Chapter 3 PROJECT DESCRIPTION FOR SCOPING

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3.1 PROJECT DESCRIPTION

The proposed Manila-Cavite Toll Expressway Project (MCTEP) Segment 5 is a 22-kilometer modern tollway that will interconnect the fast-growing population and industrial centers in Cavite's coastal towns and cities towards the MCTEP network and Metro Manila, thereby significantly spurring economic development and shortening travel times. The alignment will also greatly compliment the narrow main road connections in the area which can serve as the catalyst for its further future development and progress.

3.1.1 Project Location

The main alignment of MCTEP Segment 5 will start at CAVITEX exit in Binakayan-Aplaya, Kawit, Cavite and will traverse westward along the wet and marshland areas of Kawit and Noveleta, then veer west south-west towards the Manila Bay shoreline of Rosario and Tanza, Cavite (see **Figures 3.1** and **3.2**). Connecting roads will be constructed to link the main alignment with the Cavite Export Processing Zone (CEPZ) in Rosario, and Sangley Point in Cavite City.

Table 3.1 lists all the barangays traversed by the project alignment.

Table 3.1: List of Barangays Traversed by the MCTEP Segment 5

Municipality	Barangays	Traversing Component
Kawit	Binakayan-Aplaya, Binakayan-Kanluran, Marulas, Kaingen, Poblacion, Wakas II, Sta. Isabel	Segment 5.1 Kawit Interchange
Noveleta	San Rafael I, San Rafael II, San Rafael III, San Rafael IV, Salcedo I, Sta. Rosa I, Sta. Rosa II	Segment 5.1 Segment 5.2 Segment 5.3 Noveleta Interchange CEPZ Spur Road
Cavite City	Brgy. 8, Brgy. 49M, Brgy. 49A	Segment 5.3
Rosario	Wawa I, Wawa III	Segment 5.2 Rosario Exit Ramp
Tanza	Amaya I	Segment 5.2

3.1.2 Project Area

The project's starting point and the easternmost portion of the project is at Brgy Binakayan-Aplaya, Kawit which is located approximately 16 km southwest of Metro Manila, while the northernmost portion is situated at Sangley Point in Cavite City, and the southern and westernmost portion is at Brgy Amaya I, Tanza, Cavite. The project area is bounded between geographic coordinates 14°23'0" N to 14°29'20" N latitude, and 120°50'10" E to 120°55'7" E longitude.

3.1.3 Accessibility

The project site can be accessed from the City of Manila by 20-km route along Padre Burgos Ave., Roxas Blvd. and Cavite Expressway (CAVITEX). It can be accessed also using the Epifanio delos Santos Ave. (EDSA) – Roxas Blvd. – CAVITEX route.

The site can be accessed by any means of land transportation. For commuters, buses traversing the Kawit Exit of CAVITEX are available at Lawton, Libertad, and Baclaran area going to Cavite City, Noveleta, Tanza, or Naic. Local transportation such as mini buses, jeepneys, and tricycles are also available within Kawit, Noveleta, Cavite City, Rosario, and Tanza to access the different portions of the project.

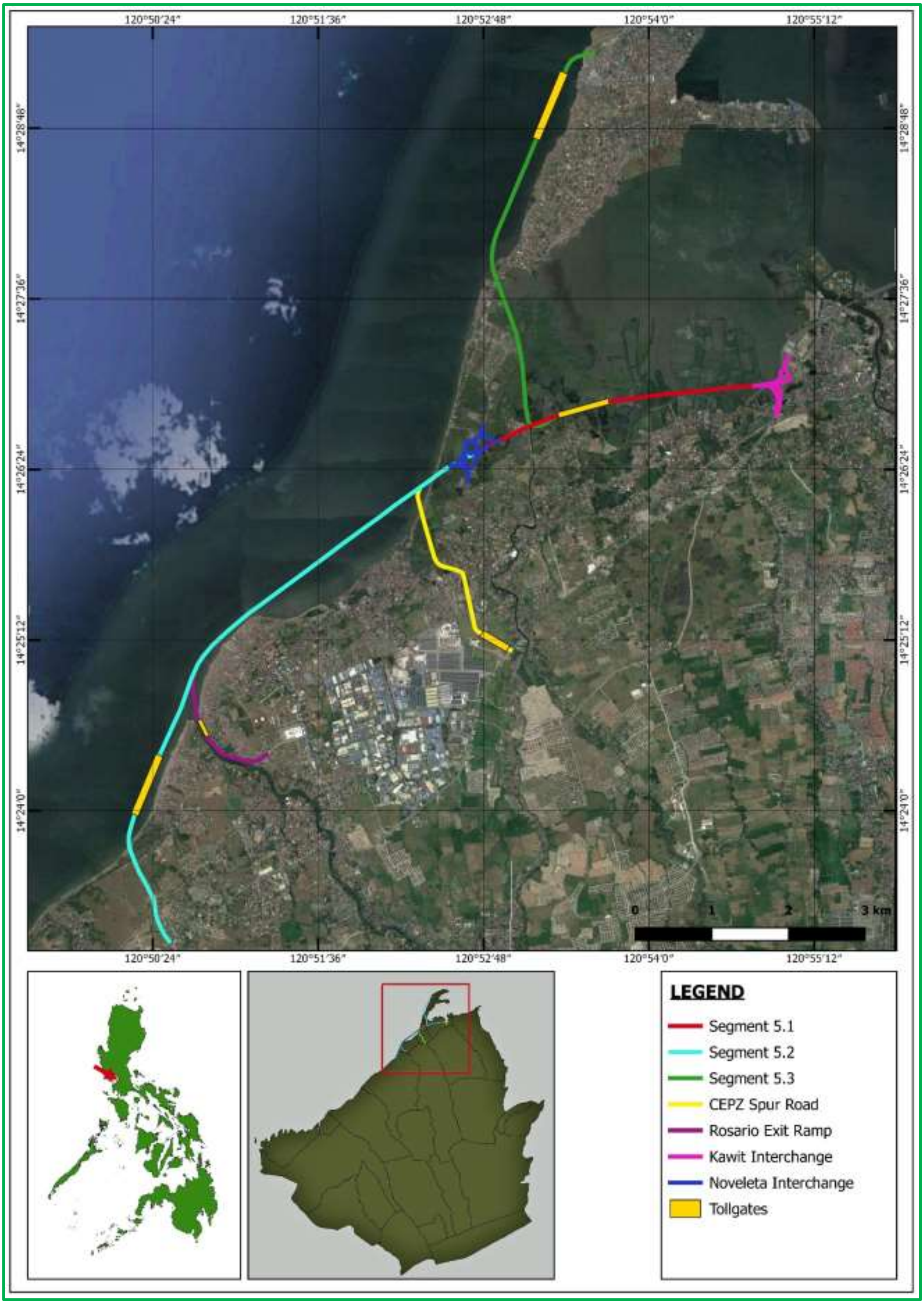

Figure 3.1: MCTEP Segment 5 Alignment (in Google Satellite Image Base Map)

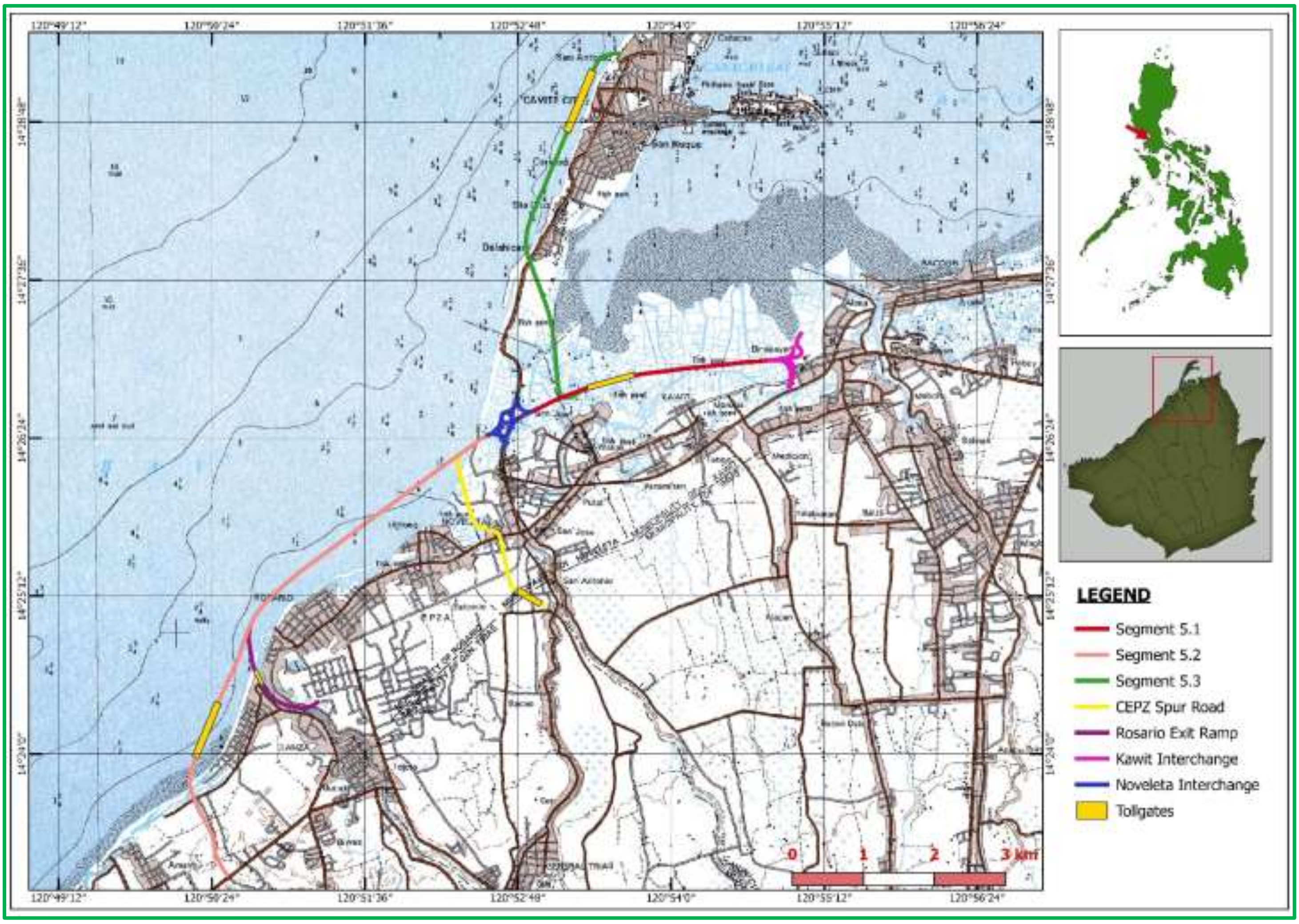

Figure 3.2: MCTEP Segment 5 Alignment (in NAMRIA Base Map)

3.1.4 Delineation of Impact Areas

The Project's impact areas were identified based on the socioeconomic, hydrological, and biophysical assessment conducted within and near the vicinity of the project area. Specific impact areas are delineated into two categories; the primary/direct impact areas and the secondary/indirect impact areas.

3.1.4.1 Direct Impact Areas (DIA)

Based on Annex 2-2 of EMB-MC 2007-002 or the Revised Procedural Manual (RPM) for DAO 03-30, the Direct Impact Area (DIA) is initially delimited during the Pre-EIA Study Stage as the area where all project facilities are proposed to be constructed/situated and where all operations are proposed to be undertaken.

For MCTEP Segment 5, the following DIAs are identified:

- Areas to be directly traversed by the project alignment which includes;
    a. Mangrove areas to be affected at Poblacion, Kawit, and Brgy. San Rafael IV and San Rafael II, Noveleta;
    b. Settlements and establishments to be displaced, and lots to be acquired in Kawit, Noveleta, Rosario, Cavite City, and Tanza;
    c. Fish farms to be affected in Kawit and Noveleta;
    d. Trees to be cleared along project alignment; and

  e. Facilities to be affected such as electrical and utility posts, water pipelines, waiting sheds, barangay outposts, etc.

- Areas where temporary facilities (i.e. offices, bunk houses, storage facilities, construction access roads) will be constructed;
- Quarry areas where embankment materials will be obtained;
- The portions of the bay and rivers which will be impacted by the degradation of water quality during the construction phase of the project; and
- The municipalities of Kawit, Noveleta, Rosario, Tanza, Cavite City, including General Trias and Naic, and the province of Cavite as a whole which will be benefited by the project through increased mobility, reduced traffic congestion, and other benefits brought by the project.

3.1.4.2 Indirect Impact Areas (IIA)

IIA during the pre-EIA Study can only be assumed or qualitatively estimated but may be guided by secondary data and information from key interviews of reliable local authorities. IIA is clearly delineated only after the EIA Study is done, and is more accurately established during post-ECC monitoring.

At this stage, the following are the anticipated IIAs for the MCTEP Segment 5:

- Portions of the roads which will be negatively impacted by anticipated increased traffic congestion during the construction phase of the project;
- Sensitive receptors near the project area such as schools, hospitals, churches, and residential areas which will be disturbed through increased air and noise pollution during the construction and operation phases of the project;
- Fisherfolks which will be affected by disturbance on their access routes to their fishing grounds during the construction phase of the project; and
- The municipalities of Kawit, Noveleta, Rosario, Tanza, and Cavite City which will be benefited by the generation of local employment and livelihood opportunities during the construction and operation phases of the project.

Generally, most of the impacts are considered temporary while the benefits brought by the project will be exceptional especially in the coastal municipalities of Cavite.

3.2 RATIONALE

An efficient road subsector is crucial for the Philippines' economic growth and poverty reduction. An Asian Development Bank (ADB) analysis of roads in the Philippines and other countries found that roads are critical as social arteries for the delivery of government services, penetration of ideas and cultures, and dissemination of technology to the people.

The Philippine Development Plan, 2011–2016 envisions "a safe, secure, efficient, viable, competitive, dependable, integrated, environmentally sustainable, and people-oriented Philippine transportation system." It specifies six activities necessary to achieve this overall objective: (i) adopt a comprehensive long-term national transport policy; (ii) develop strategic transport infrastructure, and maintain and manage transport infrastructure assets; (iii) develop an integrated multimodal logistics and transport system; (iv) separate the regulatory and operation functions of transport and other concerned agencies; (v) comply with safety and security standards; and (vi) provide links to bring communities into the mainstream of progress and development.

The proposed project area is currently serviced by six (6) major road networks: (i) Manila-Cavite Road, which connects Kawit, Noveleta, and Cavite City; (ii) Marsiella St., which connects Noveleta and Rosario; (iii) Centennial Road and (iv) A. Soriano Highway, which joins Kawit, Rosario, General Trias, Tanza, and Naic; (v)

General Trias Drive, which links Rosario and General Trias; and (vi) Tanza-Trece Martires Road, connecting Tanza and Trece Martires City. Due to increasing population and continuing development, traffic is a worsening problem in the area.

The project implementation is expected to address the worsening traffic situation and catalyze the economic development in the coastal towns of Cavite. It also envisioned to cater the proposed development of Sangley Point as an alternative airport to help decongest air traffic at Nino Aquino International Airport (NAIA).

3.3 PROJECT ALTERNATIVES

Before the conduct of the feasibility study (FS) for the project, a preliminary alignment was provided by CIC (see **Figure 3.3**). This alignment became the baseline of the project alignment, and alternatives were generated during the duration of the study.

Figure 3.3: Preliminary Alignment for MCTEP Segment 5 before the Conduct of Feasibility Study

The following alternatives were examined during the study:

1. Alternative Alignments for Segment 5.1 and Segment 5.2
2. Alternative Alignments for Segment 5.3
3. Alternative Alignments for Spur Road to CEPZ
4. Embankment and Viaduct Type Schemes
5. With and Without the Project Scenario

3.3.1 Alignment Alternatives for Segment 5.1 and Segment 5.2

Three options were considered in the study for the preferred alignment for both Segment 5.1 and Segment 5.2 (**Figure 3.4**), and these are:

Option 1 – CIC Recommended Alignment (exit in Rosario)

Option 2 – Geometrically Re-Aligned Option 1 (exit in Rosario)

Option 3 – Extended Option 2 (exit in Tanza)

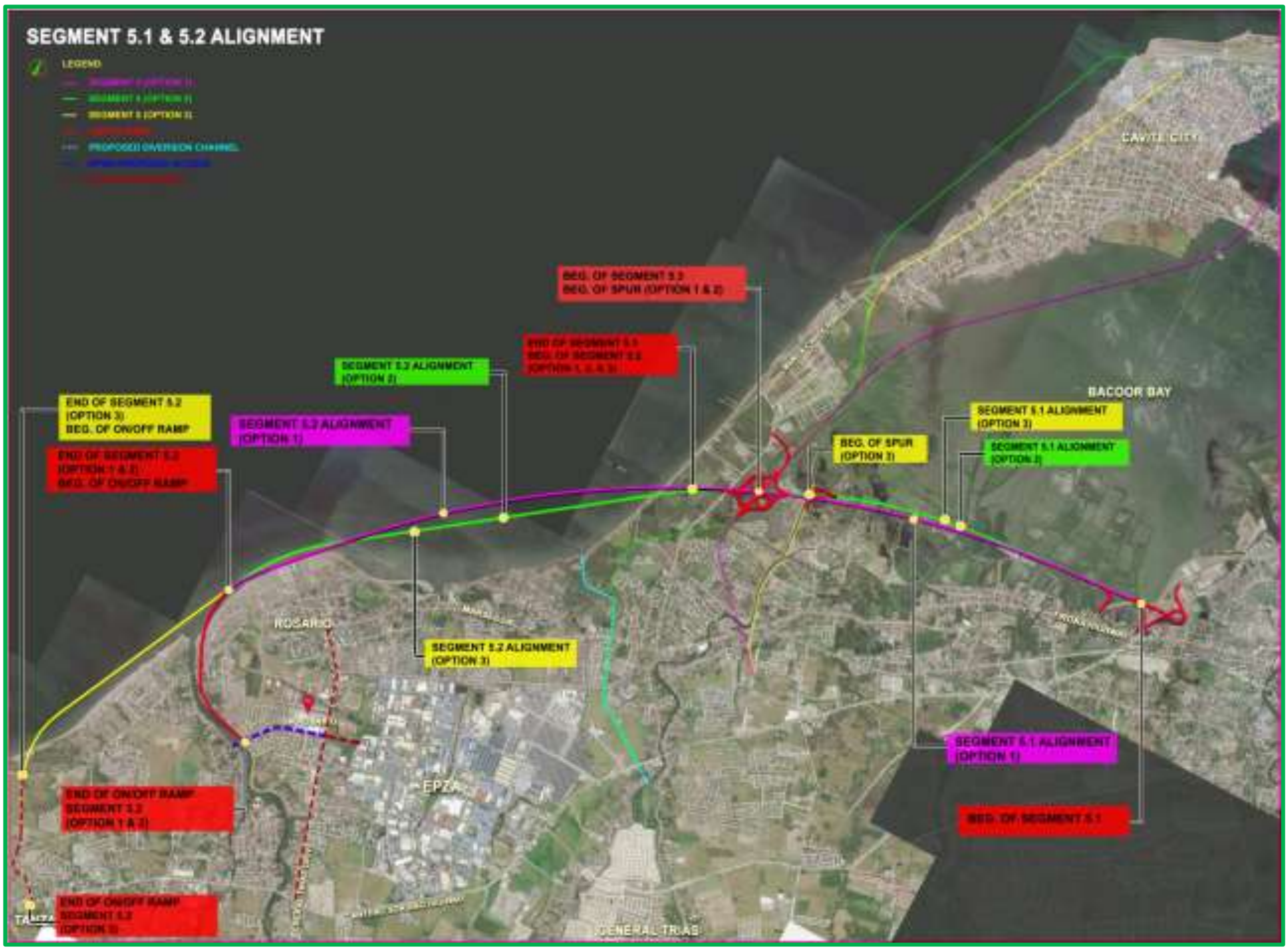

Figure 3.4: Alignment Alternatives Considered for Segment 5.1 and Segment 5.2

Each of these options were rated based on their topography, geological characteristics, environmental and social impacts, engineering requirements, and cost (see **Table 3.2**). Based on the analysis conducted, a geometrically reconfigured alignment with an exit ramp in Tanza, Cavite is considered the preferred option.

Exit in Rosario will traverse a populated area at Brgy. Wawa III, while exit at Amaya I, Tanza will offer less affected residential and commercial structures (see **Figures 3.5** and **3.6**). There are more than 120 houses and commercial structures to be affected at proposed Rosario Exit, while only less than 15 houses at proposed Tanza Exit.

Option 3 is the preferred scheme in this segment of the project because it features less social impact in terms of affected residential and commercial structures. It also offers additional service area for the project because it will cater the development needs of the municipality of Tanza which includes the proposed SM Tanza, the on-going construction Cavite Gateway Terminal, and developing Tanza Export Processing Zone.

Table 3.2: Selection Matrix for Segment 5.1 and Segment 5.2

Criteria		SEGMENT 5.1 AND SEGMENT 5.2						Remarks
		Option 1		Option 2		Option 3		
		Features	Score	Features	Score	Features	Score	
Topography or Terrain Conditions								
Mountainous<= Rolling <= Flat	10	Flat	10.00	Flat	10.00	Flat	10.00	
Subtotal	10		10.00		10.00		10.00	
Geotechnical and Geological Characteristics								
Liquefaction / Settlement Prone	6	Highly Susceptible	0.00	Highly Susceptible	0.00	Highly Susceptible	0.00	
Landslide Prone Sections	4	Not Susceptible	4.00	Not Susceptible	4.00	Not Susceptible	4.00	
Subtotal	10		4		4		4	
Social and Environmental Issues								
Affected Residential and Commercial Structures	10	224 nos.	2.81	224 nos.	2.81	63 nos.	10.00	Option 3 with lesser affected residential and commercial structures
Affected Mangroves	5	With mangroves affected	0.00	With mangroves affected	0.00	With mangroves affected	0.00	
Subtotal	15		2.81		2.81		10.00	
Geometric Characteristics								
Horizontal Alignment	6	8.68 kms.	6.00	8.7 kms.	5.99	10.57 kms.	4.93	
Horizontal Bends	2	7.15 kms.	0.93	3.34 kms.	2.00	3.74 kms.	1.79	
Steep Slopes	2	None	2.00	None	2.00	None	2.00	
Subtotal	10		8.93		9.99		8.71	
Structures Requirements								
Number of Road Crossing / Bridges	2	7 nos.	2.00	7 nos.	2.00	7 nos.	2.00	
Length of On / Off Ramp	3	1.72 kms.	3.00	1.72 kms.	3.00	1.9 kms.	2.72	
Length of Embankment Type Structure	3	4.16 kms.	3.00	4.17 kms.	2.99	4.17 kms.	2.99	
Length of Bridge/Viaduct System	2	4.52 kms.	2.00	4.53 kms.	2.00	6.4 kms.	1.41	
Subtotal	10		10.00		9.99		9.12	
Right of Way Requirements								
Agricultural Lands	5	26.82 hec.	5.00	27.24 hec.	4.92	29.4 hec.	4.56	
Residential and Commercial Areas	8	10.32 hec.	5.35	10.32 hec.	5.35	6.9 hec.	8.00	Option 3 smaller area of residential and commercial area affected
Offshore Areas	2	24.24 hec.	1.87	22.68 hec.	2.00	38.4 hec.	1.18	
Subtotal	15		12.22		12.27		13.74	
Construction Requirements								
Improvement / Widening of Existing Roads	8	2.82 kms.	3.26	2.82 kms.	3.26	1.15 kms.	8	Option 3 requires less road improvement and widening
Magnitude of Construction works	4		4		4		4	
Duration of Construction	3	60 mos.	3.00	60 mos.	3.00	72 mos.	2.50	
Subtotal	15		10.262		10.262		14.500	
Project Cost								
Construction Cost	10	13.360 B	10.00	13.384 B	9.98	14.720 B	9.08	
Right of Way Cost	3	2.183 B	2.41	2.148 B	2.45	1.754 B	3.00	
Eng'g and Management Cost	2	1.603 B	2.00	1.606 B	2.00	1.766 B	1.82	
Subtotal	**15**		14.41		14.43		13.89	
TOTAL SCORE	100		72.64		73.75		83.97	**Option 3 - Recommended Option**

Figure 3.5: Area Traversed by Exit Ramp if Proposed Rosario Exit will be Pursued

Figure 3.6: Area Traversed by Tanza Exit Ramp

3.3.2 Alignment Alternatives for Segment 5.3

In case of the road alignment going to Sangley Point, Cavite City (Segment 5.3), the following alternatives were considered (see **Figure 3.7** and **Table 3.3**):

Option 1 – CIC Recommended Alignment traversing Eastern Coastline of Cavite City

Option 2 – Alignment Traversing Western Coastline of Cavite City

Option 3 – Alignment Traversing the Existing J.Felipe Blvd.

Figures 3.8 to **3.10** shows the impact areas considered in alignment selection for Segment 5.3. Option 3 is least preferred mainly due to its impact in the affected built-up areas along the road alignment if the existing J. Felipe Blvd will be expanded. Its cost will be higher due to right-of-way requirements. This option will also cause high negative impact on traffic during the duration of construction of this segment of the project.

On the other hand, Option 1 will traverse and block the beautiful scenery at Cavite City Baywalk. It will also pass beside the San Sebastian College-Recoletos de Cavite, Cavite City Hall, and Samonte Park which will give a negative impact in terms of air and noise pollution during construction and operation phases of the project. It may also generate minimal impact on the livelihood of some fishermen in the area because it will traverse some fish ponds and shell farms in Bacoor and Cañacao Bay.

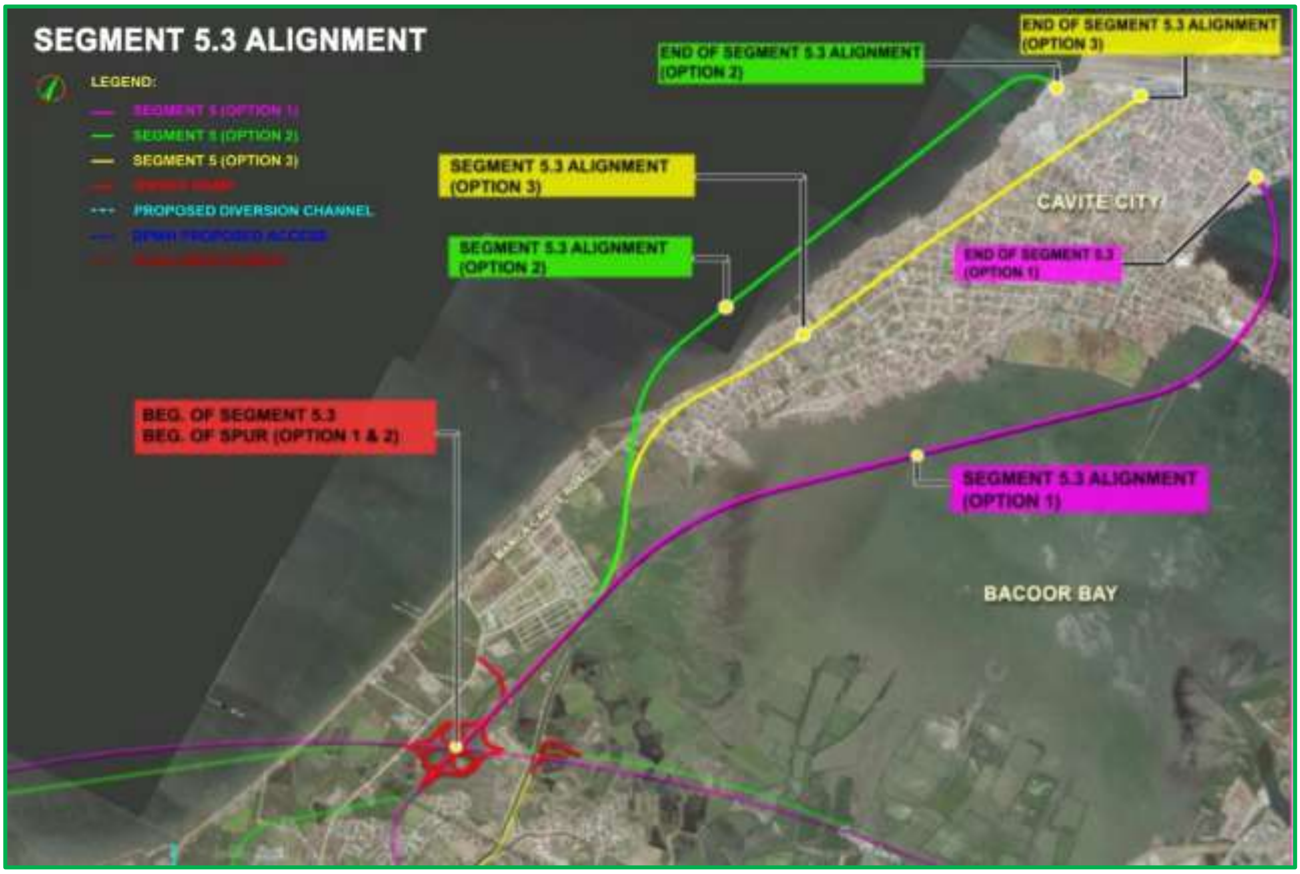

Figure 3.7: Alignment Alternatives Considered for Segment 5.3

Table 3.3: Selection Matrix for Segment 5.3

Criteria		SEGMENT 5.3						Remarks
		Option 1		Option 2		Option 3		
		Features	Score	Features	Score	Features	Score	
Topography or Terrain Conditions								
Mountainous<= Rolling <= Flat	10	Flat	10.00	Flat	10.00	Flat	10.00	
Subtotal	10		10.00		10.00		10.00	
Geotechnical and Geological Characteristics								
Liquefaction / Settlement Prone	6	Highly Susceptible	0.00	Highly Susceptible	0.00	Highly Susceptible	0.00	
Landslide Prone Sections	4	Not Susceptible	4.00	Not Susceptible	4.00	Not Susceptible	4.00	
Subtotal	10		4.00		4.00		4.00	
Social and Environmental Issues								
Affected Residential and Commercial Structures	**10**	35 nos.	10.00	42 nos.	8.33	320 nos.	1.09	
Affected Mangroves	5	With mangroves affected	0.00	With mangroves affected	0.00	With mangroves affected	0.00	
Subtotal	15		13.00		11.33		1.09	
Geometric Characteristics								
Horizontal Alignment	6	6.26 kms.	6.00	6.78 kms.	5.54	5.64 kms.	6.00	Option 2 shorter length of horizontal bends
Horizontal Bends	2	2.83 kms.	1.28	1.81 kms.	2.00	2.06 kms.	1.76	
Steep Slopes	2	None	2.00	None	2.00	None	2.00	
Subtotal	10		9.28		9.54		9.76	
Structures Requirements								
Number of Road Crossing / Bridges	2	2 nos.	2.00	2 nos.	2.00	2 nos.	2.00	
Length of On / Off Ramp	3	--	3.00	--	3.00	--	3.00	
Length of Embankment Type Structure	3	1.59 kms.	3.00	2.25 kms.	2.12	2.13 kms.	2.24	
Length of Bridge/ Viaduct System	2	4.67 kms.	1.50	4.53 kms.	1.55	3.51 kms.	2.00	
Subtotal	10		9.50		8.67		9.24	

Right of Way Requirements								
Agricultural Lands	5	14.64 hec.	4.34	12.72 hec.	5.00	13.4 hec.	4.75	Option 2 smaller area of agricultural land and Residential areas to be affected
Residential and Commercial Areas	**8**	1.55 hec.	5.52	1.07 hec.	8.00	20.58 hec.	0.42	
Offshore Areas	2	19.27 hec.	0.01	18.78 hec.	0.01	--	2.00	
Subtotal	15		9.88		13.01		7.16	
Construction Requirements								
Improvement of Existing Roads	**8**	--	8	--	8	3.18	2.52	
Magnitude of Construction works	4		4		4	Construction along major road	2	
Duration of Construction	3	56 mos.	2.89	54 mos.	3.00	66 mos.	2.45	
Subtotal	15		14.89		15.00		6.97	
Project Cost								
Construction Cost	10	8.940 B	9.26	8.279 B	10.00	9.426 B	8.78	Options 2 Construction lower than Option 1 & 3
Right of Way Cost	3	1.059 B	2.65	.938 B	3.00	4.395 B	0.64	Options 2 ROW Cost lower than Option 1 & 3
Eng'g and Management Cost	2	1.073 B	1.85	.994 B	2.00	1.131 B	1.76	
Subtotal	**15**		13.77		15.00		11.18	
TOTAL SCORE	100		81.32		**83.55**		59.41	**Option 2 - Recommended Option**

Figure 3.8: School and Baywalk/Park along the proposed Segment 5.3 (Option 1)

Figure 3.9: Western Coastline of Cavite City where Segment 5.3 (Option 2) will Traverse

Figure 3.10: Commercial and Residential Structures along the Proposed Segment 5.3 (Option 3)

Option 2 is the preferred option because it will feature less negative impacts and cost than the other options. Beside these factors, Option 2 will also complement with the proposed developments and reclamation projects in the western coastline of Cavite City (see **Figure 3.11**).

Figure 3.11: Proposed Reclamation Projects at the Western Coastline of Cavite City

3.3.3 Alignment Alternatives for Spur Road to CEPZ

There were also three considerations for the Spur Road to CEPZ (see **Figure 3.12**), these are:

Option 1 – Spur Road from Proposed Noveleta Interchange to EPZA Diversion Road

Option 2 – Spur Road Traversing the Proposed Diversion Channel of CIAFMP

Option 3 – Spur Road Traversing the Ylang-Ylang River and Connecting to EPZA Diversion Road

The result of the alternative matrix shows that Option 2 is the best option among the three (3) considered option (**Table 3.4**). All of the options are expected to traverse high density residential areas and expected to relocate more than 100 households, and due to the anticipated construction of the proposed CIAFMP, this option will have an advantage due to minimized social impacts. It can be anticipated that households along the proposed CIAFMP in the municipality of Noveleta are already aware that they will be relocated due to the construction of the 100-meter wide diversion channel. Therefore, social impact in terms of displacement of settlers and properties is lower compared to relocating another set of settlers.

3.3.4 Embankment and Viaduct Type Schemes

Embankment or viaduct type of elevated road were considered for the project. Three (3) schemes were studied:

Scheme 1 – Mixed Embankment and Viaduct Type (**Figure 3.13**)

Scheme 2 – Mostly Viaduct Type (**Figure 3.14**)

Scheme 3 – Mostly Embankment Type (**Figure 3.15**)

For this project, the embankment type of road will cover 40 to 60-meter wide of land area along the road alignment while viaduct type will only affect more or less 25-meter wide. Therefore, in terms of environmental and social impact, viaduct type will clear less land area (mangroves, vegetation, and settlements) compared to embankment type. In addition, embankment type requires a huge amount of embankment material for its construction. The environmental impact at the source of the embankment material should be also taken into consideration. Therefore, in terms of environmental impact, viaduct type (Scheme 2) is highly recommended. This scheme will offer reduced mangrove area to be cleared and settlements to be displaced.

In contrast, however, embankment type (Scheme 3) cost less at Php 0.88 billion per km, compared to viaduct type (Scheme 2) which costs approximately Php 1.71 billion per km. Meanwhile, mixed embankment and viaduct type (Scheme 1) costs Php 1.36 billion per km.

To minimize the project cost, as well as reduce the environmental impact of the project, mixed embankment and viaduct type (Scheme 1) is recommended.

Figure 3.12: Alignment Alternatives Considered for Spur Road to CEPZ

Table 3.4: Selection Matrix for Spur Road to CEPZ

Criteria		Spur Road to CEPZ						Remarks
		Option 1		Option 2		Option 3		
		Features	Score	Features	Score	Features	Score	
Topography or Terrain Conditions								
Mountainous<= Rolling <= Flat	10	Flat	10.00	Flat	10.00	Flat	10.00	
Subtotal	10		10	0	10	0	10	
Geotechnical and Geological Characteristics								
Liquefaction / Settlement Prone	6	Highly Susceptible	0.00	Highly Susceptible	0.00	Highly Susceptible	0.00	
Landslide Prone Sections	4	Not Susceptible	4.00	Not Susceptible	4.00	Not Susceptible	4.00	
Subtotal	10		4	0	4	0	4	
Social and Environmental Issues								
Affected Residential and Commercial Structures	**10**	130 nos.	7.69	100 nos.	10.00	145 nos.	6.90	Considering the JICA flood control project will be implemented earlier, there are lesser affected residential and commercial structures for Option 2
Affected Mangroves	5	With Mangroves affected	0.00	With mangroves affected	0.00	With mangroves affected	0.00	
Subtotal	15		7.69		10.00		6.90	
Geometric Characteristics								
Horizontal Alignment	6	1.87 kms.	5.61	3.41 kms.	3.08	1.75 kms.	5.00	
Horizontal Bends	2	.31 kms.	2.00	.9 kms.	0.68	.99 kms.	0.62	
Steep Slopes	2	None	2.00	None	2.00	None	2.00	
Subtotal	10		9.61		5.76		7.62	
Structures Requirements								
Number of Road Crossing / Bridges	2	None	2.00	None	2.00	None	1.00	
Length of On / Off Ramp	3	None	3.00	None	3.00	None	3.00	
Length of Embankment Type Structure	3	-	3.00	-	3.00	-	3.00	
Length of Bridge/ Viaduct System	2	1.87	1.87	3.41	1.03	1.75	2.00	
Subtotal	10	1.87	9.87	3.41	9.03	1.75	9.00	
Right of Way Requirements								
Agricultural Lands	5	3.42	2.32	2.64	3.00	1.98	4.00	
Residential and Commercial Areas	**8**	6.3	1.37	0.96	9.00	10.50	0.82	
Offshore Areas	2	1.44	1.53	6.36	0.35	1.10	2.00	
Subtotal	15		5.215		12.346		6.82	
Construction Requirements								
Improvement of Existing Roads	**8**	None	8.00	None	8.00	None	8.00	
Magnitude of Construction works	4		4.00		4.00		4.00	
Duration of Construction	3	24	2.63	24	2.63	21	3.00	
Subtotal	15		14.625		14.625		15.000	
Project Cost								
Construction Cost	10	2.244 B	10.00	3.028 B	7.41	2.745 B	8.17	Considering the JICA flood control project will be implemented earlier, ROW Cost will be less for Option 2
Right of Way Cost	3	1.114 B	1.42	.527 B	3.00	1.436 B	1.10	
Eng'g and Management Cost	2	.269 B	2.00	.363 B	1.48	.329 B	1.63	
Subtotal	**15**		13.42		11.89		10.91	
TOTAL SCORE	100		74.44		**77.65**		70.25	**Option 2 - Recommended Option**

Figure 3.13: Scheme 1 - Embankment and Viaduct Type

Figure 3.14: Scheme 2 - Mostly Viaduct Type

Figure 3.15: Scheme 3 - Mostly Embankment Type

3.3.5 With and Without Project Scenario

The proposed project area is currently serviced by six (6) major road networks which include the Manila-Cavite Road, Marsiella St., Centennial Road or A. Soriano Highway, General Trias Drive, and Tanza-Trece Martires Road. Due to increasing population and continuing development, traffic is a worsening problem in the area.

With the Project Scenario includes the implementation of the MCTEP Segment 5 which is expected to address the worsening traffic situation and catalyze the economic development in the coastal towns of Cavite. It also envisioned to cater the proposed development of Sangley Point as an alternative airport to help decongest air traffic at Nino Aquino International Airport (NAIA).

Without the project, the aforementioned benefits will not be achieved. Traffic condition, especially at major choke points at crossing of Manila-Cavite Road and Marsiella St. in Poblacion, Noveleta, and intersections of A. Soriano Highway and General Trias Drive, Advincula Road, and Tirona Highway at Tajero, Gahak, and Binakayan, respectively, will worsen until new road development projects will be implemented in the area. In addition to traffic, air pollution will worsen in the area and incidents of respiratory diseases will increase.

3.4 PROJECT COMPONENTS

MCTEP Segment 5 is composed of the following components (**Table 3.5**):

Table 3.5: Major Components of MCTEP Segment 5

Project Component	Location/Area Jurisdiction		Length/ Area
Major Components			
Segment 5.1 *(Kawit to Noveleta)*	**Kawit** **Noveleta**	*Brgy. Binakayan-Kanluran, Brgy. Marulas, Brgy. Kaingen, Brgy. Poblacion, Brgy. Wakas II, Brgy. Sta. Isabel* *Brgy. San Rafael IV*	4.38 km
Segment 5.2 *(Noveleta to Tanza)*	**Noveleta** **Rosario** **Tanza**	*Brgy. San Rafael IV* *Western coast of Rosario* *Brgy. Amaya I, coastal area of Julugan*	7.58 km
Segment 5.3 *(Noveleta to Cavite City)*	**Noveleta** **Cavite City**	*Brgy. San Rafael IV* *Brgy. 8 (Dalahican)* *Brgy. 49M, Brgy 49A (San Antonio)* *Western coast of Cavite City*	5.39 km
CEPZ Spur Road	**Noveleta**	*Brgy. San Rafael III, Brgy. San Rafael II, Brgy. San Rafael I, Brgy. Salcedo I, Brgy. Sta. Rosa I, Brgy. Sta. Rosa II*	2.66 km
Rosario Exit Ramp	**Rosario**	*Brgy. Wawa I, Brgy. Wawa III*	1.80 km
Kawit Interchange	**Kawit**	*Brgy. Binakayan-Aplaya, Brgy. Binakayan-Kanluran*	2.2 km (7 has)
Noveleta Interchange	**Noveleta**	*Brgy. San Rafael III, Brgy. San Rafael IV*	2.9 km (13 has)

3.4.1 Segment 5.1

Segment 5.1 starts at Segment 4 Cavitex exit ramp in Brgy. Binakayan-Kanluran, Kawit, Cavite and will traverse westward along the wet and marsh land areas of barangays Marulas, Kaingen, Poblacion, Wakas II, and Sta. Isabel, in the direction of Noveleta. At Noveleta, Segment 5.1 terminates where Segment 5.2 crosses the Manila-Cavite road at San Raphael IV. Total length of Segment 5.1 is 4.38 km (see **Figure 3.16**).

Figure 3.16: Segment 5.1

3.4.2 Segment 5.2

This segment begins where Segment 5.1 terminates at San Rafael IV, Noveleta, Cavite, as the alignment crosses the Manila-Cavite Road. Segment 5.2 will then veer west south-west towards the Manila Bay shore line of Noveleta and then to Rosario and exits at Amaya I, Tanza, Cavite. Total length of Segment 5.2 is 7.58 km (see **Figure 3.17**).

Figure 3.17: Segment 5.2

3.4.3 Segment 5.3

A connecting road from the portion of Segment 5.1 at Brgy. Sta. Isabel, Kawit, Cavite will veer northwards along the Ylang-Ylang River, and traverse the wet and marsh lands of Bacoor Bay at Noveleta. It will then cross the Manila-Cavite Road at Dalahican and bend towards western coastline of Cavite City until it reaches Sangley Point. Total length of Segment 5.3 is 5.39 km (see **Figure 3.18**).

Figure 3.18: Segment 5.3

3.4.4 CEPZ Spur Road

Spur road will connect the MCTEP main alignment and the Centennial Road to accommodate vehicles from CEPZ in Rosario and General Trias. The 2.66 km spur road is proposed to traverse beside the planned Cavite Industrial Area Flood Management Project (CIAFMP) in Noveleta, Cavite (see **Figure 3.19**).

Figure 3.19: CEPZ Spur Road

3.4.5 Rosario Exit Ramp

This 1.80 km exit ramp will connect Segment 5.2 at the coast of Brgy. Wawa I, Rosario, Cavite and will traverse beside the Cañas River at Brgy. Wawa III until it reaches SM Rosario (see **Figure 3.20**).

Figure 3.20: Rosario Exit Ramp

3.4.6 Kawit Interchange

At the existing Kawit Exit of CAVITEX in Brgy. Binakayan-Aplaya and Brgy. Binakayan-Kanluran will be developed and an interchange will be built to manage traffic from CAVITEX to Segment 5.1, Centennial Road, and the on-going construction Cavite-Laguna (CALA) Expressway (see **Figure 3.21**). The interchange will cover an area of 7 hectares and road length of 2.2 km.

Figure 3.21: Kawit Interchange

3.4.7 Noveleta Interchange

The proposed MCTEP Segment 5 interchange will be located at barangays San Rafael III and San Rafael IV, Noveleta, Cavite. This interchange will connect the MCTEP Segment 5 to the Manila-Cavite Road and has an approximate area of 13 hectares and total length of 2.9 km (see **Figure 3.22**).

3.4.8 Support/Accessory Facilities

3.4.8.1 Toll Gates

Five (5) toll gate will be constructed in each exit points of the expressway. Toll gates will be located in before the exits of Noveleta, Sangley Point, CEPZ, SM Rosario, and Tanza.

3.4.8.2 Traffic Safety Devices

The traffic safety features of the geometric alignments were complemented with the provision of adequate safety devices, such as pavement markings, traffic signs, guardrails and crash cushions.

<u>Pavement Markings</u>

Pavement markings are to be provided to delineate the carriageway and guide motorists travelling along the expressway. These will be reflectorized markings.

Figure 3.22: Noveleta Interchange

Pavement markings are designed in accordance with DPWH Highway Safety Design Standards, Part 2: Road Signs and Pavement Markings, 2012 and consist of the following:

a. Longitudinal lines, either white or yellow, which show the delineation of the travelway from the shoulders and of one lane from the other.
    - Solid White Line – delineates the edges of the roadway and to be provided at pavement edges adjacent to the shoulders and at interface of the interchange ramps with the main expressway lanes.
    - Broken White Line – divide lanes in the same direction and to be provided at merging and diverging lanes and between the adjacent lanes of the expressways.

b. Traverse lines, which are laid across the direction of travel and provide guidance for the location of yield and stop areas. Reflectorized pavement markings were specified to provide visibility of the travelway at night.

Traffic Signs

Traffic signs were designed to guide the safe and orderly movement along the expressway. The signs comply with the standards and guidelines specified in the DPWH Highway Safety Design Standards, Part 2: Road Signs and Pavement Markings, 2012.

The traffics signs that were adopted for the expressway are as follows:

a. Regulatory Signs – to inform motorists of traffic laws or regulations. The regulatory signs for the dike expressway consists of the following:
    - Priority Series (R1), specifically the “Yield Sign” at ramp terminals to give priority to the main carriageway traffic.

    - Direction Series (R2) to preclude wrong entry along channelized intersections, especially along locations of merging and diverging channels.
    - Prohibitive or Restrictive Series (R3), specifically the prohibition of overtaking at areas where it is not allowed. These are specified at locations of merging areas and along the main carriageway alignment since the same consist of two (2) lanes bi-directional travel-way only.
b. Warning Signs (Type W) – to warn motorists of conditions ahead which may be unexpected or hazardous, like merging and diverging areas, and reduction in pavement or shoulder width. These are specified along horizontal curves of the interchange ramps and main expressway alignment.
c. Guide Signs or Informative Signs (Type G) – to guide motorists of the destinations along the expressway route, directions and distances of points of interest. These are specified at approaches to interchange sites or locations, toll plazas and at areas prior to entering the expressway.
d. Signs for Road Works and Special Purposes (Type T) – to warn and advise of temporary hazardous conditions which could endanger motorists or road users or workers engaged on road works. These are specified to guide contractors for the installation of the traffic safety requirements during the execution of the road works.

Guardrails

Guardrail is the most common traffic safety system adopted on road and highway projects and it is installed to reduce the severity of run-off-road accidents. This is accomplished by redirecting a vehicle away from embankment slopes or fixed objects and dissipating the energy of the errant vehicle.

Crash Cushions and Impact Attenuators

Crash cushions are systems that mitigate the effects of errant vehicles that strike obstacles, either by smoothly decelerating the vehicle to a stop when hit head-on, or by redirecting the errant vehicle. The two types of crush cushions that are used are stationary crash cushions and truck mounted attenuators. Crash cushions help protect the drivers from the exposed ends of barriers, fixed objects, shadow vehicles and other obstacles.

Crash cushions are most often warranted at fixed-point locations. Typical highway features that may warrant an installation are the following:

- Exit gate areas, particularly on structures.
- Bridge rail ends, piers or abutments.
- Non-breakaway sign and signal supports.
- Retaining wall ends or culvert head walls.
- Median barrier exposed ends.

Impact attenuators will be provided at the nosing of toll islands, while guard rails will be installed at the sides of toll islands to protect toll island facilities and equipment.

3.4.8.3 Construction Temporary Facilities

Camp sites which includes offices, storage facilities, bunk houses, fabrication yards, and other temporary construction facilities, will be constructed during the duration of the project construction. Contractor shall designate camp site/s near within the vicinity of the project site. Temporary access roads may be also constructed in hard to reach areas of the project site.

At this stage, these areas are not yet unidentified. However, as much as possible, these areas should be located within the proposed project area only (i.e. at the proposed Noveleta Interchange area) to reduce additional environmental impact brought by the construction of these temporary facilities.

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At this stage, these areas are not yet unidentified. However, as much as possible, these areas should be located within the proposed project area only (i.e. at the proposed Noveleta Interchange area) to reduce additional environmental impact brought by the construction of these temporary facilities.

3.4.8.4 Waste Management and Pollution Control Facilities

Construction Phase

Material Recovery Facilities (MRF) will be constructed at the camp sites to serve as segregation area for recyclable, reusable, and hazardous construction spoil materials. Temporary drainage and sewage facilities will be also constructed.

Temporary drainage and silt management facilities will be also constructed in every area where construction activities will be done to mitigate siltation especially during excavation and construction of the embankment.

The project will coordinate with the concerned local government units (LGUs) for the use their existing waste management facilities such MRFs, composting and recycling facilities, and sanitary landfills.

Operation and Maintenance Phase

Noise barriers will be constructed in areas near the noise sensitive receptors such us schools, churches, hospitals, and residential areas. Tree planting activities and mangrove reforestation projects will be actively conducted beside the MCTEP Segment 5 alignment. Trees and mangroves will mitigate air and noise pollution from vehicles using the project.

Adequate drainage system with grease traps will be constructed to prevent oil and grease and other pollutants drain to the Manila Bay.

3.5 PROCESS/TECHNOLOGY OPTIONS

3.5.1 Preliminary Designs for the Project

3.5.1.1 Superstructure

The following bridge types shall be adopted depending on the span length, economy, and sight conditions:

- Simple span pre-stressed concrete AASHTO I-Girders with continuous concrete deck slab every three or four spans; and
- Simple/multi span reinforced concrete deck girder.

Deck discontinuity such as expansion joints shall be kept to minimum in accordance to the DPWH Design Advisory.

The following types of expansion joints shall be adopted depending on the bridge type and movement:

- Hot poured joint sealer with angles type; and
- Closed cell elastomeric sealer made of Neoprene type.

Catch basins shall be made of cast iron and PVC drainpipes shall be used for bridge surface drainage system. Elastomeric bearing pad shall be used for pre-stressed concrete girder supports. Asphalt concrete pavement with 5 cm thickness shall be laid on concrete deck slab. And, Forces and Effects developed during construction shall be considered in design.

3.5.1.2 Substructure and Foundation

The following type of pier shall be adopted in accordance to the site conditions and restrictions:

- Reinforced concrete column with pier-head type pier,
- Reinforced concrete hammerhead type pier.

Pile bent-type shall be allowed for ramps and multi column type pier. Footings in the ordinary condition shall be embedded into the ground at least 1.0 meter from the top of footing, and at least 2.0 meters shall be taken in the river area. Where necessary, effect of buoyancy on the structure shall be verified.

Depending on the result of the sub-surface investigation of the site, construction constraints and other factors, the following types of foundation shall be used: (a) spread footing type; and (b) cast in place concrete pile.

General Arrangement Drawing was prepared showing the features of the bridges and structures proposed to be constructed along the road sections covered under the Study. These features such as alignment, overall length, span arrangement, cross section, deck level, founding level, type of bridge components (superstructure, substructure, foundations, bearings, expansion joint, return walls etc.) were established based on the preliminary highway design, bridge site study/investigation, hydrologic study, geological and geo-technical studies, environment and social impact assessment study, cost effectiveness and ease of construction.

Preliminary drawings for the project are presented in **Figures 3.23** to **3.27**.

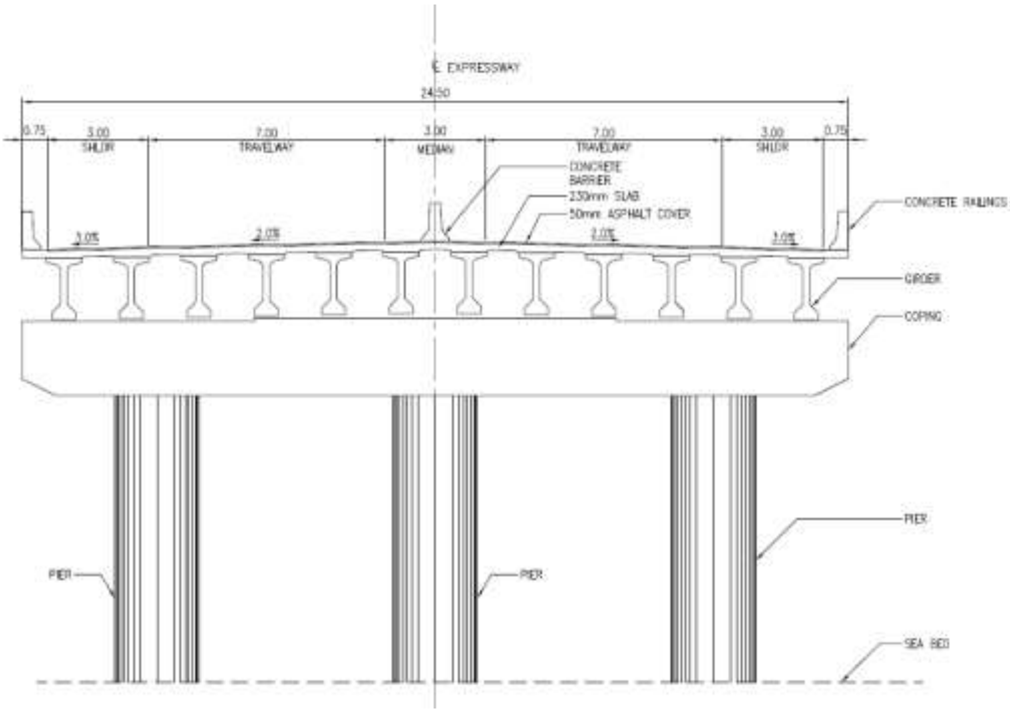

Figure 3.23: Typical Cross-Section for Viaduct

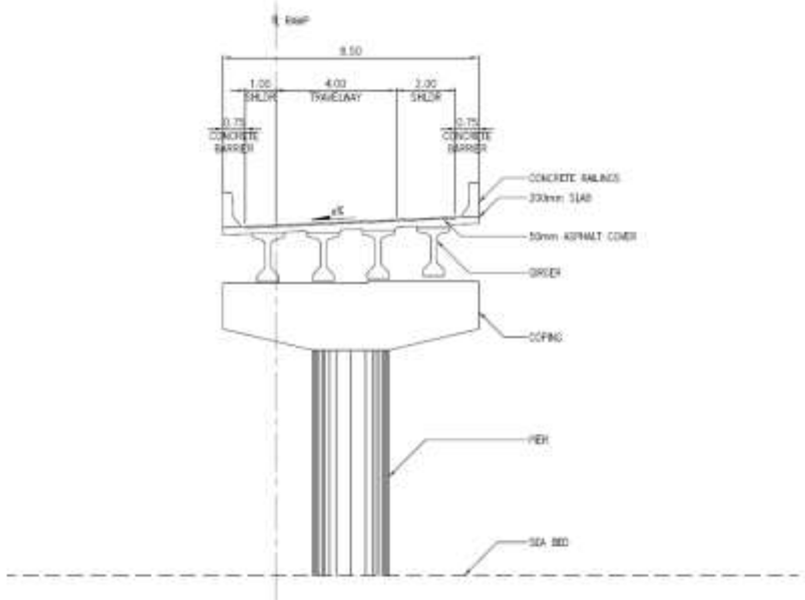

Figure 3.24: Typical Cross-Section for Ramps

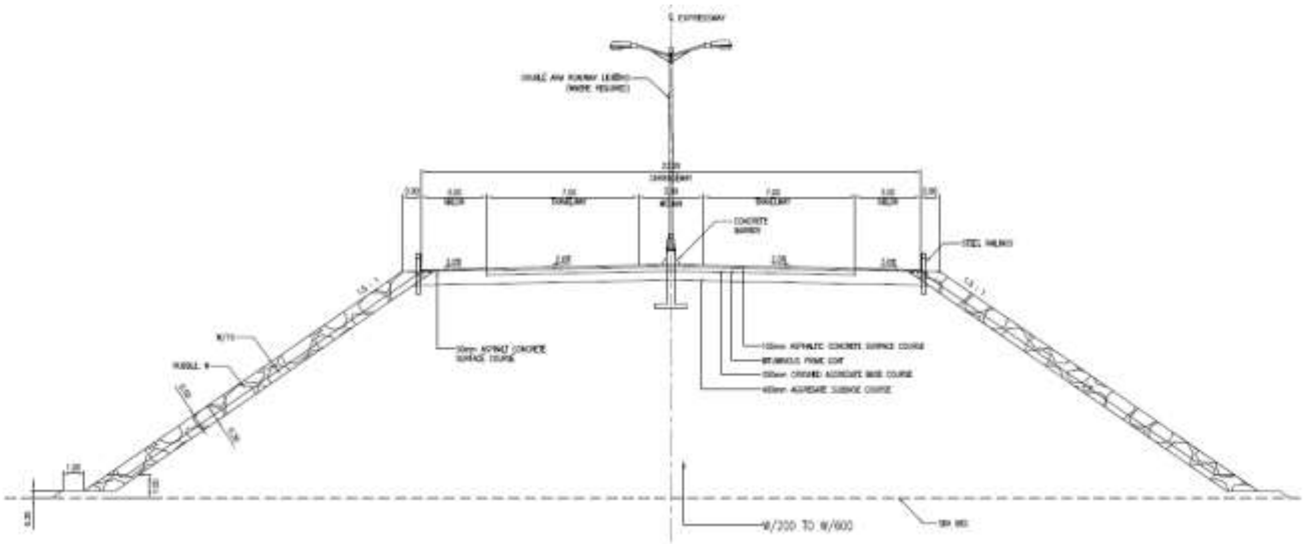

Figure 3.25: Typical ACP Road at Rubble-Mounded Embankment Section for Nonbreaking Wave Condition

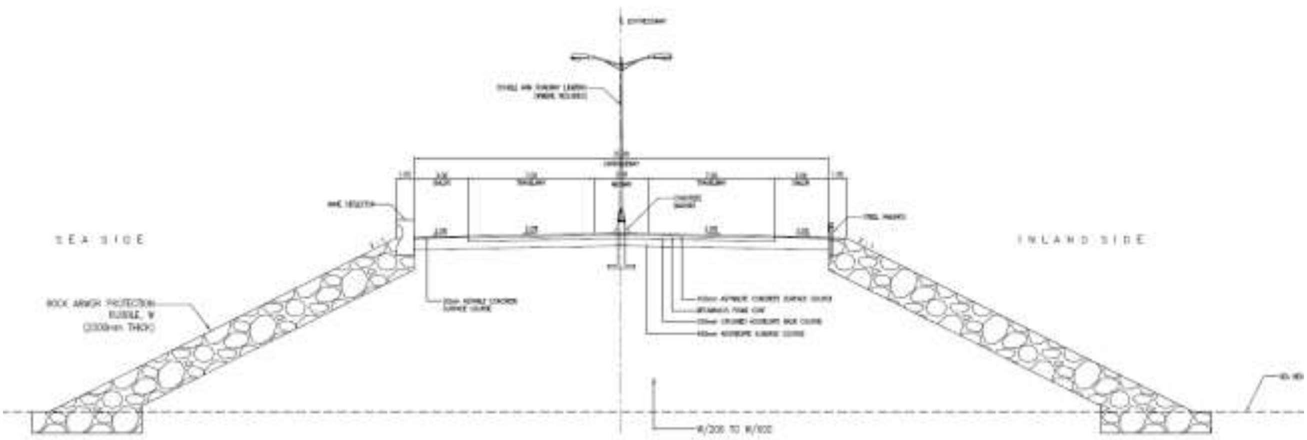

Figure 3.26: Typical ACP Road at Rubble-Mounded Embankment Section for Breaking Wave Condition

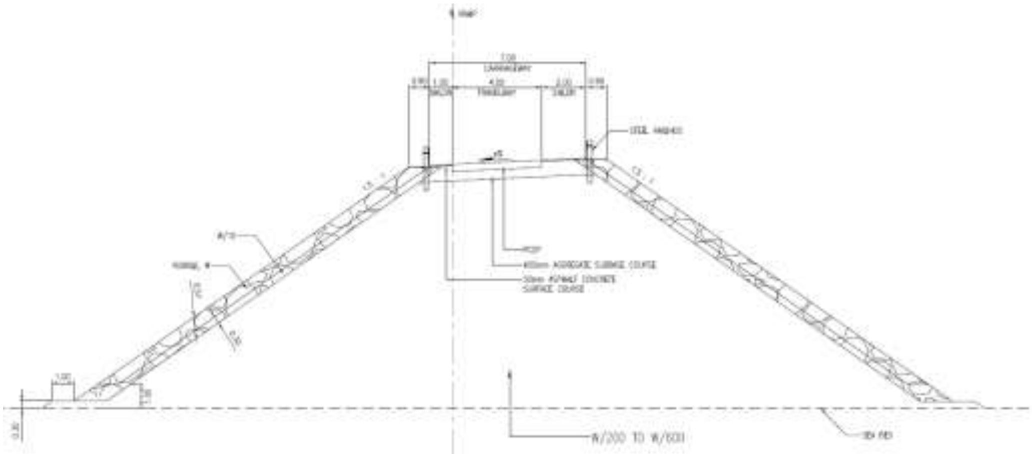

Figure 3.27: Typical Cross-Section for Ramps at Rubble-Mounded Embankment Section for Nonbreaking Wave Condition

3.5.2 Design Criteria and Standards

The design guidelines, criteria, and standards adopted for the project are similar to those established by the DPWH for expressway projects and from recently planned projects with similar high standard highway classification.

The functionality of the project expressway is classified under the highest type of arterial highway, which is defined as an expressway with fully controlled access, so that design controls considered contain values corresponding to its high speed function.

Level of Service C has been adopted in the development of preliminary design for the expressway alignment. The AASHTO's "A Policy on Geometric Design of Highways and Streets" recommends that such type of facility should generally be designed for level-of-service (LOS) C, which is illustrated by the Highway Capacity Manual as a LOS which provides for stable operations, but flows approach the range in which small increases in flow will cause substantial deterioration in service. Average travel speeds are still over 54 mph (86.40 kph) and freedom to maneuver within the traffic stream is noticeably restricted at LOS C, and lane changes require additional care and vigilance by the driver.

Geometric design deals with such features as horizontal and vertical alignments, roadway sections, sight distance both for passing and stopping, super elevation and other factors that will be considered in a such a way that the finished structure will be an economical, functional, and safe facility to travel.

Design standard covers a lot of factors controlled by mechanical, physical, geometrical and other laws that are interrelated.

Whenever possible, desirable values in design standards will be adopted. Existing conditions sometimes may not allow this such that the maximum values instead will be applied.

3.5.3 Geometric Design Standards

The geometric alignments of the proposed expressway consist of the horizontal alignment and vertical alignment. In the design of geometric alignment for the expressway, the following design guidelines were adopted:

- DPWH's Design Guidelines, Criteria and Standards 2015
- AASHTO's "A Policy on Geometric Design of Highway and Streets" 2011 6th Edition
- DPWH Road Safety Design Manual

3.5.4 Design Speed

Design speed is the safe speed that can be maintained over a given section of the highway when weather, light and traffic conditions are such that the design features of the highway govern. Once it is selected, all the design features are interrelated to it to obtain a balanced design. For the expressway the design speed is 100 kph, for the expressway to expressway interchange the design speed is 60kph and for the local road is 40kph.

3.5.5 Interchange / Intersection Design

Ramps maybe two-way in direction but entries and exits to and from the expressway must always be one-way. They should be considered as an integral but independent road element. Different movements and location of these ramps will dictate the type of interchange.

3.5.5.1 Type of Interchanges

There will be two types of interchanges that will be utilized.

- Three Leg Directional Interchange (Kawit Interchange) - at Kawit Exit Portion (**Figure 3.28**)
- Diamond Interchange (Noveleta Interchange) along Cavite – Manila Road – End of Segment 5.1, Beg. of Segment 5.2 and Segment 5.3 at Noveleta (**Figure 3.29**)

3.5.5.2 Intersections

Roads also intersect at-grade. The intersection will be designed to provide adequately for turning, and crossing movements with due consideration given to sight distance, signs, grades and the alignment.

3.6 DEVELOPMENT PLAN AND DESCRIPTION OF PROJECT PHASES

3.6.1 Pre-Construction Phase

Activities involved during the pre-construction phase of the project include:

- Pre-Feasibility and Feasibility Studies;
- Environmental Impact Assessment and Acquisition of Environmental Compliance Certificate (ECC) for the Project;
- Securing Various Permits and Clearances (i.e. Special Tree Cutting Permit, Project Endorsements, LGU Clearances, etc.);
- Conduct of Detailed Engineering Design (DED);
- Right-of-Way (ROW) / Land Acquisition and Implementation of the Resettlement Action Plan (RAP);
- Pre-qualification, Tendering, and Awarding of Contract for the Construction of the Project; and
- Securing Financing for the Project.

3.6.2 Construction Phase

3.6.2.1 Site Clearing

This activity includes cutting of trees and vegetation along the proposed road alignment. For areas where embankment-type will be used, approximately 60m or more will be cleared in areas below sea level, while more or less 40m in areas above sea level. Meanwhile, for viaduct-type areas, only 25m wide will be cleared.

In Segment 5.1, most of the areas traversed by the alignment are fish ponds and portions of mangrove area at Poblacion, Kawit. There were also salt-beds along this portion of the alignment.

Figure 3.28: Three Leg Directional Interchange (Kawit Interchange)

Figure 3.29: Diamond Interchange (Noveleta Interchange) along Cavite – Manila Road

Segment 5.2, on the other hand, will traverse more than 20 coconut trees and a number of huge acacia trees in Brgy. Amaya 1, Tanza. There were also a small number of mangrove trees in this portion of the alignment. While exiting to the A. Soriano Highway in Tanza, residential houses, apartments, a mansion house, and electrical, light and utility posts will need to be cleared for the preparation for road widening.

The Noveleta Mangrove Ecotourism Project will be traversed by the Segment 5.3. There were also settlements to be affected in Brgy. San Rafael IV, Noveleta, and Brgy. 49M and Brgy. 49A, Cavite City.

Site clearing for the construction of Kawit Interchange is expected to affect informal settlers at Brgy. Marulas. Meanwhile, Noveleta Interchange will traverse a number of houses, a chapel, a police outpost, and a LPG refiling plant in barangay San Rafael III and San Rafael IV. Electrical posts and a cell site are also situated within the area.

Site clearing for the spur roads will be a huge work for the proponent because more than 200 houses is expected to be relocated by the spur roads to CEPZ and SM Rosario.

Prior to site clearing, Tree Cutting Permit, land acquisition documents, and other necessary permits and clearances related to site clearing should be secured to avoid problems and delays in the implementation.

3.6.2.2 Excavation Works

Before placing the embankment, all the accessible and fertile topsoil, together with the natural root systems, will be removed to stock piles for later use on cut-and-fill slopes. The depth of excavation for topsoil stripping will be carefully controlled, on the basis of previously ascertained topsoil thickness, to avoid contamination with subsoils.

If the excavated soil will be not suitable as embankment material, it will be used as soil enhancer in agricultural areas (if the soil is fertile), soil cover for sanitary landfill and dump sites, and other appropriate uses.

3.6.2.3 Construction of Embankment

Filling materials for the embankment will be hauled and compacted along the proposed project alignment. The embankment material will be sourced out from the nearest available sources.

Currently, there are 54 hectares of quarry area operated by 11 quarry operators issued with permit in the Province of Cavite. Quarry materials ranges from base course, conglomerate stone, andesite conglomerate stones, boulders, armor rock and filling materials. Most of these quarry sites were located at Brgy. Pinagsanhan, Maragondon, Cavite. There were also quarry areas in Ternate, Tanza, Silang, and Dasmariñas.

Beside these there were also quarry sites in Zambales and Rodriguez, Rizal. The project may also source out its embankment material from the excavated soils from the construction of CIAFMP diversion channel, in case its construction schedules will coincide.

3.6.2.4 Construction of Viaduct Foundation

Viaduct foundations will be constructed in the areas where viaduct-type will be used. This activity includes construction of enclosure, piling of iron/steel bars, and filling of concrete.

Foundations will be laid by temporarily filling up or enclosing the specific location, over which piers will be casted. Piles are then driven inside the bed.

3.6.2.5 Construction of Superstructure and Road Pavement

Once the embankment and viaduct foundations are built, the superstructure will then be constructed. Road will be paved and facilities such as toll gates and guardrails will be made. This activity also includes placement of traffic signage, painting of road, and installation of light posts and other ancillary facilities.

3.6.3 Operation and Maintenance Phase

Once construction phase is finished, the project will be opened for public use. Activities during the O&M phase of the project include:

- Regular monitoring, maintenance, and repair of the project;
- Regular conduct of tree and mangrove planting activities;
- Observance and implementation of road safety practices; and
- Continuously improve road facilities, if necessary.

3.6.4 Abandonment/Decommissioning Phase

Abandonment phase for the project is not applicable for this project. Abandonment or decommissioning in this project can be only referred to the pulling out of temporary facilities used during the construction of the project once construction of the project is done.

During the decommission of the construction contractor, it will be assured that all the construction areas will be cleared. All construction spoil materials will be hauled out from the site. Recyclable construction spoils will be sold to interested buyers, residuals will be dumped to sanitary landfill, and spoils containing hazardous materials will be hauled by a DENR-registered Treat-Store-Dispose (TSD) Facility.

3.7 PROJECT SIZE

The length of the proposed MCTEP Segment 5 is 21 km. The whole alignment is subdivided into three (3) sub-segments, namely, Segment 5.1, Segment 5.2, and Segment 5.3, and two (2) spur roads. The project also includes construction of two (2) interchanges, and five (5) tollgates.

3.8 MANPOWER REQUIREMENTS

More than 2,000 skilled and unskilled workers will be required during the construction of the project, while more or less 50 personnel will be employed during its operation phase. **Table 3.6** shows the details of the project's manpower requirements.

Table 3.6: Manpower Requirement for MCTEP Segment 5

Project Phase	Manpower Requirement	
	Skilled	Unskilled
Construction Phase	500	1,500
Operation Phase	20	30

3.9 IMPLEMENTATION SCHEDULE

The whole pre-construction and construction phases of the project is expected to last for ten years. (see **Figure 3.30**).

3.10 PROJECT COST

The project is currently under feasibility stage and the project cost is not yet determined.

3.11 PROPONENT INFORMATION

Project Proponent:	**METRO PACIFIC TOLLWAYS CORPORATION (MPTC)** MGO Building, 10th Floor, Legaspi Corner Dela Rosa Streets Legaspi Village, Makati City 0721 **THRU:** **CAVITE INFRASTRUCTURE CORPORATION (CIC)** PEATC Compound, KM 11 CAVITEX Aguinaldo Blvd. (Formerly Manila-Cavite Coastal Road), Paranaque City 1700 Tel. Nos.: (02) 683-8001; (02) 683-8002 Email: cx_customerservice@cavitexpressway.com
Environmental Consultant:	**FILIPINAS-DRAVO CORPORATION (FDC)** 5th Floor Aurora Milestone Bldg. 1045 Aurora Blvd. Quezon City, Philippines, 1111

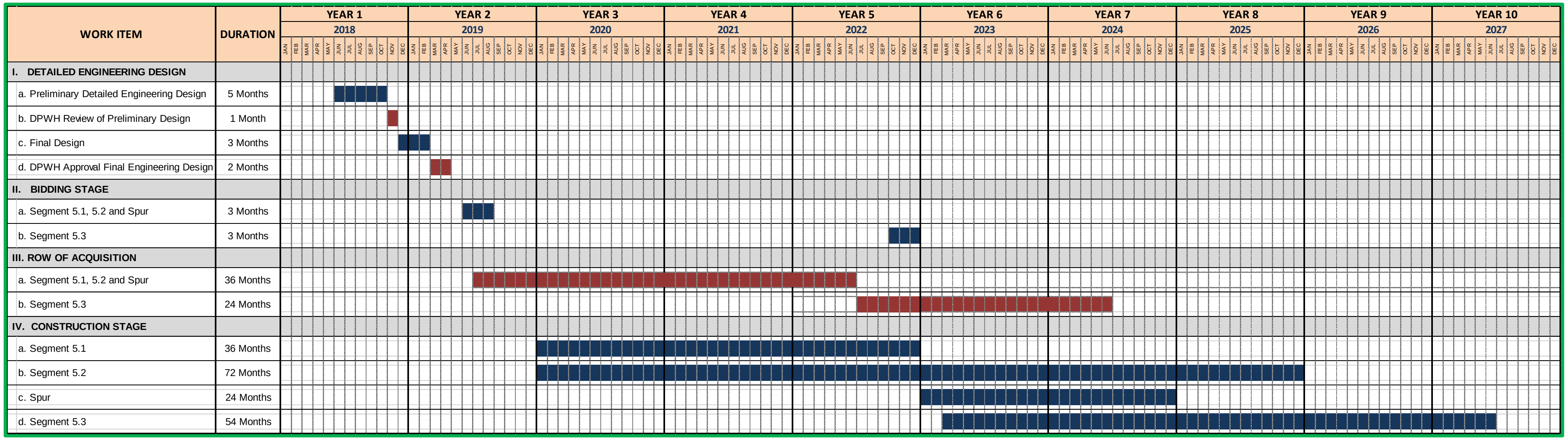

Figure 3.30: Proposed Implementation Schedule for MCTEP Segment 5