sampling observed concentration is far below the limit set by DENR standard (see Table 25). These values are well within DENR ambient standards of 340 µg/Ncm for SO_2 and 260 µg/Ncm for NO_2 for one-hour sampling.

Table 22: Ambient Air Quality at the Proposed CALAX (Cavite Section) based on SMEC Sampling

Station	Time/Date	Concentration in		
		TSP	SO2	NO2
AQC1 Tirona Highway	0858-0958H	196	3	1
	1440-1540H	211	3	1
AQC2 Advincula Road	1017-1117H	119	2	5
	1620-1720H	122	2	7
AQC3 Kalayaan-Toclong Road	0720-0820H	7	2	7
	1320-1420H	8	2	7

AQC4 Open Canal Road	0710-0810H	128	2	8
	1255-1355H	113	2	9
AQC5 Bonifacio Avenue	0855-0955H	125	2	1
	1510-1610H	159	2	1
AQC6 Casa De Biga Nueva	1020-1120H	5	1	3
	1645-1745H	3	1	4
AQC7 Governors Drive	0740-0840H	171	3	1
	1435-1535H	119	2	1
AQC8 Aguinaldo Highway	0950-1050H	152	3	8
	1610-1710H	146	3	1
DENR Standard	1-hour Sampling	300	34	260

Source: Draft EIS, CALAX, SMEC

4.3.2.2 Impacts on Air Quality

During the construction stage, the expected primary impact of the project on air quality is the increase in TSP concentrations near construction areas. During the construction phase of the project, the civil works and operations will entail digging and excavation of the soil that may cause some level of dust pollution in the air. Winds may carry soil particles to nearby areas, including the adjacent areas.

In addition, the increased number of vehicles moving in and around the project could result to an increase of pollutants coming from motor vehicles.

This is a concern at the Kawit section due to presence of dense residences along the alignment as well as other sections where receptors are located within the 200m primary impact area. Possible sources of fugitive dust are transport and hauling of construction materials, travel of project vehicles over unpaved roads, concrete mixing and batching.

Aside from residents along the alignment, workers themselves are also exposed to health hazards of fine suspended particulate matter (an occupational hazard).

4.3.2.3 Noise Quality

Daytime noise level sampling in the eight locations where the ambient air sampling was also conducted. Noise sampling was conducted using the 1978 Rules and Regulations of the National Pollution Control Commission. Noise was measured in “A” weighting network and “slow response”. Readings in each measuring station pointed at the north, east, south and west to check noise levels in all directions per station. Noise levels were compared with Class A residential standard of 55 dB(a) during daytime (6:00 a.m. to 6:00 p.m.)

Sampling results showed that the noise level measurement at all stations did not exceed the DENR limit for Class A (residential). The highest noise readings were taken at the stations near Governor’s Drive and Aguinaldo Highway. The dominant noise sources in the area during the time of sampling are community noise such as passing vehicles, honking of vehicles, and people talking.

Table 17. Noise Level Monitoring Results

Stn. No.	Location	Time of Sampling	Category of Area (Standard)	Ave SPL (dBA)	Result
1	Tirona Highway	1830H-1835H	Class A (50 dBA)	45.7	Pass
2	Advincula Road	1555H-1600H	Class A (55 dBA)	45.1	Pass
3	Kalayaan-Toclong Road	1320H-1325H	Class A (55 dBA)	46.3	Pass
4	Open Canal Road	1050H-1055H	Class A (55 dBA)	46.4	Pass
5	Bonifacio Avenue	1810H-1815H	Class A (50dBA)	46.3	Pass
6	Casa de Biga Nueva Subd	1600H–1905H	Class A (55 dBA)	46.4	Pass
7	Governor's Drive	1350H-1355H	Class A (55 dBA)	46.7	Pass
8	Aguinaldo Highway	1115H-1120H	Class A (55 dBA)	46.5	Pass

Noise measurements were also conducted by SMEC during the preparation of the draft EIS report using a Center 322 data logging sound level meter on A-weighting scale. The location of noise sampling is the same with the air quality stations. The observed average noise levels for four time periods are shown in Table __.

Table 22: Noise Level Results for the Proposed CALAX (Cavite Section), SMEC

Station	Average Noise Levels in dBA			
	Daytime Period (9AM – 6PM)	Evening Period (6PM – 10PM)	Nighttime Period (10PM – 5AM)	Morning Period (5AM – 9AM)
AQC1 Tirona Highway	76.4	75.9	70.3	71.4
AQC2 Advincula Road	54.1	57.6	54.7	54.7
AQC3 Kalayaan-Toclong Road	58.9	60.5	56.8	56.9
AQC4 Open Canal Road	63.1	64.6	58.0	59.5
AQC5 Bonifacio Avenue	66.9	62.4	51.7	65.6
AQC6 Casa De Biga Nueva Subdivision	56.5	58.7	49.1	53.6
AQC7 Governors Drive	76.5	75.2	65.3	77.7
AQC8 Aguinaldo Highway	72.3	73.5	66.0	77.4
Noise Standard	70.0	65.0	60.0	65.0

Source: Draft EIS, CALAX, SMEC

4.3.2.4 Impact of Noise

The expected noise sources during the development of the project are the construction equipment such as backhoe, graders, pay loaders, generators, compressors and heavy trucks. The expected noise levels at various distances from this equipment are shown in Table 21. In work areas near communities, noise levels may exceed the DENR standards. Noise levels ranging from 70 to 90 dB(A) may be experienced in adjacent areas near the roadsides (Dapitan St.) and immediate property due to passage of vehicles and operation of heavy equipment in the project construction.

Table 18. Expected Noise Levels from Construction Equipment, dB(A)

Site Clearing		Excavation & Earth Moving		Structure Construction	
Equipment	Noise Level	Equipment	Noise Level	Equipment	Noise Level
Bulldozer	80	Bulldozer	80	Pneumatic tool	81-98
Front end Loader	72-80	Backhoe	72-93	Crane	75-77
Dump Truck	83-94	Dump Truck	83-94	Welding Machine	71-82
Grading & Compacting		Jack Hammer	80-93	Concrete Mixer	74-88
Grader	80-93	Landscaping & Clean Up		Concrete Pump	81-84
Roller	73-75	Bulldozer	80	Concrete Vibrator	76
Paving		Excavator	72-93	Air compressor	74-87
Paver	86-88	Truck	83-94	Bulldozer	80
Truck	83-94	Paver	86-88	Cement and dump trucks	83-94
Tamper	74-77				

Table 19. DENR Standards for Noise in General Areas

Area	Maximum Allowable Noise Level, dB(A)		
	Daytime	Morning/Early Evening	Nighttime
Schools, Hospitals	50	45	40
Residential	55	50	45
Commercial	65	60	55
Light Industrial	70	65	60
Heavy Industrial	75	70	65

Source: Official Gazette, 1978 Implementing Rules and Regulations of P.D. 984.
Notes:
Category of Area is as follows:
AA - a section or contiguous area which require quietness such as area within 100 meters from school sites, nursery schools, hospitals, and special home for the aged.
A - a section or contiguous area primarily used for residential purposes.
B - a section or contiguous area primarily used as commercial area.
C - a section primarily reserved as a light industrial area.
D - a section primarily reserved as a heavy industrial area.

Division of 24-hour period is as follows:
Morning - 5:00 AM to 900 AM
Daytime - 9:00 AM to 6:00 PM
Evening - 6:00 PM to 10:00 PM
Nighttime- 10:00 PM to 5:00 AM.

Construction noise can be a nuisance to residents living along the road. Noise attenuation based on the doubling distance rule as shown in the following graph shows that residents living next to the road will occasionally be exposed to high noise levels if no mitigation measures are implemented.

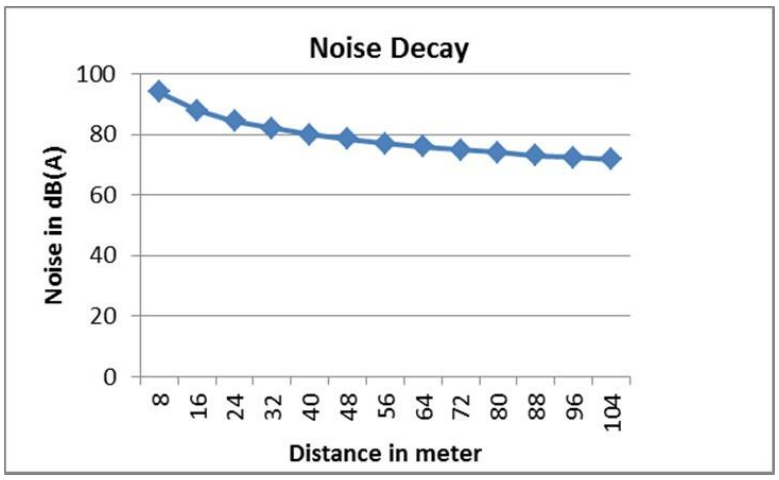


Figure 42: Noise decay based on the doubling distance rule

As indicated in the decay graph, residences within the 200m primary impact area will experience occasional exceedance of noise levels during the construction period, thus the need for managing the noise impact.

4.4 PEOPLE

4.4.1 PUBLIC PARTICIPATION AND DISCLOSURE

DPWH conducted various public consultation meetings about the proposed project. Initial project presentations were conducted for the LGUs of the province, municipalities, cities and barangays to be traversed by the road alignment. The consultations were conducted in the five impact areas of the project, namely, municipalities of Kawit, Silang, General Trias, and cities of Imus and Dasmarinas in Cavite Province. Consultations were also held with the stakeholders such as business sector whose interests will be affected by the project, barangay, municipal, city and provincial representatives, and land developers. The land developers have been identified to be among the key stakeholders that need to be consulted and informed by the project due to the prevalence of land developments along the project corridor which may be directly affected by the project. Follow-up consultation meeting was conducted in December 2013 at the Stateland Hills relative to the design of the proposed CALAX section which will traverse the subdivision. In addition, the proposed project was also presented to the Regional Development Council in February and June 2014. Annex B presents the Public Scoping report while Annex C presents the documentation of the public consultation meetings.

Major issues raised during the consultation meetings are summarized as follows:

Issues and Concerns	Proponent/Consultant Response
KAWIT (November 17, 2011)	
Clarify the Kawit alignment. It will traverse Tuklong – Tabon Road not Advincula.	CALAX will commence at Marulas in Kawit to cross the Open Canal, Amaia Scapes, then to farmlands to avoid affecting many houses. At Governor's Drive, there will be an interchange and the alignment will end in Aguinaldo

Issues and Concerns	Proponent/Consultant Response
Up to where is the viaduct portion in Kawit?	Highway in Silang. Km 27 will connect to SLEX. All major roads will be provided with interchange, viaduct will be used to lessen the effect to environment. The design is still being studied and will be bided out to concessionaires.
How many hectares of agricultural/farmland will be affected in Kawit?	This is still subject to final desin but rest assured that the project ill abide by agricultural laws and regulations.
Can an exit point be in Kawit?	This will be addressed in the final design.
Based on the map, the river going to Tuklong will be affected by the road. If affected, will it be rehabilitated?	CALAX alignmen will not affect or block the stream/river. Government projects should avoid such situation. DPWH will see to it that the issue will be addressed in the final design.
Road enhancement will mean more vehicles and there will be high rate of road accidents. How will this be addressed?	If the expressway will traverse a community, there will be noise and air pollution which needs to be addressed to avoid adverse effects to health of the people. With regards to accidents, there will be limited access by the people because it is not open to pedestrians since it is a toll road where vehicles have to pay to pass the road. Mitigation measures will be provided to address traffic accidents.
Since the toll gate is within the municipality, will the municipality have a share in the taxes?	This will be included in the bid documents.
DPWH should closely coordinate with the Municipal Planning and Development Council (MPDC) during the planning of the project. An exit point near Advincula Road is proposed.	One technical required to be considered in putting up interchanges is the level of vehicular flow. One interchange is very expensive, hence, we cannot put many interchanges to limit the cost and avoid giving high toll to recover the investment. Suggest that the Council to issue a Resolution proposing for an interchange for study of DPWH.
Before approval of right of way, the property owner should get clearance first from the municipality to be able to pay tax deficiencies.	DPWH is coordinating with the Municipal Assessor's Office to determine the owners of properties. Once the lot is identified, DPWH will proceed to the Treasurer's Office to get the name of the owner for them to be informed about the tax deficiencies. Informal settlers are no longer required to secure tax clearance (special case) except for agricultural land and legitimate owners.
In the Assessor's Office, there are many properties acquired by DPWH in Kawit that are not yet subdivided to owners. Who will be accountable for the payment of tax?	Before the properties are subdivided, there is a need for Special Power of Attorney (SPA). Due to the urgency of project, we cannot wait for the subdivision of the properties. What is being done is to have a pledge of undertaking, get the permit to enter, then later on discuss the subdivision of properties and have it forwarded

Issues and Concerns	Proponent/Consultant Response
	to the Assessor's Office.
	Parcellary survey will be conducted to distinguish property lot and the properties belonging to the State.
For informal settlers that will be affected, is there a resettlement program?	The team will coordinate with NHA to look for a resettlement area. NHA will coordinate also with the LGUs for the resettlement site. Also road line interview for informal or real estate developer will be conducted to address this matter.
	If there is a resettlement site in the municipality that is identified in the CLUP, DPWH can assist in the development of the site but the purchase of the lot will be shouldered by the concerned LGU.
In case the affected lot was planted by the caretaker with many trees, are these going to be paid?	This will be included in the Resettlement Action Plan (RAP). All structures, irrigation canal, electric post, etc. have corresponding payments.
IMUS (November 17, 2011; December 2, 2011)	
How many kilometers of road will be in Imus?	It is almost 6 kms long starting at Km. 1 (right side) Estella Homes, Borromeo up to the Open Canal.
Based on the alignment map, there are several houses to be affected. Many of the areas to be covered by CALAX are owned by developers. What should he SB of Imus do if CALAX is not yet very certain? Do we wait for 3 to 5 years before we proceed with our ow development plans?	CALAX project started 10 years ago because we are not yet certain on R1. Several studies were undertaken by JICA and DPWH proposing several alignments. The latest alignment shown is the final version for Cavite side and this has lesser impact compared to the other alignment options. Most of the affected land are rice land or farmland and not much houses. DPWH has been coordinating with the MPDO of Imus for the past five years regarding the proposed alignment of CALAX.
DPWH should be strict in regulating proliferation of establishments and informal settlers on the road side once the expressway is established.	There will only be 2 exit points – in Open Canal and at Governor's Drive. The expressway design will be fenced and elevated so outside edges of the road are fully secured and protected.
In Imus, the only exit at the moment is in Daang Hari. If there is heavy traffic in Bacoor and Kawit up to Coastal area, it will add up to the heavy traffic congestion in Imus. Full support for the proposed CALAX is affirmed to alleviate the present traffic problem.	DPWH is thankful for the support. There is a need to immediately reserve the affected area through a resolution.
There are many excavation activities of MWSS along Cavite highway. What is the liability of MWSS with the government to restore the constructed roads? Why not do the excavation during Saturday or Sunday or summer time so as not to affect schools and offices?	DPWH has a MOA with Maynilad. Maynilad will restore the roads that they have excavated. Official complaint letter may be forwarded to the local ditrict of DPWH.

Issues and Concerns	Proponent/Consultant Response
Will it charge higher toll fee which ordinary citizen may not be able to pay?	R1 or CAVITEX entailed high cost because of the reclamation work done in the sea, thus, toll fee is quite high. In the case of CALAX, the toll fee will be probably P60 or less than P100.
How do you define environmental concern in relation to this development project?	An EIS is now being done to be submitted to DENR by SMEC. The study covers all environmental concern from land, water, air, etc. The consultants are studying and identifying the impacts that may be brought about by the construction of CALAX and will be coming up with various environmental and social management plans to mitigate adverse impacts. All concerns will be included in the project design.
Will a flyover be situated in the existing NIA road?	In Kawit, the plan is to put a viaduct. In the Open Canal, there will be an interchange (bridge) and farm crossing for animals like carabaos.
Will there be relocation schemes for residents who will be affected?	Resettlement consultants will evaluate all areas that will be affected to determine the resettlement action plan including compensation package. Livelihood and skills training will be assessed in case of relocation. In the CLUP, there is a reserve area for resettlement and DPWH can assist in the development together with partner agencies like NHA and DSWD.
CAVITEX is not maximized by commuters per observation because of high cost of toll fee. CALAX might face the same predicament.	Access road is narrow that why very few use it. If there is a connection already through the CALAX, people will start to appreciate it. Only P60 will be imposed unlike in R1 which has a high cost of investment.
If there are disagreements on the purchase of the right of way between the government and the property owner, will you change your plan/alignment? Will you still negotiate with other affected lot owners?	It will undergo process. The concerned municipality will provide the resettlement area, then DPWH will be responsible for the development of the area while the NHA will be on housing. The negotiated ale will be based on the the zonal valuation and current fair market value. If there are no agreements reached, it will undergo expropriation proceedings. The Court will issue permit to enter where they like it or not.
The survey team should coordinate first with the concerned barangay captains so that they can jointly explain the project to the affected property owners.	Yes the RAP team will be coordinating with all concerned barangay captains.
Will Pag-Asa 1 be affected also by the road?	No, it is very far.
Will there be enclosures in the road?	Yes, there will be road enclosures but road crossings will be provided.
Where is the entrance of the tollway?	There will be entrance at the Open Canal.
Will there be a flyover and an exit near 7-11?	At end of CAVITEX, there is viaduct, it is

Issues and Concerns	Proponent/Consultant Response
	elevated. There is no exit but the road is open because it has existing toad (up to 1 km). At Governor's Drive, it is elevated also.
SILANG (November 21, 2011) How long is the road traversing Silang?	Silang starts from Km 25.4 to 27 and covers 4 barangays, namely: Batas, Adlas, Biluso, and Biga II. Originally, alignment was near the school but later was changed near Eurotiles where the project ends.
What will happen to the private properties to be affected by the project?	We have to evaluate on the ground if there are structures to be affected to undertake valuation and compensation. If the owner is not amenable to the payment, zonal valuation will be used as basis. If there is till no agreement on the pricing, then there will be expropriation proceedings. A Municipal Resettlement Action Plan Committee will be created composed of the MPDO, Sangguniang Bayan members, Municipal Agricultural Officer (MAO), concerned stakeholders, and affected individuals.
When will the project start?	CALAX' timeline is projected to be completed by 2016. There will be detailed engineering design then an invitation for investors to bid for the project.
How much is the value of lot near Eurotiles area considering there will be an exit to be located near Km 27?	This will be assessed. There will be interchange in Governor's Drive and Auinaldo Highway and 2 exits only.
Will there be widening of road if there is an exit near Aguinaldo Highway?	The project will have minimal impact on existing structures and will pass through open fields.
In the last Barangay meeting, most of the residents were mad since their lots will be affected by the road and this is their only source of livelihood. The proposed payment is only based on fair market value.	The buying value of affected lots is based on present fair market value, thus, affected residents will not be at a disadvantage.
Can we stop the survey and find other routes for the road?	We cannot just simply locate to other routes. The road alignments were chosen based on several considerations such as safety, speed limit, no sudden curves, etc.
How wide is the road?	60 meter wide with 4 lanes but intended also for 6 lanes.
If the project will push through, where will the funds come from?	The tollway project will be under a Public Private Partnership (PPP) arrangement.
DPWH should also take note of people's sentiments on high toll fee being imposed including VAT which at present is almost 300% increase.	Noted
There is parcel of land which will be affected by the road project which has an on-going negotiation to sell the lot. What will happen with the deal? How much will be the asking price of the government to the affected lots?	Determination of payment will be based on zonal valuation. If there is expropriation proceedings, the Court will determine the real value of land but will be based first on zonal valuation.

Issues and Concerns	Proponent/Consultant Response
Hw much is the value of lot if property is near a subdivision?	The value of lot is higher if near a subdivision. The classification of the land is also important as it commands higher value, e.g. commercial, subdivision, etc.
What is the BIR zonal value?	The BIR zonal valuation is based on current fair market value.
If the Cavite alignment is alright already but the Laguna side still has a problem, will the projects till push through.	The Cavite side will not start without the Laguna side.
GENERAL TRIAS (November 25, 2011)	
How far is Mary Cris complex in Km 11 from the road. Are you going to pay also the farmland that will be affected?	Approximately 100+ meters is the distance from the complex. About 60 meters of the farmland will be affected. Yes there wil be payments but if you are not paying taxes to the municipality, the taxes will be deducted from the payment.
In the open canal area, will an elevated road be constructed?	Yes it is elevated. There will be crossing at the Open Canal.
Will there be crossing in the existing NIA road?	In all existing roads, there will be flyover crossing.
Will there be interchange in all intersection.	Interchanges will be situated at the Open Canal and Governor's Drive only.
Is there a connection from Open Canal to Daang Hari? It is suggested that an exit be aso situated in the Daang Hari area.	At Km 9 and 10, there will be an intersection that will connect to Daang Hari. In all interchanges there will be exitss. The connection in Daang Hari will be further studied whether elevated or not.
It is suggested that drainage system be drained directly to the river and not in the creeks to avoid flooding.	To be considered in the detailed design
Request to have a toll exit in the provincial road near Amai in Barangay Santiago. If the exit is not feasible in Amaia, how about in Buenavista? To create a new road connecting the area of Velagio, what is the spacing?	At least 5 km is the spacing. Suggestions will take into consideration several factors mentioned earlier.
In the San Francisco area eastside of Purefoods, within the yellow line at Km 20, that is the aea where the new General Trias Municipal Office is proposed. The area was donated covering 3 hectares.	In the San Miguel area, there is a proposed elevated interchange.
Will the road pass through Barangay Javelera near Gateway?	No. that is Silang portion already.
Will the LRT housing from the Amaia, near the Open Canal be affected by the road?	All subdivisions will be avoided, except Casa de Biga. The small red line in the alignment is the 60 m right of way while the bid red line is the center road.
When will the project start? Since 2007, we were already being consulted about this project and we have been waiting for this to materialize. We hope that this will not be another DPWH project that has more negative impacts than benefits to the locals.	We are still in the study phase and aims to complete this by 2016. DPWH intends to enhance the consultation process for the CALAX project to win-win situation and to ensure that the project will be cost-effective and beneficial to the locals and economy of Cavite. Lessons learned from past projects have been taken into consideration by the consultants and

Issues and Concerns	Proponent/Consultant Response
	DPWH. We request a municipal resolution will be issued by the LGU of Silang in support of the CALAX project.
Suggest that DPWH install notices such as billboards so that developers will know that there is a proper CALAX tollway project in the area.	Noted.
Most of the affected area is in Barangay Biclatan where there are properties of San Miguel Corporation.	There will be a stakeholder's consultation in Quezon City and San Miguel Corp. has been invited.
At Mary Cris complex, there are farmlands to be affected but the owners have not been notified yet.	In the forthcoming consultations, the RAP team will consult with specific lot owners.
DASMARINAS (December 2, 2011) Where is the coverage of the road in Dasmarinas?	Between Km 24 and 26, near the boundary of Silang, there is a V curve and in the center of that curve is the area covered by Dasmarinas. It is about 600 to 800 meters only. Most of the affected area are farm lots planted with corn and sugarcane.
Is the map based on table map or ground survey?	The map shown is satellite image map. The details will be worked out once the survey starts. Initially, we are doing the assess of the magnitude of project impacts, how much will be paid for the right of way, and processes are being undertaken to secure the Environmental Compliance Certificate (ECC). Detailed engineering design will follow after we have completed the studies needed under the feasibility study phase of the project.
We are now aware that you have already started the survey activities for this project.	Actual surveys will be done after we have secured your permission through consultation process. We will be coordinating with the barangays for all survey activities to be conducted.
Do we have an exit and tolloway to be situated in Dasmarinas? How much is the toll fee?	Estimated fee is about P60.00 to P80.00
Where will the exits points be? How many exits in General Trias?	We target to have four exit points – In Kawit, Open Canal connecting Daang Hari, in Governor's Drive, and at Silang. One exit will be situated in Open Canal.
If the national government will pay the cost of road right of way, will the local government provide for any countyerpart payment to those residents that will be affected?	Only the national government will pay. There is no counterpart from the local government.
Will the project be subjected to environmental assessment?	This activity is for compliance in securing the ECC. It considers the level of social and environmental impact of the project.
Is there a limitation as to the distance between exits? We have an industrial zone if possible to have access for big trucks. Can we have another exit for industrial zone?	At least 5 kms for interchange. Putting exits are expensive, we need to purchase big areas and that will entail higher investment cost which may result to higher toll fee rates also. Filinvest donated a land for their own purpose.

Issues and Concerns	Proponent/Consultant Response
	High-end subdivisions usually donate areas for exits.
If our industrial zone can afford to donate an area, is it possible to have another exit?	Just submit your proposal to DPWH. All proposed exits are outcomes of studies such as traffic flow and congestion.
Is there a possibility that traffic will worsen in next few years starting at the entrance of CAVITEX from Coastal Road?	That is why we proposed CALAX. After CAVITEX, we will put a viaduct. The elevated road will complement CAVITEX and decongest vehicular flow in that area.
CONSULTATION WITH DEVELOPERS (November 29, 2011)	
Our property is in Mary Cris between Km 10 and Km 11. Can you do a new alignment near Km 10 because we have no access to the expressway.	Suggestion will be noted. So far, the present alignment has the best access to local road network and with the least social and environmental impact.
Where is the existing Arnaldo Highway within Km 16? Our project site is Sunny Brooke.	It is located near Purefoods area. It is not affected by the road alignment.
Will the alignment go as far as McDonalds's and Amadello?	Said areas are not affected by the road alignment.
In Km 2 in Kawit area withtin Vereneo cluster near a creek rill the road affect an open space which is still part of our subdivision? Is it possible to move the alignment to the right so it will not affect our project?	We are trying to minimize impact of the alignment. It will cross over the road so it will not affect your project.
Will there be an exit in Kms 17, 18 and 19?	None. An exit will be located between Kms 19 and 20 at Governor's Drive. Next exit will be at the Open Canal at Daang Hari.
In Km 12 is Amaia Scapes project. Can you provide a copy of the parcellary survey of CALAX to our company?	The present and approved alignment shown to you took into consideration all the pertinent data provided by DPWH and LGUs, specifically the MPDOs. In your case, DPWH informed us that there were no developments yet in the area. DPWH district office also advised to offset 100 meters up from our former alignment in consideration of said development in your area. Thus this alignment is basically based on what has been recommended by the authorities to complement the technical considerations for the project. We will secure approval of the DPWH regarding request for copy of the survey.
Is the width of the proposed road right of way of Cavite the same with Laguna side?	60 m road right of way is proposed for the Cavite alignment. However, area with small impact could be avoided by reducing the road right of way.
Will there be an overpass at Km 19?	That part of the interchange is elevated, however, it is still a proposal and currently being studied. As far as the project is concerned, the government sector and the local government units have already approved it in principle. But still much of the area that will be affected is from

Issues and Concerns	Proponent/Consultant Response
	private lands. As long as the traffic warrants we can provide access subject to further assessments and evaluation.
In the Laguna side, will there be more developers affected by the project?	It will only affect Ayala Land, Inc. and Greenhills.

4.4.2 STAKEHOLDER INTERVIEWS

Socio-cultural characterization of the PAFs/ PAPs was conducted through a social survey of households along the Project corridor.

There are three types of PAPs survey interviewed. 267 are those households who are also structure owners, 54 are landowners including the tenants, and 15 are business owners.

Tables 41, 42 and 43 provide a brief socio-economic characterization of the PAPs per Municipality. The tabular presentation of survey results, as well as a detailed analysis of their socio-economic characteristics, is presented in SMEC's *Resettlement Policy Framework and Land Acquisition and Resettlement Action Plan (LARAP)* Report.

4.4.2.1 Household Size

Of the purely household respondents, 119 or 40% of the households have 4-5 members, 30% have 1-3 members, 30% has 6-9, and less than one percent has 10 or more members. This shows that the majority of the households have 4-5 members.

As for purely landowner respondents, 21 out of 54 households have 4-5 members, 19have 1-3 members and 14 respondents have 6-9 members.

4.4.2.2 Residency

Regarding the years of residency of the interviewed PAPs in their current place of stay, the greater percentage of the respondents are new residents (47%), having stayed in their places of residence only from 2000 to present. The rest (13%) have been staying in their residences from 1993-1999. These results show that most of the respondents have stayed in their places for 20 years or at the least, for 12 years.

For purely landowner respondents, the great majority (80%) has been in their places of residence prior to 1992.

12 to 20 years is long enough for any resident to establish a good network of family, friends, classmates, and other support groups. The relocation site for these PAPs should therefore be near their current residential places so as to provide access to the same social network.

The results of the PAPs Survey show that, of those who opted to be relocated, 67% desired for an "in-Barangay" relocation while the remaining 33% preferred to be relocated within the City/Municipality.

4.4.2.3 Religion

Religion is one of the more important aspects of the CALA affected LGUs' community life, especially because several historic churches are located in Cavite. A vast majority of the PAPs are members of the Catholic Church and since several Catholic Churches are found across the Province of Cavite, the PAPs would not be adversely affected by relocation within the Province.

Table 20: Religion of Project Affected Persons (PAPs) by Household

City/ Municipality		Catholic	Protestante	Iglesia Ni Cristo	Aglipay	Islam	Born Again	Jehovah's Witnesses	7th Day Adventist	Methodist	Total
KAWIT	Count	147	4	8	1	-	4	-	1	-	165
	% within MUNICIPALITY	89%	2%	5%	1%	-	2%	-	1%	-	100%
IMUS	Count	43	-	1	-	1	3	1	-	2	51
	% within MUNICIPALITY	84%	-	2%	-	2%	6%	2%	-	4%	100%
GENERAL TRIAS	Count	23	1	-	-	-	1	-	-	-	25
	% within MUNICIPALITY	92%	4%	-	-	-	4%	-	-	-	100%
DASMARINAS	Count	1	-	-	-	-	-	-	-	-	1
	% within MUNICIPALITY	100%	-	-	-	-	-	-	-	-	100%
SILANG	Count	24	-	-	-	-	-	-	1	-	25
	% within MUNICIPALITY	96%	-	-	-	-	-	-	4%	-	100%
Count		238	5	9	1	1	8	1	2	2	267
% within MUNICIPALITY		89%	2%	3%	0.33%	0.33%	3%	0.33%	1%	1%	100%

The table above shows that an overwhelming majority (89% or 238 of 267) of purely household respondents are members of the Catholic Church, with no significant dominance amongst the remaining religions.

Table 40: PAP's Religion by Landowner

Type of PAPs	City/Municipality		Catholic	Protestante	Iglesia Ni Cristo	Born Agai	Jehovah's Witness	Total
Purely	KAWIT	Count	6	-	-	-	-	6
		% within MUNICIPALITY	100%	-	-	-	-	100%
	IMUS	Count	22	-	-	-	-	22
		% within MUNICIPALITY	100%	-	-	-	-	100%
	GENERAL TRIAS	Count	10	1	1	-	-	12
		% within MUNICIPALITY	83%	8%	8%	-	-	100%

Landowner Respondents	DASMARINAS	Count	1	-	-	-	1	2
		% within MUNICIPALITY	50%	-	-	-	50%	100%
	SILANG	Count	8	-	-	4	-	12
		% within MUNICIPALITY	67%	-	-	33%	-	100%
Total		Count	47	1	1	4	1	54
		% within MUNICIPALITY	87%	2%	2%	7%	2%	100%

As for purely landowner respondents, 47 or 87% of them are Catholic by religion while 7% are Born Again Christians. The rest are Protestante, Iglesia Ni Cristo and Jehovah's Witness members.

Table 41: PAP's Religion by Business

Type of PAPs	City/Municipality		Catholic	Protestant	Iglesia Ni Cristo	Born Again	Total
Purely Business Respondents	KAWIT	Count	-	1	-	-	1
		% within MUNICIPALITY	-	100%	-	-	100
	IMUS	Count	8	-	1	1	10
		% within MUNICIPALITY	80%	-	10%	10%	100
	GENERAL TRIAS	Count	2	-	-	-	2
		% within MUNICIPALITY	100%	-	-	-	100
	DASMARINAS	Count	1	-	-	-	1
		% within MUNICIPALITY	100%	-	-	-	100
	SILANG	Count	1	-	-	-	1
		% within MUNICIPALITY	100%	-	-	-	100
Total		Count	12	1	1	1	15
		% within MUNICIPALITY	80%	7%	7%	7%	100

4.4.2.4 Ethno-Linguistic Characteristic

Ethno-Linguistic characteristic is an important consideration in determining possible relocation sites. PAPs surveyed mostly speak Filipino/Tagalog. Their relocation site should be in areas of Filipino/Tagalog-speaking residents for easier adjustment to their community life.

Table 42: Ethnolinguistic Grouping

Type of PAPs	City/Municipality	Tagalo	Ilocano	Bisay	Wara	Ilonggo	Musli	Total
	Count	157	1	4	1	2	-	165

Type of PAPs	City/Municipality		Tagalo	Ilocano	Bisay	Waray	Ilonggo	Musli	Total
Purely Household Respondents	KAWIT	% within MUNICIPALITY	95%	1%	2%	1%	1%	-	100 %
		Count	48	-	1	-	1	1	51
	IMUS	% within MUNICIPALITY	94%	-	2%	-	2%	2%	100 %
		Count	25	-	-	-	-	-	25
	GENERAL TRIAS	% within MUNICIPALITY	100%	-	-	-	-	-	100 %
		Count	1	-	-	-	-	-	1
	DASMARINAS	% within MUNICIPALITY	100%	-	-	-	-	-	100 %
		Count	23	1	-	-	1	-	25
	SILANG	% within MUNICIPALITY	92%	4%	-	-	4%	-	100 %
		Count	254	2	5	1	4	1	267
Total		% within MUNICIPALITY	95%	1%	2%	0%	1%	0.4%	100 %

The table shows that 254 (95%) of the 267 purely household respondents speak Tagalog, five speak Bisaya, four are Ilonggo and the remaining respondents speak Ilocano and Waray.

As for purely landowner respondents, all 54 speak Tagalog. Similarly, for purely business respondents, all 15 respondents speak Tagalog.

4.4.2.5 Highest Educational Attainment of Household Head

In terms of education, the RAP survey shows that most of the husbands or heads of the family have reached elementary to high school as their highest level of educational attainment. There were only a few respondents who reached the collegiate level or even those with vocational education. The same trending of results was also observed in the case of structure owners and landowners. Results only prove that most of the respondents have a relatively lower or limited educational attainment. This makes them more vulnerable to the lack of livelihood opportunities if displaced.

The social development plan identifies these residents as the priority sector in the provision of skills training and livelihood opportunities. Most of the skills of men identified through the survey are construction and driving (16%). Since the available relocation sites discussed in SMEC's *Resettlement Policy Framework and LARAP Report* are located in the Province of Cavite, these men can be hired in the construction activities of the project as needed.

4.4.2.6 Highest Educational Attainment of the Wife

Most wives in purely household respondents were found to be elementary (24%) to high school graduates (45%). Most of the wives in both landowners and structure owners are also mostly elementary (48%) and high school graduates (22%).

This situation renders the wives a little more vulnerable as they have less opportunity to access other means of livelihood. The social development plan identifies these residents as the priority sector in the provision of skills training and livelihood opportunities.

Several college graduates (23% in purely household respondents and 28% in purely landowner respondents) could also increase their employment/livelihood opportunities if given additional skills training.

4.4.2.7 Primary Source of Income

Services, Commerce, Construction and Pension/Financial Assistance are the top sources of income of the interviewed PAPs who are purely household respondents. Analysis of these figures per Municipality however, shows that though the sources of income of the respondents are varied, most of those from General Trias, Dasmarinas, and Silang are still engaged in agriculture and agriculture-related activities, while those from Kawit and Imus are engaged in services and commerce.

Since the large tracks of land to be affected by the CALAX (Cavite Section) are mainly agricultural land, and most of the respondents from the survey conducted are tenants, restoration of the PAPs' source of income from farming should be given priority in General Trias, Dasmarinas, and Silang. PAPs in Kawit and Imus would have to be relocated in areas that would provide them similar sources of income from Commercial and Service activities.

A significant portion of the respondents are dependent on pension or financial assistance. It can be assumed that this group of respondents may have relatives or family members working overseas who are willingly providing them support for a living. They may be incapacitated, in old age or too young to earn their own income. This group may not be adversely affected by the Project as their source of income is not tied to the land from where they would be displaced.

4.4.2.8 Other Sources of Income

The PAP Survey Results show that the majority (52%) of the respondents do not have other sources of income. There are 10% of the respondents who have secondary sources of income like small-scale business or "sari-sari stores" while some (12%) render services in different companies. This group may not be adversely affected by the Project as their source of income may easily be restored.

4.4.2.9 Household Income Bracket

The determination of household income bracket is important for DPWH to be able to ensure that relocated families will be given the ability to restore/improve income after relocation.

The survey results show that 67 out of 267 of the purely household respondents have a household income of PhP 72,001 to PhP 120,000 per annum, 48 purely household

respondents have a household income of PhP 120,001 to PhP180,000 per annum, 42 purely household respondents have a household income of PhP 180,001 to PhP 240,000 per annum, and 11 respondents have a household income of PhP 720,001 or more.

11 of the 54 purely landowner respondents have a household income of 240,001 to 360,000 while three (respondents have a household income of 720,001 or more.

The RAP includes a monitoring plan on how the PAPs are coping with activities such as job- hunting, engaging in small family business, and women helping their husbands augment their income. Rehabilitation assistance in the form of skills training equivalent to the amount of PhP 15,000 per family will be provided. This will be coordinated with the receiving (host) LGU through livelihood programs.

4.4.2.10 Household Facilities

In addition to the type of structures that the PAPs have as their dwelling units, the determination of household facilities is important for DPWH to be able to ensure that relocated families will be able to restore/improve their living conditions after relocation.

Lighting of Dwelling Units

The table below shows that 243 out of 267 purely household respondents rely on electric companies for lighting of their dwelling units, while 21 respondents use kerosene. The remaining respondents use batteries or candles for lighting.

Table 43: Lighting of Dwelling Units

City / Municipality		Electric Company	Battery	Kerosene	Candle	
KAWIT	Count	158	1	6	-	165
	% within municipality	96%	1%	4%	-	100%
IMUS	Count	47	-	2	2	51
	% within municipality	92%	-	4%	4%	100%
GENERAL TRIAS	Count	15	-	10	-	25
	% within municipality	60%	-	40%	-	100%
DASMARINAS	Count	1	-	-	-	1
	% within municipality	100%	-	-	-	100%
	Count	22	-	3	-	25

SILANG	% within municipality	88%	-	12%	-	100%
	Count	243	1	21	2	267
	% within municipality	91%	-	8%	1%	100%

Water Supply

The table below shows that 114 out of 267 purely household respondents have tube wells for water supply, 64 respondents have their own faucets in the house, 32 have faucets outside the house, 24 have dug wells, 16 rely on public tap waters, while the rest of the respondents use spring water and bottled water.

Table 44: Water Supply

		Faucet in the house	Faucet outside the	Public tap	Tube well	Dug well	Spring	Bottled water	Water district	Total
KAWIT	Count	44	28	1	68	17	-	5	2	165
	% within MUNICIPALIT	27%	17%	1%	41%	10%	-	3%	1%	100 %
IMUS	Count	6	1	1	41	-	-	2	-	51
	% within MUNICIPALIT	12%	2%	2%	80%	-	-	4%	-	100 %
GENERAL TRIAS	Count	2	2	10	4	6	-	1	-	25
	% within MUNICIPALIT	8%	8%	40%	16%	24%	-	4%	-	100 %
DASMARINAS	Count	-	-	1	-	-	-	-	-	1
	% within MUNICIPALIT	-	-	100%	-	-	-	-	-	100 %
SILANG	Count	12	1	3	1	1	2	-	5	25
	% within MUNICIPALIT	48%	4%	12%	4%	4%	8%	-	20%	100 %
	Count	64	32	16	114	24	2	8	7	267
	% within MUNICIPALIT	24%	12%	6%	43%	9%	1%	3%	3%	100 %

Toilet Facilities

The table below shows that the majority or 148 out of 267 purely household respondents use a common sealed flush as their toilet, 84 have personal water sealed flush, the other respondents use open pit and covered pit toilets, while one respondent uses another type of toilet facility that is not covered (by their choice).

Table 45: Toilet Facilities

City/Municipality		Personal Water sealed flush	Common Water sealed flush	Open pit	Covered pit	Other	Total
KAWIT	Count	59	96	3	6	1	165
	% within MUNICIPALITY	36%	58%	2%	4%	1%	100%
IMUS	Count	17	31	1	2	-	51
	% within MUNICIPALITY	33%	61%	2%	4%	-	100%
GENERAL TRIAS	Count	5	11	1	8	-	25
	% within MUNICIPALITY	20%	44%	4%	32%	-	100%
DASMARINAS	Count	-	1	-	-	-	1
	% within MUNICIPALITY	-	100%	-	-	-	100%
SILANG	Count	3	9	-	13	-	25
	% within MUNICIPALITY	12%	36%	-	52%	-	100%
	Count	84	148	5	29	1	267
	% within MUNICIPALITY	31%	55%	2%	11%	0.4%	100%

Type of Fuel Used for Cooking

167 out of 267 purely household respondents use LPG (Gasul) for cooking, 84 use wood, eight use charcoal and the remaining seven respondents use kerosene. One respondent did not specify the fuel he/she uses for cooking.

Table 46: Type of Cooking Fuel

City/Municipality		LPG	Wood	Charcoal	Kerosene	Other	Total
KAWIT	Count	120	34	3	7	1	165
	% within MUNICIPALITY	73%	21%	2%	4%	1%	100%
	Count	28	18	5	-	-	51

City/Municipality			LPG	Wood	Charcoal	Kerosene	Other	Total
IMUS	%	within	55%	35%	10%	-	-	100%
	Count		6	19	-	-	-	25
GENERAL TRIAS	%	within	24%	76%	-	-	-	100%
	Count		1	-	-	-	-	1
DASMARINAS	%	within	100%	-	-	-	-	100%
	Count		12	13	-	-	-	25
SILANG	%	within	48%	52%	-	-	-	100%
	Count		167	84	8	7	1	267
	% within MUNICIPALITY		63%	31%	3%	3%	0.4%	100%

4.4.2.11 Awareness About CALAX Project

Overall results revealed that the majority or 63% (167 out of the 267) of the purely household respondents have knowledge of the proposed Project. A significant 37% or 100 of the respondents mentioned that they do not have any knowledge of the proposed Project. For purely landowner respondents, 69% of the respondents are aware of the Project, and for the purely business respondents, 53% have awareness of the Project.

Looking at the distribution of the respondents, the results are consistent with the majority of the structure owners, landowners and business owners having knowledge of the Project. There are however still a significant quantity of the respondents admitting their lack of awareness about the CALAX (Cavite Section).

Most of the respondents are aware of the proposed project and the identified sources of information for the project are surveyors (29%), SMEC (22%), LGUs (17%), friends (11%), DPWH (5%), and relatives (2%). Results manifest that the entrusted government agencies are performing their roles as information disseminators for the project since they have attended the IECs conducted in City/Municipal and Barangay Levels. When the specific distribution of responses was considered, the same pattern of results was observed.

4.4.2.12 Social Acceptability of the Project

Overall results revealed that 192 of 336 (53%) of the respondents accept and approve of the implementation of the Project. 121 (36%) of the respondents do not approve of the Project and 7% are still not sure.

Table 52: PAPs Acceptance of the Project

Type of PAPs	City/Municipality		Yes	No	Not sure	Total
Household	KAWIT	Count		98	12	165
		% within MUNICIPALITY	33%	59%	7%	100%
	IMUS	Count	31	16	4	51
		% within MUNICIPALITY	61%	31%	8%	100%
	GENERAL TRIAS	Count	21	3	1	25
		% within MUNICIPALITY	84%	12%	4%	100%

Type of PAPs	City/Municipality		Yes	No	Not sure	Total
Structure Owner	DASMARINAS	Count	1	-	-	1
		% within CITY	100%	-	-	100%
	SILANG	Count	21	1	3	25
		% within MUNICIPALITY	84%	4%	12%	100%
Total - HH Structure Owner		Count	129	118	20	267
		% within MUNICIPALITY	48%	44%	7%	100%
Landowner	KAWIT	Count	5	-	1	6
		% within MUNICIPALITY	83%	-	17%	100%
	IMUS	Count	19	2	1	22
		% within MUNICIPALITY	86%	9%	5%	100%
	GENERAL TRIAS	Count	12	-	-	12
		% within MUNICIPALITY	100%	-	-	100%
	DASMARINAS	Count	2	-	-	2
		% within CITY	100%	-	-	100%
	SILANG	Count	11	1	-	12
		% within MUNICIPALITY	92%	8%	-	100%
Total - Landowner		Count	49	3	2	54
		% within MUNICIPALITY	91%	6%	4%	100%
Business Owner	KAWIT	Count	1	-	-	1
		% within MUNICIPALITY	100%	-	-	100%
	IMUS	Count	9	-	1	10
		% within MUNICIPALITY	90%	-	10%	100%
	GENERAL TRIAS	Count	2	-	-	2
		% within MUNICIPALITY	100%	-	-	100%
	DASMARINAS	Count	1	-	-	1
		% within CITY	100%	-	-	100%
	SILANG	Count	1	-	-	1
		% within MUNICIPALITY	100%	-	-	100%
Total - Business Owner		Count	14	-	1	15
		% within MUNICIPALITY	93%	-	7%	100%
Grand Total		Count	192	121	23	336
		Percentage	57%	36%	7%	100%

Examining the respondents' distribution according to the type of PAPs reveal that a great majority of the landowners and business groups accept and approve the implementation of the Project but household owners are divided between approval and non-approval of the Project.

While most of the respondents accepted the Project, it is likewise important to see the reasons for their level of acceptance. Dominant and common reasons identified were for the

benefit of the GOP's economic development. The Project is expected to propel the GOP's income and later translate to the economic wellbeing of the area. This finding only proves that the respondents are mature enough to identify the positive benefits of the Project, rather than the consequences and sacrifices they have to endure.

Most of the respondents mentioned that they don't have any other option left. Hence, they might as well accept the project and the outcomes that the project will give them. A minority answered that they accept the project since they will be paid and relocated.

4.4.2.13 Perception About Possible Impacts of the Project

Population Increase

The table below shows that the majority or 178 out of 267 purely household respondents think that there will be more increase in population upon the implementation of the Project, while 40 respondents think otherwise. The remaining 49 respondents think that the Project will neither cause more or less population increase.

The majority or 43 out of 54 purely landowner respondents believe that there will be an increase in population once the Project is complete, while seven respondents think otherwise. The remaining four respondents think that the Project will neither bring more or less increase in population.

The table shows that 11 respondents out of the 15 purely business respondents are of the opinion that the population will increase once the Project is implemented, while two respondents think otherwise. The other two respondents think neither.

Table 53: PAPs Opinion on Population Increase due to Project

Type of PAPs	City/Municipality		None	More	Less	Total
Household Structure Owner	KAWIT	Count	20	115	30	165
		% within MUNICIPALITY	12%	70%	18%	100%
	IMUS	Count	6	34	11	51
		% within MUNICIPALITY	12%	67%	22%	100%
	GENERAL TRIAS	Count	7	12	6	25
		% within MUNICIPALITY	28%	48%	24%	100%
	DASMARINAS	Count	-	1	-	1
		% within CITY	-	100%	-	100%
	SILANG	Count	7	16	2	25
		% within MUNICIPALITY	28%	64%	8%	100%
Total - HH Structure Owner		Count	40	178	49	267
		% within MUNICIPALITY	15%	67%	18%	100%
Landowner	KAWIT	Count	-	5	1	6
		% within MUNICIPALITY	-	83%	17%	100%
	IMUS	Count	-	22	-	22

Type of PAPs	City/Municipality		None	More	Less	Total
		% within MUNICIPALITY	-	100%	-	100%
	GENERAL TRIAS	Count	2	7	3	12
		% within MUNICIPALITY	17%	58%	25%	100%
	DASMARINAS	Count	1	-	1	2
		% within CITY	50%	-	50%	100%
	SILANG	Count	1	9	2	12
		% within MUNICIPALITY	8%	75%	17%	100%
Total - Landowner		Count	4	43	7	54
		% within MUNICIPALITY	7%	80%	13%	100%
Business Owner	KAWIT	Count	-	-	1	1
		% within MUNICIPALITY	-	-	100%	100%
	IMUS	Count	1	8	1	10
		% within MUNICIPALITY	10%	80%	10%	100%
	GENERAL TRIAS	Count	-	2	-	2
		% within MUNICIPALITY	-	100%	-	100%
	DASMARINAS	Count	-	1	-	1
		% within CITY	-	100%	-	100%
	SILANG	Count	1	-	-	1
		% within MUNICIPALITY	100%	-	-	100%
Total – Business Owner		Count	2	11	2	15
		% within Municipality	13%	73%	13%	100%
Grand Total		Count	46	232	58	336
		Percentage	14%	69%	17%	100%

Migration

The table below shows that 126 out of 267 purely household respondents believe that there will be increase in migration once the Project is completed, while 70 respondents think otherwise.

71 respondents believe that the Project will neither result in an increase or decrease in migration.

The table also shows that 33 out of 54 purely landowner respondents think that there will be more migration upon the Project's completion while 14 respondents think otherwise. The remaining seven respondents think that the Project will neither cause more or less migration in the area.

The majority or seven out of 15 purely business respondents believe that there will be more migration after the Project is done while three respondents think otherwise. The remaining five respondents think that the Project will bring neither more nor less migration in the area.

Table 54: PAPs Opinion on Migration due to the Project

Type of PAPs	City/Municipality			Non	More	Less	Total
Household Structure Owner	KAWIT	Count		43	77	45	165
		% within MUNICIPALITY		26%	47%	27%	100%
	IMUS	Count		9	29	13	51
		% within MUNICIPALITY		18%	57%	25%	100%
	GENERAL TRIAS	Count		8	9	8	25
		% within MUNICIPALITY		32%	36%	32%	100%
	DASMARINAS	Count		-	1	-	1
		% within CITY		-	100%	-	100%
	SILANG	Count		10	10	5	25
		% within MUNICIPALITY		40%	40%	20%	100%
Total - HH Structure Owner		Count		70	126	71	267
		% within MUNICIPALITY		26%	47%	27%	100%
Landowner	KAWIT	Count		-	5	1	6
		% within MUNICIPALITY		-	83%	17%	100%
	IMUS	Count		3	17	2	22
		% within MUNICIPALITY		14%	77%	9%	100%
	GENERAL TRIAS	Count		5	5	2	12
		% within MUNICIPALITY		42%	42%	17%	100%
	DASMARINAS	Count		1	-	1	2
		% within CITY		50%	-	50%	100%
	SILANG	Count		5	6	1	12
		% within MUNICIPALITY		42%	50%	8%	100%
Total - Landowner		Count		14	33	7	54
		% within MUNICIPALITY		26%	61%	13%	100%
Business Owner	KAWIT	Count		-	-	1	1
		% within MUNICIPALITY		-	-	100%	100%
	IMUS	Count		2	5	3	10
		% within MUNICIPALITY		20%	50%	30%	100%
	GENERAL TRIAS	Count		-	1	1	2
		% within MUNICIPALITY		-	50%	50%	100%
	DASMARINAS	Count		-	1	-	1
		% within CITY		-	100%	-	100%
	SILANG	Count		1	-	-	1
		% within MUNICIPALITY		100%	-	-	100%
Total - Business Owner		Count		3	7	5	15
		% within MUNICIPALITY		20%	47%	33%	100%
Grand Total		Count		87	166	83	336
		Percentage		26%	49%	25%	100%

Factories

The PAPs Survey shows that 111 out of 267 purely household respondents have answered that they think the Project will bring more factories into the area, while 109 think that the Project will bring in less factories, and 47 think that the Project will neither bring in more factories/industries nor bring in less factories/industries.

The 21 of 56 purely landowner respondents are of the opinion that there will be more factories/industries upon the Project's completion, while 17 believe that the Project will bring less factories/industries, and the remaining 16 respondents think that it will neither cause more nor cause less industries to rise in the area.

For purely business respondents, seven out of 15 believe that there will be an increase in the number of factories and/or industries upon the Project's completion, while six respondents think that it will bring in less factories/industries, and the remaining two respondents do not think that there will be an increase nor a decrease in factories.

Table 55: PAPs Opinion on Factories due to the Porject

Type of PAPs	City/Municipality		Non	More	Less	Total
Household Owner Structure	KAWIT	Count	70	71	24	165
		% within MUNICIPALITY	42%	43%	15%	100%
	IMUS	Count	27	17	7	51
		% within MUNICIPALITY	53%	33%	14%	100%
	GENERAL TRIAS	Count	3	18	4	25
		% within MUNICIPALITY	12%	72%	16%	100%
	DASMARINAS	Count	1	-	-	1
		% within CITY	100%	-	-	100%
	SILANG	Count	8	5	12	25
		% within MUNICIPALITY	32%	20%	48%	100%
Total - HH Structure Owner		Count	109	111	47	267
		% within MUNICIPALITY	41%	42%	18%	100%
Landowner	KAWIT	Count	2	4	-	6
		% within MUNICIPALITY	33%	67%	-	100%
	IMUS	Count	7	5	10	22
		% within MUNICIPALITY	32%	23%	45%	100%
	GENERAL TRIAS	Count	3	6	3	12
		% within MUNICIPALITY	25%	50%	25%	100%
	DASMARINAS	Count	1	-	1	2
		% within CITY	50%	-	50%	100%
	SILANG	Count	4	6	2	12
		% within MUNICIPALITY	33%	50%	17%	100%
Total - Landowner		Count	17	21	16	54
		% within MUNICIPALITY	31%	39%	30%	100%

Type of PAPs	City/Municipality			Non	More	Less	Total
Business Owner	KAWIT	Count		-	-	1	1
		% within MUNICIPALITY		-	-	100%	100%
	IMUS	Count		5	4	1	10
		% within MUNICIPALITY		50%	40%	10%	100%
	GENERAL TRIAS	Count		-	2	-	2
		% within MUNICIPALITY		-	100%	-	100%
	DASMARINAS	Count		-	1	-	1
		% within CITY		-	100%	-	100%
	SILANG	Count		1	-	-	1
		% within MUNICIPALITY		100%	-	-	100%
Total - Business Owner		Count		6	7	2	15
		% within MUNICIPALITY		40%	47%	13%	100%
Grand Total		Count		132	139	65	336
		Percentage		39%	41%	19%	100%

Land Conversion

The table below shows that majority or 155 of the 267 purely household respondents is of the opinion that there will be more land converted into subdivisions once the Project is completed, 65 respondents think otherwise, and the remaining 47 think that the Project will neither cause more or less land conversion.

The majority of purely landowner respondents or 37 out of 54 think that there will be more land converted into subdivisions upon the Project's completion, while nine respondents think otherwise, and the remaining eight respondents believe that the Project will not bring any difference to the number of converted land into subdivisions.

Of the purely business respondents, nine of 15 think that there will be more land conversions upon the Project's completion while three respondents think otherwise, and the remaining three believe that the Project will neither cause more or less land conversion.

Table 56: PAPs Opinion on Land Conversion due to the Project

Type of PAPs	City/Municipality			Non	More	Less	Total
Household Structure Owner	KAWIT	Count		43	103	19	165
		% within MUNICIPALITY		26%	62%	12%	100%
	IMUS	Count		15	31	5	51
		% within MUNICIPALITY		29%	61%	10%	100%
	GENERAL TRIAS	Count		2	10	13	25
		% within MUNICIPALITY		8%	40%	52%	100%
	DASMARINAS	Count		1	-	-	1
		% within CITY		100%	-	-	100%

Type of PAPs	City/Municipality			Non	More	Less	Total
		Count		4	11	10	25
	SILANG	% within MUNICIPALITY		16%	44%	40%	100%
		Count		65	155	47	267
Total - HH Structure Owner		% within MUNICIPALITY		24%	58%	18%	100%
Landowner		Count		-	4	2	6
	KAWIT	% within MUNICIPALITY		-	67%	33%	100%
		Count		3	17	2	22
	IMUS	% within MUNICIPALITY		14%	77%	9%	100%
		Count		1	9	2	12
	GENERAL TRIAS	% within MUNICIPALITY		8%	75%	17%	100%
		Count		1	-	1	2
	DASMARINAS	% within CITY		50%	-	50%	100%
		Count		4	7	1	12
	SILANG	% within MUNICIPALITY		33%	58%	8%	100%
		Count		9	37	8	54
Total - Landowner		% within MUNICIPALITY		17%	69%	15%	100%
Business Owner		Count		-	-	1	1
	KAWIT	% within MUNICIPALITY		-	-	100%	100%
		Count		2	6	2	10
	IMUS	% within MUNICIPALITY		20%	60%	20%	100%
		Count		-	2	-	2
	GENERAL TRIAS	% within MUNICIPALITY		-	100%	-	100%
		Count		1	-	-	1
	DASMARINAS	% within CITY		100%	-	-	100%
		Count		-	1	-	1
	SILANG	% within MUNICIPALITY		-	100%	-	100%
		Count		3	9	3	15
Total - Business Owner		% within MUNICIPALITY		20%	60%	20%	100%
		Count		77	201	58	336
Grand Total		Percentage		23%	60%	17%	100%

Loss of Income from Farming

Perception on the Project's impact on farm income is an important consideration in the determination of interventions to restore income after relocation.

The table below shows that 96 out of 267 purely household respondents are of opinion that there will be more income from farm harvest once the Project is implemented while 99 think otherwise and 72 respondents think that the Project will neither result in more or less income from farming.

The same table shows that the majority or 34 of the 54 purely landowner respondents believe that there will be lower income from farm harvest after the Project is completed while eight think otherwise, and the remaining 12 respondents do not think that there will be a change in the income derived from farming.

The table below also shows that of the 15 business respondents, seven think that there will be less income from farm harvest upon the Project's completion, five believe that there will be more income, and three respondents do not think that income from farming will either increase or decrease.

Table 57: PAPs Opinion on Income from Farming due to the Project

Type of PAPs	City/Municipality			None	More	Less	Total
Household Structure Owner	KAWIT	Count		60	63	42	165
		%	within MUNICIPALITY	36%	38%	25%	100%
	IMUS	Count		21	20	10	51
		%	within MUNICIPALITY	41%	39%	20%	100%
	GENERAL TRIAS	Count		13	4	8	25
		%	within MUNICIPALITY	52%	16%	32%	100%
	DASMARINAS	Count		0	1	0	1
		% within CITY		0%	100%	0%	100%
	SILANG	Count		5	8	12	25
		%	within MUNICIPALITY	20%	32%	48%	100%
Total - HH Structure Owner		Count			96	72	267
		% within MUNICIPALITY		37%	36%	27%	100%
Landowner	KAWIT	Count		0	5	1	6
		%	within MUNICIPALITY	0%	83%	17%	100%
	IMUS	Count		5	14	3	22
		%	within MUNICIPALITY	23%	64%	14%	100%
	GENERAL TRIAS	Count		3	7	2	12
		%	within MUNICIPALITY	25%	58%	17%	100%
	DASMARINAS	Count		0	1	1	2
		% within CITY		0%	50%	50%	100%
	SILANG	Count		0	7	5	12
		%	within MUNICIPALITY	0%	58%	42%	100%
Total - Landowner		Count			34	12	54
		% within MUNICIPALITY		15%	63%	22%	100%
Business	KAWIT	Count		0	0	1	1
		%	within MUNICIPALITY	0%	0%	100%	100%
	IMUS	Count		4	5	1	10
		%	within MUNICIPALITY	40%	50%	10%	100%
		Count		0	1	1	2

Type of PAPs	City/Municipality		None	More	Less	Total
Business Owner	GENERAL TRIAS	% within MUNICIPALITY	0%	50%	50%	100%
	DASMARINAS	Count	1	0	0	1
		% within CITY	100%	0%	0%	100%
	SILANG	Count	0	1	0	1
		% within MUNICIPALITY	0%	100%	0%	100%
Total - Business Owner		Count		7	3	15
		% within MUNICIPALITY	33%	47%	20%	100%
Grand Total		Count	112	137	87	336
		Percentage	33%	41%	26%	100%

Flooding

The table below shows that 104 out of 267 purely household respondents think that there will be more flooding in low lands upon the Project's completion, 69 think otherwise, and 94 respondents think that the Project will neither cause more or less flooding in the low lands.

The majority or 24 out of 54 purely landowner respondents think that the Project will neither cause an increase nor decrease in the possibility of flooding in the low lands. 21 respondents believe that it will cause less flooding while the remaining nine respondents think otherwise.

According to the 11 out of 15 purely business respondents, the project's implementation will mean more flooding in the low lands, two think that there will be less flooding, and the other two respondents believe that there will neither be more nor less flooding in the low lying areas.

Table 58: PAPs Opinion on Flooding due to the Project

Type of PAPs	City/Municipality		Non	More	Less	Total
Household Structure Owner	KAWIT	Count	51	72	42	165
		% within MUNICIPALITY	31%	44%	25%	100%
	IMUS	Count	6	27	18	51
		% within MUNICIPALITY	12%	53%	35%	100%
	GENERAL TRIAS	Count	21	-	4	25
		% within MUNICIPALITY	84%	-	16%	100%
	DASMARINAS	Count	-	-	1	1
		% within CITY	-	-	100%	100%
	SILANG	Count	16	5	4	25
		% within MUNICIPALITY	64%	20%	16%	100%
Total - HH Structure Owner		Count	94	104	69	267
		% within MUNICIPALITY	35%	39%	26%	100%
Landowner	KAWIT	Count	1	3	2	6
		% within MUNICIPALITY	17%	50%	33%	100%
	IMUS	Count	9	3	10	22
		% within MUNICIPALITY	41%	14%	45%	100%
	GENERAL TRIAS	Count	7	2	3	12
		% within MUNICIPALITY	58%	17%	25%	100%
	DASMARINAS	Count	1	-	1	2
		% within CITY	50%	-	50%	100%
	SILANG	Count	6	1	5	12
		% within MUNICIPALITY	50%	8%	42%	100%
Total - Landowner		Count	24	9	21	54
		% within MUNICIPALITY	44%	17%	39%	100%
Business Owner	KAWIT	Count	-	-	1	1
		% within MUNICIPALITY	-	-	100%	100%
	IMUS	Count	2	8	-	10
		% within MUNICIPALITY	20%	80%	-	100%
	GENERAL TRIAS	Count	-	2	-	2
		% within MUNICIPALITY	-	100%	-	100%
	DASMARINAS	Count	-	1	-	1
		% within CITY	-	100%	-	100%
	SILANG	Count	-	-	1	1
		% within MUNICIPALITY	-	-	100%	100%
Total - Business Owner		Count	2	11	2	15
		% within MUNICIPALITY	13%	73%	13%	100%
Grand Total		Count	120	124	92	336
		Percentage	36%	37%	27%	100%

Water Pollution

The table below shows that 134 out of 267 purely household respondents are of the opinion that the Project will not cause more water pollution in the area, while 70 respondents think that it will bring more water pollution with the remaining 56 respondents thinking that there will be no increased water pollution.

The same table shows that the majority or 32 out of 54 purely landowner respondents think that the Project will cause more water pollution while 15 respondents think otherwise, and the remaining seven believe that the Project will neither cause more or less water pollution.

The table also shows that seven out of 15 purely business respondents believe that the Project will bring about more water pollution while four respondents think otherwise. The other four respondents believe that the project will bring neither more nor less water pollution.

Table 59: PAPs Opinion on Water Pollution due to the Project

Type of PAPs	City/Municipality		Non	More	Less	Total
Household Structure Owner	KAWIT	Count	77	45	43	165
		% within MUNICIPALITY	47%	27%	26%	100%
	IMUS	Count	20	23	8	51
		% within MUNICIPALITY	39%	45%	16%	100%
	GENERAL TRIAS	Count	18	5	2	25
		% within MUNICIPALITY	72%	20%	8%	100%
	DASMARINAS	Count	1	-	-	1
		% within CITY	100%	-	-	100%
	SILANG	Count	18	4	3	25
		% within MUNICIPALITY	72%	16%	12%	100%
Total - HH Structure Owner		Count	134	77	56	267
		% within MUNICIPALITY	50%	29%	21%	100%
Landowner	KAWIT	Count	-	4	2	6
		% within MUNICIPALITY	-	67%	33%	100%
	IMUS	Count	2	18	2	22
		% within MUNICIPALITY	9%	82%	9%	100%
	GENERAL TRIAS	Count	7	4	1	12
		% within MUNICIPALITY	58%	33%	8%	100%
	DASMARINAS	Count	1	-	1	2
		% within CITY	50%	-	50%	100%
	SILANG	Count	5	6	1	12
		% within MUNICIPALITY	42%	50%	8%	100%
Total - Landowner		Count	15	32	7	54
		% within MUNICIPALITY	28%	59%	13%	100%
Business	KAWIT	Count	-	-	1	1
		% within MUNICIPALITY	-	-	100	100

		Count	3	5	2	10
	IMUS	% within MUNICIPALITY	30%	50%	20%	100%
		Count	-	2	-	2
	GENERAL TRIAS	% within MUNICIPALITY	-	100%	-	100%
Business Owner		Count	-	-	1	1
	DASMARINAS	% within CITY	-	-	100%	100%
		Count	1	-	-	1
	SILANG	% within MUNICIPALITY	100%	-	-	100%
		Count	4	7	4	15
Total - Business Owner		% within MUNICIPALITY	27%	47%	27%	100%
		Count	153	116	67	336
Grand Total		Percentage	46%	35%	20%	100%

Air Pollution

The table below shows that in general, the PAPs believe that Project will not cause more or less air pollution.

The majority or 149 of the 267 purely household respondents do not think that there will be a change in air pollution, while 62 respondents think that the Project will cause more air pollution, and the remaining 49 respondents think that there will be less air pollution.

Out of 54 purely landowner respondents, 26 think that there will be more air pollution that will be caused by the Project while eight respondents think that there will be less air pollution, and the remaining 20 respondents think that the Project will neither cause more nor cause less air pollution.

The same table shows that the majority or eight out of 15 purely business respondents believe that the project will cause more air pollution in their area while three respondents think otherwise, and the remaining four respondents think that the Project will neither bring more nor bring less air pollution.

Table 60: PAPs Opinion on Air Pollution due to the Project

Type of PAPs	City/Municipality		Non	More	Less	Total
		Count	87	43	35	165
	KAWIT	% within MUNICIPALITY	53%	26%	21%	100%
		Count	20	22	9	51
	IMUS	% within MUNICIPALITY	39%	43%	18%	100%
		Count	22	1	2	25
	GENERAL TRIAS	% within MUNICIPALITY	88%	4%	8%	100%
Household Structure Owner		Count	1	0	0	1
	DASMARINAS	% within CITY	100%	0%	0%	100%
		Count	19	3	3	25
	SILANG	% within MUNICIPALITY	76%	12%	12%	100%

Total - HH Structure Owner		Count		149	69	49	267
		% within MUNICIPALITY		56%	26%	18%	100%
Landowner	KAWIT	Count		0	3	3	6
		% within MUNICIPALITY		0%	50%	50%	100%
	IMUS	Count		5	16	1	22
		% within MUNICIPALITY		23%	73%	5%	100%
	GENERAL TRIAS	Count		8	4	0	12
		% within MUNICIPALITY		67%	33%	0%	100%
	DASMARINAS	Count		1	0	1	2
		% within CITY		50%	0%	50%	100%
	SILANG	Count		6	3	3	12
		% within MUNICIPALITY		50%	25%	25%	100%
Total - Landowner		Count		20	26	8	54
		% within MUNICIPALITY		37%	48%	15%	100%
Business Owner	KAWIT	Count		0	0	1	1
		% within MUNICIPALITY		0%	0%	100%	100%
	IMUS	Count		3	5	2	10
		% within MUNICIPALITY		30%	50%	20%	100%
	GENERAL TRIAS	Count		0	2	0	2
		% within MUNICIPALITY		0%	100%	0%	100%
	DASMARINAS	Count		1	0	0	1
		% within CITY		100%	0%	0%	100%
	SILANG	Count		0	1	0	1
		% within MUNICIPALITY		0%	100%	0%	100%
Total - Business Owner		Count		4	8	3	15
		% within MUNICIPALITY		27%	53%	20%	100%
Grand Total		Count		173	103	60	336
		Percentage		51%	31%	18%	100%

Noise Pollution

The table below shows that in general, the PAPs believe that Project will not cause more or less noise pollution.

A great majority or 133 of the 267 purely household respondents do not think that there will be a change in noise pollution, 82 respondents think that the Project will cause more noise pollution while the remaining 52 respondents think that there will be less noise pollution.

Of the 54 purely landowner respondents, 16 think that there will be more noise pollution that will be caused by the Project while 18 respondents think that there will be less noise pollution, and the remaining 20 respondents think that the Project will neither cause more nor cause less noise pollution.

The table below also shows that the majority or nine out of 15 purely business respondents believe that the Project will cause more noise pollution in their area while one respondent thinks otherwise, and the remaining five respondents think that the Project will neither bring more nor bring less noise pollution.

Table 61: PAPs Opinion on Noise Pollution due to the Project

Type of PAPs	City/Municipality		Non	More	Less	Total
Household Structure Owner	KAWIT	Count	75	49	41	165
		% within MUNICIPALITY	45%	30%	25%	100%
	IMUS	Count	17	27	7	51
		% within MUNICIPALITY	33%	53%	14%	100%
	GENERAL TRIAS	Count	23	1	1	25
		% within MUNICIPALITY	92%	4%	4%	100%
	DASMARINAS	Count	1	0	0	1
		% within CITY	100%	0%	0%	100%
	SILANG	Count	17	5	3	25
		% within MUNICIPALITY	68%	20%	12%	100%
Total - HH Structure Owner		Count	133	82	52	267
		% within MUNICIPALITY	50%	31%	19%	100%
Landowner	KAWIT	Count	0	2	4	6
		% within	0%	33%	67%	100
	IMUS	Count	9	7	6	22
		% within MUNICIPALITY	41%	32%	27%	100%
	GENERAL TRIAS	Count	7	3	2	12
		% within MUNICIPALITY	58%	25%	17%	100%
	DASMARINAS	Count	1	0	1	2
		% within CITY	50%	0%	50%	100%
	SILANG	Count	3	4	5	12
		% within MUNICIPALITY	25%	33%	42%	100%
		Count	20	16	18	54

Total - Landowner		% within MUNICIPALITY		37%	30%	33%	100%
	KAWIT	Count		0	0	1	1
		% within MUNICIPALITY		0%	0%	100%	100%
	IMUS	Count		3	7	0	10
		% within MUNICIPALITY		30%	70%	0%	100%
	GENERAL TRIAS	Count		0	2	0	2
		% within MUNICIPALITY		0%	100%	0%	100%
Business Owner	DASMARINAS	Count		1	0	0	1
		% within CITY		100%	0%	0%	100%
	SILANG	Count		1	0	0	1
		% within MUNICIPALITY		100%	0%	0%	100%
Total - Business Owner		Count		5	9	1	15
		% within MUNICIPALITY		33%	60%	7%	100%
Grand Total		Count		158	107	71	336
		Percentage		47%	32%	21%	100%

Traffic

The PAPs Survey shows that the majority or 144 out of 267 purely household respondents are of the opinion that the Project will not cause more or less traffic, 78 think that it will cause more while the remaining 45 think that the Project will cause less traffic.

As for the purely landowner respondents, the majority of them or 25 out of 54 believe that the Project will bring neither more nor less traffic, 18 respondents think that it will bring more traffic congestion in the affected areas while the remaining 11 respondents think that the Project will bring less traffic congestion.

The table below also shows that nine out of 15 purely business respondents think that the Project will cause more traffic in their area, while one respondent thinks otherwise. The remaining five respondents believe that the Project will neither bring more nor bring less traffic.

Table 62: PAPS Opinion on Traffic due to the Project

Type of PAPs	City/Municipality			Non	More	Less	Total
Household Structure Owner	KAWIT	Count		82	47	36	165
		% within MUNICIPALITY		50%	28%	22%	100%
	IMUS	Count		18	26	7	51
		% within MUNICIPALITY		35%	51%	14%	100%
	GENERAL TRIAS	Count		25	0	0	25
		% within MUNICIPALITY		100%	0%	0%	100%
	DASMARINAS	Count		1	0	0	1
		% within CITY		100%	0%	0%	100%
	SILANG	Count		18	5	2	25
		% within MUNICIPALITY		72%	20%	8%	100%
Total - HH Structure Owner		Count		144	78	45	267
		% within MUNICIPALITY		54%	29%	17%	100%
Landowner	KAWIT	Count		1	3	2	6
		% within MUNICIPALITY		17%	50%	33%	100%
	IMUS	Count		8	9	5	22
		% within MUNICIPALITY		36%	41%	23%	100%
	GENERAL TRIAS	Count		8	3	1	12
		% within MUNICIPALITY		67%	25%	8%	100%
	DASMARINAS	Count		1	0	1	2
		% within CITY		50%	0%	50%	100%
	SILANG	Count		7	3	2	12
		% within MUNICIPALITY		58%	25%	17%	100%
Total - Landowner		Count		25	18	11	54
		% within MUNICIPALITY		46%	33%	20%	100%
Business Owner	KAWIT	Count		0	0	1	1
		% within MUNICIPALITY		0%	0%	100%	100%
	IMUS	Count		3	7	0	10
		% within MUNICIPALITY		30%	70%	0%	100%
	GENERAL TRIAS	Count		0	2	0	2
		% within MUNICIPALITY		0%	100%	0%	100%
	DASMARINAS	Count		1	0	0	1
		% within CITY		100%	0%	0%	100%
	SILANG	Count		1	0	0	1
		% within MUNICIPALITY		100%	0%	0%	100%
Total - Business Owner		Count		5	9	1	15
		% within MUNICIPALITY		33%	60%	7%	100%
Grand Total		Count		174	105	57	336
		Percentage		52%	31%	17%	100%

Other Perceived Changes

The PAPs were asked whether they perceive changes in the community such as increased factories/power plants/industries, lands converted into subdivision, lower farm harvest, flooding in lowlands, population increase and pollution.

The Survey of PAPs shows that the majority or 107 out of 267 purely household respondents think they do not foresee any more changes in their area that will be caused by the Project. The other 79 respondents think that there will be more observed changes caused by the Project while the remaining 81 respondents think otherwise.

As for the purely landowner respondents, 21 out of 56 think that there will be more changes in their area as an effect of the Project while 15 respondents think otherwise, and the remaining 18 respondents think that there will be no other changes that will be caused by the Project.

The same table below shows that nine out of 15 purely business respondents think that there will be more observed changes in their community caused by the Project while the other four respondents think otherwise, and the remaining two respondents believe that there will be no other changes in their area caused by the project.

Table 63: PAPs Opinion of Other Perceived Changes due to the Project

Type of PAPs	City/Municipality		Non	More	Less	Total
Household Structure Owner	KAWIT	Count	58	49	58	165
		% within MUNICIPALITY	35%	30%	35%	100%
	IMUS	Count	16	26	9	51
		% within MUNICIPALITY	31%	51%	18%	100%
	GENERAL TRIAS	Count	12	1	12	25
		% within MUNICIPALITY	48%	4%	48%	100%
	DASMARINAS	Count	1	0	0	1
		% within CITY	100%	0%	0%	100%
	SILANG	Count	20	3	2	25
		% within MUNICIPALITY	80%	12%	8%	100%
Total - HH Structure Owner		Count	107	79	81	267
		% within MUNICIPALITY	40%	30%	30%	100%
Landowner	KAWIT	Count	0	4	2	6
		% within MUNICIPALITY	0%	67%	33%	100%
	IMUS	Count	5	9	8	22
		% within MUNICIPALITY	23%	41%	36%	100%
	GENERAL TRIAS	Count	5	4	3	12
		% within MUNICIPALITY	42%	33%	25%	100%
	DASMARINAS	Count	1	0	1	2
		% within CITY	50%	0%	50%	100%
		Count	7	4	1	12

	SILANG	% within MUNICIPALITY	58%	33%	8%	100%
		Count	18	21	15	54
Total - Landowner		% within MUNICIPALITY	33%	39%	28%	100%
Business Owner	KAWIT	Count	0	0	1	1
		% within MUNICIPALITY	0%	0%	100%	100%
		Count	2	6	2	10
	IMUS	% within MUNICIPALITY	20%	60%	20%	100%
		Count	0	2	0	2
	GENERAL TRIAS	% within MUNICIPALITY	0%	100%	0%	100%
		Count	0	1	0	1
	DASMARINAS	% within CITY	0%	100%	0%	100%
		Count	0	0	1	1
	SILANG	% within MUNICIPALITY	0%	0%	100%	100%
		Count	2	9	4	15
Total - Business Owner		% within MUNICIPALITY	13%	60%	27%	100%
		Count	127	109	100	336
Grand Total		Percentage	38%	32%	30%	100%

4.4.2.14 Overall Perceived Effects of the Project

Based on the survey of PAPs, 90 of the 267 purely household respondents believe that the Project will substantially help the community and local residents, 85 think that it will be able to help but not much, 46 think that it will not help the community at all, and another 46 respondents think that the Project will be detrimental to the community.

For 27 of the 54 purely landowner respondents, the Project will substantially help the community and local residents, 15 think that it will be able to help but not much, and 12 think that it will not help the community at all.

As for the purely business respondents, 12 out of 15 is of the opinion that the Project will substantially help the community as well as the local residents, while the other three think that it will be able to help but not much.

Table 64: PAPs Opinion of Overall effects of the Project on the Community

Type of PAPs	City/ Municipality		Substantially help the community and local residents	Be able to help but not much	Not help the community at all	Be detrimental to the community	Total
		Count	47	47	31	40	165
	KAWIT	% within MUNICIPALIT	28%	28%	19%	24%	100%
		Count	23	13	10	5	51
	IMUS	% within MUNICIPALIT	45%	25%	20%	10%	100%
		Count	3	17	5	-	25

Household Structure Owner	GENERAL TRIAS	% within MUNICIPALIT	12%	68%	20%	-	100%
		Count	-	1	-	-	1
	DASMARINAS	% within CITY	-	100%	-	-	100%
		Count	17	7	-	1	25
	SILANG	% within MUNICIPALIT	68%	28%	-	4%	100%
		Count	90	85	46	46	267
Total - HH Structure Owner		% within MUNICIPALIT	34%	32%	17%	17%	100%
Landowner	KAWIT	Count	3	2	1	-	6
		% within MUNICIPALIT	50%	33%	17%	-	100%
		Count	14	7	1	-	22
	IMUS	% within MUNICIPALIT	64%	32%	5%	-	100%
		Count	3	4	5	-	12
	GENERAL TRIAS	% within MUNICIPALIT	25%	33%	42%	-	100%
		Count	1	1	-	-	2
	DASMARINAS	% within CITY	50%	50%	-	-	100%
		Count	6	1	5	-	12
	SILANG	% within MUNICIPALIT	50%	8%	42%	-	100%
		Count	27	15	12	-	54
Total - Landowner		% within MUNICIPALIT	50%	28%	22%	-	100%
Business Owner	KAWIT	Count	1	-	-	-	1
		% within MUNICIPALIT	100%	-	-	-	100%
		Count	8	2	-	-	10
	IMUS	% within MUNICIPALIT	80%	20%	-	-	100%
		Count	2	-	-	-	2
	GENERAL TRIAS	% within MUNICIPALIT	100%	-	-	-	100%
		Count	1	-	-	-	1
	DASMARINAS	% within CITY	100%	-	-	-	100%

4.4.2.15 Perceived Positive Impacts of the Project

For 89 of the 217 purely household respondents, the most positive effect of the Project will be bringing employment to local residents, 61 think that it will assist in community projects, 32 believe that it will help in the industrialization of the community, and 18 think that the Project will bring additional revenue to the local government. On the other hand, 17 think that it will not bring any positive impact.

The most positive impact according to 16 of the 56 purely landowner respondents is the industrialization that the Project will bring, 14 believe that it will bring employment to local residents, and 12 believe that it will bring additional income to the local government. Meanwhile six respondents think that it will assist in community projects.

For the six purely business respondents, the Project will bring employment for local residents as well as assist in community projects, each with three responses. Only one thinks that it will bring additional income to the local government while two respondents think that the Project will bring industrialization to the area.

4.4.2.16 Perceived Negative Impacts of the Project

As for the perceived negative impacts of the Project, there are varied responses from purely household respondents. Some (24%) think that there will be a decrease in farm harvest, some (13%) fear loss of property, while others (12%) perceive increased air pollution. 10% think there will be peace problems and other hazards, and the rest perceive that the project might bring about flooding, decrease in ground water, water pollution, noise pollution, and traffic congestion, while a few (8%) stated that they don't think there will be any negative impacts.

Majority of the purely landowner respondents (56%) are of the opinion that the project will cause decreased farm harvest as its negative impact, while the rest have varied opinions similar to the household respondents.

The survey also shows that the purely business respondents also have varied answers of what they perceive as negative impacts of the project; ranging from flooding, health hazards, disruption of peace, air pollution, noise pollution, and traffic congestion.

4.4.2.17 Approval of the Project

The overall results revealed that 192 of 336 (53%) of the respondents accept and approve of the implementation of the Project. 121 (36%) of the respondents do not approve of the Project and 7% are still not sure.

Most of the landowners and business groups accept and approve of the implementation of the Project, but household owners are divided between approval and non-approval of the Project.

While most of the respondents accepted the Project, it is likewise important to see the reasons for their level of acceptance. Dominant and common reasons identified were for the benefit of the government's economic development. The project is expected to propel the government's income and later translate to the economic wellbeing of the area. This finding only proves that the respondents are mature enough to identify the positive benefits of the project, than the consequences and sacrifices they have to endure.

Most of the respondents mentioned that they don't have any other option left. Hence, they might as well accept the Project and the outcomes that it will give them. A minority answered that they are accepting of the Project since they will be paid and relocated.

4.4.2.18 Approval of the Project Should Perceived Adverse Impacts be Mitigated

The survey shows that the majority or 105 out of 267 purely household respondents think that they are going to approve of the Project if its perceived adverse effects will be controlled and mitigated while 139 will still not approve of the Project and 23 are not sure. Most respondents were consistent in their approval of the Project but there are a few respondents who first stated that they approve of the Project then answered negatively when asked if they approve of the Project if adverse impacts are mitigated. When asked the reason for their answer, some said that the loss of their houses cannot be mitigated, others said that they do not want to leave their place or be relocated elsewhere, and one respondent said that adverse effects cannot be mitigated.

The majority (47 of 54) of the purely landowner respondents will approve of the Project if the perceived adverse effects will be controlled or mitigated but six stated that they will still not approve of the Project, and three are still not sure.

As for the purely business respondents, 13 out of 15 said that they will approve of the Project if the perceived adverse effects will be controlled or mitigated but the remaining two respondents will still not approve of the Project.

4.4.3 SOCIO-ECONOMIC PROFILE

Cavite Province is situated south of Luzon, the most northerly of the large islands of the Republic of the Philippines. It is bounded by its neighboring provinces of Batangas in the south, Laguna in the east, Rizal in the northwest, Metro Manila and Manila Bay in the north, and the China Sea in the west. Cavite belongs to Region IV-A or the CALABARZON region.

The Province is divided into seven legislative districts, composed of 19 Municipalities and four cities having a total of 829 Barangays. The four cities include the seat of the Provincial Government - Trece Martires City, the defense frontier - Cavite City, the provincial summer capital - Tagaytay City and the newly declared City of Dasmariñas under the *Republic Act 9723, as ratified last November 25, 2009*. The City of Dasmariñas also happens to be a lone legislative jurisdiction of District IV.

By virtue of *Presidential Decree 1163*, Imus is the Provincial Capital but the seat of the Provincial Government is located at Trece Martires City.

4.4.3.1 Population

The project site is located within Cavite Province which had a recorded population of 3,091,691 persons as of May 1, 2010. This is an increase of 1,027,530 persons over its total population of 2,063,161 persons in the 2000 Census of Population and Housing. The increase in the population count from 2000 to 2010 translated to an average annual population growth rate of 4.12 percent. This is lower than 5.99 percent annual population growth rate of the province between census years 1990 and 2000. If the average annual growth rate recorded at 4.12 percent during the period 2000 to 2010 continues, the population of Cavite would double in 17 years. Fifty years ago, the population of Cavite was only 378,138 persons. The population size is less than one eighth of the population of the province in 2010 census.

Cavite's population almost doubled from 1990 to 2000 and grew for another million in 2010. The peak of in-migration an dpopulation growth was met during the industrialization period.

From 1990 to 2000, Cavite has become a prime destination of workers with jobs at manu industrial companies. A lot of residential areas were developed in Cavite, ranging from resettlement and low-cost housing as well as high-end commercial residences.

Table 21: Population of Cavite Province

Censal Year	Population	Growth Rate (%)	CALABARZON Growth Rate (%)	Philippines Growth Rate (%)
1980	771,230	4.19%		
1990	1,152,534	4.10%	3.91%	2.34%
2000	2,063,161	5.99%	3.07%	1.90%
2010	3,090,691	4.12%	3.49%	2.12%

Source: NSO

Among the six cities and 17 municipalities comprising the province of Cavite, the City of Dasmarinas was the most populous with a population size making up 18.6 percent of the total provincial population. The City of Bacoor was second with 16.8 percent share, followed by the City of Imus with 9.8 percent and the municipality of General Trias with 7.9 percent. The rest of cities/municipalities contributed less than 7.0 percent each.

The least populated area was the municipality of General Emilio Aguinaldo with 0.6 percent share to the total population of the province. It was also the least population area in 2000.[3]

In 2007, the population of the Province of Cavite is 2,856,765 with a growth rate of 4.59%. Since 2000, the population of the Province has steadily increased. During the censal period of year 2000, the population of the Province was at 2,063,161 at a growth rate of 4.45%. In a span of seven years, it increased by 793,604 reaching 2,856,765 at a rate of 4.59%. Since the start of Cavite's industrialization in 1990's, the rapid escalation of the Cavite population has mainly being attributed to in-migration. In-migrants consist of people moving in due to employment and those that establish residence in Cavite due to its proximity to Metro Manila. Based on the growth rate of 4.59%, the 2009 population of Cavite is projected to reach 3,139,760. The combined projected population of the CALAX (Cavite Section) host LGUs was expected to make up about 46.2% of the Province's projected population. The following table enumerates the projected population of each of the CALAX (Cavite Section) host LGUs and its corresponding percentage share in the projected provincial population for 2009 *(National Statistics Office (NSO) Census of Population,2000 and 2007).*

Table 22: Household and Institutional Population of LGUs Traversed by CALAX

City/Municipality	2010 Household Population	2010 Total Population
Kawit	78,181	78,209
Imus	301,228	520,216
Dasmarinas	575,669	575,817
Silang	206,577	213,490

[3] Source: National Statistics Office (NSO), http://psa.gov.ph

General Trias	242,917	243,322

Source: Socio-Economic Profile, Cavite Province, 2013

4.4.3.2 Housing

According to the 2010 Census of Population and Housing, there are a total of 849,755 housing units in the province. Around 65.27% of which or equivalent to 554,657 units are single-detached houses. Because of the rapid population increase in the province, real estate developer started to offer multi-unit residential housing units such as townhouses and row houses as well as low-rise condominiums, accouting to 25.84% or 219,612 units. Other building/house tyes are duplex, commercial, and institutional living quarters.

Table 23: Number of Occupied Housing Units by Type of Building/House, Province of Cavite, 2010

Type of Building/House	Total
Single house	554,657
Duplex	72,812
Multi-unit residential	219,612
Commercial/industrial/agricultural	1,834
Institutional living quarter	145
Other housing units	119
Not reported	576

Source: Socio-Economic Profile, Cavite Province, 2013

4.4.3.3 Religion

The province's religion is dominated by Catholicism. A total of 87.20% of the population are Catholics as of 2013. This is followed by the Iglesia ni Cristo (3.45%). Other religions are Aglipayan, Islam, Protestants, Baptists, Born Again Christians, and Jehova's Witnesses.

4.4.3.4 Education

There are five Division Offices of the Department of Education (DepEd) in the province. These are the Divisions of Cavite City, Cities of Dasmarinas, Bacoor, and Imus, and Cavite (office located in Trece Martires City) which covers the rest of the province. In SY 2013-2014, there are 1,193 elementary institutions in the province. Out of the total, 820 instutitions which account to 68.73% are being run privately. For secondary education, there are 547 secondary schools in the province in which only 15.36% or 84 schools are government-owned. In terms of higher education, Cavite has seven government-run colleges and unitversities that includes the Cavite State University with eleven campuses and the Polytechnic University of the Philippines with two campuses. This is complemented by 57 private universities and colleges. Cavite's higher education sector offers courses in medicine, science, arts, education, engineering, accountancy and finance, business, agriculture, technology and information and communications technology. There are also schools that offer theology and divinity. There are also 183 institutions the offer technical and vocational courses such as the TESDA accredited instutitions.

Table 24: Number of Educational Instituions, Province of Cavite, 2013-2014

Level of Education	Public	Private	Total
Elementary	373	820	1,193

Secondary	84	463	547
Technical/Vocational	4	179	183
Higher Education	18	57	75
Total	479	1,519	1,998

Source: Socio-Economic Profile, Cavite Province, 2013

4.4.3.5 Health

In 2013, Barangay Health Stations (BHS) in the province has increased to 591 from 564 in 2012. The city of Dasmarinas has the most number of BHS with 84 units; followed by Silang, Imus and Bacoor with 61,50 and 47 units, respectively. Rural health units in 2013 has remained the same as in 2012 with a total of 34. The number of government of hospitals increased to 12.

According to data from the Provincial Health Office, the number one leading cause of morbidity in 2013 is Upper Respiratory Infection with 120,552 cases. Other leaded causes of morbidity are Lower Respiratory Tract Infection, Injury,, Hypertension, Urinary Tract Infection, Disorder of Digetive System, Dermatitis, Fever, Asthma, and Ear Infection.

Table 25: Leading Causes of Morbidity (Rate per 100,000 population), Province of Cavite, 2013

Disease	Number	Rate
1. Upper respiratory tract infection	120,552	49.1%
2. Lower respiratory tract infection	31,050	12.6%
3. Injury	25,237	10.3%
4. Hypertension	18,498	7.5%
5. Urinary tract infection	17,263	7.0%
6. Disorder of digestive system	9,814	4.0%
7. Dermatitis	7,765	3.2%
8. Fever	7,088	2.9%
9. Asthma	5,496	2.2%
10. Ear infection	2,934	1.2%

Source: Socio-Economic Profile, Cavite Province, 2013

The incidence of deaths in 2013 reached 15,715, composed of 8,992 males (57.22%) and 6,723 females (42.78%). For the year 2013, the month of January recorded the highest number of deceased persons (1,541), followed by the month of October with 1,507 and April with 1,422. The month of March recorded the least number of deaths with 6.94% or 1,090 deaths.

Heart diseases is the leading cause of death with 1,287 total death occurrences or 37.7% in 2013. This is followed by Cancer and pneumonia.

Table 26: Leading Causes of Mortality (Rate per 100,000 population), Province of Cavite, 2013

Disease	Number	Rate
1. Heart diseases	1,287	37.7
2. Cancer	439	12.86

3. Pneumonia	438	12.83
4. Hypertension	224	6.56
5. Stroke	209	6.12
6. Renal failure	179	5.24
7. Diabetes mellitus	176	5.16
8. Tuberculosis	131	3.84
9. COPD	118	3.46
10. Asthma	96	2.81

Source: Socio-Economic Profile, Cavite Province, 2013

4.4.3.6 Economic Setting

Industry

The province's economic activities are centered on industry, agriculture and commercial trade. There are a total of 46 industrial estates in Cavite Province. Out of these, there will be a total of twenty-nine (29) industrial estates which are located within the host cities and municipalities of the CALAX (Cavite Section). The number of industrial locators in the province is maintained and the number of industrial establishments increased from 853 in 2012 to 898 in 2013.

Among the cities and municipalities, Rosario has the highest number of industrial establishments with 284; followed by Carmona with 251 and the City of Dasmarinas with 111. The 5th District consisting of Carmona, Silang, Gen. Mariano Alvarez have the most number of operating industrial establishments with 335, followed by the 1st District with 286 and the 4th District with 111 industrial establishments.

The products produced by these industrial estates include food and beverage, textile, wearing apparel and leather, wood and wood products, paper and paper products, chemical and chemical products, non-metallic mineral products, basic metal products, fabricated metal products, machinery and equipment, electronic and electrical equipment, parts and telecommunications, agri-business, livestock and poultry, toys, games and sporting goods, and services. A total of 99,445 jobs were made available by the industrial establisments in Cavite. This value accounts for 16.27% of the total numbers of jobs brought forth by all operating industrial establishments in the country as reported by the *Philippine Economic Zone Authority (PEZA)*. As compared to 2008 data total employment decreased from 113,842 to 99,445 or a difference of 14,397 that corresponds to -12.65%. This was due to closure and reduction of manpower in some industrial establishments.

Table 27: Number of Industrial Establishments by District, City/Municipality, Province of Cavite, 2013

City/Municipality	Number of Establishments
1st District	286
Noveleta	2
Rosario	
Cavite Economic Zone	284

City/Municipality	Number of Establishments
2nd District	4
City of Bacoor	4
3rd District	27
City of Imus	
Imus Informal Industrial Estate	7
Anabu Hills Industrial Estate	10
EMI Special Economic Zone	1
Outside Industrial Estate	9
4th District	111
City of Dasmarinas	
First Cityland Heavy Industrial Center	1
First Cavite Industrial Estate	84
Dasmarinas Technopark	10
Outside industrial estate	16
5th District	335
Carmona	
Cavite-Carmona Industrial Estate	
People's Technology Complex-SEZ	49
Outside PTC	3
Granville Industrial Complex	19
Mountview Industrial Complex I	29
Mountview Industrial Complex II	12
Southcoast Indutsrial Estate	24
Welborne Industrial Park	24
Golden Mile Business Park	46
Sterling Technopark	11
Outside industrial complex	34
Gen. Mariano Alvarez	
GMA-NHA Industrial Estate	4
Silang	
Maguyam Industrial Complex	7
Daiichi Industrial Park SEZ	5
Greenway Business Park	6
Sterling Tecnopark SEZ	15
Cavite Light Industrial Park	17
Meridian Industrial Park	7
Outside industrial complex	23
6th District	103
Trece Martires City	37
Gen. Trias	
New Cavite Industrial City	21
Gateway Business Park	17
Manggahan Industrial Estate	2
Outside industrial estate	10
Cavite Economic Zone II	6
Tanza	

City/Municipality	Number of Establishments
Lu Chu Industrial Estate	2
Outside industrial estate	8
7th District	32
Tagaytay City	3
Alfonso	10
Indang	5
Naic	14
TOTAL	898

Agriculture

Agriculture is one of the key economic activities in the Province of Cavite due to the volcanic soil and relatively mild climate which makes it suitable for cultivation. The usual mix of crops planted in Cavite are rice, coconut, corn, papaya, coffee, pineapple, ad vegetables. These agricultural crops are classified as food crops. The total area planted in major crops accounts for 56,147.06 ha or 79.68% of the agricultural lands worked by 85,838 farmers. Silang has the widest planted area having 7,014.66 ha followed by Magallanes and Indang with 6,809.05 ha and 6,009.38 ha respectively.

Rice is the most planted crop in Cavite for 2009 with around 14,398 ha of land planted, producing 62,406.31 metric tons of palay. The majority of the rice land is irrigated. Furthermore, around 8,305 farmers rely on this agriculture niche. The CALAX (Cavite Section) host LGUs contribute towards about 40% of the Province's rice production (combined irrigated and rainfed). On the other hand, corn is not a well-cultivated crop in Cavite which has led to importation of corn from other Provinces. Corn issued mainly for the production of animal feed which is also a major agro-industry in Cavite. The CALAX (Cavite Section) hosts LGUs produce about 60% of the Province's annual corn production. As for vegetable production, the CALAX (Cavite Section) host LGUs produce about 35% of Cavite's production.

Coffee is also considered as a provincial cash crop. The Province is producing roughly one third of the entire national production. Much attention is being given to coffee farming to improve its efficiency and productivity. Of the LGUs along the CALAX (Cavite Section) corridor, Silang is the only coffee producer, producing about 1,221 MT, which is equivalent to almost 16% of the Province's production.

Silang is also a major producer of coconut, producing more than 13 million pieces of coconut, representing about 16% of the Province's annual production. The Municipality also contributes to the Province's annual fruit production, i.e. banana and pineapple and 35,934 MT (8% of provincial output) and 22,567 MT (12% of provincial production) respectively. Silang is also major producer of other fruits such as jackfruit, avocado, citrus, lanzones, etc. Its annual production is more than 2,000 MT, equivalent to 12% of Cavities total annual production.

As for mango and sugarcane, it is only Dasmarinas City among the CALAX (Cavite Section) host LGUs that has significant production of sugarcane and mango. Its annual production (2009) of sugarcane is reportedly 1,700 MT; equivalent to a mere 2% of the Provincial annual production. Mango however it is a major product, with annual production of over 4,000 MT, representing about 20% of the total production of Cavite.

One agricultural product that is also gaining prominence is cut flower production. Silang is the leading producer of cut flowers and ornamentals in the entire Province of Cavite.

In terms of livestock production, General Trias is the top hog producer with an annual production of 308,354, followed by Imus with 33,517, Silang with 28,695 and Dasmarinas with 11,250. Contract broiler growing on the other hand is led by Dasmarinas with an annual production of 1,363,000 heads, followed by Silang with 1,209,750 heads and Imus with 13,000 heads.

Commerce

Commercial sector businesses, which includes malls, shopping center, supermarket, personal, education, recreational, health, and other forms of commercial business endeavors develops faster than the agricultural sector. This is primarily brought about by the growing population in the province.

In 2013, there were 38,004 business enterprises that are registered in the province of Cavite. The micro, small and medium enterprises represent 99.47% with 37,803 establishments while the large enterprises represented 0.53% with 201 establishments. The Micro enterprises comprised 91.05% (34,612) of the total number of micro, small and medium enterprises while the small and medium enterprises accounted for 7.98% (3,034) and 0.41% (157), respectively. These business establishments include those informed in wholesale and retail trade, services, information and commonudation, financial and insurance activities, human health and social work activities, education, professional, scientific and technical activities, arts, entertainment, and recreation, administrative and support service, real estate, among others.

Tourism

Cavite Province is part of the southern Tagalog tourism circuit. This is made up of the provinces of Laguna, Batangas and Cavite. Cavite in itself is divided into three tourism nodal points according to tourism destination and products. The three clusters are:

- Tagaytay – This upland area is famous for natural tourist attractions and is conducive for meditating, sight-seeing, picnicking, and other countryside activities

- Ternate-Corregidor-Naic-Maragondon Area - Popularly attractive because of the presence of world-class beach resorts complementing the area's historical attractions

- Kawit-Cavite City Area - Cavite's focal point for pieces of rich historical legacies the great Caviteño forefathers gave for the birth of Philippine Independence

According to the records of the Department of Tourism, a total of 61,851 tourists have visited the Province from January to December of 2009. This consisted of 72.63% or 44,920 domestic visitors, 16,160 or 26.13% as Day-Tour Tourists/Overseas Filipinos, and 771 or 1.24% as foreign visitors.

Tourism attractions of Cavite consist of natural and historical sites as well as cultural attractions. Being one of the early sites occupied by the Spaniards in the country and being the seat of the Philippine Revolution, the Province hosts a number of significant historical sites.

Aside from historical and cultural attractions, the Province is a popular destination for sports and recreational. As an example, the Province hosts eight golf courses, with three being located in the CALA LGU hosts of Silang, General Trias and Dasmarinas.

4.4.3.7 Infrastructures

Roads and Bridges

The province of Cavite is accessible by various land-based vehicles from Manila and other nearby provinces and cities. It may be reached through public utility jeepneys an dbuses taking the major entrances and exits such as the Aguinal Boulevard (Manila-Cavite Coastal Road) via Coastal Road Extension and via Talaba, Bacoor, South Luzon Expressway (SLEX) in Carmona, the Aguinaldo Highway (Batangas-Alfonso-Tagaytay Road), the Zapote-Las Pinas Road, the Sta. Rosa-Tagaytay Road, and the Alabang-Molino via Daanghari Road.

In 2011, the Cavite Expressway (CAVITEX) was opened which lessened the heavy volume of vehicles on Aguinaldo Highway in Bacoor. Travel time from Imus to Baclaran-Pasay City was lessed to one hour.

Last July 1, 2013, the Kaybiang Tunnel, the country's longest underground highway tunnel at 300 meters was opened along the Ternate-Nasugbi Road piercing through Mt. Pico de Loro's north ridge that shortens the travel time from Manila to the western coves of Cavite and Nasugbi, Batangas.

The province's road network totaled to 2,143.3459 kilometers wherein 19.13% or 410.0930 kilometers are national roads while 369.6810 kilometers or 17.25% are provincial roads. City/municipal roads comprise 12.48% or 267.5256 kilometers while barangay roads have a total lengt of 1,096.0463 kilometers or 51.14% of the total road length. 6464^ or 1m385.4885 kilomters of these roads are paved with concrete; 314.8107 kilometers or 14.69% are paved with asphalt while 13.53% or 290.0055 kilometers city/municipal and barangay roads are still earthfilled. Roads that are gravel-paved comprise 7.14%.

There are 332 bridges which connect roads in different cities and municipalities in the province. A total of 102 bridges were classifiedas nationa;' 69 bridges are provincial; 39 are city/municipal bridges; and 122 are barangay bridges. These have a total length of 6.4812 kilometers.

Communication

Telephone services within the Province are being provided by the Philippine Long Distance Telephone Company (PLDT), Digital Telecommunications Philippines Inc. (DIGITEL) and Globe Telecommunications. In addition, the entire Province is being serviced by the major cell phone service providers Globe, Smart and Sun Cell. The Province hosts a number of

local radio stations and is also generally covered by radio stations broadcasting from Metro Manila.

Power

It is reported that the Province of Cavite is 100% energized. Power is distributed in the Province by the Manila Electric Company.

Water Supply

As reported in the *2013 Provincial Profile (PPDO 2013),* the entire province of Cavite has access to clean and safe water that is provided by the Manynilad Water Services, Inc. (MWSI) and water districts. MWSI serves the cities of Imus, Bacoor, and Cavite and the municipalities of Noveleta, Kawit, and Rosario. The municipalities of Mendez, Indang, Silang, Gen. Mariano Alvarez, Maragondon, Tanza, Carmona, Amadeo, Gen. E. Aguinaldo, City of Dasmarinas, Tagaytay City, and Trece Martirez City are supplied by water districts. Likewise, there are private corporations operating as water service providers in the province ine General Trias Water Corporation in Gen. Trias, Naic Water System Corporation in Naic and Wester Cavite Water Supply and Servive Corporation in Ternate. The municipal governments of Alfonso and Magallanes manage their respective water supply systems while others use deepwells as traditional water source.

The water supply situation within the CALAX (Cavite Section) host LGUs as of 2009 is enumerated in the following table:

Table 30: Water Supply Situation within the CALAX (Cavite Section) host LGUs as of 2009

LGU	Level I	Level II	Level III
Kawit	3,775		8,216
Imus	17,968		22,161
Dasmarinas	115		94,130
General Trias	5807		33,969
Silang	97	2,631	29,596

Level 1 – Point source of water supply
Level II – Water is supplied through a common faucet / water tank where communities draw water from
Level III – Piped water to individual houses

It can be gleaned from the above table that Dasmarinas has the best water supply system within the CALAX (Cavite Section) host LGUs, with only a small proportion of water users depending on a Level 1 water supply system.

4.4.3.8 Solid Waste

The Province of Cavite crafted the Solid Waste Management Plan 2011-2020 in compliance with the Solid Waste Management Act (Republic Act 9003). The most appropriate manner of solid waste disposal in the province considering the type and volume of wastes is through sanitary landfill. However, currently, there is still no sanitary landfill in the province. Despite

this, the local government units are undertaking various means of solid waste management such as recycling and composting.

As of 2013, there are thirteen (13) cities/municipalities which are practicing composting. Overall, thie constitutes a total of nineteen (19) composting centers. The location of these composting facilities are presented in Table 28.

Table 28: Location of Composting Facilities

City/Municipality	Location of Composting Facility
Cavite City	Bagong Pook, San Antonio
Noveleta	Poblacion, San Antonio I
Imus	Alapan 1-A, Tanzang Luma IV
Dasmarinas	Eco-Center at Central Market
Carmona	Carmona Ecology Center
Gen. M. Alvarez	Olaes, Poblacion I, Poblacion V
Tanza	Tanza Public Market, Bunga
Alfonso	Marahan I
Indang	Banaba Lejos
Magallanes	Kabulusan, Bendita I
Maragondon	Layong Mabilog
Mendez	Asis II

Source: Socio-Economic Profile, Cavite Province 2013

RA 9003 requires the LGUs to develop a solid waste management plan and to establish a Material Recovery Facility (MRF) in every barangay or cluster of barangays. The MRF receives mixed waste for final sorting, segregation, composting and recycling. Despite the mandate of the law, out of the 829 barangays in Cavite, there are only ninety-seven (97) MRFs in the entire province. Majority of the MRFs are located in the City of Imus and municipality of Carmona with 39 and 31 MRFs, respectively. Centralized MRF which cater to the entire city/municipality and accepts bigger volime of wastes are also present. Out of the 23 cities/municipalities, only 11 have centralized MRFs.

There are fifteen (15) cities/municipalities which are still using dumpsite. Nine (9) of these dumpsites are open and only six (6) are controlled dumpsites. Those without a dumpsite are engaged into a contract with a sanitary landfill.

Table 29: Solid Waste Disposal System, Cavite Province (2013)

City/Municipality	Type of Waste Disposal	Location	Land Area
1st District			
Cavite City	Open dumpsite	Bgy. Pook, San Antonio	
Kawit	Open dumpsite	By. Batong Dalig	0.01 ha
Noveleta	By contract/sanitary landfill	Bgy. De Ocampo, Trece Martires City	0.15 ha
Rosario	By contract/sanitary landfill	Bgy. De Ocampo, Trece Martires City	
2nd District			
City of Bacoor	By	Montalban, Rizal	

	contract/sanitary landfill		
3rd District			
City of Imus	By contract/sanitary landfill	Bgy. Pasong Buaya	1.37 ha
4th District			
City of Dasmarinas	Open dumpsite	Bgy. Salawag	6.0 ha
5th District			
Carmona	By contract/sanitary landfill	San Pedro, Laguna	
Silang	Open dumpsite	Bgy. Lalaan I	1.2 ha
Gen. M. Alvarez	By contract/sanitary landfill	Byg de Ocampo, Trece Martires City	
6th District			
Trece Martires City	Open dumpsite	Bgy. De Ocampo	
Amadeo	Controlled dumpsite	Bgy. Poblacion V	0.18 ha
Gen. Trias	Open dumpsite	Bgy. Tapia	1.5 ha
Tanza	Open dumpsite	Bgy. Sahud-Ulan	5.0 ha
7th District			
Tagaytay City	By contract/sanitary landfill	San Pedro, Laguna	
Alfonso	Controlled dumpsite	Bgy. Marahan I	0.4 ha
Gen. Emilio Aguinaldo	Open dumpsite	Bgy. Lumipa	1.25 ha
Indang	By contract/sanitary landfill		
Magallanes	Open dumpsite	Bgy. Kabulugan	0.1 ha
Maragondon	Controlled dumpsite	Bgy. Layong Mabilog	1.6 ha
Mendez	Controlled dumpsite	Bgy Asis II (Eco-Center)	0.75 ha
Naic	Controlled dumpsite	Bgy. Sabang	1.3 ha
Ternate	Controlled dumpsite	Bgy. Sapang II	3.0 ha

Source: Socio-Economic Profile, Cavite Province 2013

4.4.4 SOCIO-ECONOMIC IMPACTS

4.4.4.1 Displacement of Settlers and Properties

The Inventory of Loss (IOL) identified __ structures and __ households within the project site as presented in the LARAP.

4.4.4.2 Conflict in Land Ownership and Right-of-Way

The land to be utilized for the CALAX property needs to be acquired by the Government. The alignment that passes along the property of Stateland, Inc. (SLI) will affect six different lots. SI, as the owner of Lot No. 2805 and as representative and property manager of Lot 3710-B will cause the cession and donation of the affected 6,245 sqm to DPWH. In addition, SLI as authorized by the owners of Lots A-1-B, 3951, 2644 and 2 will cause the cession and donation of the affected 19,108 sqm to DPWH to form part of the CALAX. A Memorandum of Agreement between SLI and DPWH was approved as shown in Annex F.

Right of way / access to properties and locations shall be provided by CALAX. This includes the section of the CALAX tat passes through the property owned by Philippine Estates Corporation (PEC) where CALAX intersects the PEC property in effect bocking the entrance to the said property at Sta 12+000. PEC will be provided with access to their property and along Arnaldo Highway leading to the property.

Likewise, the section of CALAX that passes through the SLI property will have access for Lot 2805 and Lot 3710-B of SLI. A land area of 6,245 sqm shall be donated to the DPWH to form part of the six-lane interchange access / entrance road. Pursuant to the SLI MOA, the Concession shall be required to provide at least two lanes at points A, B, C and D of the access/ entrance road and a minimum of 50 meters opening along the west-bound side of the access/ entrance road.

4.4.4.3 In-Migration Patterns as a Result of Project Implementation

In-migration patterns because of the project implementation will not vary significantly. In-migration is primarily the result of more employment opportunities that are available in Cavite as well as its proximity to Metro Manila.

Uncontrolled in-migration due to land speculation and/or job opportunities during pre-construction have a negative (–) impact, severe (S) in magnitude, a high (H) probability of occurrence especially in the Philippines where there is no clear mechanism that would track in-migrants, is temporary (T) in nature and has a short-term (ST) impact.

During road construction, more labor-intensive jobs would be available for residents and non- residents alike. The increased access between Cavite and Metro Manila would make the job availability more attractive to migrants.

Migrants that do not have skills but are willing to try to get a job would increase competition with local residents for job availability. This kind of in-migration is a negative (–) impact, moderate (M) in magnitude, has a high (H) probability of occurrence especially with the high level of unemployment in Metro Manila, is temporary (T) in nature and has a short-term (ST) impact.

On the other hand, migrants that do have skills, are productive, and would be able to transfer their knowledge and skills to workers in Cavite would be a welcome thing. This kind of in- migration is a positive (+) impact, moderate (M) in magnitude, has a low (L) probability of occurrence, is permanent (P) in nature and has a long-term (LT) impact.

4.4.4.4 Impacts on Indigenous Peoples and Culture/Lifestyle

There are no indigenous people at the site and immediate vicinity. There are no anticipated adverse impacts on culture and lifestyle.

4.4.4.5 Impacts on the Host Communities

The temporary housing of construction workers in construction camps can cause some social concerns on the host communities. Since some of the workers may be from other places, conflicts with local communities might arise. In addition, social problems like gambling and consumption of alcoholic drinks, among others, may cause problems with the host communities.

This impact is negative (–), moderate (M) in magnitude, has a low (L) probability of occurrence, is temporary (T) in nature and has a short-term (ST) impact.

The relocation of transmission lines that may be affected by the proposed project would cause temporary and intermittent disruption of power supply to the host communities. This would adversely affect business establishments that rely heavily on the existing power supply.

This impact is negative (–), severe (S) in magnitude, has a high (H) probability of occurrence, is temporary (T) in nature and has a short-term (ST) impact.

4.4.4.6 Threats to Public Health vis-à-vis Baseline Health Conditions

Pollutants created during the pre-construction/preparatory period may have adverse impacts on the health of construction workers and residents of nearby communities. Pollutants created during the construction period (e.g. suspended particulates, gaseous emissions, etc.) may have adverse impacts on the health of construction workers and residents of nearby communities.

Workers will be exposed to ergonometric stress and they will be exposed to high levels of noise, dust and heat during the construction. They will also be exposed to occupational hazards associated with heavy lifting, moving heavy equipment and the likes.

This impact is negative (–), moderate (M) in magnitude, has a low (L) probability of occurrence, is temporary (T) in nature and has a short-term (ST) impact. This impact is not severe in magnitude and is relatively easy to address given the number of health facilities and health personnel in the area.

The project contractor will be required to implement a Construction Health and Safety Plan to avoid accidents at the workplace. In the operation of the expressway, emergency and disaster preparedness will be included in the maintenance procedures.

4.4.4.7 Local Benefits Expected from Project Implementation

Project benefits from project implementation include land appreciation because of improvement at the site and in the surrounding community, increased revenues by the Government from taxes, and provision of employment opportunities.

During pre-construction, preparatory activities would provide temporary employment to local residents. Enterprising residents would also have increased livelihood opportunities. This is important as the Survey of PAPs reveals that most of those who will be adversely affected by the Project depend on farming as their primary source of income. This is a positive (+) impact, moderate (M) in magnitude, has a high (H) probability of occurrence, is temporary (T) in nature and has a short-term (ST) impact.

During road construction, more labor-intensive jobs would be available for residents and non- residents alike. Local residents that do not have skills but are willing to try to get a job would have an increase chance of getting hired. This impact is a positive (+) impact, moderate (M) in magnitude, has a high (H) probability of occurrence, is temporary (T) in nature and has a short-term (ST) impact.

Local residents that are enterprising could have increased livelihood opportunities from selling food to the workers to providing board and lodging facilities to them. This impact is a positive (+) impact, moderate (M) in magnitude, has a high (H) probability of occurrence, is temporary (T) in nature and has a short-term (ST) impact.

In general though, employment opportunities in the CALAX (Cavite Section) host LGUs are mostly those that are generated by the Ecozones and those that are generated by MSMEs.

4.4.4.8 Employment Opportunities

The proposed project can generate employment for qualified personnel in the community. Priority hiring of qualified workers should be accorded to the host barangay. Job requirements shall be provided to the host barangays prior to the hiring of workers during the construction and operational phases.

4.4.4.9 Contribution to Economy

The project is expected to contribute to the economy of Cavite Province. This is most likely accompanied by increase in economic activities in the province.

4.4.4.10 Property Valuation

There is a potential for improvement in the values of properties where there is visible improvement in infrastructures and aesthetics. It was projected that the property values are likely to increase by 10% with improvement in community infrastructures.

4.4.4.11 Government Income from Taxes

Another benefit of the proposed project is the increase in taxes and income of the LGU from receipts of the proposed project. This will redound to the generation of funds for the implementation social services projects. The income generated from taxes and revenues will translate into funds for the implementation of projects for improved social services like education, public health, waste management, and infrastructure.

4.4.5 BASIC SERVICES AND RESOURCE COMPETITION IN THE AREA

4.4.5.1 Water Supply

The area is being served by the MWSI, which serves the West Concession. The approved/proposed land uses within the MWSI service area provides for a general increase in residential, commercial and industrial area with the residential area increasing with a higher rate than the two other uses. This implies increased water needs and wastewater production in all three major activities. It is estimated that domestic water supply will have a higher proportion than industrial water supply requirements not only because of the high growth rate in residential areas but also because most LGUs in Cavite are also limiting their industrial development to light industries which have limited water consumption.

4.4.5.2 Power Supply

The power requirement of the city and study area is being supplied by the National Power Corporation (NAPOCOR) and distributed by the Manila Electric Company (MERALCO). With the current adequacy of supply from NAPOCOR, there is no problem on power supply of the community and the proposed project.

4.4.5.3 Traffic

During road construction, traffic congestion may become unmanageable, presenting a host of other community problems, such as decreased revenue for business establishments along the congested area, increased risk of vehicular accidents, opportunity losses for residents along the alignment, and the like. Traffic congestion is a negative (–) impact, severe (S) in magnitude, has a high (H) probability of occurrence, is temporary (T) in nature, but has a long-term (LT) impact.

More often than not, the members tasked to manage traffic in barangays traversed by a road are the Barangay Officers or Barangay Tanod. During road construction, they will be pre- occupied by traffic management that time is taken away from the resolution of other community problems. This is a negative (–) impact, moderate (M) in magnitude, has a high (H) probability of occurrence, is temporary (T) in nature, and has a short-term (ST) impact.

During road operation, improved road conditions will decrease traffic congestion but may increase vehicular accidents due to the faster speeds that a good road allows. This is

both a negative (-) and a positive (+) impact, moderate (M) in magnitude, has a high (H) probability of occurrence, is permanent (P) in nature and has a long-term (LT) impact.

The calibration process for traffic forecasting was derived from the traffic count surveys. 16-hour traffic counts were conducted and spread across all major roads in the area, with 24-hour traffic counts conducted for selected traffic stations. The average daily traffic (ADT) for the 16-hour traffic count stations were calculated using expansion factors derived from 24-hour traffic counts. ADTs were then converted to annual average daily traffic (AADT) using seasonal factors published by DPWH. Table 3 summarizes the AADT derived for each traffic count stations and are shown in equivalent PCUs. Table 4 presents the public transport terminal inventory.

Table 30. Public Transport Terminal Inventory

Name	Location	Area (ha)	No. of Routes	Capacity (no. of parking bays)	
				For large vehicles	For small vehicles
Park 'N Ride	Lawton, Manila near LRT Line 1 Central Terminal Station	0.52	6	20	30
Cavite-Batangas Bus Terminal	Pasay on-street near Savemore Market	Na	5	3	1
BSC Bus Terminal	EDSA corner Taft Ave. near MRT Line 3, Taft Ave Stn	0.21	6	20	20
Mini-Bus Terminal	Roxas Blvd. near Baclaran Church in Pasay City	0.08	7	6	32
SM Mall of Asia Transportation Terminal	SM MOA Compound near Marina Way in Pasay	0.42	22	0	200
Robinsons Transport Terminal, Dasmarinas	Robinsons Dasmarinas near Governor's Drive	0.08	10	0	48
SM Transport Terminal, Dasmarinas	SM Dasmarinas near Governor's Drive	0.25	10	0	156
Trece Martires Terminal	Trece MArtires Indang Road near Governor's Drive	0.12	7	5	35
Zapote-Naic Terminal	Naic, Cavite	0.05	5	5	15

Source: CALA Feasibility Study, Annex 3

Table 31. Public Transport Route Inventory

Route	Mode	Route Description
Baclaran-Cavite City via Binakayan, Noveleta (AC/ORD)	PUB	Via Redemptorist, Roxas Blvd, Coastal Rd., Bacoor: Real, Tirona Highway, Highway 25; Kawit: Gen. M. Alvarez, Gen. P. Alvarez, Juliam Felipe Blvd, P. Burgos to terminal and back via

Route	Mode	Route Description
		same route
Baclaran-Naic via Tanza (ORD)	PUB	Via MIA Rd, Roxas Blvd, Coastal Rd, Bacoor: TIrona Highway 25; Kawit: Gen. M. Alvarez; Noveleta: Marseilla; Rosario: Bgy. Wawa; Tanza: Bgy Amaya up to Naic Terminal and back via same route.
Buendia-Cavite City via Ayala (AC)	PUB	Via Gil Puta Ave, Ayala Ave, EDSA, Roxas Blvd, Coastal Rd; Bacoor: Real St., Bgy Talaba, Maliksi, Bgy Alma, Tirona Highway, Bgy Binakayan, Highway 25; Kawit: Gen M. Alvarez; Noveleta: Gen P. Alvarez, Juan Felipe Blvd, P. Burgos up to Cavite terminal and back via same route
Vito Cruz-GMA (AC)	PUB	Via Vito Cruz, Roxas Blvd, Gen Aguinaldo Highway; Dasmarinas: Salitran, Bucal, Paliparan up to GMA terminal and back via same route
Vito Cruz-Naic via Salinas, EPZA (AC/ORD)	PUB	Via Vito Cruz, Roxas Blvd, Coastal Rd; Bacoor: Real, Tirona Highway (Bgy Talaba, Bgy Maliksi, Bgy Alma); Kawit: Highway 25, Gen M. Alvarez (Bgy Binakayan, Kaingen, Wakas, Tabon, Panamutan, Magdalo); Noveleta: Gen M. Alvarez (Bgy Magdiwang, Poblacion, Salcedo 1, Salcedo 2); Rosario: Marseilla (Bgy Ligtong II, Bagbag, Silangan, Poblacion, Wawa); Tanza: Bgy Biwas, Daang Amaya, Halayhay, Calibuyo, Capipisa up to NAIC terminal and back via same route.
Vito Cruz-Silang via Dasmarinas (AC/ORD)	PUB	Via Vito Cruz, Roxas Blvd, Coastal Rd, Aguinaldo Highway; Dasmarinas: Bgy Salitran, Bgy Bucal; Silang: Bgy Biga, Bgy San Vicente up to terminal and back via same route
Baclaran-Alfonso via Silang, Tagaytay (ORD)	PUB	Via Roxas Blvd/MIA Rd, Coastal Rd; Bacoor: Real, Tirona Highway; Imus: Highway 25, Medicion, Gen F. Yengco, Bayang Luma, Bacandala, Barangay Rd; Dasmarinas: (Barangay San Angustin, Pala-pala, Sampaloc, Bucal, Malinta); Silang: (Barangay Biga, Sabutan, Luksuhin, Balubad, Lalaan I, Santol, Lalaan II, Buho); Tagytay City: Mahogany Ave, Bgy Kaybagal; Alfonso: Barangay Mangas up to terminal
Baclaran-Amadeo via Silang, Tagaytay (ORD)	PUB	Via Roxas Blvd/MIA Rd, Coastal Rd; Bacoor: Real, Tirona Highway; Imus: Highway 25, Medicion, Gen F. Yengco, Bayang Luma, Bacandala, Barangay Rd; Dasmarinas: (Barangay San Angustin, Pala-pala, Sampaloc, Bucal, Malinta); Silang: (Barangay Biga, Sabutan, Luksuhin, Balubad, Lalaan I, Santol, Lalaan II, Buho); Tagytay City: Mahogany Ave, Bgy Kaybagal; Amadeo: (Bgy Solaban, Loma up to Amadeo terminal
Baclaran-Indang via Dasmarinas, Trece (ORD)	PUB	Via Roxas Blvd/Mia Rd, Coastal Rd; Bacoor: Real, Tirona Highway; Imus: Highway 25, Medicion, Gen F. Yengco, Bayang Luma, Bacandala, Barangay Rd; Dasmarinas: Palapala, Governors Drive; Trece Martirez: Trece-Indang Rd up to terminal
Baclaran-Magallanes (Cavite) via Tagaytay (ORD)	PUB	Via Roxas Blvd/Mia Rd, Coastal Rd; Bacoor: Real, Tirona Highway; Imus: Highway 25, Medicion, Gen F. Yengco, Bayang Luma, Bacandala, Barangay Rd; Dasmarinas: (Bgy San Agustin, Palapala, Sampaloc, Bucal, Malinta); Silang: (Bgy Biga, Sabutan, Balubad, Lalaan I, Santol, Lalaan II, Buho); Tagaytay City: Mahogany Ave; Alfonso: (Bgy Kaytitinga; Magallanes: (Bgy

Route	Mode	Route Description
		Medina, Calauan, Urdaneta) tp to terminal.
Baclaran-Mendez via Silang, Tagaytay (ORD)	PUB	Via Roxas Blvd/Mia Rd, Coastal Rd; Bacoor: Real, Tirona Highway; Imus: Highway 25, Medicion, Gen F. Yengco, Bayang Luma, Bacandala, Barangay Rd; Dasmarinas: (Bgy San Agustin, Palapala, Sampaloc, Bucal, Malinta); Silang: Bgy Biga, Sabutan, Balubad, Lalaan I, Santol, Lalaan II, Buho); Tagaytay City: Mahigany Ave (bgy Galicia) up to Mendez terminal
Pasay- Calatagan (AC/ORD)	PUB	Via EDSA, Roxas Blvd, Coastal Rd; Bacoor: Real, Tirona Highway, Medicion; Imus: Gen Yengco, Bayang Luma, Bacandala, Barangay Rd, Bgy Sabang, Dasmarinas, Silang, Tagayta (Mahogany Ave); Batangas: Batulao, Lian, Binubusan, Talisay, Balitoc up to Calatagan
Pasay-Nasugbu (AC/ORD)	PUB	via EDSA, Roxas Blvd., Coastal Rd., BACOOR: Real, Tirona Hi-way, Medicion, IMUS: Gen. Yengco, Bayang Luma, Bacandala, Brgy. Rd, (Brgy. Silang), Dasmariñas, Silang, Tagaytay (Mahogany Ave.), BATANGAS: Batulao, Lian up to Nasugbu
Cavite City – Olongapo via Cubao (AC)	PUB	via P. Burgos Ave., Julian Felipe Blvd., Manila-Cavite Rd., Gen. P. Alvarez, Gen. M. Alvarez, Highway 25, Tirona Highway, Real, Coastal Rd., Roxas Blvd., Edsa Balintawak Cloverleaf, A. Bonifacio, North Expressway, PAMPANGA: San Fernando Exit, Olongapo-Gapan Rd., Bacolor, Guagua, Lubao, Layak, Dinalupihan National Highway up to Olongapo
Cavite City-Baguio (AC)	PUB	via P. Burgos Ave., Julian Felipe Blvd., Manila-Cavite Rd., Gen. P. Alvarez, Gen. M. Alvarez, Highway 25, Tirona Highway, Real, Coastal Road, Roxas Blvd., EDSA Balintawak Cloverleaf, A. Bonifacio, North Expressway, PAMPANGA: DAU Exit, Mabalacat, Magalang, TARLAC: Capas, Tarlac-Tarlac, Gerona, Paniqui, Moncada, San Manuel, PANGASINAN: Sto. Tomas, Urdaneta, Binalonan, Pozorrubio, Sison, BENGUET: Twin Peaks up to Baguio
Baclaran-Cavite City via Noveleta, Coastal Rd (ORD)	Mini Bus	via Roxas Blvd., Coastal Rd., BACOOR: Real, Tirona Hi-way, Highway 25, KAWIT: Gen. M. Alvarez, Gen. P. Alvarez, Julian Felipe Blvd., P Burgos up to terminal
Baclaran-Naic via Tanza (ORD)	Mini Bus	via MIA Rd., Roxas Blvd., Coastal Rd., BACOOR: Real, Tirona Hi-way, Highway 25, KAWIT: Gen. M. Alvarez, NOVELETA: Marseilla, ROSARIO: Bgy. Wawa, TANZA: Bgy. Amaya up to Naic terminal
Zapote-Cavite City (ORD)	Mini Bus	via Real, Evangelista, Tirona Hi-way, Highway 25, KAWIT: Gen. M. Alvarez, Gen. P. Alvarez, Julian Felipe Blvd., Padre Burgos, Judge F. Ibanez to terminal and back via same route

Route	Mode	Route Description
Baclaran-Dasmarinas	PUJ	No route description available(NRDA)
Zapote-Dasmarinas	PUJ	NRDA
Baclaran-DBB.C	PUJ	NRDA
Zapote-DBB.C	PUJ	NRDA
Baclaran-DBB.I	PUJ	NRDA
Baclaran-Paliparan	PUJ	NRDA
Zapote-Paliparan	PUJ	NRDA
Zapote-Rosario	PUJ	NRDA
Zapote-Tanza	PUJ	NRDA
Bacoor-Binakayan	PUJ	NRDA
Bacoor-Rosario	PUJ	NRDA
Binakayan-Imus	PUJ	NRDA
Binakayan-Noveleta	PUJ	NRDA
Cavite City-Gen Trias	PUJ	NRDA
Cavite City-Naic	PUJ	NRDA
Cavite City-Rosario	PUJ	NRDA
Dasmarinas-DBB.C	PUJ	NRDA
Dasmarinas-GMA	PUJ	NRDA
Dasmarinas-Imus	PUJ	NRDA
Dasmarinas-Silang	PUJ	NRDA
Dasmarinas-Trece Martirez	PUJ	NRDA

Source: CALA Feasibility Study, Annex 3, Traffic Data

The Traffic Impact Assessment (TIA) is based on the volume to capacity (V/C) ratio of road sections. It is the ratio of projected peak hour volume along a road section in passenger car unit (pcu) to the capacity of the road section also in pcu per hour. Capacity of a road section is

affected by the lane width, road side friction, etc. In this analysis, capacity is assumed to be 900 pcu per lane per hour. The corresponding level of service (LOS) based on the calculated V/C ratio is shown in Table 1. Table 2 shows the LOS of sections of major roads within the study area during the start of operation of the expressway (2017) and these are generally LOS C. A level of service of C is generally accepted as a benchmark of stable traffic flow without immediate need for traffic mitigating measures to be implemented.

Table 1: Level of Service

Level of Service	Characteristics	V/C Ratio
A	Condition of free flow with high speeds and low traffic volume. Drivers can choose desired speeds without delays.	0.00 - 0.19
B	In the zone of stable flow. Drivers have reasonable freedom to select their speed.	0.20 - 0.44
C	In the zone of stable flow. Drivers are restricted in selecting their speed.	0.45 - 0.69
D	Approaches unstable flow with nearly all drivers restricted. Service volume corresponds to tolerable capacity.	0.70 - 0.84
E	Traffic volumes near or at capacity. Flow is unstable with momentary stoppage.	0.85 - 1.00
F	Forced or congested flow at low speeds. Long queues and delays.	> 1.00

Table 2: V/C Ratio and LOS of Affected Roads

Section		2017 AADT - With Project (pcu)				Peak Hour Volume (pcu)	Total No. of Lanes	Total Capacity (pcu)	V/C Ratio	LOS
		Class 1	Class 2	Class 3	Total					
Along Molino Blvd. / Molino Road / Paliparan Road	Aguinaldo Highway - Aniban III	37,624	7,639	2,519	47,782	3,345	4	3,600	0.93	E
	Aniban III - Palico Daanan	24,884	4,116	2,101	31,101	2,177	4	3,600	0.60	C
	Palico Daanan - GSIS Road	18,261	3,241	2,027	23,529	1,647	4	3,600	0.46	C
	GSIS Road - Avenida Rizal	24,425	3,654	2,889	30,968	2,168	4	3,600	0.60	C
	Avenida Rizal - Daang Hari Road	29,775	4,798	3,252	37,825	2,648	4	3,600	0.74	D
	Daang Hari Road - Jose Abad Santos	16,131	4,636	3,257	24,024	1,682	4	3,600	0.47	C
	Jose Abad Santos - Zone 121	17,724	4,614	3,000	25,338	1,774	4	3,600	0.49	C
	Zone 121 - Fatima Road	14,293	4,132	1,664	20,089	1,406	4	3,600	0.39	B
	Fatima Road - Governor's Drive	13,531	2,651	1,768	17,950	1,257	4	3,600	0.35	B
Along Aguinaldo Highway	MCTE - Molino Blvd.	28,395	7,407	5,047	40,849	2,859	6	5,400	0.53	C
	Molino Blvd. - Tirona Highway	43,540	7,692	4,319	55,551	3,889	6	5,400	0.72	D
	Tirona Highway - Zone 99	34,363	6,896	4,089	45,348	3,174	6	5,400	0.59	C
	Zone 99 - Palico Daanan	21,448	4,602	2,768	28,818	2,017	4	3,600	0.56	C
	Palico Daanan - Palanas	19,766	4,503	2,757	27,026	1,892	4	3,600	0.53	C

	Palanas - Daang Hari Road	30,680	5,887	3,253	39,820	2,787	4	3,600	0.77	D
	Daang Hari Road - Salitran	23,139	5,390	3,207	31,736	2,222	4	3,600	0.62	C
	Salitran - Zone 120	21,106	5,301	3,179	29,586	2,071	4	3,600	0.58	C
	Zone 120 - P. Guevarra	24,109	3,543	1,075	28,727	2,011	4	3,600	0.56	C
	P. Guevarra - Congressional Road	23,751	4,200	1,737	29,688	2,078	4	3,600	0.58	C
	Congressional Road - Don P.P. Campos	23,647	3,907	1,421	28,975	2,028	4	3,600	0.56	C
	Don P.P. Campos - Governor's Drive	24,886	4,150	1,597	30,633	2,144	4	3,600	0.60	C
	Governor's Drive - Palapala	15,687	2,601	1,110	19,398	1,358	4	3,600	0.38	B
	Palapala - Zone 122	32,552	6,527	3,653	42,732	2,991	4	3,600	0.83	D
	Zone 122 - CALAX	15,649	4,232	2,409	22,290	1,560	4	3,600	0.43	B
	CALAX - Sabutan	23,147	5,599	2,029	30,775	2,154	4	3,600	0.60	C
	Sabutan - Silang-Banaybanay Road	10,916	2,829	1,104	14,849	1,039	4	3,600	0.29	B
Along Andres Bonifacio	Gen. Trias Drive - Open Canal Road	12,407	2,084	1,067	15,558	1,089	2	1,800	0.61	C
	Open Canal Road - San Francisco	11,505	1,597	615	13,717	960	2	1,800	0.53	C
	San Francisco - Governor's Drive	10,343	2,369	1,473	14,185	993	2	1,800	0.55	C
Along Gen. Trias Drive /	A. Soriano Highway - Zone 110	12,694	2,271	1,291	16,256	1,138	2	1,800	0.63	C
	Zone 110 - A. Bonifacio	15,651	2,298	1,094	19,043	1,333	2	1,800	0.74	D

	A. Bonifacio - Open Canal Road	12,709	1,814	720	15,243	1,067	2	1,800	0.59	C
	Open Canal Road - Zone 111	15,144	1,938	627	17,709	1,240	2	1,800	0.69	C
	Zone 111 - Buenavista 3	8,216	2,147	1,369	11,732	821	2	1,800	0.46	C
	Buenavista 3 - Governor's Drive	8,216	2,147	1,369	11,732	821	2	1,800	0.46	C

Section		2017 AADT - With Project (pcu)				Peak Hour Volume (pcu)	Total No. of Lanes	Total Capacity (pcu)	V/C Ratio	LOS
		Class 1	Class 2	Class 3	Total					
	Governor's Drive - Zone 113	14,967	2,158	577	17,702	1,239	2	,800	0.69	C
	Zone 113 - Silang-Banaybanay Road	10,444	1,532	300	12,276	859	2	1,800	0.48	C
Along Tirona Highway / Centennial	Aguinaldo Highway - E. Evangelista Road	13,859	2,498	1,462	17,819	1,247	4	3,600	0.35	B
	E. Evangelista Road - Bisita	24,754	5,000	3,346	33,100	2,317	4	3,600	0.64	C
	Bisita - Centennial Road	20,300	3,699	2,256	26,255	1,838	4	3,600	0.51	C
	Centennial Road - Zone 107	22,667	4,018	2,097	28,782	2,015	4	3,600	0.56	C
	Zone 106 - San Sebastian Road	7,724	2,351	1,696	11,771	824	4	3,600	0.23	B
	San Sebastian Road - Gen. Antonio	10,539	3,102	2,190	15,831	1,108	4	3,600	0.31	B
	Gen. Antonio - Gen. Trias Drive	9,674	3,127	2,263	15,064	1,054	4	3,600	0.29	B
	Gen. Trias Drive - Tanza-Trece Martires Road	21,064	5,015	3,196	29,275	2,049	4	3,600	0.57	C

	Tanza-Trece Martires Road - Zone 115	10,886	1,667	765	13,318	932	2	1,800	0.52	C
	Zone 115 - Governor's Drive	7,280	1,243	574	9,097	637	2	1,800	0.35	B
Along Daang Hari Road / Open Canal Road	SLEX - Victoria Ave.	15,215	2,598	1,709	19,522	1,367	4	3,600	0.38	B
	Victoria Ave. - Molino Road	15,735	2,901	1,986	20,622	1,444	4	3,600	0.40	B
	Molino Road - Zone 104	11,887	1,826	923	14,636	1,025	4	3,600	0.28	B
	Zone 104 - Aguinaldo Highway	10,124	1,342	588	12,054	844	4	3,600	0.23	B
	Aguinaldo Highway - Malagasang Road	20,338	2,652	1,189	24,179	1,693	2	1,800	0.94	E
	Malagasang Road - CALAX	7,944	1,395	753	10,092	706	2	1,800	0.39	B
Along Governor's Drive	SLEX - Zone 131	31,235	6,347	4,358	41,940	2,936	4	3,600	0.82	D
	Zone 131 - GMA-Silang Road	15,039	3,225	2,268	20,532	1,437	4	3,600	0.40	B
	GMA-Silang Road - Paliparan Road	14,456	3,132	2,361	19,949	1,396	4	3,600	0.39	B
	Paliparan Road - Aguinaldo Highway	17,255	2,414	1,162	20,831	1,458	4	3,600	0.41	B
	Aguinaldo Highway - Palapala	9,070	3,956	3,178	16,204	1,134	4	3,600	0.32	B
	Palapala - Amuntay Road	18,270	5,506	3,665	27,441	1,921	4	3,600	0.53	C
	Amuntay Road - A. Bonifacio	24,861	6,468	3,951	35,280	2,470	4	3,600	0.69	C
	A. Bonifacio - Gov. Ferrer	29,041	5,793	2,925	37,759	2,643	4	3,600	0.73	D
	Gov. Ferrer - Tanza-Trece Martires Road	20,568	3,991	2,062	26,621	1,863	4	3,600	0.52	C

	Tanza-Trece Martires Road - Zone 119	4,190	521	214	4,925	345	2	1,800	0.19	A
	Zone 119 - A. Soriano Highway	4,120	500	201	4,821	337	2	1,800	0.19	A

Source: EIS Supplemental Information, CALAX (Cavite Section), SMEC

4.4.5.4 Solid Waste

Waste and garbage disposal has always been a concern of the province. During the construction and operation of the proposed project, the wastes could provide an additional burden to the local government as regards to the collection and disposal and maintenance of hygiene and sanitation in the area.

Construction wastes on the CALAX construction sites mainly refer to residual construction materials such as aggregates, sand, cement, steel materials, timber, precast components, among others. The aforesaid construction materials are procured according to the schedule of the construction progress. However, as the expressway project involves huge quantity of materials, therefore, it is expected that residual construction materials may inevitably be left over.

If these materials are stockpiled in work sheds or in open air in a disorderly way, such materials may result in visual pollution and will have an aesthetic impact on the landscape. Permeation of lime or cement into the ground with water will result in soil hardening, higher pH value and ground water pollution and in the end the polluted land will lose productivity and the valuable land resources will be wasted.

In order to reduce and eliminate the environmental impacts of the aforesaid solid wastes, the construction plans and operating instructions will be followed to strictly control and minimize residual materials. In addition, the construction materials should be stockpiled in an orderly manner and any residual wastes may be reused in the rehabilitation of the rural roads or other structures in the neighborhood so as to mitigate the impacts of disposal of construction wastes on the environment.

After the proposed CALAX project is opened to traffic, the local people will enjoy better accessibility and greater convenience in their daily life and work. On the other hand, the wastepaper, plastic and other traffic wastes will produce adverse impacts on the surrounding environment. These wastes not only increase the load of road maintenance but also damage the view of the road landscape.

Roadside facilities to be constructed along the proposed CALAX include service areas, parking areas and toll entry/exits. After the expressway is opened to traffic, the road administrative staff and road users (drivers and passengers) will generate waste paper, plastic bags, cigarette butts and other domestic wastes. It is estimated that the total volume of wastes produced along the highway will amount to 0.4t/day assuming that there will be around 400 people (including staff and passengers) every day in the service areas, parking areas and tolls and 1kg solid wastes will be generated per person per day. If such domestic wastes are not properly treated, certain impacts will be produced on the surrounding natural environment. The CALAX administration should strengthen their supervision over the pollution management of solid wastes and make sure that garbage bins are provided at service facilities and the solid wastes are periodically removed and transported to the local solid wastes treatment facilities for centralized treatment. Materials recovery facilities (MRFs) should be provided in tolls and service stations.

4.4.6 ENTITY ACCOUNTABLE FOR ENVIRONMENTAL MANAGEMENT IN THE AREA

The management of the environment in the area is supervised by the Provincial Environment and Natural Resources Office of Cavite Province, particularly related to the collection of solid wastes. Through the said office, measures to manage solid wastes and sanitation are implemented within the city. However, current conditions are found to be insufficient resulting to the disposal of garbage into the waterways.

5 Impacts Management Plan

Table below presents the Environmental Management Plan of the proposed project. The plan outlines the mitigating measures to be undertaken to address potential adverse environmental impacts of the project.

Table 32. Environmental Management Plan

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
I. Pre-Construction Phase						
Project planning/ ecological sustainability	General Ecology	Impact on ecosystem	Integrate the concept of Green Highways in the planning and design of the proposed road.	DPWH/ Concessionaire/ project designers	Covered by planning cost	Project plans
Design of drainage system	Water/Land	Localized flooding due to embankment and effects of climate change	Provision of cross drainage through the embankment All bridges and culverts to be designed at a capacity of not less than their current capacity. Design a stormwater / rainwater collection system to retard flow of storm water into existing drainage lines. Use collected rainwater for road cleaning and maintenance activities.	DPWH/ Concessionaire / project designers	Covered by planning cost	Project plans

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Displacement of families and establishments; permanent loss of agricultural land	People	Loss of homes and businesses; loss of agricultural land	Design a Land Acquisition and Resettlement Plan (LARP) in coordination with DPWH and NHA. Organize public consultations and forums with affected stakeholders. Provide assistance in the transfer and movement of affected families during relocation For protection of agricultural lands along the periphery of the road alignment, the following measures should be adopted: • Extent of construction area should be clearly marked on the ground to guide equipment operators and workers • If there are seasonal crops, timing of construction or temporary • occupation of agricultural land should be done after	DPWH and NHA	To be determined	Approved LARP

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			harvest • Stockpiles and equipment yard should be located in flat areas away from productive agricultural lands			
Temporary closure of affected commercial businesses and industries	People	Loss of businesses	Establishment of land acquisition scheme and relocation site prior to closure of businesses. Provide adequate lead time/advance notices to affected establishments.	DPWH and NHA	To be determined in the Detailed Engineering Design	Approved LARP
Access to public utilities such as water, power, and telephone may be hampered	People Land use	Utility service interruption	Coordination with the local utilities such as MWSI, MERALCO, and other utility companies.	Concessionaire / DPWH	Part of pre-construction cost	TOR with Concessionaire and contractor
Contractor management plans	People Environment	Impacts of construction works on people and the environment	Require contractor to submit the following for approval prior to implementation of works: 1. Soil erosion management plan to be taken during earthworks to avoid/mitigate erosion arising from cut and fill, stockpiling, and stabilization and revegetation of embankments.	Concessionaire / DPWH	Part of pre-construction cost	TOR with Concessionaire and contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			2. Borrow Pits and Spoil Management Plan activities, technology, potential environmental impacts, and mitigation measures for aggregate/borrow pits to ensure (i) borrow areas to be located outside the road corridor; (ii) after use, borrow area need to be graded to ensure drainage and visual uniformity; (iii) borrow pit restoration follows completion of works in full compliance with applicable specifications, and (vi) any topsoil from borrow pits be saved and used during restoration. 3. Spill Management Plan requirements, protocols, responsibilities, and materials necessary to implement an emergency spill response. 4. Construction Camp Management Plan which are preventive/mitigation measures for environmental impacts of construction camp and work sites including fuel storage filling station, and			

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			vehicle washing sites. 5. Waste Management Plan for operation of construction camp and work sites to provide procedures for management of domestic wastes, hazardous wastes, and sewage. Evaluate the type and quantities of waste and provide detail arrangements for storage and transportation work to disposal point. 6. Bridge Walkway and Cross Drain Construction Method Statements for the proposed methodology for construction of the walkway at bridges for the avoidance of surface water pollution at rivers and all river crossings. 7. Health and Safety Management Plan to be submitted to DPWH for review to include: safety management to minimize and control health and safety risks; clean water, sewage and wastewater, solid waste,			

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			liquid chemical waste, personal protection, emergency prepared and response, records management, safety communication, and training awareness and competence of works.			
II. Construction Phase						
Land Use						
Site clearing causing dust emission	Air	Generation of dust	Use water lorry and water sprinkling of areas prone to dust emission. Require haulers to cover materials with canvass during hauling.	Contractor/ Hauler	Covered by construction cost	Included in the Contractor's Agreement
Site clearing causing loss of trees and other vegetation	Terrestrial flora and fauna	Loss of vegetation and displacement of fauna	Replacement of trees and replanting of earthballed trees Secure Tree Cutting/ Earthballing Permit from the DENR.	Contractor	Covered by construction cost	Included in Contractor's Agreement
Degradation of existing access roads used for hauing materials and for movement of heavy equipment	Land	Deterioration of existing roads	Conduct regular road maintenance and restoration of roads to original condition after construction activities. As practiced, the roads used by the contractors that are degraded by the passage of heavy equipment are	Concessionaire/ Contractor	Part of road maintenance cost	Minimum Performance Standards and Specifications (MPSS)

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			restored or repaired at the end of the project or upon completion of construction activities in the particular area.			
Soil						
Impacts on soil	Land	Loss of top soil Compaction of soil Contamination of soil	Management of top soil during earthworks Set aside top soil for use in landscaping of the verges Restoration / rehabilitation of compacted soil e.g. through deep tillage Prevention of pollution of soil, remediation of contaminated soil or removal and safe disposal	Concessionaire / Contractors	Part of construction cost	Minimum Performance Standards and Specifications (MPSS)
Destabilization of slopes	Soil	Destabilized slopes will cause erosion of exposed areas of soil	Minimize slope cutting Stabilize slopes using engineering methods, i.e. rock bolts, rip-rap, gabions, geotextile membranes, etc. where appropriate, to prevent water eroding cut faces, stockpiles and other exposed areas of soil particularly if construction occurs in the rainy season.	Concessionaire /Contractors	Part of construction cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			Properly stabilize slopes and revegetate disturbed surfaces and embankments using locally available indigenous grass and species whenever feasible. Protect slopes on both sides of any road crossing structures to prevent soil loss.			
Terrestrial Flora and Fauna						
Loss of vegetation	Flora and fauna	Loss of some trees and displacement of some fauna	Selective cutting/uprooting of trees Earthballing of young trees Revegetation of cleared area according to the requirements of the DENR. Secure Tree Cutting/Earthballing Permit	Contractor/ Concessionaire	Covered by construction cost	Include in TOR with contractor
Geologic Hazards						
Localized settlement and liquefaction	Land	Settlement and liquefaction in areas underlain by alluvial deposits	Design structure according to requirements of the National Structural Code of the Philippines Observe lateral spread of foundation.	Designer/ Concessionaire/ Contractor	Part of project design cost	TOR with designer and contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Earthquake	Land	Ground movement that will affect structural stability.	Design of the structures should strictly follow the findings of the geotechnical investigation and should comply with the requirements of the National Structural Code of the Philippines and National Building Code of the Philippines			
Drainage and Flooding						
Erosion and surface soil runoff that may contribute to clogging of drainage lines, thus, further aggravating the flooding problems in the locality. Siltation and interference with surface drainage as a result of erosion, surface run-off, and accidental spills of construction materials and spoils	Water	Impacts on erosion and siltation, runoff of mud and cement-containing materials that may clog canals and cause sedimentation of waterbodies	To limit the runoff of materials into water bodies during construction, no materials will be stored within 50 m of a water course, including soil, spoil, aggregated, chemicals and other materials used during construction. Provision of temporary drainage during construction to ensure that any storm water running off construction areas will be controlled around all water bodies. Immediate rehabilitation of bare areas Management of spoil	Concessionaire / Contractor	Part of construction cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			Construction in erosion and flood-prone areas shall be mainly restricted to the dry season where possible.			
Water Quality						
Wastewater from worker's camps	Water	Water pollution of receiving waterbodies	Temporary toilet facilities will be utilized to avoid contamination of surface water by sewage.	Concessionaire / Contractor	Php50,000/ month	TOR with contractor
Impacts on surface waterbodies	Water	Pollution due to construction associated activities	No slope tipping No disposal of construction wastes in rivers No stockpiling of construction materials, fuel and lubricants No construction camp along river banks Provide enclosed drainage around chemical storage areas on construction sites Develop and implement contingency plans for control of spills of oil and other hazardous substances (as specified in the Spill	Concessionaire /Contractor	Part of construction cost	TOR of contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			Management Plan in pre-construction actions). Fuel storage, maintenance shop and vehicle cleaning areas must be placed at least 300 m away from the nearest water body and will include enclosed drainage to ensure contaminated water does not cause pollution.			
Air Quality						
Increased ground level concentration of total suspended particulates from site clearing and construction activities as well as from exhaust emissions of heavy construction equipment.	Air People	Air pollution	Concessionaire to observe and apply the listed dust suppression methods in sections where subdivisions and other human receptors are located, such as: • Spray water on exposed surfaces during dry periods • Wet the quarry loads or road fill loads being carried in open trucks • Construction materials and spoil to be covered during transportation • Siting of stockpiles area and asphalt mix plant away from	Concessionaire/ Contractor	Php200,000/ month	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			residential areas • Borrow sites and bare areas rehabilitated as soon as possible • In case of unpaved roads near settlements, reduced speed limit imposed on haulers and other vehicles of Contractors • Batching plants and stockpiles areas located away from settlements • Implement dust mitigation suppression measures as recommended by IFC guidelines			
Generation of excavated soil, construction debris and spoils	Land Water	Localized temporary flooding due to soil runoff	Disposal of spoils in appropriate landfill areas immediately after excavation.	Contractor	Part of construction cost	Included in Contractor's Agreement
Noise Quality						
Noise and vibration due to construction activities	Noise People	Noise and Vibration	Scheduling of noisy construction works and limit noisy activities at nighttime. Install silencers or mufflers on vehicle engines and heavy equipment.	Project mgt office/ Contractor	Part of construction mgt cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			Fencing of the construction area.			
Noise	Noise	Increase in noise level	Use silencers and mufflers on construction vehicles/haulers	Contractor	Part of pre-construction cost	Included in Contractor's Agreement
Traffic						
Impact to normal traffic flow due to traffic rerouting	People	Traffic	Sidestreet parking at the adjacent roads will not be allowed. Design a traffic management plan in coordination with LGUs Assign traffic aides at key road sections to assist in traffic management. Install lights and cautionary signs in hazardous areas Establish footpaths and pull-off bays along roads; through villages; and near markets, schools and other community facilities. Include safety instructions for the construction activities in the contract documents.	Concessionaire / Contractor	Part of construction mgt cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			Ensure sufficient visibility along the road section according to standard specifications.			
Accidental spills of construction materials causing traffic accidents	People	Hazard to road safety.	Regulate speed of vehicles Require canvass covers on materials.	Project contractor haulers	Part of construction cost	TOR with contractor and hauler
Solid Wastes						
Generation of construction wastes	Land	Solid waste generation	Require contractor to submit a detailed Solid Waste Management Plan as part of the construction plan, including permit to dump at a Government-approved disposal site. Proper collection and recycling of construction wastes. Stockpile, waste, excess and scrap materials will be hauled out on a weekly basis and as necessary. Provision of waste bins in various strategic points within the construction area.	Project contractor	Part of construction mgt cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			Reuse and recycling of scrap materials. Conduct orientation of workers on proper waste disposal. Regular hauling of construction debris to prevent accumulation of wastes onsite. Waste to be disposed of in approved solid waste disposal facility e.g. San Mateo, Montalban, Laguna, etc.			
Hazardous Wastes						
Pollution due to disposal of construction wastes including hazardous substances (e.g. oil and grease, paints and thinners, worn out tires, etc.)	Land	Hazardous waste generation	Segregation of hazardous materials and substances from ordinary wastes. Collection and disposal through DENR-recognized hazardous waste disposal facility.	Contractor	Part of construction cost	TOR with contractor
Aesthetics						
Mud tracking of vehicles coming in and out of the construction site	Land People	Aesthetics	Provision of wash bays	Contractor	Part of mgt cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Generation of mud on streets and cluttering of construction spoils	People	Aesthetics	Workers and sweepers will be assigned to keep the construction premises clean. Install wash bay for vehicles getting out of the site.	Contractor	Part of construction mgt cost	TOR with contractor
Health and Safety						
Impact of construction activities on welfare and safety of workers and passersby.	People	Health and Safety of Workers and Passersby and Damage to Adjacent Properties	Implementation of Construction Safety and Management Plan by General Contractor Designation of onsite Safety Officer duly accredited by DOLE Damage caused by Concessionaire on private properties, community facilities to be immediately repaired at cost by the Concessionaire. Provision of scaffoldings, canopy, safety nets, and other materials for protection and safety. Wearing of safety gadgets such as hard hats, gloves,	Contractor	Part of construction cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			safety belts, rubber boots, goggles, etc. will be a mandatory requirement for workers. Safety signs/reminders will be posted in strategic areas within the construction area Sufficient lighting shall be installed in dark areas.			
Peace and order during construction	People	Disruption of peace, order, and safety	Security guards shall be assigned to monitor and maintain peace and order due to the presence of migrant workers. Coordination with LGUs	Contractor	Part of construction cost	TOR with contractor
Employment Opportunities						
Increased employment opportunities	People	Provide employment opportunities	Priority in hiring will be given to qualified locals from the barangay and adjacent community. Orientation of hired personnel regarding construction management practices and regulations.	Concessionaire / Contractor	Part of mgt cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
III. Abandonment Phase (Post-Construction)						
Demollition of temporary structures causing dust emission	Air	Post-construction impacts	Clear roadsides of piles of construction materials, construction wastes, equipment, etc. Contain all waste and dispose in approved sites During site cleanup, remediate oil stained soils Dispose all non-biodegradable solid waste in an approved disposal area Remove all disabled machinery from the project area Rehabilitate borrow sites and stockpile areas	Project contractor/ Concessionaire	Part of management cost; to be implemented by Concessionaires when each road section is completed.	TOR with contractor; DPWH to conduct ocular inspection of site
Noise	Noise	Noise generation	Undertake work during daytime. Regulate noise generating activities in areas near sensitive receptors.	Project contractor	Project management cost	TOR with contractor
Generation of construction spoils	Land	Waste generation	Segregation of wastes To be sold to junk shops or recycled in other projects.	Project contractor	Part of management cost	TOR with contractor

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
Traffic	People	Traffic congestion	Prohibit roadside parking by construction vehicles Coordinate with the LGUs on the abandonment schedule.	Project contractor	Part of construction cost	TOR with contractor
III. Operation Phase						
Land Use						
Emergence of new land use developments	Land	Land use changes	LGUs to adhere to the approved Comprehensive Land Use Plans LGUs to regulate and control development that are incompatible with the CLUP	LGUs	LGU cost	CLUP
Change in land value	Land	Land valuation	Property appraisal	LGUs	LGU cost	
Enhance aesthetic characteristic of the area	Land		Implement landscaping and beautification of the highway through greeneries	Concessionaire to include in detailed engineering design	To be determined	Landscaping plan
Terrestrial Flora and Fauna						
Change in biodiversity	Flora and fauna	Removal of vegetation	Planting of nesting, trees, and ornamental plants as part of the project landscaping plan.	Concessionaire	To be determined	Landscaping plan
Water Quality						
Contamination of waterways with oil/grease	Water	Water pollution	Prohibit motor vehicle maintenance activities at roadside that would lead to	Concessionaire	Part of management cost	Roadside maintenance regulations

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			oil drippings.			
Erosion at major discharge points of road's storm drainage line	Water	Water pollution and flooding	Install dissipators and rainwater collection system at major discharge points of the road's storm drains.	Concessionaire	To be determined	Project plans
Air Quality						
Increased air pollution from motor vehicles	Air	Air pollution	Strict enforcement of anti-smoke belching law. Conduct IEC to road users on the proper maintenance of engines for efficient fuel burning and minimization of gaseous emissions. Tree planting along the road. Regular road cleaning	Concessionaire	Part of project design Part of maintenance cost	SMR
Emissions from the operation of the standby generator unit.	Air	Air quality deterioration	Regular maintenance will be undertaken to prevent emission of pollutants. The generator sets will be provided with mufflers and enclosure with soundproof acoustical walls and ceiling.	Concessionaire	Part of maintenance cost	Permit to Operate from DENR-EMB
Noise Quality						
Increased noise level	Noise	Contribute to	Install sound barrier or	Concessionaire	To be determined	Part of project

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
at Segment 10 due to passing of motor vehicles		increase noise levels in the vicinity	buffers particularly in areas with sensitive receptors such as schools, hospitals, and residential communities. Plant low-growth trees as buffers. Traffic controls (e.g. speed limits and traffic volume restrictions and vehicle controls along the highway (e.g. truck bans)			design
Traffic						
Lessen traffic congestion and improve access to public utilities and services	People	Traffic improvement	Enhance the accessibility by providing appropriate signages to guide travelling public to use shortest and most convenient route to reach interior sections of the cities through the connector road.	Concessionaire	Part of management cost	Traffic plan
Socio-Economic						
Increase in employment opportunities, government revenues and improved social services	People	Socio-economic impacts	The project will provide priority hiring for qualified people from the LGUs. The revenues from the project will increase the funds of the LGUs in general for	Concessionaire	Part of the training and project maintenance cost.	Tax payments

Project Phase / Environmental Aspect	Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement	Responsible Entity	Cost	Guarantee/ Financial Arrangements
			social services projects. Social development program shall be undertaken.			
Increased migration and population	People	Increase in population	Concerned LGUs to regulate encroachment through implementation of CLUP. LGUs to adequately plan/provide for social services and infrastructures including health services, waste management facilities, and secondary road network.	Concessionaire	Part of management cost	Part of project plans
Increased road accidents	People	Road accidents	Provision of adequate signages and warning signs for road users. Provision of emergency bays.	Concessionaire	Part of management cost	Part of project design

5.1 LAND

5.1.1 SOIL EROSION CONTROL

The project will affect river crossings as well as several canals. During construction, runoff may be transported to the rivers and cause sedimentation, turbidity and deterioration of water quality. The agricultural land in the immediate vicinity and along the right of way will also likely be impacted to some extent by runoff and from frequent movement of vehicles to the sites during the construction phase. Appropriate mitigating measures to prevent soil runoff will be required during the construction phase.

The additional areas which are exposed due to earthmoving but will not necessarily be occupied by the proposed road must be immediately revegetated or as soon as construction activities are completed. Selected surfaces may be covered with geotextiles or equivalent materials to mitigate severe cases of erosion.

As far as practicable, earthmoving works should be undertaken during the dry season. Stockpiles of excavated materials must be located in natural depressions to reduce amount of materials exposed to wind and water action.

A balance between cuts and fill for the desired road grade should be planned to reduce the earthmoving activities to a minimum without compromising design and safety standards. This will translate to fewer areas which will be subjected to erosion. Excavated materials should be used as part of the road embankments if these satisfy the required engineering properties.

Siltation of drainage systems and low areas could be reduced through a combination of good materials handling, installation of sediment traps or silt basins at road segments near waterways and the proper siting and maintenance of excavated materials. Excavated materials should not be placed on water ways or slopes adjacent to stream banks. Vegetation buffers could be established and maintained to shield streams and rivers from sedimentation. As in erosion control, these recommendations could be better implemented if these are included in the Concessionaire's MPSS.

A balance between cut and fill for the desired road grade should be adopted to minimize the modification of the terrain with due consideration for design and safety standards.

River bank sections which will be modified to facilitate bridge construction must be identified during the design stage. Such slopes must be subjected to stability analysis so that the appropriate protection measures such as rock bolts, benched slopes with riprap and slope drainage could be installed. These measures should be instituted based on the results of site specific geotechnical studies.

A sufficient number of culverts or outlets linked to a natural waterway should be provided to allow the passage of runoff from either side of the expressway.

The CALAX (Cavite Section) has the following components: the road along the alignment, interchanges and viaducts/bridges/culverts as it crosses the deeply incised creeks

and rivers with steep to very steep riverbanks/sideslopes. The alignment passes agricultural fields from km 1+00 in Kawit to km 29+280 in Silang. Agricultural fields are paddy rice, sugarcane, annual crops and treegrove/fruit tree orchards. The agricultural fields along the alignment will be lost with the implementation of the Project. The shrubs and trees on the riverbanks where the alignment will pass will be destroyed and/or removed during the preconstruction phase. During construction phase the topsoil along the alignment will be scrapped prior to compaction. The scrapped topsoil materials maybe carried by runoff water during rainfall event, and may cause sedimentation of the rivers. Earth movement/ excavation will be undertaken for the foundations of viaducts, bridges culverts and interchange ramps. Erosion and landslides may occur with rainfall events, with subsequent sedimentation of the rivers downstream. Increased storm water runoff may also render road structure collapsed. During the operation phase, soil quality of the agricultural fields adjacent to the toll way maybe contaminated with heavy metals, particularly lead and zinc brought about by the passing vehicles overtime.

Timing is also one of the critical factors involved in erosion and sedimentation control in construction sites. Careful scheduling of construction oeprations can minimize the exposed area during the rainy season. Site clearing, earthworks, and other civil works will be scheduled during the dry season.

5.1.2 REVEGETATION AND LANDSCAPING

The loss of vegetation can be mitigated by keeping vegetation removal to a minimum such that only necessary/planned clearings would be undertaken. Replanting the surrounding area after construction, preferably with indigenous plants and wildlife food extant in the area, is also another mitigation measure. This will reinstate to the maximum extent possible the aesthetic value of the vegetation and the ecological services it provides to the adjacent community. All of these should be included in the Concessionaire's MPSS.

Planned vegetation removal will be implemented which will be included in the Concessionaire's MPSS.

Landscaping/revegetation will be undertaken to selected islands and spots of the new highway to provide aesthetic value which in the long run can also serve as habitat for wildlife.

Provision of culverts and similar structures will be integrated in the overall design of the road system in order not to block the movement of crawling and non-flying wildlife from one side of the road to the other.

5.2 WATER

5.2.1 FLOOD PROTECTION

A sufficient number of culverts or outlets linked to a natural waterway should be provided to allow the passage of runoff from either side of the expressway.

The *Flood Mitigation Study by CTi Engineering International Co., Ltd*. conducted in depth analyses on the drainage and flooding on the low lands of Cavite. The flood inundation

model created was verified against Typhoon Milenyo in 2006 which was found to have a recurrence interval of 100 years. According to the interviews with the residents that were conducted by CTi, the Typhoon inundated about 26.51km^2 of the San Juan watershed.

The study states that the low lying areas of Cavite, particularly that for the Municipalities of Kawit, Imus and General Trias, were inundated during Typhoon Milenyo which is considered as the worst Typhoon to hit Cavite. This Typhoon also caused the collapse of Butas Dam. Butas Dam is located at 20.7km starting from the mouth of San Juan River, which is also at an offset of 2.67km from km 16+75 of the CALAX (Cavite Section) alignment.

One of the reasons for flooding was that most of the canals and rivers sections were not adequate enough to handle the runoff and were further aggravated by the amount of debris that ended up in the waterways.

The study also proposed several options to mitigate flooding in the area. Among the proposal are retarding basins and retention ponds. Engineer Nodoc of the NIA was interviewed last November 15, 2011 and according to him the flood measures indicated in the Study were still not implemented at this time.

The flood modeled the spread of flooding based on future development condition with and without the flood mitigation structures. The results show that at the present development condition the extent of inundation for the overall effect of the runoff would be 47.38km^2 for the 50-year and 44.68km^2 for the 30 year rainfall occurrence. The flood water levels generally range from 0.01m to 1.0m, with only a few isolated cases having experienced flooding more than 1.0m.

The first 4km of the proposed CALAX (Cavite Section) alignment will be passing through the low-lying and flood prone areas of Cavite.

5.2.2 PROTECTION OF DRAINAGE SYSTEMS

Siltation of drainage systems and low areas could be reduced through a combination of good materials handling, installation of sediment traps or silt basins at road segments near waterways and the proper siting and maintenance of excavated materials. Excavated materials should not be placed on water ways or slopes adjacent to stream banks, spoils shall be not tipped on the slopes. Vegetation buffers could be established and maintained to shield streams and rivers from sedimentation. As an erosion control, these recommendations shall form part of the Concessionaire's MPSS.

5.3 AIR QUALITY MANAGEMENT

Air quality can be affected by the operation of vehicle and equipment, excavation and backfilling of soil, and transport of materials. There will be exhaust gas emissions containing TSP, SOx, NOx, and CO during operation of vehicle and equipment. Dust generation is expected with an increase in TSP ground level concentration due to earthworks, contact of machinery with bare soil, and exposure of bare soil and soil piles to wind.

Best management practices will be applied to minimize impacts coupled with effective environmental monitoring. An Air Emission and Dust Control Plan will be prepared,

disseminated to workers, and implemented by the Contractor. Mitigation measures to be applied include:

a) Stockpile of excavated soil will be covered and kept moist.
b) Vehicles and equipment will be maintained regularly to ensure emissions comply with the standards.
c) Construction materials such as cement, sand and aggregates will be covered during transit and while stored on-site.
d) Burning of waste materials will be prohibited.
e) Inform and educate workers on the Air Emission and Dust Control Plan in the EMP prior to start of construction works.
f) Require construction haulers to cover materials with tarpaulin or other suitable materials during transport of materials.
g) Impose speed limits on construction vehicles.

The various means of mitigating dusts (after IFC guidelines) and the respective control efficiency of each measure is enumerated in Table 90. Mitigation of fugitive dust is most critical in sections of the road near residential and commercial areas.

Table 90: Dust Mitigtaion Measures

Control Type	Control Efficiency
Chemical Stabilization	0% - 98%
Hygroscopic salts Bitumens/adhesives	60% - 96%
Surfactants	0% - 68%
Wet Suppression – Watering	12% - 98%
Speed Reduction	0% - 80%
Traffic Reduction	Not quantified
Paving (Asphalt / Concrete)	85% - 99%
Covering with Gravel, Slag, or "Road Carpet"	30% - 50%
Vacuum Sweeping	0% - 58%
Water Flushing/Broom Sweeping	0% - 96%

5.4 NOISE MITIGATION

Noise and vibration are generated by activities such as operation of earthmoving and excavation equipment, concrete mixers, and cranes. Furthermore, vehicles transporting construction materials will add to the average noise level along the transport route. Immediate

and nearest receptors are households and establishments along routes of materials transport. Impacts may be immediately felt by these receptors and can create nuisance to the normal living conditions.

Measures that can be applied to minimize impacts of noise and vibration are:

a) Operate construction equipment only at daytime and minimize works at night.
b) Install suitable mufflers on engine exhausts when appropriate
c) Maintain regularly all vehicle and equipment to ensure good-working condition.
d) Require drivers to minimize blowing of horn and to comply with speed limits, particularly when passing through residential areas.
e) The Contractors will coordinate with the concerned communities on the agreed schedule of construction and transport of materials.
f) Comply with the World Bank Environment, Health and Safety guidelines on the maximum noise limits on construction equipment near receptor sites, along access roads and some areas along the ROW, i.e. not more than 3 dB maximum increase in background levels.The proposed mitigation measures for noise during construction in road sections with adjoining settlements are listed in the following table:

Table 91: Noise Mitigation Measures

Means of Reducing Noise	Specific Examples
Substitute process or equipment with another exhibiting lower noise levels	Use of new and/or well maintained equipment, e.g. new power generators, use of vibratory or hydraulic
Eliminate or minimize noise at source	▪ Install mufflers ▪ Retrofit old equipment ▪ Operate equipment according to manufacturer's specifications damp noisy or vibrating parts and/or equipment
Increase distance between source and receptor	Doubling distance from source reduces noise by as much as 6dB, depending on site condition, e.g. soft or hard
Timing of activities	Construction /operations of heavy equipment should be limited to daylight hours
Isolate or enclose process or operator	▪ Use noise enclosures/noise barriers ▪ minimize leaks in barriers ▪ use of equipment with operator enclosures / cab
Change work practices	▪ Limit time of use of noisy equipment ▪ Rotate use among workers ▪ Provide breaks from noisy work place ▪ Turn off equipment when not in use ▪ For public protection, avoid operating at night
Promote occupational health and safety in work places	▪ OHS briefing regularly ▪ Provide Personal Protective Equipment (PPE)

5.5 WASTE MANAGEMENT

5.5.1 SOLID WASTE MANAGEMENT

Different types of construction wastes are expected from project construction. These are domestic solid waste, domestic wastewater, inert construction waste, hazardous waste, and excavated soil.

a) **Domestic solid waste.** In general, construction workers generate the domestic solid waste, which may include food wastes, plastic and glass bottles, paper, cardboard, and packaging wastes, among others. The impact is considered low, localized and short-term.

b) **Domestic wastewater.** The direct discharge of domestic wastewater by construction workers may result to unsanitary conditions within the construction sites. There will be about 269 workers during the construction phase, which will generate approximately 51 m^3/day of wastewater. If disposed untreated, the wastewater will cause degradation of water quality and contamination of groundwater that may lead to spread of water-borne diseases.

c) **Inert construction waste.** These wastes can be scrap wood and metals, cement bags, aggregates and concrete debris, among others. These wastes are generally disposed of and/or landfilled in appropriate sites and represent no direct danger to health and thus considered of low impact.

d) **Hazardous waste.** Hazardous waste may include contaminated soils and machinery maintenance materials such as oily rags, used oil filters, used oil, empty paint and solvent containers, spent batteries, and spill cleanup materials. Potential release activities may be during storage, transfer, and disposal of these wastes. Wastes generated are anticipated to be small yet harmful to the environment and public health. The impact is considered high and localized for a short-term.

e) **Excavated soil.** Most of the excavated soils are intended as fill material onsite. There is no anticipated waste from excavated soil.

Pre-Construction

The proposed project is currently in the feasibility study stage and location of borrow pits and spoil sites may change at the design stage. The following site selection principles will be followed when changes are made to the selected sites. In addition, protection facilities will be designed for borrow pits and spoil sites, which should be restored to grassland where possible.

Principles for selection of borrow pits and spoil sites include:

- In the layout design of the borrow pits and spoil sites, the borrow volume and spoil volume should be reasonably planned and allocated by maximizing reuse of waste and minimizing the borrow volume so as to optimize and adjust the layout of borrow pits and spoil sites.
- Both borrow pits and spoil sites shall not be sited on basic grassland;
- Borrow pits should be sited on barren land with small gradient for the sake of future reclamation or vegetation restoration.
- Spoil sites shall not be sited in waterways to avoid possible impacts on flood;
- The impacts that the borrow pits or spoil sites may produce on the landscape should be taken into account upon selection of such sites, which should be sited outside the field of vision of the road users and pedestrians; if it is unlikely to integrate the spoil sites into the surrounding landscape in a harmonious way through or engineering measures, such sites should be relocated.
- Borrow pits and spoil sites shall not be located in drinking water source protection areas.

- Borrow pits and spoil sites shall not be located in drinking water source protection areas.

The design of protection measures for borrow pits and spoil sites include:

Stockpiling: The top mellow soil on the borrow pits will be stripped and reused in the future as soil for land rehabilitation in the borrow pits. Initially, a relatively flat stockpiling site for the stripped top soil will be prepared in the borrow pit and then the top soil stripping and soil borrowing will be conducted simultaneously to avoid soil erosion due to large area of exposed slope surface as a result of large-scale stripping. Where it is physically difficult to stockpile the stripped topsoil, a new stockpiling site may be selected with care to minimize occupation of land and damages to vegetation. Then, woven bags filled with soil will be used to temporarily fence up the topsoil stockpile on all four sides. Vegetation in the areas temporarily occupied for stockpiling of topsoil will be restored after the topping process is finished to prevent additional soil erosion due to artificial activities.

Land rehabilitation: Upon the completion of the borrowing operation, the borrow pits will be leveled and covered with topsoil in a timely manner to get ready for vegetation restoration. Initially, the plan should be based on the size of the site and the leveling situation. Ridges will be set out along the contour line and the whole site will be leveled in a number of sections and the side slope will be preliminarily leveled and compacted; after leveling and compacting, the site may either be fully covered with a thin layer of top soil or partially covered with thick layers of top soil.

Vegetation measures: Considering that arable land is relatively scarce in the project area, the borrow pits should be restored into grassland, where possible.

Protection measures for spoil sites: Protection measures designed for protection of borrow pits, such as top soil stripping and stockpiling, land rehabilitation and vegetation restoration shall also apply to the spoil sites of the proposed expressway. For those sited in trenches or ditches, before any dumping operation is conducted, an earth bund or retaining wall of adequate length and height will be constructed at an appropriate position downstream of the dumping site (at the outlet opening or foot of the trench or ditch) to prevent the dumps from being washed away. In the design stage, the retaining wall for each dumping site will be specifically designed in accordance with the environmental characteristics of each dumping site. The pits and spoil sites will be included in the landscape design of the project.

Vegetation restoration in the right-of-way of the proposed project as well as the borrow pits. In the next stage of design, the basic grassland should be avoided to the best possibility to minimize occupation of basic grassland and arable land.

Construction

Vegetation protection and restoration measures include:

- The planning of temporary facilities in the construction sites will be reviewed in detail prior to the commencement of the works to not only minimize the occupation of basic grassland and arable land but also provide necessary conditions for the construction activities.
- The subgrade construction area will be strictly controlled within the boundary line to avoid damages to the surrounding vegetation.

- Ready-made or assembled houses will be selected where possible as temporary buildings on construction sites or camps to mitigate damages to soil and vegetation.
- Top soil (i.e. the plough horizon in a thickness of 15cm) stripped from the grassland temporarily occupied for subgrade fill and by borrow pits will be stockpiled in a centralized way and temporarily protected for reuse in future landscaping and land rehabilitation.
- Borrow pits and dumping of wastes will be carried out in borrow pits or spoil sites specified in the design drawings. It is not allowed to dump construction waste into rivers. Prior to borrow operation, the fertile top soil in the borrow pits will be stripped and properly stockpiled for future land reclamation of the borrow pits. The borrowing area and depth will be strictly controlled and must not be increased without prior consent to avoid damages to the surrounding vegetation.
- The construction vehicles shall travel on designated access roads to prevent damages to vegetation due to uncontrolled traveling routes of such vehicles.
- Reclaim the various land temporarily occupied upon completion of the construction activities. The construction camps, access roads and other temporary construction sites will be selected in accordance with the following environmental protection requirements:
- Concrete precast yards for bridge members, lime soil mixing plants, asphalt mixing plants and material stockpiles and other temporary facilities will be located in the right-of-way of the Project, e.g. on the subgrade of the main expressway, where possible.
- The construction camps will be sited at local residents' houses or public houses or within the right of way of the proposed highway, if possible, so as to minimize temporary occupation of land and avoid occupation of grassland and damages to ground vegetation.
- The existing provincial highways or roads will be used as access roads to avoid construction of temporary access roads. The occupation time of land temporarily acquired for constructional purposes will be minimized and the original functions of such land will be restored in a timely manner after they are no longer occupied.
- Use the ROW as access roads where possible.
- The total area of land temporarily occupied for the various construction purposes will be strictly controlled within the specified area in the design and uncontrolled occupation of land will be strictly banned.

Full-time person shall be arranged to be responsible for the cleanup and removal of construction rubbish and waste. All construction rubbish and waste generated by road construction shall be transported to the disposal place designated by the local government.

Operation

The landscaping works as a part of the project should be implemented in time and stronger efforts should be made in management and maintenance of the plants to make sure they survive. Supervision over the pollution control of solid wastes should be strengthened in the project area by making sure that dusty materials are transported in properly covered trucks and garbage bins are provided in service facilities along the highway.

Dustbins with waterproof, windproof and anti-leakage functions shall be set in the construction residential sites, and shall be periodically cleared and transported to the disposal site designated by the local government. Particular attention shall be paid to the maintenance and management of temporary garbage disposal site or materials recovery facility (MRF), to

avoid dumping garbage casually. Meanwhile, sterilization spray, insecticide syrup shall be carried out periodically to reduce the breeding of mosquitoes and germs, particularly for biodegradable wastes.

Management on road vehicles shall be strengthened to reduce vehicle falling objects. Full-time person shall be arranged to be responsible for road cleanup of solid waste. Transportation of bulk goods shall be covered with tarpaulin.

5.5.2 MANAGEMENT OF SPILL OR LEAKAGE OF HAZARDOUS CONSTRUCTION CHEMICALS

Hazardous chemicals such as oil, grease, fuel, paint, lead-acid batteries, etc. will be used during construction. Improper management, storage, handling, and use can lead to spill or leakage to the soil, groundwater, and biological resources. Impact of a spill is high although localized for a short-term. The rice and crop plantations and irrigation canals will be protected against disposal of any waste materials as advised during the consultation meetings.

Mitigation measures to be applied shall be in accordance with the requirements of Republic Act 6969 and DENR-EMB rules and regulations which include:

a) Minimize, if not avoid, storage of hazardous materials onsite.
b) Implement proper labeling and storage in leak-proof containers, on areas with concrete surface and secondary containment to prevent potential spills and leakages reaching soil or groundwater.
c) Display the Materials Safety Data Sheet (MSDS) of all hazardous chemicals used in work areas.
d) Designate areas of impervious surface for equipment services and refueling.
e) Provide oil and grease traps.
f) Provide portable spill containment and cleanup equipment.
g) Train workers on safe use, handling, storage, disposal, and spill response for the hazardous chemicals.
h) Provide workers with personal protective equipment (PPE).
i) Inform and educate workers about the Hazardous Chemicals Management Plan in the EMP prior to the start of construction.

5.6 HEALTH AND SAFETY MANAGEMENT

5.6.1 OCCUPATIONAL HEALTH AND SAFETY

Construction activities may cause harm and danger to the lives and welfare of workers. Hazards during project construction and equipment installation include ergonomic and mechanical hazards and exposure to chemicals and fire and explosion. General construction impacts include physical hazards, trip and fall hazards, exposure to dust and noise, falling objects, and ergonomic injuries and illnesses.

The Contractor will be required to prepare, educate workers, and implement a Health and Safety Plan as part of the EMP. Mitigation measures to be applied will include:

a) Implement associated plans and mitigation measures previously mentioned as part of the CEMP (Air Emission and Dust Control Plan, Hazardous Chemicals Management Plan, Traffic Management Plan, and Waste Management Plan)
b) Contractor must prepare, educate workers, and implement a Safety and Management Plan;
c) Implement fall protection systems that include provision of hoisting equipment, safety belts and second (backup) safety strap for workers.
d) Conduct training of workers in the identification of occupational hazards.
e) Provision of first-aid facilities readily accessible by workers.
f) Post safety signs, reminders, or warning notices at visible areas onsite.
g) Hire only trained and certified workers on electrical works.
h) Plan work site layout to minimize need for manual transfer of loads.
i) Provide appropriate and accessible fire fighting equipment.
j) Ensure unobstructed access of fire responders and egress of vehicles
k) Provide security personnel in areas where appropriate.
l) Strictly implement a “No Alcohol and Drug Policy”.
m) Prohibit illegal activities such as but not limited to gambling.
n) Inform and educate workers on the Health and Safety Plan.

5.6.2 COMMUNITY HEALTH AND SAFETY

The project construction may also result to moderate impacts associated with community health and safety such as construction traffic, transport of materials, fires, emergency spills of materials, and unauthorized entry by the villagers into dangerous working areas.

To mitigate these potential impacts, the civil works Contractor will be required to develop a Community Health and Safety Plan that incorporates good international practice and recognized standards. The plan will include emergency response and preparedness procedures to be developed in close consultation with potentially affected communities and local authorities, including information on the hazards of electricity The plan will include specific emergency response procedures, communication systems and protocols, interaction with local and regional emergency and health authorities, provision of emergency equipment and facilities such as fire truck, emergency service vehicles, and fire drills.

6 Social Development Framework and IEC Framework

6.1 RESETTLEMENT FRAMEWORK

In the implementation of the project, all efforts will be executed to help ensure that Project Affected Persons (PAPs) are not worse off. Towards this end, and to ensure standards relating to resettlement are maintained, and that laws of the Government are not contravened, the following principles will be applied:

a) The PAPs residing or doing business within the project impacted areas as of cut-off date are entitled to compensation and/or assistance sufficient to improve, or at least maintain their pre-project living standards, income and earning capacity.

b) Lack of legal rights to the assets lost or adversely affected tenure, status and social or economic status will not bar the PAP form entitlements to such compensation for structures, assistance and rehabilitation measures.
c) PAPs will be meaningfully consulted in order to give them every opportunity to participate in matters that will have adverse effects on their lives.
d) Compensation shall be valued at full replacement cost, free of depreciation, transfer costs or eventual salvaged materials.
e) The PAP will be entitled to take possession of materials salvaged from structures unless specifically prohibited under the Government's law.
f) There shall be effective mechanisms in place to address grievances during project implementation.

6.1.1 POLICY ON ELIGIBILITY

A PAP is defined as any person or persons or household who, on account of the involuntary acquisition of assets, would have their rights or interest in all or any part of the house or any other fixed or movable asset acquired or possessed, in full or in part, permanently or temporarily, and who might suffer income or business loss as a consequence thereof.

Only those PAPs found to be residing in, doing business or having rights over resources within the affected lands as of the cut-off date are eligible to compensation of lost of assets. In order to prevent further population influx, the cut-off date was set as the day the census was conducted. Persons making claims based on subsequent occupation after the cut-off date are not eligible for compensation and entitlements.

PAPs having business or incomes inhibited due to the project include those who will lose income due to temporary closure of business or permanent closure of business due to relocation.

Owners of structures, including shanty dwellers, who have no land title or tax declaration or other acceptable proof of ownership are classified as PAPs with structures.

Another group is the informal settlers (IS) and encroachers. The IS are families who occupy a portion of the affected lands and whose combined household income falls below the poverty threshold as defined by the National Economic and Development Authority (NEDA). This shall include those who live in makeshift dwelling units and do not enjoy security of tenure (often referred to as squatters).

6.1.2 UNIT OF ENTITLEMENT

The units of entitlement include the following categories:

a) Individuals having legal ownership or residential/non-residential structures shall be considered as the unit of entitlement of the subproject property.
b) Residential/non-residential structures of informal settlers shall be recognized as the property of the household who is actually residing in or is using the structure at the time of the census.
c) Female-headed households are to be equally recognized as a unit of entitlement similar to male-headed households. In cases where there are two spouses, both will be included in the survey and the compensation will be equitably distributed in both names.

d) Households that are "extended" or composed of several members other than the nuclear family of the household head shall be considered as one household when they apply for resettlement assistance.
e) Loss of income from business activities shall be legally registered owner (formal) or informal businesses, which at the time of the census, operated the business on the land or a structure to be acquired.

6.1.3 VALUATION, COMPENSATION AND RESETTLEMENT MEASURES

The categories of assets to be compensated include structures; business and income losses and other losses. Described below are the compensation and entitlements provision for which the PAPs are eligible, per the classification of assets affected. Valuation is carried out, in conformance with, at minimum, Philippine Government standards.

6.1.3.1 Compensation and Rehabilitation Entitlements

The following are the proposed compensation and rehabilitation entitlements:

a) Compensation for structure - Compensation in cash at replacement cost for the affected portion of the structure, including the cost of restoring the remaining structure, with no deduction for salvaged building materials and depreciation.

b) Income loss - Permanent loss of business will be compensated based on the replacement costs of the structure and previous yearly income.

c) Transitional Allowance - With severely affected structures which require relocation and new construction, a transitional sum for 3 months temporary rental and relocation expenses shall be given to the affected persons.

6.2 SOCIAL DEVELOPMENT FRAMEWORK

Assistance shall be given by the proponent to the barangay on various social development projects. Community meetings shall be conducted in order that the communities will be able to give their feedback and comments to the proponent regarding their concerns related to the project as well as in the improvement of the SDP.

During project construction, priority will be given to qualified local people in terms of hiring. Contractors will be directed to ensure that this becomes an internal policy. Orientation and training will be granted to hired personnel regarding construction management practices and regulations.

During the operational phase, the management will likewise institute this policy in hiring personnel. In terms of social services, the proposed project will provide revenues in terms of tax payments to the LGU. The revenues from the project will correspond to additional funds to support social development projects in the locality.

Table 33. Social Development Program

Major Topics of Concern	Responsible Community Member / Beneficiary	Government Agency / Non-government Agency and Services	Proponent	Indicative Timeline / Frequency	Indicative Cost / Source of Fund
Displacement of settlers	LGUs Project affected families	NHA LGUs	DPWH	Pre-construction	LGU-NHA DPWH
Uncontrolled In-migration / Setting up of the Barangay Migration Information Center	▪ Barangay Chair ▪ Barangay Secretary ▪ Barangay Treasurer	LGUs (MPDO) or Population Management Center	Barangay Council	Pre-construction Construction	▪ Initial Fund – Proponent ▪ Succeeding Funds to come from Migrants' Registration Fees
Social Problems due to temporary construction camps / Coordination with the Communities	▪ Barangay Officials	▪ Barangay Officials ▪ Municipal Planning and Development Coordinator	▪ Proponent ▪ Barangay Council	Construction	▪ None
Environment and sanitation Drainage maintenance/ clean-up/ declogging Waste collection	Barangay	PENRO/ CENRO/ MENRO Engineering Office	LGU	Pre-construction Construction Operation	Proponent LGU-IRA
Pollutants affecting the health of workers / 1. Coordination with the local health service providers 2. Access to Health Care Facilities 3. Seminars / Orientation on	Barangay Officials	▪ Barangay Officials ▪ Municipal Health or RHU Officers	▪ Municipal Health Office (MHO) ▪ Proponent ▪ Barangay Council	Construction Operation	▪ LGU ▪ MHO ▪ PCSO Initial Fund – Proponent

Major Topics of Concern	Responsible Community Member / Beneficiary	Government Agency / Non-government Agency and Services	Proponent	Indicative Timeline / Frequency	Indicative Cost / Source of Fund
Health Care					
Local benefits / 1. Provision of Employment Opportunities as most women and youth are not employed 2. service oriented workers like food vendors/ sari-sari store owners could be offered to provide food during the construction phase of the project with a fair compensation which could help them increase their income	▪ Barangay Chair Barangay Kagawad in charge of Employment and Livelihood	▪ LGUs (Public Employment Service Office) ▪ Civic Groups ▪ Technical Education and Skills Development Authority (TESDA) - *to provide skills training to qualify barangay residents for the quality of work required by Proponent..Moreover, male and female household heads of*	▪ Public Employement Service Office (PESO) ▪ Proponent Barangay Council	Pre-construction Construction	▪ Proponent ▪ Policy for employment on project related activities *(priority should be residents of Kawit, Imus, General Trias, Dasmariñas, and Silang)* ▪ Civic Groups TESDA
Fear of increased competition for natural resources	▪ Barangay Chair Barangay Kagawad in charge of Employment and Livelihood	▪ LGUs (Public Employment Service Office) ▪ Civic Groups ▪ TESDA - to provide skills training to qualify barangay residents for the quality of work required by Proponent	▪ PESO ▪ Proponent Barangay Council	Pre-construction Construction	▪ Policy for employment on project related activities *(priority should be residents of Kawit, Imus, General Trias, Dasmariñas, and Silang)*

Major Topics of Concern	Responsible Community Member / Beneficiary	Government Agency / Non-government Agency and Services	Proponent	Indicative Timeline / Frequency	Indicative Cost / Source of Fund
					▪ Civic Groups ▪ TESDA
Traffic congestion / Preparation of a TMP	▪ Barangay Officials ▪ Municipal Planning and Development Coordinator	▪ Barangay Officials ▪ Municipal Planning and Development ▪ Coordinator	▪ Proponent ▪ Barangay Council ▪ DPWH ▪ LTO	Pre- Construction	▪ Initial Fund – Proponent
Access to Health Care Facilities (especially for those near the road) / Seminars/Orientation Health Care and Population Management	▪ Barangay Chair ▪ Barangay Kagawad in charge of Health ▪ Barangay Health Workers	▪ MHO	▪ MHO	Construction Operation	▪ MHO ▪ PCSO

6.3 IEC FRAMEWORK

The Information, Education and Communication Framework of the project aims to foster active participation by the communities and generate support for the project. It also aims to inform the people about the details of the project. Information should be provided as needed so that the people will decide, not only on the basis of the economic benefits that they may derive from the project, but also after taking into consideration the environmental risks that the project may entail. Full disclosure of information enables a community to consider the options open to them and to make informed decisions.

The IEC framework shall consist of advisories and IEC programs designed to inform the LGU and adjoining establishments regarding activities of the project construction. Table below outlines the proposed IEC program of the project during the pre-construction/construction and operational phases.

Table 34. Information and Education Campaign (IEC) Program

Target Sector Identified as Needing Project IEC	Major Topic/s of Concern in Relation to Project	IEC Scheme/Strategy/ Methods	Information Medium	Indicative Timelines and Frequency	Indicative Cost
LGU Province of Cavite	▪ Project Description ▪ Benefits due to the	Letter and Project Description Handouts or Powerpoint	Multi-media (print, face- to-face meeting, powerpoint	▪ Project Description and Benefits – prior to	▪ Transport costs

Target Sector Identified as Needing Project IEC	Major Topic/s of Concern in Relation to Project	IEC Scheme/Strategy/ Methods	Information Medium	Indicative Timelines and Frequency	Indicative Cost
	Province (share from the taxes to be derived from the Project) ▪ Updates on the Project	Presentation of Project Description	presentation)	Project Start ▪ Updates – at the start of every major phase in the project	▪ Printingof IEC Materials
LGU ▪ Municipalities of Kawit, Imus, General Trias, and Silang City of Dasmarinas	▪ Project Description ▪ Benefits that could be derived from the project ▪ Updates on the Project	Letter and Project Description Handouts or Powerpoint Presentation of Project Description	Multi-media (print, face- to-face meeting, powerpoint presentation)	▪ Project Description and Benefits – prior to Project Start ▪ Updates – at the start of every major phase in the project	▪ Transport costs Printing of IEC Materials
LGU ▪ 6 Barangays-Kawit ▪ 7 Barangays-Imus ▪ 8 Barangays - General Trias ▪ 4 Barangays-Silang 1 Barangay-Dasmarinas	▪ Project Description ▪ Benefits that could be derived from the project ▪ Information on acquisition of land Updates on the Project	Letter and Project Description Handouts or Powerpoint Presentation of Project Description	Multi-media (print, face- to-face meeting, powerpoint presentation)	▪ Project Description and Benefits – prior to Project Start Updates – at the start of every major phase in the project	▪ Transport costs Printing of IEC Materials

7 Environmental Compliance Monitoring

Presented in Table 30 is the action plan for environmental monitoring of the proposed project.

Table 35. Action Plan for Environmental Monitoring with Environmental Quality Performance Levels

Key Environmental Aspects per	Potential Impacts per Envtl Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limi
PRE-CONSTRUCTION PHASE													
People	Relocation; land acquisition	Compensation and resettlement of affected persons Implementation of social development plan	Monitoring of payment of compensation and resettlement Monitoring of social development plan	Continual monitoring of settlement of entitlements	Project affected sites	DPWH	Part of pre-construction cost	No approved LARAP	ROW not acquired		Seek LARAP approval	Secure PAP agreement, LGU	
CONSTRUCTION PHASE													
Water	Runoff of sediments	turbidity of stormwater runoff	observation	rainfall events	Canals, rivers traversed by CALAX	DPWH	Php350,000/yr	Mud at site and at gutters	Clogged gutters and canals		Observe mud accumulation on gutters	Cleaning of gutters and canals	
Air	Dust generation	TSP	Visual observation Ambient air quality sampling	Daily Quarterly	Construction site; concrete batching plant	Contractor	Php300,000/yr	Airborne dust at intermittent occasions within the day	Excessive airborne dust reducing visibility and affecting workers movement		Water sprinkling	Stop work. Impose penalty on contractor	
People	Traffic	Traffic conditions along affected road sections	observation	daily	Construction site	contractor	Php10,000	Moderate vehicle congestion due to	Heavy vehicle congestion		Assign traffic aide infront of site	Schedule deliveries at night	

Key Environmental Aspects per	Potential Impacts per Envtl Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL Management Scheme					
								EQPL Range			Management Measure		
			Method	Frequency	Location			Alert	Action	Limit	Alert	Action	Limi
								construction vehicles going to/from site					
People	noise	Noise levels, dBA	measurement	quarterly	Construction site	contractor	Part of construction cost	50dBA (daytime) 40dBA (nighttime)	55dBA (daytime) 45dBA (nighttime)	60dBA (daytime) 50dBA (nighttime)	Maintenance of equipment	Schedule heavy noise generating activities during daytime	Stop worl
People	Occupational hazards	LTA	recording	daily	Construction site	contractor	Part of construction cost	0	0	0	Implement safety guidelines		
Land	Disposal of construction wastes	Collection of construction wastes	estimation	weekly	Construction site	contractor	Part of construction cost	Bi-weekly waste collection	Weekly waste collection	monthly	Proper segregation of wastes	Cleanliness/ orderliness of waste segregation	Require contracto haul wastes
Land	Disposal of HW	Segregation and proper mgt of HW as per RA6969	observation	weekly	Construction site	contractor	Part of construction cost	Weekly HW collection	Bi-monthly HW collection	monthly	Proper HW segregation/mgt	Cleanliness / orderliness of waste segregation area	Require contracto haul wastes
OPERATIONAL PHASE													
Air	Genset emission	SO2, NO2	Sampling and lab analysis	As required by PTO	genset	PCO	P50,000/yr	SO_2- 0.4g/ncm NO_2- 430mg/ncm	SO_2- 0.5g/ncm NO_2- 430mg/ncm	SO_2- 0.6g/ncm NO_2- 450mg/ncm	Check equipment	Servicing and repair of genset	Decommi equipmen
Land	Solid waste generation	Collection of solid waste	observation	daily	Waste segregation area	PCO	Part of mgt cost	Bi-weekly collection	Weekly collection	Monthly collection	Contract with hauler	Regular collection by hauler	Find h replaceme
Land	HW generation	Collection of HW	observation	Semi-annual	Waste segregation area	PCO	Part of mgt cost	Contract with DENR-recognized TSD facility	Contracted TSD facility cannot collect HW	HW segregation area is full	Segregation of HW; collection by TSD facility	Check HW segregation area	Contract services other D recognize TSD facili

7.1.1 SELF-MONITORING PLAN

An environmental monitoring program should be designed specifically to achieve the following: (Refer to Table 36)

- To monitor the changes in key environmental elements so that any long term adverse impact caused by project interventions can be predicted in a cost efficient and timely manner; and
- To provide a tool of the decision making on whether any modification of project or mitigation of adverse impacts is necessary.

Quarterly self-monitoring reports (SMRs) will be submitted by the PCO during the operation of the project to DENR-EMB.

Pre-Construction
The following activities are to be monitored during pre-construction:

- Coordination with the different concerned offices and LGUs
- Public announcement of the upcoming construction
- Evaluation of the construction methodology, timetable and environmental plan
- Identification of relocation site
- Organization of an environmental monitoring team
- Mobilization of personnel and equipment
- Construction of temporary facilities
- Demolition of existing structures
- Construction of access roads
- Sanitation and safety regulations introduced

Construction
The following points are to be noted for implementation during construction:

- The stability and safety of the works to be checked
- Following excavation, steps to be taken to complete drainage and slope protection in advance of the rainy season
- Activities should not result in any contamination of land or water by pollution substances.
- Physical and operational measures such as earth bunds around fuel, oil and solvent storage tanks, oil and grease traps in drainage systems
- No trees, shrubs or other vegetation shall be felled except those required to be cleared for the execution of the works
- Adequate fire-fighting equipment at the camp must be provided
- All activities should only have a minimal impact on existing communities
- All necessary precautions must be ensured so that no public or private services, utilities or similar facilities are damaged or interrupted by the works. If occurs, they must be rectified immediately
- The Concessionaire shall make his own arrangement regarding water supply for construction
- The Concessionaire shall not locate any hot-mix, screening, crushing plants closer than 200m to any settlement unless fitted with dust suppression devices

- In the removal of topsoil, trial holes should first be excavated to measure the depth of topsoil. Topsoil should be stockpiled in suitably controlled locations
- No borrow pit or quarry operation should be permitted until the method of working proposed by the Contractor for that particular pit and quarry has been approved in writing by the IC
- Monitoring of the approved plans/program
- Monitoring of the TMP.
- Monitoring of the construction of access roads
- Monitoring of dust generation due to earthmoving activities
- Conduct of air and noise quality monitoring
- Monitoring of the water quality along the waterways
- Temporaray slope protection structures to be built as maybe required
- Occupational health and safety regulations to be implemented
- Regular inspection of the sanitary conditions at worker's camps
- Preparation and submission of environmental monitoring reports

Operation
The following are the activites that should be monitored during operation:

- Air quality including enforcement of clean air act regulations
- Noise levels
- Water quality along the waterways
- Maintenance of roads
- Success and/or remediations measures for revegetation activities
- Flow and safety of traffic along the completed expressway

7.1.2 MULTI-SECTORAL MONITORING FRAMEWORK

DPWH will conduct regular audits of its compliance with the environmental management commitments. The reports of monitoring shall be submitted to the EMB together with the CMR and SMR. Likewise, regular coordination with the LGUs shall be instituted.

The DPWH will involve wider participation of stakeholders based on DENR 2003-30 throuh the Multi-partite Monitoring Team (MMT). The MMT will be organized and initiated by DPWH upon issuance of the ECC, with the objective of encouraging public participation, promoting greater stakeholder vigilance, and to provide appropriate check and balance mechanisms in the monitoring of project implementation.

The MMT has the primary responsibility of validating DPWH's environmental performance, with the following specific functions:

- Validate project compliance with the conditions stipulated in the ECC and the EMP
- Validate DPWH's conduct of self-monitoring
- Receive complaints, gather relevant information to facilitate determination of validity of complaints or concerns about the project and timely transmittal to DPWH and EMB on recommended measures to address the complaint
- Prepare, integrate and disseminate simplified validation reports to community stakeholders

- Make regular and timely submission of MMT reports based on the EMB-prescribed format.

The guidelines and procedure for the selection and organization of the MMT as provided in Annex 3-4 of the Revised Procedural Manual for DAO 2003-30 shall be followed. As stated in the guideline, the MMT will consist of representatives from EMB, DENR Region IVA, affected LGUs, recognized NGOs and POs, representing the affected sectors and concerned government agencies. The proposed composition of the MMT is as follows:

Name of Office	Specific Department / Organization
1. Provincial Government of Cavite	Provincial Planning and Development Office (PPDO) Provincial Environment and Natural Resources Office (PENRO)
2. Municipality of Kawit, Cavite	Municipal Planning and Development Office (MPDO) Municipal Agricultural Office (MAO) Municipal Environment and Natural Resources Office (MENRO) Municipal Engineering Office (MEO) Association of Barangay Councils (ABC) President
3. Municipality of Imus, Cavite	Municipal Planning and Development Office (MPDO) Municipal Agricultural Office (MAO) Municipal Environment and Natural Resources Office (MENRO) Municipal Engineering Office (MEO) Association of Barangay Councils (ABC) President
4. Municipality of Silang, Cavite	Municipal Planning and Development Office (MPDO) Municipal Agricultural Office (MAO) Municipal Environment and Natural Resources Office (MENRO) Municipal Engineering Office (MEO) Association of Barangay Councils (ABC) President
5. Dasmarinas City, Cavite	City Planning and Development Office (CPDO) City Agricultural Office (CAO) City Environment and Natural Resources Office (CENRO) City Engineering Office (CEO) Association of Barangay Councils (ABC) President
6. Locally recognized people's organizations such as farmers, transport groups and subdivision associations	Yet to be finalized
7. Land developers	Yet to be finalized
8. Local/provincial agencies	Yet to be finalized

7.1.3 ENVIRONMENTAL GUARANTEE AND MONITORING FUND COMMITMENT

Funds shall be allocated for the implementation of the Environmental Management Plan and Environmental Monitoring Action Plan. The environmental monitoring fund shall be allocated for the maintenance and operation of the expressway, regular sampling and monitoring of effluents and emissions, management of the MRF, disposal of garbage, and treatment of hazardous wastes.

8 Emergency Response Policy and Generic Guidelines

8.1 GENERIC GUIDELINES

The CALAX should adopt an emergency response policy as part of its environment, health and safety program (HSE). The emergency response plan shall comply with the pertinent DOLE Occupational Safety and Health Standards (OSHS). The preparation of the emergency response policy should as a minimum include:

- Formulation of corporate HSE policy and guidelines
- Organization of the HSE section / department
- Formulation of HSE rules, reporting requirements and procedures
- Assessment of hazards in the work place
- Identification of HSE training needs of staff
- Training to include skills in emergency first response
- Establishment of first aid stations, other emergency facilities and procedures
- Provision of PPE
- Formulation of Regular HSE programs, e.g. fire drills, earthquake drills, rescues drills, etc.
- Continuing program for HSE skills upgrading
- Monitoring and evaluation system for HSE and emergency response program.

8.2 ENVIRONMENTAL EMERGENCY RESPONSE PLAN

The potential for an environment emergency exists at the site due to the number of different construction activities being carried out and the equipment to be used. In addition, natural events may create an environmental emergency situation that must be appropriately managed.

8.2.1 SPILL CONTAINMENT AND RESPONSE

The main objective of spill containment is to minimise uncontrolled releases to prevent soil and surface water contamination and protect adjacent water environments.

Hazardous materials are stored in their respective storage method. Oils and fuels are to be contained in bunded areas to reduce the risk of spills. If a spill does occur, the spill will be diked using sandbags, sand or soil to contain the spill and prevent it from going to the drainage system. Spills involving flammable liquids must be treated with caution to minimise risk of injury and damage. The on-site storage tank must be kept in a bunded area. Solid spills from accidents or improper packaging of materials will be cleaned by the appropriate carrier.

8.2.2 INJURY TREATMENT

Injuries should be dealt with in accordance to proper procedures specified in the safety plan.

8.2.3 FIRE PREVENTION

No burning of waste will be allowed on the site. Procedures on the safety plan should be followed in case of fire. Instructions and directions regarding site evacuation and clean up methods must be followed.

8.2.4 PRECAUTIONS RELATING TO RAINSTORMS

The following measures are recommended to mitigate the impacts of excessive rainfalls:

- Silt removal facilities, channels and manholes to be regularly maintained
- Deposited silt and grit to be removed regularly
- Exposed slope surfaces to always be covered
- Intercepting channels to be provided to prevent storm runoff from washing across exposed soil surfaces
- Preventative/mitigative measures to minimise the ingress of rainwater into trenches

8.2.5 PRECAUTIONS FOR BUILDINGS AND COMPOUNDS

Keeping the area clean and free from unnecessary debris at all times will prevent accidents and emergencies during the construction period and operational phase. Maintaining the place clean can eliminate common accidents such as falling debris and workers stepping on nails and other pointed objects. The wearing of PPE will be a mandatory requirement for all workers.

During the operational phase, operational controls are to be installed and implemented to minimize accidents.

For buildings and compounds, the facility must be provided with an emergency lighting system that will automatically light emergency exits in case of failure of the main electrical power line. Fire detection and alarm systems and signals must also be provided.

Warning systems for extreme weather conditions should also be put in place to allow the facilities staff to take the prescribed actions for the protection of the facility.

On a regular basis, the facility should review all relevant processes, activities and operations and identify potential emergency situations and potential accidents associated with the plants significant hazards and environmental aspects. Through this, the plant may be able to develop and access credible emergency scenarios and adopt corresponding emergency preparedness plans. This should be reviewed regularly as to its sufficiency and appropriateness.

8.2.6 EMERGENCY MEDICAL SERVICES

Emergency medical services should be provided at all construction facilities. To comply with the requirements of the OSHS, there must be a fulltime first aider, which shall stay in the premises of the workplace. There should also be adequate quantity of medicines, supplies and equipment as required by the OSHS. In addition, an emergency clinic with adjacent washroom should be made available.

9 Abandonment / Decommissioning / Rehabilitation Policies and Generic Guidelines

The Rehabilitation Policies will be based on *DPWH DO #45-02 - Interim Guidelines for the Maintenance and Rehabilitation of Unreinforced Concrete Roads.* This document aims to provide guidance on maintenance and rehabilitation so that all concrete roads can achieve the longest economic life.

The abandonment activities during the post-construction stage include the dismantling of the temporary facilities and structures used by the workers during the actual construction as well as the cleaning up of the site. The project contractor will demolish the temporary structures upon completion of the project. Warranty provisions with the contractors, specialty contractors, and suppliers shall be implemented to provide maintenance support.

Temporary facilities including septic tanks shall also be properly demolished after the completion of the project. Wastewater contents shall be pumped out through the contractor of the portable toilet facilities for appropriate treatment. The emptied tanks shall be covered with appropriate materials.

The likelihood of abandoning the project once operational would likely occur at the end of the design life of the road. When abandonment becomes necessary, removable equipment and demolish concrete and rigid structures will be dismantled to give way for other uses in an environmentally acceptable and safe manner.

10 Institutional Plan for EMP Implementation

The agencies and organizations with authority and responsibilities for the implementation of mitigation measures and monitoring are summarized in the following table:

Table 96: Agencies and their Responsibilities in EMP Implementation

Organization	Responsibilities
DPWH	• Implementing agency • Overall planning, management and monitoring of the environmental management • Ensure that the TCA and MPSS include the project EMP (specific conditions) and specify requirements for preparation and implementation of the construction EMP • Ensure that environmental protection and mitigation measures proposed in the project EMP are incorporated into the DED and that the Project is implemented following GOP's environmental regulations and are compliant with WB's environmental and social safeguards policies • Ensure that all environmental protection and mitigation measures are carried out in accordance with policies, regulations on environment and to relevant GOP laws. • Supervise the monitoring activities • Responsible for reporting to the DENR (and WB if required) on a semi-annual basis • Based on the results of the EMP monitoring, identify environmental corrective actions and prepare a corrective action plan, as necessary for submission to

DED Consultant (Concessionaire)	Secure the ECC of the project Ensure that the DED captures all design related proposed and approved environmental mitigation measures
IC Consultant	Review and approve DED for environmental compliance and report to DPWH Provide environment specialists to undertake regular project monitoring and reporting based on EMP provisions Assist DPWH in monitoring the implementation of mitigation measures and the environmental performance of the Concessionaire based on the EMP Incorporate in the environmental monitoring reports the results of environmental monitoring and any subsequent monitoring data analysis Assist DPWH in environmental monitoring and in preparing monitoring reports for submission to DENR-EMB on a semi-annual basis If required, implement the capacity building/training program on environmental management contained in the EIA/EMP
General Contractor (Concessionaire)	Main responsibilities include but not limited to: Construction works and implementation of the construction EMP Designate on site an Environment and Health and Safety Officer who will oversee the implementation of the construction mitigation measures Ensure proper implementation of the mitigation measures Submit regular reports to IC/DPWH - ESSO regarding the status of the EMP
Stakeholders /MMT	Monitor and assess the implementation of the mitigation measures and monitoring as proposed in the EMP Participate in public consultation so they can give their opinions regarding the implementation of the EMP
LGUs	Issuance of building permits

11 Bibliography

2005 Updated List of Classified Rivers and Bays, Environmental Management Bureau (EMB), 329 pp.

Active Faults in the Philippines. In: Proceedings of the 13th Annual GSP Geological Convention, Besana, G., Daligdig J. et.al, 2000 Bookmark, Makati City. 389 pp.

Bureau of Printing, Manila 1935 Soil Survey of Cavite Province, Philippines

Bureau of Soils and Water Management, 1988. Micronutrient Status of Some Philippine Soils. Soils and Water Technical Bulletin, Volume II.

Bureau of Soils and Water Management, 1998 SAFDZ Maps of Kawit, Imus, General Trias, and Silang, Cavite

Capacity Development Project on Water Quality Management, Project Document, DENR/JICA, August 2005

Carpenter, RA and JE Maragos (eds) 1989. How to Assess Environmental Impacts on Tropical Islands and Coastal Areas. Asian Development Bank and Environment and Policy Institute, East-West Center. Honolulu, Hawaii.

Census of Population, (Cavite Province), Socio-Economic and Demographic Characteristics, 2010.

Climate change impacts and responses in the Philippines coastal sector, Rosa Perez, Leoncio A. Amadore, Renato B. Fier, PAGASA, NAMRIA, DENR, Climate Research, Vol. 12:97-107, 1999.

De Guzman, Ed, RM Umali, and Ed Sotalbo. 1986. Guide to Flora and Fauna: Dipterocarps and Non-Dipterocarps. Volume III. Quezon City: Natural Resources Management Center, Ministry of Natural Resources and University of the Philippines.

DENR Administrative Order 2007-01. Establishing the National List of Threatened Philippine Plants and their Categories, and the List of other Wildlife Species

DENR Administrative Order No. 34, Series of 1990, Revised Water Usage and Classification, Water Quality Criteria Amending Section Nos. 68 and 69, Chapter III of the 1978 NPCC Rules and Regulations.

DENR Administrative Order No. 35, Series of 1990, Revised Effluent Regulations of 1990, Amending Section 68 and 69 of the NPCC Rules and Regulations.

Dierolf, Thomas, Fairhurst, Thomas and Muttert, Ernst 2001, Soil Fertility Kit, A toolkit for acid, upland soil fertility management in Southeast Asia, Potash and Phosphate Institute (PPI) Handbook series.

Environmental Impact Assessment for Developing Countries in Asia. Volume 1 - Overview. 356 pp. Asian Development Bank. Manila, Philippines.

Environmental Impact Statement for the proposed CALAX (Cavite Section), DPWH, SMEC, 2012.

Fernando E.S. and ML Castillo. 1996. Field Checklist of Species in FBS 21 (Taxonomy of Forest Plants). Third Edition. Department of Forest Biological Sciences, University of the Philippines. Los Baños, Laguna. 18 pp.

Food and Fertilizer Technology Center 2006, Dutch and Taiwan Standards for Soil Contamination assessment, in terms of total concentration of Heavy Metals in Soil. Landon, J.R. (Editor) 1984. Booker Tropical Soil Survey Manual

http://www.pagasa.dost.gov.ph/ffb/pabc.htm

Integrated Environmental Strategies, Philippines Project Report, Manila Observatory, USAID, NREL, June 2005.

IRR Governing the Collection, Handling, Transport, Treatment and Disposal of Domestic Sludge and Septage – A Supplement to the Implementing Rules and Regulations of Chapter XVII – "Sewage Collection and Disposal, and Excreta Disposal and Drainage" of the Code on Sanitation of the Philippines

IUCN. 2006. 2006 IUCN Red List of Threatened Species. <www.icunredlist.org>. Downloaded 25 June 2006.

Kennedy, R.S., P.C. Gonzales, E.C. Dickinson, H.C. Miranda,Jr. and T.H. Fisher, 2000. A Guide to Birds of the Philippines. Oxford University Press. New York, USA 369p.

Kent & Coker. 1992. Vegetation Description and Analysis: A Practical Approach. CRC Press, Boca Raton, Ann Arbor & Belhaven Press, London. 333 pp.

Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L.Tu. 1997.

Madulid. 2000. A Pictorial Cyclopedia of Philippine Ornamental Plants. 2nd edition.

Madulid. 2001. A Dictionary of Philippine plant names. Volume II. Bookmark, Makati City.

Mueller-Dombois and Ellenberg. 1971. Aims and Methods of Vegetation Ecology. Moody, K, CE Munroe, RT Lubigan and EC Paller, Jr. 1984. Major Weeds of the Philippines. College, Laguna: Weed Science Society of the Philippines and University of the Philippines Los Baños.

Odum, E. 1971. Fundamentals of Ecology. 3rd edition, W. Saunders Company, Philadelphia, U.S.A., 574 p.

Official Gazette, Implementing Rules and Regulations of Presidential Decree No. 984.

PAG-ASA Climatological Normal Sypnotic Stations 1971-2000

Philippine Development Plan (2011-2016) NEDA Region 4A DevelopmentPlan 2009, NEDA Rojo, JP. 1999. Revised Lexicon of Philippine Trees. Forest Products Research and Development Institute. College, Laguna. 484 pp.

Philippine Environment Monitor – Environmental Health, World Bank, June 2007.

Philippine Environmental Quality Report 1990 - 1995, Environmental Management Bureau (EMB), Department of Environment and Natural Resources (DENR), November 19, 1996.

Republic Act 9275, Philippine Clean Water Act

Revised Procedural Manual for DENR Administrative Order No. 30, Series of 2003 (DAO 03-30), Implementing Rules and Regulations of Presidential Decree No. 1586, Establishing the Philippine Environmental Impact Statement System, August 2007.

Socio-Economic Profile of Cavite, Provincial Planning and Development Office, 2013

Supplemental Information – Environmental Impact Statement of CALAX (Cavite Section), DPWH, SMEC, 2013

UP Science Education Center. 1971. Plants of the Philippines. University of the Philippines Press, Quezon City.

12 Annexes

A. Technical Scoping Checklist
B. Public Scoping Report
C. Documentation of Public Consultation Meetings
D. Ambient Air and Noise Sampling Results
E. Water Quality Sampling Results
F. Memorandum of Agreement between SLI and DPWH

ANNEX A

TECHNICAL SCOPING CHECKLIST

ANNEX B

PUBLIC SCOPING REPORT

ANNEX C

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ANNEX D

AMBIENT AIR AND NOISE SAMPLING RESULTS

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ANNEX F

MEMORANDUM OF AGREEMENT BETWEEN SLI AND DPWH