CHAPTER 5

PROJECT IMPLEMENTATION PLAN

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5.1 Construction Method

5.1.1 General

The construction of the Line 2 East and West Extensions will require careful planning and organization, given the magnitude of the works, time constraints and the location of the works on busy national and arterial roads within Metropolitan Manila and Rizal Province.

The challenges faced during construction will be:

- to adopt rapid construction techniques while still ensuring quality,
- the planning and organization of all construction activities to ensure smooth flow of construction and the avoidance of delays on critical path activities,
- the organization and supervision of sufficient work teams and construction equipment and proper coordination with other contractors as necessary
- the construction and organization of a suitable temporary casting yard close to the site
- to implement well planned traffic management plans to ensure minimal impact on traffic, with traffic re-routing plans as necessary
- incorporating utility relocations, or design changes imposed by utility locations, into the construction planning,
- at all times to assure safety of construction operations.

5.1.2 Viaduct

5.1.2.1 Foundations

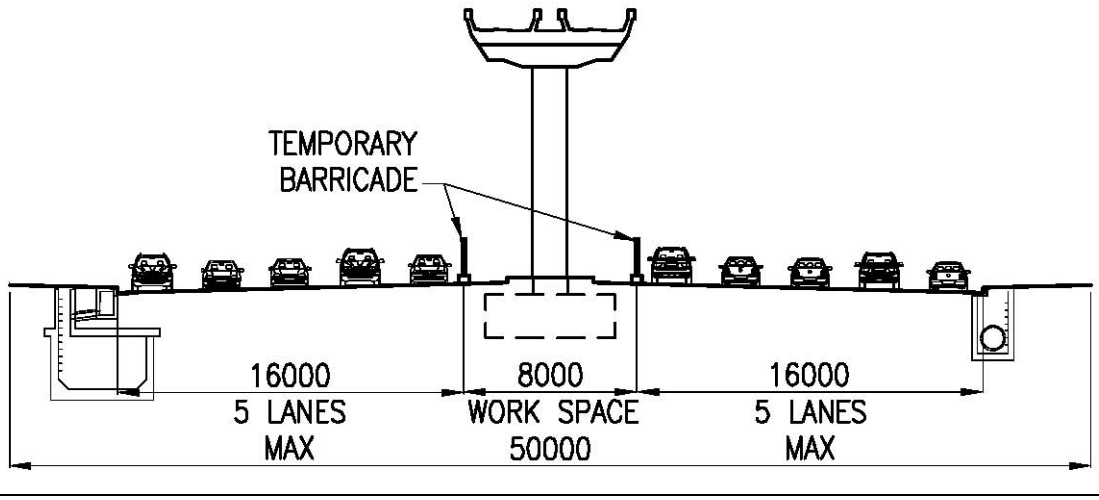
The viaduct foundations comprise of conventional bored piles and pile caps.

The bored piles will be constructed using high torque powered rotary drilling rigs mounted on crawler cranes with telescopic kelly bars and using a set of various buckets, augers and chisels. Excavation typically will be carried out under a bentonite slurry without the use of temporary casings. Following the completion of the boring and the placement of the steel rebar cage in the pile excavation, concrete is placed using a tremie pipe while the bentonite slurry is pumped away.

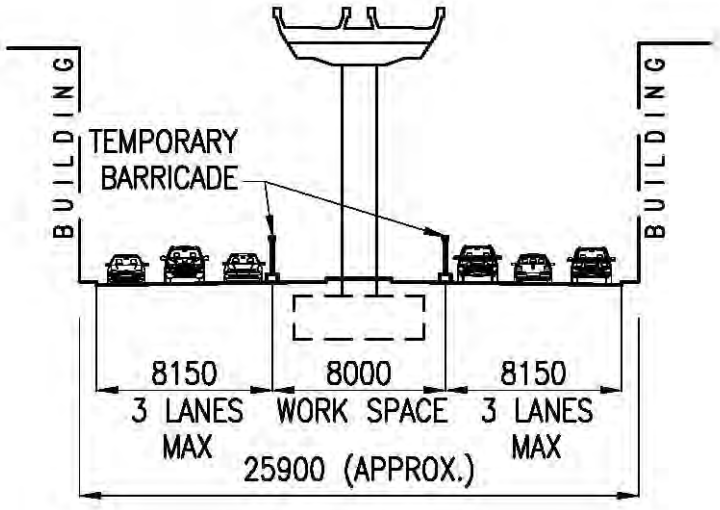
Critical issues during construction will be:

- proper mixing and recycling of the bentonite slurry to ensure the formation of a waterproof lining (“cake”) on the face of the excavation and allow clean placement of concrete
- ensuring that the end of the tremie pipe is always sufficiently embedded in the wet concrete as the bored pile concreting progresses
- avoidance of cold joints due to breakdown in supply of concrete
- overcasting of the pile and chipping back, or baling of the contaminated concrete while wet, to ensure good quality concrete at the pile head.

To allow sufficient space for the construction of the pier pile caps and to accommodate the construction equipment, a minimum width of 8m will typically be required as a work space on the central reserve of the affected roads. A typical section of the construction work space arrangement is given in **Figure 5.1-1**.



MARCOS HIGHWAY



RECTO AVENUE

Source: JICA Study team

Figure 5.1-1 Typical Work Space Layout for Foundation Construction

Notwithstanding delays caused by utility relocations, the construction period for a typical bored pile pier foundation will depend on the number and size of piles per foundation, required depth of pile, soils encountered, etc. The piling work is on the critical path for the pier construction, since once the piles are constructed, multiple teams can be mobilized to complete the remaining reinforced concrete works for the piers. During the construction of the existing LRT Line 2, the contractor scheduled to construct up to two (2) piers per month per section between stations (about 1km on average between stations). The East Extension may require four (4) or more drilling rigs to complete the piling work on a similar schedule.

5.1.2.2 Substructure

The viaduct substructures comprise of conventional reinforced concrete pier columns and pre-stressed concrete pier heads. The columns should be constructed using standardized steel forms to promote a good quality of finish and reduce construction cycle times. The pier head formwork will supported on falsework anchored to the pier columns to minimize required construction area and allow operation within the provided construction work space. Critical issues during construction will be:

Table 5.1-1 Duration for 1 pire Construction

Foundation/Footing						Column		Pier Head
	Footing(Foundation)							
	Piling Work	Excavation Work						
Survey etc.	Pile Driving 6days (a pile/day) Preliminary Works 1day Pile Head Treating 3days	Sheathing	Leveling Concrete	Reinforcement Placing/Form Placing	Concrete Placing / Curin	Reinforcement Placing/Form Placing	Concrete Placing / Curing	Instllation
1day	10days	3days	1day	6days	3days	3days	3days	3days

- accurate surveying of column location and vertical checking of steel forms
- proper quality control of column formed surfaces and joint areas
- proper handling methods for the steel forms to prevent damage and deformation

Typical progress photographs of the existing LRT Line 2 pier column construction are shown in **Photo 5.1-1** and **Photo 5.1-2.**

Photo 5.1-1 Pier Column Construction – LRT Line 2

Source: LRTA library photo

Photo 5.1-2 Pier Column Construction – LRT Line 2

5.1.2.3 Superstructure

The viaduct will comprise precast post-tensioned concrete elements, pre-fabricated at the casting yard and erected at site. Precast concrete units will be delivered with low-bed trailers of 50 to 100 tons capacity.

Advantages of precast concrete over concrete cast in-situ are:

- Rapid construction on site with minimal impact on traffic, units can be delivered during night time work shifts
- Quality can be controlled and monitored much more easily in the pre-cast yard making it easier to control the mix, placement, steam curing and formed finish
- Weather is eliminated as a factor in the pre-casting process with covered and protected casting beds in the casting yard
- Less labor is required
- On site, precast elements can be installed immediately, there is no waiting for elements to gain strength
- Repeatability—multiple units of the same precast element can be made; and by maximizing repetition, the contractor can maximize the value from a mold and a pre-casting set-up

Depending on the final form of structure adopted, the precast elements will either be PC Box segments, weighing 30 to 40 tons each, or AASHTO girders, weighing up to 50 tons each. The segments or girders units will be provided with lifting points for ease of erection.

1) PC Box Segment Erection

The PC Box segments will be erected using a double steel truss, or a single steel box girder, self propelling overhead erection gantry, depending on the type of PC Box girder segment erected. The

erection gantry will typically be designed for the project by a specialist sub-contractor hired by the main contractor for the segment erection. The gantry will be long enough to be self propelled across two viaduct spans, with a total length of at least 60m long and have a lifting capacity of at least 150 tons.

A typical erection sequence of a PC Box segment is as follows:

1. Erect and install the erection gantry support legs on the pier heads by crawler cranes or truck mounted cranes.
2. Assemble the erection gantry on the constructed support legs by crawler cranes or truck mounted cranes.
3. PC Box segment is delivered by trailer to the erection gantry, the segment is lifted by winch from a rail mounted movable gantry crane supported above the gantry.
4. The PC Box segment is rotated if necessary and launched forward by the gantry crane to its required location and then supported from the gantry by four (4) hydraulic jacks, one side of which (2 jacks) is hydraulically linked to provide a determinate 3 point lift.
5. Successive segments are similarly placed, adjusted and leveled. Segments are placed working backward so that the furthest segment is the first positioned.
6. When all of the segments for a span are positioned, the segment joints are epoxied and joined, the pre-stressing tendons are installed and stressed, and the complete span is lowered onto the bearings and prepared anchor rods before final grouting of the tendon ducts.
7. The erection gantry is then launched to the next span, and the procedure is repeated.

The position of the gantry legs can be adjusted laterally on beams attached to the pier heads such that the erection gantry can negotiate curved viaduct sections.

During the construction of the existing LRT Line 2, a total of three (3) erection gantries were used with both smaller steel plate box girder and larger steel truss girder designs for the main longitudinal gantry girders, to enable lifting of both single box segments and multiple cell box segments respectively. A typical erection cycle for one viaduct span, twin single box type, is given below:

Table 5.1-2 Duration for 1 span Erection

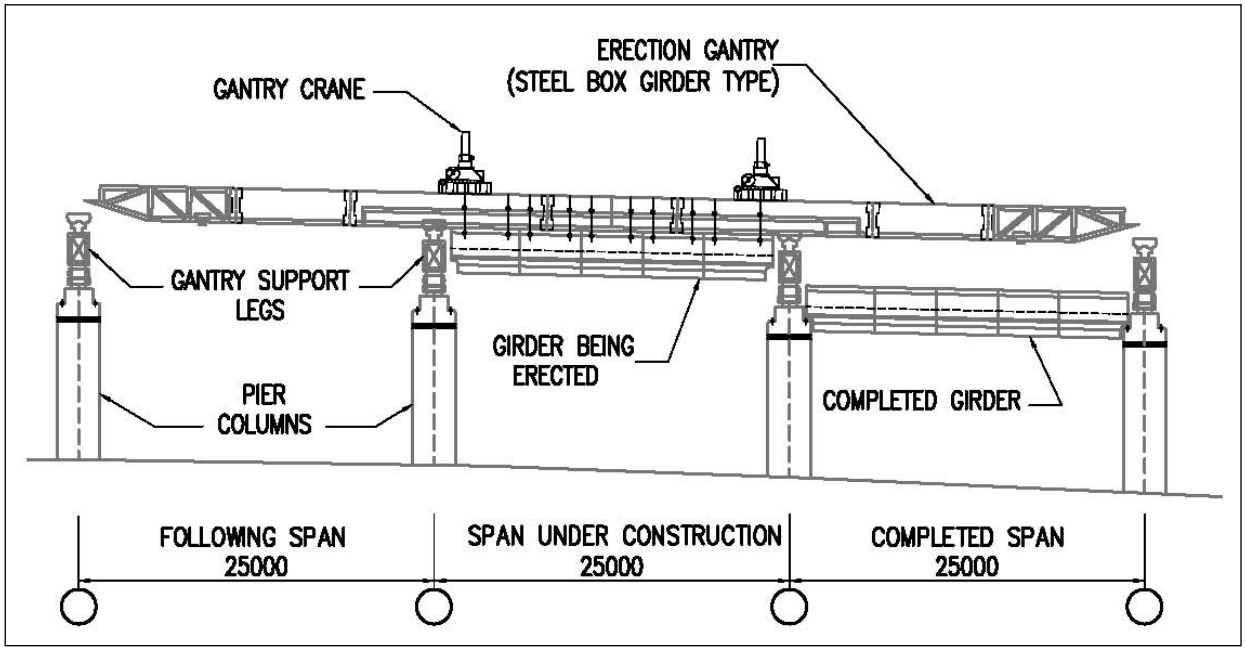
Span Girders (Twin Single Box Type)	Segments transported and erected	Epoxy & Joining of Segments	Stressing of Tendons	Anchor Rod Grouting and Final Lowering	Grouting of Tendon Ducts
Box Girder 1	Day 1	Day 2	Day 2	Day 3	Day 4
Box Girder 2	Day 3	Day 4	Day 4	Day 5	Day 6
Launching of erection girder to next span					2 – 3 Days
Total Cycle Time for One (1) Span					8 – 9 Days

For the Line 2 East and West Extension projects the number of erection gantries required for each extension will be controlled by the overall construction schedule. The East Extension may require as many as three (3) erection gantries to complete the PC Box spans in the case of a compressed construction schedule.

A typical progress photograph of the existing LRT Line 2 PC box girder construction is presented in **Photo 5.1-3** showing a truss type erection gantry used to erect multiple cell box segments. An illustration of a typical steel box girder type erection gantry, used to erect the twin box segments, is given in **Figure 5.1-2**.

Source: LRTA library photo

Photo 5.1-3 PC Box Girder Erection – LRT Line 2 (Truss Type Erection gantry)



Source: Study Team

Figure 5.1-2 Elevation on typical Erection Gantry (Steel Box Girder Type)

2) AASHTO Girder Erection

The AASHTO girders, if specified in the detailed design, will be erected using crawler cranes or truck mounted cranes. A single girder will typically require two crawler cranes supporting and lifting the girder from each end, or a single large capacity truck crane.

The main advantage of crawler cranes is that multiple sets can be mobilized to erect girders at several locations along the viaduct and they can perform each lift with little set-up, since the crane is stable on its tracks with no outriggers. In addition, a crawler crane is capable of traveling with a load.

Truck mounted cranes are able to travel on highways, eliminating the need for special equipment to transport the crane. When working on the jobsite, outriggers are extended horizontally from the chassis then vertically to level and stabilize the crane while stationary and hoisting. The outriggers allow large lifting capacities with a single crane able to lift the girders.

The Line 1 North Extension Project features a viaduct deck comprised of AASHTO Type 5 girders with typical span of 28m and a concrete deck slab formed in situ. The 5.4km of viaduct was constructed in 18 months, from June 2008 to December 2009, using truck mounted cranes to erect the girders.

Construction progress photographs showing the Line 1 NEP AASHTO girder erection are shown in **Photo 5.1-4** and **Photo 5.1-5**.

Source: LRTA library photo

Photo 5.1-4 Girder delivered at night by trailer – LRT Line 1 NEP

Source: LRTA library photo

Photo 5.1-5 Girder erected at night by single truck mounted crane – LRT Line 1 NEP

5.1.3 Elevated Stations

For the elevated station design concept adopted in this Study, the station structure is supported entirely from centrally located piers with cantilever pier heads. The critical phase in terms of impact on traffic is during the construction of the cantilever pier heads. At this stage the central construction area will occupy a width of approximately 20m along the highway to allow falsework support to the cantilever ends of the pier head. For Line 1 NEP Project, featuring a similar type of station design, the contractor occupied two (2) lanes in each direction along EDSA, the arterial road occupied by Line 1 NEP, during the construction of the cantilever piers. However, once the pier heads are constructed and the concourse level supporting beams and floor is in place, the traffic lanes can be re-opened and construction can proceed with minimal impact on traffic flow, at least during daylight hours. For the Line 1 NEP project, traffic lanes were occupied at each station for approximately 6 months before station construction progressed sufficiently to allow full road access to the traffic.

The width of EDSA is approximately the same as the width of Marcos Highway and so the traffic management challenges for the East Extension will be similar to those faced during the construction of Line 1 NEP.

Typical progress photographs of the LRT Line 1 NEP station construction are shown in **Photo 5.1-6** to **Photo 5.1-9.** Typical sections showing construction of the station piers on Marcos Highway and Recto Avenue at Divisoria are shown in **Figure 5.1-3**.

Source: LRTA library photo

Photo 5.1-6 Station Cantilever Pier Construction – LRT Line 1 NEP

Source: LRTA library photo

Photo 5.1-7 Station Concourse and Platform Construction – LRT Line 1 NEP

For the existing LRT Line 2, the elevated station substructures and frames were constructed in around eight (8) months per station under Package 2, with the superstructure and electro-mechanical installations taking a further twelve (12) to thirteen (13) months under Package 3. Total construction time, accounting for handover between contractors, was around twenty (20) to twenty one (21) months per station.

For the LRT Line 1 NEP, the stations were constructed in around fifteen (15) months per station, including handover between the Package B contractor (civil and architectural) and Package C contractor (E&M). The

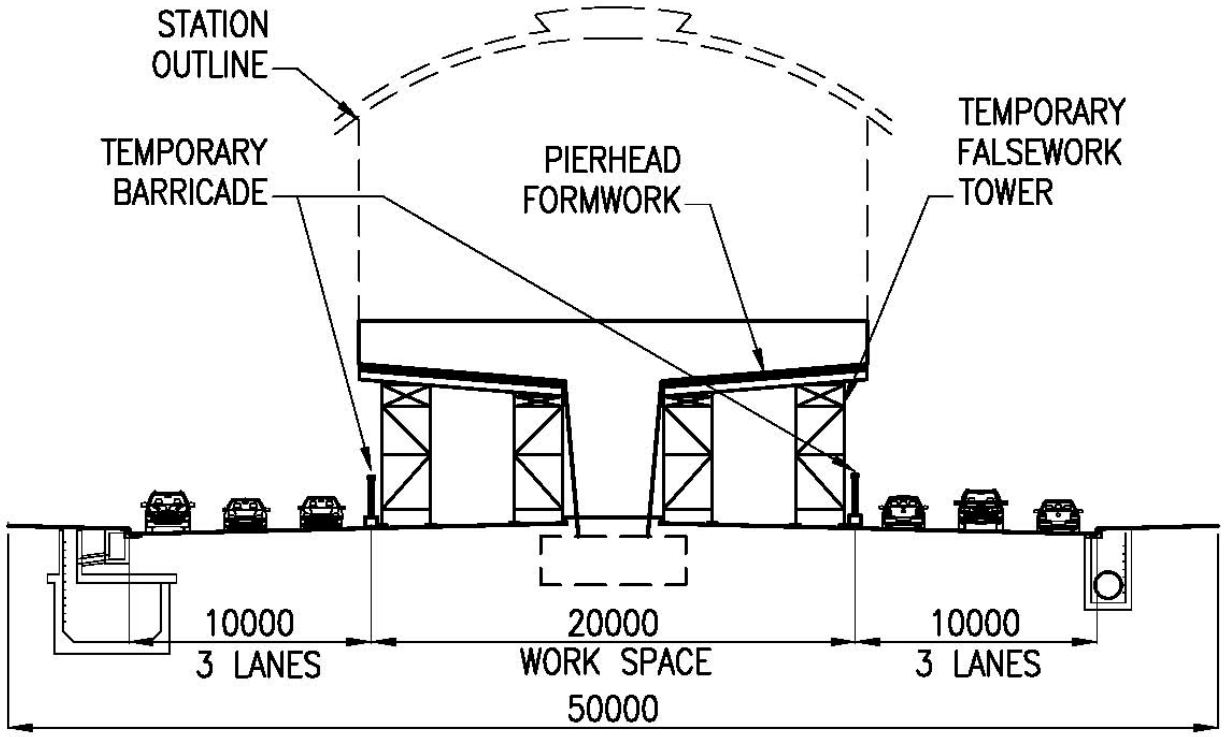
shorter station construction times at Line 1 NEP may be attributed to the simpler design (viaduct already constructed) and the better soil conditions along EDSA requiring shallower and cheaper foundations.

Source: LRTA library photo

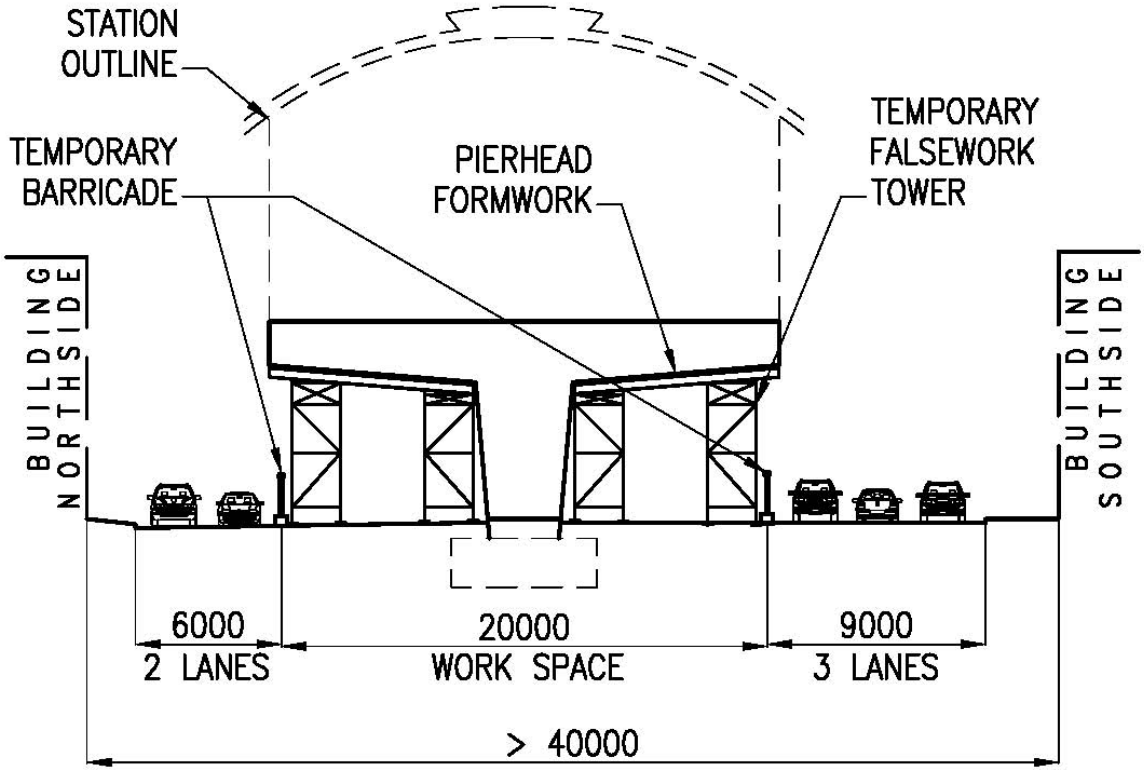
Photo 5.1-8 Station Platforms and Roof Frame under Construction – LRT Line 1 NEP

Source: LRTA library photo

Photo 5.1-9 Station Roof Covering under Construction – LRT Line 1 NEP



MARCOS HIGHWAY (EMERALD AND MASINAG STATIONS)



RECTO AVENUE (DIVISORIA STATION)

Source: Study Team

Figure 5.1-3 Typical Work Space Layout for Station Pier Construction

5.1.4 Traffic Management During Construction

The East Extension occupies the central reserve of Marcos Highway, a major national road linking Metropolitan Manila with Rizal Province and Antipolo City. The West Extension occupies the central reserve of Recto Avenue, a busy circumferential arterial road in Manila City.

In order to minimize the impact of the construction activities on traffic flow, a comprehensive traffic management plan will be required to be submitted by the contractor for approval prior to commencing work.

The traffic management should include:

- A requirement to keep a minimum number of lanes open in each direction for both Marcos Highway and Recto Avenue.
  Marcos Highway is currently being widened to five (5) lanes in each direction under the NRIMP2 World Bank project occupying a total road ROW of 50m. Other than at station locations the contractor should therefore be able to keep at least four (4) lanes in each direction open during the construction. Traffic management is therefore only going to be a challenge at the proposed station locations. At station locations a minimum of three (3) lanes in each direction should be kept open during the substructure construction. Once the station concourses are constructed, all traffic lanes should be opened.
  Recto Avenue is relatively narrow at approximately 25m width for most of the affected length. The contractor should however still be able to keep at least two (2) lanes in each direction open during the construction, including at Divisoria station where the road widens out to at least 40m.
- A traffic re-routing plan in the event that the minimum number of lanes cannot be kept open for certain construction activities requiring either that all lanes are closed or that insufficient umber of lanes are open to prevent serious congestion.
- A total truck ban should be implemented along the construction area during night time to allow the contractor maximum flexibility in utilizing available lanes for construction activities at night.
- Strictly no parking will be allowed along the affected areas during construction to maximize available space for traffic lanes.
- Traffic enforces should be deployed along the construction areas at all critical intersections.
- Proper temporary road signage and road advisories should be posted along affected routes approaching and within the construction areas.

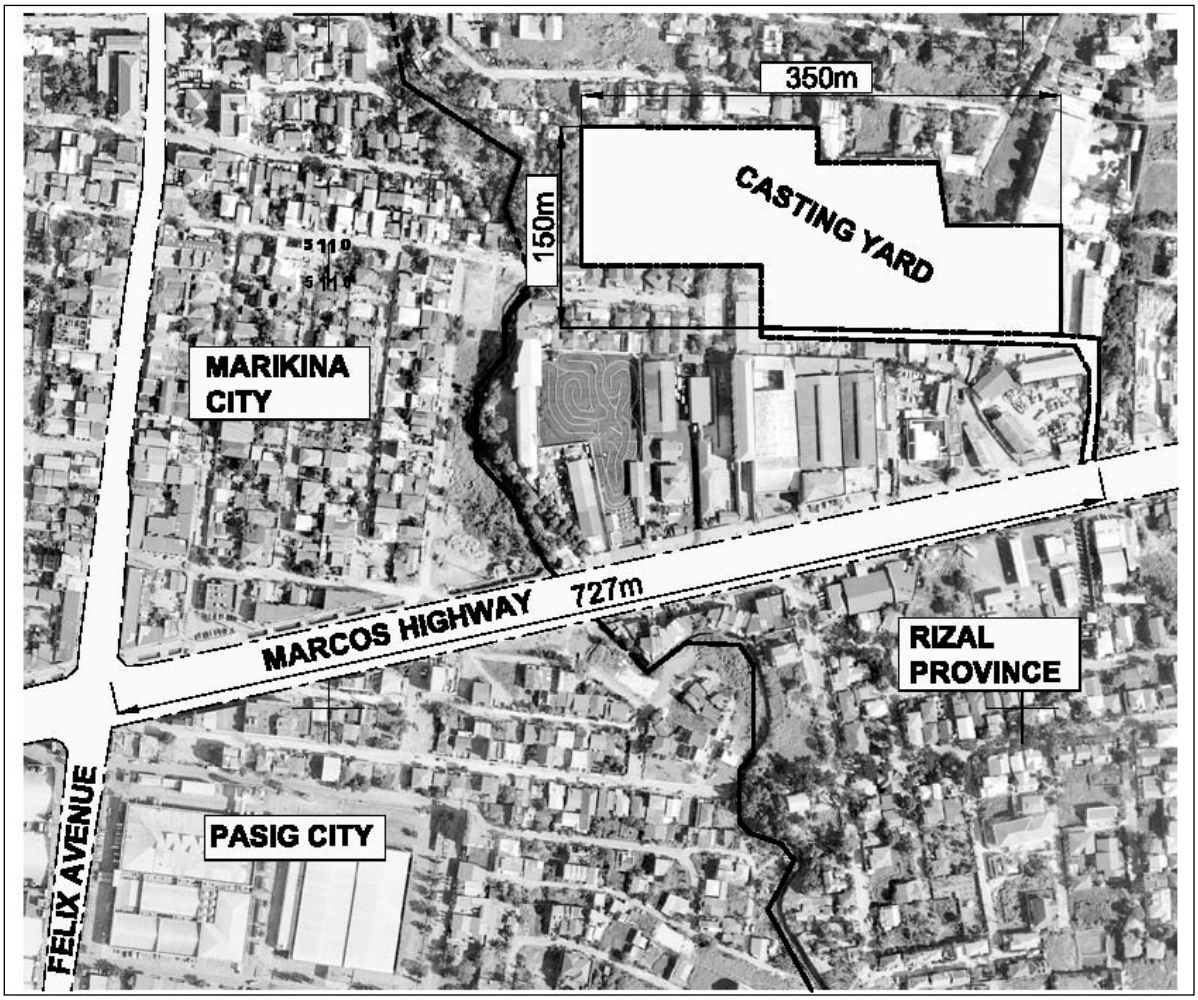
In formulating a traffic re-routing plan the contractor will be required to undertake a road inventory survey, including travel time and delay surveys, along affected roads and on identified alternative routes. Intersection traffic counts along the affected routes and on identified alternative routes should be conducted, to supplement the latest intersection data from the Traffic Engineering Center (TEC) of the Metropolitan Manila Development Authority (MMDA).

5.1.5 Casting Yard

The 4 hectare casting yard used by the contractor for the pre-fabrication of viaduct box segments during the construction of the existing Line 2 is still in service and is currently being used by the contractor undertaking the widening of Marcos Highway under the NRIMP2 World Bank project.

The casting yard is located on the north side of Marcos Highway approximately 720m east of the intersection with Feliz Avenue. The casting yard is at this time being used to fabricate large precast box culvert sections as part of the drainage improvement along Marcos Highway. The NRIMP2 project is due to be completed in January 2012. It is therefore expected that this casting yard will be available to the contractor during the construction of the East and West Extension project.

The location and size of the casting yard is indicated in **Figure 5.1-4**.



Source: Study Team

Figure 5.1-4 Location of casting yard along Marcos Highway

5.1.6 Utility Relocations

Utility relocation works can be both a significant cost item and have a major impact on the construction schedule. Careful attention must be paid to the identification of affected utilities at an early stage in the detailed design so that proper co-ordination can be made with affected utility companies and effective planning of relocation works can be made during construction.

For the existing LRT Line 2, utility relocation works amounted to more than 11% of the total cost of the Package 2 substructure works. Types of utilities affected by the existing LRT Line 2 included:

- Drainage pipes under DPWH
- Water pipes and sewer pipes under MWSS
- Electric power lines under MERALCO
- Telephone lines under PLDT
- Traffic light control cables under the Traffic Engineering Center (TEC) of the MMDA.
- Various underground cable services under private cable companies.

Waterlines and sewerlines in the greater Metro Manila area have been managed since 1997 by two separate public utility companies, namely Manila Water Company, Inc. and Maynilad Water Services, Inc.

(Maynilad), both of which were granted a 25-year exclusive concession by the Philippine Government, through the Metropolitan Waterworks and Sewerage System (MWSS). Manila Water (the East Concessionaire) manages the East Zone of the greater Metro Manila area including Marikina City, Pasig City and Rizal Province. Maynilad (the West concessionaire) is the water and wastewater services provider for the 17 cities and municipalities that comprise the West Zone of the greater Metro Manila area including Manila City.

With regard to the Line 2 Extension project, a detailed assessment of the extent and cost of the required utility relocations will have to be undertaken at the detailed design stage. A suitable Provisional Sum to cover the cost of all required utility relocations will be included in the Line 2 Extension construction contract and proper allowance made in the stipulated construction period to accommodate the required relocations. The contractor will be required to co-ordinate with the affected utility companies and obtain quotations for all relocation works for approval. All relocation work will be undertaken by the affected utility company with payment made by the contractor under the Provisional Sum item.

5.1.6.1 Utility Relocation along East Extension

With regard to the construction of the East Extension major utility relocations are not anticipated along most of Marcos Highway. The following utilities have been identified in this study:

- MERALCO overhead high voltage and low voltage electric power lines are running along Marcos Highway and are located on poles in the sidewalks at each side of the road. These utilities are therefore not expected to be affected by construction of the Line 2 Extension in the central reserve.
  There are several locations where low voltage lines cross Marcos Highway. These lines may be affected.
- PLDT telephone lines are supported on the same poles as the low voltage MERALCO lines at the side of the road on Marcos Highway. It is therefore expected that there will not be a need to relocate these PLDT utilities.
  There are several locations where PLDT lines cross Marcos Highway. These lines may be affected.
- MMDA road lighting poles occupy the central reserve on Marcos Highway. These poles will require relocation to each side of Marcos Highway.
- Manila Water have existing 1200mm diameter water pipes running along Marcos Highway but these are mostly offset from the central reserve and therefore should not require relocation. According to plans obtained from Manila Water the most problematic section along Marcos Highway is the section of road from Amang Rodrigues Avenue to the intersection with Felix Avenue, the proposed site of Emerald Station, where there is an existing 1200mm diameter steel pipe located in the central reserve and plans to lay a 1600mm diameter steel pipe under the road offset from the central reserve. Careful attention will have to be paid to foundation design of the East Extension in this section to either avoid utility relocation or minimize the extent of any required relocation works. Should utility relocation be required the affected length of relocation works for the large diameter Manila Water pipes will be in the order of 500m.
- DPWH are currently constructing drainage facilities along Marcos Highway. These drainage facilities are however located at the road side and therefore will not be affected by the proposed Line 2 Extension works.
- TEC facilities as existing along Marcos Highway are likely to be affected and will require relocation as necessary

5.1.6.2 Utility Relocation along West Extension

Utility relocation is a major construction issue for the West Extension along Recto Avenue. The following utilities have been identified in this study:

- MERALCO overhead high voltage and low voltage electric power lines running along Recto Avenue are located on poles in the central reserve of the road and therefore will be affected by construction of the Line 2 Extension. These overhead power lines will have to be relocated to the side of the road in a similar way to the MERALCO relocation works for the existing Line 2. The relocation works will be required for the entire length of the West Extension.
- PLDT telephone lines are also supported overhead on the poles carrying the MERALCO power lines. These lines will also require to be relocated.
- MMDA road lighting poles occupy the central reserve on Recto Avenue. These poles will require relocation to each side of Recto Avenue.
- Maynilad have underground waterlines and sewer lines running along and crossing Recto Avenue. According to the Maynilad plans obtained, there are several waterline services running all along Recto Avenue including Cast Iron Pipes (CIP), Asbestos Cement Pipes (ACP) and PVC Pipes ranging in diameter from 150mm to 750mm. The Maynilad records also show sewerlines running along Recto Avenue with sizes up to 1425mm in diameter.
  The waterlines and sewerlines are generally located to the road side and therefore are generally not expected to require relocation. However given the number and extent of pipes and also the services crossing Recto Avenue at numerous locations, it is likely that there will be a need to relocate some services at particular locations.
- DPWH drainage facilities may be affected by the West Extension. The layout of drainage facilities have not been identified at this study stage. The identification of drainage facilities will be a task for the detailed design.
- TEC underground facilities as existing along Recto Avenue are likely to be affected and will require relocation as necessary

Typical photographs of the existing utilities along both Marcos Highway and Recto Avenue are shown in **Photo 5.1-10** and **Photo 5.1-11** respectively.

Source: JICA Study Team

Photo 5.1-10 East Extension – High & Low Voltage Electric Power and Telecom Lines (Side of Road – Marcos Highway)

Source: Study Team

Photo 5.1-11 West Extension – High & Low Voltage Electric Power and Telecom Lines (Center of Road – Recto Avenue)

5.2 Procurement of Materials and Equipment

The procurement records for LRT Line 2 construction were studied and a plan for procurement of materials and equipment, including technical study, was studied.

5.2.1 The procurement records of LRT2 construction

The works for the existing LRT Line 2 were procured with funding from the Government of Japan under Yen Credit Packages of the Overseas Economic Cooperation Fund (OECF). These were:

- Construction Package P-1 : Depot
- Construction Package P-2 : Substructure
- Construction Package P-3 : Superstructure and Stations
- Construction Package P-4 : Systems, Vehicles and Trackwork

The materials, goods and services supplied under the contracts had their origin from eligible source countries as approved by OECF for general untied loans. There was no contractual requirement to procure a proportion of materials, goods and services from Japan.

5.2.1.1 Civil Works

The contractor for both Construction Packages P-2 and P-3 was a joint venture between South Korean and Japanese construction companies (Hanjin-Itochu Joint Venture).
The breakdown of the construction cost for the existing LRT Line 2 viaduct and elevated station civil works into local and foreign components is as given in **Table 5.2-1**.

Table 5.2-1 Breakdown of Viaduct and Station Components – Existing LRT Line 2

Item	Foreign	Local	Comment
1. Viaduct	10%	90%	Foreign cost component derived primarily from prestressing steel and erection gantry costs, in addition to bearings and expansion joint cost components
2. Elevated Stations	40%	60%	Foreign cost component derived primarily from the conveying systems (escalator and elevator), structural metalwork, mechanical and electrical installations, in addition to non structural metalwork and metal framing cost components

Note: Cost breakdowns do not include underground station at Katipunan or the Depot.

Source: Priced Bill of Quantities P-2 and P-3 from Hanjin-Itochu Joint Venture

5.2.1.2 Railway System

The contractor for the System Package-4 was ASIA-EUROPE MRT CONSORTIUM. (Marubeni Corporation, Toshiba Corporation, Korea Rolling Stock Corporation (KOTOS) and Balfour Beatty Group Ltd.,). The breakdown of the construction cost for the existing LRT Line 2 system works into local and foreign components is as given in **Table 5.2-2**.

Table 5.2-2 Breakdown of System – Existing LRT Line 2

Item	Foreign	Local	Comment
1. Power Supply and Catenary	85%	15%	Power Supply equipment was mainly imported from Japan. Catenary including Poles were 100% imported from Germany.
2. Signalling	90%	10%	Imported from Spain. Electronic Interlocking only from USA.
3. Telecommunications	95%	5%	Imported from Swiss, USA, New Zealand, Spain, UK, Germany.
4. Operation Control Center	100%	0%	Imported from Japan, New Zealand, UK, Spain, Local.
5. Management Information System	100%	0%	100% imported from Japan.
6. Track Work	90%	10%	Imported from Australia. Plinth was constructed by Local.
7. Automatic Fare Collection (AFC)	100%	0%	100% imported from UK.

Source: Priced Bill of Quantities P-4 from ASIA-EUROPE MRT CONSORTIUM

5.2.1.3 Rolling Stock

The contractor for rolling stock was ASIA-EUROPE MRT CONSORTIUM, however some parts and systems were provided by Japanese companies.
The breakdown of the components and values of the existing rolling stock is as given in **Table 5.2-3.**

Table 5.2-3 Breakdown of Components and Values – Existing LRT Line 2

tem	Country	Value Rate	
1. Contract and Assembly	Korea	5	%
2. Car Body	Korea	40	%
3. Bogie	Korea	16	%
4. Main Motor	Japan	7	%
5. Control Device	Japan	20	%
6. Break System/Device	Japan	7	%
7. Air-conditioning	Korea	5	%
	Total	100	%

Source: Study Team

5.2.2 Procurement Plan of Materials and Equipment

Since the Project is the extension of operating existing line, all most of materials and equipment would be same or upgraded with the existing one. The Study Team studied the condition of existing line and made the procurement plan for the extension project, **Table 5.2-4** shows the Procurement Plan.

Table 5.2-4 Procurement Plan – Existing LRT Line 2

Item	Foreign	Local	Comment
Civil			
1. Viaduct	10%	90%	Prestressing steel, erection gantry, bearings and expansion joint would be imported.
2. Elevated Stations	40%	60%	The conveying systems (escalator and elevator), structural metalwork, mechanical and electrical installations, in addition to non structural metalwork and metal framing would be imported.
System			
1. Power Supply and Catenary	85%	15%	Power Supply equipment would be imported from Japan. Catenary would be imported from third country.
2. Signalling	90%	10%	It should be exactly same with the existing one. It would be Imported from Spain.
3. Telecommunications	95%	5%	It would be imported from third country.
4. Operation Control Center	100%	0%	It would be imported from third country and/or local.
5. Management Information System	100%	0%	It would be imported from the third country.
6. Track Work	90%	10%	It would be imported from the third country.
7. Automatic Fare Collection (AFC)	100%	0%	Under the planning of DOTC, for upgrading and integration of AFC of Line 1, Line 2 and MRT 3.
Rolling Stock			
Rolling Stock	100%	0%	It would be imported from the third country.

Source:Study Team

5.2.3 Candidate Items of Japan Origin

Candidate items of Japan origin are shown in **Table 5.2-5**.

Table 5.2-5 Candidate Items of Japan Origin

Item	Condition	Case 1	Case 2
Civil			
1. Prestressing Steel	PC strand imported from Japan or sourced from Philippines companies which joint venture with Japanese company.	Yen 303,000,000	Yen 423,000,000
2. Girder Erection	Box girder erection using overhead gantries sub-contracted to specialist Japanese company.	Yen 303,000,000	Yen 423,000,000
3. Steel Girder	Structural steel fabricated in Japan or in Philippines by steel companies which joint venture with Japanese company.	Yen 345,000,000	Yen 407,000,000
System			
1. Power Supply	As existing is made in Japan, if there is Japanese company in JV of the Contractor.	Yen 487,700,000.	Yen 587,100,000.
2. Telecommunications	Existing CCTV is made in UK and need to be upgraded, if there is Japanese company in JV of the Contractor.	Yen 32,000,000.	Yen 47,900,000.
3. Management Information System	Existing system is made in Japan, it would be procured from the same source.	Yen 45,100,000.	Yen 45,100,000.
Rolling Stock			
1. Main Motor	If the Contractor is Japanese trading company.	Yen 0.	Yen 54,056,800.
2. Control Device	If the Contractor is Japanese trading company.	Yen 0.	Yen 154,448,000.
3. Break System/Device	If the Contractor is Japanese trading company.	Yen 0.	Yen 54,056,800.
	Total Amount =	Yen 1,515,800,000.	Yen 2,195,661,600.

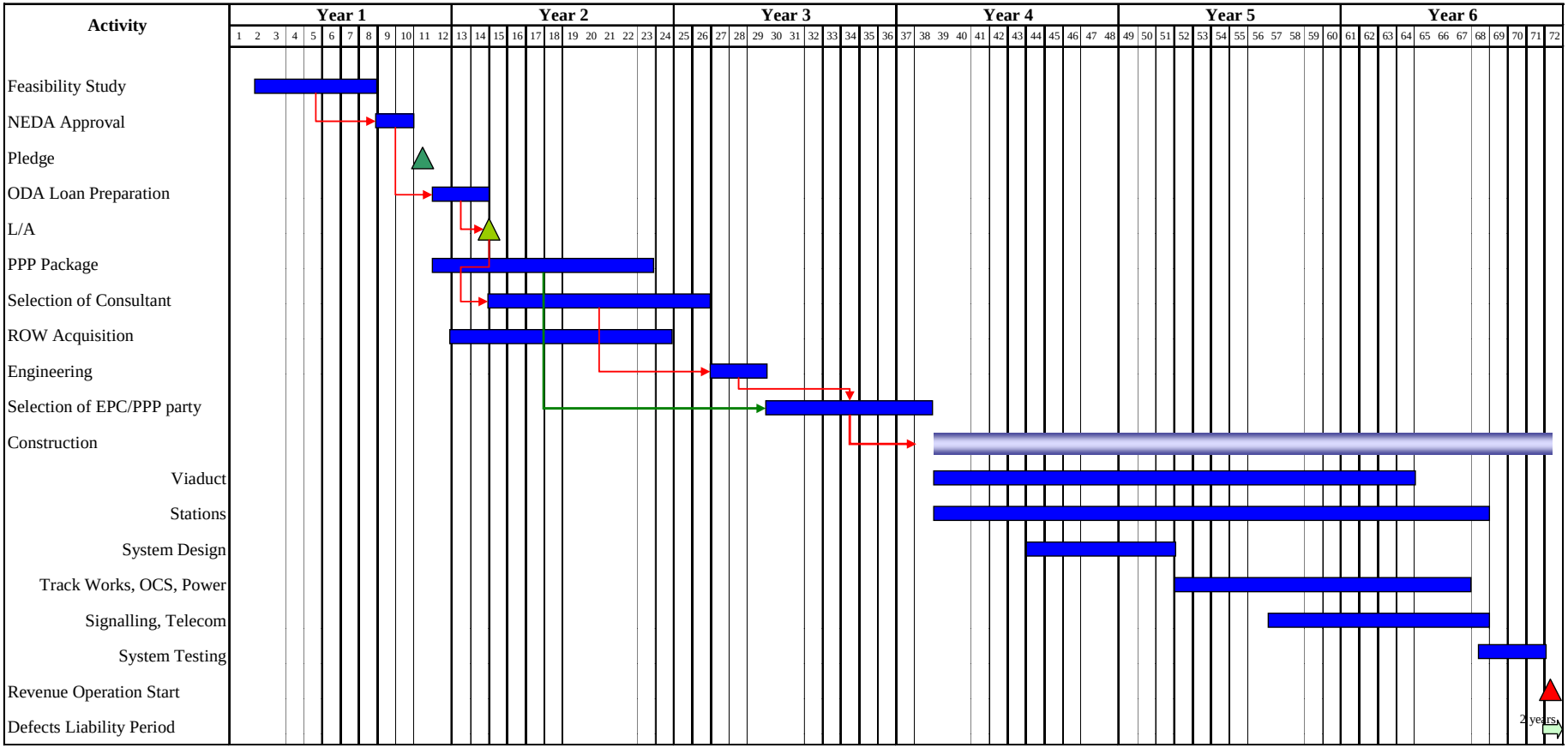
Source: Study Team

5.3 Project Implementation Schedule

This section introduces the Implementation Schedule for the Manila LRT Line 2 Extension Project. This implementation schedule includes activities such as this feasibility study, NEDA approval, Loan Agreement preparation, Consultancy bidding, Engineering, Contractor's bidding, Construction, and Defect Liability Period.

This implementation schedule is based in the assumption that this project will be funded with an ODA Loan from JICA or a PPP funding scheme, or a combination of both.

The Implementation Schedule is presented in **Figure 5.3-1**.



Source: Study Team

Figure 5.3-1 LRT Line 2 East & West Extension Project Implementation Schedule

5.4 Study of Technical Assistance

The consultancy services of a well experienced and qualified Consultant shall be contracted by the Public sector to supervise the entire project, and the proper interface between works done by contractor(s) funded by public portion and contractor(s) funded by private sector.

The main tasks to be assigned are, but limited to, the following:

1) Preparation of Project Requirements

Preparation of Project Requirements (or Employer's Requirements) for all Works for bidding purposes as well as basis for the selected Contractor to build the Project. As a minimum, the design specifications/performance criteria will be the as-built drawings of Line 2 Extension.

a) Civil/Architectural/Utility Engineering Works

- Conduct of Topographical Surveys in selected sections
- Collection and analysis of soil data in selected areas as well as of data of underground and overhead public and private utilities
- Preparation of Final Alignment and Drawings including Horizontal and Vertical Alignment of Rail Elevation
- Recommendation for optimum foundation parameters based on results of soil analysis
- Aesthetical study of viaduct and preparation of typical viaduct section drawings including center-to-center of track and width of inspection paths
- Preparation of typical station drawings at different levels including cross-sections of stations
- Preparation of typical drawings for architectural finishes
- Preparation of performance specifications and drawings for lighting and light fittings including all electrification works and architectural finishes required for the stations
- Preparation of layout drawings for station facilities (lifts and escalators, technical equipment rooms, operations room, ACU and ventilation equipment)
- Identification and earmarking of work areas for the Contractor
- Collection and analysis of traffic data and preparation of traffic management plans for execution during the construction stage
- Preparation of alternative plans to remove or reconstruct, if necessary, existing pedestrian bridges along the alignment
- Preparation of Diversion Plans for public and private utilities
- Preparation of Project Implementation Program
- Preparation of Cost Estimates based on the Consultant's data base
- Specification/s for suitable stray current protection measures.

b) Electro-Mechanical Works - Preparation of performance specifications and functional requirements for the Project's electro-mechanical equipment and the integration of their functionalities and operation onto the existing Line 2 system in the following areas:

- Signaling System
- Telecommunications System
- Overhead Catenary System
- Station Equipment
- Preparation of installation methods for trackworks and cable channels / walkways along the viaduct using a ballastless system with railings (but not parapets) and limiting noise and vibration caused by, for example, dumping materials and/or floating slabs) to preset limits in accordance with the prescribed environmental requirements

- Integration of track installation parameters with the existing rolling stock
- Preparation of performance specifications for the additional power supply substation
- Integration of SCADA, Remote Control and Redundancy, Management with the existing Line 2 equipment

2) Assistance in Pre-qualification for the Construction Contract

- Prequalification of Contractors
- Preparation of Prequalification Documents and Evaluation Criteria
- Evaluation of Prequalification Statements

3) Bidding of Contractors

- Preparation of Bid (Technical/Financial) Documents and Bid Evaluation Criteria
- Preparation of Addenda to Bid Documents, if required
- Assistance in Pre-Bid Conferences
- Clarification of Scope of Works and technical requirements to prospective bidders, if necessary
- Evaluation of Technical and Financial Proposals
- Preparation of Evaluation and Recommendation Reports to Employer
- Preparation of draft Contract Documents

4) Provision of Construction Supervision

Provision of Construction Supervision services during the construction period as well as during testing (integration/performance) and system commissioning, but not limited to:

- Review, evaluation and approval of Contractor's Work Plan, Methodology and Construction Schedule, Quality Control / Quality Assurance Plan, Safety Plan, Environmental Management Plan and Configuration Management Plan
- Review, evaluation and approval of the Contractor's Detailed Designs/Drawings/ Manuals/Submittals
- Supervision of works
- Interface between Contractors
- Site Inspections
- Material Inspections/testing/acceptance
- Equipment Inspection, Testing and Commissioning
- Making Known Defects and Deficiencies
- Checking, Inspection and Testing of Spare Parts
- Checking of Work Accomplished/Disbursements
- Evaluation of Contract Change/Variation Orders, if any
- Evaluation for Additional Payment/Time Extension, if necessary
- Evaluation of Contract Price Escalation, if any
- Coordination with Other Agencies
- Assistance in Dispute Resolution, if any
- Conduct of Regular Meetings with Employer and Contractor
- Preparation of Documents for Acceptance of Work done by Contractor
- Review and approval of "As-Built" Drawings and Plans

5) Provision of Legal services, Project Management Support and Public Relations from Project Inception to end of Defects Liability Period

6) Provision of Support during the two-year Defects Liability Period

The Consultant shall support the Employer in the resolution of issues during the Defects Liability Period such as but not limited to warranty claim issues, coordination with the Contractor in the development of technical solutions and in the proper and timely implementation of the agreed actions.

7) Transfer of Technology

The work plan of the Consultant shall include technology transfer to LRTA staff and engineers that maybe assigned to the Project. This may partake of the following forms:

- Conduct of regular management meetings with the LRTA PMO, inclusive of on-the-job lectures and workshops on the issues and methodologies being adopted;
- Organizing regular seminars to be attended by the LRTA engineers;
- Participation in actual coordination and problem-solving meetings that maybe conducted with the winning Bidder(s) in the course of construction;
- Participation/attendance in observation/study tours of similar projects for several LRTA engineers.

Table 5.4-1 Consultant Staffing

	Expatriate
A1	Project Manager
A2	Systems Integrator/Coordinator
A3	Chief Civil Engineer
A4	Chief Track Engineer
A5	Chief Signaling Engineer
A6	Chief Telecommunications Engineer
A7	Chief Power Supply (OHC and SS)
A8	Chief Rolling Stock Engineer*
A9	Contracts Specialist
A10	PPP Specialist
A11	Administration Manager

	Local Expert
B1	Deputy Project Manager
B2	Civil Engineer
B3	Supervising Civil Engineer 1
B4	Supervising Civil Engineer 2
B5	Chief Structural Engineer
B6	Structural Engineer
B7	Architect Engineer
B8	Surveyor
B9	Chief System Engineer
B10	Electrical Engineer
B11	Mechanical Engineer
B12	Traction and Power Engineer
B13	Catenary Engineer
B14	Track Engineer
B15	Signaling Engineer
B16	Telecommunications Engineer
B17	AFC Engineer
B18	Rolling Stock Engineer*
B19	Quality Assurance Specialist
B20	Safety Engineer
B21	Environmental Specialist
B22	Legal Adviser
B23	Quantity Surveyor
B24	Project Management Consultant
B25	Project Management Consultant
B26	Public Relations Officer

** : in Case1 Rolling Stock Engineer would not be needed*

Source: Study Team

5.5 Project Cost Estimation

5.5.1 The estimated cost of extensive repairs on existing Line 2

The estimated cost of extensive repairs on existing Line 2 was informed by LRTA, the summary of the repairs and costs are shown in **Table 5.5-1**. This cost is not included in the Project Implementation Cost.

Table 5.5-1 Estimated Extensive Repair cost of Line 2

All Units PHP

	Line-2		
	Item	Number	Cost
1. Civil	N/A Sub total =		0 0
2. Track	Year 2010 = 100 plinths had been repaired Year 2011 to date recorded damaged Require Repair work for damaged Plinth 1. Short Plinth = Php 50,000/number. Total = 26 nos x 50,000 2. Intermediate Plinth = Php 30,000/number Total = 17 nos x 30,000 Sub total =	 26 Locations 17 Locations	 1,300,000 510,000 1,810,000
3. Depot Equipment	1. Wheel Truing Machine Sub total =	1 unit	15,000,000 15,000,000
4. System	1. APS (Audio Paging System) 2. CCTV 3. SCADA 4. Trunk Radio 5. Signaling Sub total =	1 unit 1 unit 1 unit 1 unit 1 unit	8,000,000 25,000,000 40,000,000 80,000,000 30,000,000 183,000,000
5. Rolling Stock	3 train sets are to be repaired Each Train repair cost = Php 58 Million Total Repair Cost = 3 x 58 = Sub total =	 3 sets	 174,000,000 174,000,000
6. Automatic Fare Collection (AFC)	1.AFC a. Total number of machine TVM = 82 units b. Total number of Turnstile gate = 250 units c Total number of analyzer dipsenser = 27 units d. Total number of encoder = 4 units ***Future Project of DOTC is on going. "Upgrading and Integration of the Automatic Fare Collection Systems of the LRT 1, LRT 2, and MRT 3 Railway Systems"	Lump sum	200,000,000 200,000,000
		Total =	573,810,000

Source: LRTA

5.5.2 Procurement of Rolling Stock in near future

One set of Rolling Stock will be procured during the Project in Case 2. And following the increment of passengers, a few Rolling Stocks would be required in near future. The estimation of cost and number of Rolling Stock are shown in **Table 5.5-2**, (Based 2010 price). This cost is not included in the Project Implementation Cost

Table 5.5-2 Procurement of Rolling Stock in near Future

Case 1

Case 1 in 2030 PHP1= JPY 1.81

item	unit	Quantity	Unit Price		Cost		Total
			Foreign yen	Local PHP	Foreign yen	Local PHP	yen
Rolling Stock (3 sets)	car	12	193,060,000	1,970,000	2,316,720,000	23,640,000	2,359,508,400
Spare Parts (5% of RS)	Lump sum	1	9,653,000	0	115,836,000	0	115,836,000
Test and Commissioning (1% of RS)	Lump sum	1	1,930,600	0	23,167,200	0	23,167,200
Total					2,455,723,200	23,640,000	2,498,511,600

Case 2

Case 2 in 2028 PHP1= JPY 1.81

item	unit	Quantity	Unit Price		Cost		Total
			Foreign yen	Local PHP	Foreign yen	Local PHP	yen
Rolling Stock (4 sets)	car	16	193,060,000	1,970,000	3,088,960,000	31,520,000	3,146,011,200
Spare Parts (5% of RS)	Lump sum	1	9,653,000	0	154,448,000	0	154,448,000
Test and Commissioning (1% of RS)	Lump sum	1	1,930,600	0	30,889,600	0	30,889,600
Total					3,274,297,600	31,520,000	3,331,348,800

Source: Study Team

5.5.3 Combination of System cost

Since this project is the extension of existing line, the system costs are divided into three groups.

- Upgrading: To build more capacity with extension area.
- Extension: Newly installed in extension area.
- Reinforcement: Power supply system is required to be reinforced.

The combination of three groups is shown in **Table 5.5-3**.

Table 5.5-3 Combination of System Cost

(Unit : JPY)

Case 1 (4.1 km)				
	a) Upgrading	**b) Extension**	**c) Reinforcement of Existing Line**	**Project Cost= a+b+c**
Power supply	0	537,123,000	145,875,000	682,998,000
Catenary	0	201,301,800	0	201,301,800
Signalling	35,696,000	651,476,000	0	687,172,000
Telecommunication	428,349,000	366,391,000	0	794,740,000
Track works	0	984,087,400	0	984,087,400
OCC	195,810,000	0	0	195,810,000
MIS	46,005,000	0	0	46,005,000
	705,860,000	2,740,379,200	145,875,000	3,592,114,200

(Unit : JPY)

Case 2 (5.7 km)				
	a) Upgrading	**b) Extension**	**c) Reinforcement of Existing Line**	**Project Cost= a+b+c**
Power supply	0	646,619,000	194,500,000	841,119,000
Catenary	0	279,858,600	0	279,858,600
Signalling	35,696,000	866,433,000	0	902,129,000
Telecommunication	467,321,000	586,437,000	0	1,053,758,000
Track works	0	1,414,539,800	0	1,414,539,800
OCC	195,810,000	0	0	195,810,000
MIS	46,005,000	0	0	46,005,000
	744,832,000	3,793,887,400	194,500,000	4,733,219,400

Source: Study Team

5.5.4 Project Cost Estimation

5.5.4.1 Conditions of the estimation

1) The above mentioned 5.5.1 and 5.5.2 are not included in the Project Cost, however since they are the important factors for the development of LRTA, they should be studied with the Project Cost Estimation for comprehensive understanding.

2) Precondition

- The Rate of fund: JICA 85% and Philippine 15%
- Exchange Rate of Currency: US$1=Yen81.9, US$1=PHP 45.2 , PHP1=Yen1.81
- Price Escalation: FC=1.8%, LC=6.9% (following information from JICA)
- Physical Contingency: Construction 5%, Consultant 5% (following information from JICA)
- Billing Rate of Consultant Expert (referred information from JICA)
- Rate of Tax (VAT 12%, Import Tax 0% because included in unit price)
- Rate of Administration Cost : 5% (following information from JICA)
- Rate of Interest during Construction: Construction 1.4%, Consultant 0.01% (following information from JICA)
- Rate of Commitment Charges: 0.1% (following information from JICA)

3) Land acquisition

Location is about east side of Emerald Station, area is 300m2 (20m X 15m) and purpose is for construction of Substation.

4) The project cost are estimated based on the construction cost of existing Line 2 and referred the Line 1 North Extension Project.

The Estimated Project Cost is shown in the following **Table 5.5-4** and Table **5.5-5.**

Table 5.5-4 Summary Project Cost – Case 1

PHP 1= JPY 1.81

Breakdown of Cost / Case 1	JPY Millions			PHP Millions			JPY Millions			Described all in PHP Millions		
	Foreign Currency Portion			Local Currency Portion			Total					
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others	2011～2016	2030	Total
Civil Viaduct	527	448	79	1,948	1,656	292	4,054	3,446	608	2,240		2,240
Civil Station	1,176	1,000	176	882	750	132	2,772	2,357	416	1,532		1,532
Utility and Road Diversion	0	0	0	570	485	86	1,032	877	155	570		570
Sub Total Civil Works	1,703	1,448	255	3,400	2,890	510	7,858	6,679	1,179	4,341		4,341
Power and Catenary	778	662	117	59	50	9	884	752	133	489		489
Signalling and Telecom	1,382	1,175	207	55	47	8	1,482	1,260	222	819		819
System Miscellaneous	239	203	36	2	1	0	242	206	36	134		134
Track	876	745	131	60	51	9	984	836	148	544		544
Rolling Stock	0	0	0	0	0	0	0	0	0	0	1,380	1,380
Sub Total E & M	3,276	2,784	491	175	149	26	3,592	3,053	539	1,985	1,380	3,365
Sub Total Direct Cost	4,979	4,232	747	3,575	3,039	536	11,450	9,732	1,717	6,326	1,380	7,706
Price Escalation	304	259	46	761	646	114	1,681	1,429	252	929		929
Physical Contingency	264	225	40	217	184	33	657	558	98	363	69	432
Consulting Services	719	719	0	366	366	0	1,380	1,380	0	763		763
Land Acquisition	0	0	0	2	0	2	4	0	4	2		2
Administration Cost	0	0	0	419	0	419	759	0	759	419		419
Sub Total Indirect Cost	1,287	1,202	85	1,764	1,196	568	4,480	3,367	1,113	2,475	69	2,544
VAT	0	0	0	958	0	958	1,734	0	1,734	958	166	1,124
Interest during construction	318	318	0	0	0	0	318	318	0	176		176
Commitment Charge	81	81	0	0	0	0	81	81	0	44		44
Total	6,665	5,833	832	6,297	4,235	2,062	18,063	13,498	4,565	9,980	1,615	11,595

Source:Study Team

Table 5.5-5 Summary Project Cost – Case 2

PHP 1= JPY 1.81

Breakdown of Cost / Case 2	JPY Millions Foreign Currency Portion			PHP Millions Local Currency Portion			JPY Millions Total			Described all in PHP Millions		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others	2011～2016	2028	Total
Civil Viaduct	768	653	115	2,840	2,414	426	5,909	5,022	886	3,264		3,264
Civil Station	1,848	1,571	277	1,386	1,178	208	4,357	3,703	653	2,407		2,407
Utility and Road Diversion	0	0	0	850	723	128	1,539	1,308	231	850		850
Sub Total Civil Works	2,616	2,224	392	5,076	4,315	761	11,804	10,033	1,771	6,521		6,521
Power and Catenary	983	836	148	76	65	11	1,121	953	168	619		619
Signalling and Telecom	1,824	1,551	274	73	62	11	1,956	1,663	293	1,081		1,081
System Miscellaneous	239	203	36	2	1	0	242	206	36	134		134
Track	1,260	1,071	189	86	73	13	1,415	1,202	212	782		782
Rolling Stock	819	696	123	8	7	1	833	708	125	460	1,841	2,301
Sub Total E & M	5,125	4,356	769	244	207	37	5,566	4,731	835	3,075	1,841	4,916
Sub Total Direct Cost	7,741	6,580	1,161	5,320	4,522	798	17,370	14,764	2,605	9,597	1,841	11,438
Price Escalation	464	394	70	1,131	962	170	2,511	2,135	377	1,388		1,388
Physical Contingency	410	349	62	323	274	48	994	845	149	549	92	641
Consulting Services	802	802	0	383	383	0	1,495	1,495	0	826		826
Land Acquisition	0	0	0	2	0	2	4	0	4	2		2
Administration Cost	0	0	0	618	0	618	1,119	0	1,119	618		618
Sub Total Indirect Cost	1,676	1,545	131	2,457	1,618	838	6,123	4,475	1,648	3,383	92	3,475
VAT	0	0	0	1,430	0	1,430	2,589	0	2,589	1,430	221	1,651
Interest during construction	487	487	0	0	0	0	487	487	0	269		269
Commitment Charge	118	118	0	0	0	0	118	118	0	65		65
Total	10,023	8,731	1,292	9,207	6,140	3,066	26,687	19,845	6,842	14,744	2,154	16,898

Source: Study Team

5.6 Reducing Project Costs

When trains turn back at each terminal station in Line2, “back-turn” method, which trains turn back at reversing tracks after getting off all passengers, is used. This method is used not only in Line2 but also Line1 and Line3 except Taft Station.

“Back-turn” are also proposed at each terminal station for the LRT Line 2 Extension, namely at Masinag Station for the East Extension and at Divisoria Station at the West extension. However, this method required reverse track after terminal stations and length of structure, track, and catenary become long.

Therefore, as one of project cost reduction proposal, amount of cost reduction is calculated in case of “front-turn” method – trains turn back using crossover set before stations.

1) Advantage and disadvantage of “back-turn” and “front-turn”

Advantage and disadvantage of “back-turn” and “front-turn” is shown in the following table.

Table 5.6-1 Advantage and disadvantage of "back-turn" and "front-turn"

	Front-turn	Back-turn
Track Layout		
Advantage	- Structures, track and catenary of reverse tracks can be omitted.	- Passenger can get on/off smoothly because an arrival platform and a departure platform is separated. - 100 second, minimum headway of design specification, can be kept not to consider time of passengers getting on and off.
Disadvantage	- Train operation speed slow down when train depart/arrive at the station because of passing crossover. - The distance between train stop position and crossover is far and headway limited by crossover is long in case of island platform type. - Minimum headway is 2 to 2.5 minutes considering time of changing turnout and passenger getting on and off. - Trains may stop out of station in case trains schedule is disrupted. - The moving line of driver crosses over the moving lines of passengers at the platform and in the train.	- Train-kilometer get longer because trains go back and forth between platform and reverse tracks (Inspection time of trains come earlier.) - Cycle time of train operation increase and required number of fleet may increase.

Source: Study Team

2) Amount of Cost Reduction

Length of shortened structure by changing method of turn-back is 0.275km at Divisoria Station and 0.332km at Masinag Station. Amount of Cost Reduction is shown in the following table.

Table 5.6-2 Amount of Cost Reduction

		Case1	Case2
Length of shortened structure (km)		0.332	0.607
Amount of cost reduction (mil Yen))	Viaduct: Super-structure	170	369
	Viaduct: Sub-structure	158	278
	Subtotal of Civil	328	647
	Utility and Road Diversion	83	164
	Wayside power distribution	19	35
	Catenary	16	30
	Subtotal of Power	35	65
	Signalling and Telecommunication	120	208
	Track (double track)	70	128
	Joint	3	6
	Subtotal of Trackwork	73	134
	Ground Total	641	1,219
Original Project Cost (million Yen)		11,450	16,537
Ration of cost reduction		5.6%	7.4%

Source: Study Team

5.7 Key Points in Project Implementation

5.7.1 General

In order to smoothly implement the Project, key points will be identified in this study based on historical record of previous similar project implemented in Manila. Some of the projects identified on Chapter 1 are similar to the proposed Line 2 Extension Project. They all vary in funding and procurement method, scope of works, and size, but being all railway project, they are considered for inclusion in this section.

Each of the projects to be presented in this subsection will have the following items examined:

- Funding scheme
- Tendering regulating law
- Type of contract for:
  - Civil engineering
  - Consultant (foreign and local)
  - Eletro-mechanics
- Possibility of foreign consultant or contractors
- Selection of contractors:
  - PQ conditions
  - Tender packaging
  - Others

The projects to be studied are the following:

- Line 1 CAPEX Phase I
- Line 2 Construction
- Line 3 Construction
- Line 1 CAPEX Phase II
- Line 1 North Extension Project (NEP)

Table 5.7-1 summarizes the key points of each of these implemented projects.

In terms of scope of work and size, the Line 1 NEP is very similar to the Line 2 Extension, thus its case should be analyzed in detail. Also, MRT-3, for being implemented under BOT Law is described in detail in the next pages.

Table 5.7-1 Summary of Key Indicators for Railway Projects in Manila

Project	Funding Scheme	Regulating Law	Consultants	Contractor	Tender Conditions	Packages	Type of Contract	Others
Line 1 CAPEX I	JICA ODA Loan	JICA Guidelines Loan Agreement	KEI Nippon Koei Tonichi Consultant De Leuw Cather International Limited	Marubeni ABB Daimler-Bentz Transportation ABB Power Inc.	PQ stage and Tender Stage done separately. Two Envelop Tender scheme. Technical evaluation, then financial offer.	One package tender including of EMU, modification of power supply system and track work in depot	Designed by Consultand and BOQ contract	JICA Loan (Yen credit)
Line 2 Construction	JICA ODA Loan	JICA Guidelines Loan Agreement	KEI DeLeuw Cather International Sir William Halcrow Tonichi Consultant	Package 1 ; Sumitomo , Package 2; Itochu-Hnjin JV, Package 3; Itochu-Hanjin, Package 4; Asia Europe MRT Consortium: Lead firm Marubeni	PQ stage and Tender Stage done separately. Two Envelop Tender scheme. Technical evaluation, then financial offer.	Package P-1 : Depot Package P-2 : Substructure Package P-3 : Superstructure and Stations Package P-4 : Systems, Vehicles and Trackwork	Package 1-3; Design by Consultant, BOQ Contract, Package 4; Design and Build BOQ Contract	JICA Loan (Yen credit)
Line 3 Construction	Private Funds PPP BLT Scheme Proponent: EDSA LRT Corp, later MRTC	BOT Law R.A.#6957 (1991) BOT Law R.A.#7718 (1994)	for MRTC: ICF Kaiser Engineers & Construction for DOTC: Systra Direct negotiation. No restrictions on foreigner Consultants.	Mitsubishi Heavy Industries (MHI), Sumitomo Corporation. Civil: EEI Corp. Rolling Stock: ČKD	Solicited BOT scheme by DOTC to select concessionaire. Direct negotiations after initial PQ passed only by EDSA LRT.	Civil Package E&M and Rolling Stock Package	Turnkey type contract.	Lease fee under BLT scheme was estimated under supposition of 450k pax/day on opening year, 5% annual increase, average rate P15. This led to huge losses for GOP.
Line 1 CAPEX II	JICA ODA Loan	JICA Guidelines Loan Agreement	Manila TREN Consortium JV of PCI/OC (Japan); JARTS (Japan) in Association with local firms: FDC, TCGI, JFCA, EDCOP, DEMCO. No restrictions on foreigner Consultants. Subcontractors: PBI & STIB	Package A SIJV (Sumitomo-Itochu JV) Subcontractors: Fujita - Civil Kinki-Sharyou - Rolling Stock Package B Marubeni Subcontractor: Sigma Coaches Balfour Beatty	PQ stage and Tender Stage done separately. Two Envelop Tender scheme. Technical evaluation, then financial offer.	Package A: Rolling stock, electro mechanic system, and civil works. Package B: Air condition units (ACU) on 1st generation trains. Upgrade of 750 Switch gear ; Supplemental work: ACU on 2nd generation trains.	Package A: Design and Build, Commissioning Package B: Supply and Install, Commissioning	Tax exemptions for Consultant and Contractor. Foreign component according to JICA Obuchi loan conditions. No limitation on participation of Foreign contractors
Line 1 NEP	Philippine Government Funds	Philippine Government Procurement Law: IRR-A of R.A. No. 9184	MetroLink JV: JFCA, FDC, TCGI, EDCOP, DEMCO, Proconsult, Pertconsult, and PCI/OC (Japan). 40% maximum share of foreigner consultants.	A1, A2, B: DMCI-First Balfour JV C: Miescor/GTC JV EMS-1: DMCI-BETA-TEWET JV EMS-2: Alcatel-Lucent EMS-3: AP Trans EMS-4: DAXI-FDP JV	PQ stage and Tender Stage done separately. Two Envelop Tender scheme. Technical evaluation, then financial offer.	A1: Viaduct 1 A2: Viaduct 2 B: Stations C: Catenary, Power supply, station equipment EMS-1: Signalling EMS-2: Telecoms EMS-3: AFC EMS-4: Track works	All packages: Design and Build, Supply and Install, Commissioning.	RA 9184 restrictions on foreign contractors makes almost impossible to participate, unless proved unique special technical requirements (as done for EMS1~4). All bidders must have completed at least one similar project 50% of ABC.

Source: Study Team

5.7.2 MRT Line 3

1) Background

Manila's MRT3 (Metro Rail Transit System line 3, also called the Metrostar Express) was developed as a negotiated contract between the DOTC and EDSA LRTA Consortium, later acquired by MRTC. Metro Rail Transit Corporation (MRTC) is a consortium formed and organized in June 1995. It is composed by Fil-Estate Management Inc, Ayala Land Inc., Anglo-Phil Holding Corp., Ramcar Inc., Greenfield Development Corp, Aliante Realty and Development Inc., and DBH Inc.

ESDA LRT was the sole bidder to pass an initial prequalification phase involving four other prospective bidders. Following a lengthy process of negotiations and legal challenges, a revised concession contract was signed in 1993 and construction of MRT3 began in 1997.

Terms of Contract

Under the terms of MRT3's concession contract, MRTC would finance, design, construct, and maintain the MRT3 system in exchange for a regular lease payment to service debt, provide equity return, and fund maintenance. Because the unique legal considerations, MRTC was forbidden from operating the system and instead leased MRT3 back to DOTC for operations.

As part of this contractual arrangements, DOTC accepted all foreign exchange and revenue risks while guaranteeing the project's debt along with a 15% return on equity to the MRTC consortium.

2) Initial Ridership and Fares

An initial segment of MRT3 opened in December 1999. Charging fares in between ₱17 and ₱34, depending on distance travelled. Ridership on this section ranged from 17,000 to 45,000 passengers per day during its first months of commercial service.—well below expectations. In its first six months of operations MRT3 earned ₱150 million (roughly US$3.6 million in 2000), requiring substantial subsidies to cover the DOTC's first semiannual lease payment of US$40 million to its private partners.

In July 2000, Joseph Estrada, then president of the Philippines, directed the DOTC to reduce the MRT3's fares to between ₱9.5 and ₱15 in celebration of MRT3's full operational debut. This discount has lasted considerably longer than the six months originally intended. Although reduced fared helped increase MRT3's ridership, they have also created additional budgetary challenges for DOTC.

In 2005, the DoTC petitioned to increase fares to between ₱16 and ₱25 to reduce subsidy requirements. President Gloria Macapagal-Arroyo denied this increase, reaffirming her administration's sensitivity to the plight of the commuters. As of 2008, MRT3 fares have not changed other than rounding ticket prices up to the nearest peso (that is, ₱10 instead of ₱9.50) in the interest of efficient vending.

3) Implications

Widening operating losses and delays in subsidy funding from the national government have since prevented DoTC from regularly meeting its financial obligations under the concession contract.

MRT revenues did enjoy boost during the EDSA II revolution of January 2001, when MRTs transported thousands of protesters who were demanding President Joseph Estrada's impeachment for corruption. During the height of those protests, fare revenues were nearly double the daily average to ₱2.5 million to ₱2.7 million. However, even unusually high ridership during that period still did not enable MRT3 to cover its operating and maintenance costs, which were reportedly ₱8 million per day.

Fares ranging between ₱10 to ₱15 per trip are affordable to most income levels in Manila and only

slightly greater than "jeepney" fares (approximately ₱8.50. in 2008 plus additional charges beyond 4 kilometers) MRT3 currently attracts roughly 400,000 passengers per day--- nearly the upper limit of its designed capacity. Despite currently robust ridership figures, the system's fares still do not allow DoTC to generate sufficient revenue to cover lease payments without subsidy funding.

The national government is currently working to buy back the MRT3 concession the effort to reduce future subsidy burdens associated with MRT3's private financing. Purchase price under discussion range between US$ 865 million to US$ 1billion.

4) Key Points to take into Consideration

The Manila MRT3 project was the first PPP railway project to be implemented in Philippines, but the results, at least from the viewpoint of Government budget, has been quite negative. One important factor was the impossibility of allowing the private investor to operate the system, forcing to a type of contract under BLT scheme very disadvantageous to the Government.

The other factor is the inability to control the fares at which the project was envisioned, which had created budgetary troubles for the party that takes the risks on demand. Since in this particular case the risk falls on a government agency, the central government is politically tempted to keep fares artificially low for non-technical reasons. It might be a different case if fares are set by contract and government could not interfere with the schedule of fares without risking legal actions from the private investor.

The lessons that could be learnt from this case would be that the operation and demand risk should be allocated on the same private investor that builds the system. This is the case of the so called Net Cost Scheme, and that negotiations of contract conditions should be carefully carry out and supervised by related stakeholder and agencies to avoid one-sided clauses that would favour one party in over the other. A PPP scheme must be always a *win-win* deal.

5.7.3 Line 1 North Extension Project

1) Prequalification and Bidding Requirements

The Project is being financed by the Government of the Philippines in accordance with Government Procurement Policy Board (GPPB) requirements and therefore Republic Act (RA) 9184 and its Implementing Rules and Regulations (IRR) have to be complied with. Under the IRR of RA 9184, the prospective bidders have to meet certain defined, eligibility criterion.
Key requirements for the prequalification of Contractors under the IRR of RA 9184 include submission of:

Class "A" documents:

- Provision of certain legal documentation regarding firm structure such as SEC registration and Mayor's Permit; or equivalent, if a foreign firm and certified by the Philippine embassy in that country
- A valid Philippine Contractors Accreditation Board (PCAB) license and registration
- Bidder's audited financial statements stamped received by BIR
- Commitment from a bank for a credit line in favor of the bidder

Class "B" documents:

- Valid Joint Venture Agreement for JVs

Key eligibility criteria for infrastructure projects

- Prospective Bidding entity must be at least 60% Philippine-owned
- Possess a valid PCAB license

- Prospective bidders must have experience of having completed, within last 10 years, at least 1 contract of a similar nature, valued at least 50% of the ABC of the bid contract

2) Effects on Prequalification and Bidding for the LRT Line 1 NEP

Taking into consideration the bidding requirements, the first advertisements for bidding was published on 1 October 2007 for three Contract Packages: A (Viaduct), B (Stations) and C (Electromechanical Works). However, all 7 submissions, except for the DMCI-EEI-First Balfour Consortium for Package C, were rejected at the receipt of the submission itself due to the lack of compliance with the documentary requirements set-out in the Eligibility Documents.

On 27 November 2007, the LRTA Board issued a Resolution that all Packages (Package A, B and C) should be declared as failed; Packages A and B for lack of complete eligibility submission and Package C for lack of competition since only one proponent submitted complete documentation.

The Board further resolved that Package A is to be divided into two Packages: A1 and Package A2 in order to reduce the ABC and thus facilitate the eligibility of contractors.

While CP-A1, A2 and B proceeded on through into the bidding stage and eventually resulted in signed contracts by May 2008, 8 months since initial bidding process, the bidding for CP-C failed when the lone bidder could not comply with the ABC of Peso 2.040 billion. As a result it was proposed, while still following the requirements of RA 9184, to following measures:

- Repackage Contract Package C by deleting the work items and related Cost Centers for the four (4) major sub-components of: Signaling, Telecommunication Systems, Automated Fare Collection Systems and Track Works.
- Contract Package C would remain as Infrastructure-type procurement consisting of: Sub-Station Power Supply and Distribution, Overhead Catenary System (OCS) and Station Services. The ABC for Contract Package C would be decreased to recognize the removal of the indicated sub-components.
- The repackaged Contract Package C would be renamed to Contract Package C (Revised) and be bid following the required procedures of RA 9184.
- The sub-component systems items of Signaling, Telecommunications Systems, Automated Fare Collection Systems and Track Works would be bid as EMS-1, 2, 3 and 4 respectively on the basis of Direct Contracting of Goods, as described in RA 9184. These were determined to be proprietary systems and such a method is therefore appropriate for their procurement. LRTA wrote to GPPB regarding this concept requesting approval.
- It was also suggested at that time by the Consultant that increased ABCs would be required for the EMS packages to recognize increases in the cost of materials, currency fluctuations, etc. and so this was requested of LRTA, approved by the LRTA Board and later by NEDA in July 2009.

On 27 May 2008, GPPB advised LRTA that the alternate procurement for the specialist Sub-Systems (EMS-1~4) as proposed by LRTA/Consultant was considered acceptable.

Despite the restructuring of the electromechanical contracts, repeated cycles of prequalification and biddings were required for all of these packages except EMS-2 before contracts could be achieved. Finally, all packages were contracted by December 2008, fourteen (14) months after the initial call for tendering.

3) Key Points to take into Consideration

- The requirements of RA 9184 are quite stringent and the processing during the prequel/bidding process is quite exacting so that the Bidders must be very careful in preparation of their bids in

order to avoid disqualification. While this was often stressed by SBAC and the Consultant during the Pre-Bid meetings, it never seems to get through to the Contractors with corresponding disastrous results to the bidding process and resulting cycles of failed bids. Tight time constraints for some of the biddings further exasperated the problem.

- Recognition of different registration and licensing arrangements in other countries need to be allowed for to avoid unnecessary disqualification of foreign contractors. Additionally, sufficient time needs to be allowed for so that required Philippine Embassy verification of documents can be accomplished. Eventually, SBAC approved a two-step process wherein uncertified copies were initially allowed but Contractors advised to submit certified copies prior to award.
- The initial plans to simply have single viaduct package (A), station package (B) and electromechanical package (C) were clearly untenable from a variety of views. The shear financial size of each of the packages eliminated nearly all of the local firms. Also, qualified foreign firms could not meet the requirements for PCAB licensing. The process of obtaining a Special PCAB license is a long and difficult process in the Philippines. This has been a long-standing issue and needs to be addressed by government.
- The bidding of the electromechanical packages demonstrated that costs become escalated as a result of local contractors applying excessive mark-ups to the subcontracted foreign supplier costs. Clearly, it is less costly to deal directly with the foreign specialists firms in such cases.
- Specialized electromechanical works therefore need to be addressed as “Goods”-type procurements rather than as infrastructure projects so as to allow for foreign participation without PCAB license issues. Bidding as “Infrastructure”-type contracts prevents foreign firms from bidding due to ownership and licensing restrictions or relegates them to a minority position in a Joint Venture or as a mere subcontractor where their experience would not be considered during the evaluation. Costs also become inflated due to layering of mark-ups.
- It would probably be required to get GPPB approval for such “Goods”-type procurements in each case to avoid potential legal issues.

In summary, this Law has been tested unsuitable for large-scale, highly technical projects, and it is not recommendable for a future Line 2 Extension Project. Fortunately, as mentioned in Section 1.3.8, this Law does not apply in case of project funded by Foreign Grants, and/or project under PPP project covered by respective R.A. 7718.

5.7.4 Key Points for the Line 2 Extension Project

Based on the experience of carrying out similar projects in Manila, such as the ones mentioned in this section, and also in other developing countries, the following points are brought to be considered in the future implementation of the Line 2 Extension Project.

1) Contract Type

The contract for the Consultant is recommended to be based on Lump Sum instead of Man Months (MM), at least for the engineering and tender assistance period, which has been usually very unpredictable in terms of duration, thus usually difficult to manage in terms of human resources if contracted under MM.

In case of the Contractor, the Design & Build (DB) type of contract is recommended over the Bill of Quantity (BOQ) type of contract. The benefits of a Design & Build contract are that as detailed design is done by contractors, the time for procurement of contractors is shorter and the possibilities of large variation orders is reduced considerable. Under DB the Contractor assumes more risks than Consultant and Client, contrary to BOQ, where the Client and Consultant takes more responsibilities, ergo, risks than the Contractor.

However, the most important reason is that in railway projects it is necessary to have a proper interface between the civil portion and the electro-mechanic systems. It is a norm that the “end user” is the

electro-mechanic system, thus the civil portion receives as input the information for the proper interface. For example, the OCS indicates to the civil designer where the catenary posts will be located, so the civil designer takes that into account during detail design, in the same way, the Power contractor indicates the size of the room needed in the stations, the location of power and other connections, etc. Thus, it is important that the civil detail design is done simultaneously with the electro-mechanic design, so there is a proper interface. If Detail Design is done during Engineering stage by the Consultant valuable information will not be available at that time since the selection of contractors has not yet been implemented.

2) Operations by Private Company

In case of considering the implementation of this project under any PPP scheme, it has been pointed out that it is important to allow the private sector not only to operate the system but also collect the revenue, hence, assuming the market risk.

Needless to say, a Minimum Guaranteed Revenue (MGR) is always considered, but the definition of such parameter has to be carefully and fairly negotiated before signing Concession Agreement between Government and Private party. Together with the setting of a MGR, the Private operator should be allowed to increase fare. Also the fare structure must be defined during contract negotiations. It is highly unadvisable to leave the decision to modify the fare to the Public party, as it will be influenced by non-technical issues.

As mentioned before in this section, the operation and demand risk should be allocated on the same private investor that builds the system. This is the case of the so called Net Cost Scheme, and that negotiations of contract conditions should be carefully carry out and supervised by related stakeholder and agencies to avoid one-sided clauses that would favour one party in over the other. A PPP scheme must be always a *win-win* deal.

3) Single Package

As learnt from Line 1 NEP, and other projects world-wide, it is highly advisable to have the least amount of packages. Given that this project is relatively small in size and scope, it is perfectly possible to have a single Contractor to implement the entire project in case this is funded from a single source (ODA). On the other hand, in case of implement this project on a PPP scheme under a two-tiered condition, it will be necessary to have at least two contractors, one for each tier (ODA + Private). The bidding in the latter case has to be done almost simultaneously for the two contractors.

The benefits of having fewer packages are obvious but nevertheless mentioned here:

- Better and simpler contract and documentation management
- Better interface management between subsystems and civil works
- Single-point accountability (or two-point): if a problem arises in the works, the owner looks to a single party, namely the contractor, for accountability.

CHAPTER 6

CONFIRMING PROJECT IMPLEMENTATION STRUCTURE

CHAPTER 6 CONFIRMING PROJECT IMPLEMENTATION STRUCTURE

6.1 Confirming implementation structure

6.1.1 PPP System and Procedure

The general legal framework and procedure for a PPP project implementation are as explained in **Chapter 1.3** Review of the Legal Framework for PPP summary of which particularly applied for implementation is as follows.

The BOT Law (RA-6957) of 1990 is a policy statement authorizing the financing, construction, operation and maintenance of infrastructure projects by the private sector. The policy declaration acknowledges the 'indispensible' role of the private sector as the main engine for national growth. The policy statement is that the Government will provide favorable incentives as attraction for its immediate mobilization. The Law gave the institutional guideline as to the authorized government entities that the private sector can enter into contract with and stipulated on the process of determining the projects that could be undertaken by the private sector.

The BOT Law (RA-7718) of 1994 was enacted by amending RA-6957 to further reinforce the policy direction for private sector investments into the governments' infrastructure programs. PPP projects were identified in a wide variety of infrastructure fields from power plants, transportation, telecommunication to information technology networks to educational facilities. This amended Law further provides other forms of private participation beyond the general BOT and BT Schemes under RA-6957. The private sector may also participate in the form of Build-Own-&-Operate (BOO), Build-Lease-&-Transfer (BLT), Build-Transfer-&-Operate (BTO), Contract-Add-&-Operate (CAO), Develop-Operate-&-Transfer (DOT), Rehabilitate-Operate- &-Transfer (ROT), Rehabilitate-Own-&-&Operate (ROO).

This amending RA-7718 placed the benchmark of determining the appropriate returns-on-investment with the Investment Coordinating Council (ICC) of the National Economic Development Authority (NEDA). This authority grant makes the NEDA-ICC essentially the clearinghouse for project approvals: from feasibility studies, project implementation plans, PPP Terms-of-Reference etc.

RA-6957 also incorporated the procurement process related to public bidding of PPP projects and conditions. It was in this amendment where the Coordinating Council of the Philippine Assistance Program, together with other Government Agencies was tasked to develop and promulgate the Implementing Rules and Regulations relevant to RA-6957. The function of the Coordinating Council for Private Sector Participation (CCPSP) was to act as a one-stop-shop to support and promote private sector investments. investments. As for the supplementing Implementing Rules and Regulation (IRR) by RA-7718 were described in Section 1.3 with rules categorized shown in **Table 1.3-3**.

For LRT Line 2 Extension Project under the PPP scheme, its Project Implementation procedure and the expected schedule is explained in Chapter 5.3.2 Implementation Schedule at its **Figure 5.3-1**. To re-state each Phase so far and the planned schedule is summarized in as follows.

Table 6.1-1 PPP Project Cycle and its Phases

Phases	Content	Remarks
Phase 1	Project Identification Stagy	Done through METI Study in 2010
Phase 2	Feasibility Study Phase	This Study in Year 1
Phase 3	Project Approval Phase	Year 1
Phase 4	Financial Packaging and L/A signing Phase	Year 2
Phase 5	PPP Packaging Phase	Year 2
Phase 6	ROW/Land Acquisition Phase	Year 2
(Phase 7)	(Rehabilitation of the Existing Portions of Line 2)	(Year 2)
Phase 8	Engineering / Designing Phase	Year 3
Phase 9	EPC/PPP Party Selection Phase	Year 3
Phase 10	Construction Phase	Year 4-6
Phase 11	Operation and Maintenance Phase	Begins at the end of Year 6

Source: Study Team

6.1.2 Issues and Bottlenecks for Implementation

Since Phase 1: Project Identification and Phase 2: Feasibility Study have been done, the Issues and Bottlenecks for Implementation are reviewed from Phase 3 and onwards.

1) Phase 3: Project Approval Phase

DOTC/LRTA application preparation should be adequately completed and in a timely manner. ICC Formats were already distributed to the related agencies and the Study Team has confirmed that the requirements are well digested by both DOTC and LRTA. Their preparation work would be helped by this Study. The contents and recommendations of this Study are expected to suffice for both DOTC/LRTA to prepare their own application.

NEDA-ICC Board approval might require a lengthy application review at NEDA secretariat and further its approval process may be required longer period than expected. The Study Team, however, understands from the fact that this Project was listed as one of the priority project among the 2011 Rollouts in line with the President's strategy on PPP project implementation.

2) Phase 4: Financial Packaging and L/A signing Phase

Government side budgeting at DOF and DBM should also be in line with the expected implementation schedule so that the allocation is proposed and allocated adequately and then its fund release should be done in harmony with the other funding source and its release timings.

Private sector financial arrangement, in case where Private sector is responsible for financial arrangement, should be prepared practically and adequately. In the case of the Project, the Study Team was informed that the Philippine banks are positive in making a project funding available based on the LRTA's well established banking relationships.

Financial Risks, the detail of which is explained below at Chapter 6.2, may cause substantial bottle neck in providing the Project implementation funding. Some of them are sudden change in foreign exchange rate, a moratorium affecting overseas procurement, or increase in interest rates, caused by a global or regional financial market downturns.

3) Phase 5: PPP Packaging Phase

For a successful PPP project, Private sector sees sufficient package to secure their return on investment, primarily from railway operations and also possible associated and non-railway business opportunities. Sometimes, it would be required to consider some government subsidies to maintain the financial stability of LRTA. The role of LRTA as the indirect operator under the PPP scheme is also needed to be thoroughly reviewed. The followings are some key points to bear in mind for Public sector not to see substantial stumbling block when packaging a PPP package for the Project.

An Entire Operations and Maintenance of the Whole Line 2 would be a suitable option to expect good interest among Private sector, although this Study focuses only its Extension. Only Public sector has been operating railway including the urban railway operations. With a view to introduce an effective PPP project and its operations, an entire O&M approach is expected when compiling PPP Package.

Risk Allocation between Public and Private sectors could generate difficulties in securing a good Value for Money at Public sector while offering affordable and interesting opportunities to Private sector. The Study Team believes the recommended PPP Schemes will meet to realize the benefit of both sectors.

Recognition of the new Role of LRTA will be an important factor, with adequate capacity building, when PPP Package is prepared. The Project under PPP should be presented, as a part of PPP package, the relationships of LRTA, particularly as the indirect operator to regulate, monitor, supervise and evaluate Private sector particularly when they are expected to be engaged in O&M activities. The shortage of understanding of LRTA may lead to a bottleneck in contract negotiations of Public sector with Private sector.

4) Phase 6: ROW/Land Acquisition Phase

The LRT Line 2 Extension has, though it is relatively limited, but it goes through populated areas where careful ROW/Land acquisition activities are required. The Study already entered into its preliminary social assessment by inviting community leaders and utility companies affecting directly to the current residents.

Prior confirmation on the ownership, zoning and actual occupiers and settlers should be done adequately. The natural and social environmental issues may be expressed in the form of resistance from some land owners and occupiers.

Preparation and conduct of Environmental Impact Assessment directly affecting ROW/Land acquisition should be done property. EIA in due course in conformity with the regulations should be conducted.

Agreeing on the land and property evaluation as well as the compensation and resettlement package shown to the owners and occupiers could be difficult that may lead to lengthy and prolonged negotiations. In many of precedent projects, this has been one of the strong stumbling block in implementing infrastructure projects.

5) Phase 7: Rehabilitation of the Existing Portions of Line 2)

Rehabilitation of the existing portion of Line 2 that was originally financed by JBIC (current JICA) is one of the key issues for eventual delay and demarcation of the Public sector and Private sector, though the rehabilitation of the existing portions of Line 2 is not a part of the Terms of Reference of the Study. As pointed out in Chapter 4.4.1.4, however, some repair work, civil work, and E&M facilities are in need of rehabilitation prior to the Project implementation.

Seeking a new financial resource other than JICA (JBIC) since JICA will not accept the repeating finance on the same project. Rehabilitation is not anticipated in the original JICA Yen Loan and thus LRTA will need to arrange financial resources to cover the rehabilitation activities.

Implementation of the rehabilitation work is preferable be completed before the Phase 10: Construction Phase, though it is understood not as the prerequisite before the commencement of the construction work. It would be, however, if the rehabilitation work and the Project construction work are conducted during the Project construction, the demarcation could be complex on the role and responsibilities among LRTA and the parties engaged in the rehabilitation work and Private sector responsible for the Project construction and other engineering work under the some PPP schemes where Private sector is responsible for.

6) Phase 8: Engineering / Designing Phase

The LRT Line 2 Extension Project is that the key approach on the engineering and designing work should be under the whole Line 2 principle and not only applied to the Extension parts of the Line 2. In this respect, the Study Team believes that the new and unexpected bottlenecks during this phase may need to consider as the one seriously affecting the Project implementation.

Close coordination with the related agencies has the primary importance to comply with the civil and engineering work regulations. Primarily MMDA and each local government unit coordination in this regard is important. On top of that, coordination with utility companies for relocation and protection of public utilities is needed.

7) Phase 9: EPC/PPP Party Selection Phase

The Study Team understands that the NEDA-ICC and PPP Center have been well disseminating the concept of PPP and requirements for procedures for the EPC/PPP Party selection. Having said it, however, there might be the following bottlenecks in light of the past experience particularly in the Philippines.

Capacity and adequacy of Public agencies may cause some bottlenecking situation. They may not have well prepared documents in complying with the prescribed processes and procedures. In some cases, the improper advertisement for international tender may not be performed. In some other cases, bidding document package may be incomplete or inadequate.

Clearance and approvals required from agencies may not be obtained properly in timely manner. As stated above, ROW / land acquisition may not be completed by the time when the construction should start.

No application is made due to the lack of attractive PPP Package for Private sector in assuring good return or some other reasons such as transparency of bidding processes, or sometimes the timing of this phase may coincide with adverse political or economic situation in the country or in the neighboring countries.

Tender process may take longer period than expected. A series of required procedures may necessitate lengthy procedures and thus longer time in getting clearance, consent and approval by the agencies concerned.

8) Phase 10: Construction Phase

The line 2 extension project is extending 4.1km to east side, 1.6km to west side. If it is identified bottlenecks, it is assumed to be related to those outside the field of engineering or technical causes.

Delay in construction due to the ROW / Land acquisition is not completed. ROW/Land acquisition, as stated above, may take unexpectedly long period in agreeing with the concerned community and also resettlement plans to be implemented and finally the areas in questions is fully evacuated and ready for construction.

Poor quality and time management may cause delay in construction and even in the worst case not to achieve the quality and required a large scale reconstruction. In such cases, a more strict quality monitoring, supervision and control would be required.

Unsuitable construction management may lead to delay or blockage of the work. They could be safety to public, workers, and travelers, night and holiday work in the residential areas, traffic re-routing to mitigate traffic congestion.

9) Phase 11: Operation and Maintenance Phase

Adequate level of fare setting and its timely revision in light of business and economic reasons are crucial for sustainable O&M for both Public and Private sector whatever form of PPP Scheme is adopted. Although LRTA has an authority to fix the fare, that initiative may be affected by the government intervention due to the public good nature of services offered by LRT lines, though the affordability by the general public should be respected.

Railway operation related activities such as the O&M of PPP in other LRT network, Common ticketing services, possible associated operations, and the feeder traffic relation and inter-connectivity with other transportation means are directly affecting the O&M operations. For each case, the O&M service provider should be well consulted beforehand so that the operations are not adversely affected by those activities.

Replacement, Renewal and Large Scale Repair Work should be well planned efficiently, and not affecting O&M activities under the PPP scheme. Since LRTA Line 2 operation started in 2003, the rolling stock needs to be replaced from 2022 based on 20 years of its life expectancy. Same applies to the civil work and E&M system having about 15 years of life. They may also need to make a large scale repair and replacement under a long-term repair program. As the time goes by, the LRTA would expect substantial capital investments for maintaining its capacity but the operator should not be asked to bear those investments.

Capacity of LRTA as operational regulator and supervisor, as the indirect operator under PPP scheme, is envisaged. The regulator role on the engineering, technical and operational and the supervisor role with Private sector, not limited only those for Line 2 but also others, should not undermine the efforts of Private sector but also keep good standards particularly in connection with transport safety and security.

6.1.3 Experience and Lessons from the Past LRT Projects in the Philippines

In order to smoothly implement the Project, key points will be identified in this Study based on historical record of previous similar project implemented in Manila. They all vary in funding and procurement method, scope of works, and size, but being all railway project, they are considered for inclusion in this section.

6.1.3.1 MRT Line 3

- **Ridership responsibility and control over the fare**

Manila's MRT Line 3 was developed from 1997 under the BLT Scheme with a Concession Contract with MRTC assuming responsibilities on finance, design, construct, and maintain the MRT3 system in exchange for a regular lease payment to service debt, provide equity return, and fund maintenance. MRT

Line 3 has always negative farebox since its initial segment of MRT3 opened in December 1999 and thus DOTC needed to prepare budget to subsidize and cover its lease payment to the private sector. In July 2000, then President of the Philippines directed DOTC to reduce the MRT Line 3's fares. Although the reduced fare helped the increase the ridership, they have also created additional budgetary challenges for DOTC. In 2005, the DOTC petitioned to increase fares to reduce subsidy requirements but the President denied this increase and since then DOTC is not successful in raising the fare.

The inability to control the fares had created budgetary troubles for the party that takes the risks on demand. Since in this particular case the risk falls on a government agency, the central government is politically tempted to keep fares artificially low for non-technical reasons. It might be a different case if fares are set by contract and government could not interfere with the schedule of fares without risking legal actions from the private investor.

The Net Cost Scheme might be one solution on this case. MRT Line 3 could have been operated by Private sector concessionaire for whom the demand or ridership risk was responsible. The Net Cost Scheme was examined and recommended in Chapter 4.

6.1.3.2 LRT Line 1 North Extension Project

- **Pre-Qualification and Bidding Requirement**

LRT Line 1 North Extension Project was financed by the Government of the Philippines in accordance with Government Procurement Policy Board (GPPB) requirements and therefore Republic Act (RA) 9184 and its Implementing Rules and Regulations (IRR) have to be complied with. The first three contractual packages were published in October 2007, but all seven submissions were rejected due to the lack of compliance with the documentary requirements set-out in the Eligibility Documents.

LRTA Board issued a Resolution of failure of bid documents in November 2007 stating that all Packages were declared as failed. Repackaging of E&M contract was made, however, it It took 14 months before all the packages were contracted by December 2008 since the initial for tendering despite the restructuring of the electromechanical contracts, repeated cycles of prequalification and biddings were required for all of these packages.

The requirements of RA 9184 are quite stringent and the processing during the prequel/bidding process is quite exhausting so that the bidders must be very careful in preparation of their bids in order to avoid disqualification. While this was often stressed by SBAC and the Consultant during the Pre-Bid meetings, it never seems to get through to the Contractors. Tight time constraints for some of the biddings further exasperated the issues.

R.A.9184 is unsuitable for large-scale, highly technical projects, and it is not recommendable for a future Line 2 Extension Project. Fortunately, as mentioned in Chapter 1.3.8, this Law does not apply in case of project funded by foreign grants, and/or project under PPP project covered by respective R.A. 7718.

6.1.4 Experience and Lessons from the Past LRT Projects in Foreign Countries

There are several cases where PPP schemes have been introduced into LRT projects in foreign countries as describe in Chapter at the **Table 4.4-2**. In South East Asian countries, the following cases are the urban railway operations under the PPP Scheme.

- Bangkok MRT Purple Line under BOT Two-Tiered Gross Cost
- Bangkok MRT Blue Line under BOT One-Tiered Net Cost
- Bangkok BTS under BOT without Subsidy
- Kuala Lumpur KLIA Xpress under BOT with Subsidy

Bangkok MRTA has adopted two different schemes, adopting BOT Net Cost for the existing Blue Line since 2004 and BOT Gross Cost scheme for the planned Purple line now being implemented. MRTA started with BOT Net Cost scheme that is similar to what LRTA now envisages by inviting Private sector to participate in the urban railway operations.

MRTA has been experiencing difficulties in managing the concession contract with operating company under PPP BOT Net Cost Scheme. Reviewing themselves too remote from the railway being an Indirect Operator, they are now making their way to get closer to a Direct Operation. The first step they adopted was the BOT Gross Cost Scheme. Historically speaking, MRTA's direction is considered as a "reverse order development", while most of history of other railway companies around the world still are operating directly and some maintenance work are outsourced, some administration work such as ticket collection and traffic reporting work have been contracted out.

MRTA could not operate directly due to some political pressure when they started Blue Line PPP process in spite of the wish of its management that strongly desired a direct operation. Legal and contractual knowledge and supporting negotiating skills were not advanced enough when MRTA entered into its first PPP Project Blue Line with BOT. They realized when they began operations, they could not exercise well their regulating, supervising and evaluating role vis-à-vis the concessionaire. Having said this, however, the Study Team does not discourage LRTA to take Net Cost Scheme as one of the PPP Scheme options.

A careful approach on PPP contract package will be required when negotiating PPP contract packages to secure and protect well the right of LRTA as one party of the Concession contract, as the operational regulator and supervisor under the contract so that LRTA will be able to manage, operate and maintain properly its lines. It is thus meaningful to look into the case of MRTA as a good preceding experience to draw out lessons from them.

Several challenges by the case study for LRTA are:

- LRTA should appreciate their current railway know-how that has been accumulated since its establishment, and it will be essential expertise in carrying out its new regulator and supervisor roles,
- Economic and Financial Return as well as Value for Money are essential benchmarks when reviewing and implementing a project under PPP, but so far due to the nature of public transport as its core business, some measure to raise its performance should be sought,
- Role of LRTA will, under the PPP scheme adopted, inevitably change to an Indirect Operator where LRTA is required to rely on Private sector and will not be able to touch railway operations directly, but still asked to manage Private sector O&M activities, for example,
- Planning ability for developing associated and non-railway businesses should be further enhanced to widen the scope of LRTA as long as its charter allows.
- Legal knowledge, contractual know-how and negotiating skills will be common across LRTA starting from tender process phase through to operational phase, and Operations keeping engineering and technical expertise should be maintained and appreciated so that the staff could perform their professional duties of operational regulation and supervision.

The detail of the case study of Bangkok MRT is shown in APPENDIX-C.
In light of those expertise and know-how accumulated in LRTA, it is crucially essential to consider appropriate risk allocation between LRTA and a Private sector under the proposed schemes in Chapter 4. with a view to adequately protect the advantages and strengths of LRTA to avoid difficulties that MRTA went into.

6.2 Risk allocation table for project implementation under PPP scheme

6.2.1 Introduction

The Study Team recommends four PPP Schemes in comprehensive estimation of operational scheme in **4.4.5.** They are:

- Type 3 (Lease+O&M),
- Type 4-2 (BTO, Two-Tiered, Net Cost),
- Type 4-4 (BTO, One-Tiered, Net Cost) and
- Type 5-2 (BOT, Two-Tiered, Net Cost),

Judging from the conformity with the government policy and efficiency of asset management, and efficiency of design, construction and management, and appropriateness of public and private sector risk allocation as well as the financial evaluation.

A short summary of PPP Scheme is explained below before making a detailed risk allocation analysis for each PPP Scheme with a view to highlight the differences among the Schemes. The main risks applied to any cases are explained first on its description, magnitude, responsible party and reasons. Risks are, primarily, divided into three stages, i.e. a) risks identified in common during the whole period of the project and particularly those b) during the design and construction stage, and finally c) during the operational stage.

The possible risks are analyzed, for each case, on its i) content and magnitude, ii) the party to whom risk responsibility is allocated, and iii) remarks giving reasons of risks and specific considerations are deployed in a form of table. For some particular risks needing specific attention are explained after each Case. Many common risks, applied to all the cases, are explained later.

The analysis will further develop how to avoid, alleviate and mitigate those risks, and what managerial resources (human, technical and financial) should be deployed in 6.4.

6.2.2 Risk Allocation for Recommended PPP Scheme

6.2.2.1 PPP Scheme 1 – Type 3 Lease + O&M

Type 3 Lease and O&M, is defined that Public sector is responsible for Land acquisition, Finance, Construction and Owning assets, whereas Private sector is engaged in O&M and Fare collection. Upon completion, all the assets remain at Public sector.

During the operation, Private sector will collect both farebox and other revenues and pay a lease fee to Public sector (LRTA). Public sector (LRTA), by receiving the lease fee from Private sector, will cover its construction cost, financial expenses such as loan repayment and interest payment and its income tax as well as other expenses.

This Lease + O&M does not comply with the government policy since it will not invite Private sector investment. Assets always remain at LRTA, in line with the policy on the asset management but the implementation efficiency will not meet since the construction is done by LRTA whereas O&M is done by Private sector, i.e. by different entities.

On the business risks, Public sector (LRTA) will assume the whole construction risks. As for the Private sector, it bears the whole O&M risks such as performance risks, repair risks and deterioration risks. As for the LRTA borne risks, the other key risk for LRTA is how they secure ridership for sustainable revenue flow.

This Type 3 has been applied at the Expressway (NLEx, SLEx and SCTEx) in the Philippines.

As stated above, Public sector (LRTA) will be responsible for the whole part of Construction, that will be the most serious risk for LRTA under this Scheme. General explanation is give later in this Chapter, but let us review its contents, magnitude, and some considerations to be borne by LRTA under this scheme.

Design and Construction risks – They are defined as risks associated with the design, procurement, engineering, construction, completion, testing, and commissioning and with any integration that must take place with existing systems. Design generally takes the risk of errors in design that may lead to the failure of Project to satisfy contractual requirements or laws. The risk of faults or changes in design, latent defects, and asset life expectancy would have to be specified and responsibilities allocated. Construction risks are related to discrepancies, omissions or errors with planned specifications, including construction, integration, installation, testing, commissioning. Under this case LRTA carries the risk of increases in construction costs of price of labor or materials and is also responsible for the performance of all subcontractors as well as risk of delays.

Increased Project cost risks - Errors in forecasting may have a substantial impact on the real economic cost of construction of infrastructure, financial planning, and project management considering high capital cost of projects. Unanticipated escalations in construction costs and higher-than expected inflation rates are factors that may lead to potential overruns. LRTA must carefully analyze the forecasting techniques to establish project costs.

Table 6.2-1 Risk Allocation Chart for Type 3: Lease + O&M (1)

Public: Land Acquistion, Finance, Construction, Own
Private: O&M, Fare Collection

Stage		Type of Risks		Contents of Riks	Risk Allocation		Remarks
					Public	Private	
Common	Political and Macroeconomic Risks	Political Risks	Traditional political risks	The risks include nationalization, new tax regimes, and other events that affect debt service and profits	x		
			Regulatory risks	The risks include the imposition of new standards or the introduction of competition,whereas quasi-commercial risks include breaches by Public or interruptions because of changes in Public's plan	x		
			Other political risks	The risks include acts of war, rebellion, default, and failure of public sector entities	x		
			Change of Law Risk	The risks of change of law, including adoption, modification, or repeal, may happen after a PPP agreement has been signed and become effective. 1) Currency or capital repatriation limitations, 2) Nationalization, 3) Import and Export restrictions, and 4) Deprivation of Private rights	x		
		Macro-economic Risks	Contingent Liabilities	The risks of contingent liabilities	x		
			Risk of Change in Interest Rate	The risk of interest fluctuation during construction	x		
				The risk of interest fluctuation during operation	x		
			Risk of Change in Inflation Rate	The risk of price fluctuation during construction	x		
				The risk of price fluctuation during operation	x	x	
			Risk of Change in Foreign Exchange	The risk of foreign exchange rates during construction	x		
				The risk of foreign exchange rates during operation	x	x	
	Risk Specific to the LRT	Interface Risk		The risk of interface that Private would have under an integrated contract and the implications of the risks among the parties within Private		x	
		Risk of Increased Project Costs		Inadequate definition of scope and objectives of projects in the business case: Public risk	x		
				Inadequate management of the project during the implementation phase so that costs are not controlled and contractual risk mitigation instruments are not adhered to: Private risk	x		
	Project-Related Risks	Development Risk		The risk of the development phase includes the invitation to tender and bidding, the negotiation of the PPP agreement and various project documents, and the effort to obtain debt and equity funding.	x		
		Performance Standards Risk		The norms and standards that are to be applied during both construction and operation in the LRT PPP agreement need to be established early.		x	
		Financing Risk		The risk of increases in the interest rate or inflation rate	x		
		Facility Risk		The risk of facility damage and integrating the system with existing modes of transportation.	x		
		Environmental Risk		Environmental risk, such as noise pollution and emissions.	x		
	Third party indemnity			The risk of third party indemnity	x	x	
	Hidden defect			The risk of hidden defect	x		
	Force majeure			The risk of force majeure	x		

Source: Study Team

Table 6.2-1 Risk Allocation Chart for Type 3: Lease + O&M (2)

Stage		Type of Risks		Contents of Riks	Risk Allocation		Remarks
					Public	Private	
Design and Construction Stage	Risks during Designing and Construction Stage	Specfic Risks		The risks of the existing route and facility, and work at the connecting point between the existing and the extended part that may interfere the smooth operations for trains.	x		
	Project-Related Risks	Design and Constructio n Risk	Design	The risk of design. Whichever party takes responsibility for the design generally takes the risk of errors in design that may lead to the failure of the project to satisfy contractual requirements or laws. The risk of faults or changes in design, latent defects, and asset life expectancy would have to be specified and responsibilities allocated.	x		
			Permits and access	Providing support to Private and guaranteeing the timely delivery of land required	x		
				Obtaining such permits and licenses	x		
			Construction	The risk of construction costs, perfomance, and delay	x		
	Project-Related Risks	Government Guarantees		The risk of changes in contract costs	x		
	Risks during the Tendering Stage	Tendering Stage Risks		Delay or non-execution of the contract Delay or non-execution of the contract The risks of the project content change The risks of the case where no private sector company applies	x		
Operations and Maintenance	Risk Specific to the LRT Sector	Demand Risk	Ridership risk	The risk of ridership		x	
			Revenue risk	The risk of revenue		x	
			Demand for service	The risk of demand for service		x	
			Fare levels	The risk of fare levels		x	
			Fare collection strategy	The risk of the ticketing collection technology and strategy	x		
	Project-Related Risks	Existing Services		Private: The risk of time that Private take over the responsibility for existing service delivery		x	
				Public: Define an expected service level for existing services, specify the level of repair services needed to maintain existing standards.	x		
		Operational and Maintenance Risks		The risk of operating the existing and new assets and maintaining them to required standards.		x	
	Risks Associated with Managing the PPP Agreement	Payment Mechanism		The risk of private financing for LRT schemes.	x		
		Use of Bonuses and Penalties		The risk of using of bonuses and penalties.	x		
		Price Variations		The risk of price variations, such as inflation, input costs, legal regulations, are likely to change in unpredictable ways.	x		
		Risks of Inflation: Indexation		The risk of costs inflating over the life of the PPP agreement.	x		
		Cost Pass-Through		The cost of risks over which Private does not have any control.	x		
		Fare Risk: Indexation Formula		The risk of the effect of exogenous cost increases of Private's cost.		x	
		Residual Value Risk		The risk of how to manage the residual value.		x	
	Risks during Operations and Maintenance Stage	Operational and Maintenance Risks		Facility service delay	x		
				Non-achievement of the required quality of the facility	x		
				Required specification change	x		
				Associated with fare rise		x	
				Repair and rehabilitation	x	x	Public: Large scale rehab, Private:consumables
				Project closing process	x		
				Mal-function of AFC system	x		
				Hidden or repair on the existing route	x		

Source: Study Team

6.2.2.2 PPP Scheme 2 – Type 4-2 BTO Two-Tiered Net Cost

Type 4-2 BTO Two-Tiered Net Cost is defined that Public sector (LRTA) is responsible for Land acquisition, Finance, Construction (Civil work), Owning assets, whereas Private sector is engaged in Financing, Construction (E&M and rolling stock), O&M and Fare Collection. Upon completion of the construction work by Private sector, the ownership is immediately transferred to LRTA and then LRTA will let Private sector be engaged in O&M activities and Farebox and other revenue collection.

During the operation, LRTA will receive, when the operation is profitable, a concession fee, and if the operation is not profitable, pay a service fee to Private sector. Private sector, by receiving the service fee from LRTA, will cover its O&M cost, financial expenses such as loan repayment and interest payment and its income tax as well as other expenses in the case where the operation is unprofitable.

This BTO Two-tiered Net Cost is well in line with the government PPP policy since it will introduce a partial private investment, through E&M and Rolling stock procurement. LRTA will own the whole Assets, in harmony with the government policy. The implementation efficiency is considered good since Private sector is responsible for both E&M and Rolling stock during the construction phase and continue to be responsible for O&M as well as Fare collection. The whole life cycle except for Construction (Civil work) is offered to Private sector. ODA is possibly applied to cover financing of Public sector and, could be by an accompanying two-step loan for Private sector.

On the business risks, Private sector bears E&M system procurement and construction risk as well as Rolling stock procurement risk, On the other hand. Private sector bears the demand risk and revenue risk during the operation phase also financing risk, recovery risk and long-term management risk. Demand risk to be assumed by Private sector is considered a characteristics of this Scheme and it is analyzed below.

Demand Risk - A Demand forecast related to a LRT Project is considered as a one of the main inputs to the economic and financial analysis. In a demand assessment, ridership measurements, travel times, and train speeds are required for calculating operating costs and benefit. However, demand forecasting is typically a complicated process. For example, when ridership is lower than forecast, the revenue is reduced. However, when demand is higher than expected, more services are required, potentially affecting the quality of service. Historically, demand forecasts have proven unreliable, often failing to be sensitive to demographic changes, demand shift, competition, cost increase, and willingness to pay. Public transport passenger volumes are difficult to obtain, and such flows vary daily and seasonally.

Table 6.2-2 Risk Allocation Chart for Type 4-2: BTO, Two-tiered, Net Cost (1)

Public: Land Acquisition, Finance, Construction (Civil), Own
Private: Finance, Construction (E&M, Rolling Stock), O&M, Fare Collection

Stage		Type of Risks		Contents of Riks	Risk Allocation		Remarks
					Public	Private	
Common	Political and Macroeconomic Risks	Political Risks	Traditional political risks	The risks include nationalization, new tax regimes, and other events that affect debt service and profits	x		
			Regulatory risks	The risks include the imposition of new standards or the introduction of competition,whereas quasi-commercial risks include breaches by Public or interruptions because of changes in Public's plan	x		
			Other political risks	The risks include acts of war, rebellion, default, and failure of public sector entities	x		
			Change of Law Risk	The risks of change of law, including adoption, modification, or repeal, may happen after a PPP agreement has been signed and become effective. 1) Currency or capital repatriation limitations, 2) Nationalization, 3) Import and Export restrictions, and 4) Deprivation of Private rights	x		
		Macro-economic Risks	Contingent Liabilities	The risks of contingent liabilities	x	x	
			Risk of Change in Interest Rate	The risk of interest fluctuation during construction	x	x	
				The risk of interest fluctuation during operation	x	x	
			Risk of Change in Inflation Rate	The risk of price fluctuation during construction	x	x	
				The risk of price fluctuation during operation	x	x	
			Risk of Change in Foreign Exchange	The risk of foreign exchange rates during construction	x	x	
				The risk of foreign exchange rates during operation	x	x	
	Risk Specific to the LRT	Interface Risk		The risk of interface that Private would have under an integrated contract and the implications of the risks among the parties within Private		x	
		Risk of Increased Project Costs		Inadequate definition of scope and objectives of projects in the business case: Public risk	x	x	Public: Land, Civil Private: EM, R/S
				Inadequate management of the project during the implementation phase so that costs are not controlled and contractual risk mitigation instruments are not adhered to: Private risk	x	x	
	Project-Related Risks	Development Risk		The risk of the development phase includes the invitation to tender and bidding, the negotiation of the PPP agreement and various project documents, and the effort to obtain debt and equity funding.	x		
		Performance Standards Risk		The norms and standards that are to be applied during both construction and operation in the LRT PPP agreement need to be established early.		x	
		Financing Risk		The risk of increases in the interest rate or inflation rate	x	x	Public: Land, Civil Private: EM, R/S
		Facility Risk		The risk of facility damage and integrating the system with existing modes of transportation.	x	x	
		Environmental Risk		Environmental risk, such as noise pollution and emissions.	x		
	Third party indemnity			The risk of third party indemnity	x	x	
	Hidden defect			The risk of hidden defect	x	x	
	Force majeure			The risk of force majeure	x		

Source: Study Team

Table 6.2-2 Risk Allocation Chart for Type 4-2: BTO, Two-tiered, Net Cost (2)

Stage		Type of Risks		Contents of Riks	Risk Allocation		Remarks
					Public	Private	
Design and Construction Stage	Risks during Designing and Construction Stage	Specfic Risks		The risks of the existing route and facility, and work at the connecting point between the existing and the extended part that may interfere the smooth operations for trains.	x	x	Public: Land, Civil Private: EM, R/S
	Project-Related Risks	Design and Constructio n Risk	Design	The risk of design. Whichever party takes responsibility for the design generally takes the risk of errors in design that may lead to the failure of the project to satisfy contractual requirements or laws. The risk of faults or changes in design, latent defects, and asset life expectancy would have to be specified and responsibilities allocated.	x	x	
			Permits and access	Providing support to Private and guaranteeing the timely delivery of land required	x		
				Obtaining such permits and licenses	x		
			Construction	The risk of construction costs, perfomance, and delay	x		
	Project-Related Risks	Government Guarantees		The risk of changes in contract costs	x		
	Risks during the Tendering Stage	Tendering Stage Risks		Delay or non-execution of the contract The risks of the project content change The risks of the case where no private sector company applies	x		
Operations and Maintenance	Risk Specific to the LRT Sector	Demand Risk	Ridership risk	The risk of ridership		x	
			Revenue risk	The risk of revenue		x	
			Demand for service	The risk of demand for service		x	
			Fare levels	The risk of fare levels		x	
			Fare collection strategy	The risk of the ticketing collection technology and strategy		x	
	Project-Related Risks	Existing Services		Private: The risk of time that Private take over the responsibility for existing service delivery		x	
				Public: Define an expected service level for existing services, specify the level of repair services needed to maintain existing standards.	x		
		Operational and Maintenance Risks		The risk of operating the existing and new assets and maintaining them to required standards.		x	
	Risks Associated with Managing the PPP Agreement	Payment Mechanism		The risk of private financing for LRT schemes.	x	x	
		Use of Bonuses and Penalties		The risk of using of bonuses and penalties.	x		
		Price Variations		The risk of price variations, such as inflation, input costs, legal regulations, are likely to change in unpredictable ways.	x	x	
		Risks of Inflation: Indexation		The risk of costs inflating over the life of the PPP agreement.	x	x	
		Cost Pass-Through		The cost of risks over which Private does not have any control.	x		
		Fare Risk: Indexation Formul		The risk of the effect of exogenous cost increases of Private's cost.		x	
		Residual Value Risk		The risk of how to manage the residual value.	x		
	Risks during Operations and Maintenance Stage	Operational and Maintenance Risks		Facility service delay	x	x	
				Non-achievement of the required quality of the facility	x	x	
				Required specification change	x	x	
				Associated with fare rise		x	
				Repair and rehabilitation	x	x	
				Project closing process	x		
				Mal-function of AFC system		x	
				Hidden or repair on the existing route	x	x	

Source: Study Team

6.2.2.3 PPP Scheme 3 – Type 4-4 BTO One-Tiered Net Cost

Type 4-4 BTO One-Tiered Net Cost is defined that Public sector (LRTA) is responsible for Land acquisition and Owning assets, whereas Private sector is engaged in Financing, the entire Construction, O&M and Fare collection. When the construction work is completed by Private sector, the ownership is immediately transferred to LRTA and then LRTA will let Private sector be engaged in O&M activities and farebox collection.

During the operation, Private sector will collect farebox and other associated revenue out of which they will pay concession fee to LRTA when the operation is profitable. LRTA will thus receive the concession fee and that fee is to cover its depreciation and loan repayment. When the operation is not profitable, Public sector (LRTA) will pay a service fee to Private sector.

Conformity, asset ownership, private sector participation and others except the ODA conformity is the same as the Type 4.2. Since Private sector is solely responsible for financing, no opportunity for Private sector to make access to ODA financing. One possibility is to arrange a Two Step Loan.

As for the business risks under this scheme, Private sector bears the whole construction risks and also the whole Financial risks. When operation starts it needs to absorb demand fluctuation to be reflected on the farebox revenue and the O&M cost fluctuation such as equipment deterioration and repairing risks of parts. Financial risk is analyzed, as a characteristic of this scheme is analyzed.

Financing Risk - Private sector will be responsible for raising its own financing necessary to implement the Project. The key question is, though depending on the local financial market conditions and practices, how Private sector will be able to secure funding to cover its large scale project. The key question is, though depending on the local financial market conditions and practices, how Private sector will be able to secure funding to cover its large scale financing, availability, size, maturity, interest rate and other conditions assuring the feasibility of the Project.

Interest Rate Change Risk - Private sector has no control over prevailing interest rates. Typically loans are quoted in relation to either a fixed interest rate or sometimes to a floating interest rate, and such floating interest rates change with time and are not controllable. Usually, governments are not willing to compensate Private sector for changes in interest rates during construction or operation. Revenues cannot be in usual case adjusted in conjunction with interest rate variations.

Table 6.2-3 Risk Allocation Chart for Type 4-4: BTO, One-Tiered, Net Cost (1)

Public: Land Acquisition, Own
Private: Finance, Construction, O&M, Fare Collection

Stage		Type of Risks		Contents of Riks	Risk Allocation		Remarks
					Public	Private	
Common	Political and Macroeconomic Risks	Political Risks	Traditional political risks	The risks include nationalization, new tax regimes, and other events that affect debt service and profits	x		
			Regulatory risks	The risks include the imposition of new standards or the introduction of competition,whereas quasi-commercial risks include breaches by Public or interruptions because of changes in Public's plan	x		
			Other political risks	The risks include acts of war, rebellion, default, and failure of public sector entities	x		
			Change of Law Risk	The risks of change of law, including adoption, modification, or repeal, may happen after a PPP agreement has been signed and become effective. 1) Currency or capital repatriation limitations, 2) Nationalization, 3) Import and Export restrictions, and 4) Deprivation of Private rights	x		
		Macro-economic Risks	Contingent Liabilities	The risks of contingent liabilities	x		
			Risk of Change in Interest Rate	The risk of interest fluctuation during construction	x		
				The risk of interest fluctuation during operation	x		
			Risk of Change in Inflation Rate	The risk of price fluctuation during construction		x	
				The risk of price fluctuation during operation		x	
			Risk of Change in Foreign Exchange	The risk of foreign exchange rates during construction		x	
				The risk of foreign exchange rates during operation		x	
	Risk Specific to the LRT	Interface Risk		The risk of interface that Private would have under an integrated contract and the implications of the risks among the parties within Private		x	
		Risk of Increased Project Costs		Inadequate definition of scope and objectives of projects in the business case: Public risk	x		
				Inadequate management of the project during the implementation phase so that costs are not controlled and contractual risk mitigation instruments are not adhered to: Private risk		x	
	Project-Related Risks	Development Risk		The risk of the development phase includes the invitation to tender and bidding, the negotiation of the PPP agreement and various project documents, and the effort to obtain debt and equity funding.	x		
		Performance Standards Risk		The norms and standards that are to be applied during both construction and operation in the LRT PPP agreement need to be established early.		x	
		Financing Risk		The risk of increases in the interest rate or inflation rate		x	
		Facility Risk		The risk of facility damage and integrating the system with existing modes of transportation.		x	
		Environmental Risk		Environmental risk, such as noise pollution and emissions.		x	
	Third party indemnity			The risk of third party indemnity		x	
	Hidden defect			The risk of hidden defect		x	
	Force majeure			The risk of force majeure		x	

Source: Study Team

Table 6.2-3 Risk Allocation Chart for Type 4-4: BTO, One-Tiered, Net Cost (2)

Stage		Type of Risks		Contents of Riks	Risk Allocation		Remarks
					Public	Private	
Design and Construction Stage	Risks during Designing and Construction Stage	Specfic Risks		The risks of the existing route and facility, and work at the connecting point between the existing and the extended part that may interfere the smooth operations for trains.	x	x	
	Project-Related Risks	Design and Constructio n Risk	Design	The risk of design. Whichever party takes responsibility for the design generally takes the risk of errors in design that may lead to the failure of the project to satisfy contractual requirements or laws. The risk of faults or changes in design, latent defects, and asset life expectancy would have to be specified and responsibilities allocated.		x	
			Permits and access	Providing support to Private and guaranteeing the timely delivery of land required	x		
				Obtaining such permits and licenses		x	
			Construction	The risk of construction costs, perfomance, and delay		x	
	Project-Related Risks	Government Guarantees		The risk of changes in contract costs		x	
	Risks during the Tendering Stage	Tendering Stage Risks		Delay or non-execution of the contract Delay or non-execution of the contract The risks of the project content change The risks of the case where no private sector company applies	x		
Operations and Maintenance	Risk Specific to the LRT Sector	Demand Risk	Ridership risk	The risk of ridership		x	
			Revenue risk	The risk of revenue		x	
			Demand for service	The risk of demand for service		x	
			Fare levels	The risk of fare levels		x	
			Fare collection strategy	The risk of the ticketing collection technology and strategy		x	
	Project-Related Risks	Existing Services		Private: The risk of time that Private take over the responsibility for existing service delivery		x	
				Public: Define an expected service level for existing services, specify the level of repair services needed to maintain existing standards.	x		
		Operational and Maintenance Risks		The risk of operating the existing and new assets and maintaining them to required standards.		x	
	Risks Associated with Managing the PPP Agreement	Payment Mechanism		The risk of private financing for LRT schemes.		x	
		Use of Bonuses and Penalties		The risk of using of bonuses and penalties.	x		
		Price Variations		The risk of price variations, such as inflation, input costs, legal regulations, are likely to change in unpredictable ways.		x	
		Risks of Inflation: Indexation		The risk of costs inflating over the life of the PPP agreement.		x	
		Cost Pass-Through		The cost of risks over which Private does not have any control.	x		
		Fare Risk: Indexation Formul		The risk of the effect of exogenous cost increases of Private's cost.		x	
		Residual Value Risk		The risk of how to manage the residual value.		x	
	Risks during Operations and Maintenance Stage	Operational and Maintenance Risks		Facility service delay		x	
				Non-achievement of the required quality of the facility		x	
				Required specification change		x	
				Associated with fare rise		x	
				Repair and rehabilitation	x	x	
				Project closing process		x	
				Mal-function of AFC system		x	
				Hidden or repair on the existing route		x	

Source: Study Team

6.2.2.4 PPP Scheme 4 – Type 5-2 BOT Two-Tiered Net Cost

Type 5-2 BOT Two-Tiered Net Cost is defined that Public sector (LRTA) is responsible for Land acquisition, Finance, Construction (civil work) and Owning assets (Civil work) they build, whereas Private sector is engaged in Finance, Construction (E&M and rolling stock), Owning assets they constructed and procured, O&M and Fare collection.

During the operation, Private sector will collect farebox and other associated revenue out of which they will pay a lease fee to LRTA when profitable. LRTA will thus receive the lease fee and that fee is to cover its depreciation. When the operation is not profitable, Public sector will pay a service fee to Private sector.

The whole life cycle except Construction (Civil work) is offered to Private sector. An ODA loan is a possible application to finance Public sector and an accompanying Two Step Loan would be possible for private sector. Private sector will bear financing risk, recovery risk, long-term management risk and long-term possession of facilities risk.

As for the business risks under this scheme, Public and Private sector are sharing construction risks for the portion that each party is responsible. Private sector also bears E&M system and rolling stock procurement risks whereas Public sector is responsible for construction (Civil work).

This BOT Two-tiered Net Cost scheme has been implemented in Thailand at MRT Blue Line, and also in the Philippines, at Expressway (STRA)

Private sector will be responsible for, among others, E&M system and rolling stock. Those system and equipment are most likely to be procured from overseas sources where Private sector will face Foreign Currency Exchange risk to be explained below.

Foreign Exchange Risk - PPP projects often have large in size and complex in structure, and that they typically involve funding and procurement structures that depend on foreign exchange depending on the availability and also its changes. The LRTA operating revenue is received in Peso, whereas LRTA Project borrowing may be done in both local and foreign currency.

PPP projects are often financed with significant amounts of foreign capital in the form of bank loans, bond issues, bridging, and standby facilities, with multilateral and bilateral development assistance loans and export credit agency loans and guarantees. Changes in exchange rate of local currencies will affect the level of planned revenues and profit of the Project.

Table 6.2-4 Risk Allocation Chart for Type 5-2: BOT, Two-Tiered, Net Cost (1)

Public: Land Acquisition, Finance, Construction (Civil), Own
Private: Finance, Construction (E&M, Rolling Stock), Own, O&M, Fare Collection

Stage		Type of Risks		Contents of Riks	Risk Allocation		Remarks
					Public	Private	
Common	Political and Macroeconomic Risks	Political Risks	Traditional political risks	The risks include nationalization, new tax regimes, and other events that affect debt service and profits	x		
			Regulatory risks	The risks include the imposition of new standards or the introduction of competition,whereas quasi-commercial risks include breaches by Public or interruptions because of changes in Public's plan	x		
			Other political risks	The risks include acts of war, rebellion, default, and failure of public sector entities	x		
			Change of Law Risk	The risks of change of law, including adoption, modification, or repeal, may happen after a PPP agreement has been signed and become effective. 1) Currency or capital repatriation limitations, 2) Nationalization, 3) Import and Export restrictions, and 4) Deprivation of Private rights	x		
		Macro-economic Risks	Contingent Liabilities	The risks of contingent liabilities	x	x	
			Risk of Change in Interest Rate	The risk of interest fluctuation during construction	x	x	
				The risk of interest fluctuation during operation	x	x	
			Risk of Change in Inflation Rate	The risk of price fluctuation during construction	x	x	
				The risk of price fluctuation during operation	x	x	
			Risk of Change in Foreign Exchange	The risk of foreign exchange rates during construction	x	x	
				The risk of foreign exchange rates during operation	x	x	
	Risk Specific to the LRT	Interface Risk		The risk of interface that Private would have under an integrated contract and the implications of the risks among the parties within Private		x	
		Risk of Increased Project Costs		Inadequate definition of scope and objectives of projects in the business case: Public risk	x	x	
				Inadequate management of the project during the implementation phase so that costs are not controlled and contractual risk mitigation instruments are not adhered to: Private risk	x	x	
	Project-Related Risks	Development Risk		The risk of the development phase includes the invitation to tender and bidding, the negotiation of the PPP agreement and various project documents, and the effort to obtain debt and equity funding.	x		
		Performance Standards Risk		The norms and standards that are to be applied during both construction and operation in the LRT PPP agreement need to be established early.		x	
		Financing Risk		The risk of increases in the interest rate or inflation rate	x	x	
		Facility Risk		The risk of facility damage and integrating the system with existing modes of transportation.	x	x	
		Environmental Risk		Environmental risk, such as noise pollution and emissions.	x	x	
	Third party indemnity			The risk of third party indemnity	x	x	
	Hidden defect			The risk of hidden defect	x	x	
	Force majeure			The risk of force majeure	x	x	

Source: Study Team

Table 6.2-4 Risk Allocation Chart for Type 5-2: BOT, Two-Tiered, Net Cost (2)

Stage		Type of Risks		Contents of Riks	Risk Allocation		Remarks
					Public	Private	
Design and Construction Stage	Risks during Designing and Construction Stage	Specfic Risks		The risks of the existing route and facility, and work at the connecting point between the existing and the extended part that may interfere the smooth operations for trains.	x	x	
	Project-Related Risks	Design and Constructio n Risk	Design	The risk of design. Whichever party takes responsibility for the design generally takes the risk of errors in design that may lead to the failure of the project to satisfy contractual requirements or laws. The risk of faults or changes in design, latent defects, and asset life expectancy would have to be specified and responsibilities allocated.	x	x	
			Permits and access	Providing support to Private and guaranteeing the timely delivery of land required	x	x	
				Obtaining such permits and licenses	x	x	
			Construction	The risk of construction costs, perfomance, and delay	x	x	
	Project-Related Risks	Government Guarantees		The risk of changes in contract costs	x	x	
	Risks during the Tendering Stage	Tendering Stage Risks		Delay or non-execution of the contract Delay or non-execution of the contract The risks of the project content change The risks of the case where no private sector company applies	x	x	
Operations and Maintenance	Risk Specific to the LRT Sector	Demand Risk	Ridership risk	The risk of ridership		x	
			Revenue risk	The risk of revenue		x	
			Demand for service	The risk of demand for service		x	
			Fare levels	The risk of fare levels		x	
			Fare collection strategy	The risk of the ticketing collection technology and strategy		x	
	Project-Related Risks	Existing Services		Private: The risk of time that Private take over the responsibility for existing service delivery		x	
				Public: Define an expected service level for existing services, specify the level of repair services needed to maintain existing standards.	x		
		Operational and Maintenance Risks		The risk of operating the existing and new assets and maintaining them to required standards.		x	
	Risks Associated with Managing the PPP Agreement	Payment Mechanism		The risk of private financing for LRT schemes.		x	
		Use of Bonuses and Penalties		The risk of using of bonuses and penalties.		x	
		Price Variations		The risk of price variations, such as inflation, input costs, legal regulations, are likely to change in unpredictable ways.		x	
		Risks of Inflation: Indexation		The risk of costs inflating over the life of the PPP agreement.	x	x	
		Cost Pass-Through		The cost of risks over which Private does not have any control.	x		
		Fare Risk: Indexation Formul		The risk of the effect of exogenous cost increases of Private's cost.		x	
		Residual Value Risk		The risk of how to manage the residual value.		x	
	Risks during Operations and Maintenance Stage	Operational and Maintenance Risks		Facility service delay	x	x	
				Non-achievement of the required quality of the facility	x	x	
				Required specification change	x	x	
				Associated with fare rise		x	
				Repair and rehabilitation		x	
				Project closing process		x	
				Mal-function of AFC system		x	
				Hidden or repair on the existing route		x	

Source: Study Team

6.2.3 Overview on the Risks in PPP Schemes

When developing and implementing PPP Projects, detailed risk identification as well as its allocation among the related parties are critical and essential. The Study Team uses "**Private Sector Participation in Light Rail-Light Metro Transit Initiatives**" (LRMT) by The World Bank / PPIAF in 2010 as its analytical tool by taking advantage of its comprehensive approach.

The terminology like “grantor” and the “developer” are used to mean the government or public sector, and private sector contractor or concessionaire respectively. The LRMT document provides methods of allocating the risks and responsibilities between the grantor and the developer and discusses managing demand risk and the implications that risk has on the structure of the proposed public-private partnership (PPP) agreement.

When considering a PPP project analysis, “Critical to the base cases are the identification and quantification of risks. Effective risk allocation is premised on the notion of allocating responsibility for dealing with the consequences of each identified risk either to one of the developer or contracting authorities or through a system of shared responsibilities.” (LRMT)

Risks and responsibilities are usually allocated with the following in mind:

- Project risks should minimized and shared by allocating particular risks accordingly,
- One party may manage to take less or absorb more risks than the other parties,
- Allocating clearly risks to a party should provide incentives or opportunities for that party.

Not all risks can be predicted – It is unlikely to foresee all the risks within a PPP contract, and the legal framework will not be able to cover the whole sphere of issues and need to leave to PPP contractual arrangements. They are however, to “allow for mechanisms that deal with unpredictable, unforeseen, or unmanageable events. These mechanisms are best handled in the contract using force majeure and other clauses for unforeseen events.” (LRMT)

Mitigating Unwanted Risks – During the process of PPP arrangement, it happens quite often that risk allocation exercise might be done on the basis of commercial and negotiating strength. The economically, socially or politically stronger party may seek to avoid unwanted risks and they may end up allocating those risks to the weaker party. Seeking an arbitrator or neutral third party function is rather unrealistic.

Unified or Layered PPP Approach - Although public and private partner is responsible, on each side, for a given portion of the PPP agreement but may be implemented as a single PPP agreement with a single counterparty, the developer, who is solely responsible for the full implementation of the PPP agreement regardless of the internal risk allocation among the different parties. “This arrangement is known as a “unified approach” to the PPP agreement. An alternative to this approach may be the “layered approach”, in which the project may be split among two or more separate PPP agreements addressing the construction of infrastructure, the procurement of rolling stock, and the operation of the system”. (LRMT)

Ability to Manage Risks - Risk allocation could quite often be “agreed” as outcomes of discussion and negotiation but it will equally important that ”the parties must analyze the strengths of each party to which a specific risk is allocated and that party’s ability to manage the consequences of the risk if it should occur. (LRMT). Exercising strong bargaining power may be seen to bring a good negotiation outcomes but one needs to be carefully analyze whether the party responsible for the specific risks have sufficient ability and capacity to resole the risks.

6.2.3.1 Political and Macroeconomic Risks

The following risks are typically identified in designing, constructing and operating a PPP project. Application to specific PPP Schemes is described at each case above.

1) Political Risks

According to LRMT, political risks are defined as traditional political risks include nationalization, new tax regimes, and other events that affect debt service and profits. Regulatory risks include the imposition of new standards or the introduction of competition, whereas quasi-commercial risks include breaches by the grantor or interruptions because of changes in the grantor's plan. Other political risks include acts of war, rebellion, default, and failure of public sector entities. The grantor/the government is normally the project participant with the greatest ability to manage the risk of change in the political climate and therefore often takes this responsibility.

2) Change of Law Risk

Changes-of-law risk is defined as adoption, modification, or repeal that may occur during the PPP contract period. Developers are concerned with future changes in any law or regulations possibly affecting the development and operation of a LRT. It is essential to have an effective mechanism to deal with the consequences of any change of law after the bid date, particularly if this change requires the developer to incur costs or if it results in a decrease in profits.

Significant changes in law include

- Currency or capital repatriation limitations, moratorium or strong restriction on foreign exchange
- Nationalization or confiscation of developed assets
- Import and export prohibitions or strict employment of foreign currency allocation
- Deprivation of the developer rights granted to Developer

3) Contingent Liabilities

Contingent liabilities represent commitments to future expenditures if certain events occur. Many of the risks associated with private sector participation in infrastructure create sizable contingent liabilities for public institutions. Because such liabilities are uncertain and do not correspond to definite cash-flow events, simply relying on cash-based budgetary analysis does not take into account their potential impacts on affordability.

4) Risk of Change in Interest Rate

Private investors and the governments have nearly no control over prevailing interest rates. Typically loans are quoted in relation to a floating interest rate, and such interest rates change with time and are not controllable. Usually, governments are not willing to compensate developers for changes in interest rates during construction or operation. Revenues cannot be in usual case adjusted in conjunction with interest rate variations, equity holders and lenders. Governments usually prefer that the winning bidder-developer source a significant portion of debt at fixed rates through an interest rate swap depending upon the market availability.

5) Risk of Change in Inflation Rate

The construction and operational risks are mainly borne by the developer. On the other hand, inflation may have a serious impact on the costs of a project. To lenders, covering this risk is extremely important to limit their financial exposure and to maintain the project cover ratios and the net benefit anticipated from the revenue stream. For a typical PPP project, the time period between bidding and operating is long,

and the cumulative impact of inflation over time will be significant.

6) Risk of Change in Foreign Exchange Rates

PPP LRMT projects often have large in size and complex in structure, and that they typically involve funding and procurement structures that depend on foreign exchange depending on the availability and also its changes:

- PPP projects are often financed with significant amounts of foreign capital in the form of syndicated bank loans, bond issues, bridging, and standby facilities, with multilateral and bilateral development assistance loans and export credit agency loans and guarantees
- The project participants may have revenues in one or more currencies, but costs in several others, often due to the domestic currency financial availability whereas the PPP project revenue only expected in local currency.
- Changes in exchange rate of local currencies will affect the level of planned revenues and profit taken offshore by the developer.

6.2.3.2 Risks Specific to the LRMT Sector

1) Interface Risk

Depending on the type of PPP arrangement and its risk allocation, the design, construction, integration, installation, testing, commissioning, operations, maintenance, and performance of the assets procured or developed are the responsibility of the developer. A “joint and several liabilities” approach is generally required to ensure that interfaces between parties are tackled and that the grantor bears no residual risk.

2) Demand Risk

A Demand forecast related to a LRT PPP Project is considered as a one of the main inputs to the economic and financial analysis of any project. In a demand assessment, ridership measurements, travel times, and train speeds are required for calculating operating costs and benefit. However, demand forecasting is typically a complicated process. As an example, when ridership is lower than forecast, the revenue is reduced. However, when demand is higher than expected, more services are required, potentially affecting the quality of service. Historically, demand forecasts have proven unreliable, often failing to be sensitive to demographic changes, demand shift, competition, cost increase, and willingness to pay. Public transport passenger volumes are difficult to obtain, and such flows vary daily and seasonally. Often partial datasets are used as a basis for estimation.

3) Risk of Increased Project Costs

Errors in forecasting may have a substantial impact on the real economic cost of construction of infrastructure, financial planning, and project management considering high capital cost of LRMT projects,. Unanticipated escalations in construction costs and higher-than expected inflation rates are factors that may lead to potential overruns. It should also be noted that demand forecasting has a direct effect on establishing capital and operating costs. When evaluating bids, the grantor must carefully evaluate the forecasting techniques used by the developer to establish project costs. For example, reducing the forecasting horizons used to predict ridership would reduce the time frame within which unanticipated demographic changes, demand shifts, and changes in the legal environment could affect the forecasts.

6.2.3.3 Project Related Risks

1) Development Risk

The development phase involves the preparation and procurement of the project up to financial close of the PPP agreement. This phase includes the invitation to tender and bidding, the negotiation of the PPP agreement and various project documents, and the effort to obtain debt and equity funding. Given the nature of LRT PPP projects, both the developer/private sector and the grantor/the government will expend significant time and resources negotiating the PPP agreement. Occasionally, depending on the way the bidding process is designed and what is allowed in the tender documentation, the grantor may cover some of the developer's bidding costs. It is important that the grantor be mindful of the possible changes in costs that occur once the PPP agreement is implemented", according to LRT.

2) Design and Construction Risk

Design and construction risks here relate to responsibilities associated with the design, procurement, engineering, construction, completion, testing, and commissioning of the tracks and stations and with any integration that must take place with existing systems. Depending on the type of PPP agreement selected, the grantor will usually provide specifications for the proposed LRT scheme, and the bidding developers will base their bids on these specifications. The risk allocation during the design and construction phase is complex, as follows:

Design - Whichever party takes responsibility for the design generally takes the risk of errors in design that may lead to the failure of the project to satisfy contractual requirements or laws. The risk of faults or changes in design, latent defects, and asset life expectancy would have to be specified and responsibilities allocated. If the grantor requires variations, it typically bears that risk.

Construction - The developer/the private sector company is responsible for constructing the project to the agreed specifications, including construction, integration, installation, testing, commissioning, operation, and maintenance tasks. The developer carries the risk of increases in construction costs and is also responsible for the performance of all subcontractors. The developer also generally bears the risk of delays.

3) Performance Standards Risk

"The norms and standards that are to be applied during both construction and operation in the LRT PPP agreement need to be established early. Generally the developer/the private sector company will take risks on the basis of established norms and standards. In many countries, rules and standards for such systems do not exist, and in such situations, the absence of applicable laws will require special technical requirements to be developed and approved by the appropriate governmental department.

4) Existing Services

If the developer/the private sector company is taking over existing services and infrastructure in addition to delivering new services, the payment mechanism should be structured to incentivize the developer to deliver the new services on time and not limit its outputs to existing service levels. A fundamental question related to this is when and what the developer is handed over and starts when and on what conditions their responsibilities. LRMT states the following three issues:

- Following financial close, responsibility for all sites is taken over by the developer.
- A phased handover is used, in which the developer/the private sector company takes over responsibility for sites at the same time that it begins work on them. Under this scheme, the grantor will retain responsibility over some sites between financial close and the start of construction.

- The grantor/the government takes responsibility for bringing existing sites up to a basic specification standard before handing them over to the developer.

5) Financing Risk

The developer/the private sector will be responsible for raising its own financing necessary to implement the project whereas the grantor/the government will be responsible for securing its budgetary allocation from general funding or the capital investment allocations as appropriate.

6) Government Guarantees

Guarantees are often provided by the government to support infrastructure investments and to transfer risks from the developer to the government. It will be a substantial attraction to the private sector developer. Sometimes the government may offer an exchange rate guarantee to mitigate the effects of depreciation in the currency to the developer.

7) Operational and Maintenance Risks

Operational risks are generally known as the responsibilities associated with operating the existing and new assets and maintaining them to required standards. Depending on the type of PPP arrangements, the grantor may take less or more of the ridership and revenue risk. The grantor and developer must determine who will take the risk of integrating the system with existing modes of transportation. The developer will be responsible for the performance standard in accordance with whether the service provided to users meets the standards set out in the PPP arrangement.

8) Environmental Risk

The developer will be considered responsible for meeting environmental norms and standards, such as those related to noise pollution and emissions. However, the grantor will retain certain responsibilities related to specific issues such as preexisting conditions or special compliance waivers.

6.2.3.4 Risks Associated with Managing the PPP Agreement

The mechanism for implementing and monitoring risk allocation rules must balance the required certainty of the PPP agreement in the future with a need for possible adjustment if there are unanticipated changes in laws, indexation, and value testing.

1) Payment Mechanisms

The financial implications of a PPP agreement will depend on its type. Simply, the payment mechanism contained within the PPP agreement details the payments that the grantor/the government will make to the developer/the private sector and also sets out the framework of incentives used to encourage the developer to provide an efficient service at a cost that provides value for money. LRT systems tend to use availability payments and performance payments as the basis for the arrangement's structure; that is, the developer will receive payments for providing an available service and will incur penalties or no payment when the service is unavailable or if certain performance indicators are not met.

2) Use of Bonuses and Penalties

Bonuses and penalties arrangements are often provided for enforcing the risk allocation rules. Bonuses and penalties can be used to enhance the developer's incentive to carry out its general responsibilities under the terms of the contract and to meet agreed performance targets. As for the level, Penalties and bonuses should reflect the economic costs and benefits of the behaviors that they are trying to prevent or

promote. Without such incentives, the grantor reduces its ability to influence the developer and to demand any improvements that may be required.

3) Price Variations

The developer/the private sector should always be incentivized to mange its construction and operation costs. The regulations for adjusting the payment structure are a critical component in the risk allocation architecture. Throughout the period of the contract, many factors such as inflation, input costs, and regulations, are likely to change in unpredictable ways. To reflect these uncertainties, the PPP arrangement should allow adjustments to the payments over time.

4) Risk of Inflation: Indexation

One of the key concerns for the developer/the private sector is the risk of inflation over the PPP contract period. The availability payment should be reasonably indexed, and the proportion of the payment to be indexed should be determined at an early stage. The choice of indexes or proportion should be determined by the grantor, not the bidding developer, to facilitate comparison of rival bids.

5) Cost Pass-Through

Cost pass-through is usually defined as to cover the cost of risks that the developer does not have any control over. When input costs rise, the fare adjustment rules agreed upon between the developer and the grantor may allow for the changes in the costs to be passed through to passengers.

6) Fare Risk: Indexation Formulas

The indexation process and formulas aim to compensate the developer for the effect of cost increases on the developer's inputs. The indexation formulas, predetermined at the time of PPP Agreement, should automatically adjust fares according to agreed rules. Specific indexation formulas can adjust fares according to changes in the rate of inflation, consumer price indexes, or a consumer price index related to changes in the system's likely costs, such as a basket of prices, exchange rates, or specified inputs.

7) Residual Value Risk

Residual value is defined as the asset value at the time when the PPP agreement has expired, the grantor and the developer should agree on the residual value. In most of long-term PPP agreements, there will be a residual value at termination, especially if significant investments have been made toward the end of the contract period.

6.2.3.5 Managing the Demand or Farebox Risk

1) Availability Payment Structure

An availability payment is a payment made by the grantor to the developer. When considering the link between this classification and the payment mechanism, the developer must ensure that these conditions are reasonable, measurable, and achievable under the PPP agreement.

2) Revenue Guarantee versus Availability Payment

Availability payment and minimum revenue guarantee mechanisms both seek to manage demand risk in an LRMT scheme. The choice will depend on the specific conditions, and there is no right or wrong answer to the usage of either mechanism.

6.2.4 Risk Alleviation and Mitigation Measures for LRT Line 2

Using the definition given in the "Private Sector Participation in Light Rail – Light Metro Transit Initiatives" (LRMT) by World Bank and PPIAF, key risks associated with LRT Line 2 Extension and the PPP scheme introduction to the whole line including the extension part are analyzed below.

6.2.4.1 Political and Macroeconomic Risks

1) Political Risks

Political risks are defined risks such as:

- Nationalization, new tax regimes, imposition of new taxes
- Regulatory risks including the imposition of new standards or the introduction of competition
- Quasi-commercial political risks such as breaches by the grantor or interruptions because of changes in the grantor's plan
- Acts of war, rebellion, default, and failure of public sector entities
- Approval process delay affecting business viability

Public sector compensation - Public sector / the grantor is usually responsible for those risks and expected to manage them. In the case of the occurrence of those risks, the grantor should compensate losses caused by those to the developer / private sector.

Tax exemption confirmation - As for new tax regimes and/or imposition of new taxes, one solution would be the Public sector executing agency and Private sector developer should agree and get confirmation with the tax authority for the exemption to cover the entire PPP contract period.

Political risk insurance - If Japanese supplier / investors are participating in the project, an export insurance system is possible applied to cover the political risks. Other countries like the UK, France and USA governmental export credit and guarantee agencies also offer guarantee / insurance to cover those political risks as well. In the Philippines, a PPP Infrastructure Development Fund has been discussed and developed but not yet reached to the level of implementation.[1]

2) Change of Law Risks

Changes-of-law risk is defined as:

- Adoption, modification, or repeal that may occur during the PPP contract period
- Currency or capital repatriation limitations, moratorium or strong restriction on foreign exchange
- Nationalization or confiscation of developed assets
- Import and export prohibitions or strict implementation of foreign currency allocation
- Deprivation of the developer rights granted to the developer

Public sector compensation - Developers / Private sector are affected with those changes in any law or regulations on the development and operations of LRTA. The grantor / Public sector should compensate any losses of Developer / Private sector. As stated above, PPP Development Fund is expected to guarantee political and regulatory risks.

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[1] *Indonesia recently established an Indonesian Infrastructure Guarantee Fund (IIGF) in 2010. IIGF covers political risks such s change of law, approval delays, financial close delay, breach of contracts etc.*

3) Contingent Liabilities

Contingent liabilities represent:

- Commitments to future expenditures if certain events occur by Public sector

Beyond Cash-based budgeting – Those liabilities are often identified in the cases when the government / public sector adopt cash-based budgetary analysis. This type of exclusion might affect the affordability of Public sector / grantor and may discourage Private sector / developer. The best solution would be, although the Public sector may not be able to incorporate into their official budgeting but to express their awareness of the contingent liabilities.

4) Risks of Change in Interest Rate

- Fluctuation of interest rate in case of floating rate loans or funding
- Fluctuation of interest rate in case of floating rate loans or funding

Fixed interest rate loans and funding arrangements – Some funding is available with fixed rate interest. In the Philippines, private placement bond issue has been more popular and covering up to 10 years with a fixed rate. From Japan, ODA finance such as JICA Yen Loan is offered with a fixed rate covering the whole period of the loan, for example 25 – 30 years depending upon the project content.

Interest rate swap (IRS) arrangements – As one of the financial derivatives, the interest rate swap arrangement has been popular tool. IRS will enable local funding in fixed rate from the original floating rate loans. Banks or sometimes other Non-Bank Financial Institutions (NBFI) such as life insurance companies may offer a long-term IRS though depending on the size and maturity. In the Philippines, IRS between Peso and US dollar up to five years or so seems to be being developed.

5) Risks of Change in Inflation Rate

- Fluctuation of inflation rate during the construction and operation period
- Further amplification of the risk by the prolonged period between bidding and operating including the cumulative impact over time

Careful assessment on Long-term Inflation Rate – During the bidding stage, both Public and Private sector, by inviting professional economic research institute professionals if considered appropriate, should openly discuss the long-term view on the inflation rate and seek agreement. Government usually tends to set up its inflation rate target in line with its economic policy.

6) Risks of Change in Foreign Exchange Rates

- Fluctuation of foreign exchange rate during the construction and operation period when financing is made in foreign currency

Local currency funding – The railway and other revenue for LRTA are denominated in Peso. For business management purposes, it is not encouraged to raise financing in foreign currency but due mainly to the financing availability. In the case of the Philippines, the private sector financial markets have been growing backed up with the steady growth of the country economy. In medium term future, it is not possible as of now but in ODA financing, local currency denominated lending possibilities have been discussed in some donor institution.

Currency Swap (CRS) arrangements – Though the size and term are rather small, CRS arrangements are becoming possible in the Philippines. It will be possible to cover the entire period to arrange a CRS

but even for a medium-term CRS arrangement will help Private sector in reducing the foreign currency risks to some extent.

Currency Risk Absorption by Government – When the original lending is provided and denominated in foreign currency ODA loans, the executing agencies are passed through the loan in foreign exchange and fully exposed with the currency risks. One solution would be a currency risk absorption by the government. For example, DOF will conclude its JICA ODA Yen Loan with a very concessional long-term loan for the LRTA project. Instead of passing it through to LRTA, it may ask the central bank to invest received Yen loan as a part of their foreign reserve. At the same time, DOF will receive, in agreement with the central bank, an agreed amount of Peso currency quasi equivalent to the amount of Yen but discounted / appreciated in a long-term currency swap trend forecast. DOF, then, provide a Peso loan corresponding to the original Yen loan to LRTA by applying the similar concessional fixed rates.

6.2.4.2 Risks Specific to the LRT Sector

1) Interface Risks

- Risks associated with Public sector / the grantor and Private sector / the developer on their interfacing on the design, construction, integration, installation, testing, commissioning, operations, maintenance, and performance of the assets procured or developed

A joint and several liabilities approach – By applying and fare and open approach, a joint and several liabilities approach is adopted between Public sector executing agency and Private sector contractor / operator / concessionaire. This approach will ensure that interfaces between parties make the utmost efforts to avoid any residual risks behind.

2) Demand Risks

- Ridership lower than the demand forecast prepared for the ridership measurements, travel times, train speeds, timetabling, and necessary train sets, and for requirements on O&M for calculating operating costs and benefit
- Ridership higher than the demand forecast possibly affecting the quality of service, i.e. comfort of travel by passengers
- Demand risk associated with the macro-economic or structural economic downturn

Minimum revenue guarantee – Public sector may agree a minimum revenue guarantee primarily based on the demand forecast at the beginning of the project as well as the periodical survey, though depending on whether Public or Private sector is responsible in securing and increasing the ridership. As stated in the Study, the Gross Cost scheme attributes the ridership generation to Public sector / LRTA whereas the Net Cost scheme engages Private sector / developer / operator on the ridership.

3) Risks of Increased Project Costs

- Errors in forecasting such as construction and procurement cost, financing and project management
- Cost overruns with unanticipated escalations in construction costs, inflation rates, delay in construction

Careful assessments – Careful assessments during the designing, bidding and construction stages would be the most effective preventive measures to reduce the risks. In practice, hiring an engineering supervisor having a vast experience in the same or similar fields is advised.

6.2.4.3 Project-Related Risks

1) Development stage risks

The development phase covers the period from the preparation and procurement of the project up to financial close of the PPP agreement. This phase includes the invitation to tender and bidding, the negotiation of the PPP agreement, and financing arrangements.

a) Project preparation stage risks

- Insufficient feasibility study and preparation
- Delay in the Government approvals for the project

Sufficient time and funds for F/S - Given the nature of PPP projects, both the developer and the grantor will expend significant time and resources. Often the political agenda are visible to hasten to reach proposals for the project approval but an extensive feasibility study with sufficient time and fund would be mostly reaching to proposing a good project.

Qualified consultants – When local resources are not available, it is advised to use international consultants for the F/S but also to prepare, supervise and advise the preparation and bidding processes. When selecting consultants, the government needs to be mindful in selecting professional consultants among those who have vast experience and knowledge of the sector and not selecting from the point of local connections. In relation to this LRT Line 2 Extension Project, the F/S has been done in several stages and could be considered that the Project is well matured for its implementation.

Project related Public agencies participation – From the beginning stage of the F/S, the government should take lead in inviting related agencies to participate in the project preparation. In the case of this Study, LRTA as the executing agency in close coordination with DOTC particularly at its Railway Planning group have been collaborating with the relevant agencies such as DOF, DBM, MMDA and NEDA.

NEDA-ICC and NEDA Board – In the case of PPP projects under the new Aquino administration, both NEDA-ICC and NEDA Board play key roles in approving new projects. Both are expected to review and appraisal process on schedule without delay.

b) Biding and tendering process stage risks

- Delay in tendering process
- Unclear scope of work and technical standards
- Unclear criteria on tender evaluation

Full and detailed F/S – A full and detailed feasibility study should be prepared incorporating sufficient information on legal, technical, financial and operational information should be prepared and disclosed accordingly. The F/S should also describe clearly the scope of work and show the technical and engineering standards required.

Tender Document by Professional Consultant – With a purpose to well prepare the tender documents, it is advisable to hire a professional consultant having a wide experience and knowledge.

Evaluation Criteria – The evaluation criteria needs to be well established and incorporated in the tender documents. They should be announced accordingly to the future bidders in an open and transparent manner.

2) Design, land acquisition and construction stage risks

Design and construction risks are related to responsibilities on the design, procurement, engineering, land acquisition construction, completion, testing, and commissioning of the tracks and stations.

a) Design related risks

Public or Private sector, whichever takes responsibility for the design, it leads to the risk of errors in design to satisfy contractual requirements and laws. The risk of faults or changes in design, latent defects, and asset life expectancy would have to be specified and responsibilities allocated.

- Design error and faults including latent defects
- Errors on the asset life expectancy

Design review and value engineering – A third party professional value engineering would be advised to review the design in question and conduct a value engineering analysis. Private sector should be able to have access to all available data and information to clarify them.

Insurance on the design – With a purpose to secure the benefit of both Public and Private sectors, depending on which party should be responsible, an insurance arrangement could cover the design errors as well as the hidden / latent defect in design. It may also cover the property right of the designer.

b) Land acquisition related risks

Opposition against the project by the public due to insufficient dialog and EIA due process as well as the unsatisfactory compensation and measures to decrease social impacts may reveal this land acquisition related risks.

- Opposition and disturbance by the public
- Delay in Right of Way (ROW) land acquisition
- Delay in construction due to delayed ROW acquisition
- Construction cost increase due to inflation during prolonged ROW acquisition period

Consultation meetings – Consultation meetings starting from the time of feasibility study should be held and legal requirements should be explained to the people concerned. Land acquisition plan and resettlement plan should be explained and agreed during the feasibility study stage with those affected general public.

Collaboration with local governments – Local governments looking after mainly social environment of the community play a key role in the consultation meetings. Utility companies are also important to make sure the public utility such as electricity and water supply during the construction phase. Collaborative ways of approach to the consultation meetings are advisable.

In the case of this Project, as a part of due EIA process, the environmental consultant has been organizing consultation meetings in accordance with both East and West extension plans. For this consultation process it is also critical to invite local government, utility companies that may be engaged in during the construction stage as well as the operational period.

c) Construction stage risks

Construction stage risks are those risks emerging during construction, integration, installation, testing, commissioning, operation, and maintenance tasks. The risks include delays in construction, increases in construction costs and the performance of sub-contractors.

- Cost overrun
- Delay in material procurement
- Delay in construction
- Poor quality of work
- Conflicts with sub-contractors

Qualified management consultants – A qualified management consultants for construction supervision will assume a key role to monitor, supervise and evaluate the issues on the construction including the cost, materials, procurement, quality and time management, relationship with the contractor and sub-contractors.

Qualified contractor and reliable sub-contractors – Selecting a qualified contractor based on their technical and managerial expertise is essential. They should be in close coordination with the management consultants.

3) Performance standard risks

When the railway starts its operations under PPP scheme, it is vital that the O&M quality should improve but one may face risks such as:

a) Poor quality of operations

- Trains running in delay or not punctual, or some trains not operating
- Overcrowded with passengers
- Train carriage space not clean and tidy
- Poor driving technique, not smooth running
- Safety and security on board uncertain
- Proper care not exercised to the elderly or the disabled, and

b) Poor quality of maintenance activities

- Spare parts lucking or unstable supply of parts
- Lack of inventory management
- Preventive maintenance not exercised
- Insufficient knowledge and skills for maintenance

Norms and standards – Norms and standards for technical and engineering matters, O&M and administration reporting and standards should0 be set up by the government and/or operational regulator. Those norms and standards are presented as a part of bidding document so that Private sector bidders will make sure to incorporate those qualitative and quantitative requirements.

Capacity as Operational Regulator / Supervisor – LRTA, in relation to this Study, will transform its role to an operational regulator and operational supervisor. As the operational regulator, LRTA should develop the norms and standards to be followed by Private sector / operator / concessionaire. LRTA needs to train technical and operational professionals to be a good regulator and supervisor under indirect operational modality.

Bonuses and Penalties – The operational basic service standards is described as the Key Performance Indicators (KPI) on the punctuality, congestion or comfort of passengers. To make Private sector / operator, a common technique for operational supervision is applying bonus and penalty systems.

4) Risks related to the Existing services

The Private sector / operator is taking over the existing services and infrastructure in addition to delivering new services

- When and what the developer / operator is handed over and starts when and on what conditions their responsibilities

This will bring a very particular attention to the LRT Line 2 Extension Project. The Study focuses on the line extension parts but the PPP scheme will be introduced to cover the entire line after the completion of the extension. Private sector / developer / operator will be offered, under the PPP contracts, for construction and O&M though depending upon the Types.

LRTA Line 2 PPP in One Package – From a practical point of view, the construction of the extension and the O&M activities of the whole Line 2 is easy to handle. The Private sector / operator is selected before the construction starts and will be asked to start its O&M activities immediately on the ground that LRTA is ready. It will give Private sector / operator sufficient time to get accustomed to the Line 2 operations. However, LRTA will need to rehabilitate the existing line civil work, E&M, and rolling stock first.

5) Financing risks

Depending on the types to be selected, the Private sector / developer will be responsible for raising its own financing necessary to implement the project whereas the Public sector / grantor will be responsible for securing its budgetary allocation from general funding or the capital investment allocations as appropriate.

- Financing availability risks
- Delay in financial arrangements

Interest rate and foreign currency exchange risks are explained 6.2.9.1 Political and Macroeconomic Risks above.

Securing funding with Long-term finance – To avoid any unexpected delay in local and international finance in carrying out the PPP projects, Public / Private sector whichever is responsible for financial arrangement is to arrange a long-term funding. One good example is an ODA finance provided in ultra long-term so that the repayment conditions are relatively smooth and easy for this kind of infrastructure projects where the debt repayment period need a long term.

Slow but firm ODA financial arrangement – On the other hand, the preparation process, for example, of Japanese ODA Yen loan requires longer period of time in appraisals and the following due processes. The agreement, however, as the bilateral cooperation, the commitment is very strong and the disbursement will be done in due course.

6) Government guarantees

Guarantees are often provided by the government to support infrastructure investments and to transfer risks from the developer to the government. Risks shown in the Political and law and regulation changers are explained above.

7) Operational and maintenance risks

Operational risks are generally known as the responsibilities associated with operating the existing and

new assets and maintaining them to required standards. Depending on the Type of PPP scheme chosen, the Public sector / grantor may take less or more of the ridership and revenue risk.

For LRTA, an advanced management initiative has already been taken by DOTC/LRTA. The Common Ticketing System under PPP has already been launched in early part of 2011 and they system will be applied to the whole LRT/MRT system in Manila area.

- Increase in operation cost
- Increase in maintenance cost

Regular and Timely operational supervision – For operations, Public sector / LRTA will function as the operational supervisor. A timely and ad hoc supervision and inspection will help the Private sector / operator to keep up the efficiency of operations and thus ending up by maintaining a good level of operation cost. Regular and timely on-site and off-site supervision activities are important. One initiative of LRTA/DOTC is the Automatic Fare Collection system not only for traffic management but also operational efficiency.

Timely and preventive maintenance – On the maintenance activities, as stated at Performance Standard risks, timely and preventive maintenance activities are essential instead of the maintenance intervention when a necessity occurs that may cause the service stoppage or reduced service provision.

Long-term commitment with suppliers – In the history of LRTA, the Study team learned some spare parts is not manufactured anymore at the foreign suppliers due to the time elapsed or even sometimes the supplier is not existent. To avoid the difficulties, it would be advisable that a long-term commitment with the suppliers at the beginning of the PPP contract or the advanced procurement to cover, say next 10 – 15 years or so.

Manufacturing railway products locally - More importantly in the long-term, it would be further advised for LRTA or in collaboration with LRTA, railway parts and equipment industry to be developed to avoid any supply risks.

8) Environmental risks

a) Social

- Objection of the public against the project
- Objection of the public against fare increase
- Loss of working / shopping / living locations

b) Natural

- Natural disaster occurrence / flooding / typhoons
- Adverse impacts on air, sound, smell, hygiene quality, and other nuisance

Consultation Meetings - During the feasibility study stage, consultation meetings with local people should be held. Resettlement Action Plan, if appropriate, should be prepared and discussed thoroughly with the affected people. Both the government and the private sector should disclose information and make campaign the future benefits when the Line is completed.

Implementation by Public sector - Recommended measures for identified adverse impacts should be implemented by respective public sector

6.3 Issues pertaining to PPP projects/identification of limitations faced by ODA side

6.3.1 Political and Administration Challenges under Aquino Administration

Public-Private Partnership (PPP) is not something new to the Philippines. Since early 1990s, the Government has been making its efforts in the name of BOT. The current system, however, has been criticized on its speed, transparency, rule of law and governance that has not been resulted in positive outcomes. The newly elected President Benigno Aquino in 2010 stresses the country's need for private sector support. PPP Center, formerly called BOT Center, convened a PPP Seminar in November 2010 and announced 111 PPP projects out of which 10 projects to be rolled out by the end of 2011.

PPP Projects Roll-out On-time - The first challenge for Aquino administration is, according to some government officials and also local business and finance people, whether those announce projects would be implemented on time. So far, he has been keeping his popularity but it will largely depend on the project implementation in speedy, transparent and efficient manner. This Line 2 Extension project has been intensively prepared in close coordination with LRTA, DOTC and the key stakeholders to meet the time plan indicated.

New PPP Enabling Framework - New PPP law replacing the existing BOT law is underway to incorporate to increase transparency, speedy process, better governance and rule of law, and clearer risk allocation of risks. PPP Center has been created but it is understood a logo change was made but waiting for the new PPP enabling law in place. Private sector, not only the domestic but also foreign businesses have been closely following the new legislation.

Good Project or Fast Project - One caveat presented by the Study Team is, though agreeing to the speedy implementation of the project, infrastructure projects usually takes much longer preparation and construction period vis-à-vis the patience of voters. If the Government wishes to implement good projects for the citizens, it may not necessarily be fast projects. A challenge to the Government is how to persuade and appeal to impatient nature of mind-set of the people.

Relatively Matured Private Sector – The Philippine private business and finance sector has been developing since the beginning of 2000 and in spite of 2008 Lehman shock affecting many country economies. In Metro Manila areas, one could observe rapidly growing business, commercial and residential development where the representative private sector groups have been actively developing their businesses and seeking opportunities in the PPP infrastructure areas. In this regard, President Aquino's initiatives should be appreciated to address a closer collaboration with private sector.

Toward "Private"-Public Partnership – It is common used as Public-Private Partnership implying PPP initiatives led by the Government and seeking the ways to welcome private sector to participate. The traditional view on the private business sector has been that private sector companies seek its profit maximization at the expense of exploitation of the public. More and more "Corporate Social Responsibility" and also the "Accountability" are the common notions of those matured private sector in the Philippines. Matured Philippine private sector may take lead, as Margaret Thatcher successfully did in her smaller government approach in 1970s, to seek public sector support for their businesses having public-good nature, say, Private-Public Partnership.

6.3.2 LRTA Challenges on its Strategic Development

LRTA has been elaborating its Medium Term Strategic Plan covering 2011-2016 period in which LRTA envisage to be "financially independent, fully owning its assets and the sole government institution, in partnership with private sector. It will continue to be responsible for the construction, management and operation of the urban mass transit system in the country." Operations under PPP schemes have been clearly announced to which the Study Team wishes to send its due respect. To achieve those strategies,

however, LRTA needs, in most of the cases, a third party commitment or help. On the other hand, one can read its implicit challenges to seek their business challenges in proactive manners to “make them happen” and not in a reactive manner of “wait and see” under the new Administrator and his supporting key management members.

Fare Increase Realization – The first test to make LRTA financially viable is to realize its fare increase. It has not been realized since 1980s that has been steadily damaging the financial health of LRTA. In spite of the preparation of the due process done by LRTA since 2010 has not been realized. LRTA, according to its Charter, can decide by itself fare revisions. It followed the same due process as other public infrastructure regulatory bodies do. The realization of substantial increase of the fare will be critical for its future as the first step to restore its financial soundness.

Financial Restructuring Implementation – Several options have been reviewed and the Debt – Equity Swap option seems to be most feasible. The LRTA capitalization has been PHP3 billion since 1987. DOF managed to arrange and put subsidy to provisionally replace the debt with that subsidy and expect a new GOCC capitalization bill including the capital increase of LRTA to PHP100 billion to pass the parliament, however, its passage may not seem to happen quickly due mainly to the policy priority point of view. For the time being the provisional measures would work but it is not a structurally corrective solution.

Non-Railway Revenue Increase – LRTA has been taking its initiatives and also has been seriously seeking its ways to increase non-railway revenues. Non-Railway revenues are such as advertisement, space rental, access rights with neighboring buildings or feeder traffic. The LRTA Charter is also free to develop, lease and conduct property development and operations. LRTA's Business Development staff members are assigned but their capacity and knowledge on Non-Railway operations seem to be limited. In fact, quite extensive marketing, commerce and property management knowledge is essential. A strong capacity development would be needed.

Operational Regulator and Supervisor Role – Under the PPP scheme, LRTA will be transformed from the current Direct Operator to an Indirect Operator. An Indirect Operator will enter into its supervisory function vis-à-vis contractors on its operations and maintenance activities whether they are conducting according under the Contract. To conduct monitoring and supervision activities, LRTA needs to set up operational service standard often referred to as KPI or technical standard to keep up the quality services of the railway such as licensing of drivers or station managers as the Operational Regulator. A comprehensive capacity building programs are indispensable for LRTA to perform its new role on the public transport service delivery.

6.4 Confirming Operations and Maintenance System

6.4.1 Implementation System of Operational Regulator/Supervisor

The role of LRTA is currently the regulator and the direct operator, and it will assume a role of an indirect operator function under PPP schemes. LRTA is currently responsible for all management and implementation activities by itself except for the some outsourced maintenance operations. Once a PPP contract is put in place, the role of LRTA management system will face four key challengers. The management system of LRTA will be divided into two distinctive functions, the one as the "Operational Regulator", and the other as the "Operational Supervisor". On technical and engineering expertise, LRTA will be asked to make its strong efforts in avoiding those railway engineering knowledge and skills from "Fading Out" with a purpose to exercise its new Operational Regulator and Supervisor functions. In addition to those, a strong expertise on Legal, Contractual and Negotiation matters as the "PPP Contract Owner" is expected to LRTA.

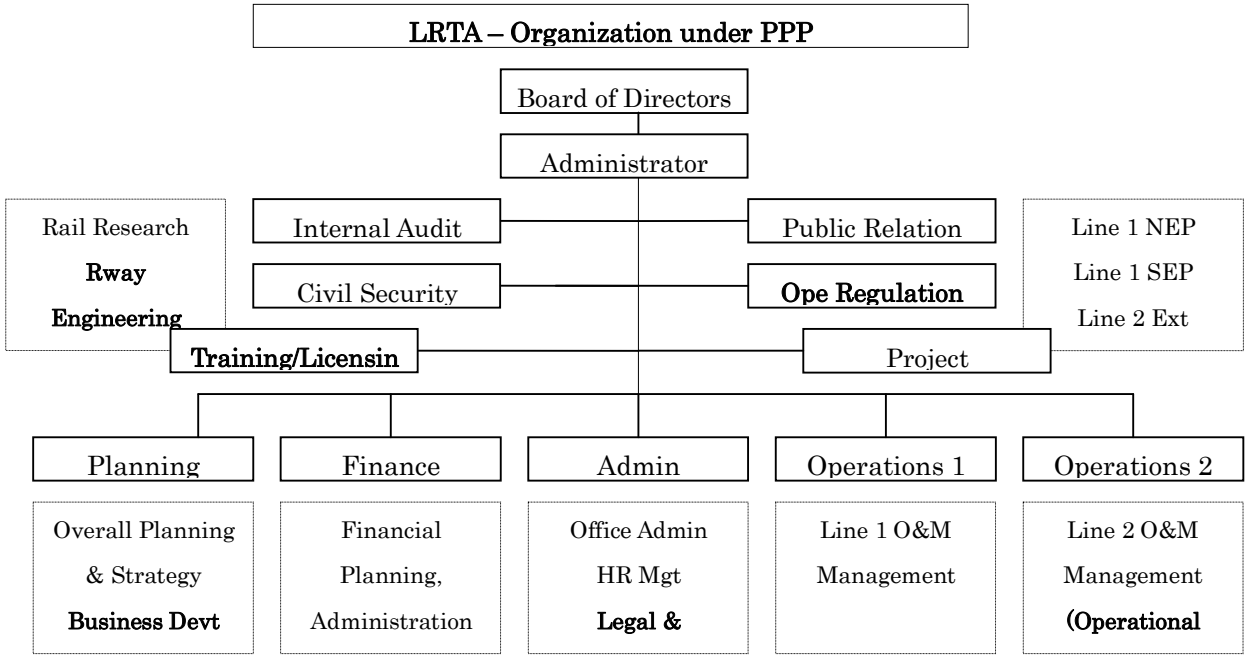
First of all, LRTA will continue to be the Regulator such as the fare level but with new responsibilities on the LRT Line Operations as "**Operational Regulator**". With a view to carry out the operational supervision activities below, LRTA will need to set up technical and operational standards on engineering, mechanical, operational and maintenance activities including benchmarks such as key performance indicators, for example, as well as certification and licensing of drivers, station managers and security & safety manager for contractors to achieve and keep professional railway service delivery.

Secondly, LRTA will assume a role as the "**Operational Supervisor**" to exercise monitoring and supervision activities vis-à-vis contractors / concessionaires whether they are providing adequate services as agreed in the PPP contracts. Till now LRTA has been doing most of the operational and maintenance activities by itself, but it will be an indirect manner to oversee services provided by contractors / concessionaires where LRTA will need to keep adequate knowledge to properly manage those outsourced services.

In the third place, LRTA, for both supervision and regulation roles, it will need to keep and maintain its current managerial, technical and operational expertise. LRTA would need to make efforts in "**Avoiding Expertise Fade-out**" during the years to come. For the time being, during a medium-term, the institutional memory, technology and skills will remain, but as the time goes by, it is quite likely those advanced knowledge and skills may subside. Some HR management and evaluation system would be needed to keep highly experienced technical and operations experts and offer them opportunities to update the latest technology and management expertise internally for those operations and maintenance activities to be supervised. If not, LRTA would be very difficult to keep itself held accountable for their contracted-out services to private sector as well as other stakeholders such as passengers.

Fourthly, in relation to new PPP project planning and implementations, the new and important role to be assumed by LRTA will be the "**PPP Contract Owner**" where procurement and contractual expertise on construction, engineering as well as operations and maintenance will have critically important. Quite often, most of the construction, engineering, technical or system unit staff have engineer background and may not have sufficient knowledge on legal, contractual and negotiation issues. Legal enabling framework would be more provided in the near future but the contractual obligation knowledge under PPP or negotiation skills with private sector companies need a more professional approach with internal capacity building which is called "Management of Technology" (MOT).

Possible organization of LRTA under PPP scheme is shown in **Figure 6.4-1** below. New units and roles are highlighted in bold.



Source: Study Team

Figure 6.4-1 Proposed LRTA Organization

6.4.2 Implementation Systems of Operations

The specific key tasks and duties to be performed at LRTA under PPP as Indirect Operator carrying out Operational Regulator and Supervisor as explained above and its demarcation between LRTA and Private sector in the field of Operations are as follows.

1) Train operations

For LRTA

- Advise, recommend and assist the Administrator in the formulation and implementation of rules and regulation necessary to carry out the objectives and policies of LRTA concerning operations,
- Approve system and train operating plans, policies, and strategies to ensure efficiency and effectiveness,
- Supervise and monitor the Private sector regarding train movements service interruption and train service,
- Supervise and monitor the Concessionaire to handles train operation in accordance with prescribed timetables and instructions and reports any abnormality along the line.

Private sector Operator will be responsible for:

- Develop system and train operating plans, policies, and strategies to ensure efficiency and effectiveness,
- Provide safe and efficient train services,
- Coordinate with Operation Departments regarding train movements service interruption and train service,
- Monitor the replacement of train drivers using prepared approved duty roster, train preparation procedures, injection/ejection/insertion/removal of trains and arrival/departure of trains at/from terminals based on approved train service schedule,
- Recommend rerouting in cases of breakdowns to prevent unnecessary delays,
- Ensure passengers aboard the train complying with safety rules and regulations.

2) Station Operations

For LRTA

- Supervise and monitor Private sector operator to promote quality frontline service
- Supervise the inspection of physical facilities in terminals/stations

For Private sector Operator

- Implement the fare collection, including the refund procedure,
- Operate the station computer operations, monitoring of equipment, sale of tickets including recording, accounting and turnover of cash/excess collected tickets,
- Promote quality frontline service,
- Assign and adjust manpower schedules, including the training of station officers,
- Assist passengers particularly senior citizens, disabled and handicapped and attend to their travelling needs at the station,
- Inspect physical facilities in terminals/stations,
- Monitor passenger ridership and implement crowd control measures,
- Monitor the accounting and turnover of cash/excess collected tickets;

3) Traffic Control

For LRTA

- Supervise Private sector operator to monitor, control and/or coordinate train movements, rail vehicles and maintenance work on the line facilities,
- Supervise Private sector operator to check equipment at terminals and stations as well as the presence of personnel on duty,
- Supervise Private sector operator to monitor train departure and arrival to ensure punctuality of schedule,
- Supervise and monitor Private sector operator to formulate timetable,

For Private sector Operator

- Monitor, control and/or coordinate train movements, rail vehicles and maintenance work on the line facilities,
- Facilitate the resumption of normal rail services in case of service interruption,
- Check equipment at terminals and stations as well as the presence of personnel,
- Provide information on service or traffic including the status of daily operation including the connecting and depot areas,
- Prepare manpower schedule including drivers schedule as well as training of traffic personnel,
- Monitor train departure and arrival to ensure punctuality of schedule,

6.4.3 Implementation Schemes of Maintenance

This section is further subdivided into 3 subsections that first describe the most common schemes, then evaluate them, and finally propose the most suitable scheme for the LRTA in general, and Line 2 in particular.

6.4.3.1 Alternatives for Maintenance Schemes

1) General

Maintenance management is a concept which integrates all the activities of maintaining and controlling rolling stock and other facilities ranging from commissioning to heavy repair.

In order to maximize the effectiveness and productivity of the system as a whole, a planned but also corrective maintenance policy is required. The primary aim is the prevention of faults that arise with a view to restoring the items concerned to their former condition as quickly as possible at any time. Maintenance involves carrying out the functions of inspection, servicing and repair.

To achieve optimum efficiency of maintenance efforts, maintenance philosophy and planning should not only consider the previous and present condition of the items concerned, but also their future expectancy and life cycle and the economic aspects of maintenance. Early failures, unexpected failures and failures due to wear and tear can also occur within the life cycle of any individual component. Each of the above problems must be approached in a different manner.

The **Maintenance Philosophy** for the LRTA must therefore not only provide for preventive maintenance, but also for predictive maintenance and to a certain extent trouble-shooting maintenance in respect of specific items. The aim will be that the operation of the rolling stock and other facilities provided, will be safe and the service and maintenance of all facilities and rolling stock will be carried out accurately so as to extend their life to a point economically and physically justified.

This section describes the general maintenance alternative schemes available for the LRTA, taking also in consideration the current maintenance scheme. There are, however, only two basic schemes for maintenance, to wit:

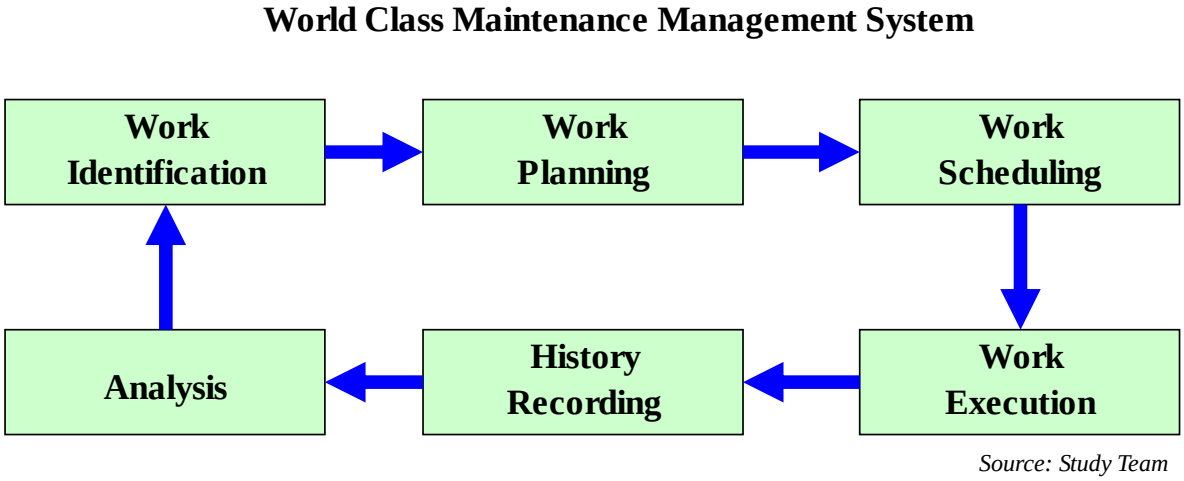
- Direct Maintenance (by Owner/Operator)
- Outsource Maintenance (by third party contractor)

As its name indicates, Direct Maintenance is the scheme where the Owner/Operator carries out the maintenance activities with an in-house work force. This scheme is self-explained, and does not require further elaborate description. Outsourced maintenance, on the other hand, has different options for the degree and tasks to be outsourced. The section below describes those options.

In our study case of concession of a new extension line plus existing line, it is advisable to simultaneously award the construction of the new line and the operations and maintenance of existing line. This would allow a smooth transition between LRTA-controlled operations to the Private-controlled operations while the construction of the extension is being implemented. This also will assist to make the project more feasible on a PPP scheme as it was shown in Section 4.4. It is not advisable to have different O&M contractor and construction contractor.

2) Maintenance Outsourcing Schemes

An important consideration in making the maintenance outsourcing decision is what aspects of maintenance to outsource. If we consider the maintenance management process as consisting of six major steps, as shown in **Figure 6.4-2** below, then a number of options exist.



Source: Study Team

Figure 6.4-2 Maintenance Task Work Flow

In the first instance, organizations may choose simply to outsource the work execution step, while retaining the remaining steps in-house. This is often done on a limited basis, for example, when employing contractors to supplement an in-house work force during times of high workload. This is the minimalist approach to outsourcing.

An alternative approach is to outsource all of the above activities with the exception of the analysis and work identification steps. In this approach, the contractor is permitted to plan and schedule his own work, and decide ***how*** and ***when*** work is to be done, but the outsourcing organization retains control over ***what*** is to be done.

A third approach is to outsource all of the above steps, thus giving control over the development of equipment maintenance strategies (i.e. Preventive and Predictive Maintenance programs) to the contractor. In this instance, the contract must be structured around the achievement of desired outcomes in terms of equipment performance, with the contractor being given latitude to achieve this to the best of his ability. This is currently the approach taken by the LRTA. There are advantages and disadvantages to each approach, and the most appropriate approach will depend on the client's particular situation.

Accordingly, outsourcing needs to be well targeted and framed by properly worded contracts. When outsourcing railway maintenance there are two contractual strategies to follow: i) functional requirements, and ii) job specific requirements. As stated in paragraphs above, variations of the two do exist and it is also possible to choose a mixture.

Contracts based on functional requirements, also known as Key Performance Indicators (KPI), are typically related, for example, to track quality, track availability, rolling stock availability, AFC availability, etc. A price for the contract is negotiated prior to the implementation of the contract, bonuses and penalties are used if performance is better, or worse than agreed upon. The time horizon for contracts could be 5 to 10 years, but also longer depending on investment.

Contracts based on job specification requirements are for example rail grinding, tamping, inspection and revision of signaling system, station equipment repair, etc. Typical time horizon is short, equal to the duration of the job.

Looking at how maintenance fits into the wider asset management strategy of an organization also raises interesting challenges.

For example, one challenge that needs to be met is how the maintenance contractors will interface with the railway operators, and the relative responsibilities and duties of each party. Many organizations today

are adopting Total Productive Maintenance principles, which encourage operators to take a higher level of responsibility for equipment performance, and also encourage them to perform many minor maintenance tasks. There is also a growing realization that the manner in which equipment is operated can have a huge bearing on maintenance costs and the maintenance activities required to be performed if equipment performance targets are to be met. A high level of teamwork between the Maintenance contractors and the railway operators is, therefore, vital to the successful completion of the contract. This leads to the view that an alternative, and possibly better, approach to the outsourcing of maintenance is to include operation in the scope of the contract. Hence, the letting of Operations and Maintenance contracts.

Finally, taking things one step further again, there is also a growing realization that maintenance is limited in achieving higher equipment performance by the fundamental design of the equipment being maintained. The best that maintenance can achieve is the inherent reliability and performance of the equipment that is built in by design. There is, therefore, a school of thought that says that the best way to overcome this limitation, in an outsourcing environment, is to also give the contractor responsibility for the design of the equipment. This can be done either by giving him responsibility for ongoing equipment modifications, or by giving him responsibility for the initial design of the equipment, as in a BOOM (Build, Own, Operate and Maintain) contract, which is gaining favour in many infrastructure projects.

Accordingly, there is a trend to contract the Original Equipment Manufacturer (OEM) as Maintenance Contractor for newly implemented projects, where equipment is not well known to the owner and it is still under warranty.

6.4.3.2 Evaluation of Maintenance Schemes

Benefits

First of all, the advantages of outsourcing the railway maintenance works over in-house maintenance are enumerated below. Companies surveyed in the UK indicated that the main benefits were reported to be[2]:

- Reduction the cost of obtaining the service 78%
- Reduction in the headcount of the organization 65%
- Increased flexibility of the business enterprise 61%

Very often not only the potential economical savings are identified as the main reason, but there are also other potential advantages that could defend a decision to outsource one or more activities:

- Outsourcing enables budget flexibility allowing operators to pay for only the services that are needed and when they are needed.
- Using a contractor to focus 100 percent on a particular area lets the Owner/Operator better manage existing assets, and focus in-house resources on core functions
- A trend toward outsourcing maintenance and adopting asset management applications is helping operators make the improvements which are crucial to keeping a railway system up and running, and keeping costs down.
- Warehousing and supply chain management will improve. Procurement of needed spare parts and equipment will be faster by employing technical experts doing the canvassing, evaluating, and testing up to acceptance of delivered spare parts.
- Less red tape or bureaucratic procedures. If maintenance is under the government, it always requires government ruling such as Commission on Audit, Government Procurement Act, etc. to carry out purchases of spare parts.
- Standby funds always available.

[2] *An Overview to Outsourcing – Trends and Different Options. SINTEF, Norway, Nov. 2003*

- It also reduces the need to hire and train specialized staff by the government operator, bringing in engineering expertise from the outside, and reduces capital expense, yielding better control of operating costs. Salary is attractive to acquire/hire qualified personnel (engineers. technicians, consultants, etc.).
- Unique technical expertise of the contractor, Improved quality of work and access to skilled personnel
- Reduced risk

Secondly, as mentioned in previous subsection, the level of outsourcing, i.e., *How much maintenance to be outsourced?*, can vary, having advantages and disadvantages to each approach, and the most appropriate approach will depend on the client's particular situation.

Needless to say, the degree of involvement of the Owner/Operator in maintenance activities will depend greatly on the technical capability of its in-house work force.

In case of experienced and well established Operator around the world, when an outsourcing scheme is applied, they usually have a great degree of freedom to choose about what type of contract to apply. They might opt to keep control of ***what*** and ***when*** or not. However, in case of newly formed Operator or Owner/Agency, the approach would be to outsource all activities under an equipment performance type of contract (functional requirements or KPI), since they have no option.

Pitfalls and Concerns

In the previous sections we discussed potential benefits that could be the result of an outsourcing strategy. However, there is no guarantee that these benefits are achieved, and there could be also negative effects of the outsourcing:

- Loss of control
- Loss of expertise
- Taxes
- Contractor is not capable for doing the job

Loss of control
When work is outsourced to a contractor, the Owner/Operator transfers control over the activity that is outsourced to the contractor. To some extent, the Owner/Operator can assure against this by conducting audits to the contractor, but full control is almost impossible to obtain. The overall responsibility will be placed at the Owner/Operator, at least in the view of the public/customers.

Loss of expertise
A negative effect of outsourcing is often that the customer loses important knowledge, competence and expertise within the area that is being outsourced, or in case or a newly formed operator, they fail to gain suitable experience, remaining clueless of the maintenance procedures and skills.

"Loss" in here is applicable to existing experienced Owner/Operator "losing" expertise and control, but in case of a new Owner/Operator means losing possibility to acquire such expertise and control.

6.4.3.3 Proposed Maintenance Schemes

This subsection introduces our proposed maintenance scheme, which is a general description of the most appropriate scheme for this project, and it is independent from the mode of implementation that would be finally selected, being that a fully ODA, PPP with two-tiered, Net or Gross Cost, etc., thus, suitable to any funding scheme.

The Study Team, taking in consideration all available information, site conditions, potential technical and financial capabilities of LRTA, is suggesting the following O&M scheme for the Line 2 Extension project: The Concessionaire/Operator shall outsource to a Maintenance Contractor all the maintenance activities, including, among others, light & heavy maintenance, troubleshooting, procurement of capital and consumable spare parts. Moreover, if the PPP scheme selected is Type 4-2 or Type 5-2, the O&M activities should be given in concession to the winner of the tendering as soon as contract is awarded, instead of after completion of construction works.

We first suggest the outline of the responsibilities to be addressed by and between the LRTA, which is the owner/Authority (A), the Concessionaire/Operator (O), and the Maintenance Contractor (C). A basic matrix of tasks and duties for the three stakeholders is shown in **Table 6.4-1**.

Table 6.4-1 Tasks & Duties Matrix for Maintenance

	Task	Responsibility		
	Maintenance	**A**	**O**	**C**
1	• Formulate policies and guidelines in the maintenance of rolling stock, E&M subsystems, and civil works		☑	
2	• Approve policies and guidelines in the maintenance of rolling stock, E&M subsystems, and civil works	☑		
3	• Implement policies and guidelines in the maintenance of rolling stock, E&M subsystems, and civil works			☑
4	• Inspect repair maintenance activities of the maintenance contractor		☑	
5	• Implement of all maintenance activities related to rolling stock, E&M subsystems, and civil works			☑
6	• Approval of special repairs and corrective maintenance activities		☑	
7	• Approval of large rehabilitation programs of capital equipment	☑		
8	• Monitor Maintenance progress implementation of all maintenance activities by using CMMS		☑	
9	• Monitors the performance of the contractor and oversee the proper implementation of Quality Assurance/Quality Control of all maintenance/repair works.		☑	
10	• Audit/approve status reports of the maintenance of the tools and equipment;		☑	
11	• Supervise and monitor the Contractor to plan and procure local and foreign spare parts, material, tools and equipment;		☑	
12	• Plan and procure local and foreign spare parts, material, tools and equipment;			☑
13	• Supervise the control of inventories and the issuance of spare parts;		☑	
14	• Responsible for the control of inventories and the issuance of spare parts;			☑
15	• Prepare annual materials/spare parts budget (local and imported) for the operation and maintenance of the system;			☑
16	• Assist in managing the procurement process;		☑	

Source: Study Team

The basic concept of sharing of duties is that the Owner approves, the Operators monitors, and the Contactor implements the Maintenance Plan, which is prepared based on policies and guidelines for maintenance, and the OEM maintenance guidelines. They all should be bound by two contracts: a Concession Agreement between LRTA and Operator (in case of Net Cost Scheme) or Service Agreement (in case of Gross Cost Scheme), and a Maintenance Contract between the Operator and Contractor for a period between 3 to 5 years.

The monitoring and supervision of the maintenance activities should be done using Computerized Maintenance Management System (CMMS). Currently, at LRTA the software MAXIMO© is being used as CMMS.

Capital equipment (rolling stock, subsystems, etc) replacement due to end of life cycle or new acquisition due to capacity expansion is responsibility of the Owner.

Accordingly, all parties (the Owner, Operator, and Maintenance Contractor) should adopt the concept of fully integrated teams. The recommended functional organization structure is shown in the following figure.

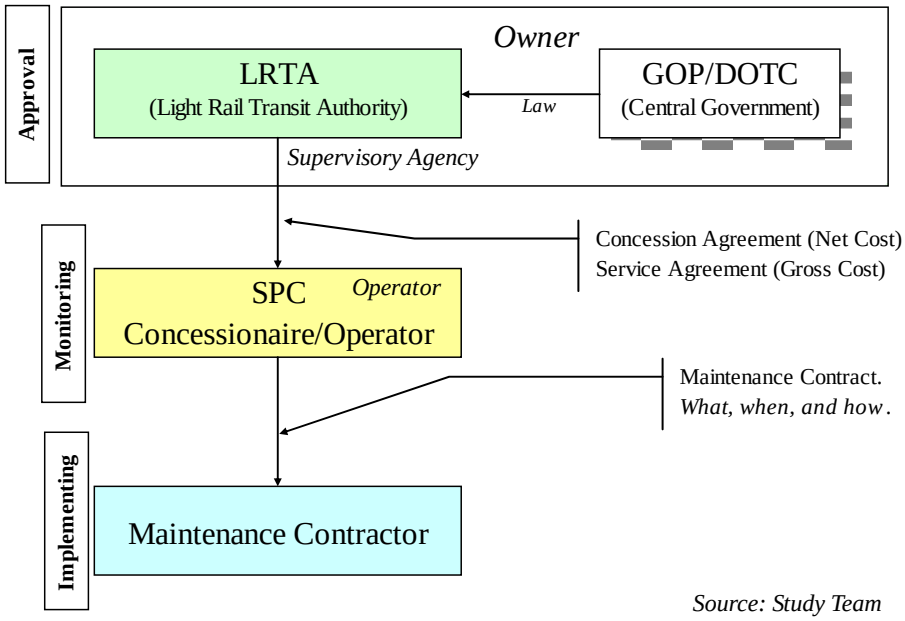


Figure 6.4-3 Functional Organization Structure for O&M Maintenance Scheme

The following measures should be taken in consideration to avoid the issues seen in other railway systems as the mentioned samples herein.

It is important that the Owner/Operator be able to have some hands-on over the maintenance process in order to keep the growth of the capacity building of the in-house workforce at all levels, especially the technician level.

Approved training programs should be carried out periodically to the benefit of the LRTA's in-house technical staff in all related activities of the O&M of the system.

Eventually, LRTA should be able to take more responsibilities, control, and risks in time for the implementation of new railway lines that will increase the network in Manila.

6.4.4 Implementation System of Contractual Management

Legal Knowledge as the PPP Contract Owner - Procurement and contractual expertise on construction, engineering as well as operations and maintenance will play a critical importance under PPP schemes. Most of the construction, engineering, operations and maintenance unit staff have engineering background and may not have sufficient knowledge on legal, contractual and negotiation issues. Legal enabling framework such as a new PPP Law will help them as their safeguard in the near future but the contractual obligation knowledge under PPP or negotiation skills with private sector companies need more professional approach with a caveat that the legal framework will not solve all the contractual matters. LRTA staff, facing with any kind of contractual issues will be required to equip themselves with at least a basic knowledge of legal matters as well as the negotiation skills to protect well the benefit of LRTA.

The key contractual tasks are conducted by Project Management Office and Operation Departments with assistance from Legal and Contractual Management unit in Administration. One strong recommendation, particularly learning from the experience of the other country under Net Cost Scheme, is to make efforts to develop capacity not only at Legal units but also at Project Management Office and Operation Departments.

The key tasks and duties requiring legal knowledge, contractual know-how and negotiating skills are as follows.

During Construction Phase

- Prepare specification and tender documents,
- Evaluate and negotiate tender documents,
- Make review and evaluation to Private sector company on construction, testing, construction, project management till commissioning,

During Operations and Maintenance Phase

The following matters will require not only engineering and technical knowledge but to be supported by legal and contractual aspects. Most of the daily operational and maintenance work will, from time to time, will be in need of legal, contractual and negotiation knowledge and skills. O&M tasks usually cover train operations, station operations, traffic control, supply and procurement management, rolling stock maintenance, M&E system, civil structure, and track work and for each task, careful review from contractual obligations to be underwritten by LRTA will be required.

6.4.5 Implementation System of Business Development

LRTA will increase its role and function on, not only the railway operations but also the associated and non-railway operations to seek its sustainable development. LRTA will also implement its MTDP in a comprehensive manner. Both initiatives will require s stronger business development expertise and organization.

Planning Department will assume the prime responsibilities but it will coordinate closely with Project Management Office, Operational Departments, Legal units and also with Private sector operator.

- Identify and prepare available and potential assets, areas/spaces for allocation and evaluation on the highest/best used for possible business opportunities.
- Monitor research, feasibility studies and formulates/develops plans and programs for rail, associated and non-railway operation revenue generated activities,
- Initiate and oversee proper implementation of approved railway, associated and non-railway revenue generated transactions for LRTA,

6.4.6 Strengthening of Overall Organization for Implementation

Bearing those new and upcoming duties and functions, LRTA will also need to make an overall organization development under PPP. Some organization aspects to be incorporated to the institutional strengths for LRTA are as follows. Most of the cases are taken from Japanese railway company experience.

Hands-on / On the Job Training – Japanese tend to appreciate more hands-on skills than theory and knowledge gained through books. The best way to gain good skills is done via hands-on and on-the-job-training (OJT) from senior engineers / staff members serving long in the company. Training center based trainings are meaningful but the real cases are invaluable comparing with the virtual ones. The second option is to establish a Staff Exchange Program described above.

Cross Sectional Rotation – Junior staff members, whatever background they have, are posted in both engineering and/or technical departments and economic, operational and/or administrative departments during the course of their initial ten years or so career stream. It will be vitally important for staff with engineer background staff to experience economic and operational units, and *vice versa*, so that they will gain the whole organizational structure concept.

Regular Job Rotation - People appreciate a staff serving for the same job and being knowledgeable on specific fields. However, this may generate issues on how to enhance institutional capacity on the basis of knowledge and skills sharing. With a view to avoid the knowledge fall-out, regular job rotation with adequate knowledge / technology transfer between predecessor to successor is an effective option for a company.

Management of Technology (MOT) – For LRTA staff managing under PPP scheme, in addition to the legal knowledge and skills, they are required to acquire more business oriented understanding particularly when they face with private sector counterparts. Considering most of the LRTA staff members dealing with PPP operational supervision activities, they are asked to equip themselves by having a "Management of Technology" expertise that was originally developed in the Silicone Valley in 1990s for IT business mid-level engineers to understand well the business management. It will be vital for LRTA supervisors on operations and maintenance to understand not only the technical and engineering aspects but also to face with their MOT knowledge.

CHAPTER 7

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

CHAPTER 7 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

This Chapter provides a summary of relevant information from the METI Study, particularly the Environmental Performance Report and Management Plan that was submitted in November 2009, as well as confirmation from the present study based on field investigation, sampling and analysis, and public consultation meetings.

Preparation of this document is in accordance with the JICA Guidelines for Environmental and Social Considerations (April 2010) for Category "B" projects. As such, potential negative and positive environmental impacts were identified, and the necessary measures to avoid, minimize, or mitigate adverse impacts, and enhance the positive ones are recommended (Please refer to Table 7.4-1). Please note that since an EIA procedure has been conducted in compliance with the Philippine EIS System (Please refer to the Environmental Performance Report and Management Plan or EPRMP), reference to said document shall be made from time to time.

Evaluation of the Environmental Assessment in Philippines is conducted under the EIS system (Department of Environment and Natural Resources (DENR) Administrative Order No.2003-30 "Implementing Rules and Regulations (IRR) for the Philippine Environmental Impact Statement (EIS) System"). For Projects that already exist and for expansion such as the LRT Line 2 Extension, the EIA document is referred to as the Environmental Performance Report and Management Plan. Note that only the name is different; the content of the EPRMP is almost the same as an Environmental Impact Assessment report for Category A projects. About the Philippine Extension Project, the environmental Compliance Certificate (ECC) and EPRMP are needed.

It is important to note at this point that no communities shall be displaced as a result of Right-of-Way acquisition for Station locations. As such, preparation of a Resettlement Action Plan (RAP) is not deemed necessary. In addition, no indigenous people shall be affected so an IPP is also not considered necessary.

The following sections provide a summary of findings, description of the scoping process, presentation of baseline information, identification of impacts, formulation of mitigation measures, and development of management and monitoring plan.

7.1 Issues Scoping

As mentioned, researches on environmental and social considerations of this project is to be conducted with the Philippine EIS, Table 7.1.1, shows "Environmental Checklist (Train)" in the "Environmental Guidelines for JICA" and scoping the problem is carried out.

Table 7.1-1(1) Environmental Checklist

	Environmental Item	Main Check Item	The result of environmental considerations
1. permits and explanation	(1) EIA and Environmental Permits	①Have EIA reports been officially completed? ②Have EIA reports been approved by authorities of the host country's government? ③Have EIA reports been unconditionally approved? If conditions are imposed on the approval of EIA reports, are the conditions satisfied? ④In addition to the above approvals, have other required environmental permits been obtained from the appropriate regulatory authorities of the host country's government?	①YES: Environmental Performance Report and Management Plan (EPRMP) report is completed. ②NO: EPRMP not submitted yet. ③EMB may request proponent to submit Engineering Geology and Geo-hazard Assessment Report (EGGAR) ④NO: LLDA permits are required for this project after obtaining an ECC. Infrastructure projects of Laguna de Bay Shore land Areas are required to secure a clearance from the LLDA before construction starts
	(2) Explanation to the Public	①Are contents of the project and the potential impacts adequately explained to the public based on appropriate procedures, including information disclosure? Is understanding obtained from the public? ②Are proper responses made to comments from the public and regulatory authorities?	①YES: According to EIA process in the Philippine, the public consultation should be conducted at least one time at each sites of east and west extension　Two (2) sets of consultation meetings have been undertaken, one during METI Study and the other during the present study.　All concerns raised were properly addressed.　Please refer to Executive Summary of the EPRMP ②YES: The dissemination information campaign and consultation with the people and the concerned authorities is required. Proper responses on the comments from the people or the authorities concerned are required. ・ EIA process in　the Philippine ・ Noise and vibration during construction ・ Construction schedule, Night-time work, removal of roadside trees, Permission for Occupancy of Road Area etc ・ Resettlement and land acquisition

Source：JICA Guideline for Environmental Considerations and Study Team

Table 7.1-1(2) Environmental Checklist

	Environmental Item	Main Check Item	The result of environmental considerations
2. Mitigation Measures	(1) Air Quality	①Is there a possibility that air pollutants emitted from various sources, such as vehicle traffic will affect ambient air quality? Does ambient air quality comply with the country's ambient air quality standards? ②Where industrial areas already exist near the route, is there a possibility that the project will make air pollution worse?	①YES: LRT systems are less demanding on the environment since exhaust gas, noise and vibration from LRT operations is small in comparison with motor vehicle operations. Therefore, the transition of the mode of transportation from motor vehicle to railway is expected to significantly reduce air pollution. ②NO: There are no industrial areas along the railway.
	(2) Water Quality	①Is there a possibility that soil runoff from the bare lands resulting from earthmoving activities, such as cutting and filling will cause water quality degradation in downstream water areas? ②Is there a possibility that surface runoff from roads will contaminate water sources, such as groundwater? ③Do effluents from various facilities, such as stations and parking areas/service areas comply with the country's effluent standards and ambient water quality standards? Is there a possibility that the effluents will cause areas that do not comply with the country's ambient water quality standards?	①NO: There is no large-scale filling and cutting work since the guide way is elevated concrete structure ②③NO: Since there is no negative impact such as contamination problem caused by drainage from stations, railroad, other facilities for the existing LRT line, no effect is expected for the proposed line in this project.
	(3) Noise and Vibration	①Do noise and vibrations from vehicle and train traffic comply with the country's standards?	①YES: Since the railway along the curve section of west extension line is close to the building, complaints from residents are expected against noise from LRT operations. Mitigation measures should be considered and the monitoring plan of noise be implemented in order to ensure that standards as required by law are maintained. On the other hand, there is no standard regarding vibration in Philippine.

Table 7.1-1(3) Environmental Checklist

	Environmental Item	Main Check Item	The result of environmental considerations
3. Natural Environment	(1) Protected Areas	①Is the project site located in protected areas designated by the country's law or international treaties and conventions? Is there a possibility that the project will affect the protected area?	①NO: The present land use in the area along proposed railway is mainly commercial area. There are no protected area designed by the country's laws or international treaties and conventions.
	(2) Ecosystem	①Does the project site encompass primeval forests, tropical rain forests, ecologically valuable habitats? ②Does the project site encompass the protected habitats of endangered species designated by the country's law or international treaties and conventions? ③If significant ecological impacts are anticipated, are adequate protection measures taken to reduce the impacts on the ecosystem? ④Are adequate protection measure taken to prevent impacts, such as disruption of migration routes, habitat fragmentation, and traffic accident of wildlife and livestock? ⑤Is there a possibility that installation of roads will cause impacts, such as destruction of forest, poaching, etc? ⑥In case where the project site is located at undeveloped areas, is there a possibility that the new development will result in extensive loss of nature environments?	①②③④⑤⑥：NO: The proposed railway starts on the existing main road in Manila; and, the present land use in the area along the proposed railway is mainly categorized as commercial area. Therefore No effect on ecosystem is expected.
	(3) Hydrology	①Is there a possibility that alteration of topographic features and installation of structures, such as tunnels will adversely affect surface water and groundwater flows?	①NO: There will be no alteration of topographic features. There will be no need for tunneling along the entire alignment
	(4) Topography and Geology	①Is there a soft ground on the route that may cause slope failures or landslides? Are adequate measure considered to prevent slope failures or landslides, where needed? ②Is there a possibility that civil works, such as cutting and filing will cause slope failure or landslides? Are adequate measure considered to prevent slope failure or landslides? ③Is there a possibility that soil runoff will result from cut and fill areas, waste soil disposal sites, and borrow sites? Are adequate measure taken to prevent soil runoff?	①NO: Although there are areas that are prone to liquefaction along the proposed extension line. Geotechnical investigation show that the potential results for liquefaction is low. ②③NO: There is no large-scale filling and cutting work.

Table 7.1-1(4) Environmental Checklist

	Environmental Item	Main Check Item	The result of environmental considerations
4. Social Environment	(1) Resettlement	①Is involuntary resettlement caused by project implementation? If involuntary resettlement is caused, are efforts made to minimize the impacts caused by the resettlement? ②Is adequate explanation on relocation and compensation given to affected persons prior to resettlement? ③Is the resettlement plan, including proper compensation, restoration of livelihoods and living standards developed based on socioeconomic studies on resettlement? ④Does the resettlement plan pay particular attention to vulnerable groups or persons, including women, children, the elderly, people below the poverty line, ethnic minorities, and indigenous peoples? ⑤Are agreements with the affected persons obtained prior to resettlement? ⑥Is the organizational framework established to properly implement resettlement? Are the capacity and budget secured to implement the plan? ⑦Is a plan developed to monitor the impacts of resettlement?	①NO: No displacement of communities will be necessary. ②NOT APPLICABLE: No residential areas will be affected ③NOT APPLICABLE: No relocation necessary. ④NOT APPLICABLE: No relocation necessary. ⑤NOT APPLICABLE: No relocation necessary. ⑥NOT APPLICABLE: No relocation necessary. ⑦NOT APPLICABLE: No relocation necessary.
	(2) Living and Livelihood	①Where roads or railways are newly installed, is there a possibility that the project will affect the existing means of transportation and associated workers? Is there a possibility that the project will cause significant impacts, such as extensive alteration of existing land uses, changes in sources of livelihood, or unemployment? Is adequate measure considered for preventing these impacts? ②Is there a possibility that the project will adversely affect the living condition of inhabitants other than the affected inhabitants? Are adequate measures considered to reduce the impacts, if necessary? ③Is there a possibility that diseases, including communicable diseases, such as HIV will be introduced due to immigration of workers associated with the project? Are adequate considerations given to public health, if necessary? ④Is there possibility that the project will adversely affect road traffic in the surrounding areas (e.g., by causing increase traffic congestion and traffic accidents)? ⑤Is there a possibility that roads and railways will cause impede the movement of inhabitants? ⑥Is there a possibility that structures associated with roads(such as bridges will cause a sun shading and radio interference?	①YES: There is a possibility that this project will affect a lot of existing public transport groups (public bus, jeepney, tri-cycles, etc) which operates passenger jeepneys at Santolan and Recto station. ②NO: The LRT system is not expected to adversely affect living condition of inhabitants along the entire stretch. ③NO: Since the project is located in Metro Manila, no influx of workers from other areas is expected. ④NO: In this project, the introduction of the LRT system will cause the transition in the means of transportation from motor vehicle to railway; and, will subsequently, lead to a decrease in motor vehicle traffic flow volume as well as the improvement of traffic congestion. ⑤NO: Since the railway is elevated guide way, the movement of inhabitants is not changed. ⑥Sun shading: YES: The project facilities may cause partial sun shading. However, sun shading is not considered an adverse impact in Philippine. Radio wave interference: NO: Since there are no negative impact such as the radio wave interference for the existing LRT line, no effect is expected for the proposed line in this project.

Table 7.1-1(5) Environmental Checklist

	Environmental Item	Main Check Item	The result of environmental considerations
4. Social Environment	(3) Heritage	①Is there a possibility that the project will damage the local archeological, historical, cultural, and religious heritage sites? Are adequate measures considered to protect these sites in accordance with the country's laws?	①NO: There are no local archeological, historical, cultural, and religious heritage sites along proposed railway.
	(4) Landscape	①Is there a possibility that the project will adversely affect the local landscape? Are necessary measures taken?	①NO: Design sympathetic with the local landscape will be considered for the guide way structure form.
	(5) Ethnic Minorities and Indigenous Peoples	①Where ethnic minorities and indigenous peoples are living in the rights-of-way, are considerations given to reduce the impacts on culture and lifestyle of ethnic minorities and indigenous peoples? ②Does the project comply with the country's laws for rights of ethnic minorities and indigenous peoples?	①②NO: Ethnic minorities and indigenous peoples are not living along proposed railway.
	(6) Working conditions	①Is the project proponent not violating any laws and ordinances associated with the working conditions of the country which the project proponent should observe in the project? ②Are tangible safety considerations in place for individuals involved in the project, such as the installation of safety equipment which prevents industrial accidents, and management of hazardous materials? ③Are intangible measures being planned and implemented for individuals involved in the project, such as the establishment of a safety and health program, and safety training (including traffic safety and public sanitation) for workers etc? ④Are appropriate measures being taken to ensure that security guards involved in the project do not violate safety of other individuals involved, or local residents?	①YES: LRTA shall not violate any Laws and ordinances associated with the working condition in the project. On the contrary, such laws and ordinances shall be strictly observed and implemented. ②YES: LRTA shall ensure safety measures for the individuals involved in the project; this provision shall be incorporated in the Health and Safety Management Plan that shall be established as part of the contract between the proponent and the contractor. ③YES: Safety instruction for new recruits, safety meetings and safety patrols shall be undertaken periodically. ④YES: LRTA shall ensure that security guards shall not violate the safety of other individuals involved or local residents; this provision shall also be incorporated as part of the Health and Safety Management Plan to be established by the contractor with the approval of the project proponent.

Table 7.1-1(6) Environmental Checklist

	Environmental Item	Main Check Item	The result of environmental considerations
5. Others	(1) Impacts during Construction	①Are adequate measures considered to reduce impacts during construction (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)? ②If construction activities adversely affect the natural environment (ecosystem), are adequate measures considered to reduce impacts? ③If construction activities adversely affect the social environment, are adequate measures considered to reduce impacts? ④If necessary, is health and safety education (e.g., traffic safety, public health) provided for project personnel, including workers?	①YES: Noise, turbid water, and wastes are expected to generate during construction. Adequate measures against these impacts should be adopted consistent with the Impact Management Plan in the EPRMP. On the other hand, there is no standard regarding vibration in Philippine. The adoption of low vibration methods shall be considered in the selection of construction equipment and construction methods. ②The proposed railway will commence on the present main road. The present land use in the area along proposed railway is mainly commercial area. No negative impact is expected. ③The disturbance of existing traffic flow will be expected due to the lane regulation during construction. The Traffic Management Plan shall be submitted to the authorities concerned prior to the construction.
	(2) Monitoring	①Does the proponent develop and implement monitoring program for the environmental items that are considered to have potential impacts? ②Are the items, methods and frequencies included in the monitoring program judged to be appropriate ③Does the proponent establish an adequate monitoring framework (organization, personnel, equipment, and adequate budget to sustain the monitoring framework)? ④Are any regulatory requirements pertaining to the monitoring report system identified, such as the format and frequency of reports from the proponent to the regulatory authorities?	①②③④ : YES: The environmental management plan and monitoring action plan ARE included in the contents of the EPRMP. Please refer to Table 4.1-1. For monitoring reports please refer to Appendix D of the EPRMP.
6. Note	Reference to Checklist of Other Sectors	①Are wastes properly treated and disposed of in accordance with the country's standards? ②Isn't an illegal deforestation associated with the project being carried out, or is an acquisition of the forest certification by the project proponent being carried out?	①YES: This waste should be hauled to the DENR specified disposal sites. ②Removal of roadside trees which are planted in the central reservation are require along proposed east extension line. A permit to cut shall be secured by the Contractor from the DENR prior to cutting of trees.
	Note on Using Environmental Checklist	①If necessary, the impacts to transboundary or global issues should be confirmed, if necessary (e.g., the project includes factors that may cause problems, such as transboundary waste treatment, acid rain, destruction of the ozone layer, or global warming).	①The LRT system will have positive impacts in terms of reduction of Greenhouse Gas due to transition in the mode of transportation from motor vehicle to railway.

Source : Study Team

7.2 Laws, Regulations, and Standards of Reference

Environmental Impact Assessment (EIA), as defined under the Philippine EIS System (PEISS), is a process that involves the prediction and evaluation of likely impacts of a project on the environment during the various phases of implementation, i.e., pre-construction, commissioning, operation and abandonment. It also includes an appropriate management plan, which aims to prevent, mitigate and enhance measures to protect the environment and the community's welfare. Through the EIA, negative environmental impacts of proposed actions are significantly reduced through a reiterative review process of locational planning, design and other alternatives, followed by the formulation of environmental management and monitoring plans.

Based on the Procedural Manual of DAO 2003-30, the key operating principles in the implementation of the Philippine EIS System are:

(i) The EIS System is concerned primarily with assessing the direct and indirect impacts of a project on the biophysical and human environment and in ensuring that these impacts are addressed by appropriate environmental protection and enhancement measures.
(ii) The EIS System helps Proponents to incorporate environmental considerations when planning their projects as well as in determining the environment's impact on their project.
(iii) Project Proponents are responsible for determining and disclosing all relevant information necessary for a systematic assessment of the environmental impacts of their projects.
(iv) The review of EIA Reports by EMB is guided by three (3) general criteria namely:
(v) Effective review of the EIA Reports depends mainly on timely, full, and accurate disclosure of relevant information by project Proponents and other stakeholders in the EIA process.

Under the PEISS, the agency responsible for reviewing application documents as well as issuing the Environmental Compliance Certificate (ECC) is the Department of Environment and Natural Resources (DENR) Environmental Management Bureau, or EMB.

7.3 Confirmation of Environmental and Social Considerations

7.3.1 The Land

1) Land Utilization

From the east end of the existing LRT Line 2 in Brgy. Santolan, Pasig City, the general land use up to Marcos Highway's intersection with Sumulong Highway in Brgy. Mayamot, Antipolo City is mixed commercial, residential, and institutional. Several private subdivisions and villages are located on both sides of the Highway. These include Filinvest East, Town Country, Vermont Royal, Vermont Park, Golden Meadows, and Kingsville. Big shopping malls such as Robinson's Metro East and Sta. Lucia Grand Mall and a number of commercial centers are also located at the quadrangle of Marcos Highway and Felix Avenue.

In terms of land use, no significant impact in the project area is expected, since the proposed East Extension Alignment will traverse the center island of Marcos Highway. Similarly, no changes are likely to occur in the commercial uses of the areas affected by the proposed Emerald and Masinag stations.

On the west side, the existing land uses from Recto Avenue's intersection with Rizal Avenue up to Asuncion St. are predominantly used for mixed commercial and residential purposes. No significant change in the land use in the area is expected to be brought about by the project. The ambulant vendors who will be affected during construction of the proposed Divisoria Station can always move to a safer

area where there are no construction activities. Depending on the discretion of the concerned Local Government Unit, these ambulant vendors can continue with their economic activities after the construction phase.

2) Physiography

The portion of the alignment along the east extension will cut across the alluvial plains of the Marikina Valley. The terrain is generally flat with terrain features common to an alluvial plain erased by the development in the area. Elevation varies along the corridor reflecting a gradual undulating feature. At the existing Santolan Station, elevation is at 12 meters above sea level. This gradually rises to 14 meters in the vicinity of the proposed Emerald Station. The elevation gradually lowers to 12 meters at the area between Samsonville and the proposed Masinag Station, before it gradually rises to 25 meters at the junction of Marcos and Sumulong Highway. This drop in elevation manifests a basin-like feature in the area between Samsonville and Masinag

The west extension will traverse through a flat terrain with spot elevation of 2 meters above sea level. The site is highly urbanized with very high concentration of structures used for residential and commercial purposes with dense roadways and other civil works. The site in general is part of what can be called the Manila Bay Coastal Plains.

3) Geological Hazards Assessment

Given the tectonic framework covering Metro-Manila area and vicinity, the geological hazards that could have an effect at the project are seismically connected and these include earthquakes and seismic shaking. The source of earthquakes near Lubang Island, south of the project site, is the most active tectonic feature in the Philippines. At least one event of magnitude greater than 4.5 is recorded in this site every month, some events exceeding magnitude 6 are recorded occasionally, and a few events reaching magnitude greater than 7 are also observed.

The Philippine Institute of Volcanology and Seismology (PHIVOLCS) and the United States Geological Survey (USGS) in 1994 did a study of the expected seismic acceleration for the whole country by quantitatively estimating the hazard of earthquake ground shaking through the analysis of the time, space, and size distribution of earthquakes at distance-dependent attenuation model for seismic energy. The calculations used applicable location, magnitude of historical earthquakes, soil conditions and the rate of seismic attenuation. The result of the calculations shows the project site to have a ground acceleration of 0.39g for medium soil and 0.6 g for soft soil. These values were considered, given the type of under laying materials at the site and represent the acceleration expected with 10% probability of exceedance in 50 years. However, this model did not include the East and West Valley Fault System as potential earthquake generator.
In terms of liquefaction potential, the east and west extension corridors cut across the Manila Bay coastal plain and the Marikina Valley alluvial plain respectively, both of which are underlain by loose, unconsolidated sediments with relatively shallow groundwater table. Both plains are deemed to be liquefiable under different earthquake scenarios for Metro-Manila[1)]. For details please refer to the submitted EIA Report.

7.3.2 The Natural Environment

1) The Air

a) Meteorology

Climate in Metro Manila belongs to Type I, which is characterized by two (2) pronounced seasons: the wet and the dry. The rainy season usually starts on the third week of May and lasts until October. The

dry season is experienced in the metropolis from November to April.

Rainfall data indicated that Metro Manila received the highest amount of precipitation of 526.8 mm during the month August. Most number of rainy days with 24 is likewise recorded for this month.

Relatively warmer temperature is felt in the project area from March to May, ranging from 33.3°C to 34.9°C. Cooler weather is experienced from November to February. Temperature varies between 30.3°C to 31.6°C during this period.

The annual relative humidity in Metro Manila is 77%. Humidity is at its highest from August to September at 84%. On the opposite, the lowest relative humidity of 67% is experienced in March.

The southwest monsoon wind which coincides with the rainy months of June to September prevails throughout the year. During the summer months, the southeasterly winds predominate, while the north and northeasterly winds prevail the rest of the year following the general wind circulation.

b) Air Quality

Ambient Total Suspended Particulates (TSP) levels observed in the vicinity of the proposed Emerald and Masinag Stations on the east extension alignment exceeded the DENR Standards of 300 µg/Ncm for a 1-hour monitoring period. On the contrary, TSP level recorded at the location of the proposed Divisoria Station is well within the allowable limit.

In terms of gaseous air pollutants, the observed concentration levels in all sampling stations are way below the allowable limit. The SO2 level recorded ranged between 21.0-36.0 µg/Ncm, while the NO2 varies from 34.0-59.0 µg/Ncm.

c) Noise Level

Ambient noise level at the proposed stations based on the result of the monitoring conducted slightly exceeded the acceptable daytime level of 75 dBA. In general, the recorded instantaneous high noise levels in the area are primarily caused by sound coming accelerating vehicles and indiscriminate honking of horns. Other sources of noise, particularly at the proposed location of Divisoria Station are the

1) the Metro-Manila Earthquake Impact Reduction Study of MMDA-PHIVOLCS & JICA (2003)

hustling and bustling crowds.

Even without train operations, the observed noise levels at the selected stations of the existing LRT Line 2 are fairly higher than the standard limit set for areas directly fronting/facing a 4-lane road. Results of the monitoring showed that the morning, daytime, evening, and nighttime ambient noise levels at the sampling sites exceeded the DENR limit.

2) Water Quality

Water quality sampling was undertaken at the upstream and downstream portions of the waterways traversed by the east and west alignments. Results showed that the coliform content of the Balante and Mayamot Creeks (East Extension) as well as Estero de San Lazaro, Estero de la Reina and Estero de Magdalena (West Extension) exceeded the acceptable limit set by the DENR (10,000 MPN/100 ml) for Class C Water. The Total Suspended Solids (TSS) of the samples from the upstream portions of Balante Creek (158 mg/L) and Mayamot Creek (180 mg/L) likewise exceeded the DENR Standard of 70 mg/L. Except from the downstream portion of the Mayamot Creek, the oil & grease level of rest of the samples are very well within the permissible limit of 5.0 mg/L. The pH levels of the waterways are still within the limit.

7.3.3 Socio-Economic Aspects

A total of six (6) barangays in the City of Manila will be traversed by the proposed West Extension Alignment. On the East Extension, the alignment will cross Brgy. De La Paz, Pasig City, Brgy. San Roque, Marikina City, brgy. Mayamot, Antipolo City, and Brgy. San Isidro, Cainta, Rizal.

Perception surveys and Consultation Meeting were conducted in the areas where construction of station is planned.

3/16	Emerald Station	attendees	:	3 people
3/17	Divisolia Station	attendees	:	19 people
4/6	Masinag Station	attendees	:	8 people

In the Consultation meeting, description and exchange of opinions were conducted about the planned route and implementation schedule, the location of each stations and properties which may affect, the PPP scheme and the procedures of EIA and RAP survey.

The main opinions and concerns are as follows.

- Interruption of service utilities (power, water, telecommunication, etc.)
- Final location of station locations so it can be incorporated into their planning process
- Traffic management and rerouting plan during construction period
- Decrease in income during construction period due to limited access
- Extend the Project further east to serve Cogeo areas

Issues and Concerns in the consultation meeting and METI survey (2010) are rshown in Table 7.3-1. Details such as the minutes of the consultation meeting were shown in the additional volume which is EPRMP. In addition, obtained responses of participants who attended the consultation meeting by the perception survey (Questionnaire method) are as follows. The number in () indicates the percentage of respondents. For detailed contents are listed in the separate EPRMP.

- They have noticed significant improvements on the commercial developments.（44.4%）
- There is not much changes in terms of residential improvements and industrialization on both sides of the extension routes.（55.5%）
- The air and noise pollution levels according to the interviewees have worsened during the past five (5) years.（50.0%）
- They have observed increase in the level of water pollution.（38.9%）
- Flooding problem in the areas crossed by the extension alignments have worsen.（66.7%）
- Aggravation of traffic situation, particularly along proposed station locations, was also mentioned by respondents to have worsened over the years.（61.1%）
- They are very well informed and aware of the proposed LRT Line 2 East and West Extension Project.（88.9%）
- Decrease in income is inevitable during construction period.（77.8%）
- The effect will continue even during operation of the rail system.（38.8%）
- Implementation of the project will most likely to affect the basic utilities along the extension alignments, particularly the power supply（33.3%）
- Operations of the system will increase their business income（22.2%）
- It will affect their business activities.（50.0%）

Although the project is perceived to caused decreased in business income levels during its construction and operational stages, the respondents still see it as socially favorable as indicated by the high percentage

of acceptability.

The PAPs are also concerned about the potential displacement of ambulant vendors presently occupying the location of proposed Divisoria Station. It was however clarified during the consultation meeting that displacements of ambulant vendors are not expected. They were advised to relocate to safer areas where there are no construction activities. Further, it was explained to them that the decision whether they will be allowed to continue their business activities in the area once construction is completed depends on the discretion of the city government of Manila, not LRTA or the selected concessionaire who will operate the LRT Line.

Table 7.3-1(1) Comparative Table of Issues/Concerns Raised (East)

STATION	METI survey (2009)	This study (2011)
Emerald Station	Impact on the landowners and establishment	Property to be affected particularly on the location of the stairway landing on the north side of the proposed Emerald Station
	Traffic re-routing plan during construction period	Not raised
Masinag Station	Traffic congestion	Not raised
	Flooding might worsen	Not raised
	Location of stockyard during construction	Not raised
	Provision of walkway from station to mall	Not raised
	Trees to be cut along the center island of Marcos Hi-way	Not raised
	Acquisition of private lots particularly on elevator landings and or access to the station	Inquiry on the total land area of Walter Mart property that would be affected by the LRT station
	Noise impact during construction	Not raised
	Not raised	Inquiry on the spacing of board piles from the stations along the private properties/establishments
	Not raised	Inquiry on the exact design and status/schedule of the project
	Not raised	Inquiry on the PPP Program
	Not raised	Inquiry on the DC substations (15m x 20m) on the west side of Emerald Station

Source: Study Team

Table 7.3-1(2) Comparative Table of Issues/Concerns Raised (West)

STATION	METI survey (2009)	This study (2011)
Divisoria Station	Elevator landing in Alternative 2 (Tutuban Mall) will fal on a Monument of Andres Bonifacio	Not raised
	Inquiries on the width and length of the station	Not raised
	Negative effect of the project to business establishments	Inquiry if the ambulant vendors could still perform their business activities in the area during construction phase of the project
	Inquiry on ROW acquisition within the private lands	Inquiry on the buildings that will be affected by the project
	Peace and order in the area	Not raised
	Re-routing plan or traffic management plan during construction period	Not raised
	Schedule of the implementation of the Project	Commencement of the construction
	Not raised	Interruption on telecommunication, water and power services during construction period
North Port Station Piers 4 Stations	Land acquisition along the Philippine National Railway (PNR)	Not included in the present study[2)]
	Relocation of Informal Settlers	
	MWSS pipeline to be affected along R-10	
	Effect on the service interruption of electricity and water	
	Schedule of the implementation of the Project	
	Maximum width of the alignment and station	
	Suggestion to give priority for employment the affected barangay	

2) Surveys of North Port Station and Piers4 Station have not been implemented because they aren't in the areas of this survey.

Source: Study Team

7.4 Impact Identification, Mitigation, and Enhancement Measures

Presented in Table 7.4-1 are the predicted impacts of the project to the receiving environment during the Pre-Construction, Construction, Demobilization/Decommissioning, Operational, and Maintenance Phases. Also included are the recommended mitigation (if negative) and enhancement (if positive) measures for each impact

Table 7.4-1(1) Impact Identification, Mitigation, and Enhancement Measures

Impacts	Duration and Type of Impacts	Mitigation/Enhancement Measures
1. PRE-CONSTRUCTION AND CONSTRUCTION PHASES		
1.1 Natural Environment		
Terrestrial Flora		
Minimal loss of vegetated areas	Long-term, negative	• Careful balling out and relocation of saplings and medium-sized trees • "Permit To Cut" will be secured by the Contractors/Sub-Contractors prior to tree cutting • Cutting and/or balling of trees will be limited along the center islands of C.M. Recto Avenue and Marcos Highway and areas affected by the stations • Vegetated areas affected by the construction of the viaduct and stations will be aesthetically restored through landscaping • Reforestation at site/s designated by the DENR will be undertaken by the Proponent
Hydrology		
Flooding along the route corridors	Short-term, negative	• Consider alternative power supply located in an area that will not be affected by flood • Keep the natural and engineered drainage lines free of obstruction at all times
Water Quality		
Possible increase in the bacteriological content of waterways	Short-term, negative	• Provision of temporary sanitation facilities such as trash bins and portable toilets to manage properly manage domestic and solid wastes; • Conduct weekly inspection of work sites; and • Regular disposal of wastes from the sanitation facilities to designated disposal sites

Source: Study Team

Table 7.4-1(2) Impact Identification, Mitigation, and Enhancement Measures

Impacts	Duration and Type of Impacts	Mitigation/Enhancement Measures
Possible increase in siltation of the waterways due to surface run-off	Short-term, negative	• Regular hauling of excavated materials to approved disposal sites • Temporary stockpiles of excavated materials and construction spoils will be covered with tarpaulin or sack material to prevent silation of the waterways during high precipitation periods • Temporary stockpiles will not be located anywhere near the waterways
Possible increase of oil and grease level of the waterways	Short-term, negative	• Washing of and maintenance of equipment and machineries along or anywhere near the waterways will be prohibited; • Conduct of daily routine equipment and machineries check-up will be strictly complied with • Regular PMS of all construction equipment and machineries will be strictly complied with
Possible increase pH level of the waterways	Short-term, negative	• Close supervision during concrete pouring of guideway sections and erection of columns near waterways • Washing of transit mixers and related equipment along or near the waterways will be prohibited
Air Quality		
Possible increase in the level of dust particulates	Short-term, negative	• Regular spraying of water at exposed and cleared construction sites • Regularly hauling of unused excavated materials and construction spoils to approved disposal sites • Temporary stockpiles will be covered with tarpaulin or sack materials
Possible increase in exhaust gas emissions such as SO_2, NO_2, CO, and other hydrocarbons	Short-term, negative	• Conduct daily routine equipment and machinery check-ups • Regular PMS of construction equipment and machineries will be strictly complied with

Source: Study Team

Table 7.4-1(3) Impact Identification, Mitigation, and Enhancement Measures

Impacts	Duration and Type of Impacts	Mitigation/Enhancement Measures
Noise Level		
Possible increase in existing noise levels along construction site and immediate vicinity	Short-term, negative	• Bored piles using a special boring equipment will be utilized during the construction of guideway substructures • Installation of noise suppressors, such as mufflers to maintain noise at permissible limits • Installation of temporary noise barriers such as corrugated metal sheets around the work areas to maintain noise at permissible levels beyond the construction site • High noise generating activities will be scheduled during daytime
1.2 Socio-Economic Aspects		
Possible loss of income of ambulant vendors at the proposed Divisoria Station Possible decrease in income of business and commercial establishments adjacent the proposed Emerald, Masinag, and Divisoria Stations	Short-term, negative	• Relocation of the ambulant vendors to other areas where there are no construction activities • Close coordination with the city government of Manila to ensure welfare of ambulant vendors • A 1.0-m crosswalk to and from adjacent buildings on sides of construction areas will be maintained at all times • Provision of pedestrian access to and from buildings affected by the construction
Possible interruption of the basic social service utilities	Short-term, negative	• Ensure that existing utilities are protected against damage due to construction; • Relocation and restoration of the affected utilities the shortest time possible; • Proper scheduling of interruption to enable affected parties undertake necessary preparations • Close coordination with the concerned utility companies to ensure immediate relocation and restoration of affected utility lines

Source: Study Team

Table 7.4-1(4) Impact Identification, Mitigation, and Enhancement Measures

Impacts	Duration and Type of Impacts	Mitigation/Enhancement Measures
Safety of pedestrians, passersby, as well as residents such as Safety of pedestrians using the steel foot bridges fronting the Sta. Lucia East Grand Mall and Robinson's East along Marcos Highway corner Felix Ave. and P. Tuazon Ave., as well as pedestrians and residents along the entire stretch of the said Highway	Short-term, negative	• A 1.0-m crosswalk to and from adjacent buildings on sides of construction areas will be maintained at all times • Sidewalks along construction sites shall be maintained at all times • Provision of crosswalks with a minimum width of 2.0 m within the construction site and shall be separated from adjacent traffic lanes • Well-trained traffic aides duly deputized by the MMDA will be designated along busy areas guide pedestrians • Provision of adequate lighting and reflectorized warning signs along the entire stretch of the construction site, particularly near busy areas and major thoroughfares • Excavation areas will be enclosed with corrugated metal sheets to limit access
Safety of U-turning vehicles along Marcos Highway, as well as those plying along C.M. Recto	Short-term, negative	• Implementation of the MMDA-approved Traffic Management Plan (TMP) • Provision of adequate lighting and reflectorized warning signs along the entire stretch of the work sites to ensure safety of motorists, especially during nighttime • Limited parking time for idle construction equipment such dump trucks and related vehicles along the major thoroughfares • Well-trained traffic aides and flagmen duly deputized by MMDA will be designated at critical construction areas to direct traffic
Generation of temporary employment within the direct impact areas during the pre-construction and construction stages of the project	Short-term, positive	• Qualified workers and laborers in the direct impact areas, duly endorsed by the respective Barangay Captains will be given top priority in hiring during the construction stage of the project

Source: Study Team

Table 7.4-1(5) Impact Identification, Mitigation, and Enhancement Measures

Impacts	Duration and Type of Impacts	Mitigation/Enhancement Measures
Temporary traffic congestions due to guideway substructure and superstructure erection as well as station structural framing	Short-term, negative	• Placement of traffic decking will be done in stages • Traffic flow restrictions will be minimized during daytime hours. A traffic flow plan will be submitted to MMDA for approval • Back-filling for surface restoration will be done in stages and work shall be performed during nighttime to the extent possible • Vehicular traffic lanes will be maintained at three (3) lanes in each direction along the entire stretch of Marcos Highway At C.M. Recto Ave. Only two (2) lanes on each direction can be maintained during construction period. In any case, the minimum width of lanes shall be in accordance with the requirements of MMDA • Beams will be transported at night • Strict implementation of the MMDA-approved TMP and re-routing plans • Traffic enforcers and flagmen, duly deputized by the MMDA will be designated along these areas to assist in directing traffic flow • Parking of idle dump trucks and transit cement mixers along busy and constricted thoroughfares will be avoided during rush hours
Exposure of construction personnel to occupational health hazards	Short-term, negative	• Provision of PPE such as earmuffs, hard hats, safety shoes, goggles, etc. • First aid stations supervised by the Environment and Safety Health Officer (ESHO) of the Contractor will be located within the construction site • Emergency vehicles will be on stand-by within the construction area at all times

Source: Study Team

Table 7.4-1(6) Impact Identification, Mitigation, and Enhancement Measures

Impacts	Duration and Type of Impacts	Mitigation/Enhancement Measures
2. DEMOBILIZATION/DECOMMISSIONING PHASE		
2.1 Natural Environment		
Water Quality		
Possible increase in siltation and clogging of waterways	Short-term, negative	• As part of the decommissioning activities the Contractors/Sub-Contractors must ensure that: ➢ All temporary stockpiles of construction spoils/debris are properly disposed to DENR-approved disposal site/s prior to decommissioning ➢ All solid wastes generated by the construction personnel are properly disposed to disposal site/s duly approved by the concerned LGUs Conduct a joint site inspection at the work sites involving the ESHO of the Contractors, representatives from the Waste Management and Disposal Department and Health Office of the concerned LGUs, and barangay leaders of affected communities
2.2 Socio-Economic Aspects		
Possible increase in the bacteriological contents of the waterways	Short-term, negative	• Ensure that all temporary sanitation facilities are completely dismantled and remaining domestic wastes from the portable toilets are properly disposed to the disposal sites duly-approved by the concerned LGUs • Conduct a joint site inspection at all work sites involving the ESHO of the Contractors, representatives from the Waste Management and Disposal Department and Health Office of the concerned LGUs, and barangay leaders of affected communities
Prolonged interruption of basic social service utilities	Short-term, positive	• The Contractors/Sub-Contractors must ensure that all affected service utilities such as water, power, and telephone are returned to their normal operations; • Close coordination with the entity who has jurisdiction over the affected utilities to ensure immediate relocation and restoration • Conduct a joint site inspection of areas where the affected utilities are located involving the ESHO of the Contractors, concerned utility entities, and community leaders of affected barangays

Source: Study Team

Table 7.4-1(7) Impact Identification, Mitigation, and Enhancement Measures

Impacts	Duration and Type of Impacts	Mitigation/Enhancement Measures
Possible spread of communicable diseases due to abandoned domestic and solid wastes from the temporary sanitation facilities	Short-term, positive	• To prevent possible spread of communicable diseases due to abandoned domestic and solid wastes the Contractors/Sub-Contractors must ensure that: ➢ All temporary sanitation facilities are completely and properly dismantled ➢ All domestic and solid wastes are properly disposed to disposal site/s duly approved by the concerned LGUs Conduct a joint site inspection at all work sites involving the ESHO of the Contractors, representatives from the Waste Management and Disposal Department and Health Office of the concerned LGUs, and barangay leaders of affected communities to ensure that all temporary sanitation facilities are completely dismantled and no domestic and solid wastes are abandoned
3. OPERATIONAL PHASE		
3.1 Natural Environment		
Air Quality		
Decline in vehicle emission rates and concentrations of air pollutants	Long-term, positive	• Active participation of traffic management groups from both the LGUs (Manila, Marikina, Pasig, Cainta, and Antipolo City), and MMDA must ensure to address traffic congestion such as those generated by public utility vehicles, particularly buses and jeepneys which are expected to produce long, and multiple queues, just to unload/load passengers alighting from/to train stations • As a long term solution, LRTA can encourage LGUs or even private partners to invest in multi-modal facilities such as jeepney and bus terminal to be located somewhere near Masinag Station (East Alignment) and Divisoria Station (West Alignment)

Source: Study Team

Table 7.4-1(8) Impact Identification, Mitigation, and Enhancement Measures

Impacts	Duration and Type of Impacts	Mitigation/Enhancement Measures
Noise Level		
Possible increase in noise levels directly radiating from the train (engines, ventilation, etc.), from the wheel, and from the rail Noise from trains round a small radius curves is caused by stick-slip sliding of the wheels. This noise can be particularly harsh because of its high frequency (500-400Hz). It is known as "squeal noise"	Long-term, negative	• To determine the significance of the train operations' impact on ambient noise levels, two (2) samplings were conducted. The results showed that the average ambient noise levels at the location of future stations are significantly higher than those taken at the platforms of existing stations on the "Without Train" situation. This can be explained by the fact that noise generated by vehicular traffic is directly detected by the equipment in the sampling sites for future stations, since these were taken at ground level, whereas at platform levels which are approximately 10-12 m high, noise coming from the same sources is already attenuated considering the height of the platforms. It can also be noted from the Table that the average noise levels on the "With Train" situation are only slightly, (i.e., <5 decibels) higher than the ambient noise levels at future stations. During actual operation, noise to be generated would still be attenuated due to the height of the platforms. Aside from this, the design of the tracks also contributes to noise reduction. This is because in the partially enclosed individual box girders, the parapet walls which extend above rail tracks level are made of concrete, and thus serve as noise barriers. Based on the foregoing, it is deemed that effects of future train operations on existing noise at ground level are expected to be insignificant
3.2 Socio-Economic Aspects		
Enhancement of workforce mobility & productivity	Long-term, positive	• Ensure continuous smooth, fast, and safe operation of the system, minimizing down times by means of regular maintenance
Enhancement of the acceptability of Off-Metro Manila relocation sites	Long-term, positive	• Ensure continuous smooth, fast, and safe operation of the system, minimizing down times by means of regular maintenance
Faster and safer mode of mass transport	Long-term, positive	• Ensure continuous smooth, fast, and safe operation of the system, minimizing down times by means of regular maintenance

Source: Study Team

7.5 Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan (EMMP) for the proposed LRT Line 2 East and West Extension Project is presented in Table 7.5-1. The standard form prescribed by the DENR Environmental Management Bureau for compliance monitoring is attached in the EPRMP.

Table 7.5-1(1) Environmental Management and Monitoring Plan (Construction Phase)

Parameters to be Monitored	Stations to be Monitored	Frequency of Monitoring	Methods of Analysis/Execution	DENR Standard	Implementor/Cost
1. PRE-CONSTRUCTION AND CONSTRUCTION PHASES					
1.1 Natural Environment					
Terrestrial Flora					
Tree Cutting/Balling/ Relocation	Center islands of Marcos Highway on the east extension alignment and C.M. Recto Ave. on the west extension alignment, and all vegetated areas where the proposed stations will be located	Daily during the tree cutting activity	Site inspection using Monitoring Checklist	"Permit To Cut" to be secured by the Contractor from DENR prior to any cutting/balling/ relocation of trees	ESH Personnel of Contractor
Water Quality					
Water Quality (Solid waste management and disposal)	Rivers and creeks, and adjacent areas	Weekly	Site inspection of work sites using Monitoring Checklist	Visual only	LRTA/P200,000.00 for entire duration of construction activities
		Twice a year	Water sampling (the west extension alignment)Estero de Magdalena and Estero de San Lazaro (the east extension alignment)Balante and Mayamot Creeks	Total Coliform 10,000 MPN/100 ml, Oil & Grease 5.0 mg/L, pH 6.5-8.5, TSS 70 mg/L (Max. 30 mg/L increase (Class C Water)	

Source: Study Team

Table 7.5-1(2) Environmental Management and Monitoring Plan (Construction Phase)

Parameters to be Monitored	Stations to be Monitored	Frequency of Monitoring	Methods of Analysis/Execution	DENR Standard	Implementor/Cost
Air Quality					
Total Suspended Particulates (TSP)	At all cleared construction sites and all identified dust sensitive receptor areas, such as residential, hospitals, and schools	Daily	Site inspection Using Monitoring Checklist	Visual TSP 300 µg/Ncm (1 hour)	ESH Officer of Contractor to be supervised by a Sr. Environmental Specialist
		Twice a year	Air quality monitoring		Cost included in Contractor's Bid – Approx. P200,000.00 for entire duration of construction phase
SO_2 and NO_2	At all identified dust sensitive receptor areas, such as residential, hospitals, and schools	Daily	Site inspection Using Monitoring Checklist	Visual	ESH Officer of Contractor to be supervised by a Sr.
		Twice a year	Air quality monitoring	NO_2 260 µg/Ncm SO_2 340 µg/Ncm (1 hour)	Environmental Specialist Cost included in Contractor's Bid – Approx. P400,000.00 for entire duration of construction phase
Noise Level	At all identified noise sensitive receptor areas, such as residential, hospitals, places of worships, and schools	Daily for high noise level generating activities; Weekly for other activities during construction Investigation on a complaint basis shall be immediately undertaken	Noise Meter and Monitoring Checklist	Noise = 70dBA (daytime) 65dBA (morning 65dBA (evening) 60dBA (nighttime) (For commercial Areas fronting 4-lane roads)	ESH Personnel of Contractor to be supervised by a Sr. Environmental Specialist (Cost already included in Air Quality above)

Source: Study Team

Table 7.5-1(3) Environmental Management and Monitoring Plan (Construction Phase)

Parameters to be Monitored	Stations to be Monitored	Frequency of Monitoring	Methods of Analysis/Execution	DENR Standard	Implementor/Cost
1.2 Socio-Natural Environment					
Supply of Basic Utilities	Areas which will experience power/water supply interruptions due to disturbance of underground and overhead utility lines (water, electricity, telephone) during excavation and erection of fixed facilities.	Depends on schedule of interruption. Investigation on a complaint basis shall be immediately undertaken	Site observation and receipt of complaints from affected population	Based on IMP	ESH Officer of Contractor, in coordination with local offices of MERALCO, MAYNILAD/Manila Waters, PLDT
Traffic Management	Road sections, crossings, malls, and other critical areas affected by guideway and station construction	Daily	Site observation to be recorded in Monitoring Checklist	Based on IMP and Traffic Management Plan duly approved by MMDA	MMDA ESH Officer of Contractor
Safety of Pedestrians	Construction areas along Marcos Highway (particularly areas fronting the Robinson's Metro East and Sta. Lucia East Grand Mall), and C.M. Recto Avenue from T. Alonzo St. up to Fiesta Shopping Mall in Divisoria, and Asuncion St.	Daily Investigation on a complaint basis shall be immediately undertaken	Site observation to be recorded in Monitoring Checklist	Based on IMP	MMDA Traffic Aides to be assigned by the Contractor ESH Officer of Contractor
Safety of motorists	All construction areas, particularly excavation sites and station locations	Daily	Site observation to be recorded in Monitoring Checklist	Based on IMP	ESH Officer of Contractor
Compliance of Contractor to occupational health and safety rules and regulation	All construction areas	Weekly	Site inspection of work areas including temporary sanitation facilities, to be recorded in Monitoring Checklist	Based on IMP	ESH Officer of Contractor

Source: Study Team

Table 7.5-1(4) Environmental Management and Monitoring Plan (Construction Phase)

Parameters to be Monitored	Stations to be Monitored	Frequency of Monitoring	Methods of Analysis/Execution	DENR Standard	Implementor/Cost
Solid and domestic wastes management and disposal	Areas where hauling of unusable excavated materials and construction spoils are necessary. Areas where temporary stockpiles are located. Work areas where temporary sanitation facilities	Daily Daily Daily	Site inspection Using Monitoring Checklist Site inspection Using Monitoring Checklist Site inspection Using Monitoring Checklist	Based on IMP	ESH Officer of Contractor
2. DEMOBILIZATION/DECOMMISSIONING PHASE					
2.1 Natural Environment					
Aesthetic Values					
Aesthetic Values	Areas directly below the newly constructed guideways and station locations stripped of vegetation	Monthly, until landscaping activities are completed	Site inspection using Monitoring Checklist	Based on IMP	ESH Officer of Contractor
Water Quality					
Water flow and siltation	All waterways crossed by the alignment and adjacent areas	Daily until all decommissioning activities are completed	Joint site inspection using Monitoring Checklist	Based on IMP	ESH Officer of Contractor With participation of Representative/s from the Waste Management and Disposal Department of concerned LGUs, and community leaders of affected barangays

Source: Study Team

Table 7.5-1(5) Environmental Management and Monitoring Plan (Construction Phase)

Parameters to be Monitored	Stations to be Monitored	Frequency of Monitoring	Methods of Analysis/Execution	DENR Standard	Implementor/Cost
Domestic and solid wastes disposal	All construction sites adjacent the waterways	Daily until all decommissioning activities are completed	Joint site inspection using Monitoring Checklist	Based on IMP	ESH Officer of Contractor With participation of Representative/s from the Waste Management and Disposal Department of concerned LGUs, and community leaders of affected barangays
2.2 Socio-Natural Environment					
Complete dismantling of the temporary sanitation facilities and proper disposal of remaining solid and domestic wastes	All work sites where temporary sanitation facilities are provided, particularly those adjacent the residential areas and waterways	Daily until all decommissioning activities are completed	Joint site inspection using Monitoring Checklist	Based on IMP	ESH Officer of Contractor With participation of Representatives from the Waste Management and Health Office Departments of concerned LGUs, and community leaders of affected barangays
Complete restoration of affected basic social service utilities	All areas where social service utilities were affected	Daily until operations of the affected utilities are returned to normal	Joint site inspection using Monitoring Checklist	Based on IMP	ESH Officer of Contractor With close coordination with the concerned entities who has jurisdiction over the affected utilities. With participation of the community leaders of affected barangays
3. OPERATIONAL PHASE					
3.1 Socio-Economic Environment					
Fast and safe mode of transportation	Entire LRT Line 2 including the newly constructed east and west extension alignments	Daily	Based on LRTA Maintenance Manual and Checklist	-	LRTA

Source: Study Team

7.6 Confirmation of System and Organization for Dealing with Environmental and Social Cosiderations of the Counterpart

Figure Figure 7.6-1 shows the institutional setup that will be put in place during project implementation. As shown in the said figure, LRTA shall be the Implementing Agency for the LRT Line 2 East and West Extension Project. The Administrator shall supervise all technical aspects of the project through the duly established Project Management Office (PMO) of Line 2.

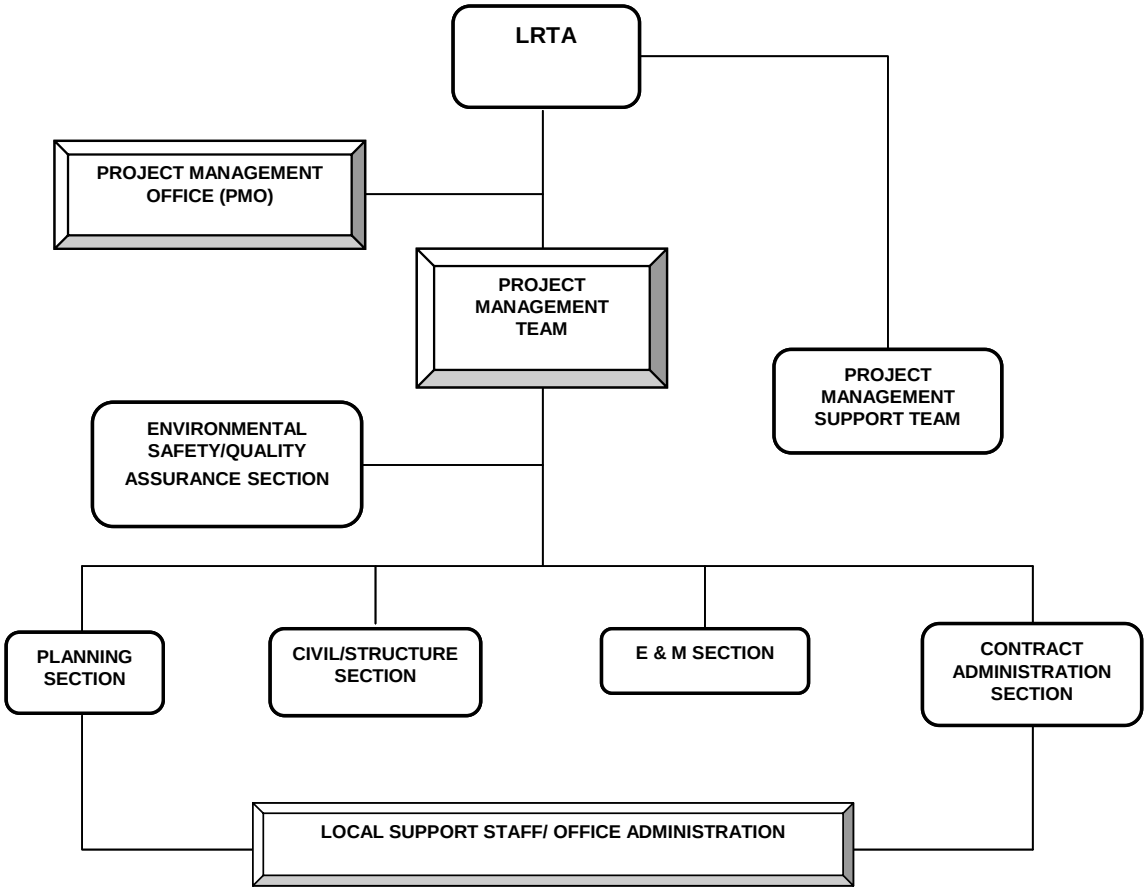
PMO of Line 2 shall be responsible for directing and supervising the (i) detailed engineering design of civil engineering works, station facilities, and electro-mechanical works (except rolling stock); (ii) preparation of tender documents and tender assistance; and (iii) construction activities. Included in Item (ii) is the updating of the Environmental Management and Monitoring Plan (EMMP) to reflect changes in configuration as well as construction methodologies based on developments brought about during Detailed Engineering Design. A Senior Environmental Specialist shall be assigned and shall be mainly responsible for:

(i) Monitoring the overall operation and effectiveness of the EMMP during the construction and operational phases
(ii) Updating of the EMMP as the need arises
(iii) Preparing the Compliance Monitoring Report to be submitted to DENR-EMB

An Environment Safety and Health (ESH) Officer shall be engaged by the Contractor during the construction phase. In coordination with the Senior Environmental Specialist of PMO Line 2, he shall be responsible for managing implementation of the Environmental Management and Monitoring Plan (EMMP) presented in 7.5-1. Other duties of the ESH Officer include:

(i) Ensure that all other concerned supervisors and staff understand and properly undertake their responsibilities
(ii) Ensure that environmental monitoring activities are being done promptly and in an accurate manner
(iii) Implement an effective preventive and corrective control system, particularly in terms of environmental emergency preparedness and response procedures
(iv) Conduct training of contractors and sub-contractors on environmental awareness and on the EMMP
(v) Collate performance data and prepare reports, which would include an assessment of performance compared to the EMMP objectives and targets, to be submitted to PMO Line 2's Senior Environmental Specialist.
(vi) Act as liaison between LRTA and the major stakeholders, particularly the concerned LGUs, other national government agencies, and affected barangays, to ensure that comments, views, and grievances can be received, recorded, and reported to proper authorities.

The Contractor shall also engage a Safety Officer to review and recommend amendments and updates to LRTA's circulars and bulletins pertaining to environment, safety, and heath, with special attention given to human lives and properties against fire, natural calamities such as typhoons, earthquake, and other disasters. He shall also be responsible for posting environmental information as well as internal and external communications pertaining to environment quality and safety. If deemed necessary during implementation, Contractors shall also be required to engage Pollution Control Officers (PCOs) to undertake actual site supervision and inspection in terms of maintenance of cleanliness and aesthetic appeal at construction sites.



Source: Study Team

Figure 7.6-1 System and Organization for Implementing Environmental and Social Considerations

7.7 Land Acquisition for Station Locations

Land acquisition for both east and west extension will only entail marginal impacts since most of the properties to be acquired mostly consist of fences, gutters, and signage of commercial establishments. It is important to note here that no residential areas shall be displaced.

To evaluate possible resettlement impacts brought about by land acquisition for station locations, field assessment and inventory of all existing building structures within and along the additional LRT Line 2 Stations that would possibly be affected by the said project as a result of its proposed extension was conducted. These Stations and its locations are as follows:

a) Emerald Station
   along Marcos Highway within Barangays De la Paz, Pasig City, Metro Manila (south side) and San Roque, Marikina City, Metro Manila (north side);
b) Masinag Station
   along Marcos Highway in Brgy. Mayamot, Antipolo City, Rizal; and,
c) Divisoria Station
   along C. M. Recto Ave., between Tabora and Ilaya Streets in Divisoria, Tondo/Binondo, Manila.

Based on the drawings of the Study, the design was generally maintained well within the existing Road Right-of-Way (RROW). Field verification show that no building structures alongside the designed above

mentioned Stations would be physically affected except for the designed locations (in some areas) of ground/road level elevator shaft/stairs access arrangement to the elevated stations which are located outside the RROW. These structures/properties affected by the main stairs/elevators access are shown in Table 7.7-1.

Table 7.7-1 Structures Affected by Acquisition of ROW for Stations)

Proposed Station	Location	Structures to be Constructed	Existing Affected Structures/Properties
East Extension			
EMERALD	Robinsons Metro East Mall Property; South side of Marcos Highway;	Main stair access and elevator shaft structure to/from ground/road level to concourse level;	a) Waiting shed (12 m x 2.8 m) along Marcos Highway, Sidewalk & access ramp; b) Covered Drainage channel/canal;
	North Side of Marcos Highway; Sidewalk area;	Stair access & elevator shaft structure to/from ground level to concourse level;	a) ~15 m x 8 m MMDA/LGU developed sidewalk/pavement; b) Covered Drainage channel/canal;
MASINAG	South Side of Marcos Highway, Masinag Area, Brgy. Mayamot, Antipolo City;	Stair access & elevator shaft structure to/from ground level to concourse level;	a) Kingsville Construction & Development Corp./JF Properties Inc. developed sidewalk/ pavement along its J & F Bldg. I; b) Possible effect on basement (or 2nd & 1stflrs.) of structures along the proposed Masinag Station section during construction of access stairs/elevator shaft & walkway structures;
	North Side of Marcos Highway, Masinag Area, Brgy. Mayamot, Antipolo City;	Main stair access and elevator structure to/from ground/road level to concourse level;	a) Land acquisition or lease; Benison Group of Companies/Walter Mart Community Mall- landowner;
West Extension			
DIVISORIA	South Side of C. M. Recto Ave. between Juan Luna &Tabora Sts., Divisoria, Binondo, Manila;	Main stair access and elevator shaft structure to/from ground/road level to concourse level and elevated Walk Way;	a) Possible effect on upper floors (2nd & up) of Angela I & Yangco Mart Bldgs. during construction of elevated walk way; based on initial drawings, said walk way & access stairs/elevator structure is very near frontage/building finished line of the 2 bldgs.
	North Side of C. M. Recto Ave. between Juan Luna & Planas Sts., Divisoria, Tondo, Manila;	Stair access & elevator shaft structure to/from ground/road level to concourse level and elevated Walk Way;	a) Possible effect on upper floors (2nd & up) of General Shopping Center & Mutual Investment (Manila Bulletin) Bldgs. during construction of elevated walk way; based on initial drawings, said walk way & access stairs/elevator structure is very near frontage/building finished line of the said bldgs.

Source: Study Team

As previously mentioned, although no building structures would be physically affected by the proposed additional LRT Line 2 Stations, building structure assessment and inventory was still done specifically where the walk way and elevator shaft and stairs access are positioned as they may however be directly or indirectly affected by the project in terms of access, income loss, safety and possible damage due to construction accidents. Furthermore these may still be subject to changes depending on the final and detailed design of the proposed LRT Stations. Shown on Table 7.7-2 is the summary of the assessment and inventory made of buildings/structures fronting and along proposed walk way and access stairs/elevator shaft structures.

Table 7.7-2 Preliminary Inventory and Cost Estimates of Structures Affected by ROW Acquisition

Station Location	No. of Structures Alongside Stations	Estimated Total Floor Area of Building Structures (sq. m.)	Total Estimated Cost of Structures* (Php)	General Structure Description and Usage
East Extension				
EMERALD	7	840.60	13,094,682.00	Caltex Gas Station Service Bay & 1 to 4 storey commercial buildings (privately owned & others with tenants/renters at north side of Marcos Highway) & all are concrete finished structures; Cost of structures also include waiting shed at south side of Marcos Highway fronting Robinsons East Mall; Not included are the sidewalk/entrance ramp development costs of Robinsons Mall;
MASINAG	1	2,700.00 ~ 160.00	77,760,000.00 320,000.00	3 storey (includes basement) concrete finished commercial building (privately owned with ~16 tenants/renters) at south side access stairs/elevator shaft of proposed Masinag Station; Land acquisition (easement only) from Benison Group of Companies/Walter Mart Community Mall (landowner). Cost of real property based on BIR Zonal Values per DO#9-2000, May 21,1999;
				West Extension
DIVISORIA	4	4,890.00	140,190,000.00	Multi-storey commercial buildings (privately owned & others with tenants/renters and with residential units); all concrete finished structures;
TOTAL	12	8,430.60	231,044,682.00	(Land acquisition not included in Total)

Note: Above estimates is based on replacement cost, defined under Philippine legislation known as the Implementing Rules and Regulations (IRR) of RA-8974, Section 10, as the "amount necessary to replace the improvements/structures based on the current market prices for materials, equipment, labor, contractor's profit and overhead, and all other attendant costs associated with the acquisition"

Source: Study Team

In addition to buildings, other structures that would be affected by the project are a total of approximately 134 concrete/wood power and telecom poles of Meralco/PLDT and kilometers of primary and distribution lines/wires that need to relocate. Total cost for its relocation can be obtained after the two utility companies have assessed said installations and completed their own detailed engineering studies.

As presented in Table 7.7-2, it is very clear that no relocation will be necessary considering that there be no residential structures to be affected. Please refer to Table 7.7-3, which presents the checklist of concerns.

Table 7.7-3 Checklist of Resettlement Concerns

ITEM/CONCERN	REMARKS
1. Necessity of land acquisition, inhabitants relocation	NO INHABITANTS so NO RELOCATION NECESSARY. In addition, please note that land acquisition will only be in terms of easement, and no transfer of ownership will be necessary. This is because the space needed is only 160 m^2
2. National population census, properties and land acquisition survey results for all occupants on the project influence area	Please refer to Table 7.7-2 (no residential areas are affected)
3. Family budget and livelihood survey results at least 20% of all occupants on the project area	No families will be affected
4. Necessary authorizations on payee of; compensation of property, and reconstruction of lost livelihood	No families shall be displaced
5. Compensation measures of lost properties based on full substitutive land acquisition cost as a result of redemption cost survey	Please refer to Table 7.7-2 as well as note in Item 1 above.
6. Family budget and living standard improvement	No families shall be displaced
7. Complaint procedures and the authorities of the agency in charge	No families shall be displaced
8. Clarification of the particular responsible authorities concerned for inhabitants relocation and the role	No relocation
9. Physical relocation starting implementation schedule after payment of compensation for the lost properties	No physical relocation to be entailed by acquisition of land for stations
10. Costs and finances	Please refer to Table 7.7-2
11. Monitoring institutional organization of the implementation agencies and the monitoring forms	Not applicable
12. Results of inhabitants meetings for the initial design and options of livelihood reconstruction measures	Not applicable; No relocation necessary as no family will be displaced

Source: Study Team

7.8 Philippine Legislations, Procedures for Land Acquisition and Resettlement

As mentioned previous section, this project doesn't require land acquisition and resettlement except the land for the substation in the east extension section.
As reference, this section mention the legislations on land acquisition and resettlement, its issue, the procedures for formulating Resettlement Action Plans (RAPs) and the method of monitoring and evaluation.

7.8.1 Philippine Legislations on Land Acquisition and Resettlement

The most current pieces of legislation pertaining to land acquisition and resettlement are presented in Table 7.8-1. The legal bases for future RAP implementation, together with its salient points may be patterned from the Department of Public Works and Highway's (DPWH) - Land Acquisition, Resettlement, Rehabilitation and Indigenous Peoples (LARRIP) Policy.

Table 7.8-1(1) Government Policies Pertaining to Land Acquisition

Year	Policy	Title/Salient Features
2007	LARRIP Policy, 3rd Ed.	Contains the latest policies and guidelines governing involuntary resettlement and the preparation of Resettlement Action Plans for projects implemented by the DPWH
2003	DO-327	"Guidelines for Land Acquisition and Resettlement Action Plans (LAPRAPs) for Infrastructure Projects" • LAPRAP document shall describe the project, expected impacts and mitigating measures, socio-economic profile of APs, compensation package, timetable of implementation, institutional arrangements, participation, consultation, and grievance procedures • LAPRAP shall be the basis for qualifying and compensating APs for lands, structures and/or improvements, that are partially or fully affected by government infrastructure projects • Provision of resettlement sites shall be the responsibility of the Local Government Units (LGUs) concerned, with assistance from the concerned government agencies tasked with providing housing
2003	DO-5	"Creation of the Infrastructure Right of Way and Resettlement Project Management Office (IROW-PMO) and the Implementation of the Improved IROW Process" • Implementing Office (IO) shall ensure that IROW costs are always included in project budgets • If ROW costs differ from the approved ROW budget after detailed design has been finalized, a budget adjustment shall be approved. • A Land Acquisition Plan and Resettlement Action Plan (LAPRAP) shall be prepared for all projects, whether local or foreign funded, that will require Right-of-Way (ROW) acquisitions, using a standardized compensation package • The determination of Affected Persons (APs) and improvements shall be based on the cutoff date, which is the start of the census of APs and tagging for improvements

Source: Study Team

Table 7.8-1(2) Government Policies Pertaining to Land Acquisition

Year	Policy	Title/Salient Features
2000	I.R.R. of RA-8974	"Implementing Rules and Regulations of R.A. 8974 (An Act to Facilitate the Acquisition of Right-of-Way, Site, or Location for National Government Infrastructure Projects and for Other Purposes) • Set the 1st offer for negotiated sale of land (just compensation) as the price indicated in the current zonal valuation issued by the BIR for the area where the property is located • Set the valuation of improvements on the land to be acquired using the "replacement cost method", which is defined as the "amount necessary to replace the improvements/structures based on the current market prices for materials, equipment, labor, contractor's profit and overhead, and all other attendant costs associated with the acquisition". • Provided for the engagement of government financing institutions or private appraisers to undertake appraisal of the land and/or improvements/structures, to determine its fair market value • Tasked the NHA to establish and develop squatter relocation sites, including provision of adequate utilities and services, in anticipation of squatters that have to be removed from the ROW in the site of future infrastructure projects
2000	RA-8974	"An Act to Facilitate the Acquisition of Right-of-Way, Site, or Location for National Government Infrastructure Projects and for Other Purposes" • Prescribed new standards for the assessment of the value of the land subject of expropriation proceedings or negotiated sale, namely: o The classification and used for which the property is suited o The size, shape or location, tax declaration and zonal valuation of the land o The price of the land as manifested in the ocular findings, oral, as well as documentary evidence presented o The reasonable disturbance compensation for the removal and/or demolition of certain improvement on the land and for the value of improvements thereon o The developmental costs for improving the land o The value declared by the owners o The current price of similar lands in the vicinity; and o Such facts and events as to enable the affected property owners to have sufficient funds to acquire similarly-situated lands of approximate areas as those required from them by the government, and thereby rehabilitate themselves as early as possible • Mandates the BIR to come up with updated zonal valuation for areas subject to expropriation proceedings, within 60 days from the date of expropriation case

Source: Study Team

Table 7.8-1(3) Government Policies Pertaining to Land Acquisition

Year	Policy	Title/Salient Features
1999	DPWH Policy Framework for LARR	"Policy Framework for Land Acquisition, Resettlement and Rehabilitation" • Government projects must serve the common good • All efforts must be exercised to ensure that: o Adverse social impacts are avoided, minimized, and/or mitigated o Everybody, including Affected Persons (APs), will benefit from the projects o APs are provided with sufficient compensation and assistance for lost assets which will assist them to improve or at least maintain their pre-project standard of living; o Project stakeholders (which include APs) are consulted regarding the projects' design, implantation, and operation • Only those APs found to be residing in, doing business, or cultivating land or having rights over resources within, the project area as of the date of the census surveys (i.e., cut-off date) are eligible for compensation for lost assets.
1997	Rule 67, Rules of Civil Procedure	"Rule 67 – Expropriation" • Gives the plaintiff (DPWH) the right to take or enter upon the possession of a real property involved if a deposit is made with an authorized government depositary an amount equivalent to the assessed value of the property for purposes of taxation to be held by such bank subject to the orders of the court
1992	RA-7279	Urban Development and Housing Act of 1992" • Uplift the conditions of the underprivileged and homeless citizens in urban areas and in resettlement areas by making available to them decent housing at affordable cost, basic services, and employment opportunities • Provide for an equitable land tenure system that shall guarantee security of tenure to Program beneficiaries but shall respect the rights of small property owners and ensure the payment of just compensation

Source: Study Team

Table 7.8-1(4) Government Policies Pertaining to Land Acquisition

Year	Policy	Title/Salient Features
1992	RA-7279	• Eviction or demolition may be allowed under the following situations: o When persons or entity occupy danger areas such as esteros, railroad tracks, garbage dumps, riverbanks, shorelines, waterways, and other public places such as sidewalks, roads, parks, and playgrounds o When government infrastructure project with available funding are about to be implemented o When there is a court order for eviction and demolition • If eviction or demolition will involve underprivileged and homeless citizens, as defined in the same law, they should be properly relocated prior to any dismantling of properties • Section 5 of the IRR directs the LGU or the government agency authorized to demolish to create a Task Force on Relocation and Resettlement to ensure smooth and effective implementation of all relocation and resettlement operations • After effectivity of R.A.7279, barangay, municipal or city government shall prevent construction of any kind of illegal dwelling units or structures within danger areas • LGUs shall prepare a comprehensive land use plan for their respective localities in accordance with the provisions of the Act
1991	RA-7160	"Local Government Code of 1991" • An LGU may exercise the power of eminent domain for public use, purpose, or welfare of the poor and the landless such as for socialized housing, upon payment of just compensation pursuant to the provisions of the Constitution and pertinent laws
1988	EO-239	"Creating Appraisal Committees in Metropolitan Manila Area" • Created the City Appraisal Committee and Municipal Appraisal Committees in the Metropolitan Manila area for assessment of fair market value of real property in Metro Manila
		• The government shall deposit 10% of the amount of just compensation provided under 1533, five (5) days after which the court shall issue Writ of Possession (WOP)
		• Payment for improvement shall be based on the physical inventory report proposed and certified by an affidavit of the claimant and affidavit of two (2) adjoining landowners
1978	PD-1533	Establishing Uniform Basis for Determining Compensation • The government is entitled to immediate possession of properties and improvements and the power of demolition upon filing of the petition for expropriation and the deposit of 10% of compensation amount determined by this decree in the Philippine National Bank (PNB)

Source: Study Team

Table 7.8-1(5) Government Policies Pertaining to Land Acquisition

Year	Policy	Title/Salient Features
1936	CA-141	"Commonwealth Act 141" • Citizens of the Philippines acquire public land through public auction. Article of free patent is provided for natural born citizen of the Philippines who continuously occupied and cultivated the land since 1926 or before • Land acquired through this law is subject to a Right-of-Way not exceeding 20 m in width for public use with damages paid for improvements only; This ROW limit is further expanded to 60 m by P.D. 635

Source: Study Team

7.8.2 Bridging the Gaps Between Local Legislation and International Standards on Involuntary Resettlement

It is important to note that although the abovementioned legal documents are able to address major resettlement concerns, some limitations are still apparent with respect to compliance with the basic international principles on Involuntary Resettlement may it be the World Bank, Asian Development Bank, or JICA. The following paragraphs describe these limitations.

Based on existing rules and regulations, each government agency has its own mandate upon which policies are drawn out in order to achieve its goals. These policies are mostly in the form of Department Orders and Memorandum Circulars. With regards to exercising the power or eminent domain either through negotiated sale or expropriation proceedings, most agencies in charge of acquiring ROW is limited to acquire land if the purpose is to develop infrastructure projects. As such, they have no legal personality to acquire land, nor provide basic facilities and services for resettlement purposes, or for any other purposes outside its mandate. In accordance with Republic Act 7279, the concerned Local Government Units (LGUs), the Housing and Urban Development Coordinating Council (HUDCC), National Housing Authority (NHA), and other concerned agencies are mainly responsible for the development of resettlement sites.

Since these NGAs are also servicing other line and attached agencies, allocation of housing units to qualified beneficiaries become very cumbersome and often results into delayed resettlement of affected persons. As long as there is no clear-cut procedure in form of an inter-agency Memorandum of Understanding between agencies tasked to acquire ROW and these NGAs or better yet an Executive Order from the President, relocation of displaced communities will perhaps remain as a section in the RP report.

Rehabilitation assistance in the form of skills training and other development activities is deemed insufficient to ensure restoration of pre-project socio-economic condition of affected families. As experienced in other government and public-private sector investment program projects, provision of skills training only “equips” the AFs in its endeavor to recover from financial losses. Income restoration couldn’t really be achieved without some form of financial aid. This may be in terms of direct soft loans, as part of loan financing or through provision of access to micro credit organizations/institutions (government and private). In any case, the type, method, and amount of financial aid or income restoration budget must be clearly spelled out in the resettlement plan to be prepared.

Government policies are also silent on the integration of resettlers into host communities. As experienced in a major railway project in Luzon sometime in 2006, truckloads of resettlers were surprised when the path going to their relocation site was barricaded with burning tires. It was found out that the barricades were set up by members of the recipient community who were strongly opposing their arrival. To avoid further chaos, the organizers, together with representatives from an NGO decided to go back and abort the scheduled relocation.

In a relocation site in Pandi, Bulacan, sometime in 2004, resettlers displaced from an expressway project complained of “discrimination” by members of the host community. Although they hold legal rights to the land, they were still referred to as “squatters” and were not given fair treatment. For example, after waiting in a long queue in fetching water from the deep well, they were always told to give way to “legal occupants” who need not queue. The situation was very awkward considering that the said deep well was built for their purpose, i.e., as part of site development for their relocation site. The resettlers said they couldn’t do anything but accept the situation because they are poor and “new” in the community.

In these cases, resettlers as well as host populations are unfairly put in situations they wouldn’t be in had there been efforts made to prepare both parties for eventualities as a result of their integration into one community. To avoid or at least minimize these type of conflicts, the following are recommended:

(i) During selection of relocation sites, resettlers and the host communities should be encouraged to participate in social preparation activities such as consultation meetings and dialogues; It must be explained during meetings that the resettlers will not be “squatting” but would be holding legal rights to the lots they will occupy;

(ii) Social services and infrastructures to be provided at the relocation site can be shared among both parties to avoid resentment on the part of the host population;
(iii) Other benefits such as trainings and livelihood opportunities must also be shared with the host communities so that they won't feel discriminated or left out.

Although not directly a resettlement concern, another factor, which significantly affects implementation of resettlement plans, is the conduct of parcellary survey. Since it is the basis for delineating properties, including structures and improvements that will either be severely or marginally affected. Inaccurate parcellary surveys can cause significant delays in project implementation. This is particularly true for those prepared without field verification. As a result, discrepancies occur, during validation, between the actual number of affected land and/or improvements and those that are budgeted in the resettlement plan.

For parcellary surveys that are contracted out, this can be corrected by drawing up a detailed Terms of Reference (TOR) together with a clause in the contract that any additional budget adjustment exceeding contingencies set, as a result of discrepancy between the submitted parcellary the contractor shall shoulder survey and actual field validation. For those conducted by the government, administrative sanctions and cases, as prescribed in pertinent guidelines must be strictly implemented.

7.8.3 Procedures for Formulating Resettlement Action Plans (RAPs)

Formulation of resettlement plans, whether it would be a short or full RAP, shall be the responsibility of the LRTA. RAPs shall be formulated based on the following:

(i) Initial categorization/screening of road sections based on anticipated impacts from resettlement;
(ii) Disclosure and explanation of policy and legal frameworks for resettlement to Affected Persons (APs);
(iii) Consultation with potential APs to obtain their inputs on avoiding or mitigating involuntary resettlement and determine their concerns, needs and preferences;
(iv) Census and socioeconomic survey of all APs and complete inventories of their assets, including estimation of compensation for structures and improvements;
(v) Social impact assessment and validation that the entitlement matrix have covered all resettlement entitlements;
(vi) Consultation meetings with APs to explain relocation plans and rehabilitation strategy, including income restoration (if required) and improvement of their living conditions;
(vii) Inclusion of itemized budget for all resettlement activities in the total project cost for each road section;
(viii) Formulation of implementation schedule;
(ix) Detailed and comprehensive procedures for grievance redress mechanism;
(x) Conceptualization of Institutional Framework for resettlement activities;
(xi) Recommendation of internal and external monitoring program and final evaluation;

7.8.4 Monitoring and Evaluation

The Implementing Agency (LRTA) shall be responsible for conducting the in-house monitoring of implementation of RAPs and as such shall be alternately referred to as the Internal Monitoring Agent (IMA). As the IMA, its task include:

(i) Regular supervision and monitoring of RAP implementation. Findings are documented in a quarterly report and shall be compiled in the project office;
(iii) Verifying whether the re-inventory baseline information on all APs have been carried out and whether the valuation of assets lost or damaged, provision of compensation and other

entitlements, and relocation, if any, have been carried out in accordance with the respective RAP;
(iv) Ensuring that RAPs are implemented as designed and planned;
(v) Verifying that funds for implementing the RAPs, MOAs, etc. are promptly provided by the LRTA and in sufficient amounts;
(vi) Recording all grievances and their resolution and ensuring that all complaints are promptly addressed;

To obtain an independent appraisal of RAP implementation, an External Monitoring Agent (EMA) shall be commissioned by the Implementing Agency (LRTA) to undertake monitoring and evaluation. The EMA can either be a qualified individual or a consultancy firm with qualified and experienced staff. The tasks of the EMA consists of:

(i) Verifying the results of internal monitoring (i.e., undertaken by the IMA)
(iii) Verifying and assessing the results of the information campaign for APs' rights and entitlements;
(iv) Verifying that the compensation process has been carried out in accordance with procedures communicated with the APs during consultations;
(v) Assessing whether resettlement objectives have been met, particularly with regards to livelihood and restoration and/or enhancement of living standards;
(vi) Assessing the efficiency, effectiveness, impact and sustainability of resettlement implementation, drawing lessons as a guide to future resettlement policy making and planning;
(vii) Establishing whether the resettlement entitlements were appropriate to meet the objectives, and whether these objectives were appropriate to APs' conditions;
(viii) If necessary, recommending modifications to the implementation procedures of RAPs, to achieve the principles and objectives of involuntary resettlement principles;
(ix) Reviewing how compensation rates were established; and
(x) Reviewing whether compliance and grievance cases were properly handled

7.8.5 Resettlement Budget

The LRTA will be responsible for providing adequate funds for land acquisition and resettlement related to the Project. Detailed estimates will be prepared during detailed design of respective road section, verified by the Implementing Office and included in the pre-construction project budget. This budget item will include the detailed costs of land acquisition, relocation, and livelihood and income restoration and improvement. All land acquisition, compensation, relocation and rehabilitation of income and livelihood will be considered as integral components of project costs.

A.	Land Acquisition	$XX,000
B.	Resettlement Costs (Includes compensation for structures, and other types of compensation for, including disturbance compensation, rehabilitation assistance, rental subsidy, and other entitlements of APs)	$XX,000
C.	Administrative and Monitoring Costs	$X,X00
D.	Contingency	$X,X00
	Total Costs	$XX,000

7.9 Summary

Present environmental conditions show some aspects that may bring about adverse impacts to the Project while others are expected to remain the same. Given the tectonic framework covering Metro-Manila area and vicinity, the geological hazards that could have an effect on the Project are seismically connected and these include earthquakes and seismic shaking. Results of ambient water and air quality sampling and analysis are strongly indicative of fairly high levels of pollutants, particularly in terms of total coliform for water and Total Suspended Particulates for air. Even without train operations, the observed noise levels at the selected stations of the existing LRT Line 2 are fairly higher than the standard limit set for areas directly fronting/facing a 4-lane road. Results of the monitoring showed that the morning, daytime, evening, and nighttime ambient noise levels at the sampling sites exceeded the DENR limit.

The west extension will traverse six (6) barangays in the City of Manila, and on the east, along one barangay each for Pasig City, Marikina City, Antipolo City, and Cainta, Rizal. Most stakeholders believe that decrease in income is inevitable during construction period. Some also feel that the effect will continue even during operation of the rail system. In terms of environmental impacts, the implementation of the project is perceived to most likely affect the basic utilities along the extension alignments, during construction period. Some anticipate that the system will result into increased business incomes, though some still feel that it will adversely affect their business activities, particularly during construction period due to limited access. Others do not see any significant changes that may be brought about by the project. Although the project is perceived to cause decrease in business income levels during its construction and operational stages, the respondents still see it as socially favorable as indicated by the high percentage of acceptability.

Land acquisition for both east and west extension will only entail marginal impacts since most of the properties to be acquired mostly consist of fences, gutters, and signage of commercial establishments. It is important to note here that no residential areas shall be displaced.

Important aspects to manage and monitor include: (i) ambient water, (ii) ambient air, (iii) noise level, (iv) traffic congestion, (v) interruption of service utilities, (vi) safety of motorists and pedestrians, and (vii) solid and domestic waste management. Responsible entities are mainly LRTA and its Contractors and Sub-Contractors.

CHAPTER 8

CONFIRMING PROJECT EFFECTS

CHAPTER 8 CONSIDERATION ON PROJECT EFFECT

Both positive and adverse impacts are expected for LRT Line 2 extension project. The negative impacts are described in "Chapter 7 Environmental and social considerations". This chapter focuses the operation/ effect indexes for railway project, the qualitative effects for surrounding area of new stations, and the estimation of greenhouse gas reduction, as positive impacts of the project.

8.1 Operation/ effect indicators

8.1.1 The reason for selection of operation or effect indicators

Table 8.1-1 shows the indicators selected for the estimation of project effects with reason for selection.

Table 8.1-1 Reason for selection of operation/effect indicators

No.	Operation or effect indexes	Reason for selection
1	Workable car ratio	Shows car operation efficiency
2	Train-km	Shows train service efficiency
3	The number of trains in operation	Shows serviceability of train operation
4	Passenger-km	Shows railway productivity
5	Fare revenue	Shows commercial merit of the project
6	Train service frequency in peak hour	Shows users convenience
7	Actual EIRR and FIRR	Shows economic and financial validity of the project
8	Fare Box Ratio	Shows profitability of the project
9	Non-railway revenue	Shows potential of auxiliary business
10	Load factor	Shows profitability of the project

Source: Study Team

8.1.2 Operation/ effect indicators

The calculation of above indexes is done for whole section including existing section and extension section. The results of operation/ effect indicators for Case 1 and Case 2 are shown in **Table 8.1-2** and **Table 8.1-3**, respectively.

Table 8.1-2 Calculation result of operation or effect indicators for Case 1

No.	Operation or effect indicators	value	Note
1	Workable car ratio	New train sets will be required in 2030	Assumed shared train operation between existing section and extension section Existing section 77.8% (actual number, 14train sets/18train sets as of 2010）
2	Train-km	Opening year- 7,376 thousand car-km/year 2030- 9,220 thousand car-km/year	Existing section 6,104 thousand km/ year (actual 2010)
3	The number of trains in operation	Opening year- same as current (ratio to extension) 2030- 1.25 times (ratio to extension)	Existing line (actual 2011) Weekday: 342OW/ Day Saturday: 286OW/ Day Holiday: 270OW/ Day
4	Passenger-km	Opening year 2,752 thousand passenger-km/year	Included existing section
5	Fare revenue per day	Opening year 2,062 Mil. PHP/year	
6	Train service frequency in peak hour	Opening year- same as current 2030-15trains/h/direction	Actual frequency in existing section is 12 OW/h (actual 2011)
7	Actual EIRR and FIRR	EIRR:17.07%(-2045) FIRR:5.10%(-2045)	Actual EIRR/ FIRR of Line2 existing section(2005-2008) EIRR：3.35 FIRR：15.35
8	Fare Box Ratio	Opening year 2.74	Line2 Existing Section 2010 Actual 0.78 2009 Audited 1.05
9	Non-railway revenue	Assumed 5% of farebox	Line 2 Existing Section 2010 Actual 3.2% (27.47M PHP/854.70M PHP) 2009 Audited 3.1% (26.14M PHP/835.03M PHP)
10	Load factor	60%	Line 2 Existing Section 2008 Actual 39%（Capacity1,628person/train sets）

Source: Study team referring the data of LRTA, ODA post report "Mitigation for traffic congestion in Metro Manila"

Table 8.1-3 Calculation result of operation or effect indicators for Case 2

No.	Operation or effect indicators	value	Note
1	Workable car ratio	New train sets will be required in opening year, and 2028	Assumed shared train operation between existing section and extension section Existing section 77.8% (actual 2010, 14train sets/18train sets)
2	Train-km	Opening year- 8,100 thousand car-km/year 2028- 10,124 thousand car-km/year	Existing section 6,104 thousand km/ year (actual 2010)
3	The number of trains in operation	Opening year- same as current (ratio to extension) 2030- 1.25 times (ratio to extension)	Existing line (actual 2011) Weekday: 342OW/ Day Saturday: 286OW/ Day Holiday: 270OW/ Day
4	Passenger-km	Opening year 3,011 thousand passenger-km/day	Included existing section
5	Fare revenue per day	Opening year 2,212 Mil. PHP/year	
6	Train service frequency in peak hour	Opening year - same as current 2028-15trains/h/direction	Actual frequency in existing section is 12 OW/h (actual 2011)
7	Actual EIRR and FIRR	EIRR:13.31%(-2045) FIRR:3.03%(-2045)	Actual EIRR/ FIRR of Line2 existing section(2005-2008) EIRR：3.35 FIRR：15.35
8	Fare Box Ratio	Openning year 2.51	Line2 Existing Section 2010 Actual 0.78 2009 Audited 1.05
9	Non-railway revenue	Assumed 5% of farebox	Line 2 Existing Section 2010 Actual 3.2% (27.47M PHP/854.70M PHP) 2009 Audited 3.1% (26.14M PHP/835.03M PHP)
10	Load factor	63%	Line 2 Existing Section 2008 Actual 39%（Capacity1,628person/train sets）

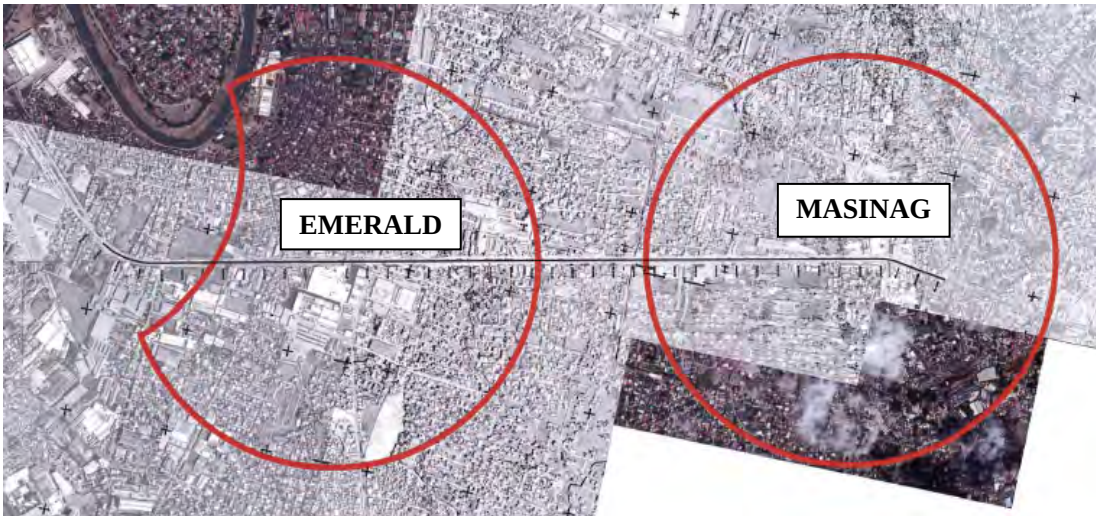
Source: Study team referring the data of LRTA, ODA post report "Mitigation for traffic congestion in Metro Manila"

8.2 Qualitative effects for surrounding area of new stations

8.2.1 Elimination of inconvenient area for using railway

Generally, feeder service modes for railway station are provided by bus, taxi, bike, other kind of motor vehicles, bicycle and walk. The traffic survey for current LRT Line 2 riders, and other modes of transport, was conducted in March 2011. The major feeder service modes are jeepney and walk, accounting for 50% to 80 % of trip share.

So, the improving effect of rail use convenience is estimated by reduction of rail use inconvenient area. The area is defined as a circle with one (1) km radius, corresponding for easy walking access/egress to/from new station, together with considering projects with existing stations.
Schematic image of improving effect for rail use is shown in **Figure 8.2-**1 and **Figure 8.2-2** for the east extension case and the west extension case respectively.



Source: Study Team

Figure 8.2-1 Area with convenient railway access improved in east extension section

Source: Study Team

Figure 8.2-2 Area with convenient railway access improved in west extension section

And the elimination effect of train use inconvenient area is shown in **Table 8.2-1**.

Table 8.2-1 Effect of eliminating inconvenient area for rail use area

	Divisoria	Emerald	Masinag	Notes
The area with convenient rail use（km^2）	2.67	2.12	3.14	
Population of beneficiaries（Pop.）	145,087	41,068	46,149	Population in 2007

Source: Study team referring "The Philippines 2007 Census"

8.2.2 Improvement of daily life conveniences

8.2.2.1 Reduction of commuting / schooling time

Time reduction for communities and schooling is expected by opening new stations. The major transfer of principal mode in public transport is from jeepney to rail, according to demand forecast result. Hypothesis on trip time reduction is explained in **Table 8.2-2** by feeder trip OD pattern and mode.

Table 8.2-2 Effect of time reduction for commuting/schooling

Feeder trip OD pattern / Previous Principal Mode	Trips between catchment area of new stations	Trips between new stations and external zones	Trips between external zones
Rail	- Both feeder mode, jeepney from/ to existing station change to walk from/ to new station. - The time reduction effect is small.	- One feeder mode, jeepney from/ to existing station is changed to walk from/ to new station. - Another feeder mode in existing station is not changed. - The time reduction effect is small.	- This type includes trips of which the nearest station is changed from existing station to new station - Feeder mode from/ to new station is not walk. - Another feeder mode about existing station is not changed. - The time reduction effect is small.
Jeepney	- Primary mode is changed from jeepney to rail, both feeder modes are walk. - Certain reduction effect for commutes will be expected.	- Primary mode is changed from jeepney to rail. - Feeder mode from/ to new station is walk, feeder mode from/ to existing station is not walk. - The effect of shorter commutes will be presence.	- Primary mode is changed from jeepney to rail, both feeder modes are not walk. - Mode transfer mostly depends on feeder mode than other types, so short rail extension will not contribute to make changing primary mode, and the effect seems small.
Beneficiaries of time reduction for commuting and schooling	Case 1 117,302 pop./day, Case 2 131,048 pop./day		

Source: Study Team

8.2.2.2 Accessibility improvement to public, commercial and medical facilities

As for the access to public, commercial and medical facilities, their improvements are expected by opening new stations as well.
The facilities, expected accessibility rising, are shown in **Table 8.2-3**.

Table 8.2-3 The facilities with accessibility improvement

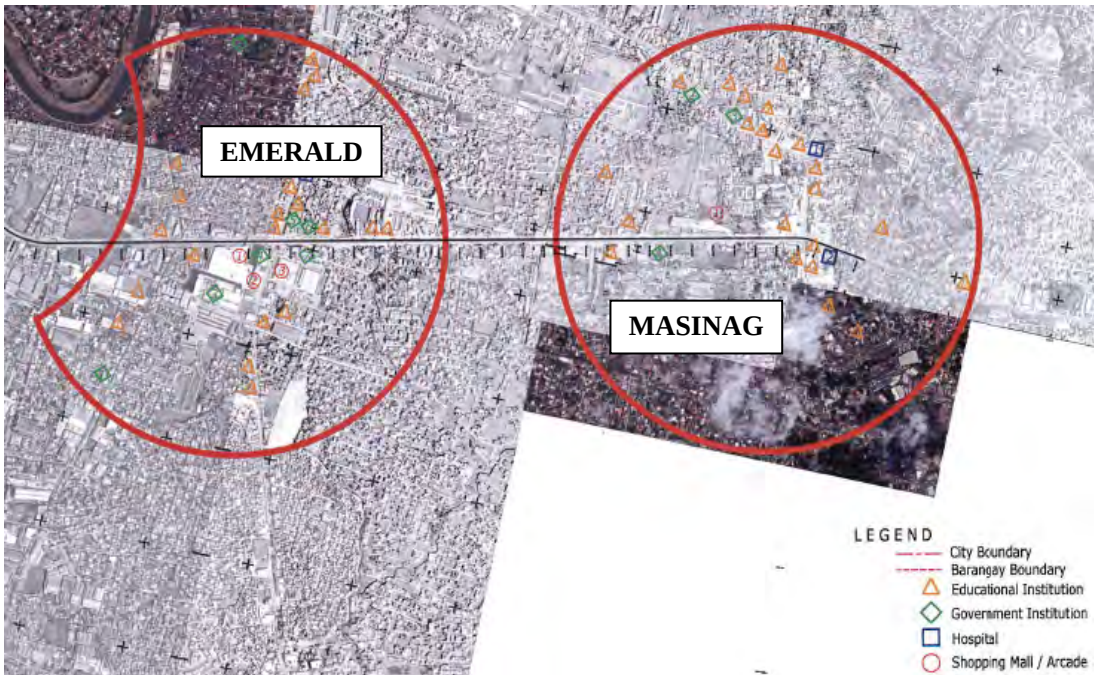
No.	Items	Divisoria		Emerald		Masinag	
1	Educational Institution	1	Rosauro Almario Elementary School	1		1	Pink Toes
		2	Rosauro Almario School	2		2	AMA Computer University
		3	Gynazo Christian Academy	3		3	Little Flower of the Childe Jesus Montesson Learning School
		4	unknown	4		4	God's Loving Kindeness Community International
		5	-Manuel L Quezon Elementary School	5		5	Justo Learning Academy
		6	Apple and Book Learning Center	6		6	unknown
		7	-Magat Satmat elementary School	7	OB Montessori Pagsasarli School	7	Mayamot Elementary School
		8	-Paaralang Magat Salamat	8	Mountain View Children's House	8	unknown
		9	-Dr Juan GNolasco High School	9	AMA Computer Learning Centre	9	All Nations Colleges
		10	-Holy Child Catholic School	10	MTC Academy	10	Haggai Christian Academy
		11	-Amazing Kids Learning	11	Child Horizon School	11	Asian College of Science and Technology
		12	-Isabelo Delos Reyes Elementary School	12	Morning Dew Montessori School	12	Center for Pop Music
		13	-Dual Tech Center	13	unknown	13	unknown
		14	-Kwangson Young Dr Memorial School	14	AMA School of Medicine	14	Kumon
		15	-Philippine San Bin School	15	Miriam Claire Integrated School	15	Otani Japanese Scholl
		16	-West Manila Christian School	16	Cad Design and Construction Center	16	International Institute of Technology
		17	unknown	17	CCT Colleges Foundation Inc	17	unknown
		18	-Gregorio Perfecto High School	18	unknown	18	Kids "R" us Early Childhood Center
		19	-Sacred Heart School	19	Morning Dew Montessori	19	Elijah Academe
		20	-Computer Language and Institute	20	unknown	20	Angel's Light Learning Camp
		21	unknown			21	Marie's Christian
		22	-Jose Abad Santos High School			22	Summeville Academy
		23	-Center for Pop Music Philippines Inc				
		24	Chiang Kai Shek College Elementary and High School Department				
		25	Phioippine Cultural High School				
		26	Chiang Kai Shek College				
2	Government Institution	1	Bureau of Animal Industries	1	De la Paz Barangay Hall	1	Bureau of Internal Revenu
		2	Barangay Hall	2	San Roque Barangay Hall	2	City Hall Annex
		3	Barangay Hall	3	Informatics International Gollege	3	unknown
		4	Barangay Hall	4	Informatics Computer Institute		
		5	Barangay Hall	5	Land Registration Authority		
		6	Barangay Hall	6	STI Education Center		
		7	Barangay Hall	7	Saint Chamuel Institute of Technology		
		8	Barangay Hall				
		9	Barangay Hall				
		10	Barangay Hall				
		11	Barangay Hall				
		12	Barangay Hall				
		13	Barangay Hall				
		14	Barangay Hall				
		15	Barangay Hall				
		16	Barangay Hall				
3	Hospital	1	unknown	1	St. John the Baptist of Marikina Hospital	1	Antipolo City Medical Hospital
		2	Mary Johnston Hospital			2	Blesses Trinity Maternity and Medical Hospital
		3	Madonna Maternity Hospital				
4	Shopping Mall	1	The Ilaya Shopping Mall	1	Robinsons Metro East	1	SM City Masinag
		2	New Divisoria Mall	2	Sta. Lucia East Grand Mall Phase2		
		3	168 Shopping Mall Annex	3	Q-Plaza Complex		
		4	168 Shopping Mall				
		5	Tutuban Center Mall 2				
		6	Tutuban Center Mall 1				

Source: Study Team

And the distributions of facilities above, in the case of east extension section and west extension section, are shown in **Figure 8.2-3**, and **Figure 8.2-4** respectively.

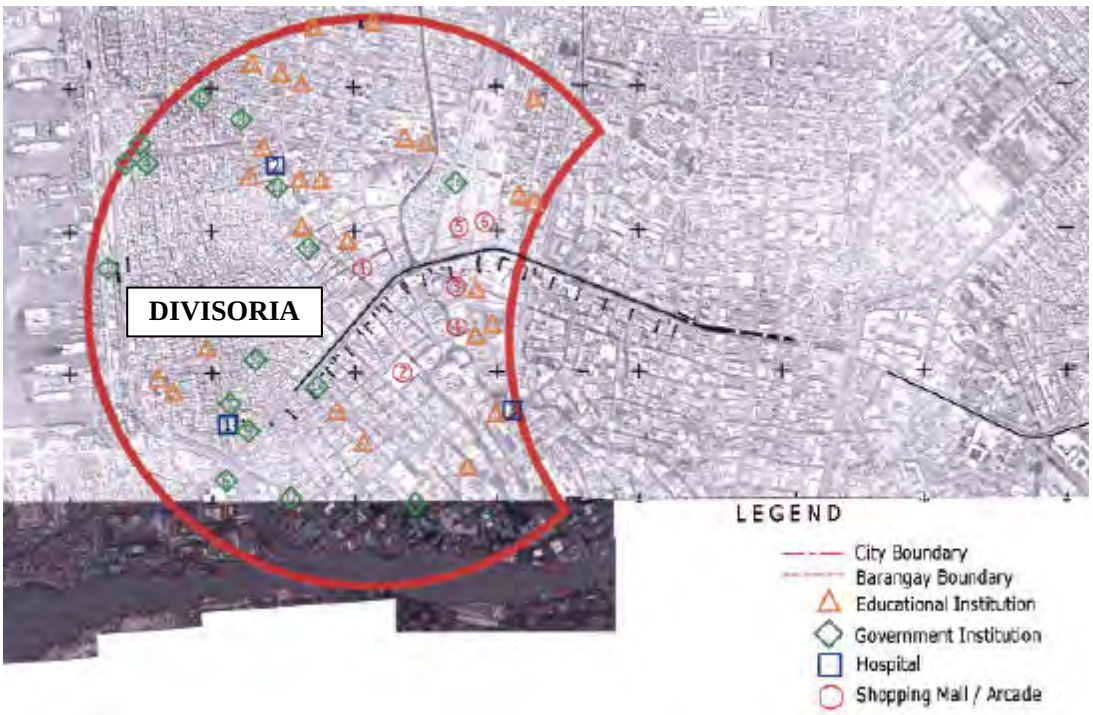
8.2.3 Change of land use

The opening new station is expected to bring higher commercial potential and new business establishment to surrounding area. And it is expected to contribute to the revitalization of communities. Construction, expansion and renovation of commercial facilities are expected by implementation of railway extension project, the construction of office building as well.



Source: Study Team

Figure 8.2-3 Distribution of facilities with rail accessibility improvement in the east extension section



Source: Study Team

Figure 8.2-4 Distribution of facilities with rail accessibility improvement in the west extension section

8.2.3.1 Present land use and future land use plan

Present land use in 2003 and future land use plan in 2020 are shown in **Table 8.2-4** and **Table 8.2-5**.

Table 8.2-4 Present land use of Metro Manila, 2003

Local Government Units	Residential	Commercial	Industrial	Institutional	Agriculture	Parks/ Open Spaces	Others
City of Manila	43.93	15.59	10.74	11.32	0.00	7.70	10.71
Kalookan City	68.37	3.97	8.05	1.92	1.70	13.30	2.70
Las Pinas City	63.59	7.84	5.90	0.76	0.00	21.70	0.21
Makati City	54.01	20.64	2.37	13.34	0.00	5.38	4.25
Malabon City	49.82	2.87	16.56	3.20	0.00	6.54	21.01
Mandaluyong City	44.80	14.21	18.50	10.07	0.00	11.54	0.88
Marikina City	67.91	3.01	9.40	4.63	0.75	11.70	2.60
Muntinlupa City	51.56	9.86	7.91	2.68	2.72	24.62	0.64
Navotas City	28.71	0.34	12.49	0.61	0.00	0.44	57.41
Paranaque City	63.06	7.25	7.44	0.52	0.13	13.02	8.58
Pasay City	31.80	8.56	1.47	4.98	0.00	21.29	31.91
Pasig City	50.23	10.60	21.16	2.42	0.41	14.45	0.73
Municipality of Pateros	83.17	1.99	0.29	1.37	8.13	4.11	0.94
Quezon City	56.38	6.51	5.26	7.44	0.64	4.94	18.83
San Juan City	75.77	10.54	4.28	6.38	0.00	1.85	1.18
Taguig City	43.92	0.45	11.61	3.22	15.51	8.74	16.56
Valenzuela City	36.35	2.01	24.39	0.61	1.57	22.94	12.13
Total	**53.78**	**7.34**	**9.37**	**4.87**	**1.52**	**11.60**	**11.53**

[1]/Institutional includes government and quasi public, health and welfare, educational and cultural, and military areas.
[2]/Others include cemetery, religious, transport and service facilities, water related land and forestland
Sources: Calculated from the MMEIRS Land Use Map, 2003; Study on Climate Change Impact over Asian Mega Cities (Phase 2)

Table 8.2-5 Future land use plan of Metro Manila, 2020

Local Government Units	Residential	Commercial	Industrial	Institutional[1/]	Special Development[2/]	Agriculture	Parks/ Open Spaces	Others[3/]
City of Manila	24.74	37.25	2.74	18.13	0.00	0.00	4.31	12.83
Kalookan City	57.39	11.29	18.65	2.53	3.19	0.00	3.46	3.50
Las Pinas City	63.59	7.84	5.90	0.76	0.00	0.00	21.70	0.21
Makati City	49.86	30.43	0.00	8.77	1.93	0.00	4.71	4.30
Malabon City	54.82	11.63	21.24	1.28	7.91	0.00	0.90	2.22
Mandaluyong City	47.84	25.26	2.06	3.35	10.20	0.00	10.57	0.72
Marikina City	58.02	14.22	10.05	4.49	4.45	0.43	4.78	3.56
Muntinlupa City	51.56	9.86	7.91	2.68	0.00	2.72	24.62	0.64
Navotas City	30.51	6.39	22.91	1.25	0.00	0.00	2.20	36.73
Paranaque City	63.06	7.25	7.44	0.52	0.00	0.13	13.02	8.58
Pasay City	23.18	10.79	1.23	11.05	22.11	0.00	3.83	27.81
Pasig City	57.58	20.17	9.86	1.57	7.27	0.00	1.15	2.40
Municipality of Pateros	72.38	21.11	0.00	4.54	0.00	0.00	1.97	0.00
Quezon City	56.15	8.84	6.74	7.83	3.22	0.00	13.58	3.63
San Juan City	75.08	15.68	1.74	6.95	0.00	0.00	0.00	0.55
Taguig City	60.37	9.30	7.43	5.31	0.00	0.00	17.59	0.00
Valenzuela City	36.35	2.01	24.39	0.61	0.00	1.57	22.94	12.13
Total	**51.86**	**12.87**	**9.28**	**5.43**	**2.92**	**0.32**	**11.45**	**5.87**

[1]/Institutional includes government and quasi public, health and welfare, educational and cultural, and military areas.
[2]/Special development sites are identified by LGUs for planned large area for mix-use developments.
[3]/Others include cemetery, religious, transport and service facilities, water related land and forestland.
Sources: Proposed land use and zoning maps of the 13 flood-affected LGUs and present land use of the metropolis; Study on Climate Change Impact over Asian Mega Cities (Phase 2)

And also land use maps for present and future plan, are shown in **Figure 8.2-5** and **Figure 8.2-6**.

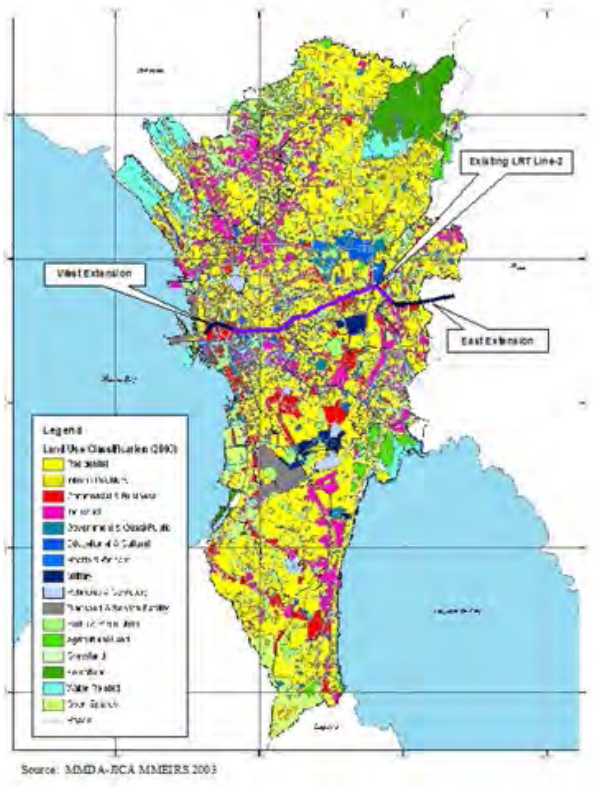


Figure 8.2-5 Present land use of Metro Manila 2003

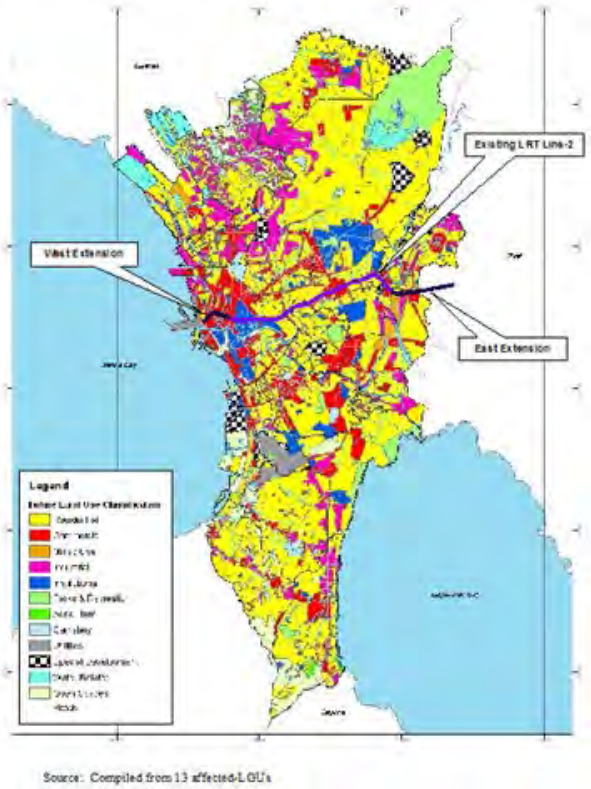


Figure 8.2-6 Future land use of Metro Manila 2020

From the tables and figures mentioned above, specific points are focused as follows:

- As for the present land use along the extension section, east part is mainly residential, west part is mainly commercial and business.
- As for the future land use plan, east part will intensity commercial use, west part will intensity commercial use also.
- Quezon city, nearest local government units attaching a part of east extension section in Rizal province, is expected to have suburban development. Other vacant spaces are expected to change to Agriculture or Parks/ Open Spaces.
- City of Manila attaching west extension section, is expected to develop commercial land use. Size of commercial area is expected to increase 2.4 times during 13 years.
- According to land use map of present and future plan, land use of along the extension section is not expected to change dramatically. Residential is dominant in east extension section and Commercial is dominant in west extension section.

8.2.3.2 Advanced land use example in Quezon City

Quezon city is selected as the advanced examples for land use change. The reason of choice is shown as follows.

- Quezon city is at the northeastern portion of Metro Manila. It has a land area of 16,112.55 hectares, almost one-fourth of the National Capital Region (NCR) and is the biggest among NCR's 17 local government units.

- A lot of new rail systems are opened in Quezon city, MRT Line 3 in 2000, LRT Line 2 in 2003, and Extension of LRT Line 1 North Extension in 2010.
- The extension east section adjoining Quezon city and its character of the area is similar. Target area which is located outer suburb of Quezon city is expected to have similar change in near future.

The change of land use in Quezon city, comparing between 1995 and 2008, is shown in **Table 8.2-6** and **Figure 8.2-7**.

Table 8.2-6 Change of land use in Quezon city (1995 and 2008)

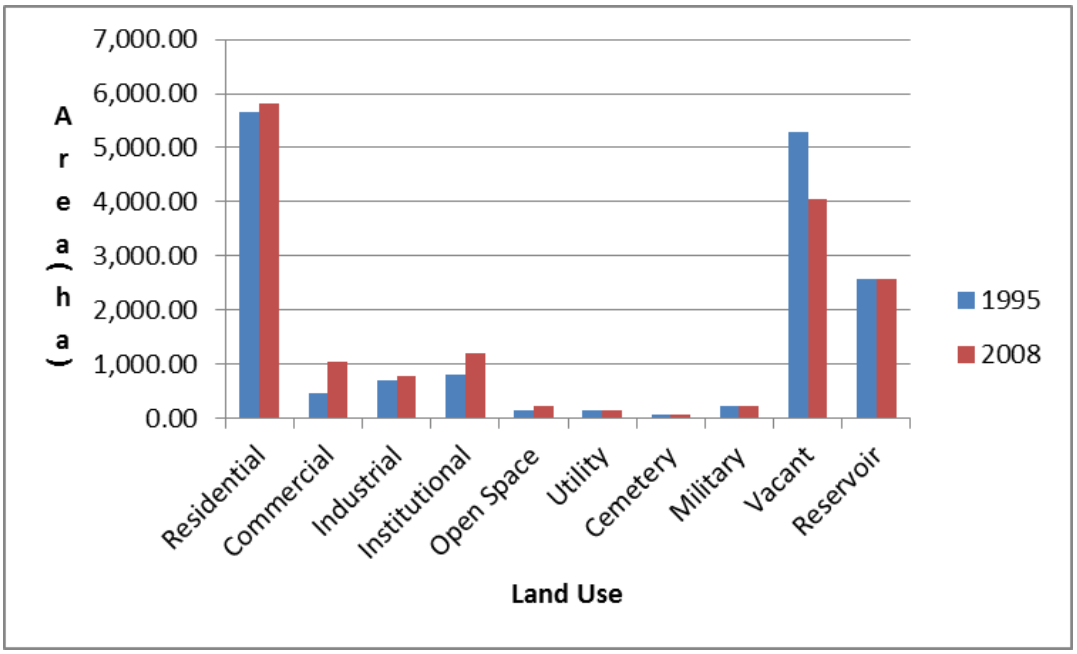
Land Use	1995		2008		Increase / Decreas	
	Area(ha)	Share(%)	Area(ha)	Share(%)	Area(ha)	Share(%)
Residential	5,649.50	35.06	5,804.21	36.02	154.71	2.74
Commercial	471.60	2.93	1,044.25	6.48	572.65	121.43
Industrial	708.22	4.40	770.32	4.78	62.10	8.77
Institutional	820.08	5.09	1,201.21	7.46	381.13	46.47
Open Space	157.27	0.98	226.06	1.40	68.79	43.74
Utility	148.44	0.92	147.24	0.91	-1.20	-0.81
Cemetery	61.74	0.38	66.81	0.41	5.07	8.21
Military	225.57	1.40	222.02	1.38	-3.35	-1.57
Vacant	5,295.72	32.87	4,060.59	25.20	-1,235.13	-23.32
Total Urban Area	13,538.14	84.02	13,542.71	84.39	4.57	0.03
Reservoir	2,574.41	15.98	2,569.84	15.61	-4.57	-0.18
Total Area	**16,112.55**	**100**	**16,112.55**	**100**		

Source: Land Area, Written by Administrator, 08 December 2008

From the above table, following points are noted:

- Residential use shares almost one –third, keeping dominant utilization in Quezon city.
- Growing up of commercial use was skyrocketed, as 2.2 times during 13 years.
- Vacant and military space were decreased.

This remarkable increase of commercial land use was attributed by construction of large shopping malls along the trunk corridor, rail and road. A question of which came first, the chicken or the egg. Both rail and commercial facility have contributed cooperatively to urban development. For the reference, the outline of recent opening shopping mall, faced to Masinag station site, is shown in **Table 8.2-7**.



Source: Land Area, Written by Administrator, 08 December 2008

Figure 8.2-7 Change of land use in Quezon city (1995 and 2008)

Table 8.2-7 Outline of new comer of Shopping Mall

Items		Note
Denomination	SM City Masinag	The 41st of SM Supermall
Developer/ Primary Tenant	SM Prime Holdings SM Department Store SM Supermarket	
Designer	DSGN Associates	Environmental friendly concept e.g. applied large ceiling fan for mildly air conditioning
Location	Masinag, Antipolo City / Rizal Province	The 2nd SM City in Rizal Province, the first is SM City Taytay. Catchment area includes Rodriguez, Marikina, San Mateo, Cainta, Taytay, Tanay, Baras, a part of Quezon.
Area	90,280 square meter	
Opening date	06 May 2011	
Contents	Anchor; Tenant; Boutique Cinema	SM Department Store, SM Supermarket 180 shops（restaurants, etc.） 158 brands 4 screens（Total 1,200 seats）

Source: Philippine Daily Inquirer, 08 May 2011

Masinag is expected to provide development site for urbanization and industrialization, from Metro Manila. Masinag, located between existing CBD(Central Business District) of Antipolo and Metro Manila, has a lot of potential for housing estate development, schools, and enterprise establishments. The shopping mall visitors expected to board on LRT line 2 as well. As an example, **Photo 8.2-1** and **Photo 8.2-2** shows bustling situation on holiday at Bicutan station, located in south bound suburbs.

Photo 8.2-1 PNR Bicutan Station on Saturday afternoon

Photo 8.2-2 Footbridge connecting SM and station at Bictan

8.2.4 Traffic accident reduction

LRT Line 2, applying two-level crossing through whole section, is safer than typical land transport mode. The extension sections, both east and west, are located in traffic congested areas. Public utility vehicles, e.g. bus, jeepney, FX, stop wherever and whenever the driver and passenger wants by preference. Therefore modal shift is expected to reduce the traffic accident.

8.2.4.1 Road accident

Actual road accident data of LRT Line 2 expansion section is shown in **Table 8.2-8**.

Table 8.2-8 Traffic accident statistics at LRT Line 2 Expansion

Incidents		Fatal	Non Fatal Injury	Damage to Property	Grand Total
West	2009	0	11	42	53
	2010	0	11	55	66
	Average	0	11	48.5	59.5 approx. 60
East	2009	1	38	317	356
	2010	1	73	469	543
	Average	1	55.5	393	449.5 approx..450

West - Claro M. Recto Ave. (LRT Extension Area Only) covers the stretch from Evangelista up to Del Pan-Radial Road.
East- Marcos Highway (LRT Extesion Area Only) covers the stretch from LRT-Santolan Station up to Marikina-Rizal boundary (Ballante Creek) only. Not including Rizal province

Source: Metro Manilla Sccident Reporting and Analysis System (MMARAS) Databese
MMDA Traffic Discipline Office Traffic Engineering Center Road Safety Unit

Length of extension is 1.9 km in Metro Manila, and also is 1.9 km in Rizal province. So, total number of accidents is assumed to be two times of actual number of Metro Manila area. Reduction of traffic accidents is shown in **Table 8.2-9**. The ratio of deduction of traffic accident is assumed as 10%, considering decreasing Jeepneys which are parking and stopping many times.

Table 8.2-9 Reduction of traffic accidents

Incidents	West	East
0. Length	1.6km	3.8km (Metro Manila 1.9km, Rizal province 1.9km)
1. Present (number)	60	450
2. Reduction ratio of the number of traffic accident	10%	10%
3. Redcution of the number of traffic accident	6	45

Source: Study Team

8.2.4.2 Railway accident

The kind of fatal accident and seriously injured accident was not reported to the safety office Line 2 systems, in recent two years. Operation related incident for 2009 and 2010 are shown in **Table 8.2-10**.

Table 8.2-10 Incidents for 2009 / 2010 of LRT Line 2

Incidents	2009	2010
Vandalism	2	1
Pilfirage	1	2
Roberry/ Snatching	3	1
Suspiscious baggage	3	2
Activation of train door	1	0
Crossing of tracks	4	3
Outbalance/slipped passenger	38	22
Elevator trapped	5	3
Pregnant passenger / labor incident	1	0
Dizzy passenger	50	72
Door pinning	92	68

Source: LRTA

From the above table, the damages of railway accident are expected extremely small, compared with the one of road accident. Moreover the length of extension sections is shorter than the one of existing section. So, benefit of reduction of rail accident is defined as N/A, because damages of existing section are negligible.

8.2.4.3 Benefit of reduction of traffic accident

According to “Make Roads Safe”, costs for traffic accident in Asian countries are assumed at 1 % of GNP of each country. According to “The Comparative study on Urban Transport and the Environment”, Philippines are categorized Type C-a “Rapid motorization in developing countries”, same as Thailand and Algeria. So, the Unit of damages on road traffic accident in Manila is assumed by actual data of Thailand, taking into account of nominal GDP ratio between Philippines and Thailand. The data is shown in **Table 8.2-11**.

Table 8.2-11 Unit of damages about road traffic accident

Item/Year			1993	1995	1997	2011	Notes
Thailand	Fatalities	Thousand	9.5	16.7	13.2		
	Injuries	Thousand	25.3	50.7	45		
	Total	Thousand	34.8	67.4	58.2		
	Damages	Mil. USD	24	38	34		
	Unit	USD	690	564	584		
Bangkok	Fatalities	Thousand	1.0	1.3	0.8		
	Injuries	Thousand	11.1	20.2	18.6		
	Total	Thousand	12.1	21.5	19.4		
	Damages	Mil. USD	5	12	11		
	Unit	USD	413	558	567	1,250	567*332.47/150.89
Nominal GDP	Thailand	Bil. USD	121.8	168.02	150.89	332.47	(Prospect)
	Philippines	Bil. USD	54.37	75.53	83.74	202.87	(Prospect)
	Ratio		45%	45%	55%	625	1,250*50%

Source; Study team referring "The Comparative study on Urban Transport and the Environment by Yoshikuni KOBAYASHI, Mikiharu ARIMURA, Hideo NAKAMURA"

Damages per accident in Manila are estimated at USD 625. Benefit of reduction of traffic accidents are shown in **Table 8.2-12**.

Table 8.2-12 Benefit of reduction of traffic accidents

	Case 1	Case 2
Benefit	4 thousand USD	28 thousand USD

Source; Study Team

8.2.5 Benefit of environmental improvement except for greenhouse gas reduction

The greenhouse gas reduction, the primary benefit in environmental field, is described in "8.3 Estimating greenhouse gas reduction". Generally, other items to be expected are enumerated concerning about nitrogen oxide (NOx), suspended particulates (SPM), and noise. Decreasing air pollutants, gaseous emissions and SPM, is expected as a result of modal change. It may probably take time. There is no quantitative description in "7 Environmental and social consideration" about these items, for negligible level. So estimation of greenhouse gas reduction is carried out only for quantitative analysis in environmental field.

8.3 Estimating greenhouse gas reduction

This section is composed by two parts, one is "Related to the construction of railway structures" and another is "Conversion from auto transportation."

8.3.1 Related to the construction of railway structures

Study team calculates the benefit with reduction of CO_2 emission, referring to "The report of the benefit about deduction of CO_2 emission by constructing urban railway, JBIC, 2008." List of unit is shown in **Table 8.3-1**.

Table 8.3-1 Index for Deduction of Emission of CO_2

Classification			Unit			Note
Railway Facility	Structure	Viaduct	6.39	*10^3	t-CO_2/km	
		Open cut tunnel	1.64	*10^4	t-CO_2/km	
		Shield tunnel	8.84	*10^3	t-CO_2/km	
		Ballast Track	3.22	*10^2	t-CO_2/km	
		Slab Track	2.86	*10^2	t-CO_2/km	
	Station	Viaduct	3.8	*10^3	t-CO_2/spot	
		Underground	3.11	*10^4	t-CO_2/ spot	
		Ground	1.93	*10^3	t-CO_2/ spot	
	Depot		6.13	*10^3	t-CO_2/ spot	
Rolling Stock	Manufacturing		6.16	*10	t-CO_2/car	
	Energy Consumption	Japanese Spec	2.48		Quotation by a	
		International Spec	3.07		t-CO_2/Train-Kilometer	
Maintenance			2.13	*10^-6	t-CO_2/Train-Kilometer	

Source: "The report of the benefit about deduction of CO_2 emission by constructing urban railway, JBIC, 2008."

8.3.2 Conversion from auto transportation

Conversion from auto transportation is assumed following items.

- Reduction of CO_2 in vehicle
- CO_2 emission by Rail
- Benefit of CO_2 reduction balance

8.3.3 Calculation result

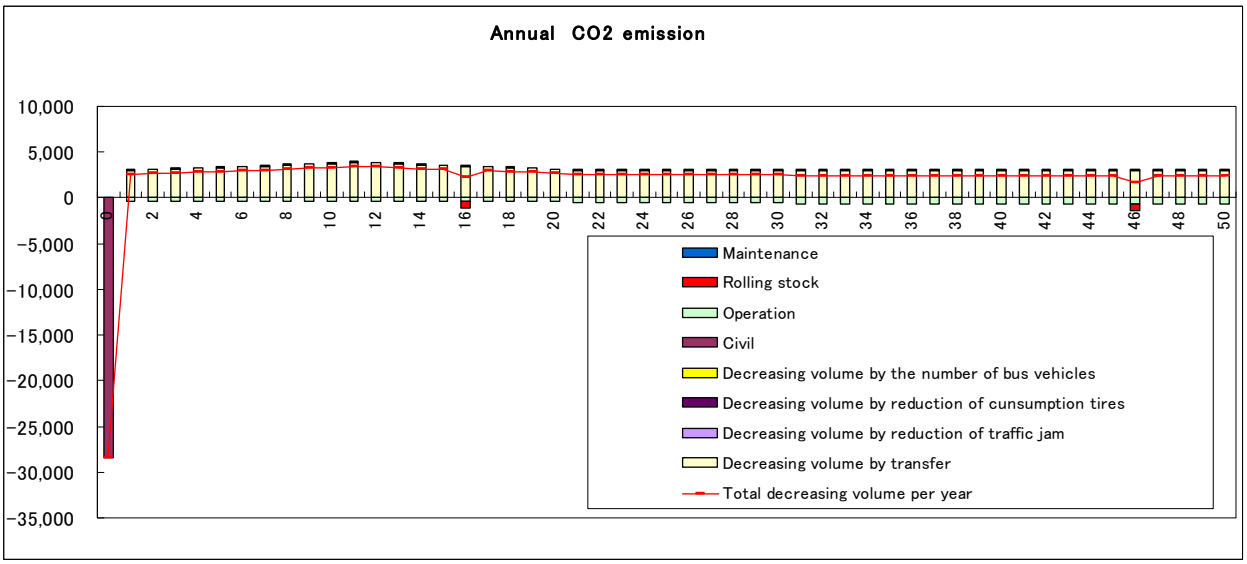
Calculation results of each case are shown as follows.

8.3.3.1 Case 1

Table 8.3-2 The effect of reduction of CO_2 emission (Case 1)

Item		30 years total	50 years total
Rail（Increasing volume） （CO_2-t)			
	Civil	28,477	28,477
	Rolling stocks	739	1478
	Operation	11,635	23,342
	Maintenance	250	502
	Sub total	41,102	53,800
Road (Decreasing volume） （CO_2- t）			
	Decreasing volume by transfer	86,986	147,769
	Decreasing volume by reduction of traffic jam	0	0
	Decreasing volume by reduction of consumption tires	1,852	3,147
	Decreasing volume by the reduction of bus vehicles	0	0
	Sub total	88,838	150,916
Total（CO_2- t）			
	Total	**47,736**	**97,116**
Balance for total of reduction of CO_2 emission (After undertaking)		14	**Years**
(After opening)		10	**Years**
Area of forest equivalent to performing reduction of CO_2 emission (ha)		**98**	**199**

Source: Study Team



Source: Study Team

Figure 8.3-1 Trend of Annual CO_2 emission (Case 1)

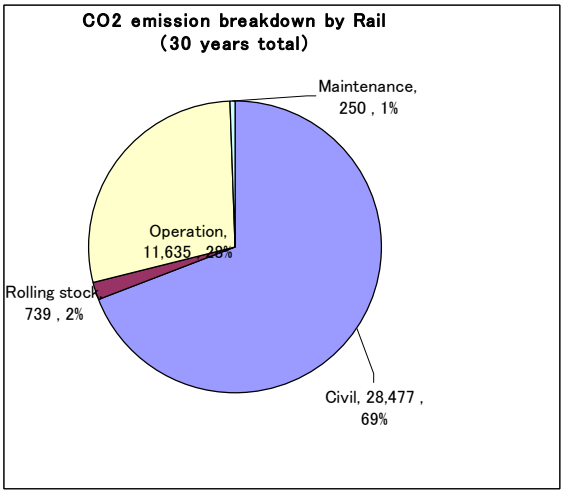


Figure 8.3-2 Breakdown of CO_2 emission from Rail (30 years total) (Case 1)

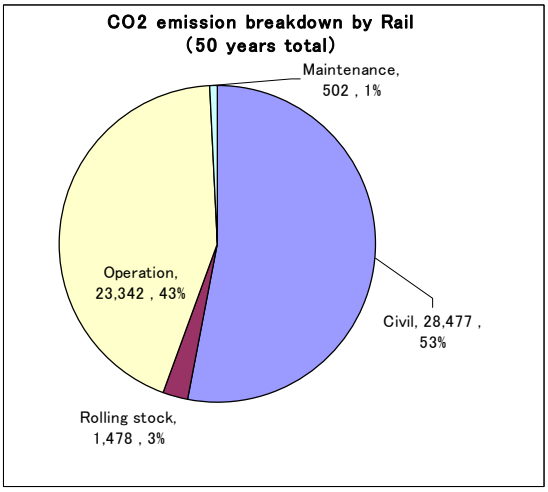


Figure 8.3-3 Breakdown of CO_2 emission from Road (30 years total) (Case 1)

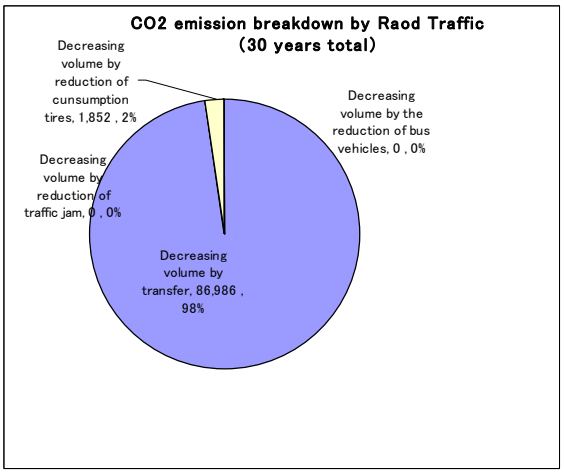


Figure 8.3-4 Breakdown of CO_2 emission from Road (30 years total) (Case 1)

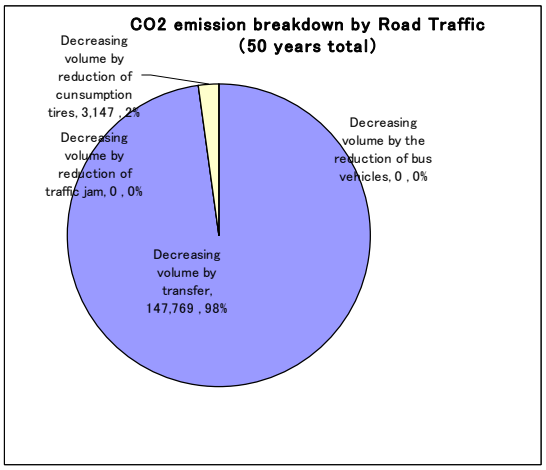


Figure 8.3-5 Breakdown of CO_2 emission from Road (50 years total) (Case 1)

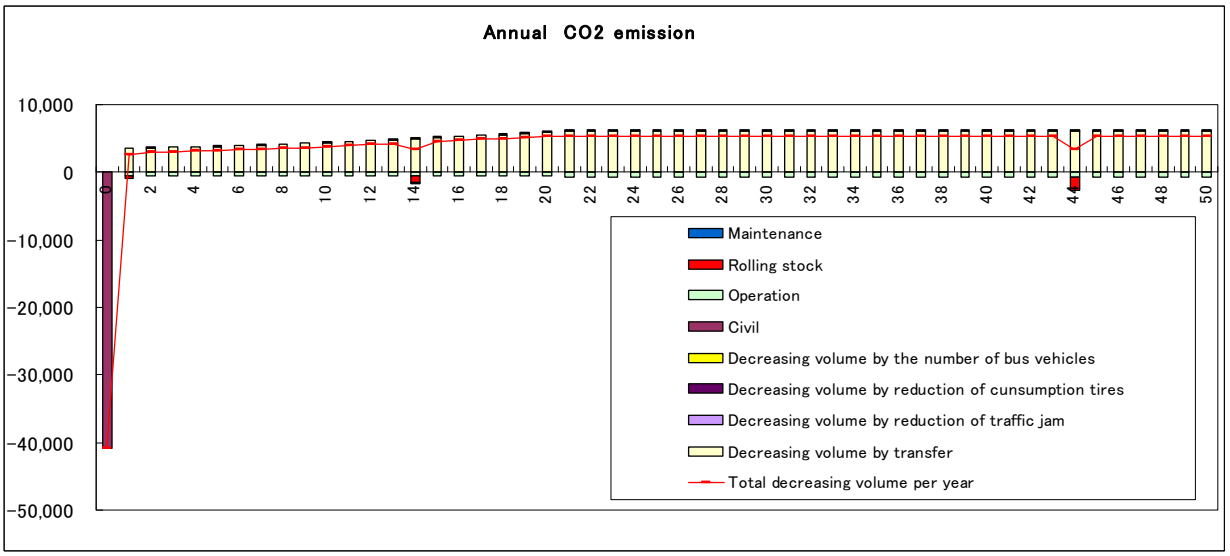
Source: Study Team

8.3.3.2 Case 2

Table 8.3-3 The effect of reduction of CO_2 emission (Case 2)

Item		30 years total	50 years total
Rail（Increasing volume） （CO_2-t)			
	Civil	40,779	40,779
	Rolling stocks	1,232	3,203
	Operation	16,566	31,625
	Maintenance	356	680
	Sub total	58,933	76,288
Road (Decreasing volume） （CO_2- t ）			
	Decreasing volume by transfer	127,846	249,401
	Decreasing volume by reduction of traffic jam	0	0
	Decreasing volume by reduction of consumption tires	2,723	5,311
	Decreasing volume by the reduction of bus vehicles	0	0
	Sub total	130,569	254,712
Total （CO_2- t ）			
	Total	**71,636**	**178,424**
Balance for total of reduction of CO_2 emission (After undertaking)		**17**	**Years**
(After opening)		**13**	**Years**
Area of forest equivalent to performing reduction of CO_2 emission (ha)		**147**	**366**

Source: Study Team



Source: Study Team

Figure 8.3-6 Trend of Annual CO_2 emission (Case 2)

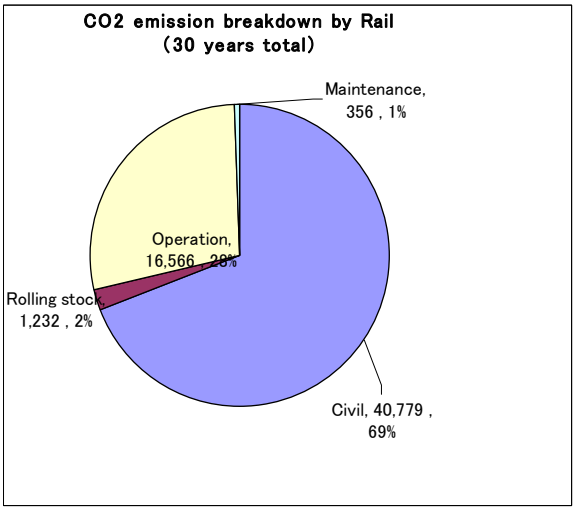


Figure 8.3-7 Breakdown of CO_2 emission from Rail (30 years total) (Case 2)

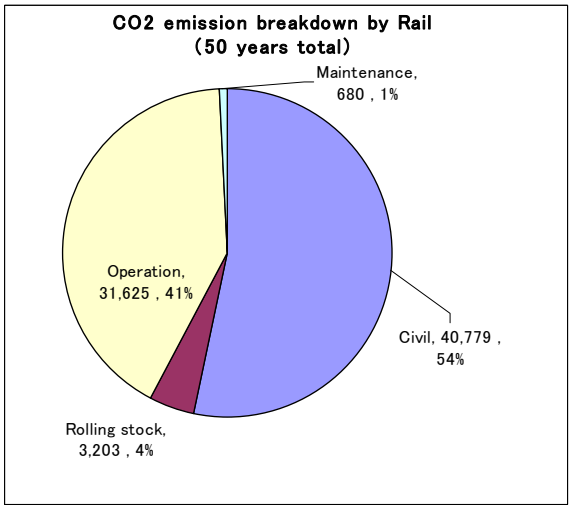


Figure 8.3-8 Breakdown of CO_2 emission from Rail (50 years total) (Case 2)

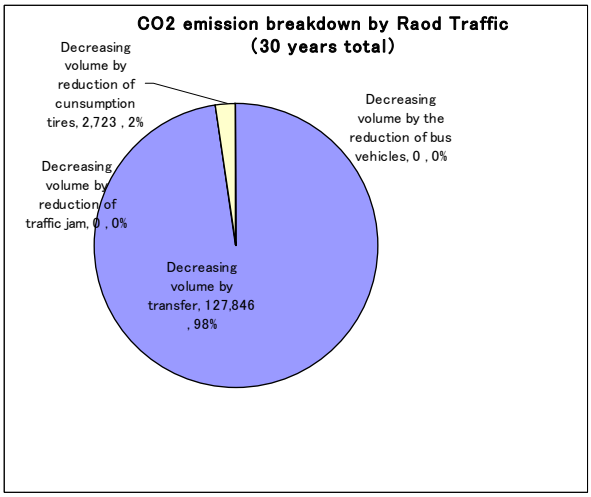


Figure 8.3-9 Breakdown of CO_2 emission from Road (30 years total) (Case 2)

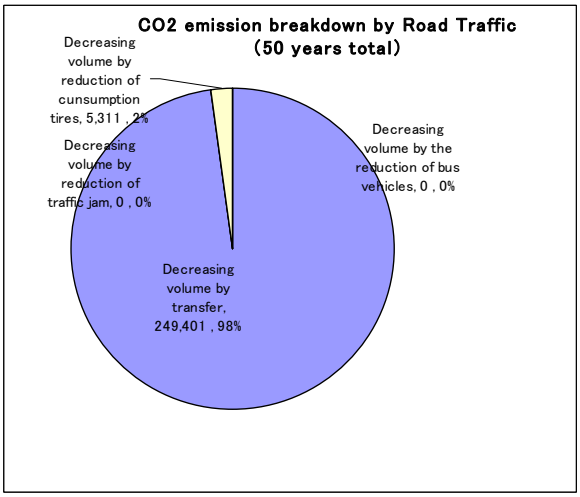


Figure 8.3-10 Breakdown of CO_2 emission from Road (50 years total) (Case 2)

Source: Study Team

8.4 EIRR & FIRR (Economic & Financial Evaluation)

Three approaches are used in evaluating the viability of the project. The first is Economic Analysis – a traditional and generally-accepted method for determining whether a proposed public infrastructure project deserves investment of public monies. The viewpoint is that of the country and the government, and the yardstick is the Economic Internal Rate of Return (or EIRR).

The second approach is Financial Analysis – which looks at the cash flows of the project, without regard to borrowings or capital leveraging. The viewpoint is the project itself, as if the project is an enterprise that is debt-free and exempt from income taxes. The yardstick is Financial Internal Rate of Return (or FIRR), which is calculated similarly as EIRR but with a different cash flow streams. This criterion is useful in determining whether a project shows potential as a private-sector undertaking or would need government support.

The third approach is Accounting Analysis (or Financial Analysis for PPP Options) – which looks at the project as a business being undertaken by a private sector enterprise. Naturally, the latter is subject to all kinds of taxes, but its investment is less than the project cost to the extent of leveraging and government support. The yardstick is Return on Equity (or Equity IRR), calculated as the net income streams after debt amortization and tax payments, if any. This analysis was performed in Section 4.4.

Table 8.4.1 illustrates the main differences in the above three evaluation methods.

Table 8.4-1 Comparison of Different Approaches to Project Evaluation

	Economic	Financial	Accounting (Financial Analysis for PPP Options)
Target	LRT Line 2 Extension Project Case 1 & 2*	LRT Line 2 Extension Project Case 1 & 2*	LRT Line 2 (including existing and extension section)
Yardstick or Criterion	EIRR	FIRR	NPER, IRR for SPC, Equity IRR, DSCR
Threshold value	EIRR≥15%, or the opportunity cost of capital	WACC (weighted average cost of capital)	IRR
Viewpoint	Country and public sector	The Project	Private sector investors
Cash Inflow Streams	Economic benefits to users and the public	Fare box Revenues & Miscellaneous Revenues	Fare box Revenues & Miscellaneous Revenues
Cash Outflow Streams	Project costs and cash operating expenses, with economic price	Project costs and cash operating expenses, without shadow pricing	Investments and (accrued) operating expenses
Depreciation	excluded	excluded	Included
Taxes	excluded	included	Included
Capital Structure/Leveraging	Not relevant	Not relevant	Relevant, impacts net incomes
Impact of Inflation	Not relevant	Not relevant	Relevant

**: Case 1 is east extension only. Case 2 is east and west extension.*

Source: Study Team

8.4.1 Economic Analysis

The project is evaluated to determine its economic viability based on the EIRR estimate by comparing the economic costs and benefits over the life of the Project, which is normally assumed to be 30 years after opening.

8.4.1.1 Methodology and Assumptions

1) Methodology

The Project is evaluated from the economic perspective, following a prevailing method of cost-benefit analysis, in which the project cost and benefit are measured in economic price and compared through the project life. Economic cost is the initial investment cost, rolling stock cost and O&M cost of the Project.

2) Economic Benefit Items to be analyzed

Economic benefit of the Project is defined as the savings in VOC (Vehicle Operation Costs) and TTC (Travel Time Costs) attributable to the Project. The benefit is the most direct one and comparatively easy to quantity. The benefit is estimated through "with-and without" comparison of traffic demand analysis.

- LRT User's Benefit: Reduction in vehicle operating cost (VOC) and savings in travel time cost (TTC) due to usage of LRT extension section (due to shift from private/public transport on road to LRT)
- Road User's Benefit along LRT Line 2 Corridor: Reduction in traffic congestion on the existing road (along LRT Line 2 corridor), as can be seen in increases in travel speeds and reduction in VOCs
- Benefit by CO_2 Reduction: CO_2 reduction by decrease of traffic volume on the existing road (along LRT Line 2 corridor), as can be seen in shifting from road transport to LRT.

The Project would generate other economic benefits such as decrease of traffic accidents, improvement in passengers' comfort ability and contribution to regional development in the long run. However, these benefits are difficult to measure and tend to be an arbitrary estimate, even they can be measured. For that reason, economic benefit is limited to the most direct ones to make the analysis safer.

3) Economic Cost Items to be analyzed

Economic cost is defined as a net consumption of goods and service for implementation of the project. In order to estimate this economic cost of the Project, the initial cost, rolling stock cost and the O&M cost stated in Chapter 5 of this Report, which is measured in financial cost, need to be converted to costs in economic price. According to various feasibility studies conducted in the Philippines, NEDA has seemingly suggested the following methods for this conversion;

Application of Standard Conversion Factor (SCF): Economic cost is simply estimated by multiplying SCF to financial cost. The previous projects by JICA or ADB, adopted this method using 0.83 as the value of SCF. The project costs excluding land acquisition are converted using SCF.

4) Other Assumptions

Project Life: Durable life of a transportation project is usually very long, that is, 50 to 60 years if it is properly maintained. On the other hand, economic project life is considered much shorter than the physical life, that is, around 30 years because the facility soon becomes outdated and uneconomical due to rapid innovation. This project life is defined as 36 years including 6 year of construction period, namely, 2011 to 2046.

Social Discount Ratio: As the opportunity cost of capital, 15% per annum is assumed as the social discount rate.
Exchange Rate: USD 1 = Pesos 43, Peso 1 = 1.81 Japanese Yen

8.4.1.2 Economic Cost

1) Capital Cost (Initial Cost & Rolling Stock Cost)

An initial estimate of project cost is discussed in Chapter 5 of this Report. This is summarized in **Tables 8.4-2 & 3** and broken down into financial and economic costs. Total economic cost in Case 1 is 9,623.9 million Peso, 83.00% of the financial cost..

Table 8.4-2 Project Cost in Financial and Economic Terms in Case 1

Unit Million Peso

Year	Financial Costs	Economic Costs
2011-2016	9,979.6	8,283.4
2030	1,615.1	1,340.5
Total	11,594.7	9,623.9

Source: Study Team

Table 8.4-3 Project Cost in Financial and Economic Terms in Case 2

Unit Million Peso

Year	Financial Costs	Economic Costs
2011-2016	14,744.2	12,238.0
2028	2,153.4	1,787.3
Total	16,897.6	14,025.4

Source: Study Team

2) O&M Expenses

The O&M costs for LRT Line 2 extension section are shown in the following table. Detail estimate of O&M cost is discussed in Chapter 3 and 5 of this Report

Table 8.4-4 O&M Expenses for LRT Line 2 Extension Section in Benchmark Years

Unit Million Peso

Case 1:

Year	Financial Costs	Economic Costs
2017	320.8	266.3
2020	320.8	266.3
2025	320.8	266.3
2030	579.1	480.6
2035	579.1	480.6

Case 2:

Year	Financial Costs	Economic Costs
2017	414.5	344.0
2020	414.5	344.0
2025	414.5	344.0
2030	699.5	580.6
2035	699.5	580.6

Source: Study Team

8.4.1.3 Economic Benefit

1) Vehicle Operating Cost (VOC)

The saving in VOC is one of the major sources of economic benefits in transport projects. **Table 8.4-5** shows the VOCs. The most important is that the VOC should be a function of vehicle speed so that the improvement of road condition would be duly reflected as economic benefit.

Table 8.3-5 Vehicle Operation Cost, 2010

*Unit: Peso/Vehicle (Train)*km*

Ave. Speed (km/h)	LRT	Jeepney	Private Car
20	-	10.91	12.01
25	-	10.36	11.41
30	-	9.38	10.45
32.8	1.57	-	-
40	-	8.29	9.25
50	-	7.85	8.65
60	-	7.74	8.29

Source: Study Team

2) Value of Time (VOT)

The saving in passenger time cost is another major source of economic benefit of transport projects. The following table presents the unit value of time assumed by the result of SP survey. VOT of LRT user is higher than that of Jeepney.

Table 8.4-6 Unit Value of Time (VOT), 2011

Mode	LRT	Private Car	Jeepney	FX
Peso/Min.	1.55	1.78	1.05	1.13
Peso/Hour	93.0	106.8	63.0	67.8

Source: Study Team

3) Carbon Price

The price of CO_2 emission seems to be depending heavily on economic market. The carbon price is set as 829 Peso[1] in 2010 price in this analysis.

4) Estimation of Economic Benefits

By applying above unit costs to the result of traffic demand and summing VOC, TTC and CO_2 reduction, aggregated transportation cost was estimated. Economic benefit is the difference of the aggregate costs between "with project" case and "without project" case. The following table shows the economic benefit in benchmark years. In 2017, about 70% of benefit will be travel time cost saving. The share of benefit by CO_2 reduction is very low compare with that of other benefits.

Table 8.4-7 Economic Benefit in Benchmark Years

Unit; Million Peso/Year

Case 1:

Year	Economic Benefit (Million Peso)			
	VOC Saving	TTC Saving	CO_2 Reduction	Total
2017	504	1,201	2	1,707
2020	535	1,275	2	1,812
2025	620	1,478	3	2,101
2030	719	1,714	2	2,435

Case 2:

Year	Economic Benefit (Million Peso)			
	VOC Saving	TTC Saving	CO_2 Reduction	Total
2017	572	1,389	3	1,963
2020	607	1,474	3	2,083
2025	703	1,709	3	2,415
2030	815	1,981	4	2,800
2035	945	2,296	4	3,246

Source: Study Team

8.4.1.4 Cost Benefit Flow and EIRR

The following table shows the economic cash flow over the project period for calculating economic internal rate of return (EIRR). According to NEDA's criteria, the threshold value to judge the economic feasibility of a project is 15% in the Philippines. EIRR in Case 1 is 17.07%, which proved to be a feasible from the economic viewpoint. On the other hand, EIRR in Case 2 is 13.31%. Therefore, it seems reasonable to conclude that the extension project in case 1 will be feasible project from the viewpoint of economy.

[1] *Carbon price in Nikkei-JBIC Carbon Quotation Index is approximately 1,500 Japanese Yen/ton in 2010.*

Table 8.4-8 Cash Flow of Economic Cost and Benefit

Case 1:

Year	Capital Cost	O&M Cost	Economic Benefit	Net Cash Flow
2011	6.2			-6.2
2012	8.6	0.0	0.0	-8.6
2013	121.0	0.0	0.0	-121.0
2014	1,960.7	0.0	0.0	-1,960.7
2015	3,510.6	0.0	0.0	-3,510.6
2016	2,700.0	0.0	0.0	-2,700.0
2017	0.0	266.3	1,707.8	1,441.5
2018	0.0	266.3	1,742.0	1,475.7
2019	0.0	266.3	1,776.8	1,510.5
2020	0.0	266.3	1,812.3	1,546.1
2021	0.0	266.3	1,866.7	1,600.5
2022	0.0	266.3	1,922.7	1,656.5
2023	0.0	266.3	1,980.4	1,714.2
2024	0.0	266.3	2,039.8	1,773.6
2025	0.0	266.3	2,101.1	1,834.8
2026	0.0	266.3	2,164.7	1,898.4
2027	0.0	266.3	2,229.9	1,963.6
2028	0.0	266.3	2,296.6	2,030.3
2029	0.0	266.3	2,364.9	2,098.7
2030	1,340.5	480.6	2,434.9	613.8
2031	0.0	480.6	2,536.6	2,056.0
2032	0.0	480.6	2,643.7	2,163.0
2033	0.0	480.6	2,756.2	2,275.6
2034	0.0	480.6	2,874.8	2,394.1
2035	0.0	480.6	2,999.6	2,519.0
2036	0.0	480.6	2,999.6	2,519.0
2037	0.0	480.6	2,999.6	2,519.0
2038	0.0	480.6	2,999.6	2,519.0
2039	0.0	480.6	2,999.6	2,519.0
2040	0.0	480.6	2,999.6	2,519.0
2041	0.0	480.6	2,999.6	2,519.0
2042	0.0	480.6	2,999.6	2,519.0
2043	0.0	480.6	2,999.6	2,519.0
2044	0.0	480.6	2,999.6	2,519.0
2045	0.0	480.6	2,999.6	2,519.0

EIRR	**(%)**	**17.07%**
NPV	**Mil. Peso**	**933**
CBR	**B/C Ratio**	**1.14**

Case 2:

Year	Capital Cost	O&M Cost	Economic Benefit	Net Cash Flow
2011	9.0			-9.0
2012	11.5	0.0	0.0	-11.5
2013	134.5	0.0	0.0	-135.0
2014	3028.9	0.0	0.0	-3041.1
2015	5187.9	0.0	0.0	-5208.8
2016	3866.3	344.0	1,924.8	-3866.3
2017	0.0	344.0	1,963.3	1,619.3
2018	0.0	344.0	2,002.6	1,658.6
2019	0.0	344.0	2,042.7	1,698.6
2020	0.0	344.0	2,083.5	1,739.5
2021	0.0	344.0	2,146.0	1,802.0
2022	0.0	344.0	2,210.4	1,866.4
2023	0.0	344.0	2,276.8	1,932.8
2024	0.0	344.0	2,345.1	2,001.1
2025	0.0	344.0	2,415.5	2,071.4
2026	0.0	344.0	2,488.8	2,144.8
2027	0.0	344.0	2,563.9	2,219.9
2028	1,787.3	580.6	2,640.9	273.0
2029	0.0	580.6	2,719.6	2,139.1
2030	0.0	580.6	2,800.3	2,219.7
2031	0.0	580.6	2,884.3	2,303.7
2032	0.0	580.6	2,970.8	2,390.2
2033	0.0	580.6	3,059.9	2,479.3
2034	0.0	580.6	3,151.6	2,571.1
2035	0.0	580.6	3,246.1	2,665.6
2036	0.0	580.6	3,246.1	2,665.6
2037	0.0	580.6	3,246.1	2,665.6
2038	0.0	580.6	3,246.1	2,665.6
2039	0.0	580.6	3,246.1	2,665.6
2040	0.0	580.6	3,246.1	2,665.6
2041	0.0	580.6	3,246.1	2,665.6
2042	0.0	580.6	3,246.1	2,665.6
2043	0.0	580.6	3,246.1	2,665.6
2044	0.0	580.6	3,246.1	2,665.6
2045	0.0	580.6	3,246.1	2,665.6

EIRR	**(%)**	**13.31%**
NPV	**Mil. Peso**	**-1,054**
CBR	**B/C Ratio**	**0.89**

Source: Study Team

8.4.1.5 Sensitivity Analysis

Sensitivity analysis was made by changing the projected cost upward and benefit downward. This analysis was done using following scenarios by "ICC Project Evaluation Procedures and Guidelines" of NEDA.

Scenario I: Increase in projected costs by 10% or 20%
Scenario II: Decrease in benefit by 10% or 20%
Scenario III: Combination of Scenario I and II

The following table shows the result of sensitive analysis by changing cost and benefit, targeting Case 1. EIRR still keeps 15% if the cost increase 10% or the benefit decreases 10%.

Table 8.4-9 Sensitive Analysis by Changing Cost and Benefit (Case1)

Changing in Cost & Benefit		Cost Increase		
		Base (0%)	10% Up	20% Up
Benefit Decrease	Base (0%)	17.1%	15.6%	14.2%
	10% Down	15.4%	14.0%	12.7%
	20% Down	13.6%	12.3%	11.0%

Source: Study Team

8.4.2 Financial Analysis

Conducting a financial evaluation of LRT extension project is very important to assess possible PPP schemes. The FIRR will be estimated by comparing project costs and fare revenues as well as other revenues (Miscellaneous Revenues) over the LRT's life. Depending upon the level of FIRR, cost-sharing between public and private sectors will differ. Cash flow analysis also is made.

8.4.2.1 Assumptions

1) Revenue

Total revenue is composed of fare box revenue and miscellaneous revenue, as shown bellow;
Fare box Revenue: The fare box revenue is estimated using the result of demand forecast.
Miscellaneous Revenue: The miscellaneous revenue is assumed as 5% of fare box revenue, based on the existing financial situation and the experience of other countries.

Table 8.4-10 Revenue in Benchmark Years

Unit Million Peso

Year	Case 1	Case 2
2017	878.72	1,042.30
2020	932.50	1,106.10
2025	1,081.03	1,282.27
2030	1,253.21	1,486.51
2035	1,452.82	1,723.27

Source : Study Team

2) Expense

The expense is composed of the construction cost and O&M cost, as shown in the following table.

Table 8.4-11 Expense on Construction Stage

Unit Million Peso

Year	Case 1	Case 2
2011-2016	9,979.6	14,744.2
2028		2,153.4
2030	1,615.1	
Total	11,594.7	16,897.6

Source: Study Team

Table 8.4-12 Expense on O&M in Benchmark Years

Unit Million Peso

Year	Case 1	Case 2
2017	320.8	414.5
2020	320.8	414.5
2025	320.8	414.5
2030	579.1	699.5
2035	579.1	699.5

Source: Study Team

3) Other Assumptions

Project Life: The project life is defined as 36 years including 4 year of construction period, namely, 2011 to 2046, same as setting for economic analysis.
Exchange Rate: USD 1 = Pesos 43, Peso 1 = 1.81 Japanese Yen

Taxes: 12% of value-added tax (VAT) in Philippines should be considered for both of foreign and domestic currency portion. The import tax for foreign currency portion is excluded from this analysis. Because, existing section of LRT Line 2 accepted tax-free loan before.

Inflation: Inflation is excluded from this analysis.

Loan Financing: Interest of STEP Loan is 0.2% that of soft loan is 1.4%. Policy interest rate in Philippines is 8.0 %[2].

Weighted average cost of capital (WACC): WACC is applied to evaluate the financial viability of this project. WACC is assumed as 1.37% under the following preconditions;

Threshold Value 1 (STEP):
Japanese ODA Loan (STEP): Interest rate: 0.2%, 85% of finance source.
Philippines Local Fund: Interest rate: 8%, 15% of finance source.
WACC = 85% * 0.2% + 15% * 8% = **1.37%**

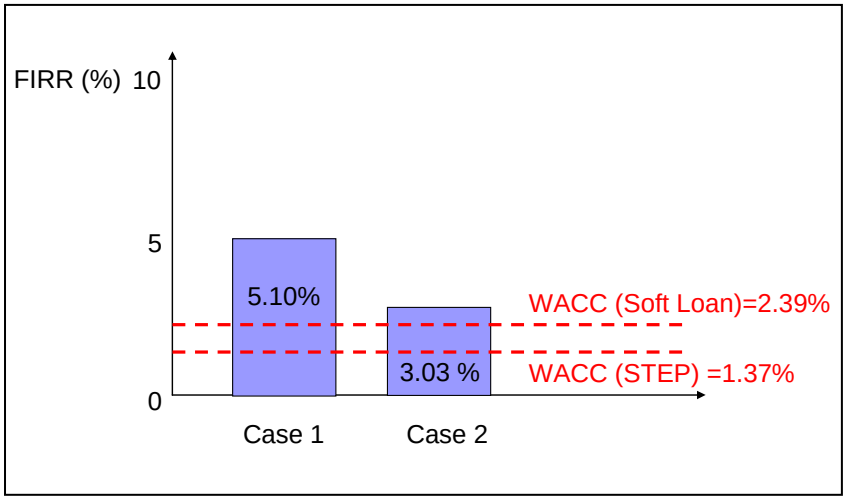
Threshold Value 2 (Soft Loan):
Japanese ODA Loan (Soft Loan): Interest rate: 1.40%, 85% of finance source.
Philippines Local Fund: Interest rate: 8%, 15% of finance source.
WACC = 85% * 1.4% + 15% * 8% = **2.39%**

[2] *According to CEIC data, the policy interest in Philippines has been stable as less than 10% since 2002, especially, that from 2008 have been during 6% and 8%. Thus, it is set as 8% for financial analysis. In METI Study, this rate was set at 7.2% based on the Treasury Bill Rates during past 5 years).*

8.4.2.2 Financial Evaluation

1) Estimation of FIRR

Based on the above assumptions, the FIRR, NPV is estimated. The summary of FIRR is shown in the following figure. FIRR in Case 1 and Case 2 seem to be profitable, if a threshold value both of 2.39% and 1.37% is assumed. FIRR in Case 1 is higher than that in Case 2. Therefore, it seems reasonable to conclude that the extension project in Case 1 will be profitable project from the viewpoint of finance.



Source: Study Team

Figure 8.4-1 Summary of FIRR

Table 8.4-13 Cash Flow of Financial Cost and Revenue

Case 1:

Year	Capital Cost	O&M Cost	Revenue	Net Cash Flow
2011	7.4			-7.4
2012	9.9	0.0	0.0	-9.9
2013	145.1	0.0	0.0	-145.2
2014	2,352.3	0.0	0.0	-2,352.3
2015	4,211.8	0.0	0.0	-4,211.8
2016	3,253.0	0.0	0.0	-3,253.0
2017	0.0	320.8	878.7	557.9
2018	0.0	320.8	896.3	575.5
2019	0.0	320.8	914.2	593.4
2020	0.0	320.8	932.5	611.7
2021	0.0	320.8	960.5	639.7
2022	0.0	320.8	989.3	668.5
2023	0.0	320.8	1,019.0	698.2
2024	0.0	320.8	1,049.5	728.8
2025	0.0	320.8	1,081.0	760.2
2026	0.0	320.8	1,113.5	792.7
2027	0.0	320.8	1,146.9	826.1
2028	0.0	320.8	1,181.3	860.5
2029	0.0	320.8	1,216.7	895.9
2030	1,615.1	579.1	1,253.2	-940.9
2031	0.0	579.1	1,290.8	711.8
2032	0.0	579.1	1,329.5	750.5
2033	0.0	579.1	1,369.4	790.4
2034	0.0	579.1	1,410.5	831.4
2035	0.0	579.1	1,452.8	873.8
2036	0.0	579.1	1,452.8	873.8
2037	0.0	579.1	1,452.8	873.8
2038	0.0	579.1	1,452.8	873.8
2039	0.0	579.1	1,452.8	873.8
2040	0.0	579.1	1,452.8	873.8
2041	0.0	579.1	1,452.8	873.8
2042	0.0	579.1	1,452.8	873.8
2043	0.0	579.1	1,452.8	873.8
2044	0.0	579.1	1,452.8	873.8
2045	0.0	579.1	1,452.8	873.8

FIRR	(%)	5.10

Case 2:

Year	Capital Cost	O&M Cost	Revenue	Net Cash Flow
2011	10.9			-10.9
2012	13.4	0.0	0.0	-13.4
2013	162.0	0.0	0.0	-162.0
2014	3,649.3	0.0	0.0	-3,649.3
2015	6,250.5	0.0	0.0	-6,250.5
2016	4,658.2	0.0	0.0	-4,658.2
2017	0.0	414.5	1,042.3	627.8
2018	0.0	414.5	1,063.1	648.7
2019	0.0	414.5	1,084.4	669.9
2020	0.0	414.5	1,106.1	691.6
2021	0.0	414.5	1,139.3	724.8
2022	0.0	414.5	1,173.5	759.0
2023	0.0	414.5	1,208.7	794.2
2024	0.0	414.5	1,244.9	830.4
2025	0.0	414.5	1,282.3	867.8
2026	0.0	414.5	1,320.7	906.3
2027	0.0	414.5	1,360.4	945.9
2028	2,153.4	699.5	1,401.2	-1,451.7
2029	0.0	699.5	1,443.2	743.7
2030	0.0	699.5	1,486.5	787.0
2031	0.0	699.5	1,531.1	831.6
2032	0.0	699.5	1,577.0	877.6
2033	0.0	699.5	1,624.3	924.9
2034	0.0	699.5	1,673.1	973.6
2035	0.0	699.5	1,723.3	1,023.8
2036	0.0	699.5	1,723.3	1,023.8
2037	0.0	699.5	1,723.3	1,023.8
2038	0.0	699.5	1,723.3	1,023.8
2039	0.0	699.5	1,723.3	1,023.8
2040	0.0	699.5	1,723.3	1,023.8
2041	0.0	699.5	1,723.3	1,023.8
2042	0.0	699.5	1,723.3	1,023.8
2043	0.0	699.5	1,723.3	1,023.8
2044	0.0	699.5	1,723.3	1,023.8
2045	0.0	699.5	1,723.3	1,023.8

FIRR	(%)	3.03

Source: Study Team

2) Sensitivity Analysis

Sensitivity analysis was made by changing the projected cost upward and revenue downward. This analysis was done using following scenarios by "ICC Project Evaluation Procedures and Guidelines" of NEDA.

Scenario I: Increase in projected costs by 10% or 20%
Scenario II: Decrease in revenues by 10% or 20%
Scenario III: Combination of Scenario I and II

Sensitivity analysis (**Table 8.4-14**) shows this FIRR is very sensitive to the varying revenue and projected cost. It means meticulous management of sales and control of cost should improve the viability.

Table 8.4-14 Sensitive Analysis by Changing Cost and Revenue

Changing in Cost & Revenue		Cost Increase		
		Base (0%)	**10% Up**	**20% Up**
Revenue Decrease	**Base (0%)**	5.10%	3.88%	2.75%
	10% Down	3.75%	2.50%	
	20% Down	2.20%		

Source: Study Team

CHAPTER 9

CONSIDERATIONS AND RECOMMENDATIONS

CHAPTER 9 CONSIDERATIONS AND RECOMMENDATIONS

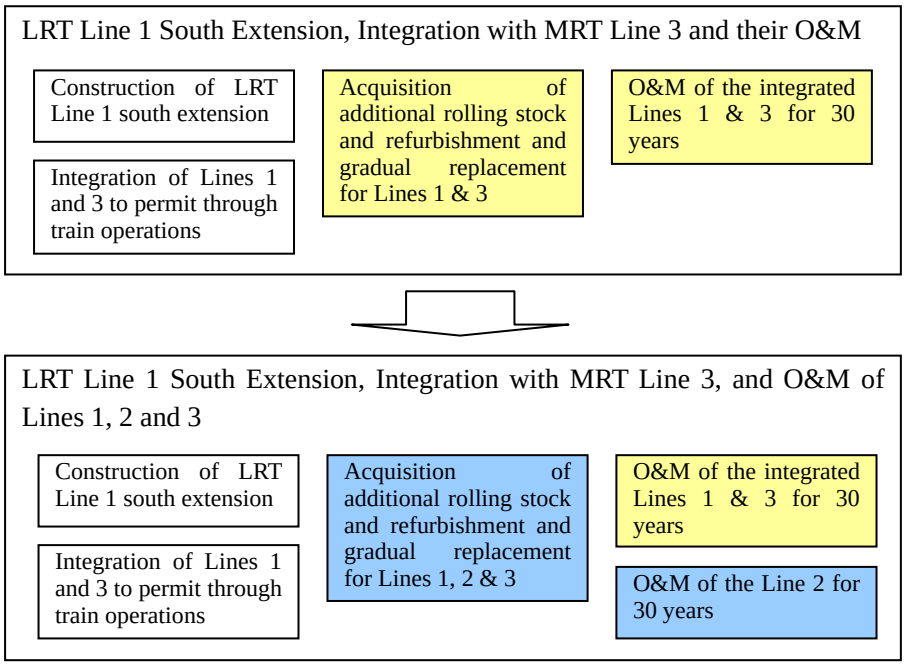
9.1 Considerations the Project and Recommendations in Implementing

9.1.1 Overall Operation of LRT 1, 2 and MRT 3

1) Project Scenario

In "4.4 Study of Efficient Project Management Scheme", the Study Team studied the feasibility of carrying out east-and-west extension construction and overall O&M of the existing and extension sections of LRT Line 2 as an independent PPP project. On the other hand, after integrating with MRT Line 3 LRT Line 1 which LRTA operates as well as LRT Line 2, carrying out south extension of LRT Line 1 and O&M of LRT Line 1 and MRT Line 3 as an independent PPP project has been studied by DOTC. And although the bid of interim O&M outsourcing of LRT Line 1 and MRT Line 3 was notified in March, 2011 as that first step, this bid was postponed.

In such a situation, we can assume a scenario of integrated O&M of LRT Line 1, 2 and MRT Line 3 which DOTC and LRTA hold jurisdiction over. The scenario is to add O&M of LRT Line 2 existing section and extension section constructed by the conventional mode to the scope of LRT Line 1 and MRT Line 3 PPP project, as an application scheme of Type 3 (Lease + O&M) in the project management schemes proposed in 4.4 (refer to **Figure. 9.1-1**).



Source: Study Team

Figure 9.1-1 Scope of PPP Project on LRT Lines 1&2 and MRT Line 3

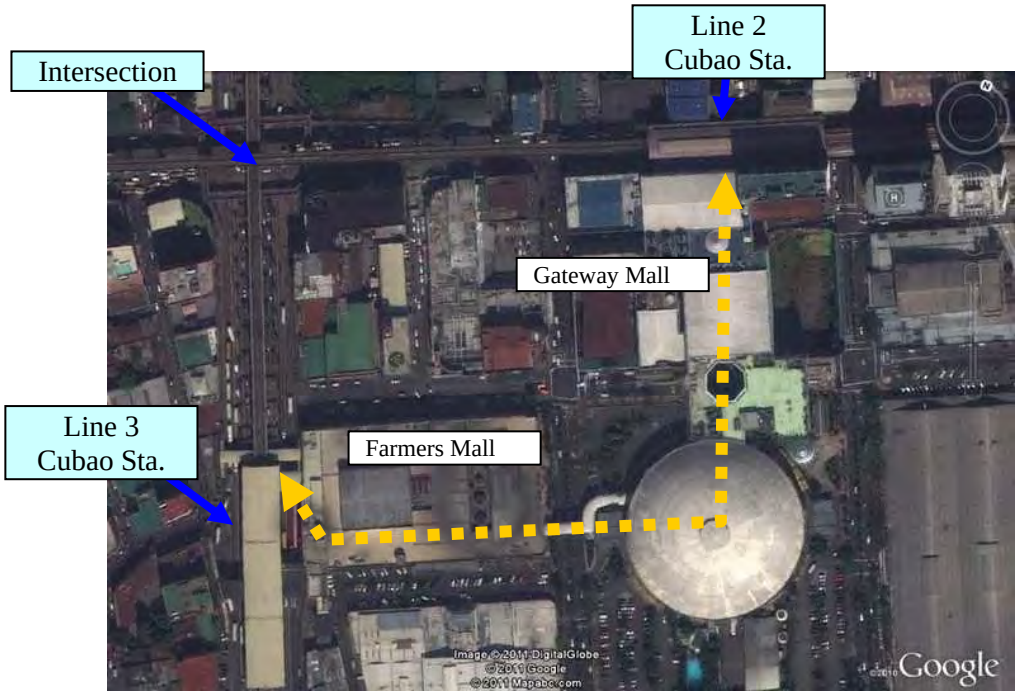
2) Technical Compatibility

LRT Line 1 and MRT Line 3 have the same track gauge and voltage, and the second and third Generation rolling stock of Line 1 and the rolling stock of Line 3 have almost the same car-body width. Consequently the limit of their structures is compatible. For this reason, it becomes possible by integrating the different signaling systems to run the rolling stock of each line in the other line. The tracks of the two lines are currently physically connected due to the Line 1 North Extension Project, and the rest is merely integration of signaling systems etc.

However, the car-body width of LRT Line 2 differs from that of LRT Line 1 and MRT Line 3, although the track gauge is the same. Consequently, the limit of their structures is incompatible, and the rolling stock of LRT Line 2 cannot run on the track of LRT Line 1 and MRT Line 3, unless facilities are replaced drastically.

3) Redevelopment Possibility of Transfer Stations

LRT Line 2 Cubao station connects with MRT Line 3 Cubao station. Although the two stations are separated by 420 meters, in-situ conditions do not allow a closer transfer station as both alignments, pass over EDSA underpass and the vicinity of the existing station. The best option to facilitate the transfer of passengers is via indoor shopping malls and walkways. This condition is already satisfied in this intersection as the transfer is done thru the malls mentioned above. There is no other possibility for the railway operator to build a different transfer facility that could increase substantially its non-rail revenue.



Source: Study Team

Figure 9.1-2 Intersection of Line 2 and Line 3

LRT Line 2 Recto station connects with LRT Line 1 Doroteo Jose station. The two stations are separated by 220 meters, and the connection between these two lines is already done by an elevated walkway. The area adjacent to Line 2 Recto station is dominated by the presence of a large squatters area and the Manila City Jail (Old Bibilid Prison). The transfer now is done conveniently thru the walkway shown in **Figure 9.1-4**.

An optimal condition would be a transfer done thru a mall owned by LRTA, which would give better convenience to passengers and additional non-railway income to LRTA. However, the only available space is now occupied by squatters. Removal of these illegal dwellers could take years, as is usually proved in infrastructure projects in Philippines. Moreover, the area is not a prime area, and only lower income costumers might be expected. It is clear that possible revenue from rental of commercial space from such building would not be profitable. It could be possible to carry out a market study of such enterprise as part of our Line 2 Study, but just common sense indicates that such business would not be profitable for LRTA, or any other private party. If it were feasible, it would have been built by some land developer already.

Source: Study Team

Figure 9.1-3 Intersection of Line 2 and Line 1

Source: Study Team

Figure 9.1-4 Elevated Walkway between Line 2 and Line 1

4) Qualitative Advantages and Disadvantages of Overall Operation of LRT 1, 2 and MRT 3

Based on points 1) to 3), the qualitative advantages and disadvantages of this project scenario are shown in **Table 9.1-1**. However, it is difficult to conclude the feasibility of integration of O&M of LRT 1,2 and MRT 3 only from this qualitative study, and study of reorganization of O&M Departments, demand forecast on condition of one operation, and the quantitative study including the estimation of O&M expenses or repair and the renewal expense of the rolling stock are required.
Besides, it is desirable to study the policy of operational entity formation all together about not only LRT Line 1, 2 and MRT Line 3 but the whole railroad network distributed in Metro Manila in the future.

Table 9.1-1 Qualitative Advantages and Disadvantages of Overall Operation of LRT 1, 2 and MRT 3

	Advantages	Disadvantages
Integration of works and organization	By partial integration of O&M work, O&M expense is reducible. By integration of the back-office section, indirect expense is reducible.	Since two standards of Civil-works facilities, E&M systems, and the rolling stock will exist for a contractor, its management and handling are complicated and will be confused. While reorganization of the depots of LRT 1 and MRT 3 is possible and efficient, the depot of LRT 2 needs to be kept independent, and cannot be streamlined.
Integration of a fare system	Since the fare system of LRT 2 will be integrated with those of the other lines, an increase in the number of transfer passengers in Cubao station is expected.	If integration of the fare systems results in a substantial price cut, the total fare revenue amount may decrease.
Service Level	Discrepancies in the service level for each line are eliminated.	Because a single contractor has a monopoly, there is no competition to improve the service level.
Risk Management	Since risk management is carried out comprehensively, more advanced risk management measure may be adopted.	Since railway operation risks concentrate on one contractor, it could cause the simultaneous cancellation of three line's services.
Procurement condition	On procurement of spare parts or system selection, it becomes possible to get the advantage of scale.	Competitiveness is lost by one contractor's monopoly and corruption may occur by it.
Implementation of non-railway Business	Economies of scale are obtained on advertising business etc., and there is possibility of revenue increase. The contractor of large business scale has an advantage in financing, and the possibility of a non-railway business increases.	The redevelopment by the railroad operator in the vicinity of the transfer stations is difficult.

Source: Study Team

9.1.2 Effective Use of the Land Property of LRTA

Effective use of the depot which LRTA holds is not appropriate to carrying out only by LRTA, considering the management know how (know how of planning, implementation, and the business of real estate development) of LRTA as shown in Chapter 4. On the other hand, it is not appropriate to give the right to development of rail yard space simply to a private sector, based on the viewpoint of the financial condition improvement of LRTA. It is necessary to build a structure which can divide the development profit mutually between the private sector and LRTA.

Supposing it does not modify its present facilities and equipment as much as possible for the Santolan depot (land area: about 95,000sq m) of LRT Line 2, the land which can be used effectively is only about 13,600sq m along the Marcos Highway (the existing parking lot, a portion of which does not overlap with the track of the main building, and the dining hall building). Therefore, large-scale development like complex development of the depot of MRT Line 3 and a shopping mall is difficult.

Accordingly, if effective land use is considered as long-term non-railroad business, it is desirable to redevelop the whole rail yard. As it becomes reconstruction while it is being used as a depot, there are many problems such as a construction cost and construction period.

The considerations in the case of using Santolan depot effectively as a PPP project together with extension of LRT Line 2, and O&M of the existing section and the extension section are as follows.

- Although the Study Team assumed 30 years as the O&M period in Chapter 4, the period of private business may be different because of the building function or project schemes, and may not be the same as the O&M period. Therefore, it is necessary to take proper action when one

project period expires if it is longer or shorter than the O&M period.

- Business type, contents, players, and risks differ greatly between the construction, and the operation and maintenance phase of a railroad which is a public service entity, and the profit-earning business of a private sector. Therefore, if the circumstances arise in which the profitability of a private profit-earning business gets worse and it reaches a situation where it must withdraw from a project, it is important to clarify risk separation measures so that execution of the railway business may not be affected.
- When carrying out a private sector profit-earning business as a PPP project for the extension of LRT Line 2, each private sector group will propose and bid, and the government will comprehensively evaluate the bid by considering them all. The evaluation of the private sector profit-earning business, including the rental of land, will impact the attractiveness of the proposal for a profit-earning business. However, since the best proposals for both railway businesses and profit-earning businesses are not necessarily achieved, it is important to sufficiently study the valuation method when including private sector profit making facilities.

Based on the assumption that a PPP scheme will be introduced, the Study Team suggests studying the following items in order for LRTA to achieve effective use of the Santolan depot in the future.

- A survey of the private sector developers' proprieties regards complex development of Santolan depot and private sector profit-earning businesses (proposing the building function, project scheme, and issues seen from the private sector viewpoint)
- Preparation of a plan for complex development with a depot and private sector profit-earning businesses which consider the extension of LRT Line 2, and the continuous use of the depot, and calculation of a rough cost estimate for construction
- Study of a project scheme, and project profitability for LRTA and the private sector

9.1.3 Business Operations of Railway Sector in Philippines

It is desirable that the business operations of the railway sector in Philippine should be promoted by the following policy along the fundamental policies of the President and the Government of Philippines: The private sector may carry out an enterprise in a more efficient and effective manner than the public sector.

The other hand, it is important that both high profitability urban railway and regional railways, which are low profitability but high needs businesses, are developed and maintained in a well-balanced manner.

It is important that railway operators should secure transportation safety, convenience for the whole transportation network, appropriate level of fares, soundness of business operation etc. The public sector, as an indirect operator, has to foster the private sector in order that the private sectors will achieve those goals on behalf of the public sector. Then, business transfer to the private sectors has to be carried out carefully and steadily.

In the development of a new railway, there are various risks such as political risk, financial risk, construction risk and demand risk. In order to promote private sector participation, it is necessary to consider measures to reduce the risk to them through public support.

9.1.4 PPP Scheme

The Study Team recommends the appropriate PPP scheme for this Project are **Type 3 (Lease+O&M)**, **Type 4-2 (BTO, Two-Tiered, Net Cost)** and T**ype 5-2 (BOT, Two-Tiered, Net Cost)** as desirable PPP scheme in Case 1, and **Type 3** and **Type 5-2** in Case 2. The result of the evaluation is shown in **Table 9.2-4**.

Table 9.1-2 Comprehensive Evaluation of Operational Scheme

Type	Scheme	Qualitative Evaluation	Financial Evaluation				Comprehensive evaluation
			Case 1		Case 2		
			IRR for SPC Equity IRR Mini DSCR	VFM M Peso	IRR for SPC Equity IRR Mini DSCR	VFM M Peso	
Type 3	Lease + O&M	- There are precedence cases in other transport sectors. This scheme is adopted on projects where the financing is difficult for the private sector. Compatibility with ODA is the highest.	14.49% 12.02% —	824.6	14.31% 12.01% —	865.2	Since cases 1 and 2 have high VFM and qualitative evaluation is also adequate, feasibility is high.
Type 4-2	BTO Two-Tiered Net Cost	- The private sector mainly bears the demand risk unlike Type 4-1, and the appropriate risk allocation of the government and the private sector according to the profitability of this project is undertaken. Applicability is high when the ease of participating of the private sector and compatibility with ODA are taken into consideration.	15.12% 16.00% 1.2	376.9	15.12% 17.79% 1.2	-102.0	Since it achieves VFM in case 1 and also qualitative evaluation is high, feasibility is high.
Type 5-2	BOT Two-Tiered Net Cost	- This scheme is adopted on projects of rather high profitability, and there are also many precedence cases. The appropriate risk allocation of the government and the private sector according to the profitability of this project is undertaken. - It could be a problem if ownership differed between the existing section and the extension section.	13.29% 12.03% 1.2	956.8	13.17% 12.57% 1.2	556.7	Although qualitative evaluation is slightly low, cases 1 and 2 have high VFM and feasibility is high.

Source: Study Team

9.1.5 Technical Considerations

The new facilities and equipment in the extension section have to be considered for consistency and compatibility, such as unification of spare parts, with the existing facilities and equipment because through train operation between the existing section and the extension section will be carried out regardless of project implementation scheme. The technical considerations are shown in **Figure 9.1-3**.

Table 9.1-3 Technical Consideration

System	Points of Consideration
Viaduct	• A parapet should be installed for maintenance personnel and passenger egress in case of emergency. • Cable troughs should be installed on the same surface as the tracks for the efficiency of maintenance work. It is desirable that troughs are installed on the external side of the viaduct.
Power Supply	• An approximately 300m^2 (20 x 15m) lot to the east of Emerald Station needs to be obtained to build a new rectifier substation (RSS#7). • Standard height for installing substation facilities and building structure standards should be established considering possible floods evidenced by Tropical Storm Ondoy. • Any possible voltage drop should be examined in detail, and the high output of the substation facilities to be reinforced should be considered at the time of designing as necessary. • Installation of emergency lighting system and ventilation equipment at substations and stations' electric rooms should be considered to improve the work environment.
Overhead contact system	• Lightning arrestors should be installed on the rooftops of new station buildings and on the center poles in the extension for lightning protection.
Track works	• It is desirable to adopt a track structure such as tracks using anti-vibration measures which are expected to absorb vibrations and deter track deformation. • Detailed inspection will be required where track deformation is expected to occur on the existing line. It is considered that the existing track structure will be replaced with a Continuous slab structure.
Fiber optical transmission line	• Transmission line for signaling and CCTV should be integrated as a single cable.
Telephones	• Investigate how many additional telephones are needed at the existing stations and facilities, and examine the number of additional racks that can be installed.
Train radios	• A radio wave sensitivity test should be conducted prior to setting up radio stations at each terminal station in the extended zones, and the test results should be reflected in the design of the stations.
AFC	• As part of the phased transition to the common ticketing system, it is planned to retain the exterior of the automatic ticket gates and replace the interiors with the contactless system successively. Thus, the specifications should be thoroughly examined upon converting the AFC system.
UPS	• Telecommunication system failures have occurred in the past due to UPS malfunction. The cause of these failures should be summarized to take measures to prevent recurrence of such failures.
CCTV	• Since the existing operational systems and new systems will be used in combination to operate CCTV for the moment, the specifications of connection areas, etc. need to be designed assuming a complete update to new systems in the future.
OCC	• Connecting between the extension and the existing lines should be done outside the hours of operation and within a short time. Therefore, the new system shall be built with other systems that will not affect the existing systems; comprehensive tests should also be conducted. • OCC facilities have already started deteriorating; equipment including Train supervisor control equipment, control center equipment for signaling and telecommunication, and MIS, also need to be updated. • For the large operation display panel, which is currently out of service, a monitor display type is recommended.

Source: Study Team

9.1.6 Management and Maintenance Systems

1) Management System

The new role of LRTA will be as an Indirect Operator under the PPP Scheme from the current Direct Operator status. LRTA conducts all operations except for some outsourced activities. Once the PPP Scheme is introduced, LRTA will be responsible for the following four new activities.

- Operational Regulation
- Operational Supervision
- Keeping railway operation knowledge and technical level from fading out
- Legal, Contractual and Negotiation Capacity as the PPP main contractor

In response to these new responsibilities, LRTA will need to establish new units or jobs in its organization as shown in **Table 9.1-4**.

Table 9.1-4 New Units and Responsibilities under PPP Scheme

Units	Typical Tasks	Current	PPP	Remarks
Planning	MTDP implementation Railway fare	Actual	Maintained	Primary Regulator role
Business Dev't	Non-railway activities	Limited	Reinforced	Strengthened capacity on marketing required under MTDP
Project Mgt	New projects	Actual	Reinforced	Strengthened capacity required under MTDP & PPP
Operations	PPP Operation regulation / supervision PPP	Directly Operated	Indirectly Managed	New role as indirect operator under PPP. Existing operational expertise to be maintained
Maintenance and Engineering	PPP Maintenance regulation / supervision PPP	Directly Operated (Limited Outsourcing)	Indirectly Managed	New role as indirect operator under PPP. Existing engineering expertise to be maintained
Legal	PPP Contractual Management	Limited	Reinforced as PPP Contractor	Strengthened capacity on contractual and negotiation skills required under PPP

Source: Study Team

2) Maintenance Scheme

A maintenance scheme is required to build an independent system from the mode of implementation that would be finally selected And, Owner/Authority, the Concessionaire/Operator, and the Maintenance Contractor have to build a functional organization structure to adopt the concept of fully integrated teams.

9.2 Study on Feasibility for Efficient Project Implementation

As the final section, the matters studied in each chapter are summarized and the roadmap for project implementation is shown.

9.2.1 Feasibility from the Financial and Economic Viewpoints

The summary of financial and economic evaluation is shown in **Table 9.2-1**.

Table 9.2-1 Financial and Economic Evaluation

		Case 1 East Only	Case 2 East & West	Note
Total Length	(km)	17.66	19.28	Existing Section: 13.52km East Section: 4.13km West Section: 1.63km
Cost	(PhP M)	11,595	16,898	
FIRR	(%)	5.10	3.03	WACC(Soft Loan) = 2.39% WACC(STEP) = 1.37%
EIRR	(%)	17.07	13.31	NEDA's Criteria >15%
NPV (@15%)	(PhP M)	933	-1054	
B/C		1.14	0.89	

Source: Study Team

FIRR in Case 1 and Case 2 seem to be profitable, if threshold values of both of 2.39% and 1.37% are assumed. However, Case 2 seems difficult for this Project to implement from the economic view because EIRR is less than NEDA's criteria, 15%, and NPV is negative.

9.2.2 Roadmap for Project Implementation

1) Challenges to be resolved

The challenges to be resolved for implementation of LRT Line 2 Extension Project are shown below.

a) Short-Term Challenges (till beginning of construction)

Mentioned below are the short-term challenges which should be resolved soon as the improvement measures for LRTA's financial condition. If these are not carried out, the conclusion-of-a-contract for PPP may have to be delayed, or the private sector may have to bear the risk.

Change of Fare Level

The Fare-box Ratio of Line 2 registered 0.78 in 2010, whereas this figures in 2009 was 1.05. The main reason is attributed to operational expenses higher than the operational revenue. To improve such low profitability, a change in fare level is required at first. Implementing a required fare hike before the O&M contract with the private sector by introducing PPP makes it possible to reduce the demand and revenue fluctuation risk of the public sector and the fare determination/change risk of the public sector or private sector.

Capital Increase of LRTA

The Net Asset at the end of 2010 were a negative 17,059 million Pesos, LRTA needs to continue principal payment of 4 billion yen every year till 2024 where the Yen loan occupies 96% of funded debts, and it is expected that net assets will decrease further. If LRTA reduces its debt and increases its capital, LRTA not only may correct its excessive liabilities, but secure soundness and continuity of LRTA operation corresponding to the change of the future vision of LRTA by introduction of PPP.

Rehabilitation of the Existing Section

It would be difficult for the private sector to be engaged in the damage and repair of those facilities in the existing portion. Even if a contractual scheme is offered that LRTA will assume the risks derived from the existing portion of the line, one should not overlook the eventual impact to the private sector engaged. Thus, it is recommended that LRTA will firstly conduct the necessary rehabilitation work to

recover the level of the facilities, equipment and system on the existing portion of Line 2 so that it can be operated safely, and, thus, minimize the possible risks caused by the existing portion of the line.

Reorganization and Capacity Building of LRTA

The role of LRTA is currently the regulator and the direct operator, and it will assume a role of an indirect operator function under a PPP scheme. To deal with this, LRTA should establish new units and roles, and build its capacity as an indirect operator. So, LRTA has to reorganize before the beginning of the PPP process (decision of PPP scheme, selection of PPP contractor etc.) and carry out capacity building continuously by before the beginning of construction.

Land Acquisition

Land acquisition for both the East and West Extension Sections will only entail marginal impacts since most of the properties to be acquired mostly consist of fences, gutters and signage of commercial establishments. In the East Extension Section, although a new sub-station is required, its size is only 15m X 20m and its site is relatively flexible if power cable can be placed. It seems that it would be easy to acquire the land because LRTA can choose a site that does not require resettlement. A concrete location will be considered during the basic design.

b) Mid-Term Challenges (till inauguration of the extension section)

Improvement of Profitability with Expansion of Non-Railway Businesses

Although LRTA is expanding non-railway businesses, such as advertisement, access charge to stations, and rental fees from shops in stations, such non-railway revenue is only 3.6% of farebox revenue (2010). Since each new station of the extension section is to be built in a road lot, the utilization of the space over or under the station is not expected. Santolan Station and the Depot in the existing section of Line 2 have large-scale land parcels, so the development businesses for utilization of over land is expected

If the right to this development work can be granted to the private sector entity who undertakes a PPP project and a part of that development profit can be allotted to collection of the construction cost of the extension section, the governmental fiscal burden may be eased sharply.

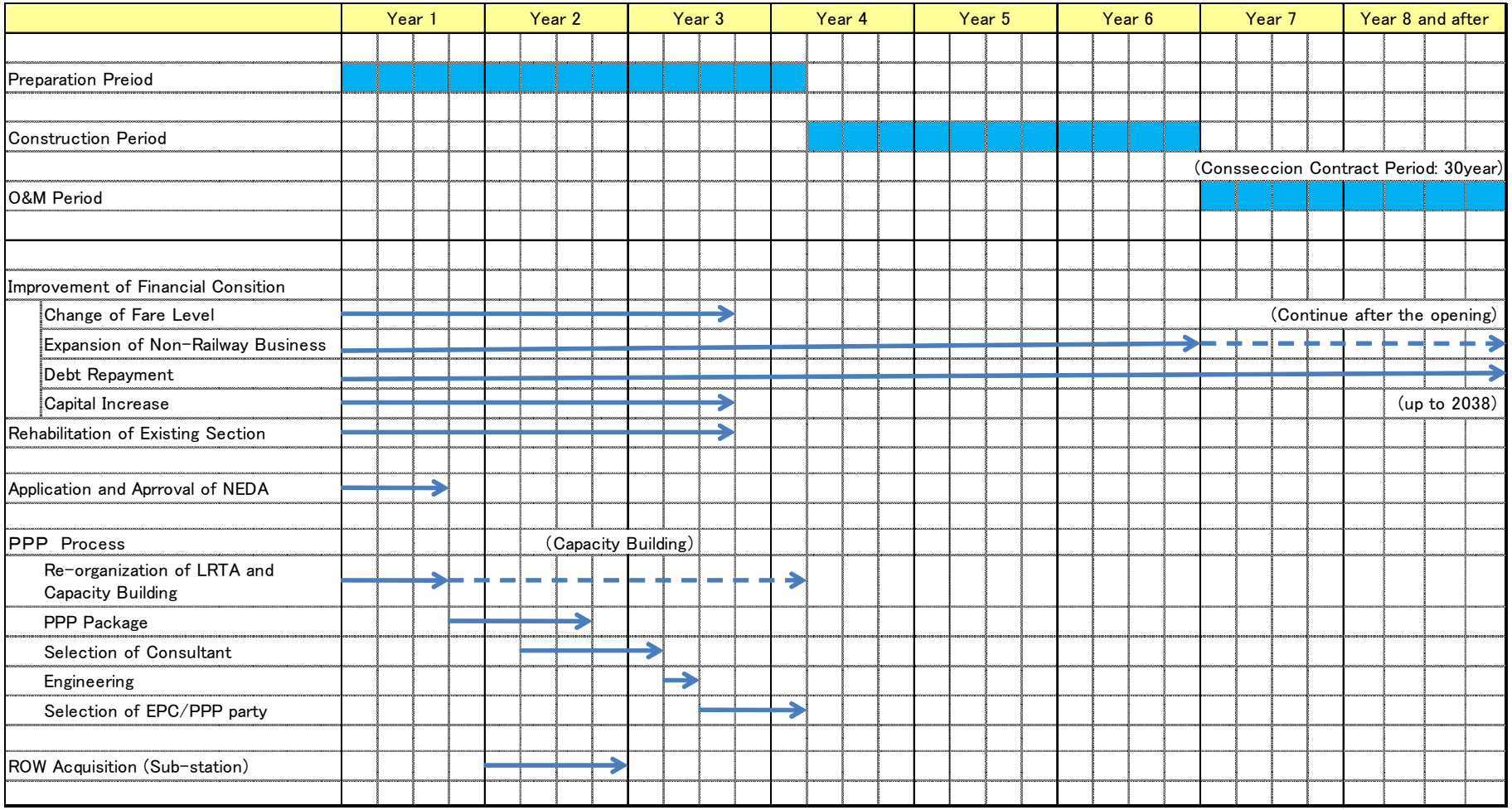
c) Long-Term Challenges (after inauguration of the extension section)

Debt Repayment

Repayment of the Yen Loan representing 96% of Long-term Debt will be completed in 2040. LRTA should pay nearly 6 billion Yen to the Philippine government including principal, interest and the spread to the government for the next five years, and a further 4 billion Yen / year till 2024.

2) Roadmap

The roadmap for the Project Implementation is shown in **Figure 9.2-1**.



Source: Study Team

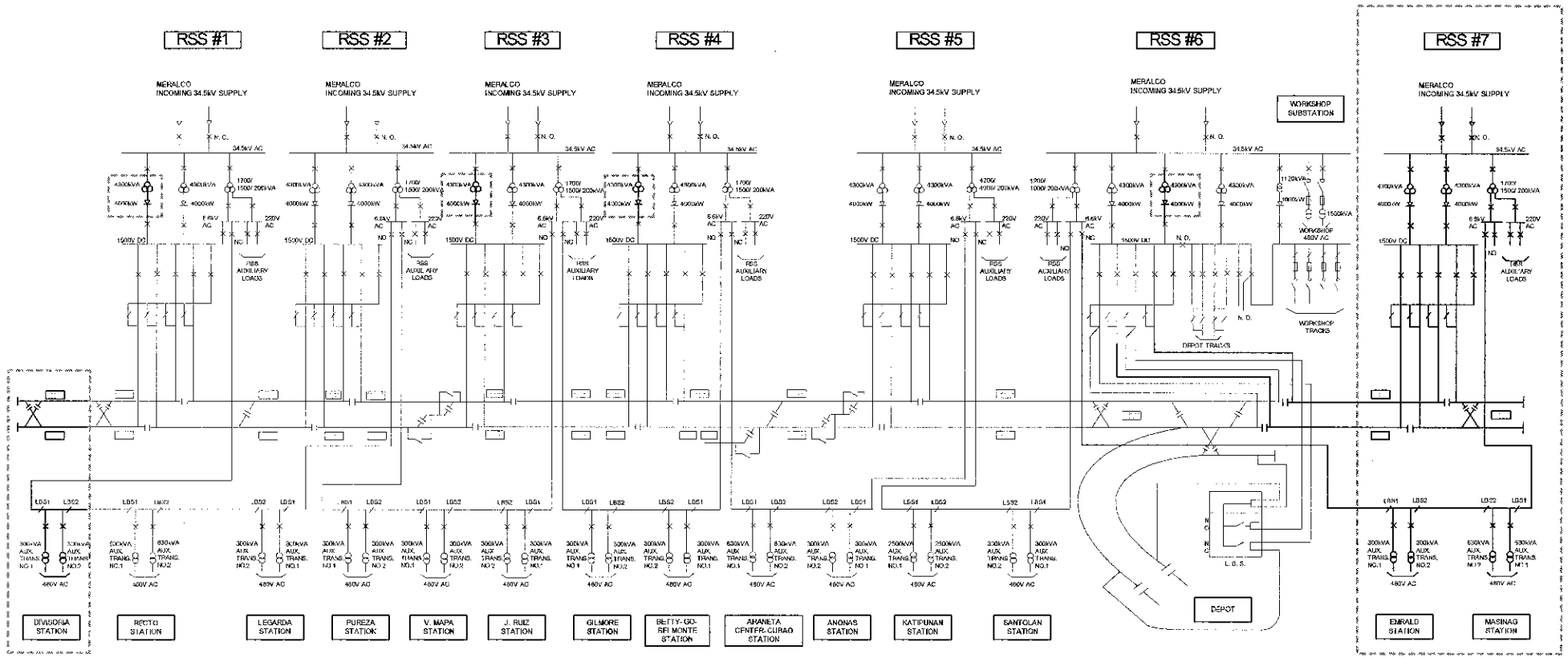
Figure 9.2-1 Roadmap for Project Implementation

APPENDIX.A

DRAWINGS OF E&M SYSTEM

PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT
DRAWING LIST OF E & M SYSTEM

SHEET No.	DWG No.	DRAWING TITLE	SCALE	NOTE:
EM-1001	PWS - 1	Power Supply Single Line Diagram	NTS	
EM-1002	PWS - 2	Standard Rectifier Substation Single Line Diagram	NTS	
EM-1003	PWS - 3	Standard Station Power Supply Single Line Diagram	NTS	
EM-1004	OCS - 1	OCS Cantilever Principal Arrangement	NTS	
EM-1005	SIG - 1	Signalling System Single Line Diagram	NTS	
EM-1006	SIG - 2	Separation of Signalling / Telecommunication Single Line Diagram	NTS	
EM-1007	SIG - 3	Interlocking Single Line Diagram	NTS	
EM-1008	SIG - 4	ATO Single Line Diagram	NTS	
EM-1009	SIG - 5	PIS Single Line Diagram	NTS	
EM-1010	COM - 1	Fiber Optic Ring Transmission Line System Overview	NTS	
EM-1011	COM - 2	Scada RTU / ITU Cable Layout	NTS	
EM-1012	COM - 3	Standard Station Telephone System Single Line Diagram	NTS	
EM-1013	COM - 4	Radio System Overview	NTS	
EM-1014	COM - 5	Standard Station Audio / Paging System Single Line Diagram	NTS	
EM-1015	COM - 6	Standard Station Clock System Single Line Diagram	NTS	
EM-1016	COM - 7	Standard Station CCTV System Single Line Diagram	NTS	
EM-1017	COM - 8	MIS Single Line Diagram	NTS	
EM-1018	COM - 9	FOTL System SDH Traffic Allocation	NTS	
EM-1019	AFC - 1	AFC Equipment Layout (for Example)	NTS	
EM-1020	TWK - 1	Typical Direct Fixation Track Cross Section	NTS	
EM-1021	DPO - 1	Track Layout in Existing Depot	NTS	
EM-1022	DPO - 2	Existing Workshop Layout	NTS	



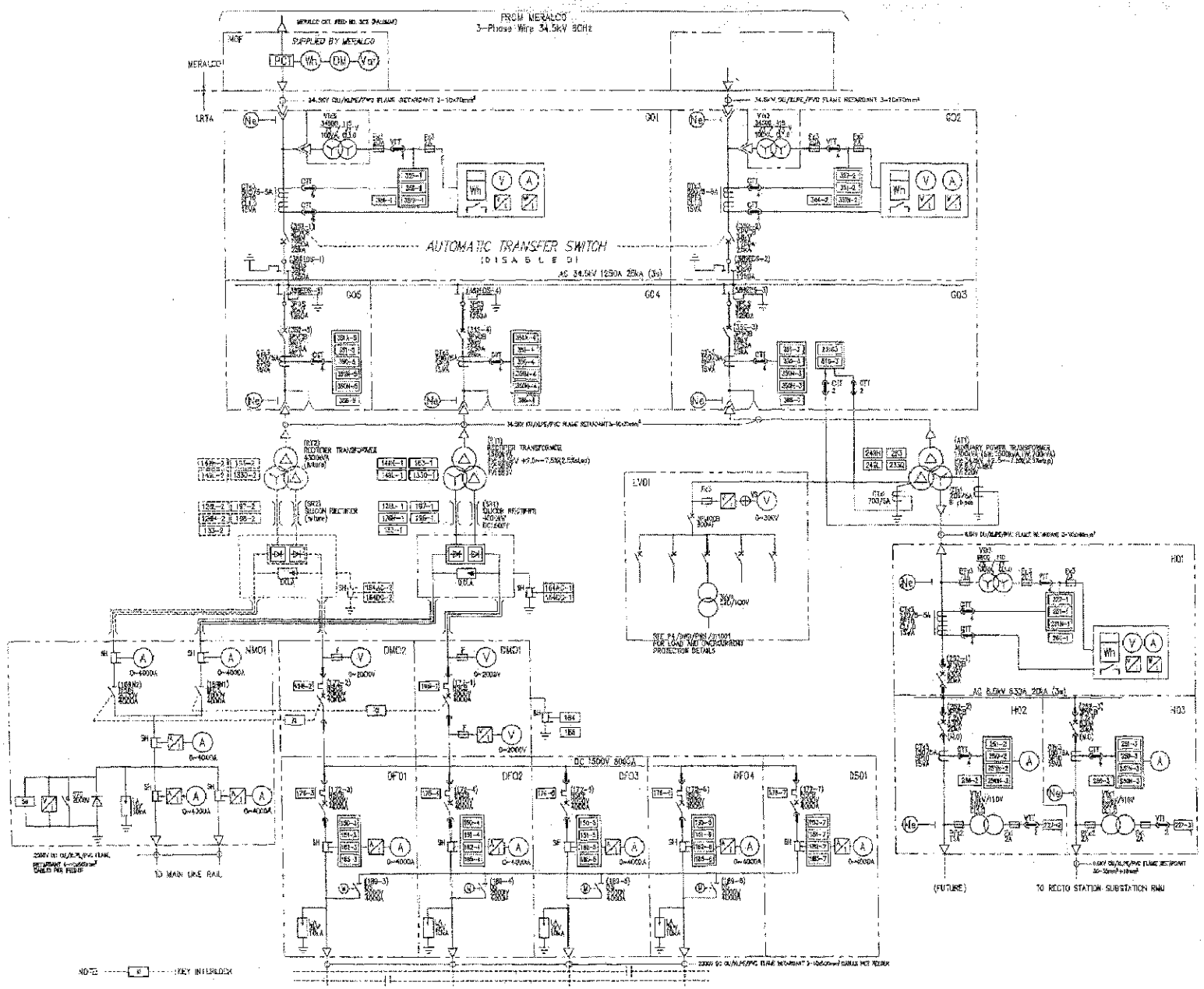
Oriental Consultants (OC)

Katahira and Engineers International (KEI)

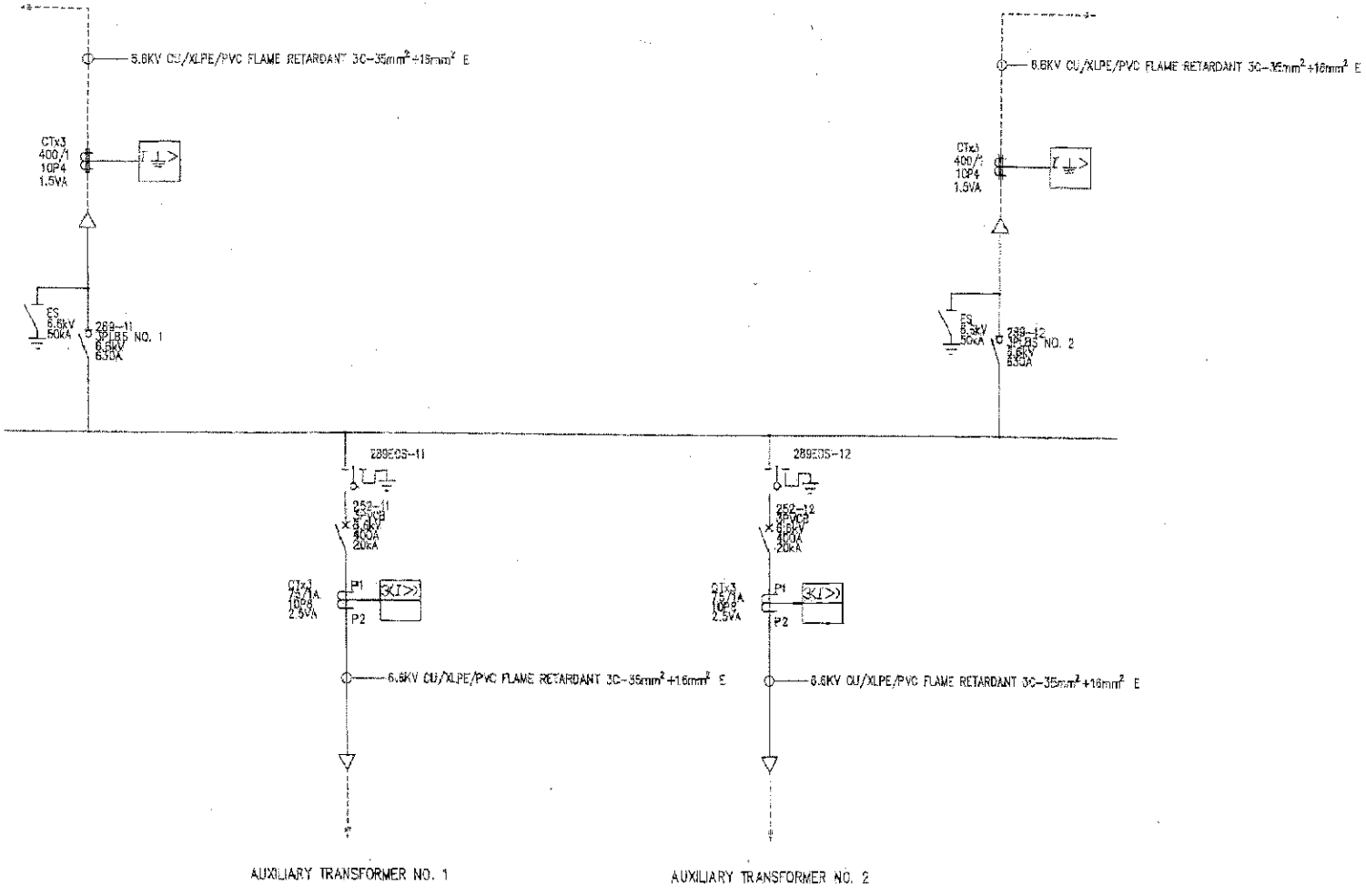
Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

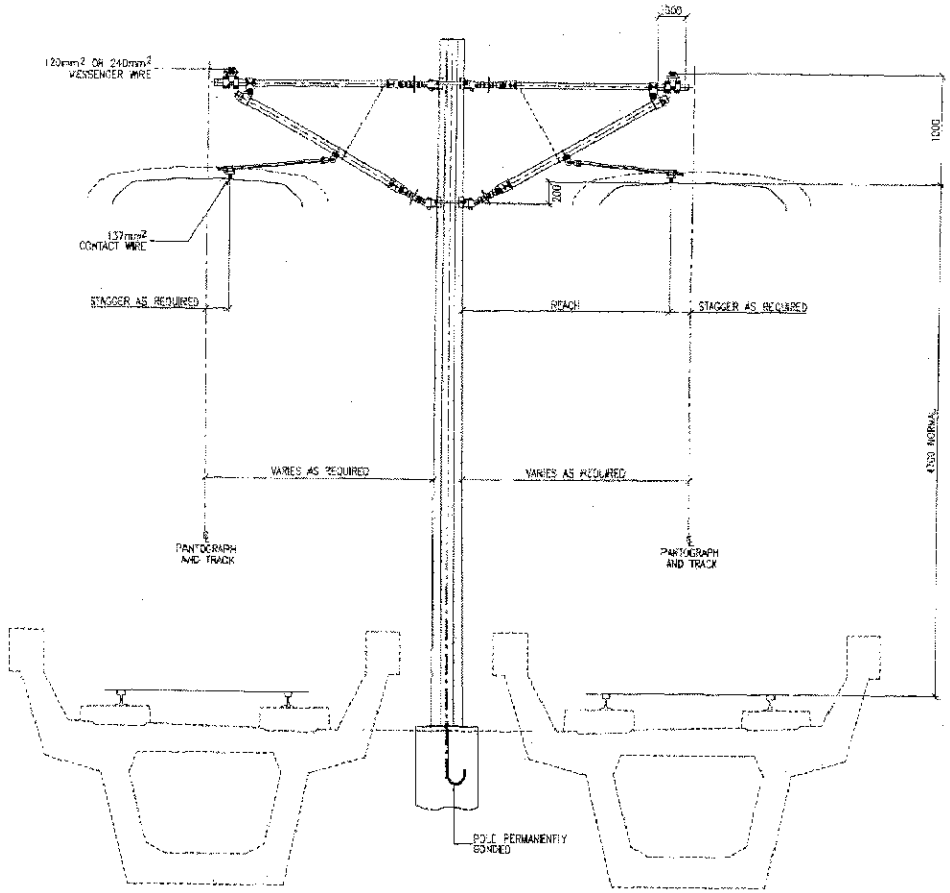
PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	FULL SIZE A3	POWER SUPPLY SINGLE LINE DIAGRAM	PWS-1
			SHEET NO : EM-1001



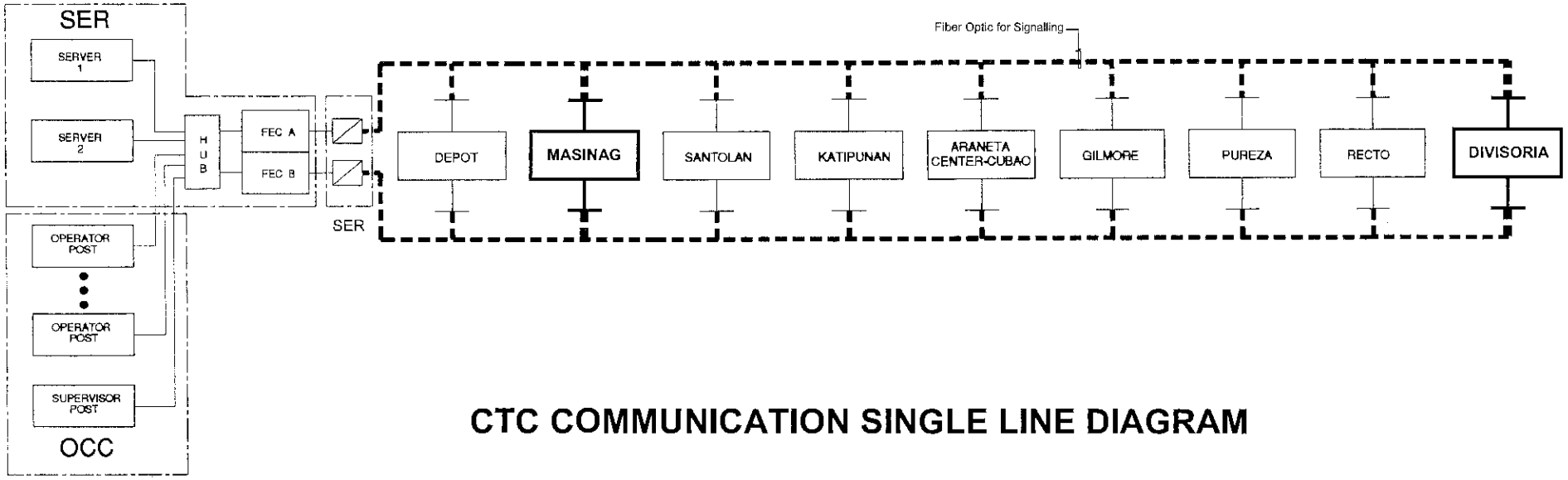
Oriental Consultants (OC) · Kokusai Engineers International (KEI) · Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : STANDARD RECTIFIER SUBSTATION SINGLE LINE DIAGRAM	DRAWING NO : PWS-2 SHEET NO : EM-1002



Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE AS	DRAWING TITLE : STANDARD STATION POWER SUPPLY SINGLE LINE DIAGRAM	DRAWING NO. : PWS-3 SHEET NO. : EM-1003



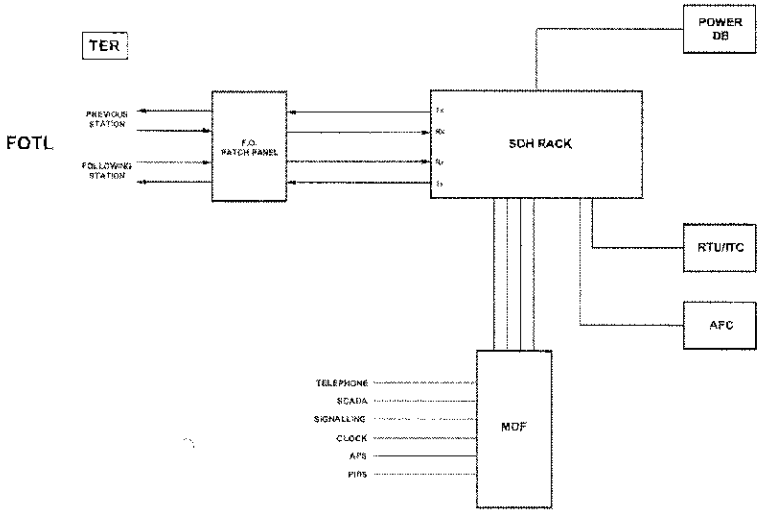
Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Yonkichi Engineering Consultants, Inc. (YONKICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FINAL SIZE A3	DRAWING TITLE : OCS CANTILEVER PRINCIPAL ARRANGEMENT	DRAWING NO : OCS-1 SHEET NO : EM-1004



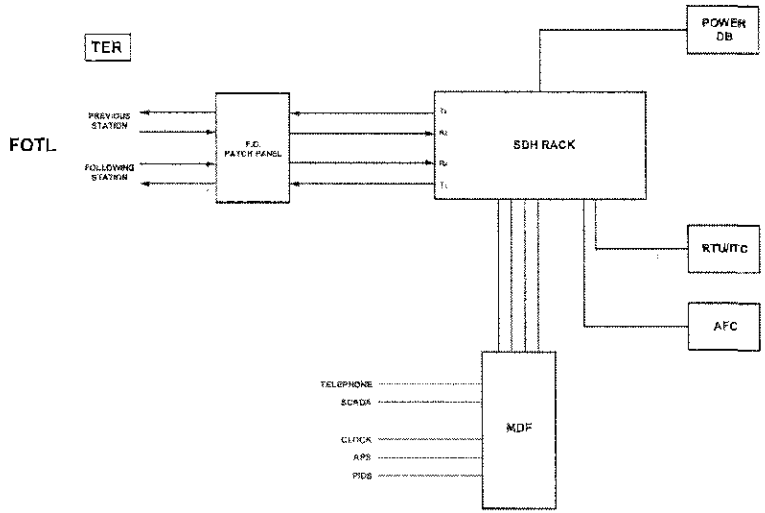
CTC COMMUNICATION SINGLE LINE DIAGRAM

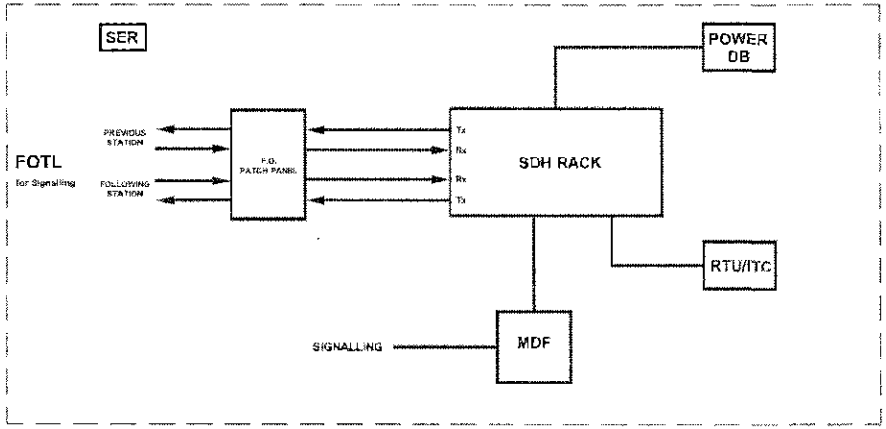
Oriental Consultants (OC) / Katahira and Engineers International (KE) / Tonichi Engineering Consultants, Inc. (TONTECHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : SIGNALLING SYSTEM SINGLE LINE DIAGRAM	DRAWING NO : SIG-1 SHEET NO : EM-1005

EXISTING LINE



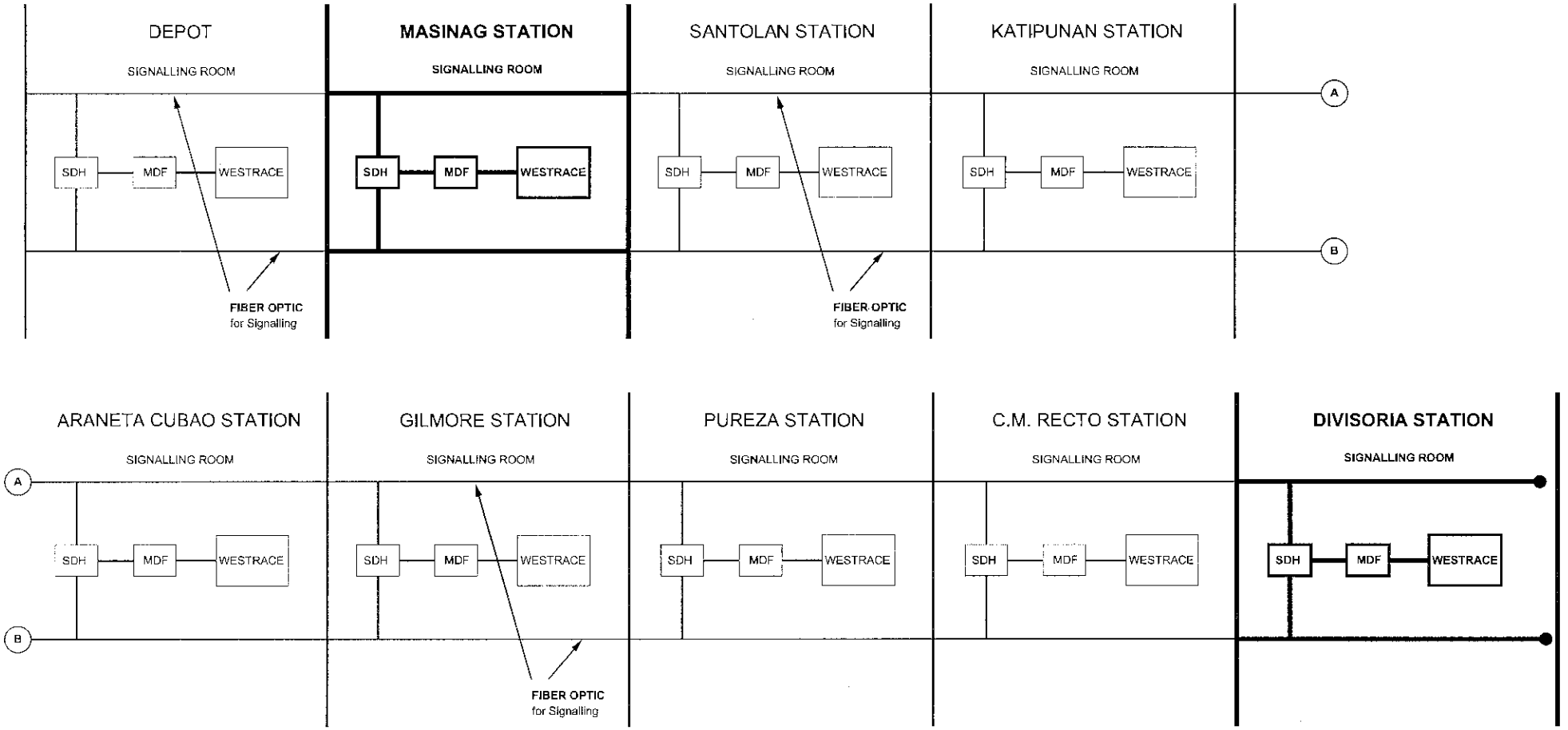
EXTENSION LINE





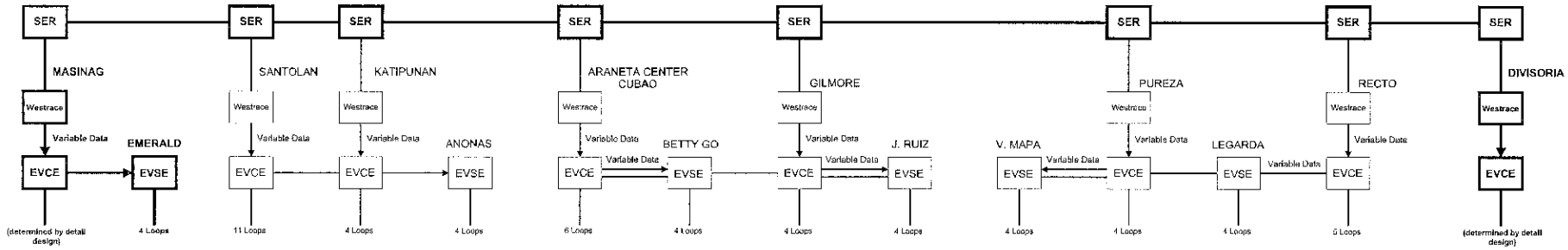
FOTL / SDH SYSTEM AT STATION

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc (TONICONS)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : SEPARATION OF SIGNALLING / TELECOMMUNICATION SINGLE LINE DIAGRAM	DRAWING NO : SIG-2 SHEET NO : EM-1006

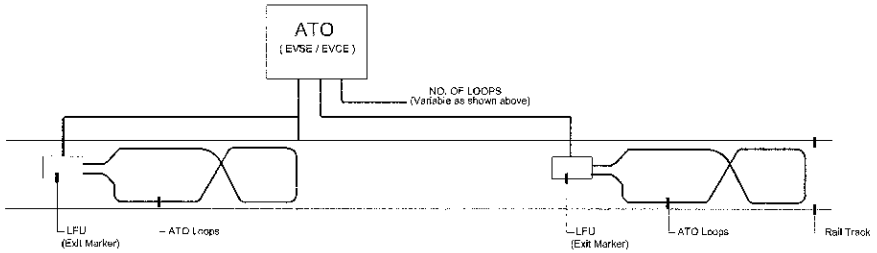


INTERLOCKING SINGLE LINE DIAGRAM

Oriental Consultants (OC) / Kataoka and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : INTERLOCKING SINGLE LINE DIAGRAM	DRAWING NO : SIG-3 SHEET NO : EM-1007

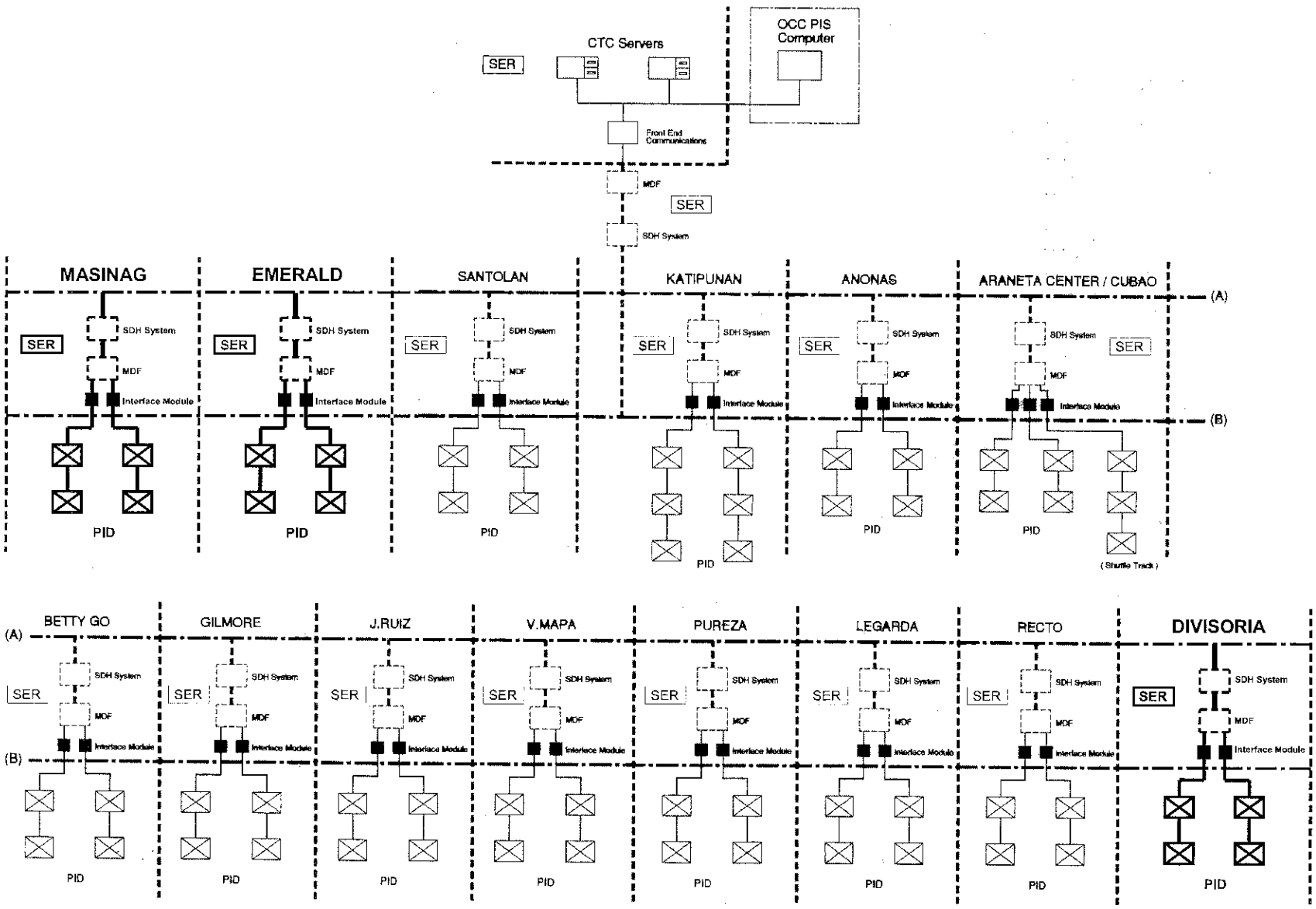


GENERAL COMMUNICATION LINE

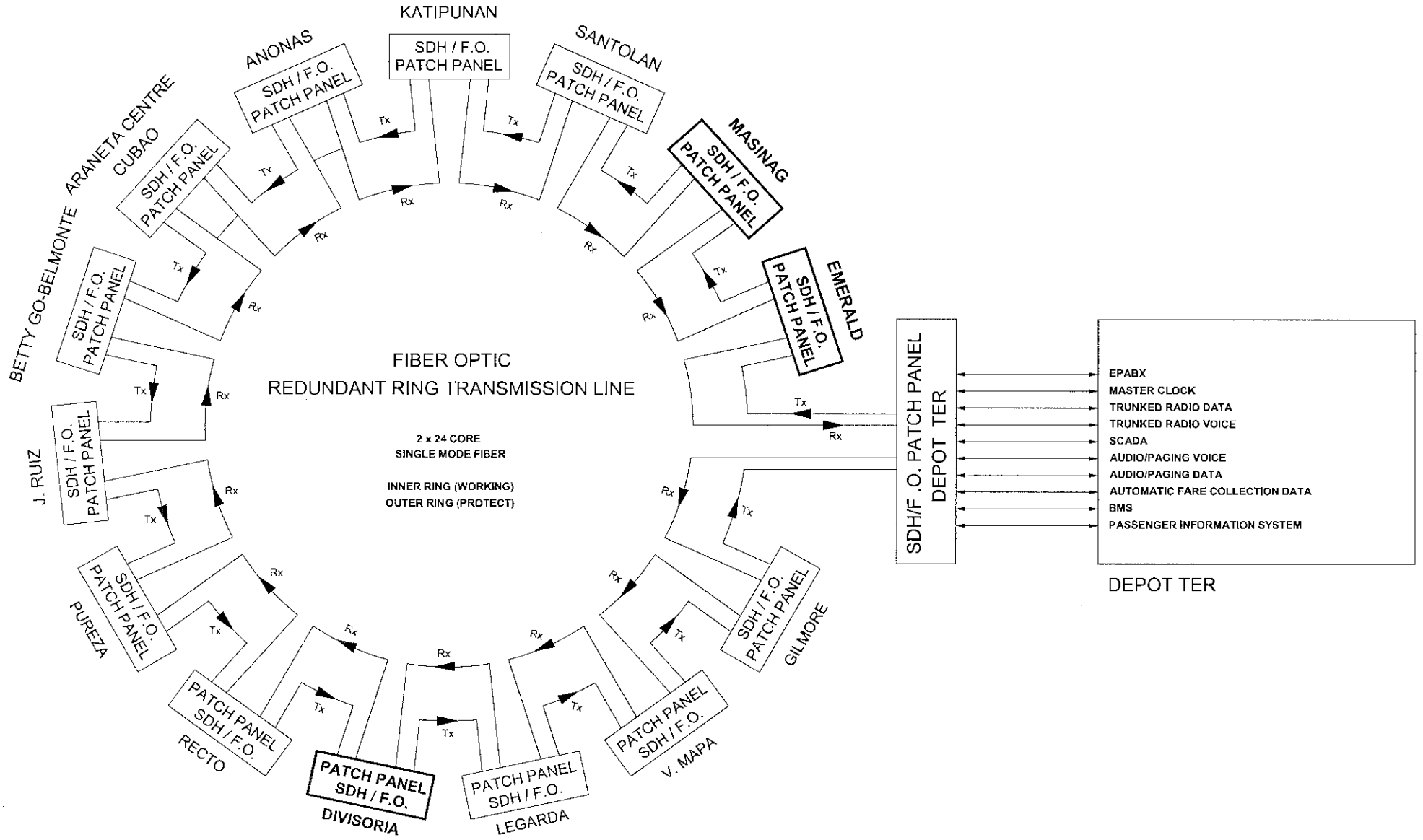


COMMUNICATION WITH ATO LOOP FEED UNITS

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : ATO SINGLE LINE DIAGRAM	DRAWING NO : SIG-4 SHEET NO : EM-1008



Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : PIS SINGLE LINE DIAGRAM	DRAWING NO : SIG-5 SHEET NO : EM-1009



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REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	FULL SIZE A3	FIBER OPTIC RING TRANSMISSION LINE SYSTEM OVERVIEW	COM-1
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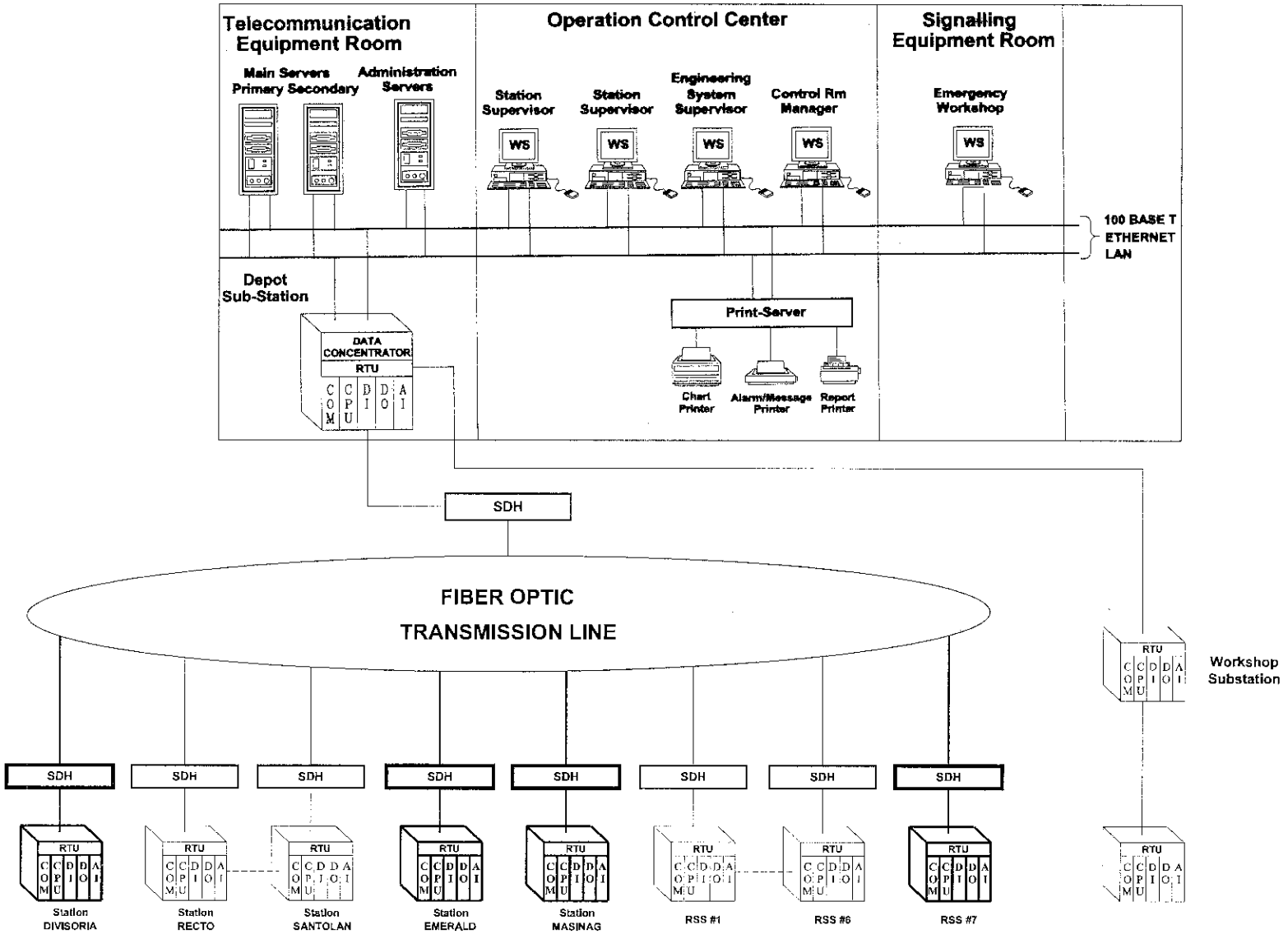
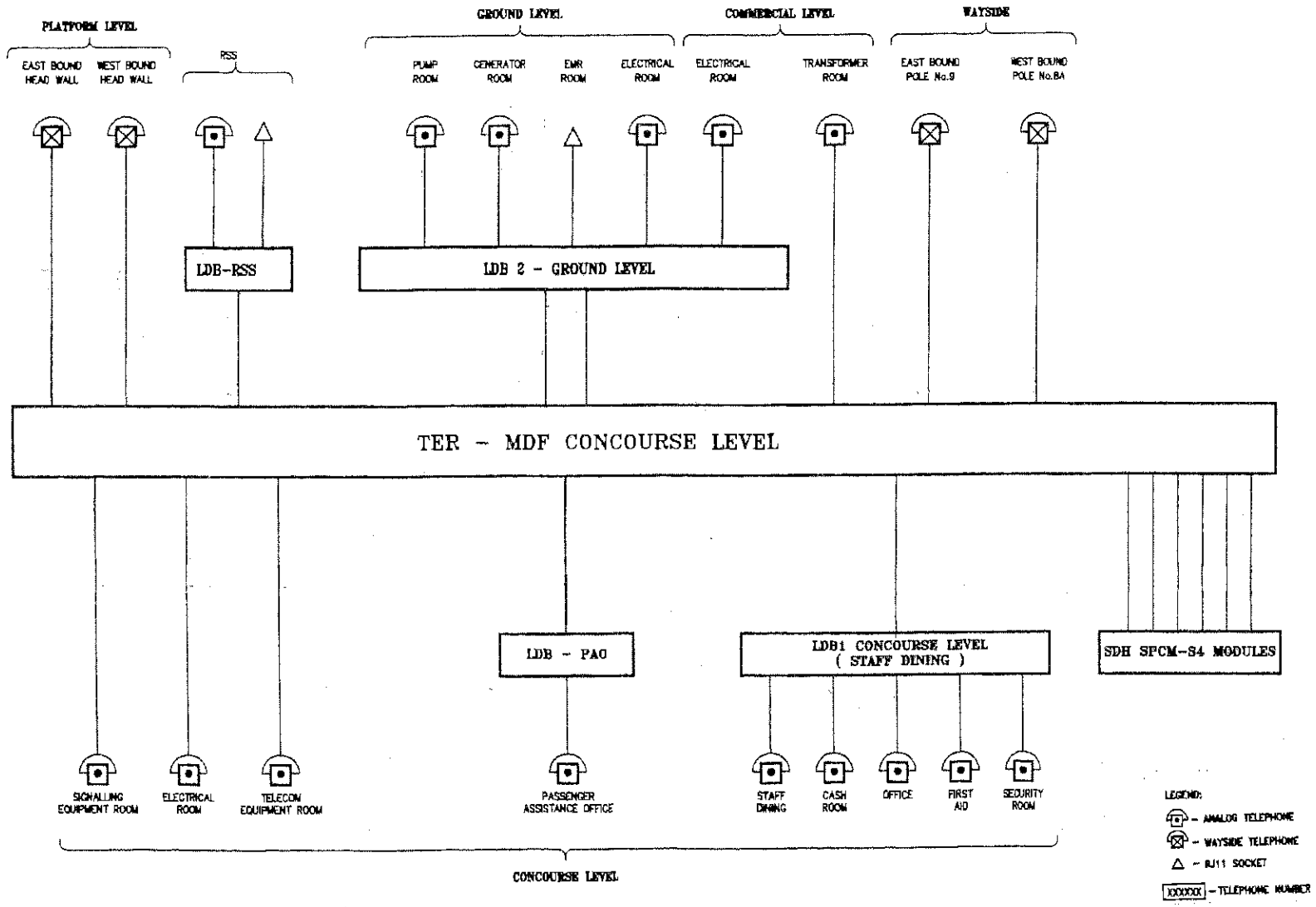


Oriental Consultants (OC) / Kanahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : SCADA RTU / ITC CABLE LAYOUT	DRAWING NO : COM-2 SHEET NO : EM-1011



Oriental Consultants (OC)

Kataniko and Engineers International (KEI)

Toriehi Engineering Consultants, Inc. ("ONICHI")

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

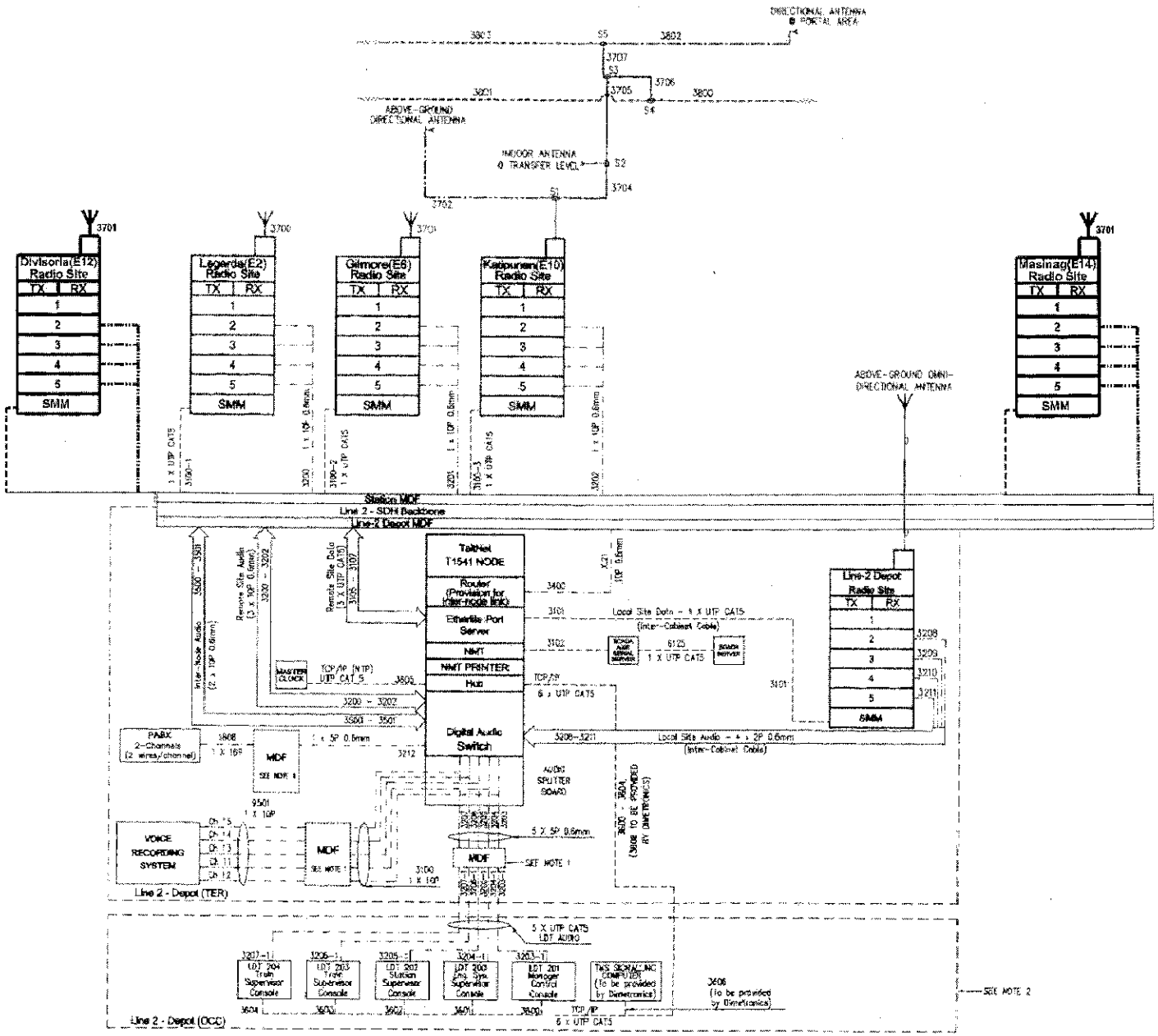
SCALE :

FULL SIZE A3

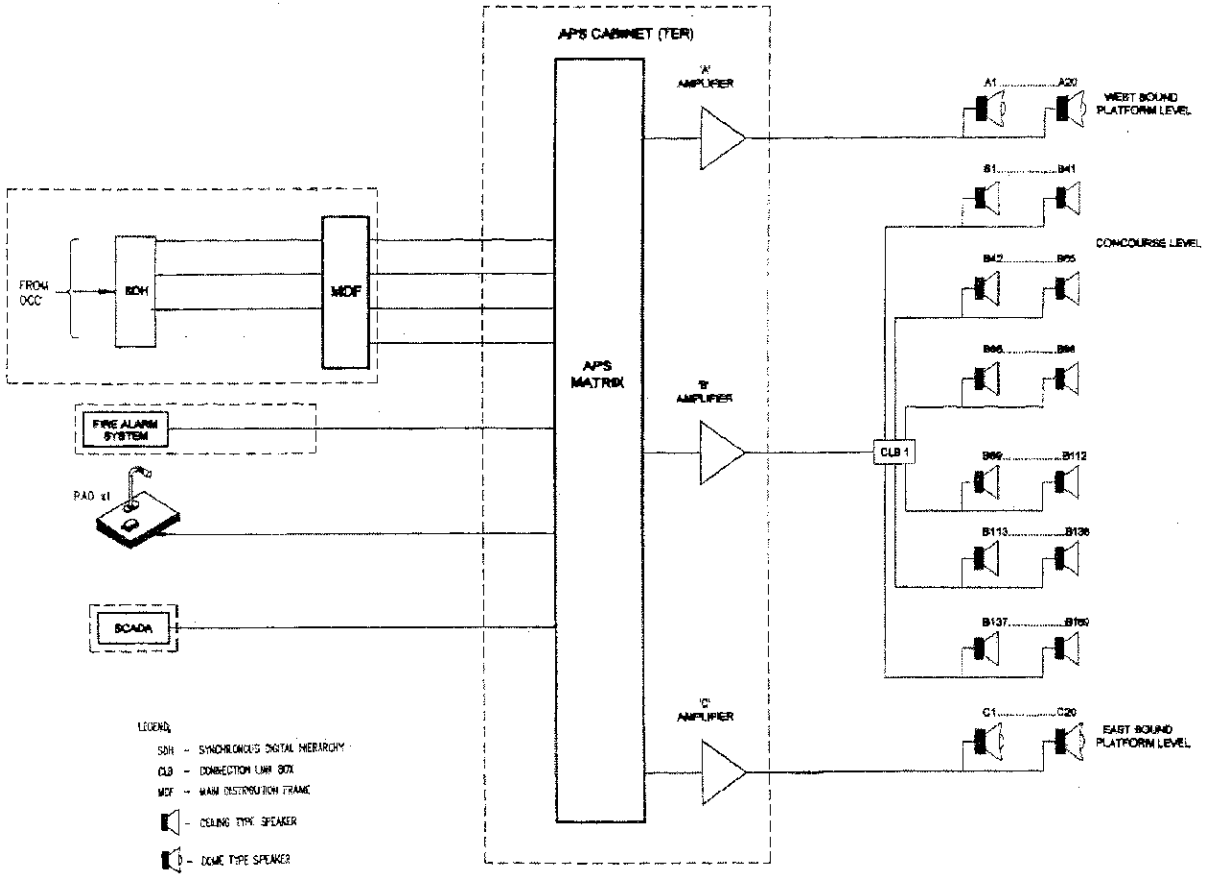
DRAWING TITLE :
STANDARD STATION TELEPHONE SYSTEM
SINGLE LINE DIAGRAM

DRAWING NO :
COM-3

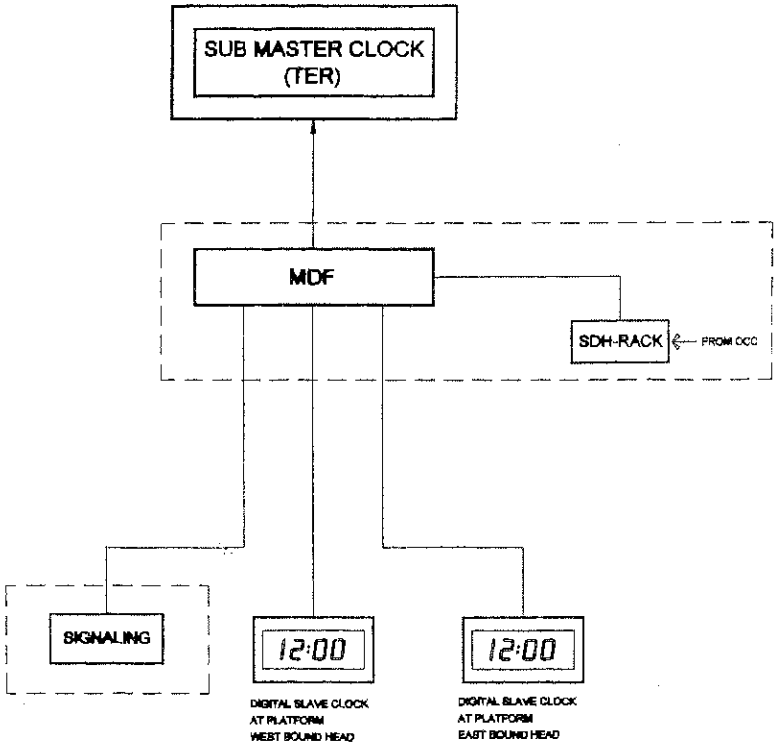
SHEET NO :
EM-1012



Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : RADIO SYSTEM OVERVIEW	DRAWING NO : COM-4 SHEET NO : EM-1013



Oriental Consultants (OC) / Kattahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : STANDARD STATION AUDIO/PAGING SYSTEM SINGLE LINE DIAGRAM	DRAWING NO : COM-5 SHEET NO : EM-1014



Oriental Consultants (OC)

Katahira and Engineers International (KEI)

Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

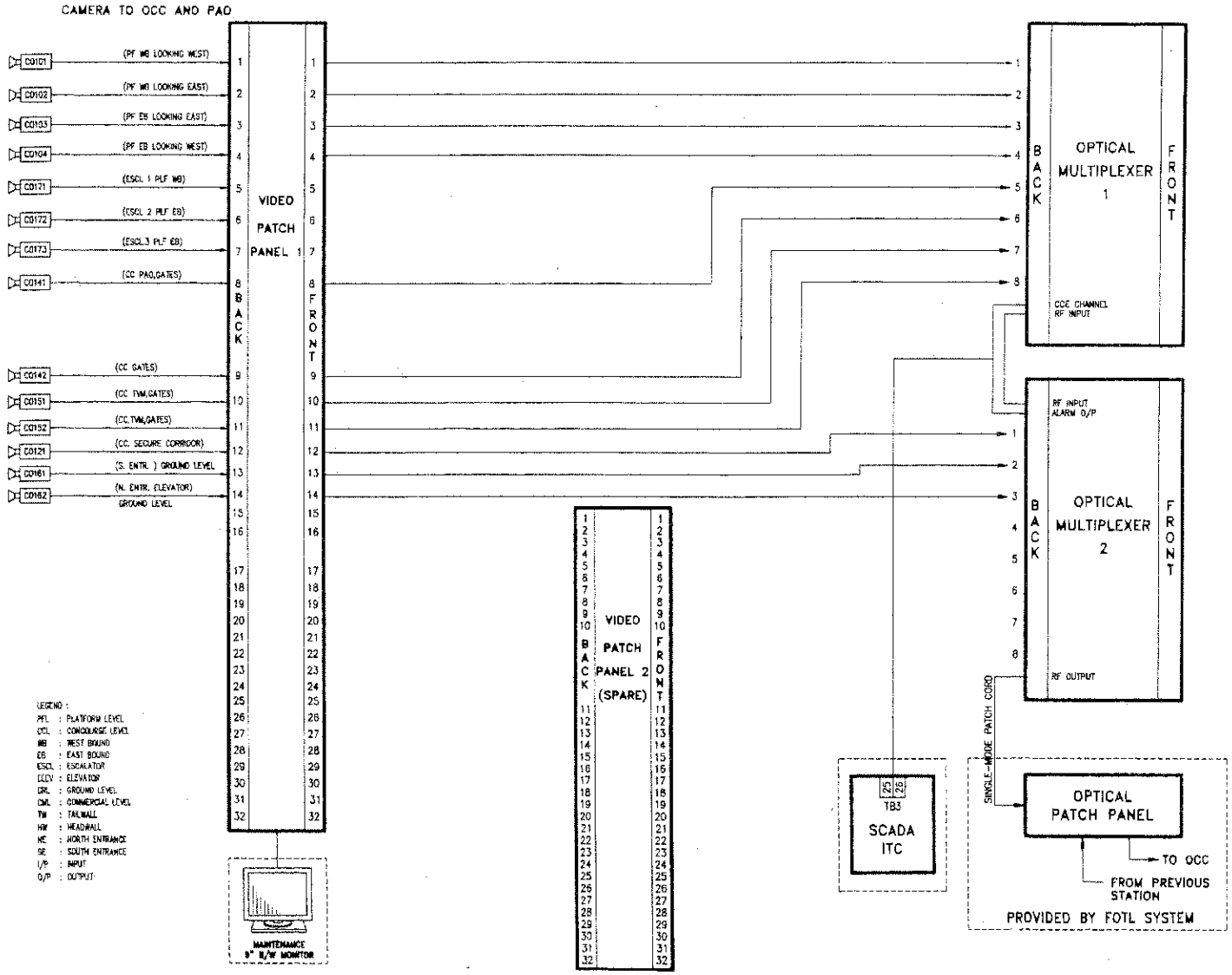
PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

SCALE :
FULL SIZE A3

DRAWING TITLE :
STANDARD STATION CLOCK SYSTEM
SINGLE LINE DIAGRAM

DRAWING NO :
COM-6

SHEET NO :
EM-1015



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REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

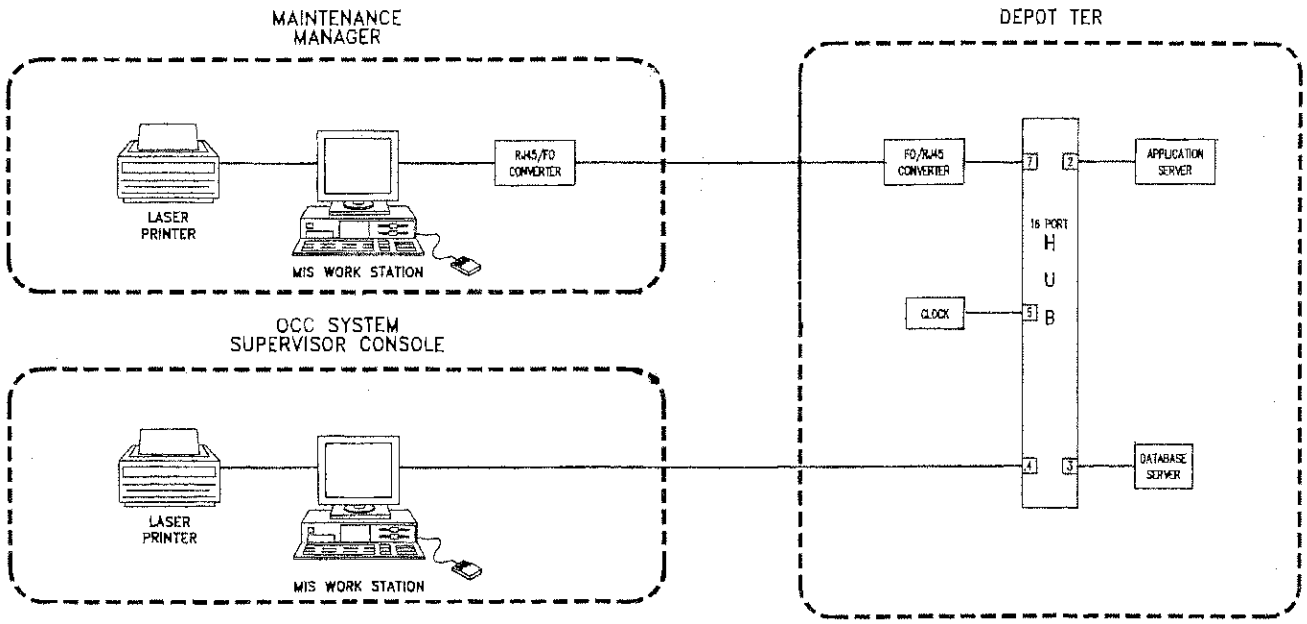
PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

SCALE :
FULL SIZE A3

DRAWING TITLE :
STANDARD STATION CCTV SYSTEM
SINGLE LINE DIAGRAM

DRAWING NO :
COM-7

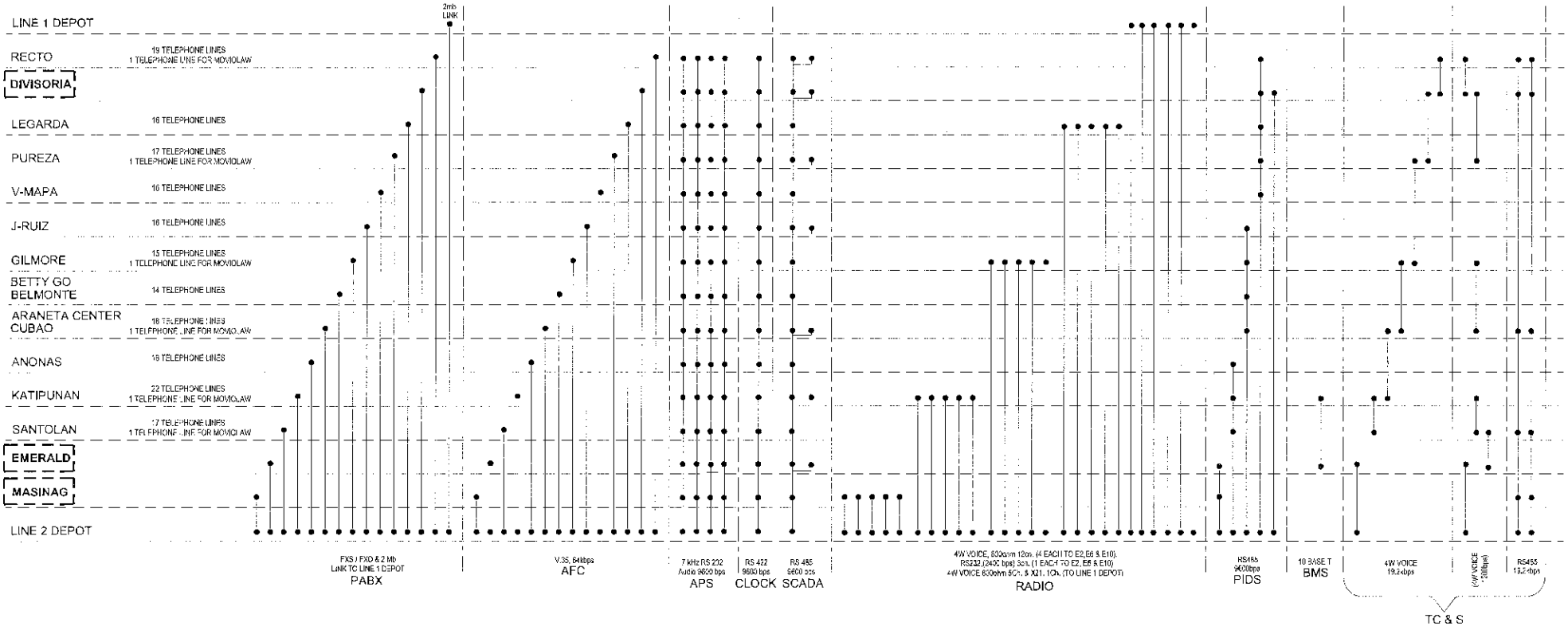
SHEET NO :
EM-1016



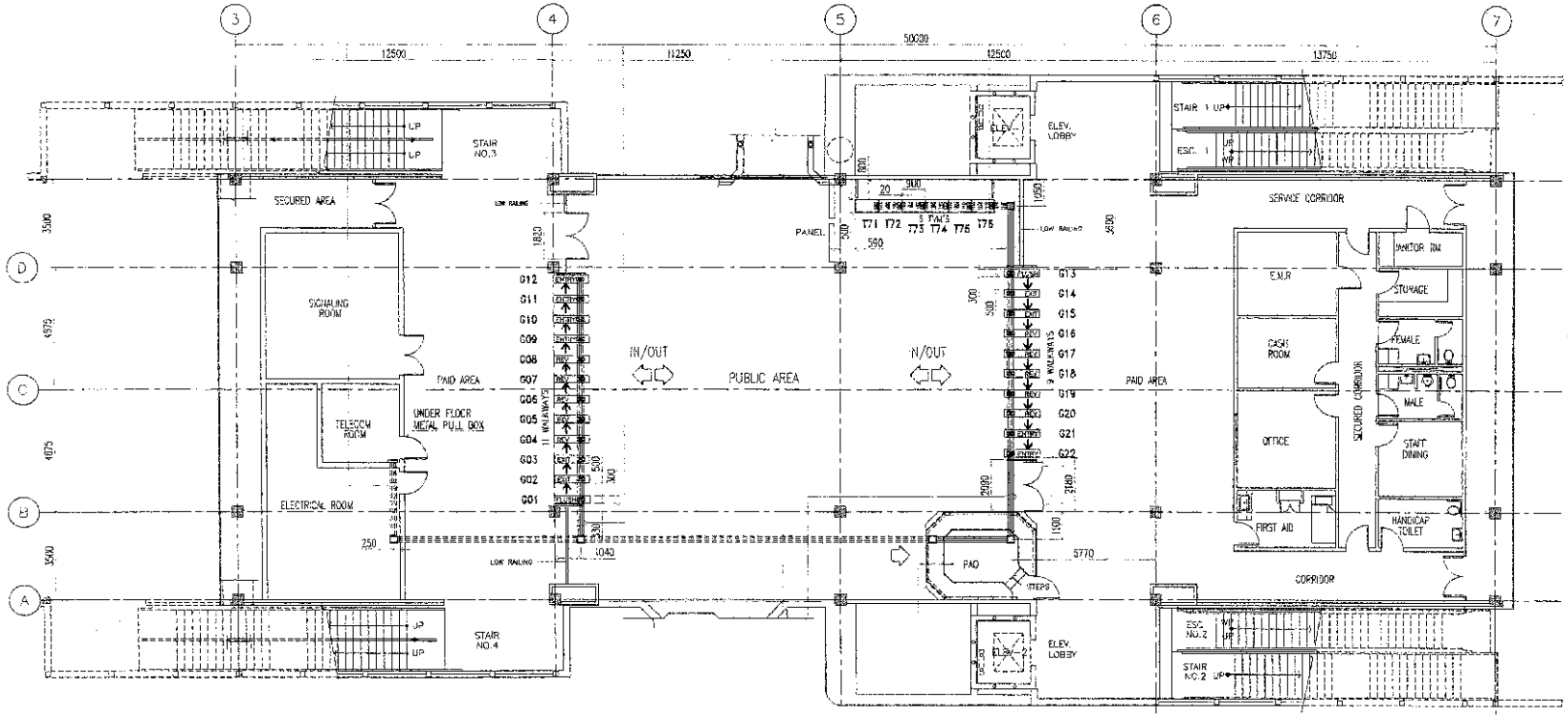
Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : MIS SINGLE LINE DIAGRAM	DRAWING NO : COM-8 SHEET NO : EM-1017

LEGEND :

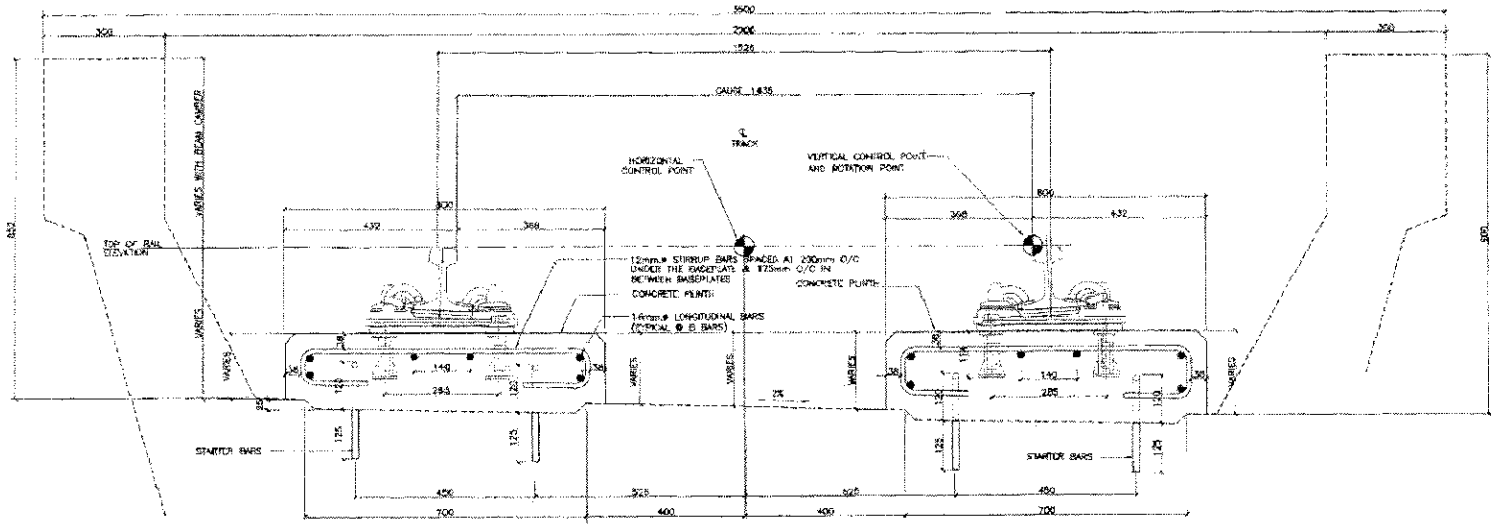
PABX – PRIVATE AUTOMATIC BRANCH EXCHANGE
AFC – AUTOMATIC FARE COLLECTION
APS – AUDIO PACING SYSTEM
PIDS – PASSENGER INFORMATION DISPLAY SYSTEM
BMS – BUILDING MANAGEMENT SYSTEM
TC&S – TRACK CIRCUIT & SIGNAL
FXS/FXO – FOREIGN EXCHANGE SUBSCRIBER/OFFICE



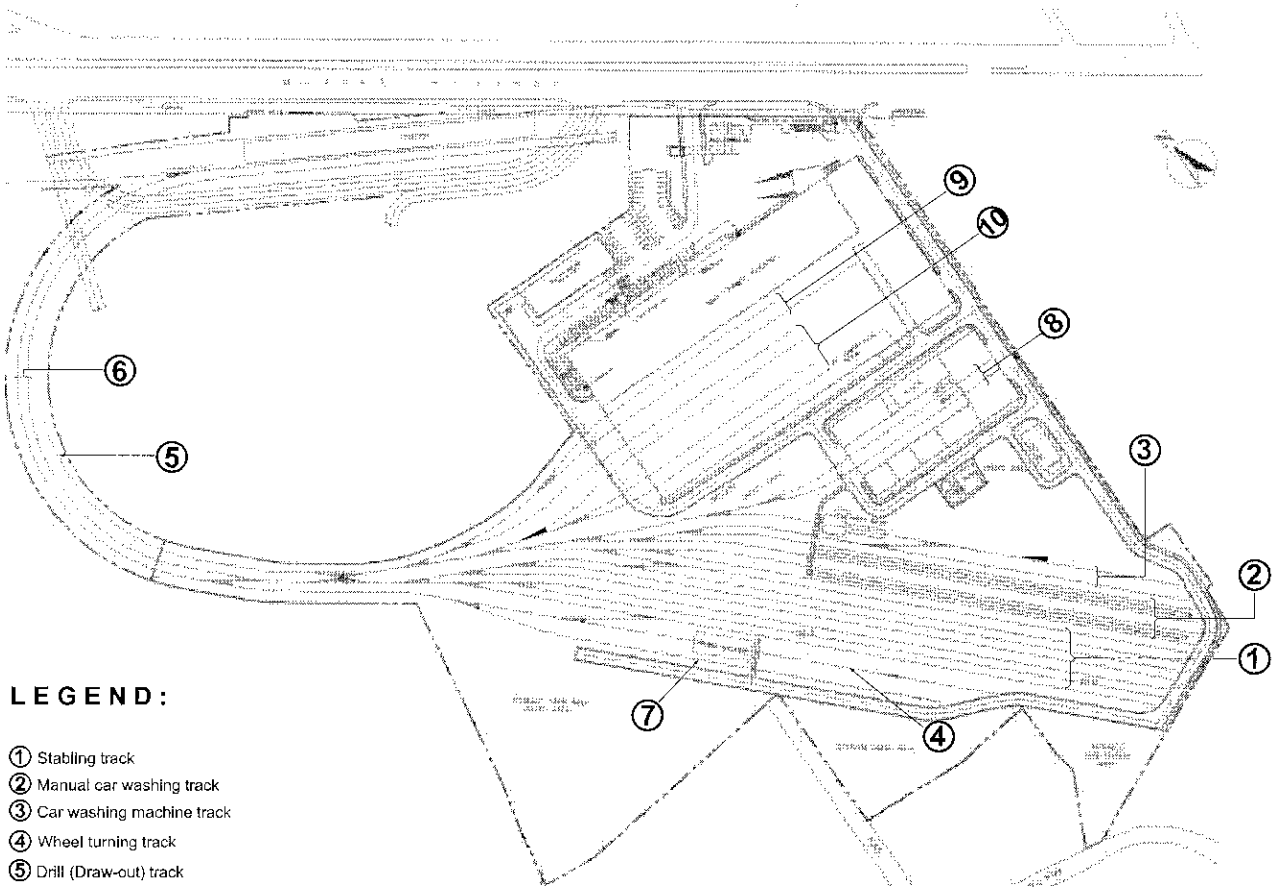
Oriental Consultants (OC) · Kawasaki Heavy Industries International (KHI) · Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : FOTL SYSTEM SDH TRAFFIC ALLOCATION	DRAWING NO : COM-9 SHEET NO : EM-1018



Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : AFC EQUIPMENT LAYOUT (FOR EXAMPLE)	DRAWING NO : AFC-1 SHEET NO : EM-1019



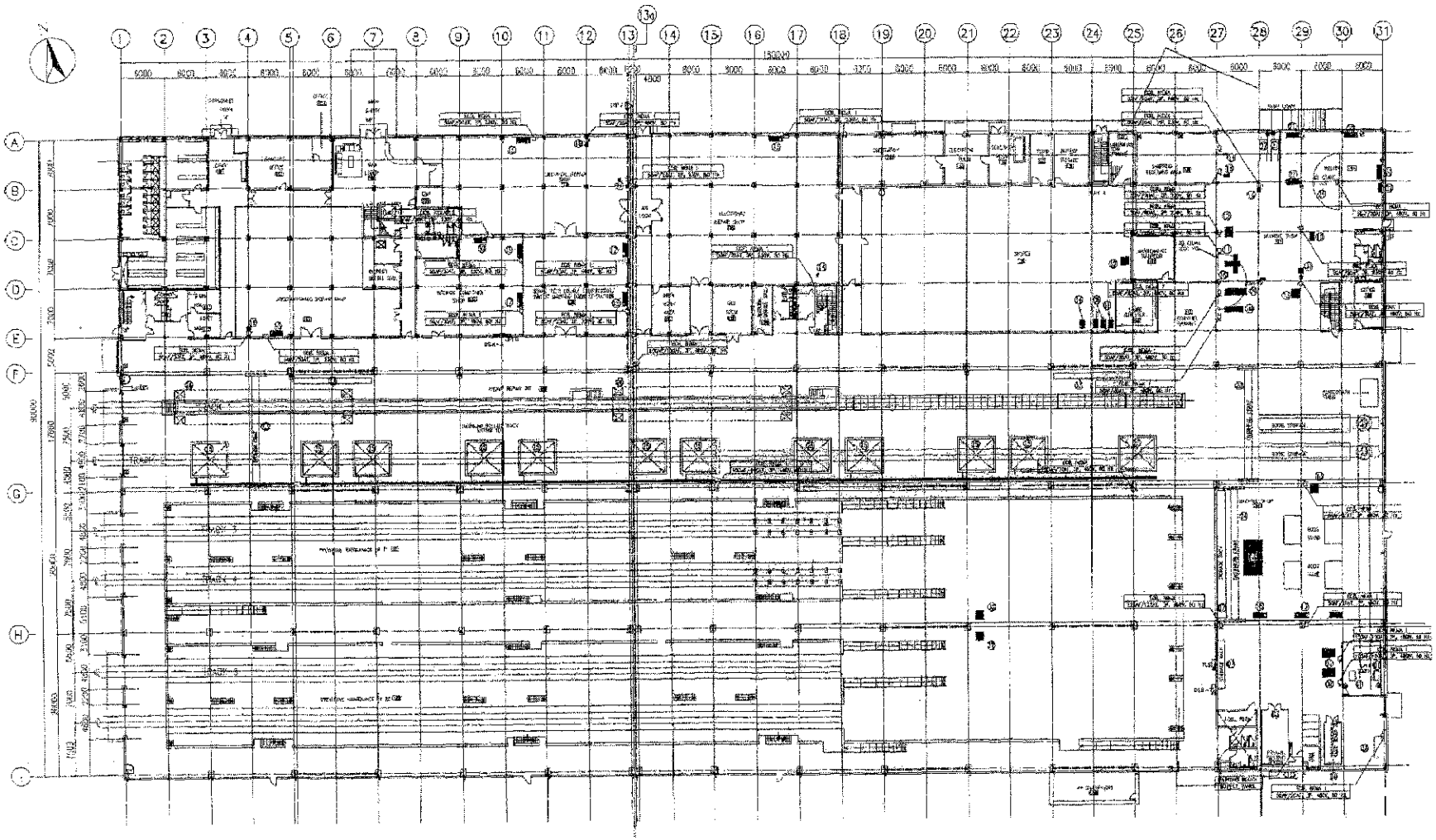
Oriental Consultants (OC) / Katahira and Engineers International (KE) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : TYPICAL DIRECT FIXATION TRACK CROSS SECTION	DRAWING NO : TWK-1 SHEET NO : EM-1020



LEGEND:

① Stabling track
② Manual car washing track
③ Car washing machine track
④ Wheel turning track
⑤ Drill (Draw-out) track
⑥ Departure/arrival track
⑦ Test track
⑧ Maintenance Vehicle stabling track
⑨ Heavy maintenance track
⑩ Light maintenance track

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : TRACK LAYOUT IN EXISING DEPOT	DRAWING NO : DPO-1 SHEET NO : EM-1021



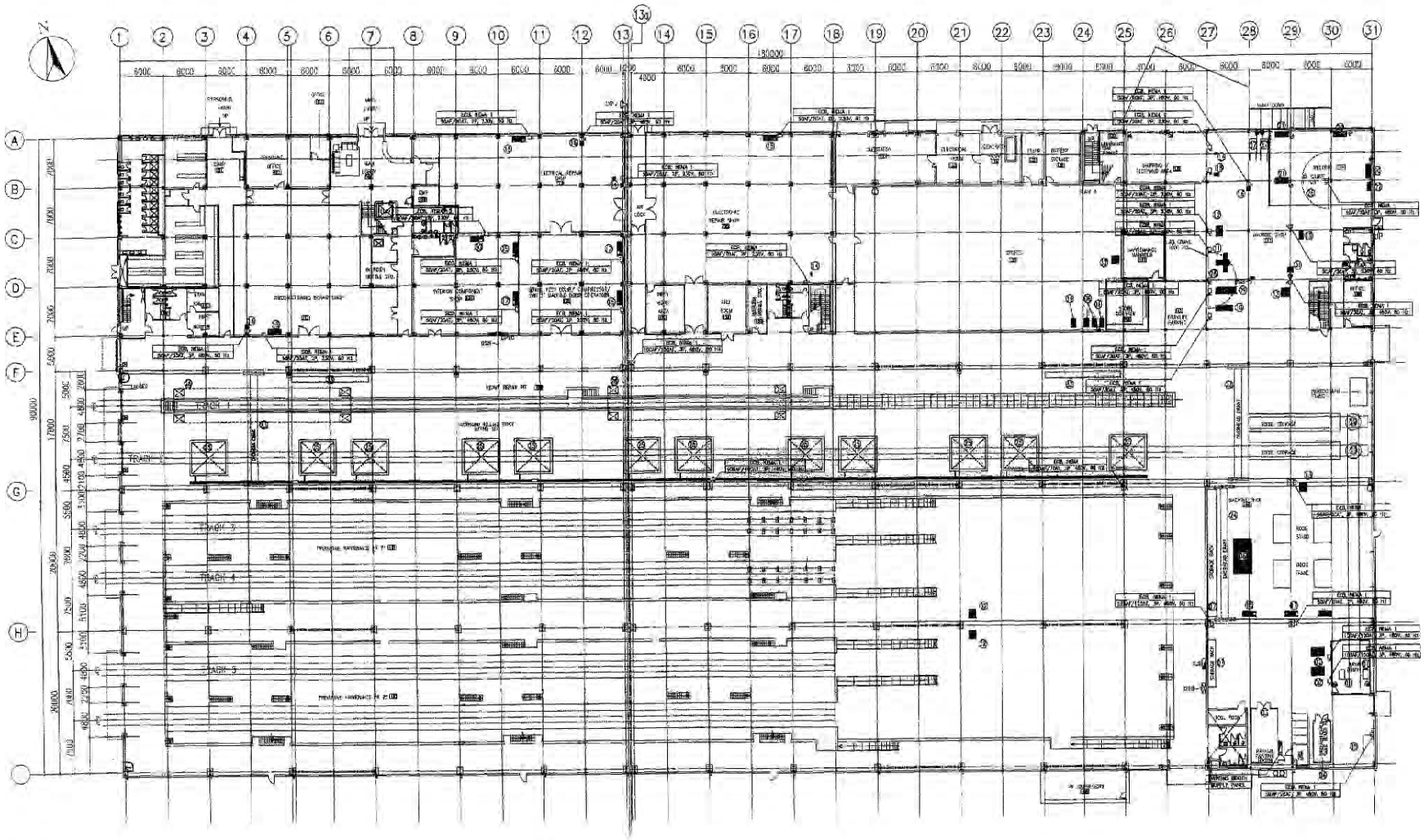
LEGEND:

- MC – MC COMBINATION MAGNETIC STARTER NEMA SIZE AND TYPE AS REQUIRED
- SS – SAFETY SWITCH 240V, 3P3T/3P3T NEMA 1 ENCLOSURE UNLESS OTHERWISE NOTED
- DB – DISTRIBUTION SWITCHBOARD 480V, 3Φ, 3W+E
- – POWER OUTLET, 3P, 480V, 60Hz, GROUNDING TYPE RATING AS REQUIRED
- – POWER OUTLET, 3P, 120V, 60Hz, GROUNDING TYPE RATING AS REQUIRED
- – POWER OUTLET, 2P, 120V 60Hz, GROUNDING TYPE RATING AS REQUIRED

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : EXISTING WORKSHOP LAYOUT
				DRAWING NO : DPO-2
				SHEET NO : EM-1022

APPENDIX.B

DRAWINGS OF CIVIL WORKS



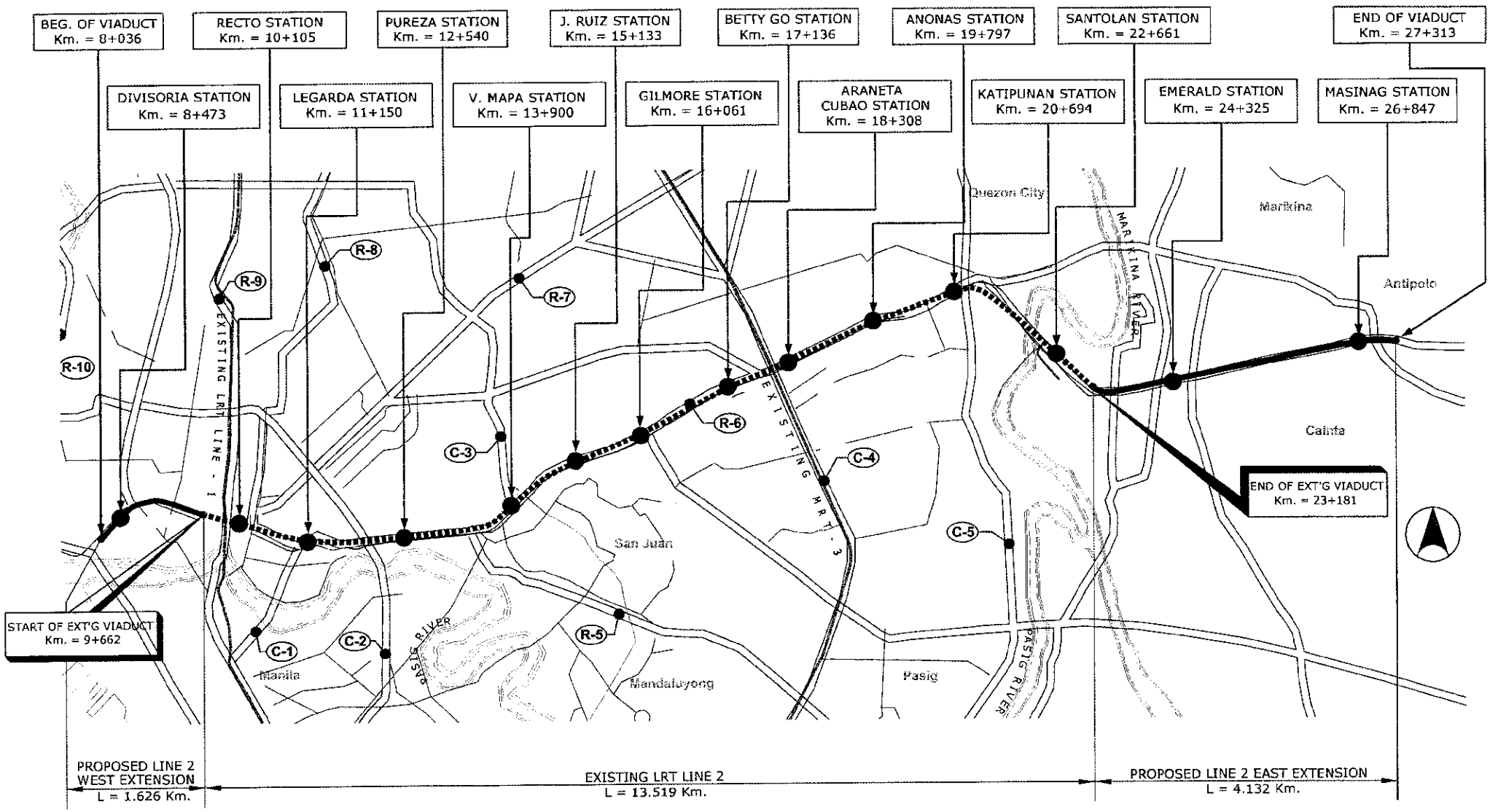
LEGEND:

- ⊠ - AC COMBINATION MAGNETIC STARTER NEMA SIZE AND TYPE AS REQUIRED
- ⊟ - SAFETY SWITCH 240V, 3PST/3PST NEMA 1 ENCLOSURE UNLESS OTHERWISE NOTED
- DSB - DISTRIBUTION SWITCHBOARD, 480V, 3ϕ, 3W+E
- ⊕ - POWER OUTLET, 3P, 460V, 60HZ, GROUNDING TYPE RATING AS REQUIRED.
- ⊕ - POWER OUTLET, 3P, 220V, 60HZ, GROUNDING TYPE RATING AS REQUIRED.
- ⊕ - POWER OUTLET, 3P, 220V, 60HZ, GROUNDING TYPE RATING AS REQUIRED.

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : EXISTING WORKSHOP LAYOUT	DRAWING NO : DPQ-2 SHEET NO : EM-1022

PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT
DRAWING LIST

SHEET No.	DWG No.	DRAWING TITLE	SCALE
1 / 41	G - 1	Index of Plans	NTS
2 / 41	G - 2	Vicinity Map	1/50000
3 / 41	G - 3	Key Maps	NTS
4 / 41	E - 1	LRT Line 2 Eastern Extension - Layout Plan	1/5000
5 / 41	E - 2	LRT Line 2 East Extension - Layout of Trackwork	NTS
6 / 41	E - 3	Plan and Profile - Eastern Extension	H=1/2000, V=1/200
7 / 41	E - 4	Plan and Profile - Eastern Extension	H=1/2000, V=1/200
8 / 41	E - 5	Plan and Profile - Eastern Extension	H=1/2000, V=1/200
9 / 41	E - 6	Plan and Profile - Eastern Extension	H=1/2000, V=1/200
10 / 41	E - 7	Plan and Profile - Eastern Extension	H=1/2000, V=1/200
11 / 41	E - 8	Plan and Profile - Eastern Extension	H=1/2000, V=1/200
12 / 41	E - 9	Plan and Profile - Eastern Extension	H=1/2000, V=1/200
13 / 41	E - 10	Cross Section - Eastern Extension	1/250
14 / 41	E - 11	Cross Section - Eastern Extension	1/250
15 / 41	E - 12	Cross Section - Eastern Extension	1/250
16 / 41	E - 13	Cross Section - Eastern Extension	1/250
17 / 41	E - 14	Emerald Station Plan and Elevations	1/500
18 / 41	E - 15	Emerald Station Sections	1/100,1/200
19 / 41	E - 16	Masinag Station Plan and Elevations	1/500
20 / 41	E - 17	Masinag Station Sections	1/100,1/200
21 / 41	W - 1	LRT Lino 2 Western Extension - Layout Plan	1/5000
22 / 41	W - 2	LRT Line 2 Western Extension - Layout of Trackwork	NTS
23 / 41	W - 3	Plan and Profile - Western Extension	H=1/2000, V=1/200
24 / 41	W - 4	Plan and Profile - Western Extension	H=1/2000, V=1/200
25 / 41	W - 5	Plan and Profile - Western Extension	H=1/2000, V=1/200
26 / 41	W - 6	Cross Section - Western Extension	1/250
27 / 41	W - 7	Cross Section - Western Extension	1/250
28 / 41	W - 8	Divisoria Station Plan and Elevations	1/500
29 / 41	W - 9	Divisoria Station Sections	1/100,1/200
30 / 41	SC - 1	East & West Extension Concourse Floor Plan	1/400
31 / 41	S - 1	Pier Layouts (1/2)	1/100,1/200
32 / 41	S - 2	Pier Layouts (2/2)	1/100,1/200
33 / 41	S - 3	Viaduct Arrangement and Sections - Type 1	1/100,1/200
34 / 41	S - 4	Viaduct Arrangement and Sections - Type 1A	1/100,1/200
35 / 41	S - 5	Viaduct Arrangement and Sections - Type 1A[1]	1/100,1/200
36 / 41	S - 6	Viaduct Arrangement and Sections - Type 2	1/100,1/200
37 / 41	S - 7	Viaduct Arrangement and Sections - Type 3	1/100,1/200
38 / 41	R - 1	Construction Gauge	1/25
39 / 41	R - 2	Viaduct Walkway and Railing	1/25
40 / 41	BH - 1	Soil Profile - East Extension	1/25
41 / 41	BH - 2	Soil Profile - West Extension	1/25



Oriental Consultants (OC)

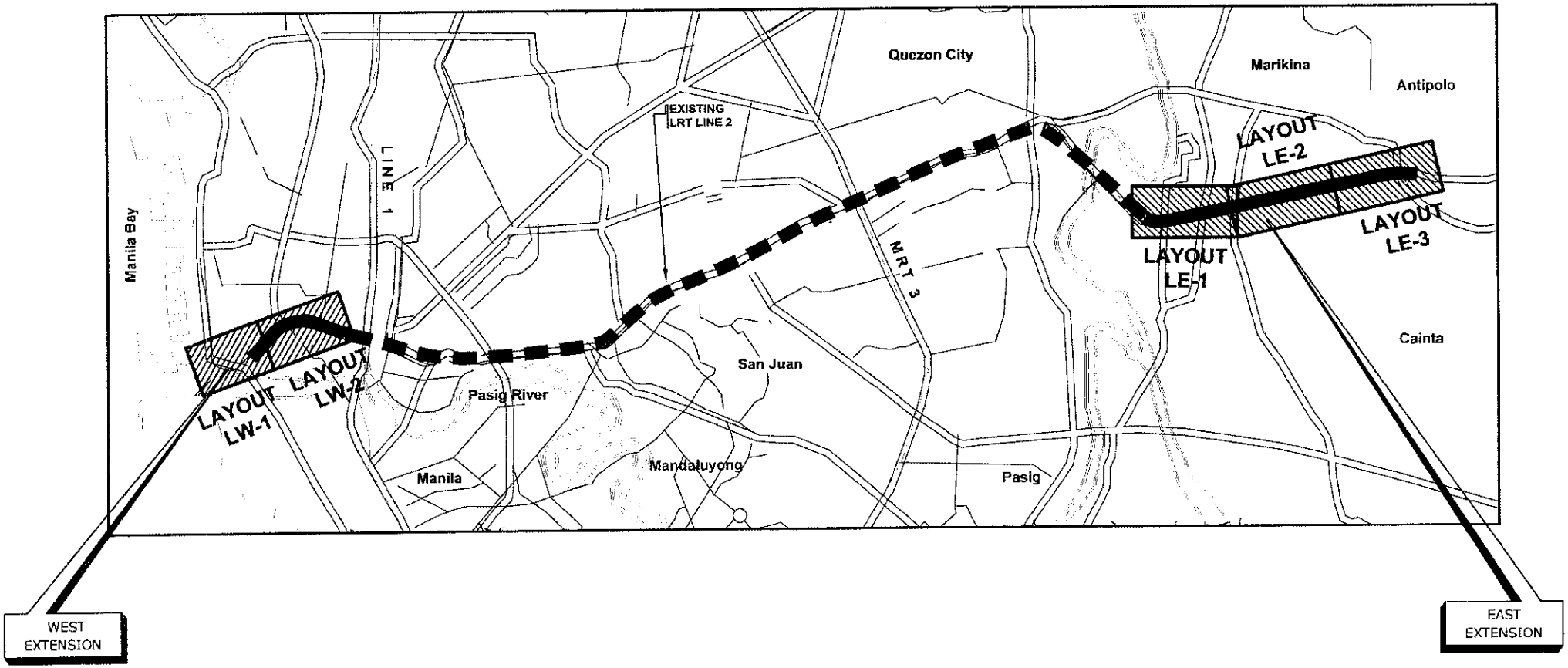
Katahira and Engineers International (KEI)

Tonichi Engineering Consultants, Inc. (TONICHI)

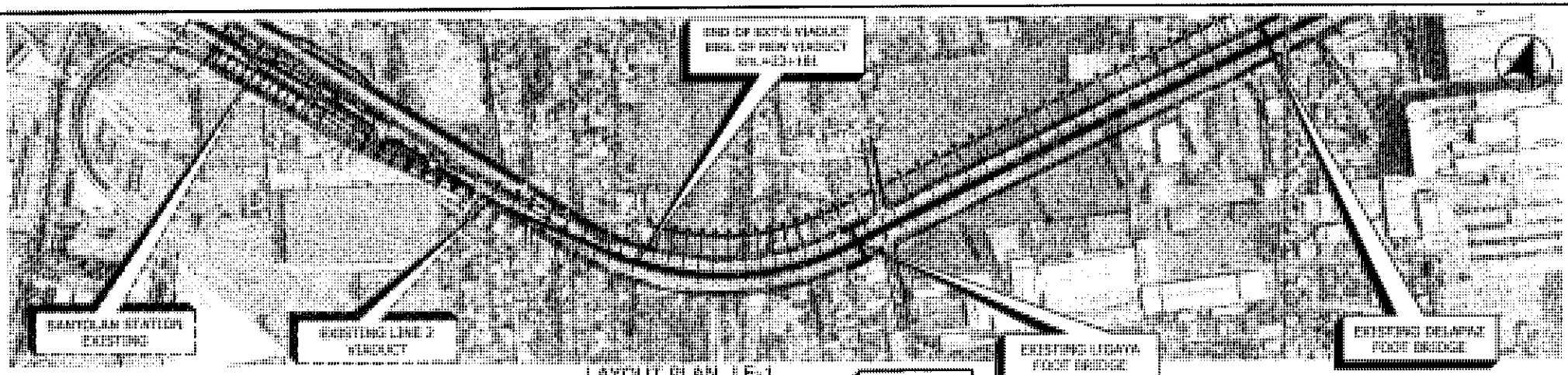
REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	1 : 50000 FULL SIZE A3	EAST AND WEST EXTENSION VICINITY MAP	G-2
			SHEET NO : 2 / 41

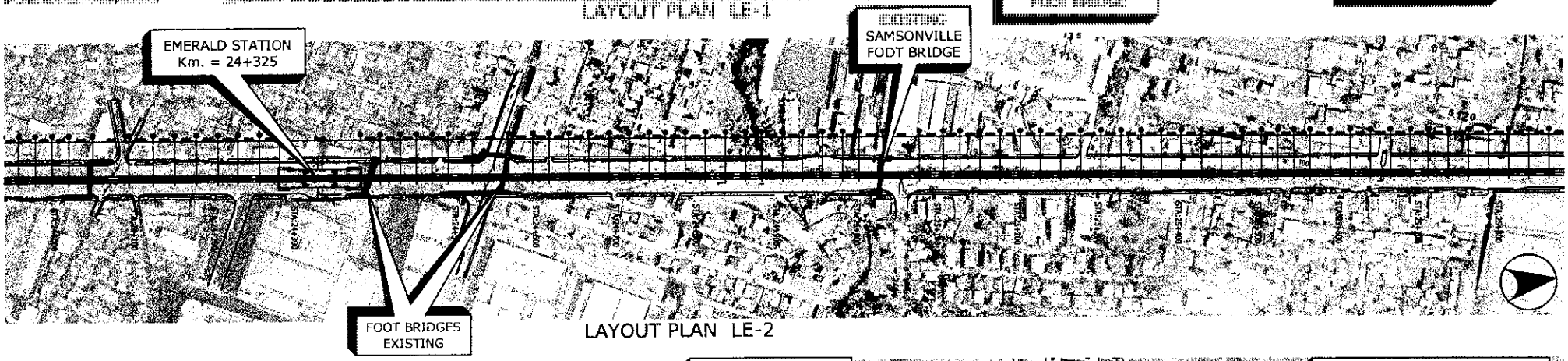
KEY MAPS



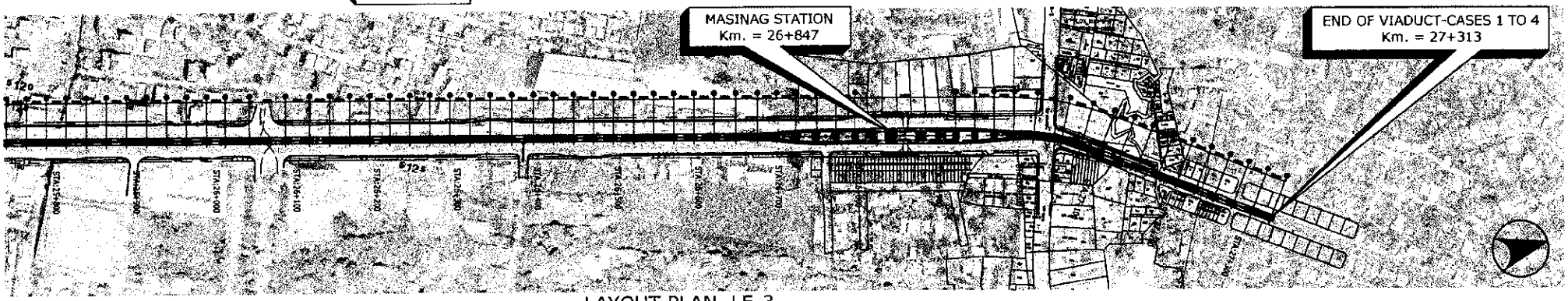
Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : NTS FULL SIZE A3	DRAWING TITLE : LAYOUT PLAN KEY MAPS	DRAWING NO : G-3 SHEET NO : 3 / 41



LAYOUT PLAN LE-1

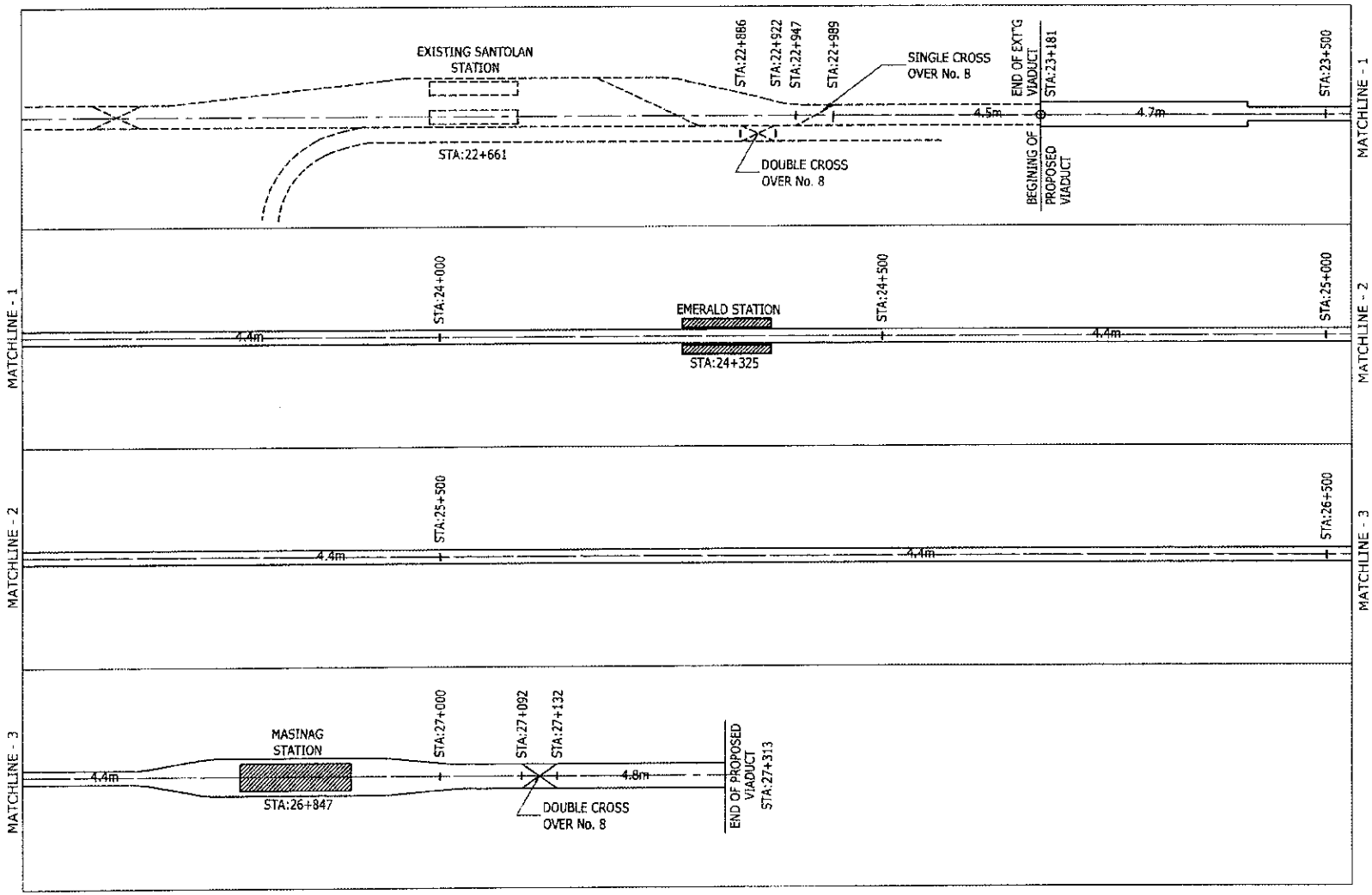


LAYOUT PLAN LE-2



LAYOUT PLAN LE-3

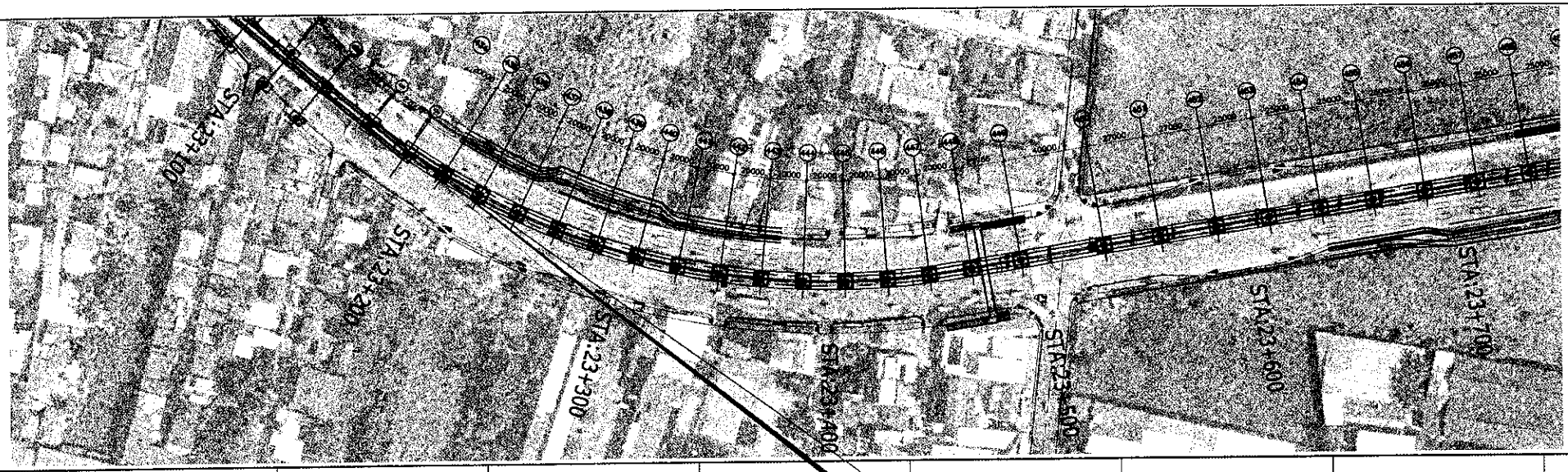
Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonchi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 5000 FULL SIZE A3	DRAWING TITLE : EAST EXTENSION LAYOUT PLAN	DRAWING NO : E-1 SHEET NO : 4 / 41

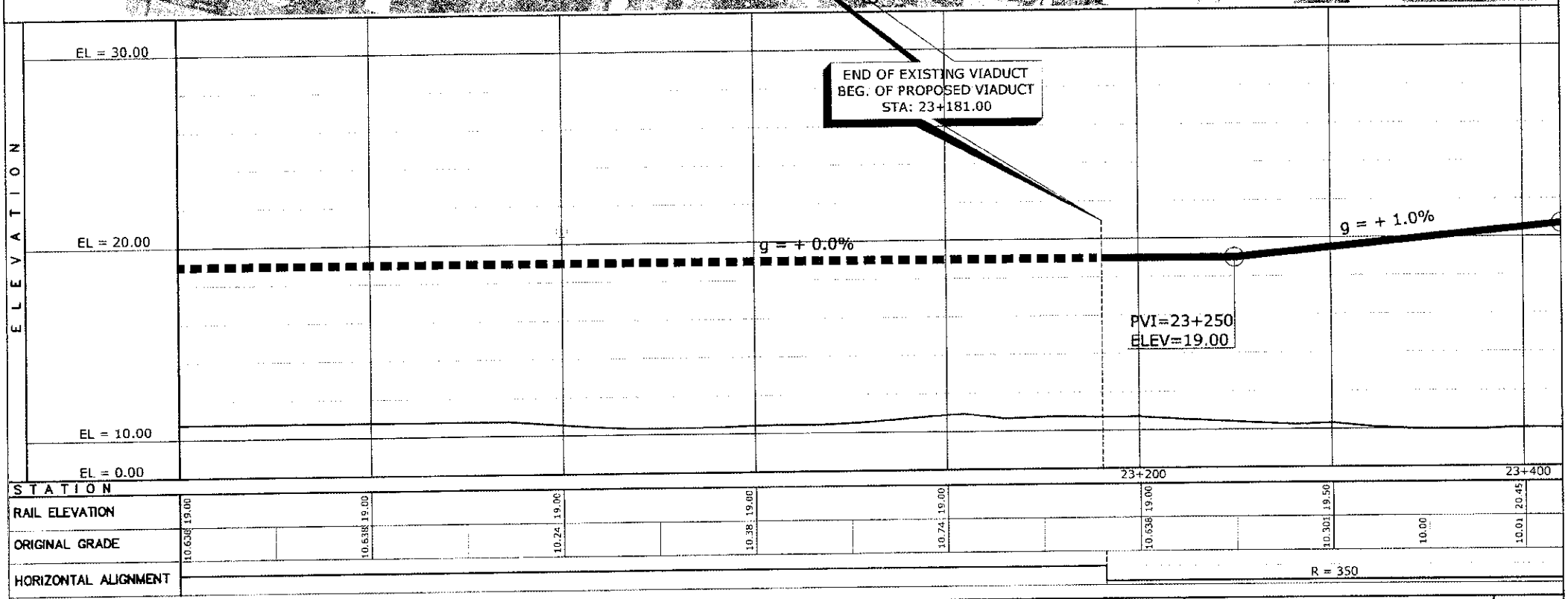


PLAN ON TRACKWORK
(ALL CASES)

NOT TO SCALE

Oriental Consultants (OC) · Katahira and Engineers International (KEI) · Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : N T S FULL SIZE A3	DRAWING TITLE : LRT Line 2 Eastern Extension LAYOUT OF TRACKWORK	DRAWING NO : E-2 SHEET NO : 5 / 41





Oriental Consultants (OC)
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Tonichi Engineering Consultants, Inc (TONICHI)

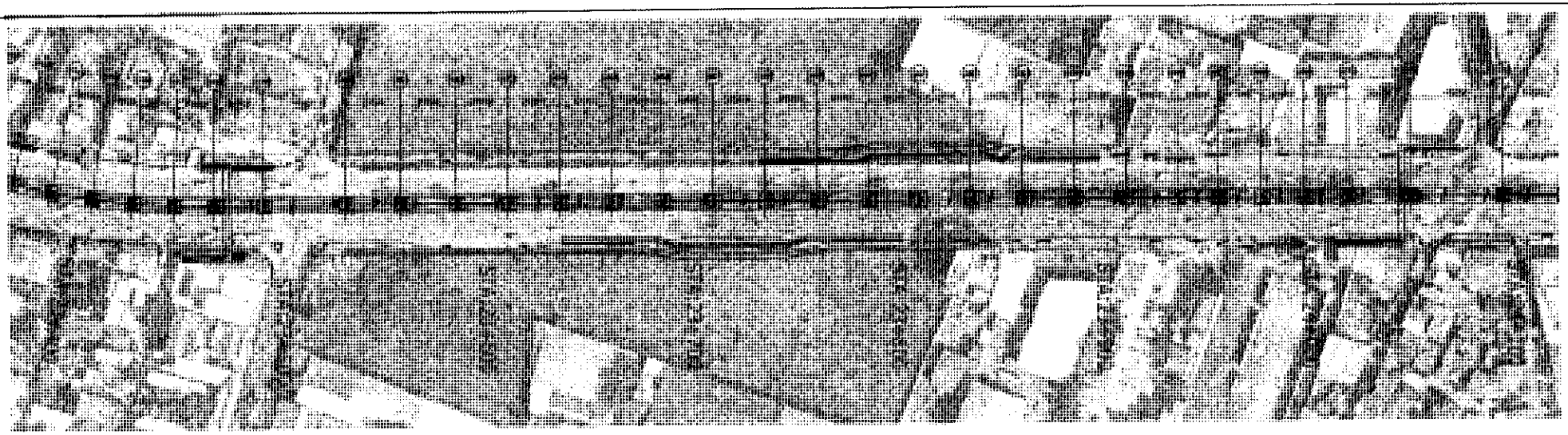
REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

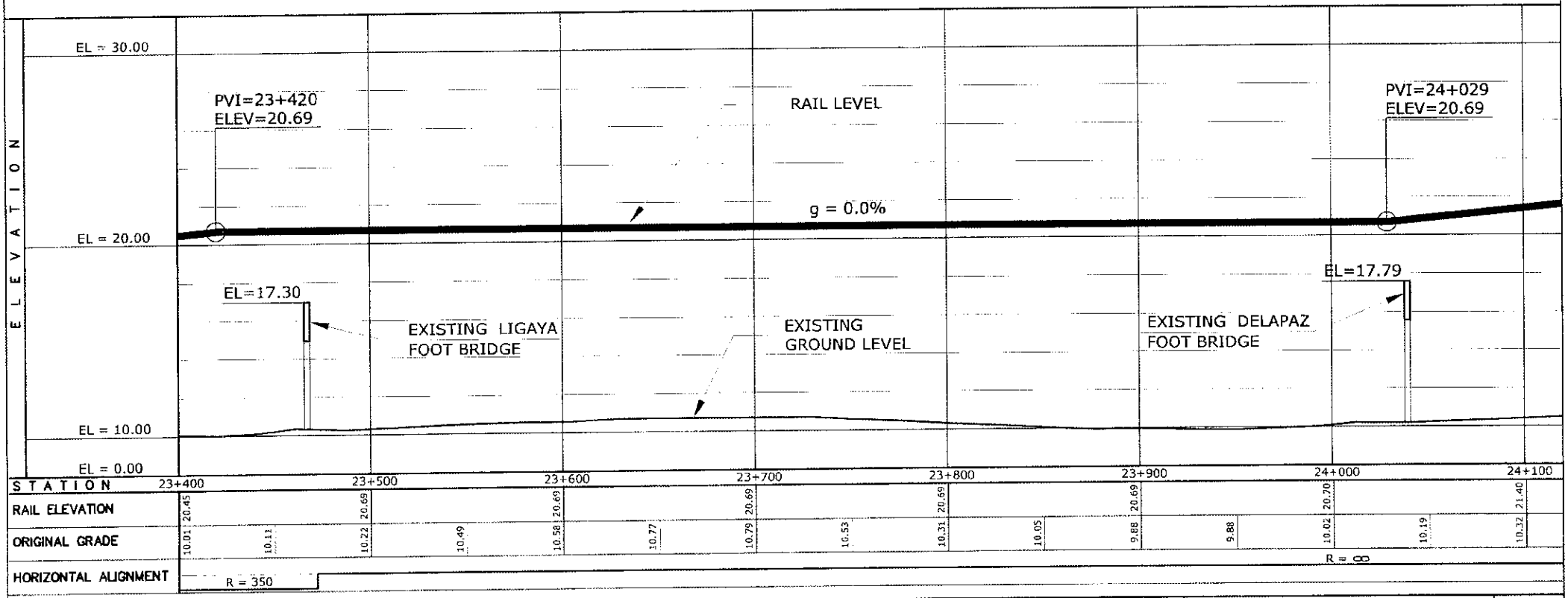
PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

SCALE :
H=1/2000
V=1/200
FULL SIZE A3

DRAWING TITLE :
EAST EXTENSION
PLAN AND PROFILE
KM. 23+181 TO 23+400

DRAWING NO. : E-3
SHEET NO. : 6 / 41





STATION	23+400	23+500	23+600	23+700	23+800	23+900	24+000	24+100
RAIL ELEVATION	20.45	20.69	20.69	20.69	20.69	20.69	20.70	21.40
ORIGINAL GRADE	10.01	10.11	10.22	10.49	10.58	10.77	10.79	10.53	10.31	10.05	9.88	9.88	10.02	10.19	10.32
HORIZONTAL ALIGNMENT	R = 350						R = ∞								

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Katahira and Engineers International (KEI)

Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

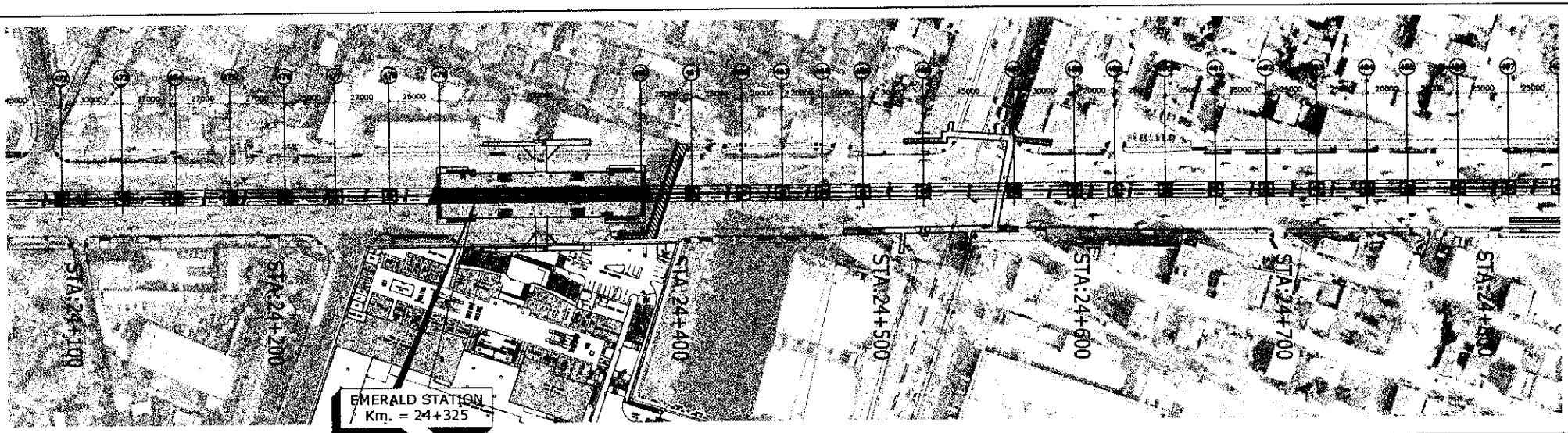
PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

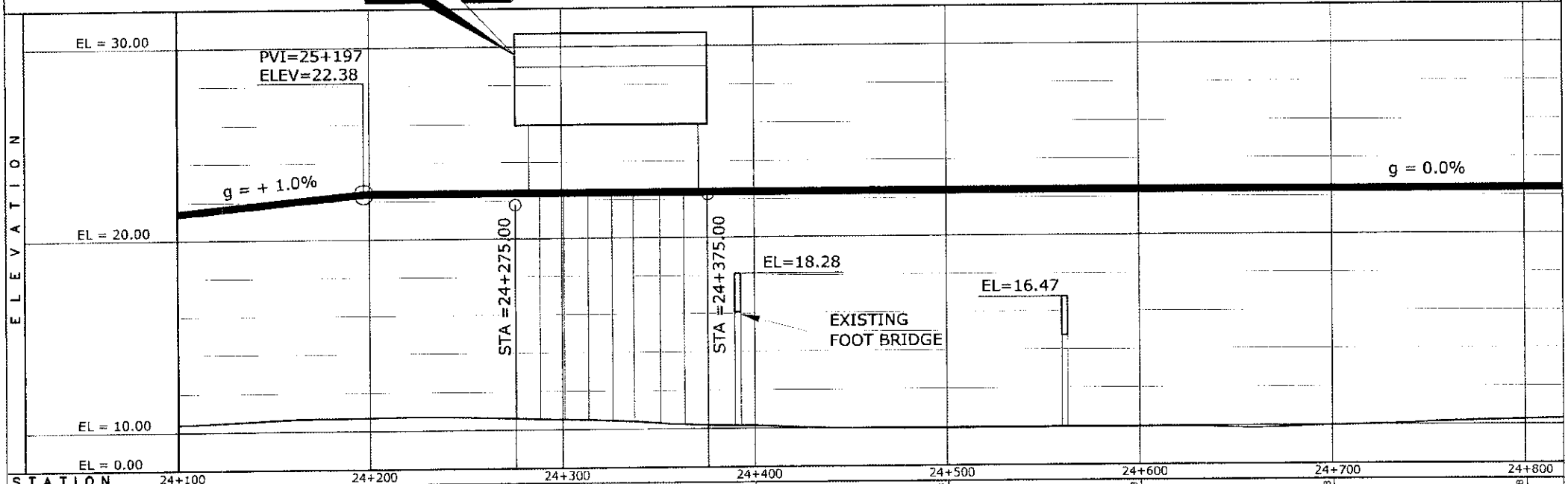
SCALE :
H=1/2000
V=1/200
FULL SIZE A3

DRAWING TITLE :
EAST EXTENSION
PLAN AND PROFILE
KM. 23+400 TO 24+100

DRAWING NO :
E-4

SHEET NO :
7 / 41





STATION	24+100		24+200		24+300		24+400		24+500		24+600		24+700		24+800
RAIL ELEVATION	21.40		22.27		22.38		22.38		22.38		22.38		22.38		22.38
ORIGINAL GRADE	10.32	10.52	10.69	10.70	10.58	10.26	10.15	9.99	9.92	9.71	9.77	9.55	10.00	10.16	10.24
HORIZONTAL ALIGNMENT															

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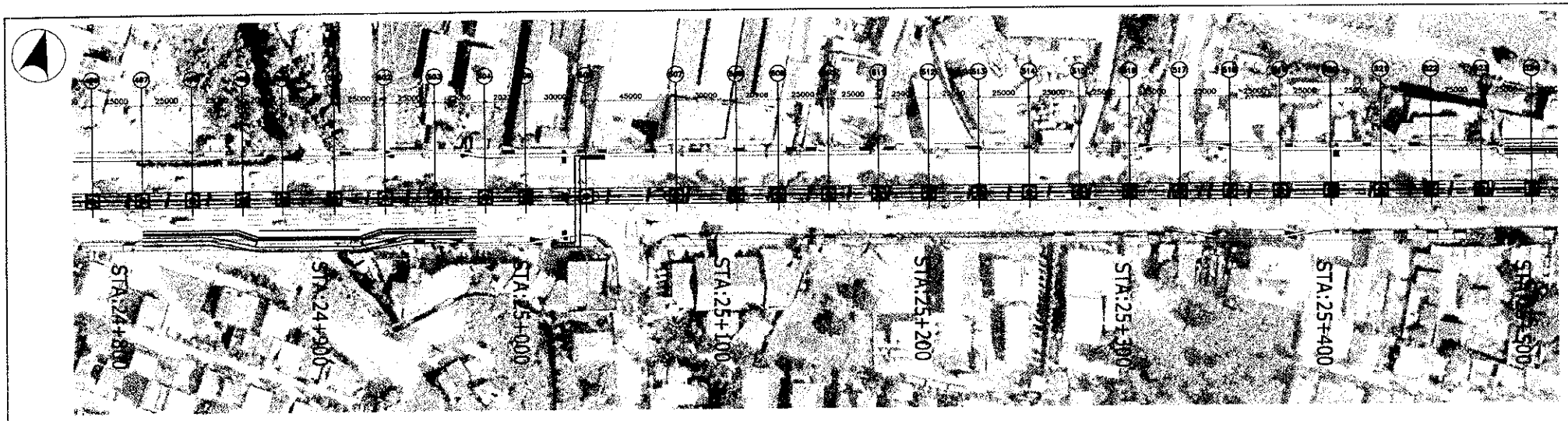
REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

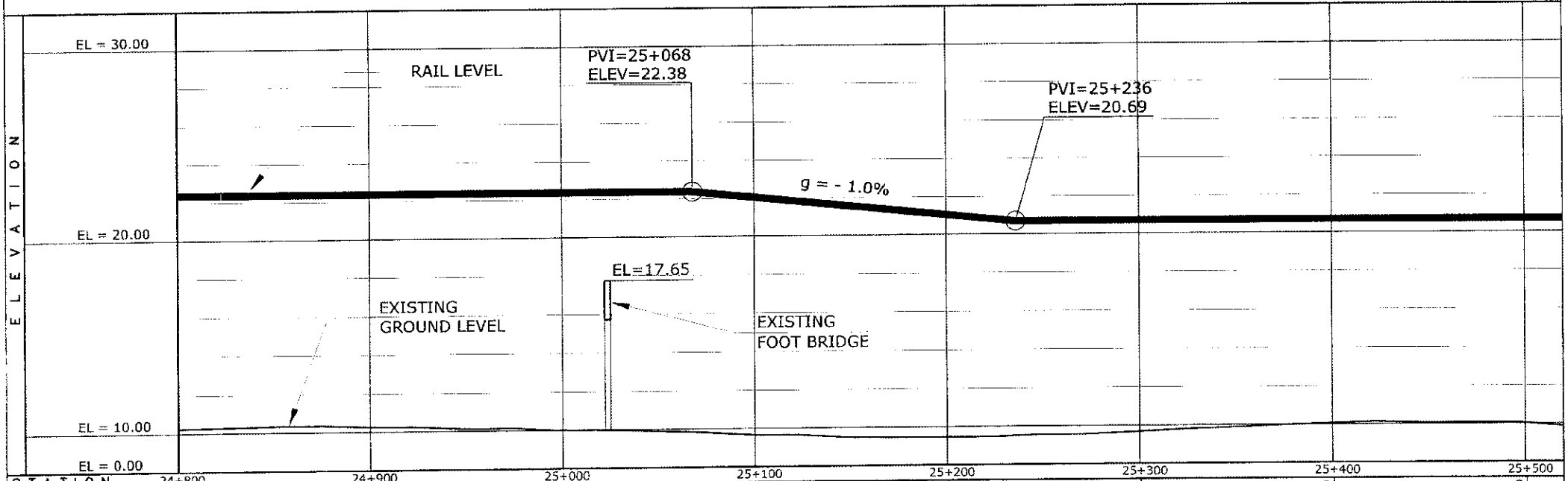
PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

SCALE :
H=1/2000
V=1/200
FULL SIZE A3

DRAWING TITLE :
EAST EXTENSION
PLAN AND PROFILE
KM. 24+100 TO 24+800

DRAWING NO. : E-5
SHEET NO. : 8 / 41





STATION	24+800		24+900		25+000		25+100		25+200		25+300		25+400		25+500
RAIL ELEVATION	22.38		22.38		22.38		22.04		21.05		20.69		20.69		20.69
ORIGINAL GRADE	10.24	10.33	10.28	10.12	10.22	9.94	9.65	9.51	9.43	9.57	9.65	9.88	10.06	10.07	10.04
HORIZONTAL ALIGNMENT	R = ∞														

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REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

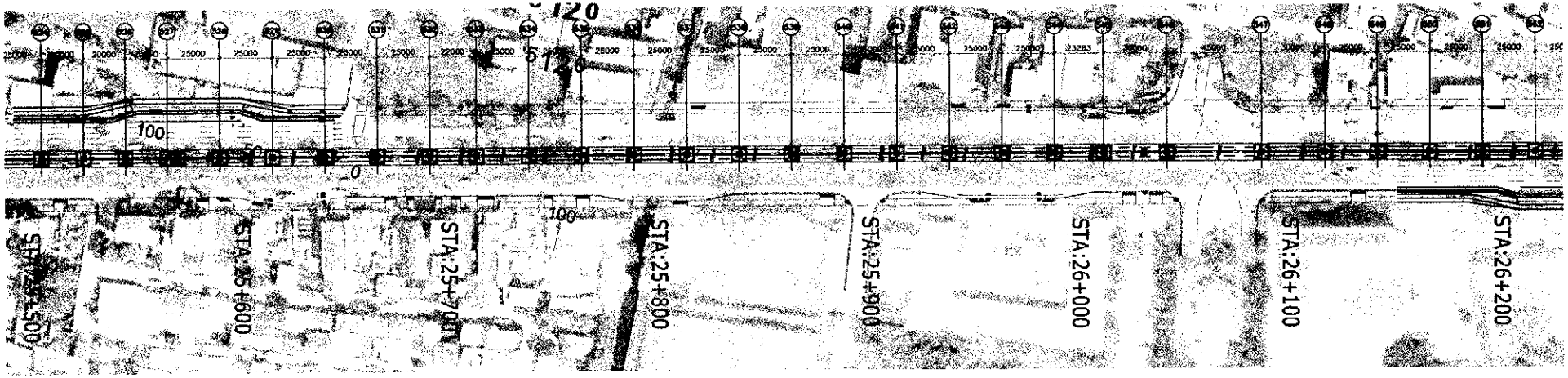
PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

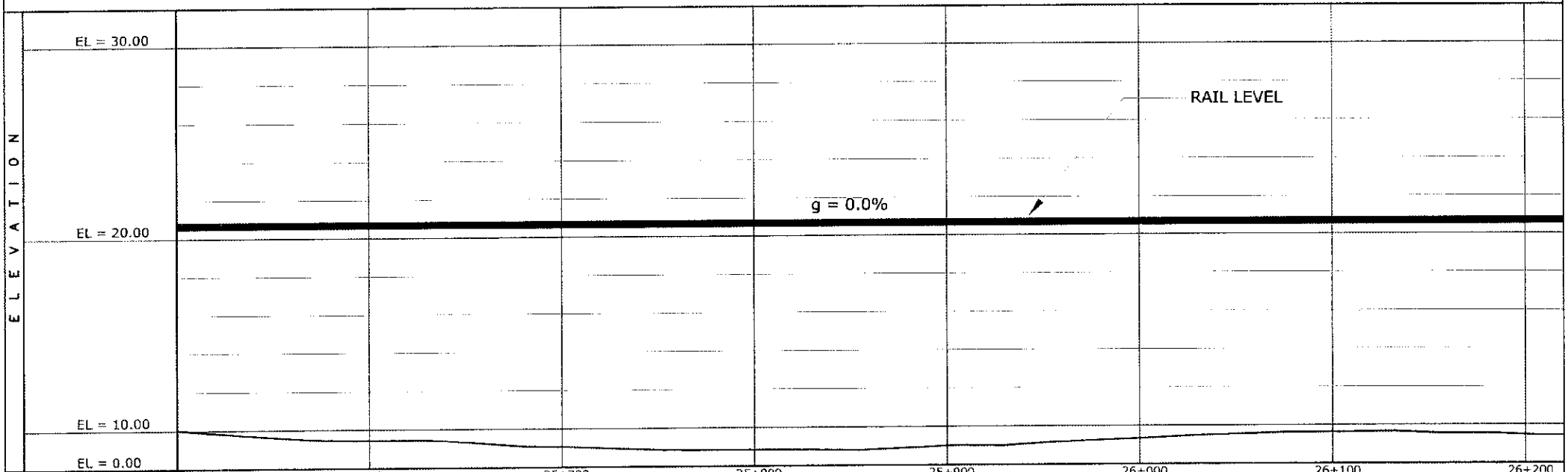
SCALE :
H=1/2000
V=1/200
FULL SIZE A3

DRAWING TITLE :
EAST EXTENSION
PLAN AND PROFILE
KM. 24+800 TO 25+500

DRAWING NO :
E-6

SHEET NO
9 / 41





STATION	25+500		25+600		25+700		25+800		25+900		26+000		26+100		26+200
RAIL ELEVATION	20.69		20.69		20.69		20.69		20.69		20.69		20.69		20.69
ORIGINAL GRADE	10.04	10.63	9.46	9.26	9.07	8.89	8.82	8.82	9.01	9.15	9.35	9.50	9.63	9.61	
HORIZONTAL ALIGNMENT															

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REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

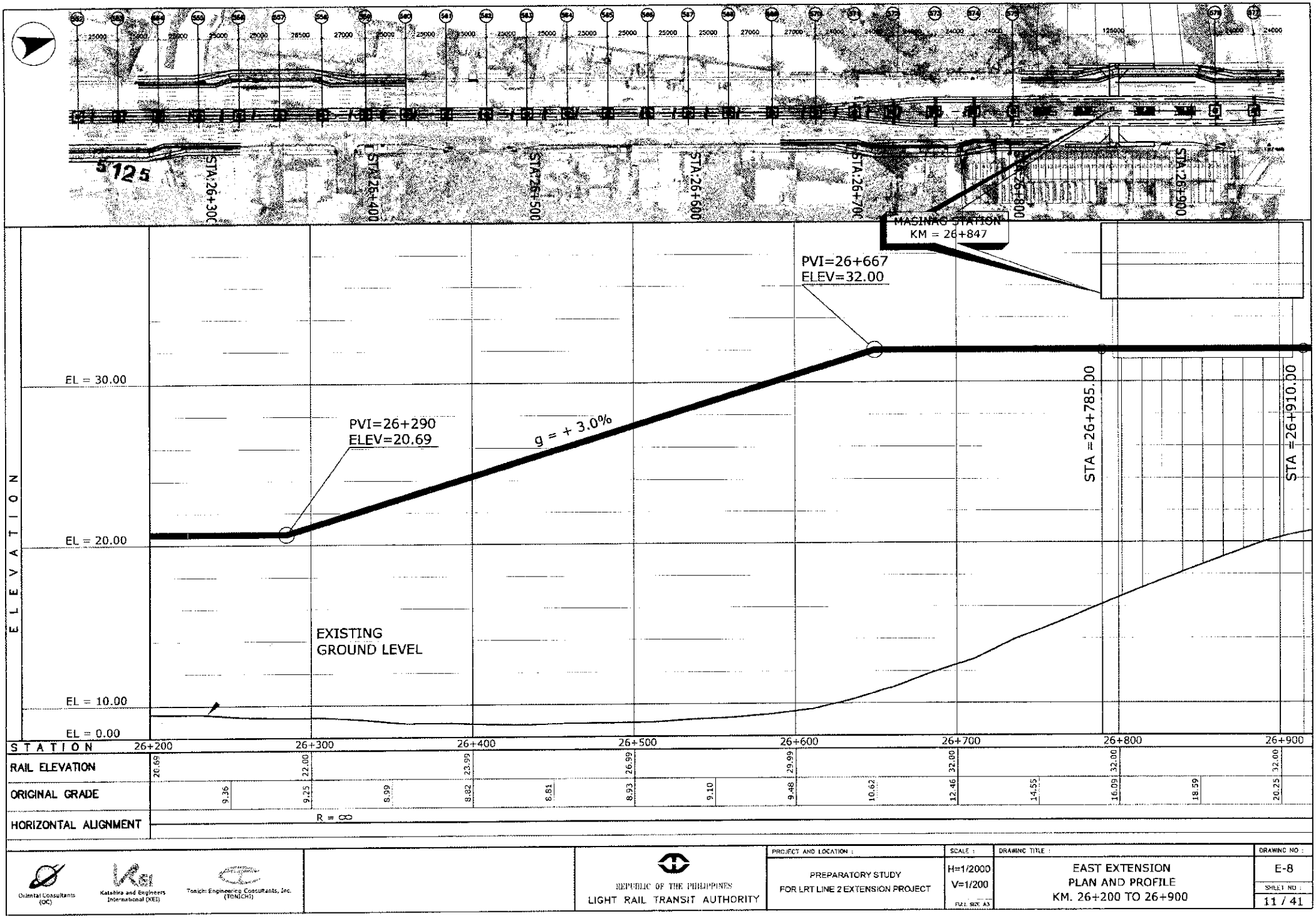
PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

SCALE :
H=1/2000
V=1/200
FULL SIZE A1

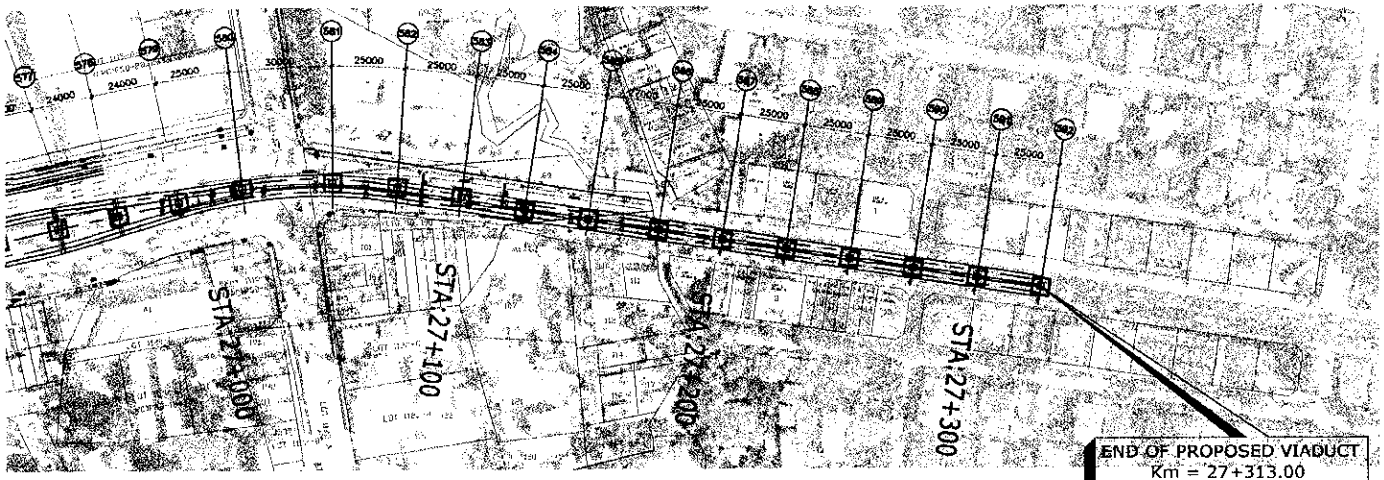
DRAWING TITLE
EAST EXTENSION
PLAN AND PROFILE
KM. 25+500 TO 26+200

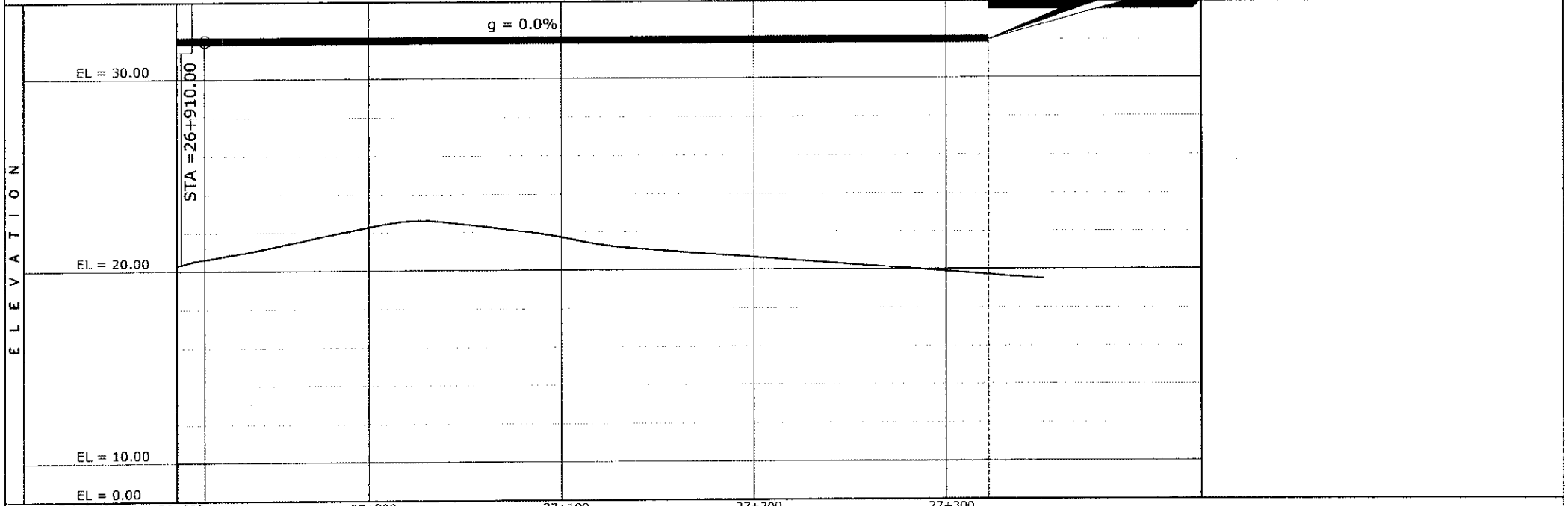
DRAWING NO : E-7

SHEET NO : 10 / 41



Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : H=1/2000 V=1/200 FULL SIZE A3	DRAWING TITLE : EAST EXTENSION PLAN AND PROFILE KM. 26+200 TO 26+900	DRAWING NO : E-8 SHEET NO : 11 / 41





STATION	26+900	27+000	27+100	27+200	27+300
RAIL ELEVATION	32.00	32.00	32.00	32.00	32.00
ORIGINAL GRADE	20.25	21.24	22.18 / 22.42	21.70 / 21.03	20.65 / 20.25 / 19.87
HORIZONTAL ALIGNMENT		R = 180		R = ∞	

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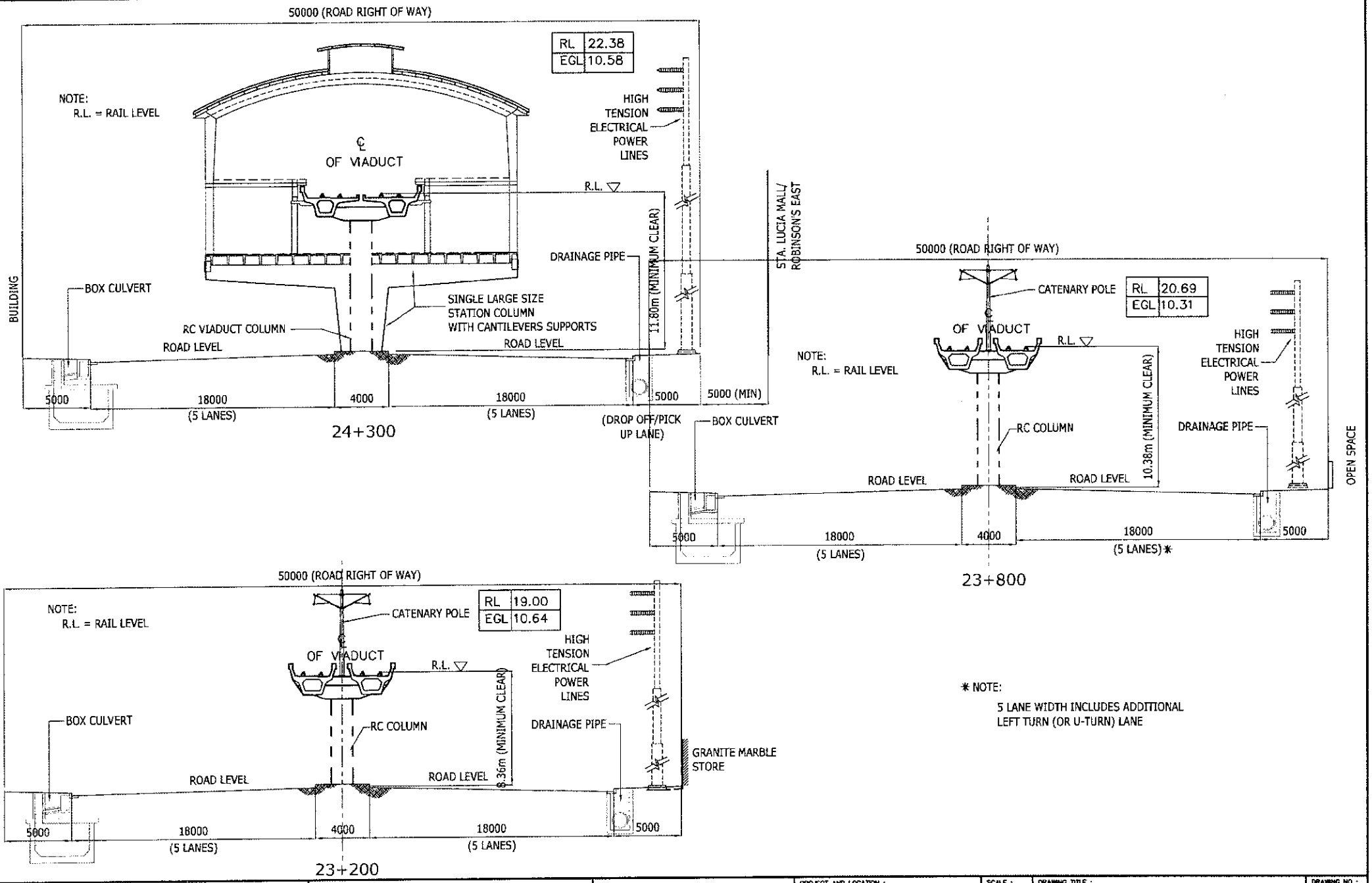
REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

SCALE :
H=1/2000
V=1/200
FULL SIZE A3

DRAWING TITLE :
EAST EXTENSION
PLAN AND PROFILE
KM. 26+900 TO 27+322

DRAWING NO : E-9
SHEET NO : 12 / 41



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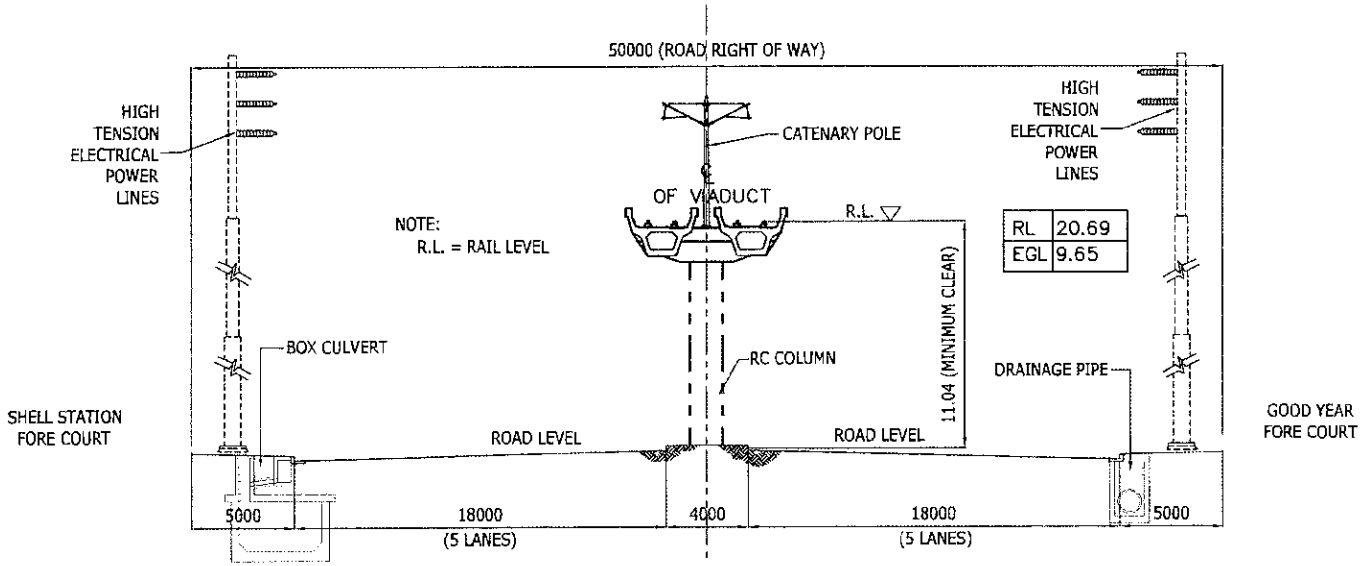
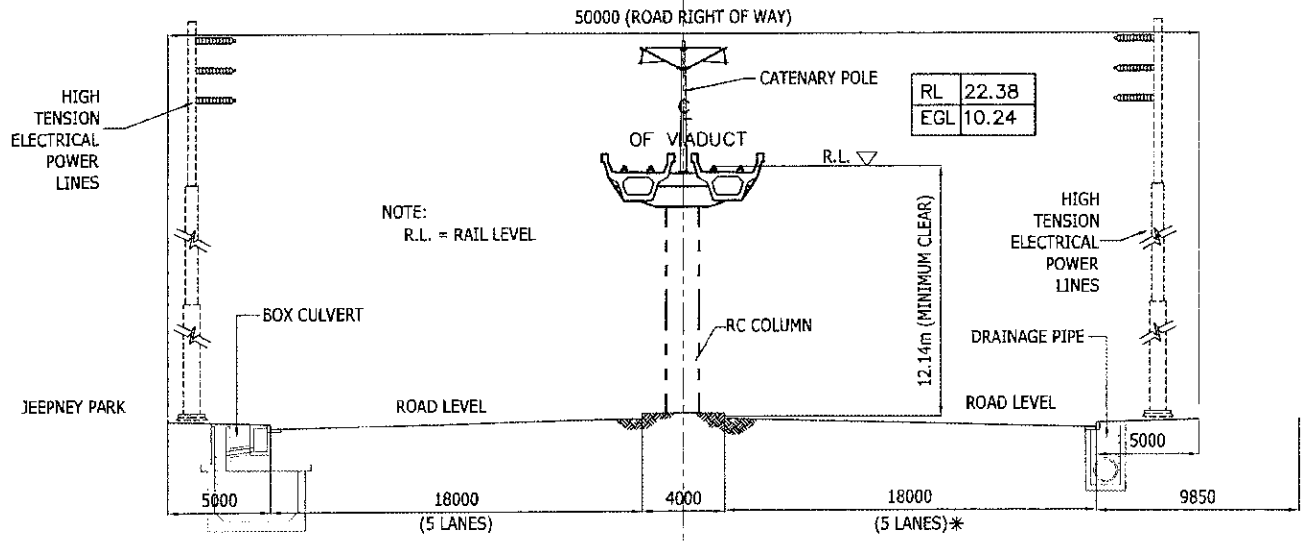
REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	1 : 250 FULL SIZE A3	EAST EXTENSION CROSS SECTION KM = 23+200 TO KM = 24+300	E-10 SHEET NO : 13 / 41



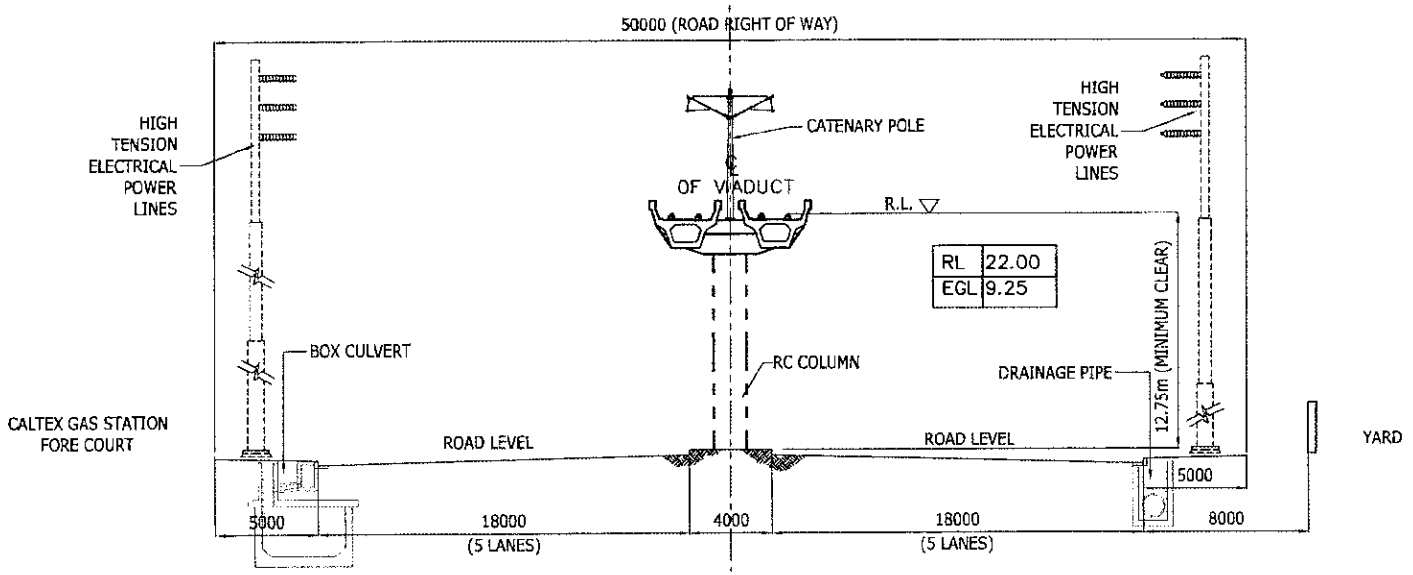
25+300



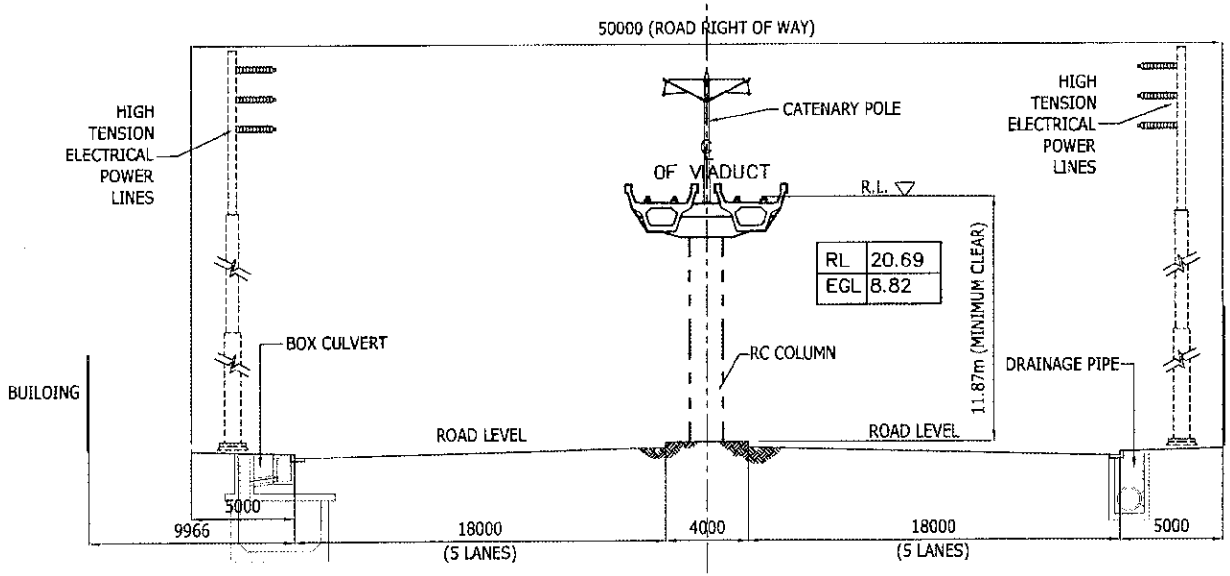
24+800

* NOTE:
5 LANE WIDTH INCLUDES ONE LEFT TURN (U-TURN) LANE

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 250 FULL SIZE A3	DRAWING TITLE : EAST EXTENSION CROSS SECTION KM = 24+800 TO KM = 25+300	DRAWING NO : E-11 SHEET NO : 14 / 41



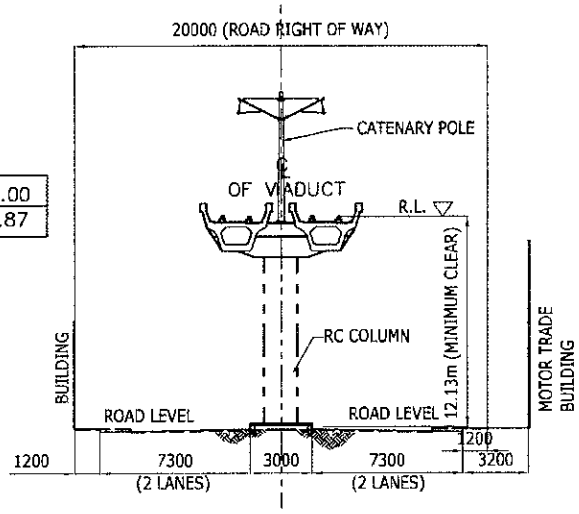
26+300



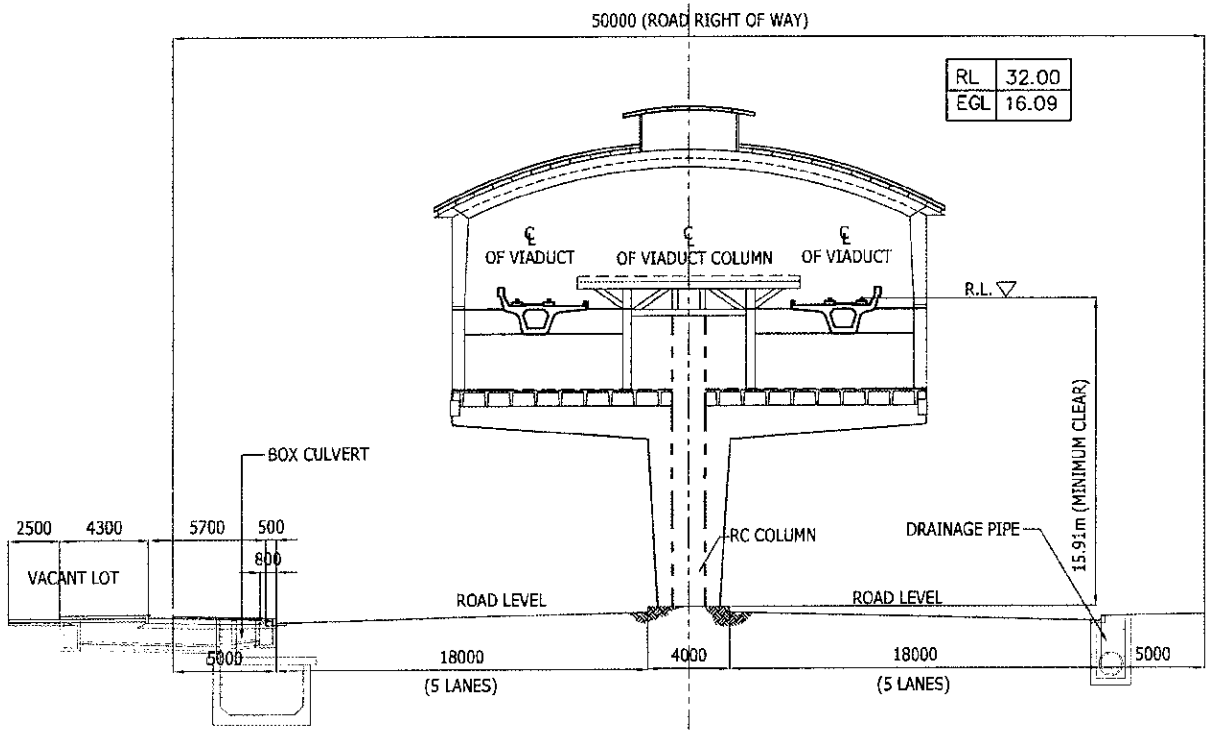
25+800

NOTE:
R.L. = RAIL LEVEL

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 250 FULL SIZE A3	DRAWING TITLE : EAST EXTENSION CROSS SECTION KM = 25+800 TO KM = 26+300	DRAWING NO : E-12 SHEET NO : 15 / 41



27+300

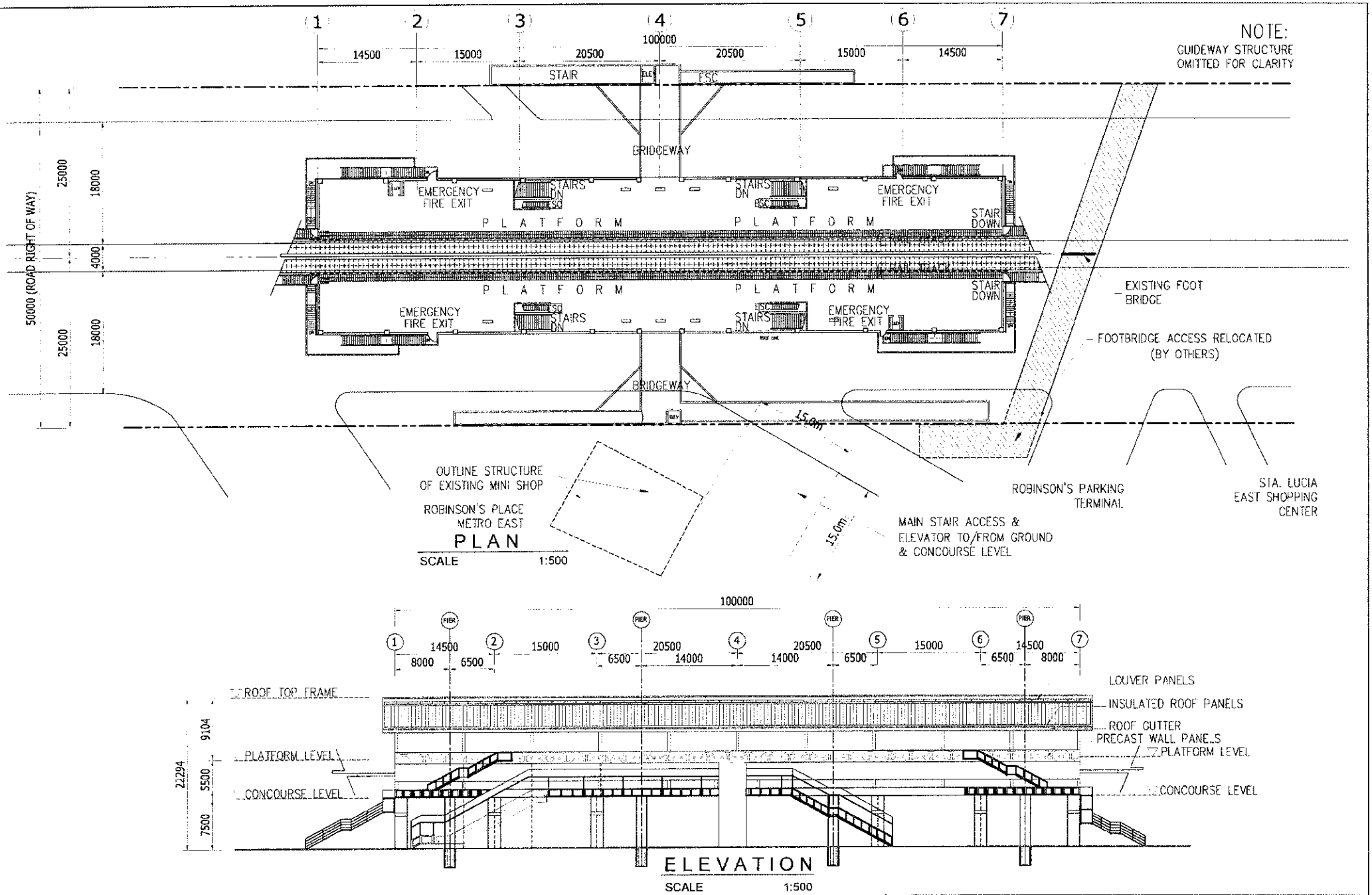


NOTE:
R.L. = RAIL LEVEL

26+800

Oriental Consultants (OC) / Katahira and Engineers International (K&I) / Tonichi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 250 FULL SIZE A3	DRAWING TITLE : EAST EXTENSION CROSS SECTION KM = 26+800 TO KM = 27+300

DRAWING NO : E-13
SHEET NO : 16 / 41



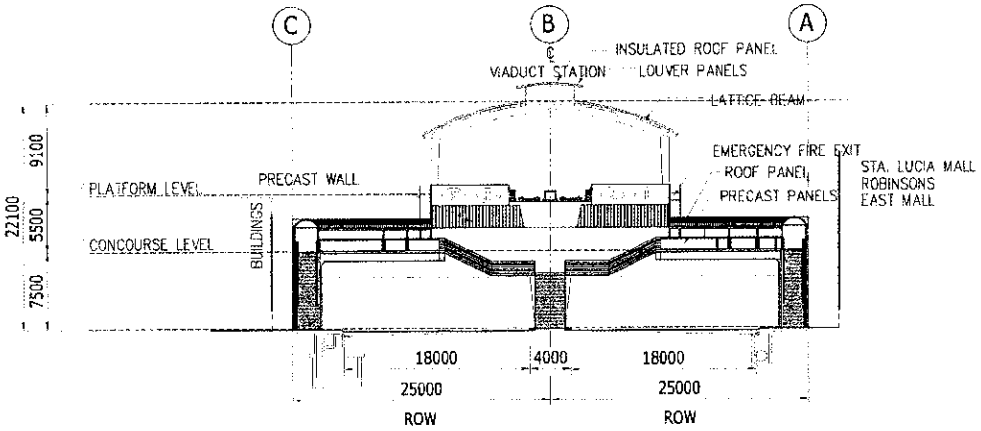
Oriental Consultants (OC)

Katahira and Engineers International (KEI)

Tonichi Engineering Consultants, Inc. (TONICHI)

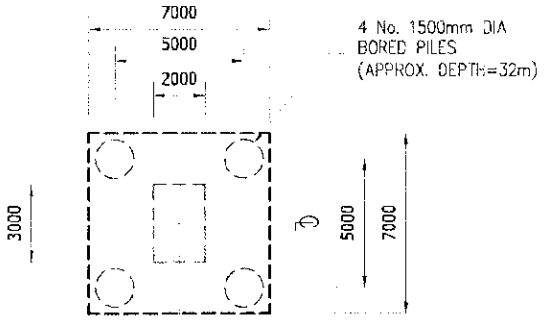
REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	1 : 500 FULL SIZE A3	EAST EXTENSION EMERALD STATION PLAN & ELEVATION	E-14
			SHEET NO : 17 / 41



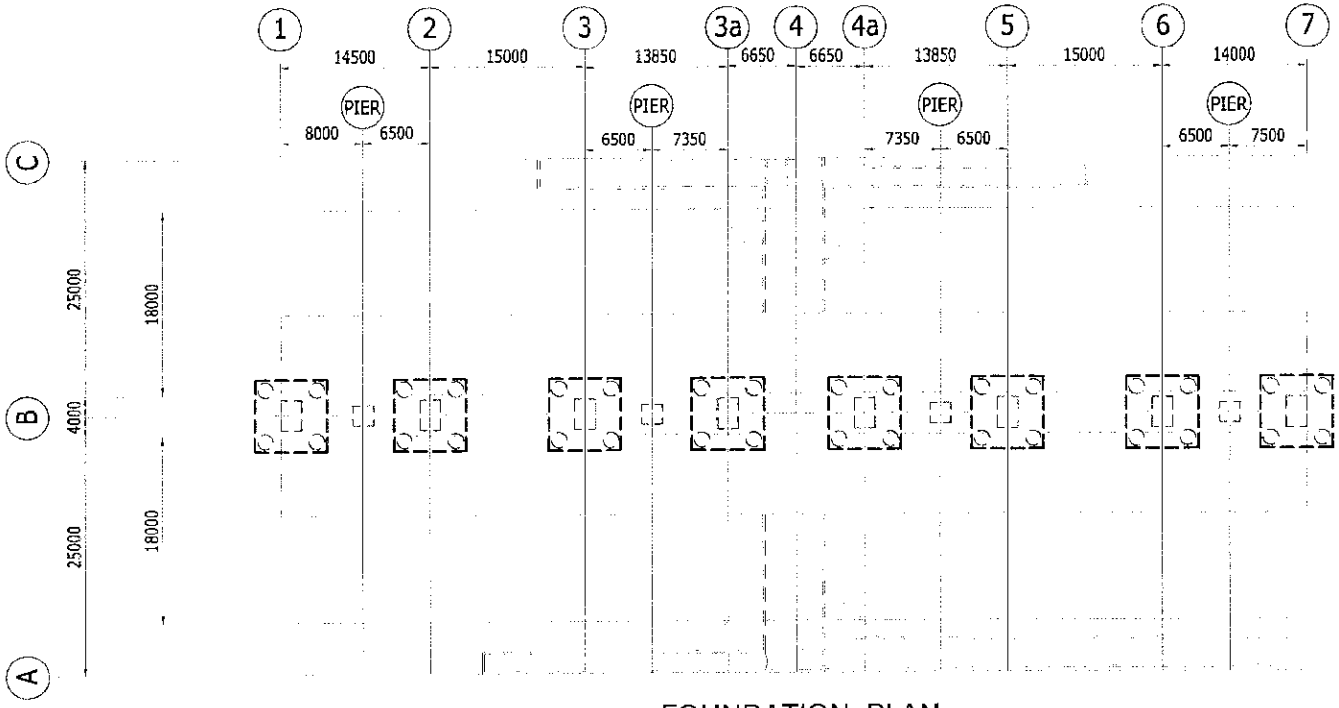
ELEVATION

SCALE 1 : 500



TYPICAL PILE CAP PLAN

SCALE 1 : 200



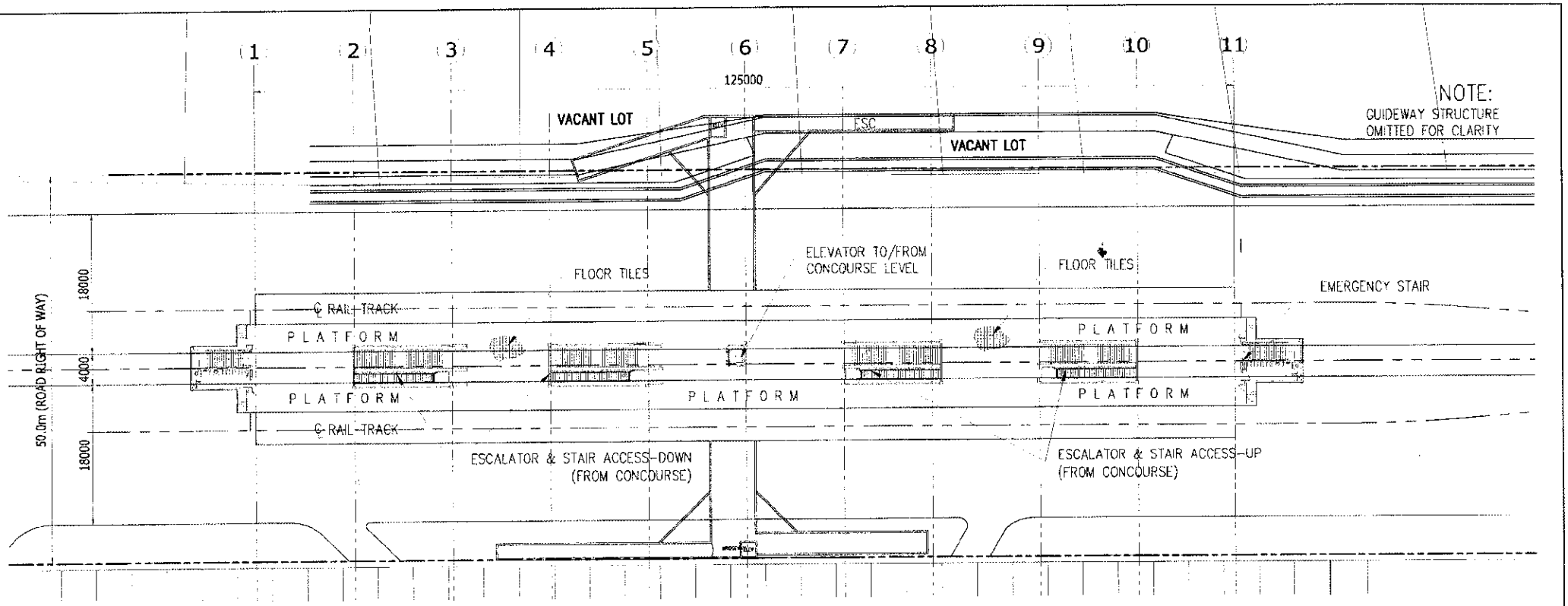
FOUNDATION PLAN

SCALE 1 : 500

Oriental Consultants (OC) | Katahira and Engineers International (KEI) | Tonichi Engineering Consultants, Inc. (TONICHI)

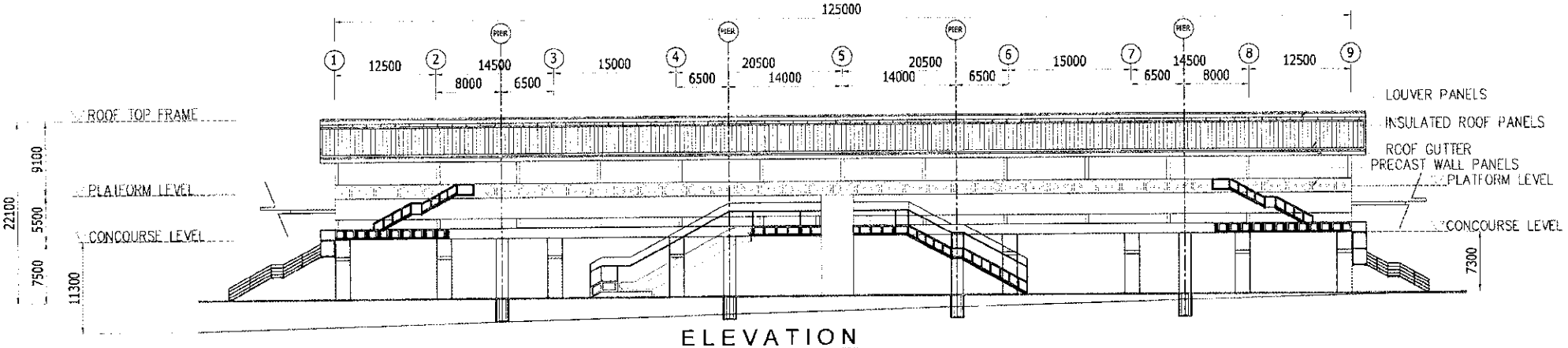
REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	1 : 500 1 : 200 FULL SIZE A3	EAST EXTENSION EMERALD STATION SECTIONS	E-15 SHEET NO : 18 / 41



PLAN

SCALE 1:500



ELEVATION

SCALE 1:500

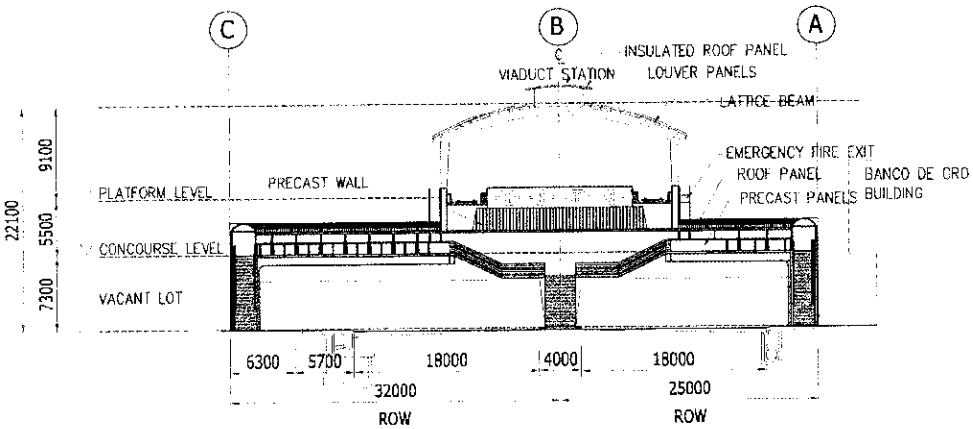
Oriental Consultants (OC)

Katahira and Engineers International (KEI)

Tonichi Engineering Consultants, Inc. (TONICHI)

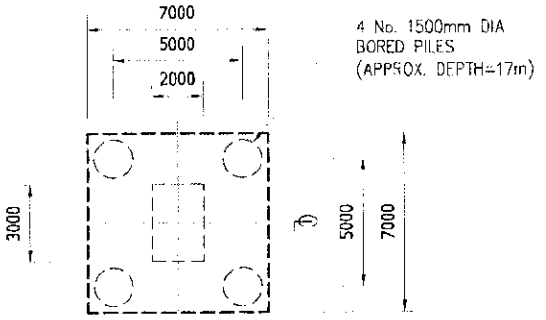
REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	1 : 500 (FULL SIZE A3)	EAST EXTENSION MASINAG STATION PLAN & ELEVATION	E-16
			SHEET NO : 19 / 41



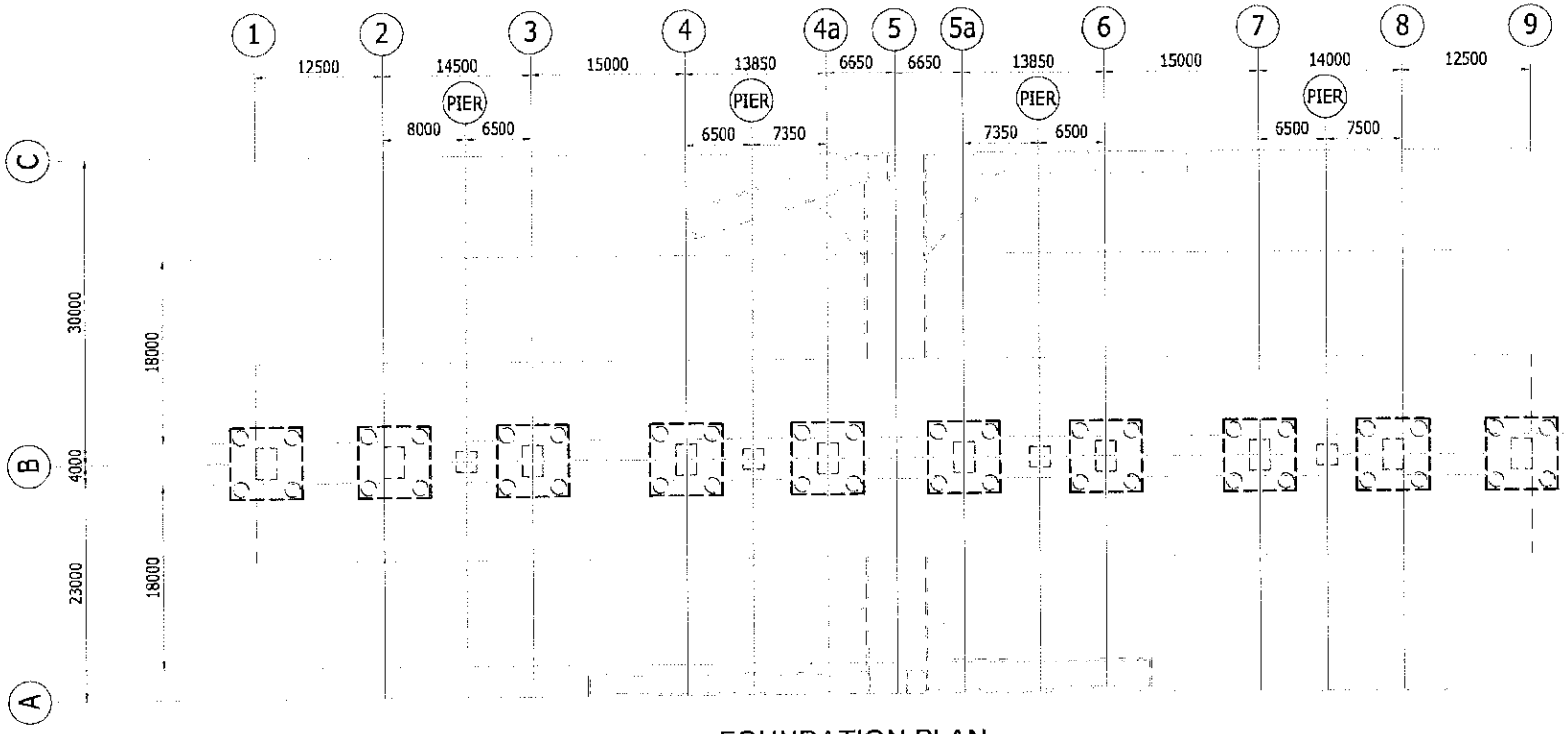
ELEVATION

SCALE 1 : 500



TYPICAL PILE CAP PLAN

SCALE 1 : 200



FOUNDATION PLAN

SCALE 1 : 500

Oriental Consultants (OC)

Katahira and Engineers International (KEI)

Yunichi Engineering Consultants, Inc. (YONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

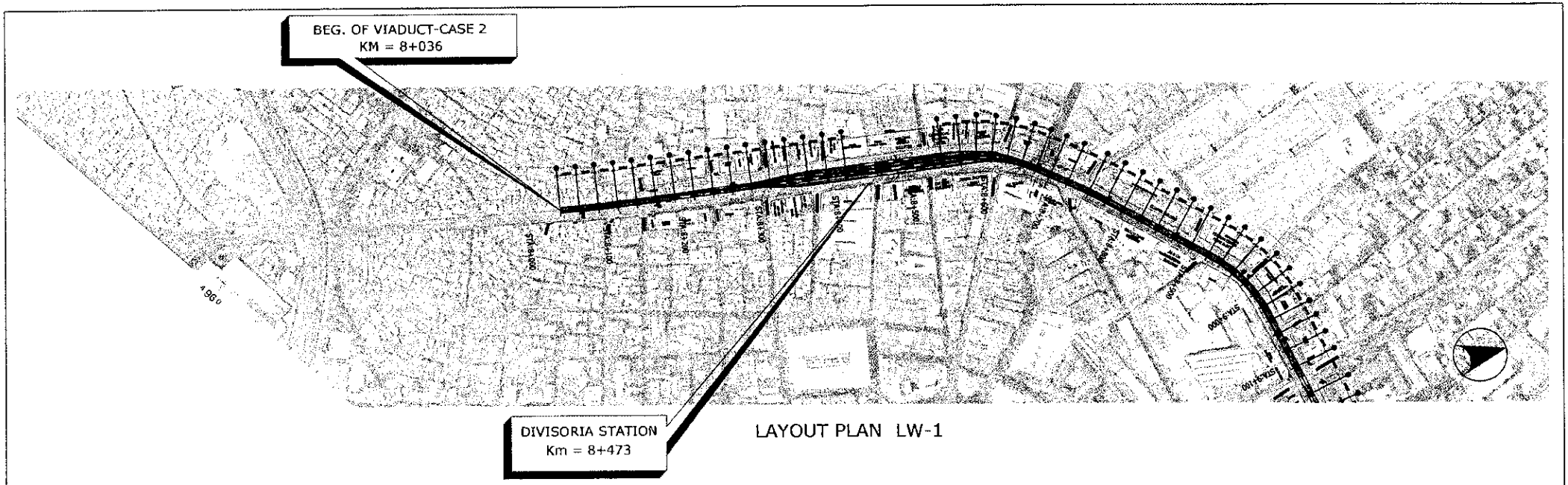
PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

SCALE :
1 : 500
1 : 200
FULL SIZE A3

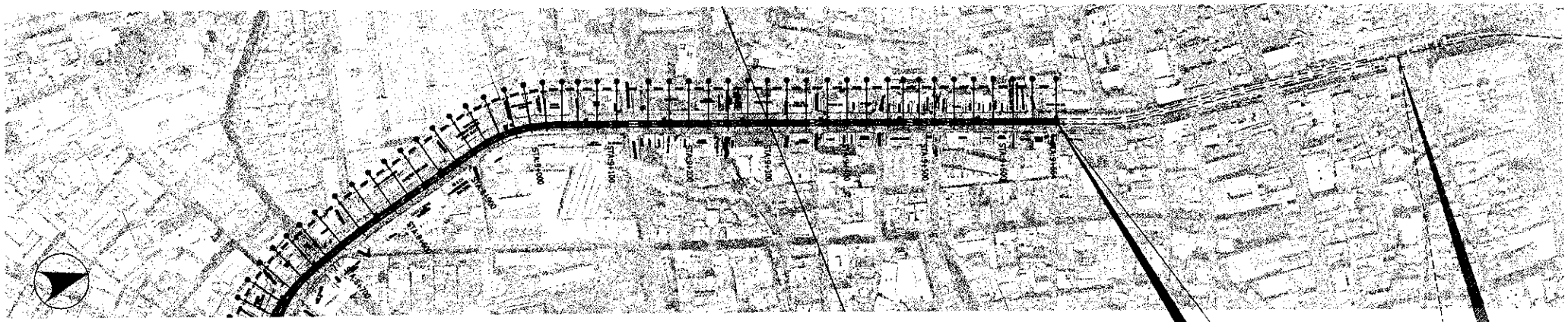
DRAWING TITLE :
EAST EXTENSION
MASINAG STATION
SECTIONS

DRAWING NO :
E-17

SHEET NO :
20 / 41



LAYOUT PLAN LW-1

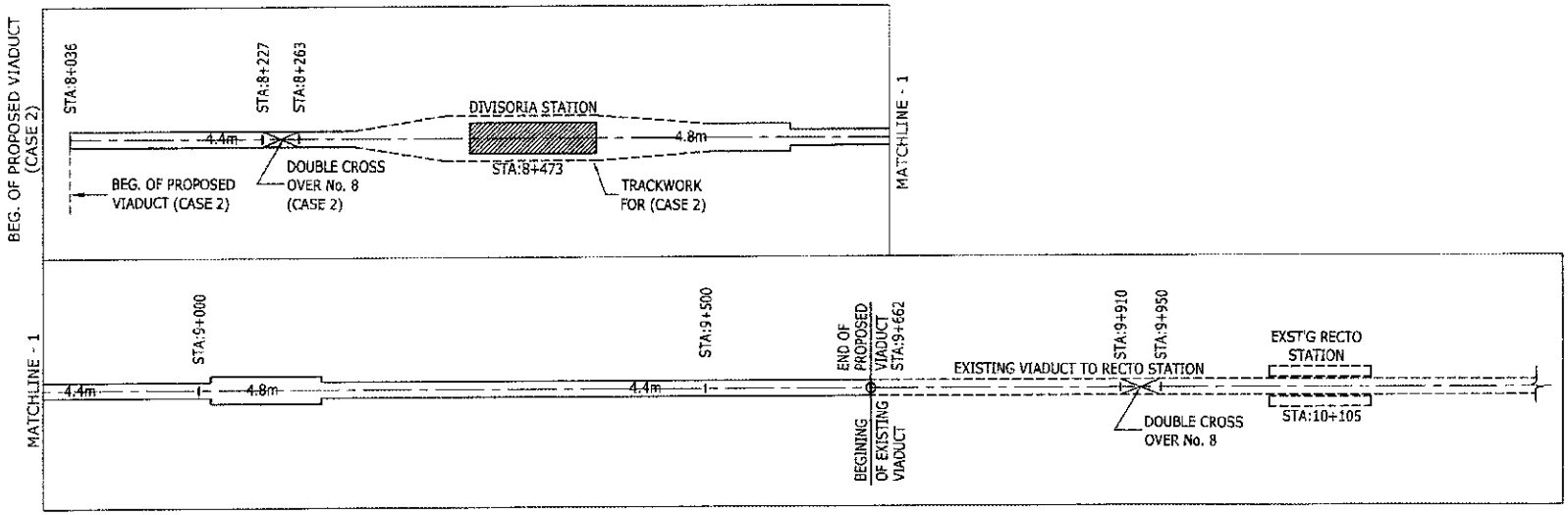


LAYOUT PLAN LW-2

END OF NEW VIADUCT
BEG. OF EXT'G VIADUCT
Km.= 9+662

EXISTING RECTO STATION

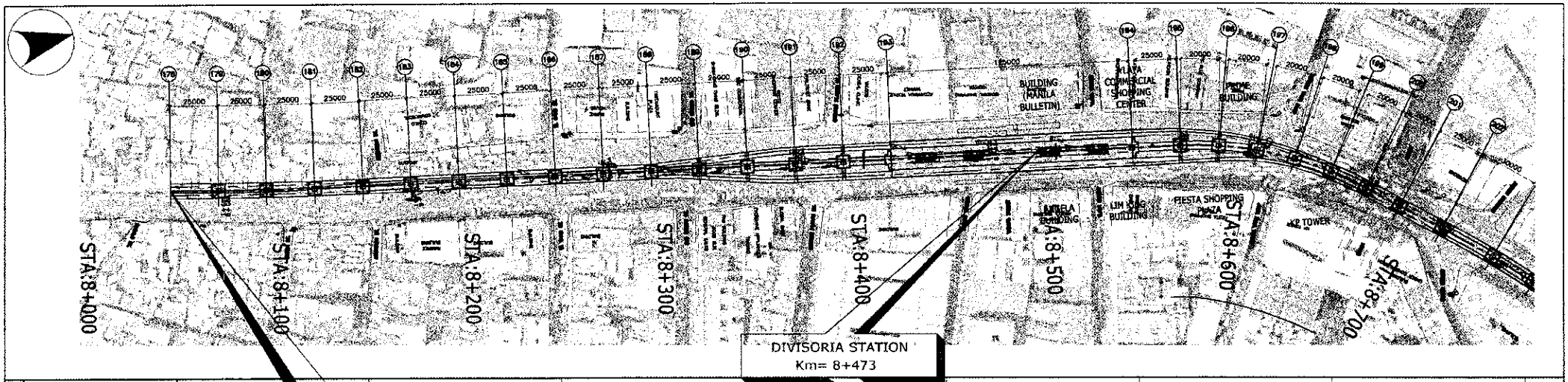
Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 5000 FULL SIZE A3	DRAWING TITLE : WEST EXTENSION LAYOUT PLAN	DRAWING NO : W-1 SHEET NO : 21 / 41

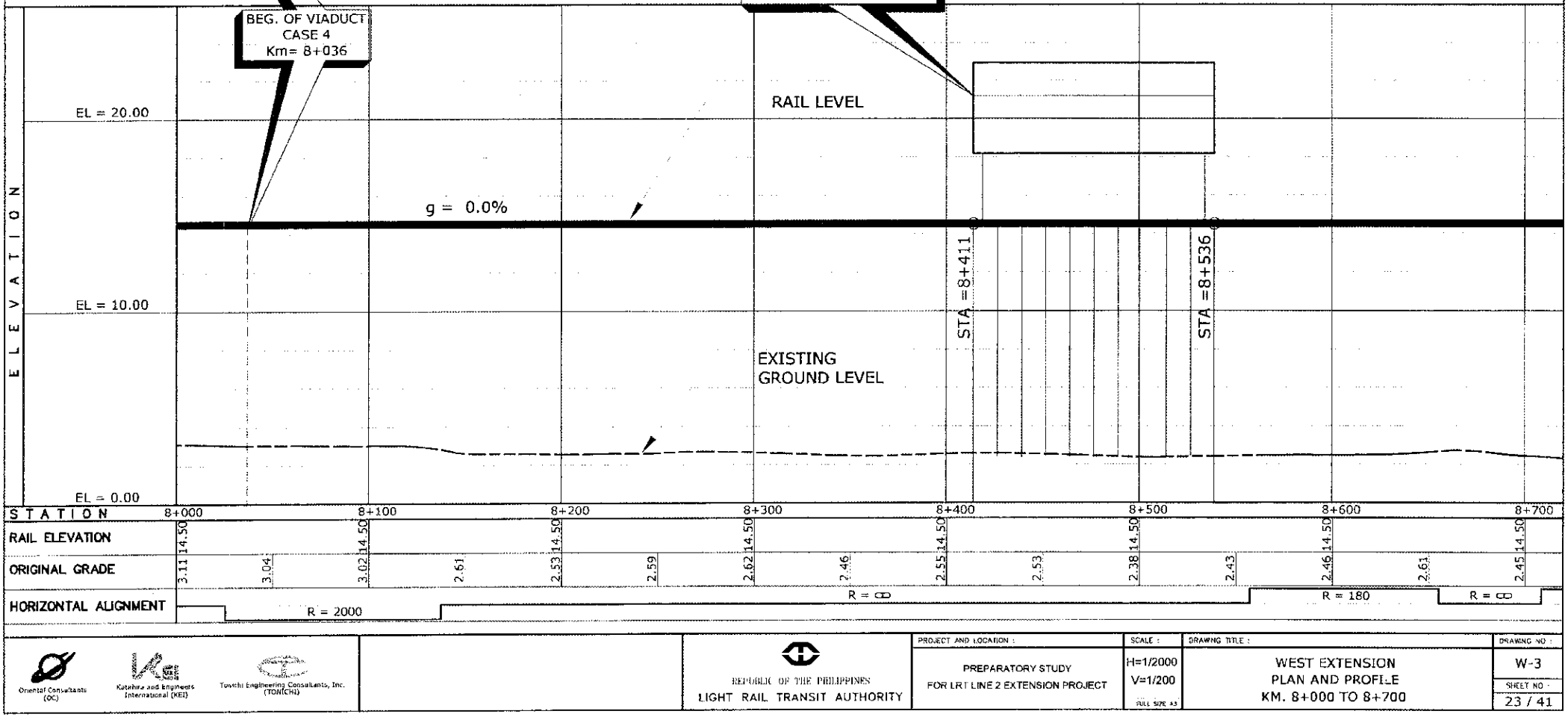


PLAN ON TRACKWORK

NOT TO SCALE

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : N T S FULL SIZE A3	DRAWING TITLE : WEST EXTENSION LAYOUT OF TRACKWORK	DRAWING NO : W-2 SHEET NO : 22 / 41





Oriental Consultants (OC)

Katahira and Engineers International (KEI)

Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

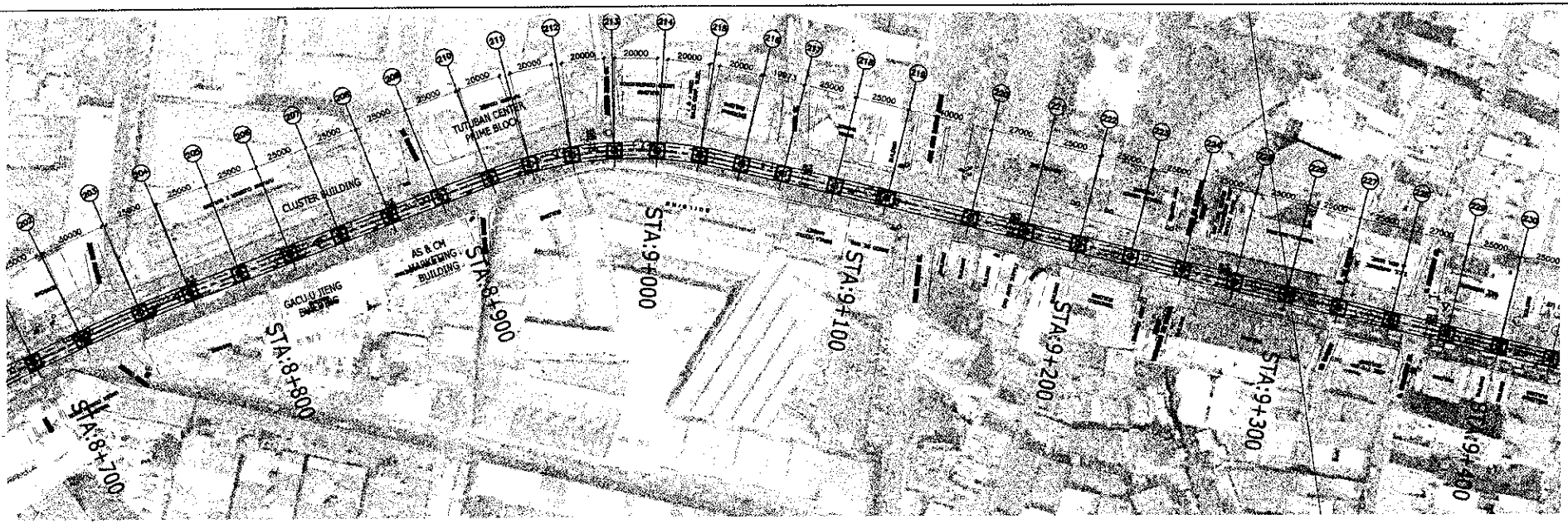
PROJECT AND LOCATION :
PREPARATORY STUDY
FOR LRT LINE 2 EXTENSION PROJECT

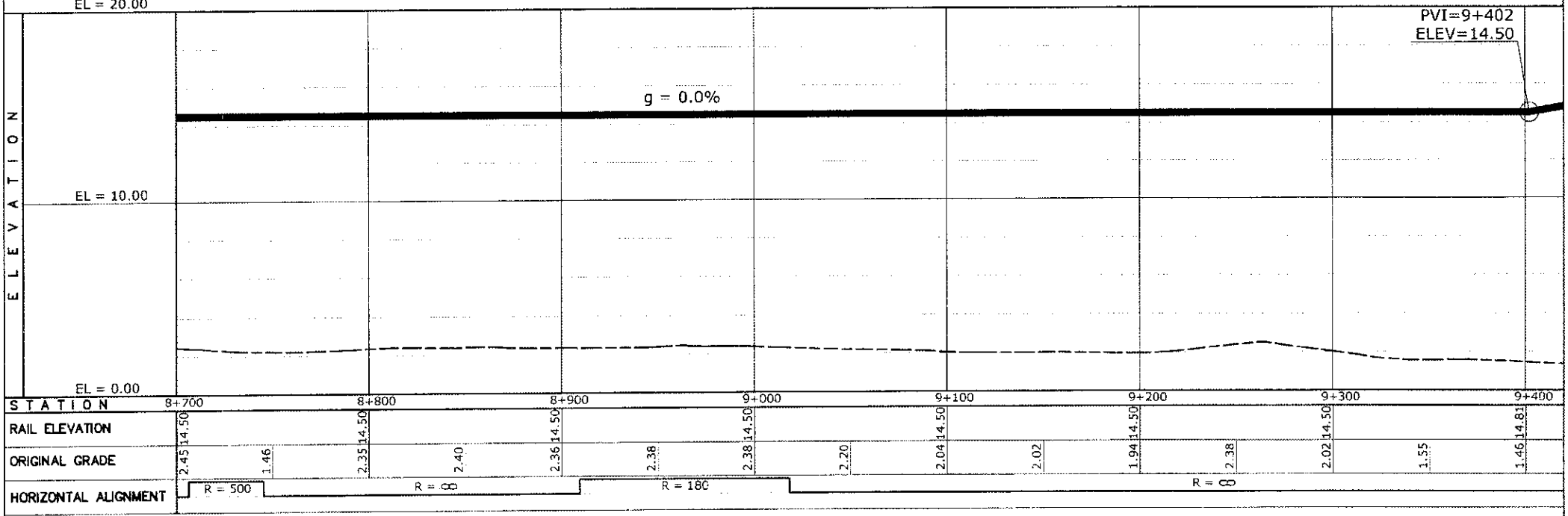
SCALE :
H=1/2000
V=1/200
FULL SIZE A3

DRAWING TITLE :
WEST EXTENSION
PLAN AND PROFILE
KM. 8+000 TO 8+700

DRAWING NO :
W-3

SHEET NO :
23 / 41

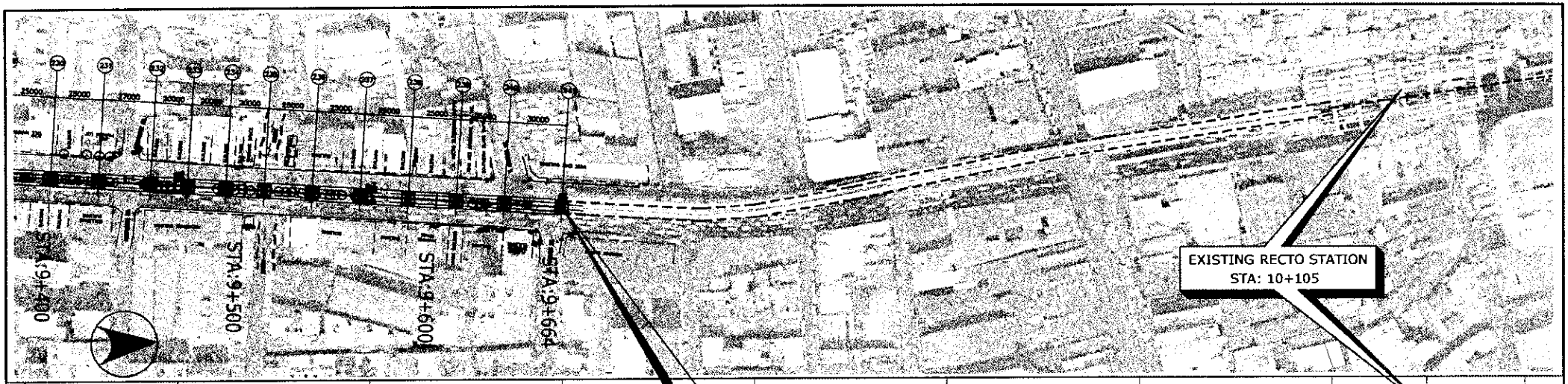


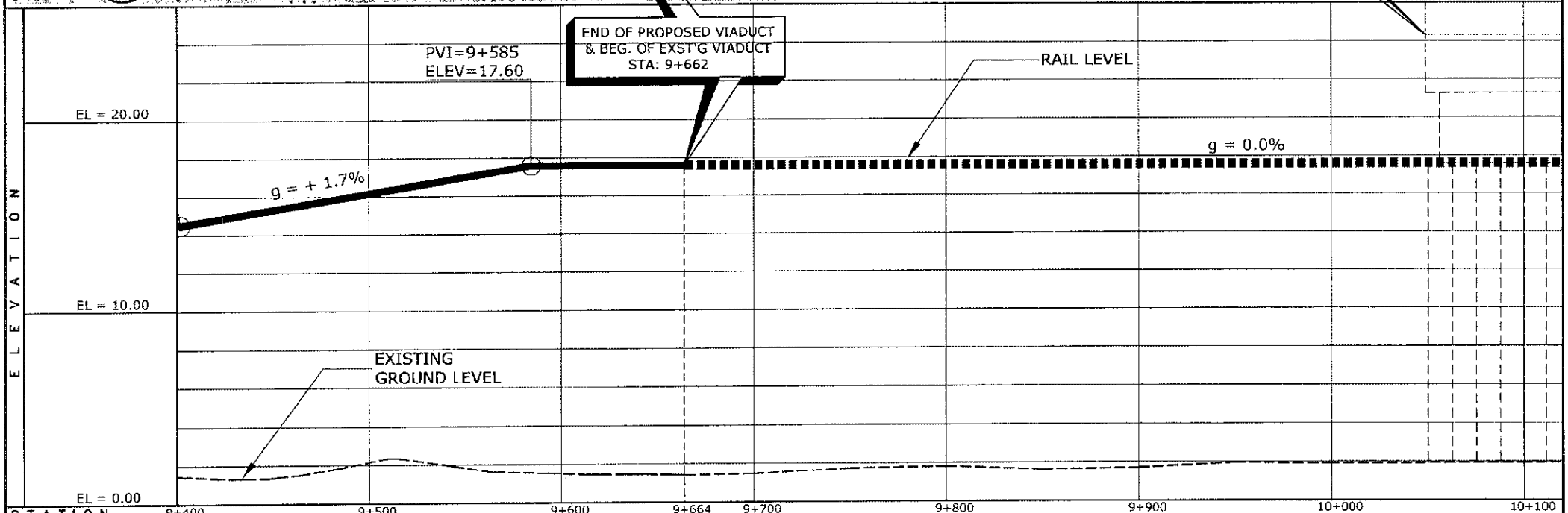


Oriental Consultants (OC)
Katahira and Engineers International (KEI)
Tonichi Engineering Consultants, Inc. ("ONTECH")

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	H=1/2000 V=1/200 FULL SIZE A3	WEST EXTENSION PLAN AND PROFILE KM. 8+700 TO 9+400	W-4
			SHEET NO : 24 / 41



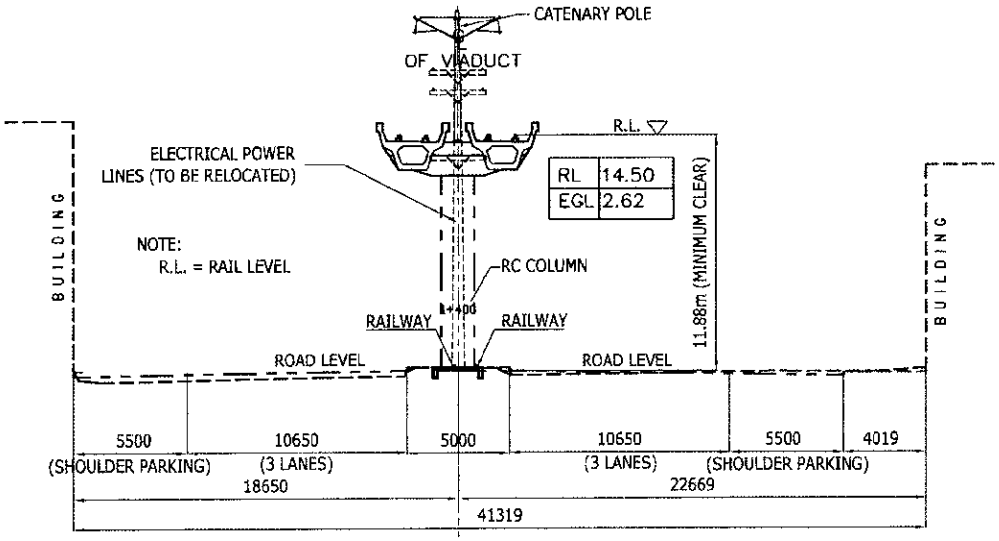


STATION	9+400	9+500	9+600	9+664	9+700	9+800	9+900	10+000	10+100
RAIL ELEVATION	14.81	16.17	17.40	17.60		17.60	17.60	17.60	17.60
ORIGINAL GRADE	1.46 / 1.38	2.16 / 1.84	1.52 / 1.84	1.42	1.84 / 1.72	1.81 / 1.67	1.71 / 1.95	1.90	1.93
HORIZONTAL ALIGNMENT	R = ∞								

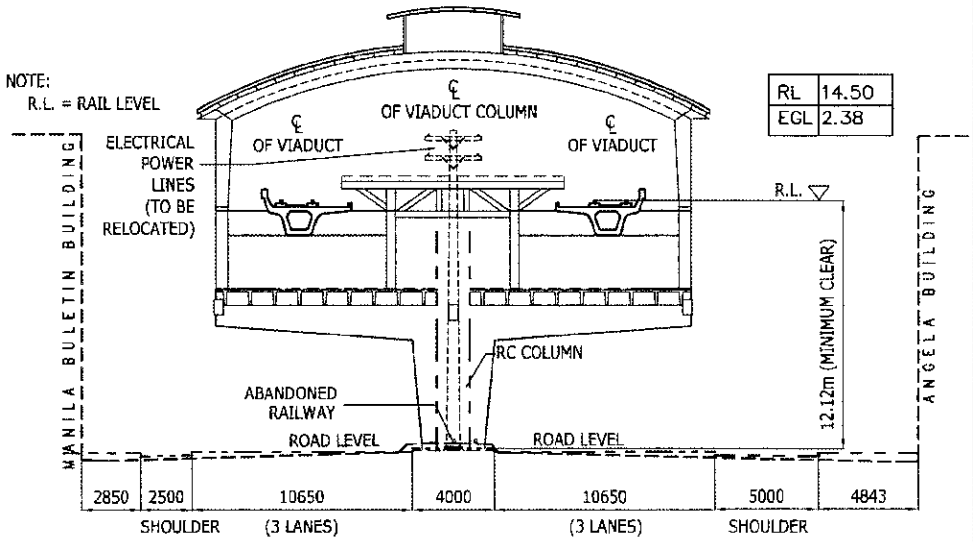
Oriental Consultants (OC) | Katahira and Engineers International (KE) | Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

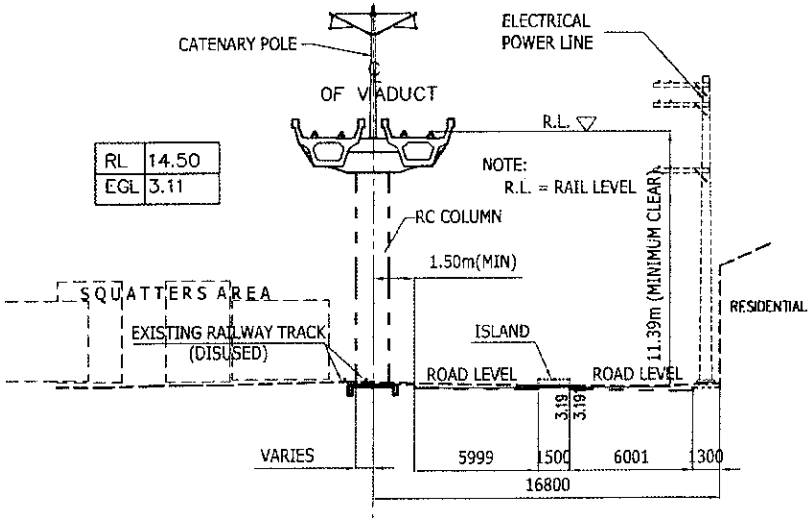
PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	H=1/2000 V=1/200 FULL SIZE A3	WEST EXTENSION PLAN AND PROFILE KM. 9+400 TO 10+100	W-5 SHEET NO : 25 / 41



8+300

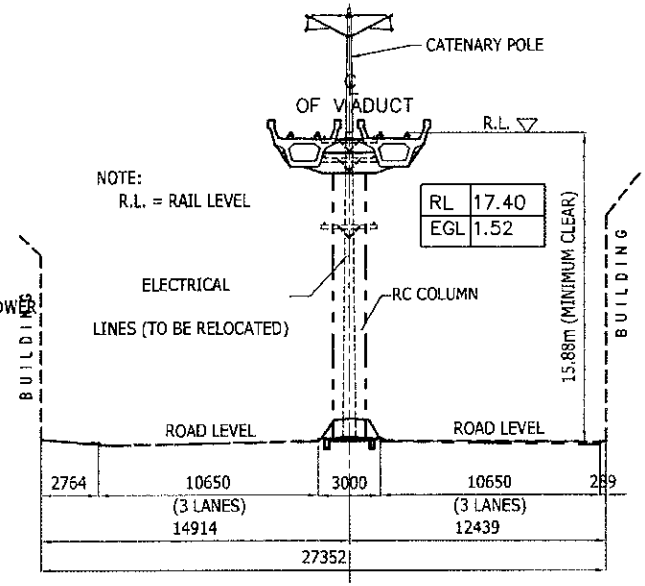


8+500

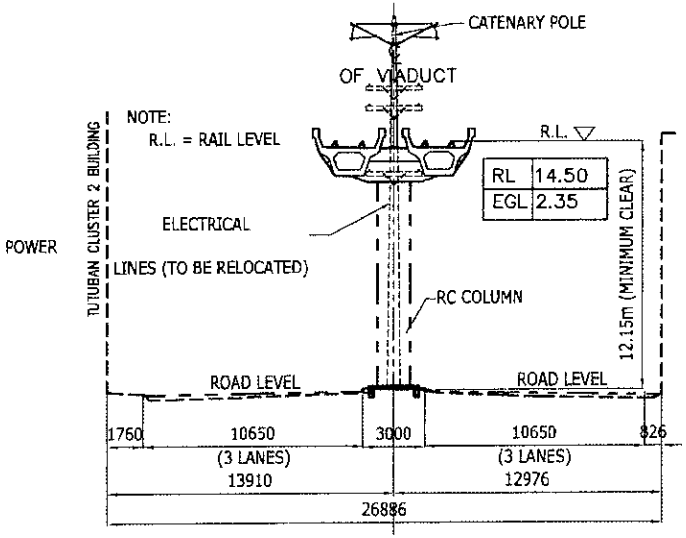


8+050

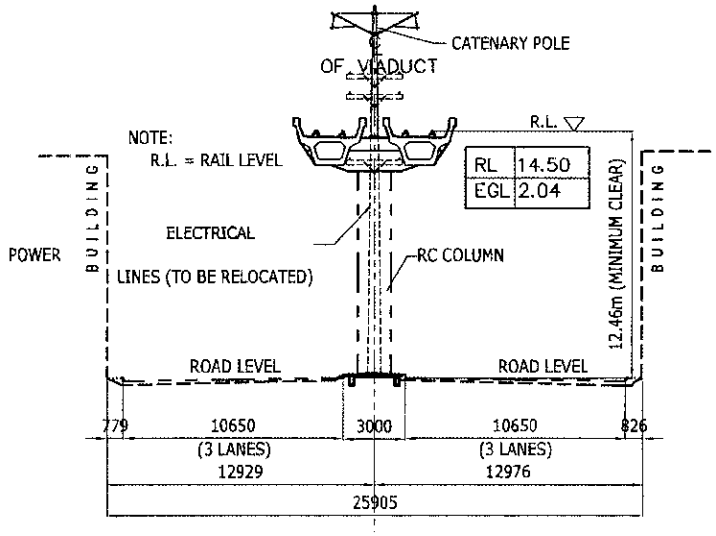
Orientel Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 250 FULL SIZE A3	DRAWING TITLE : WEST EXTENSION CROSS SECTION KM = 7+600 TO KM = 8+500	DRAWING NO : W-6 SHEET NO : 26 / 41



9+600



8+800

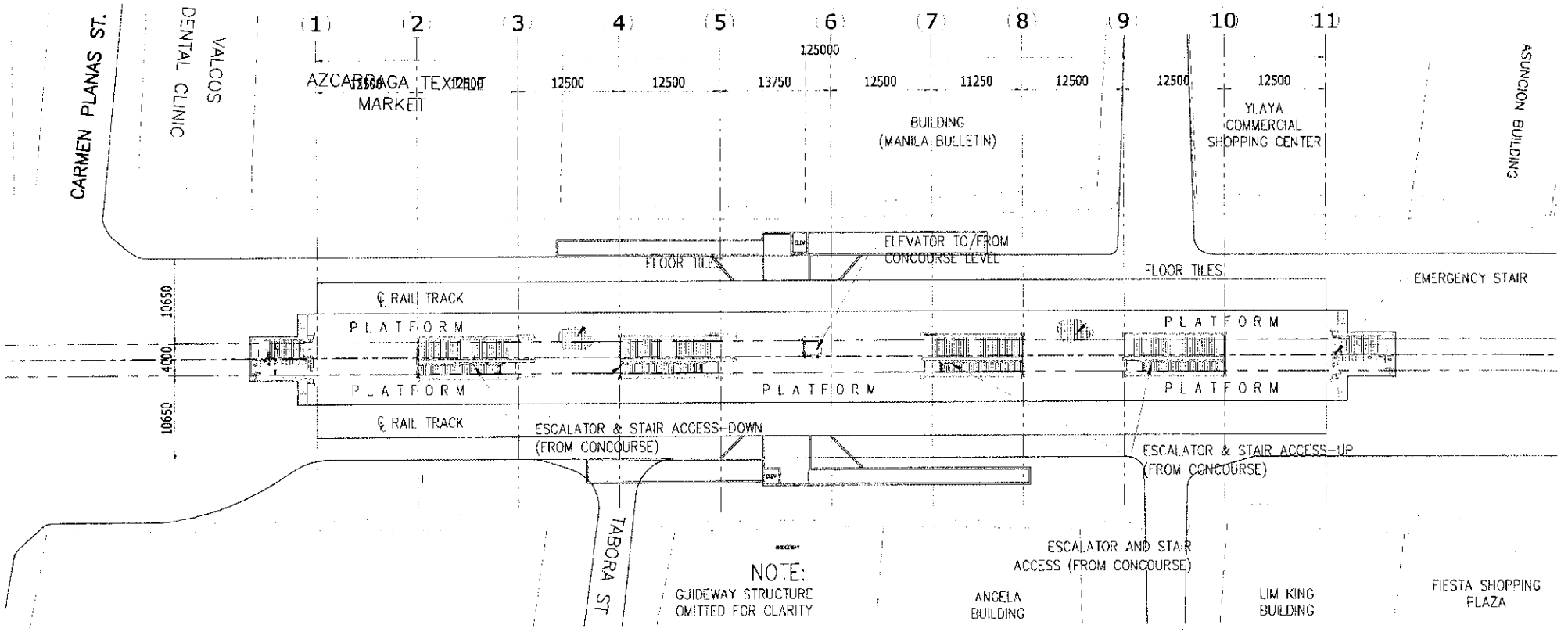


9+100

Oriental Consultants (OC) | Katahira and Engineers International (KES) | Tonichi Engineering Consultants, Inc. (TONICHI)

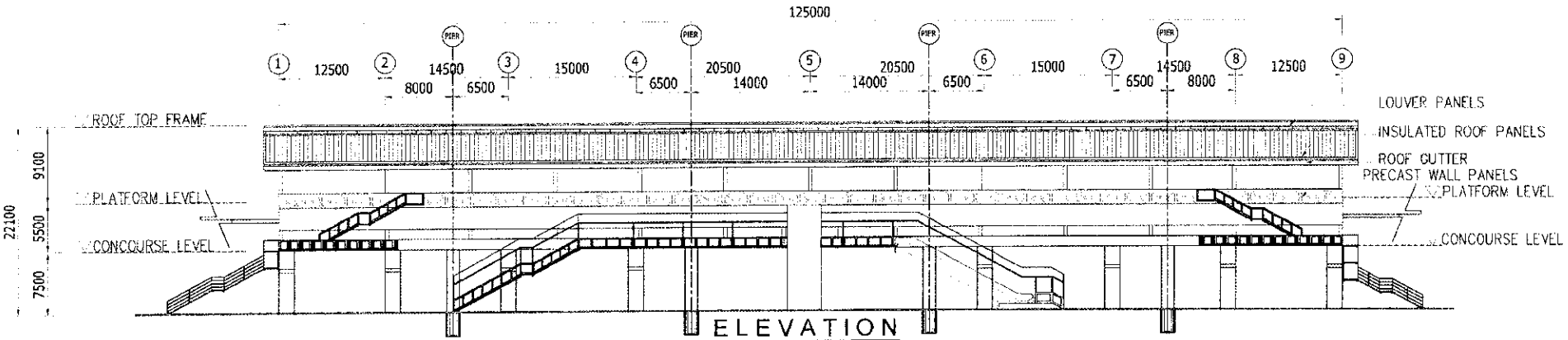
REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	1 : 250 FULL SIZE A3	WEST EXTENSION CROSS SECTION KM = 8+800 TO KM = 9+600	W-7
			SHEET NO : 27 / 41



PLAN

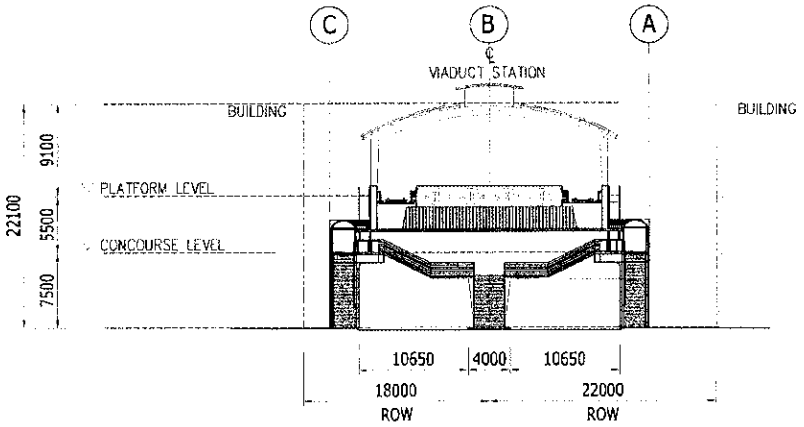
SCALE 1:500



ELEVATION

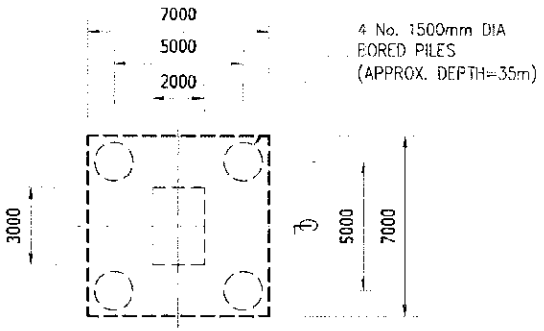
SCALE 1:500

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 500 FULL SIZE A3	DRAWING TITLE : WEST EXTENSION DIVISORIA STATION PLAN & ELEVATION	DRAWING NO : W-8 SHEET NO : 28 / 41



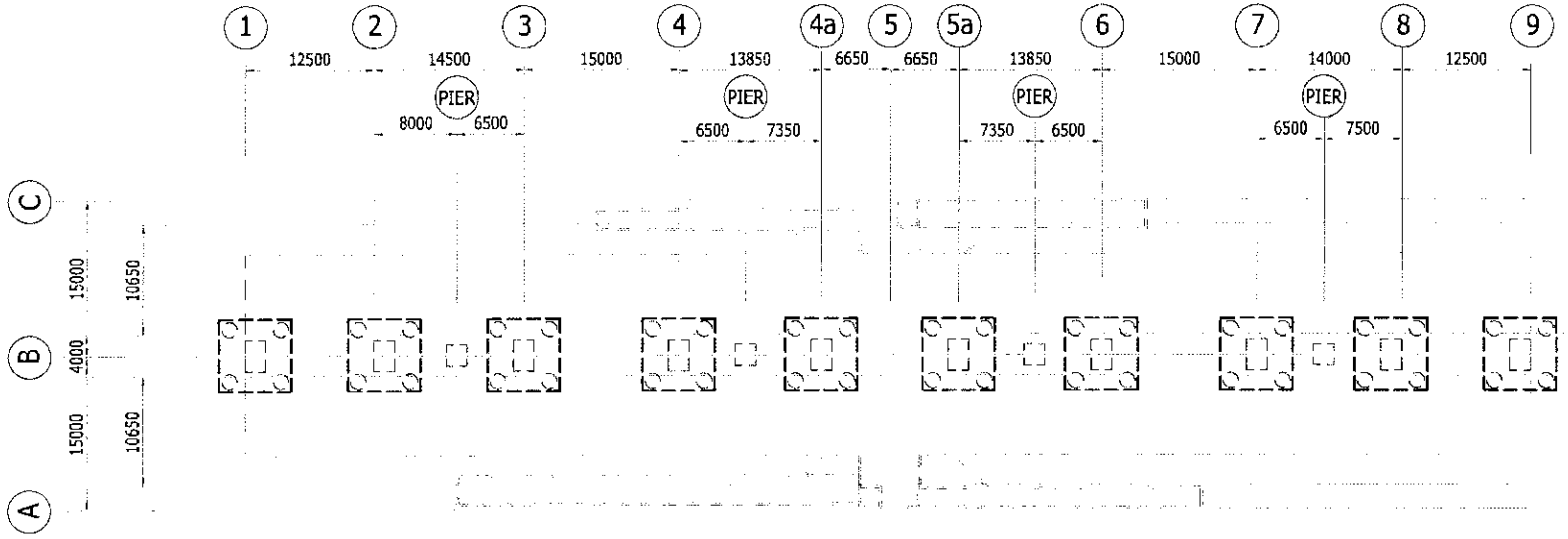
ELEVATION

SCALE 1 : 500



TYPICAL PILE CAP PLAN

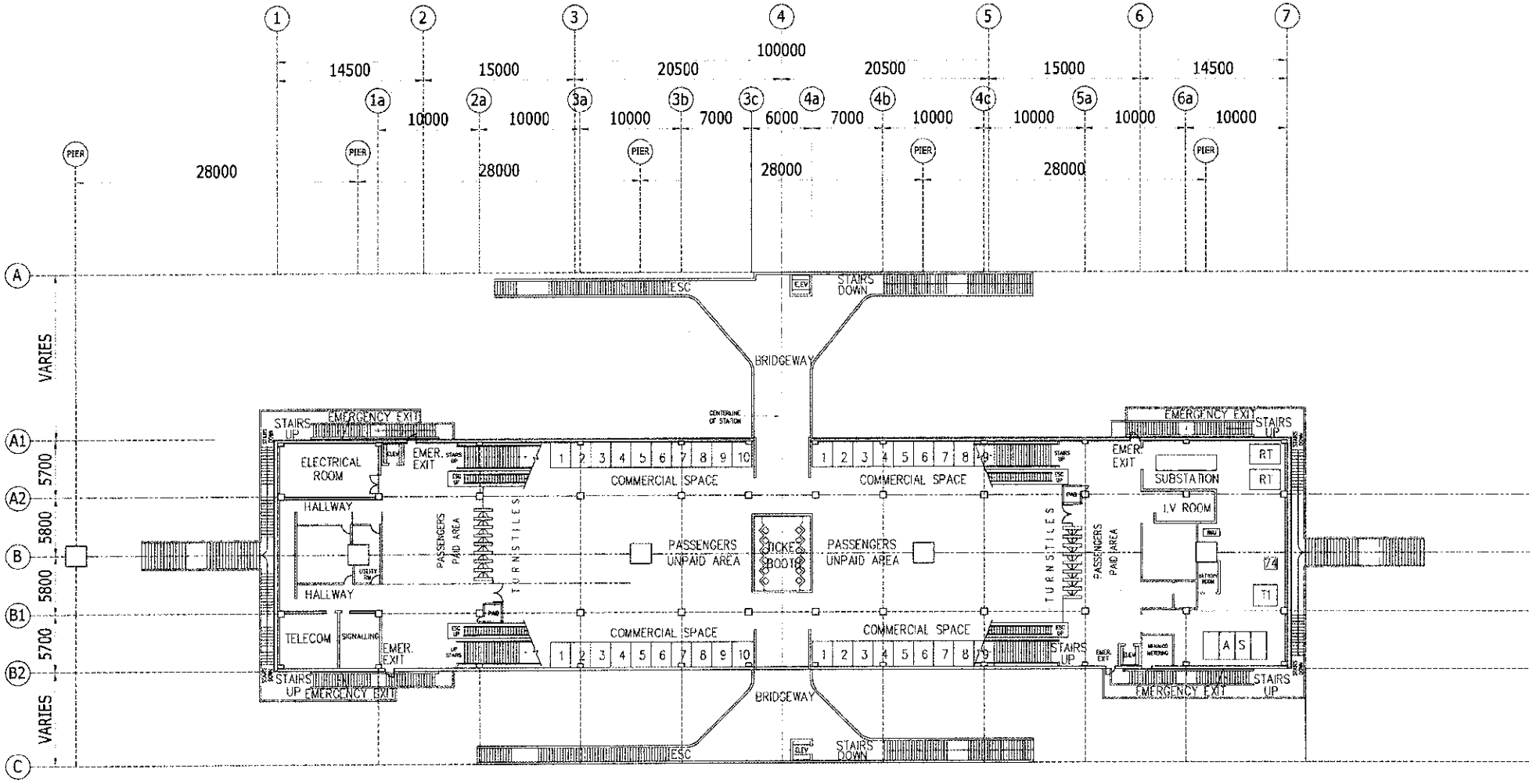
SCALE 1 : 200



FOUNDATION PLAN

SCALE 1 : 500

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 500 1 : 200 FULL SIZE A3	DRAWING TITLE : WEST EXTENSION DIVISORIA STATION SECTIONS	DRAWING NO : W-9 SHEET NO : 29 / 41

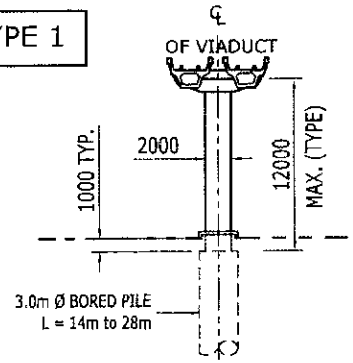


CONCOURSE LEVEL FLOOR PLAN

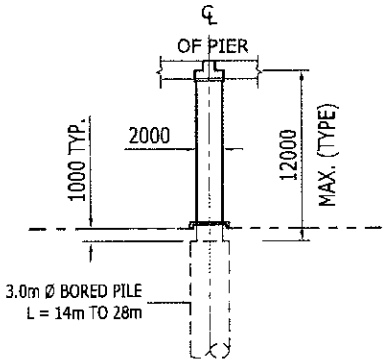
SCALE 1:400

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 400 FULL SIZE A3	DRAWING TITLE : EAST & WEST EXTENSION STATION CONCOURSE FLOOR PLAN	DRAWING NO. : SC-1 SHEET NO. : 30 / 41

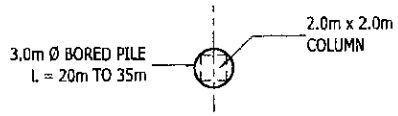
PIER TYPE 1



TRANSVERSE ELEV.

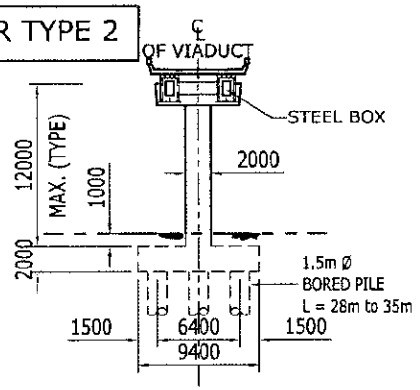


LONGITUDINAL ELEV.

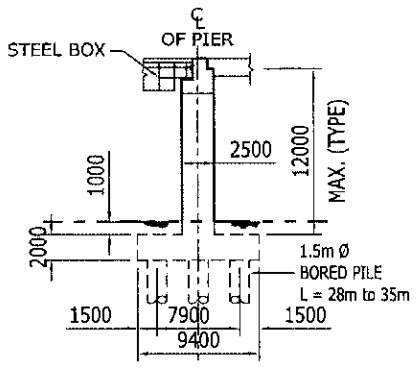


FOOTING PLAN

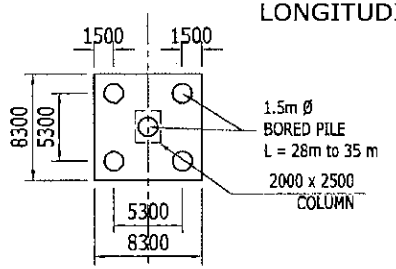
PIER TYPE 2



TRANSVERSE ELEV.



LONGITUDINAL ELEV.

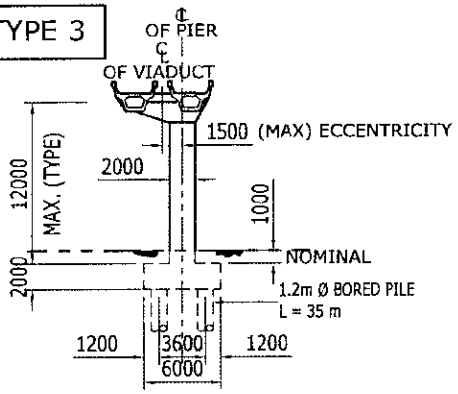


TYPICAL FOOTING PLAN

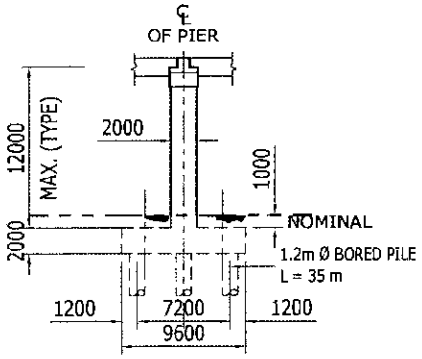
PIER TYPE	APPLICABLE PROJECT		APPLICABLE DECK TYPE	COMMENT
	EAST EXTENSION	WEST EXTENSION		
1	✓		1, 1A, 4	NOT APPLICABLE TO WEST EXTENSION GIVEN THE POOR SOIL CONDITIONS
2	✓	✓	2	REQUIRED TO SUPPORT 40m TO 45m SPAN GIRDERS

NOTE: REFER TO DRAWINGS S-3. S-4, S-5, S-6 & S-7 FOR DECK TYPE DETAILS

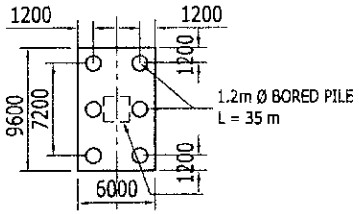
PIER TYPE 3



TRANSVERSE ELEV.



LONGITUDINAL ELEV.

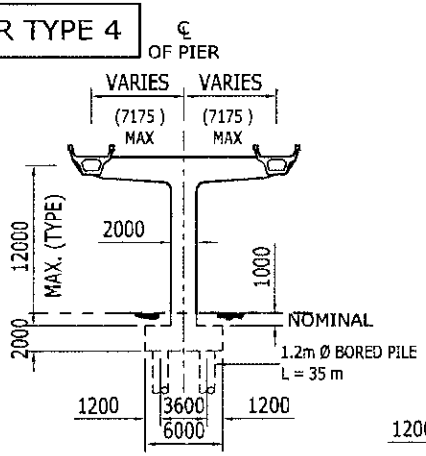


FOOTING PLAN

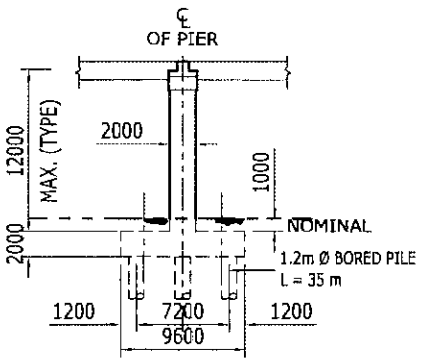
PIER TYPE	APPLICABLE PROJECT: EAST EXTENSION	APPLICABLE PROJECT: WEST EXTENSION	APPLICABLE DECK TYPE	COMMENT
3		✓	1, 1A, 4	APPLICABLE DUE TO POOR SOIL CONDITIONS
4		✓	1, 1A	REQUIRED AT APPROACH TO DIVISORIA STATIONS
5	✓		1, 1A	REQUIRED AT APPROACH TO MASINAG STATIONS

NOTE: REFER TO DRAWINGS S-3. S-4, S-5, S-6 & S-7 FOR DECK TYPE DETAILS

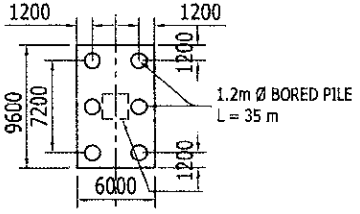
PIER TYPE 4



TRANSVERSE ELEV.

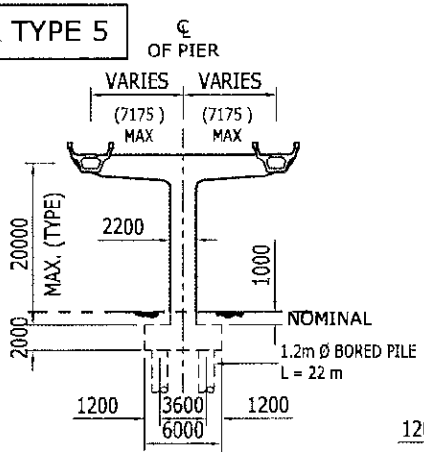


LONGITUDINAL ELEV.

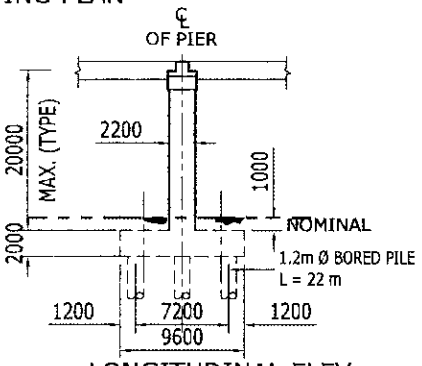


FOOTING PLAN

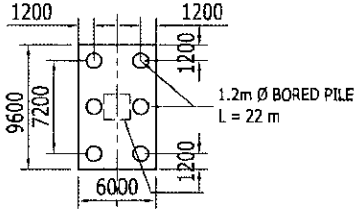
PIER TYPE 5



TRANSVERSE ELEV.



LONGITUDINAL ELEV.

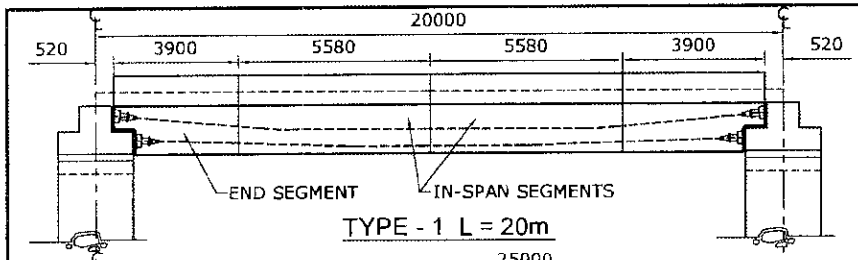


FOOTING PLAN

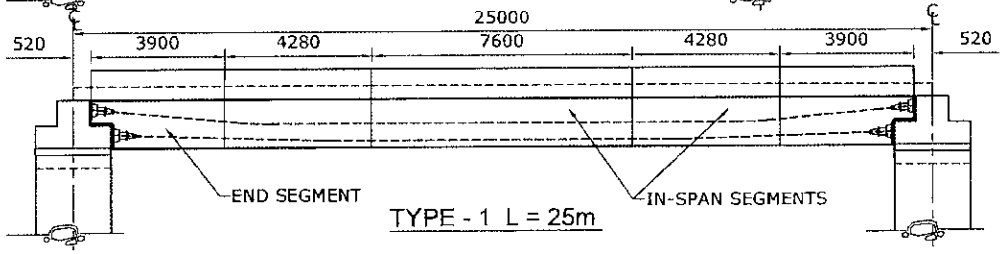
Oriental Consultants (OC) | Katahira and Engineers International (KEI) | Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

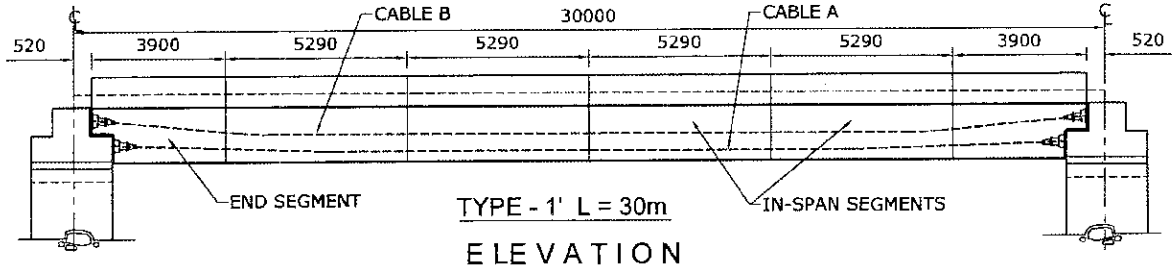
PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	1 : 400 FULL SIZE A3	EAST & WEST EXTENSION PIER LAYOUTS (2/2)	S - 2
			SHEET NO : 32 / 41



TYPE - 1 L = 20m



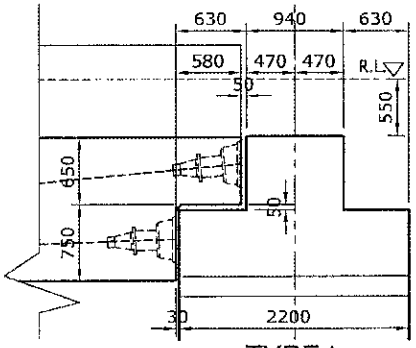
TYPE - 1 L = 25m



TYPE - 1' L = 30m

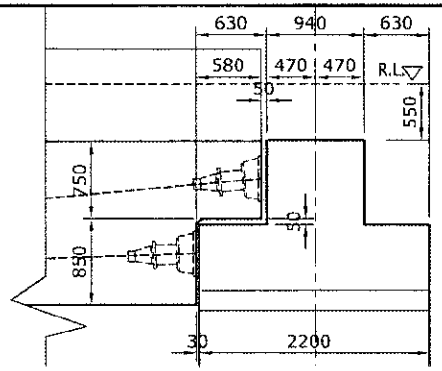
ELEVATION

SCALE 1:150



TYPE I

SCALE 1:50



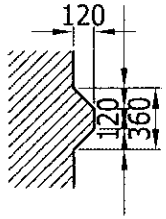
TYPE I'

SCALE 1:50

DETAIL @ SUPPORT

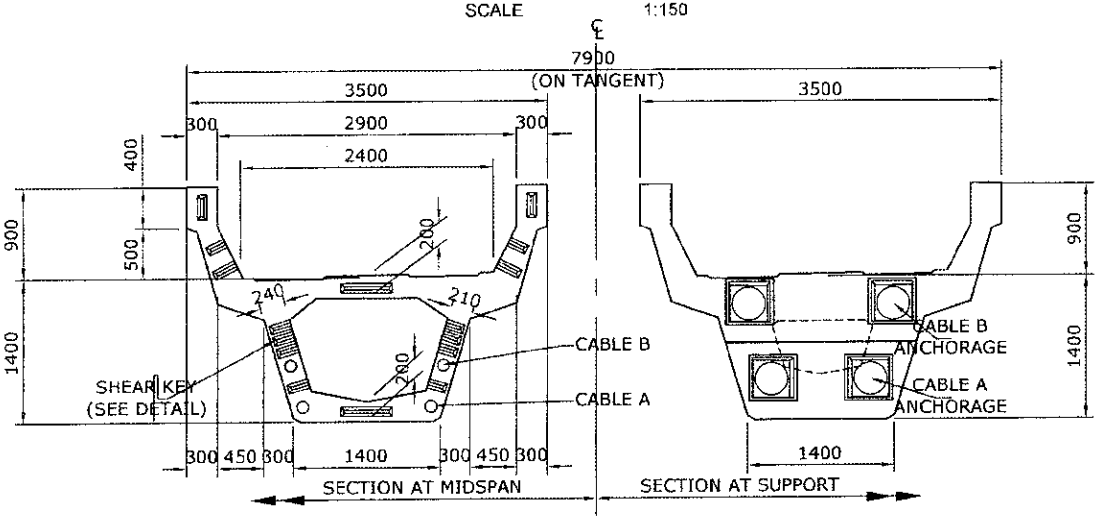
SCALE AS SHOWN

SPAN LENGTH (m)	NUMBER OF 15.2mmØ STRAND PER CABLE	
	CABLE A (4 No.)	CABLE B (4 No.)
20	7	9
25	12	15
30	15	19



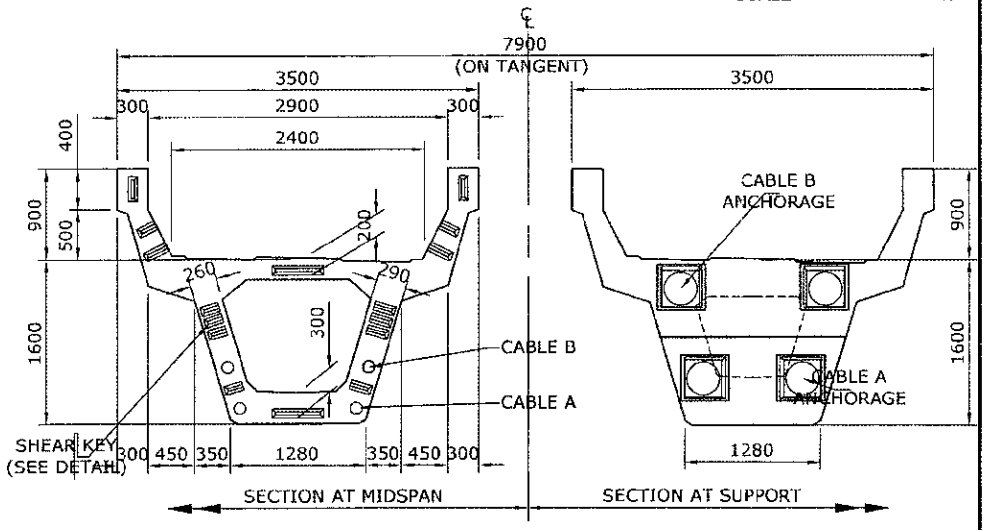
SHEAR KEY DET.

SCALE 1:3



TYPE 1 TYPICAL SECTION

SCALE 1:50



TYPE 1' TYPICAL SECTION

SCALE 1:50

NOTE:
RL = RAIL LEVEL

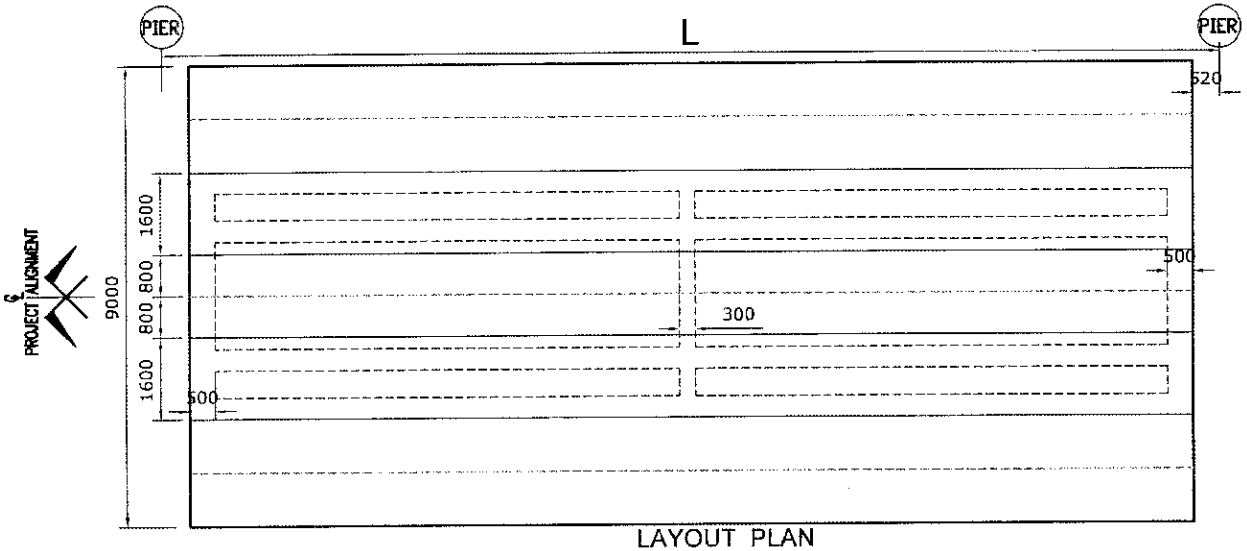
Oriental Consultants (OC)

Katahira and Engineers International (KEI)

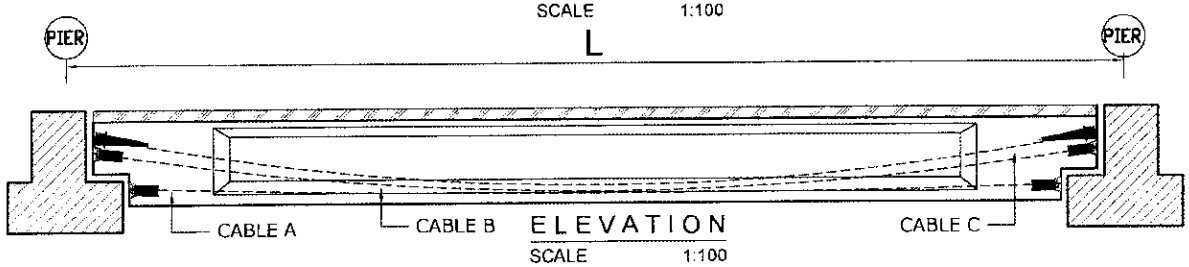
Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

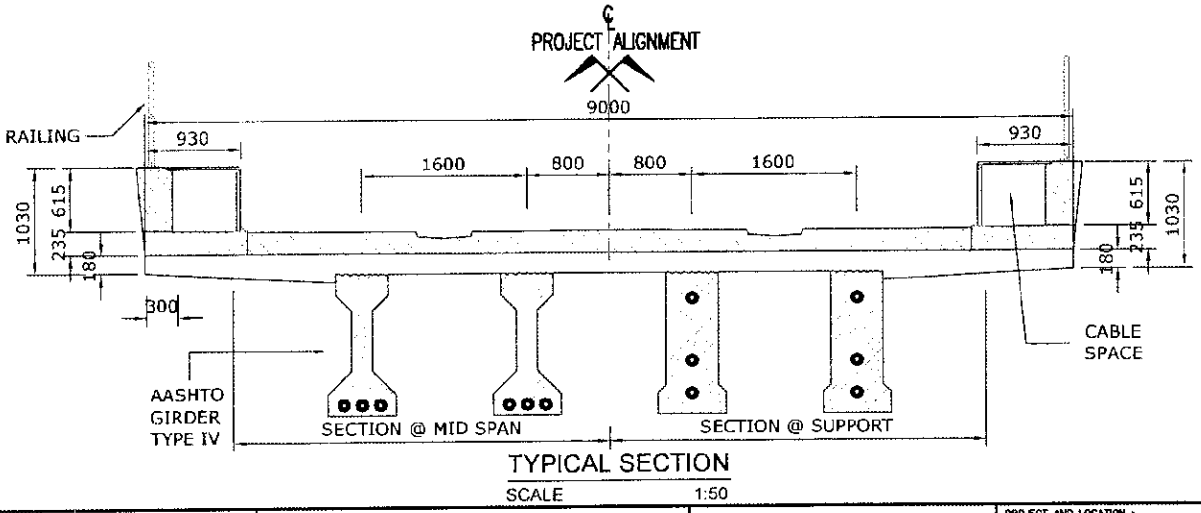
PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	1 : 150 1 : 50 1 : 3 FULL SIZE A3	EAST AND WEST EXTENSION VIADUCT ARRANGEMENT AND SECTIONS TYPE 1	S-3 SHEET NO : 33 / 41



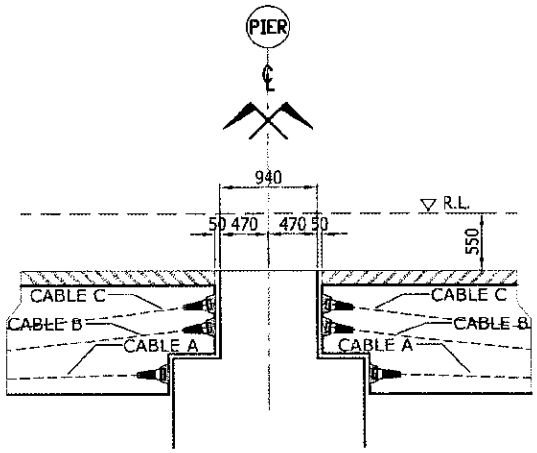
LAYOUT PLAN
SCALE 1:100



ELEVATION
SCALE 1:100



TYPICAL SECTION
SCALE 1:50



DETAIL @ SUPPORT
SCALE 1 : 50

NOTE:
RL = RAIL LEVEL

SPAN LENGTH L (m)	NUMBER OF 12.7mmØ STRAND PER CABLE		
	CABLE A	CABLE B	CABLE C
20	12	-	12
25	12	12	12

Oriental Consultants (OC) | Katahira and Engineers International (KEI) | Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

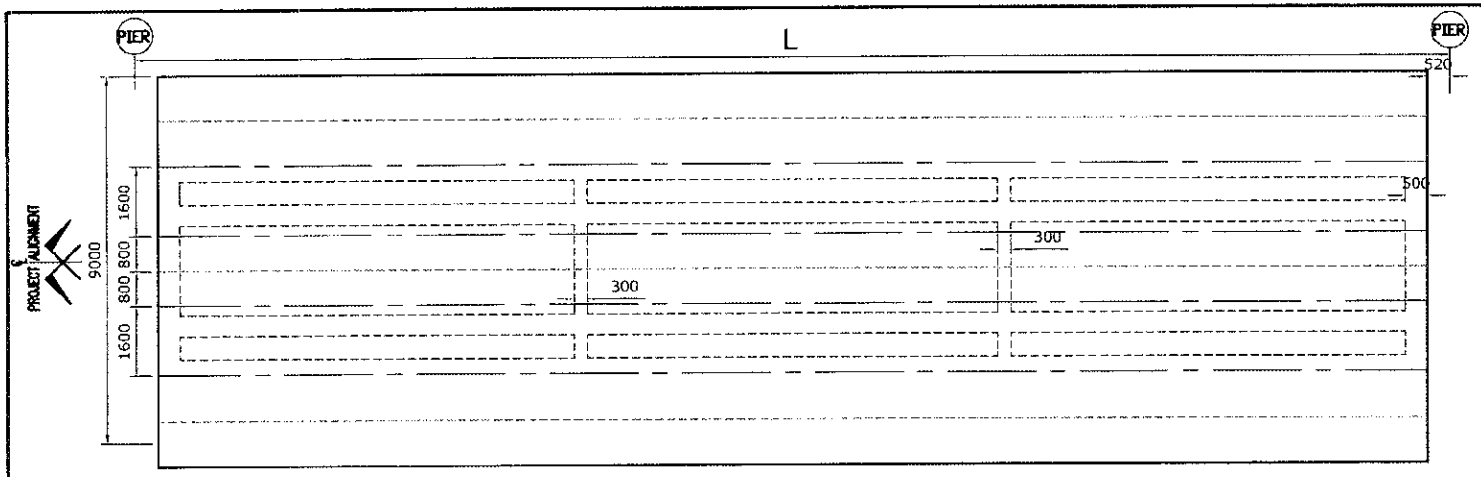
PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT

SCALE : 1 : 100, 1 : 50, FULL SIZE A3

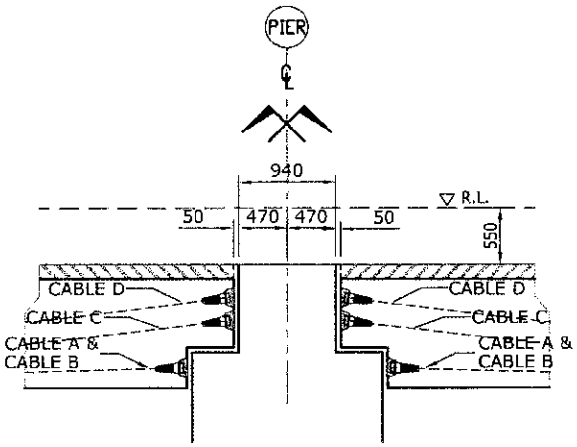
DRAWING TITLE : EAST AND WEST EXTENSION VIADUCT ARRANGEMENT AND SECTIONS TYPE 1A

DRAWING NO : S - 4

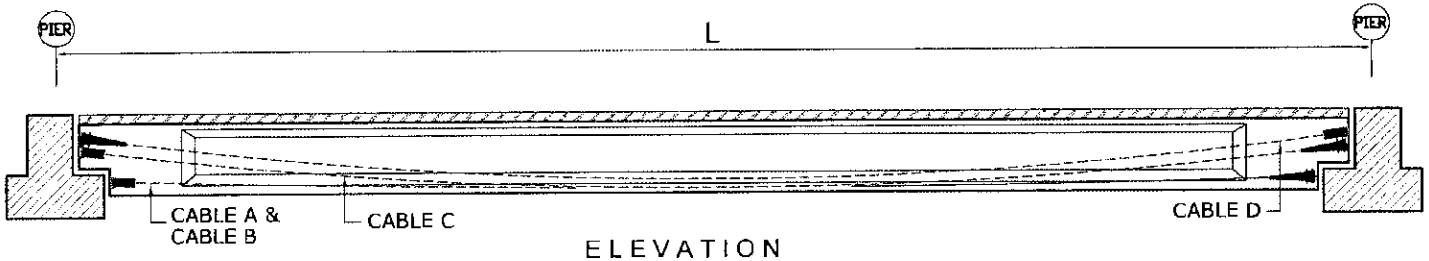
SHEET NO : 34 / 41



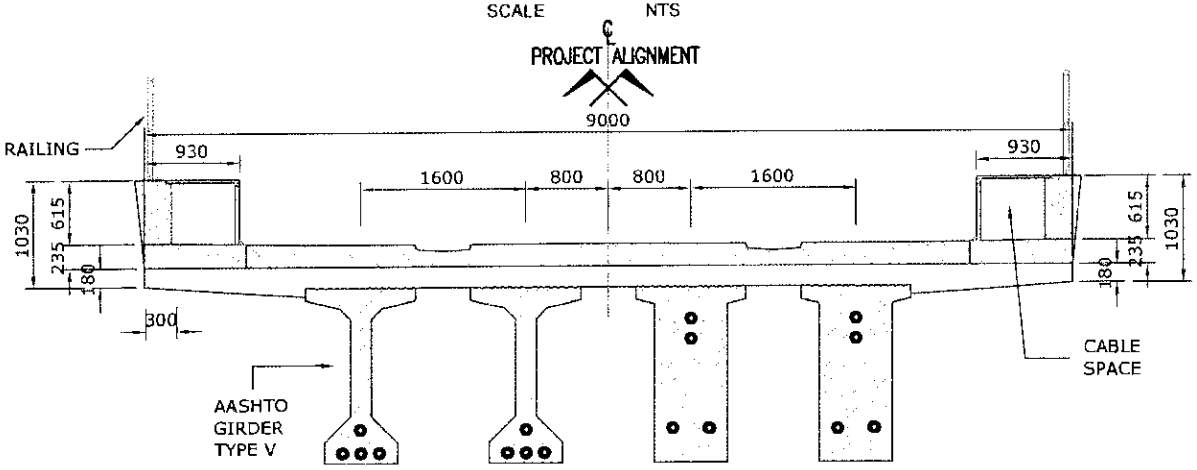
LAYOUT PLAN
SCALE NTS



DETAIL @ SUPPORT
SCALE 1 : 50



ELEVATION
SCALE NTS



TYPICAL SECTION
SCALE 1:50

NOTE:
RL = RAIL LEVEL

SPAN LENGTH L (m)	NUMBER OF 12.7mmØ STRAND PER CABLE		
	CABLE A CABLE B	CABLE C	CABLE D
27	12	7	7
30	12	12	12

Oriental Consultants (OC) | Katahira and Engineers International (KEI) | Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

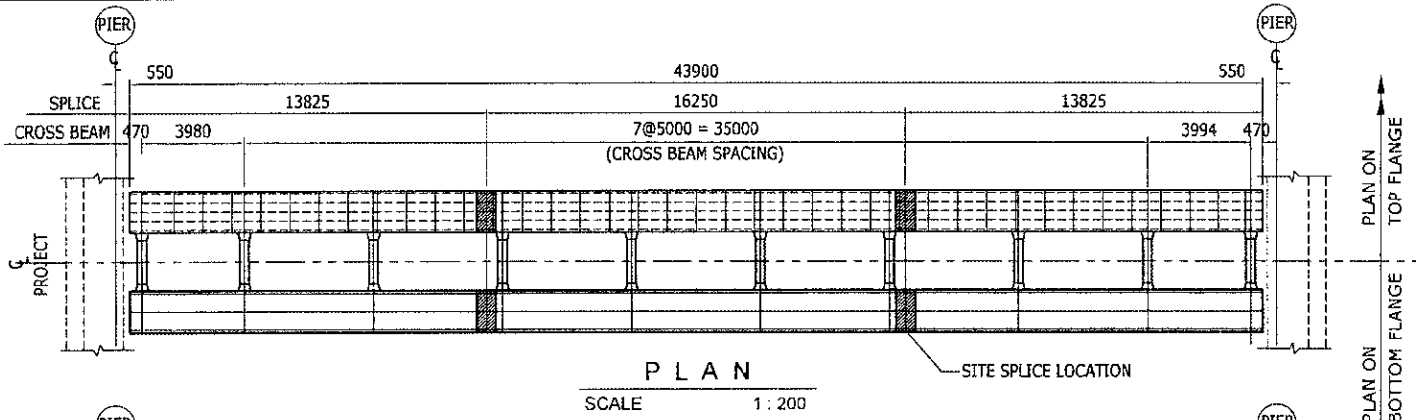
PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT

SCALE : 1 : 50 (FULL SIZE A3)

DRAWING TITLE : EAST AND WEST EXTENSION VIADUCT ARRANGEMENT AND SECTIONS TYPE 1A[1]

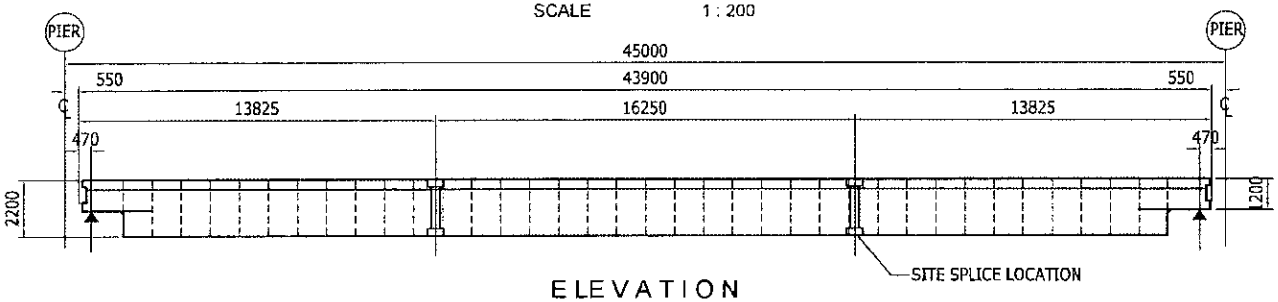
DRAWING NO : S - 5

SHEET NO : 35 / 41



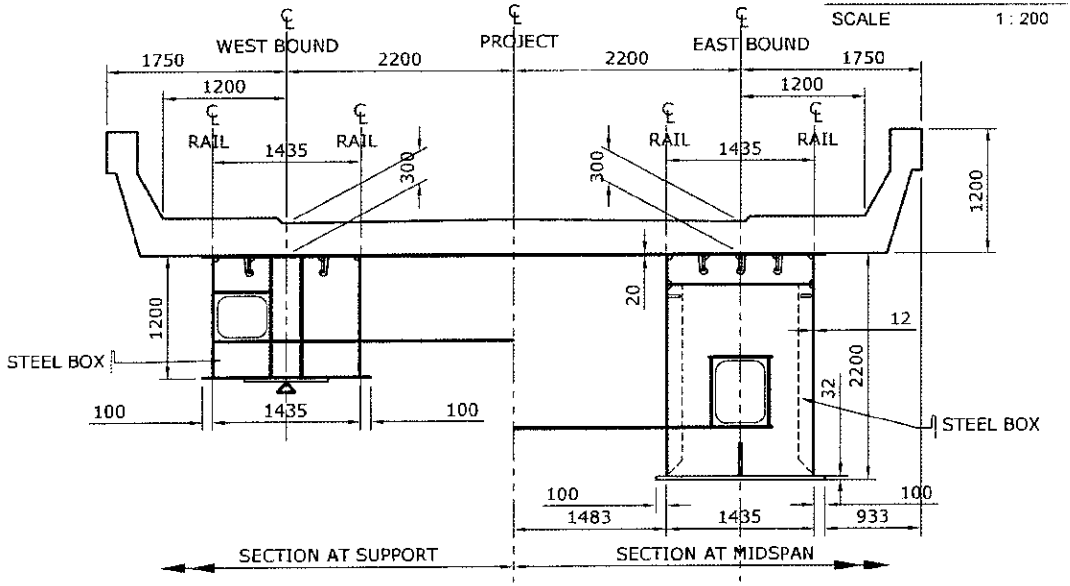
PLAN

SCALE 1 : 200



ELEVATION

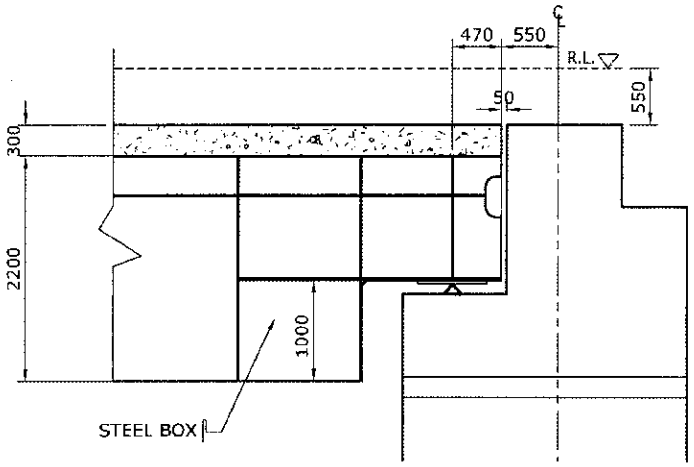
SCALE 1 : 200



TYPICAL SECTION

SCALE 1 : 50

NOTE:
RL = RAIL LEVEL



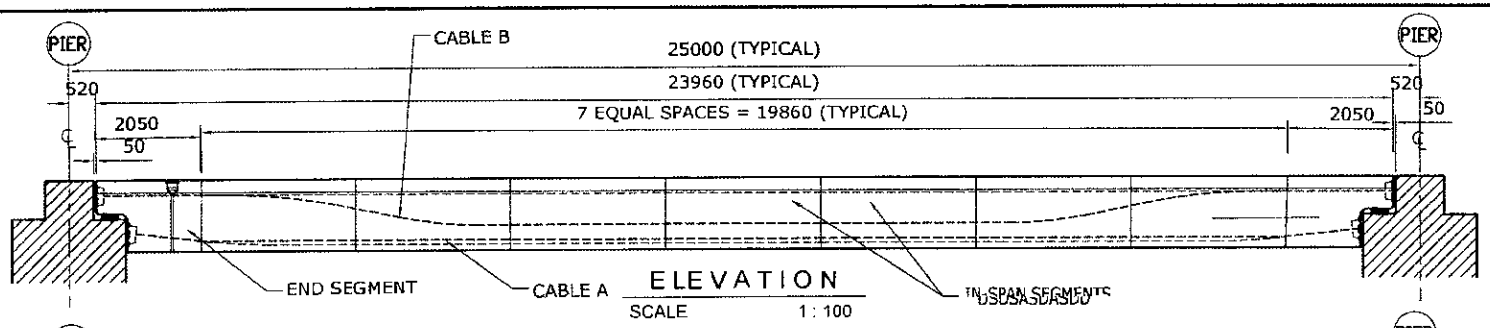
DETAIL AT SUPPORT

SCALE 1 : 50

Oriental Consultants (OC)
Katahira and Engineers International (KEI)
Tonichi Engineering Consultants, Inc. (TONICHI)

REPUBLIC OF THE PHILIPPINES
LIGHT RAIL TRANSIT AUTHORITY

PROJECT AND LOCATION :	SCALE :	DRAWING TITLE :	DRAWING NO :
PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	1 : 200 1 : 50 FULL SIZE A3	EAST AND WEST EXTENSION VIADUCT ARRANGEMENT AND SECTIONS TYPE 2	S-6 SHEET NO : 36 / 41

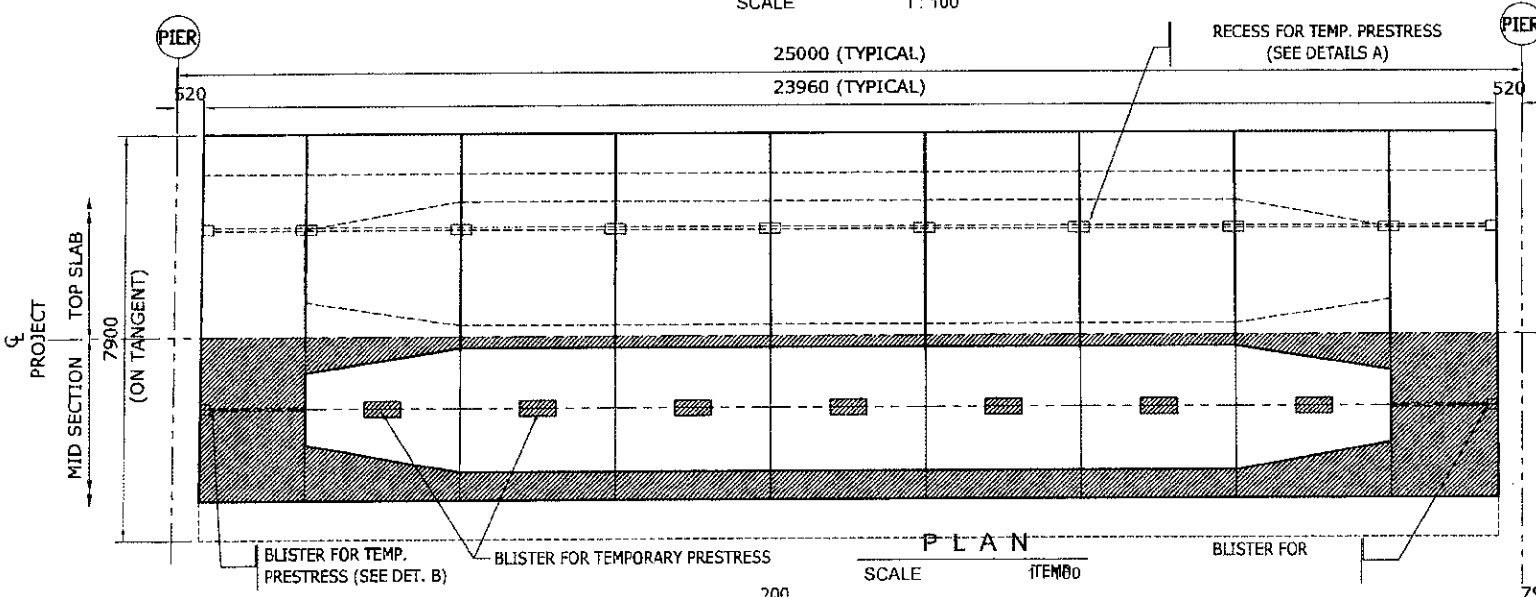


ELEVATION

SCALE 1 : 100

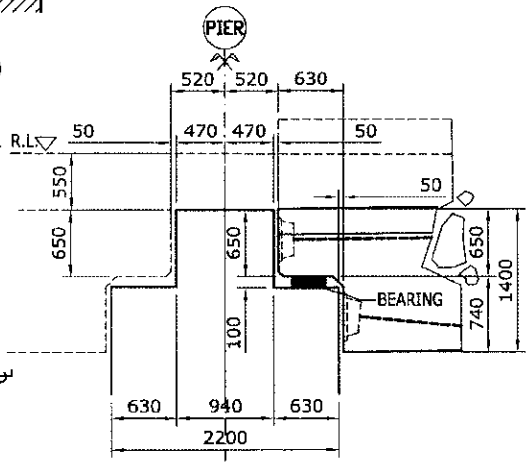
NOTE:
RL = RAIL LEVEL

SPAN LENGTH (m)	NUMBER OF 15.2mmØ STRAND PER CABLE	
	CABLE A (6 NO.)	CABLE A (4 NO.)
25	15	12



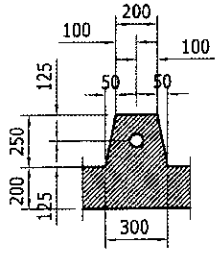
PLAN

SCALE 1:100



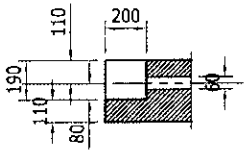
DETAIL @ SUPPORT

SCALE 1 : 50

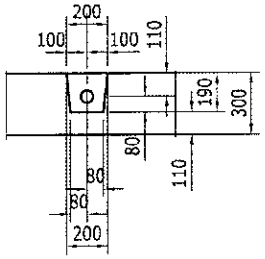


DETAIL - B

SCALE 1 : 25



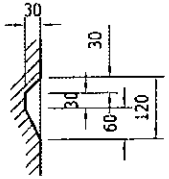
SECTION



VIEW

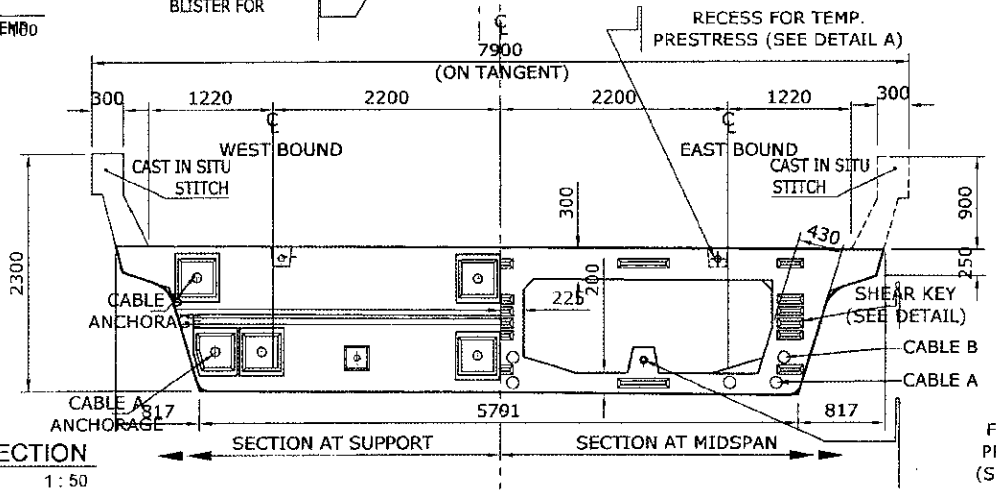
DETAIL - A

SCALE 1 : 25



SHEAR KEY DETAIL

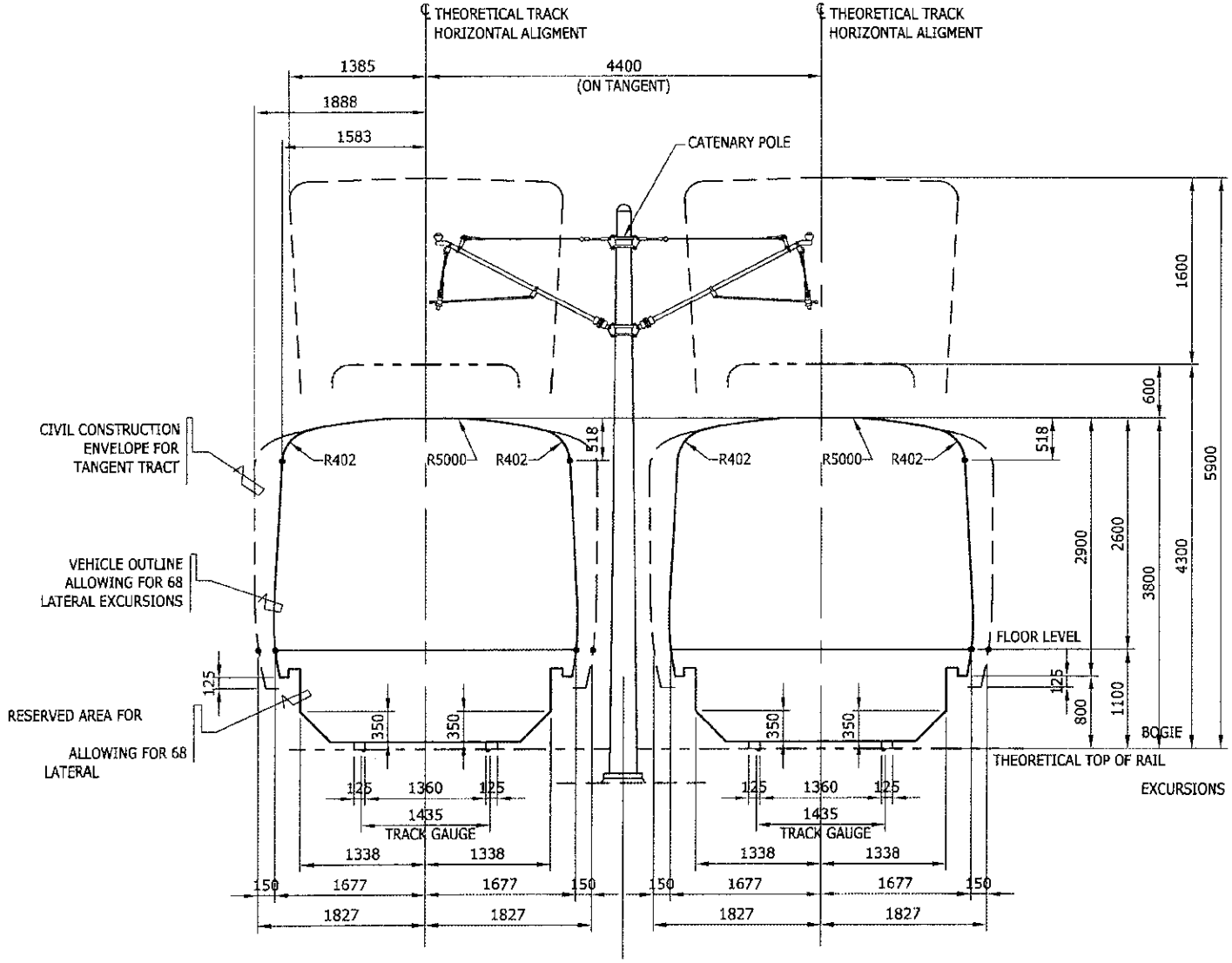
SCALE 1 : 10



TYPICAL SECTION

SCALE 1 : 50

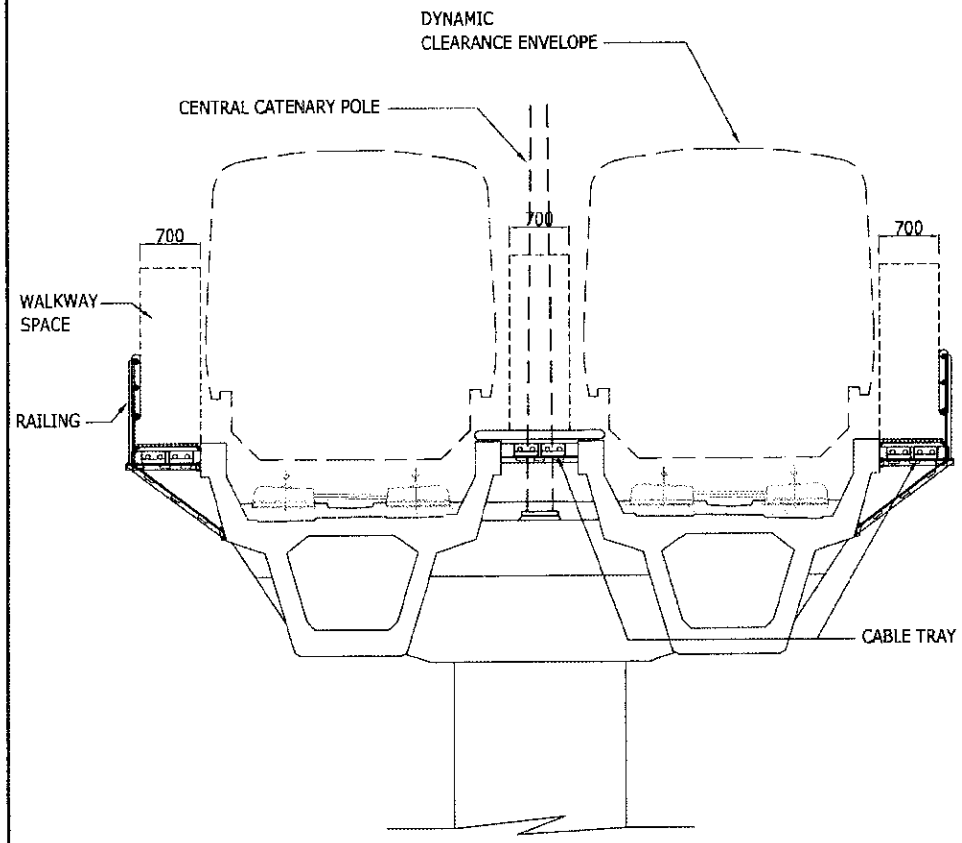
Oriental Consultants (OC) · Katahira and Engineers International (KEI) · Tonichi Engineering Consultants, Inc (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 100 1 : 50 1 : 25 1 : 10 FULL SIZE A3	DRAWING TITLE : EAST AND WEST EXTENSION VIADUCT ARRANGEMENT AND SECTIONS TYPE 3	DRAWING NO : S - 7 SHEET NO : 37 / 41



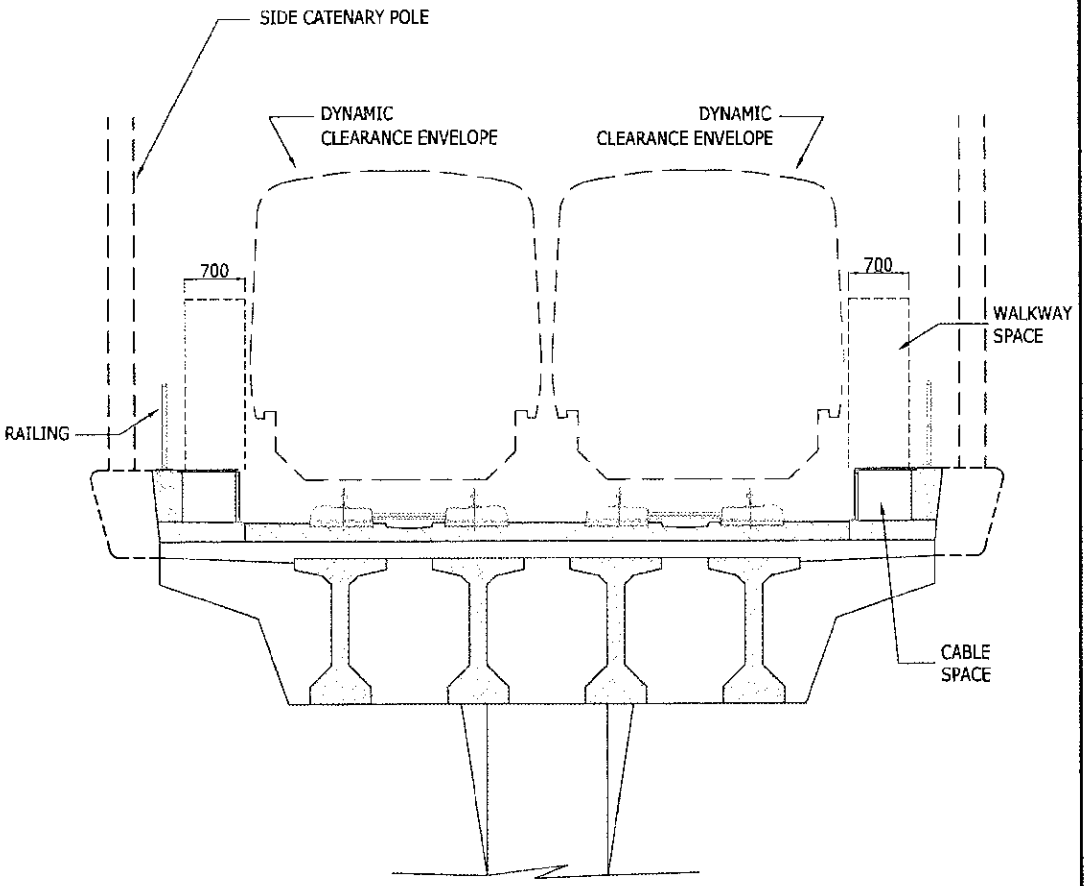
CONSTRUCTION GAUGE (CENTRAL CATENARY)

SCALE 1 : 50

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 50 FULL SIZE A3	DRAWING TITLE : EAST AND WEST EXTENSION CONSTRUCTION GAUGE	DRAWING NO : R - 1 SHEET NO : 38 / 41



TWIN SINGLE BOX GIRDER
WITH CENTRAL CATENARY POLE

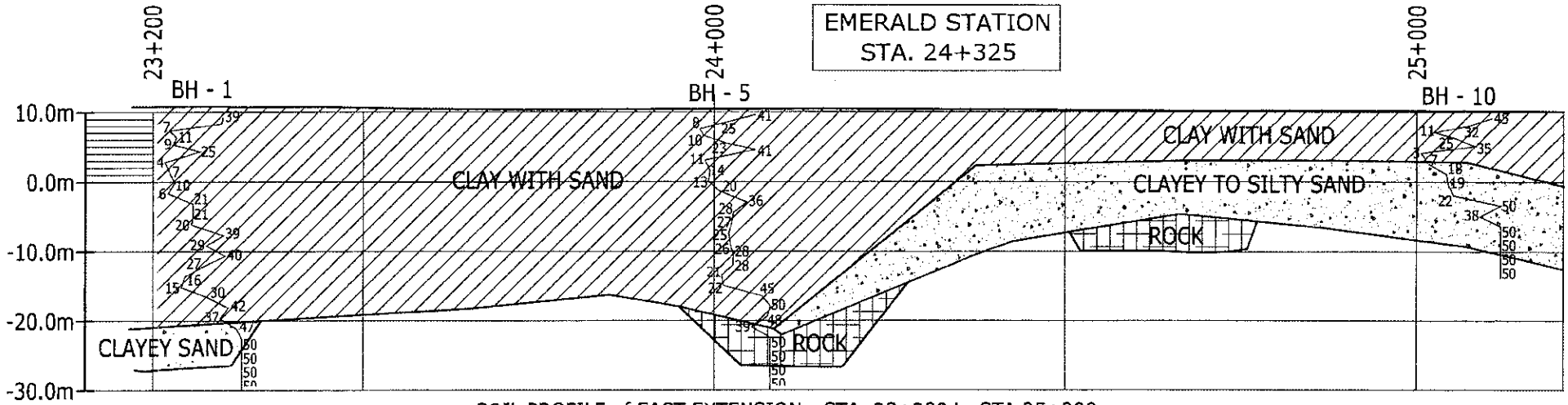


AASHTO GIRDER WITH SIDE
CATENARY POLE

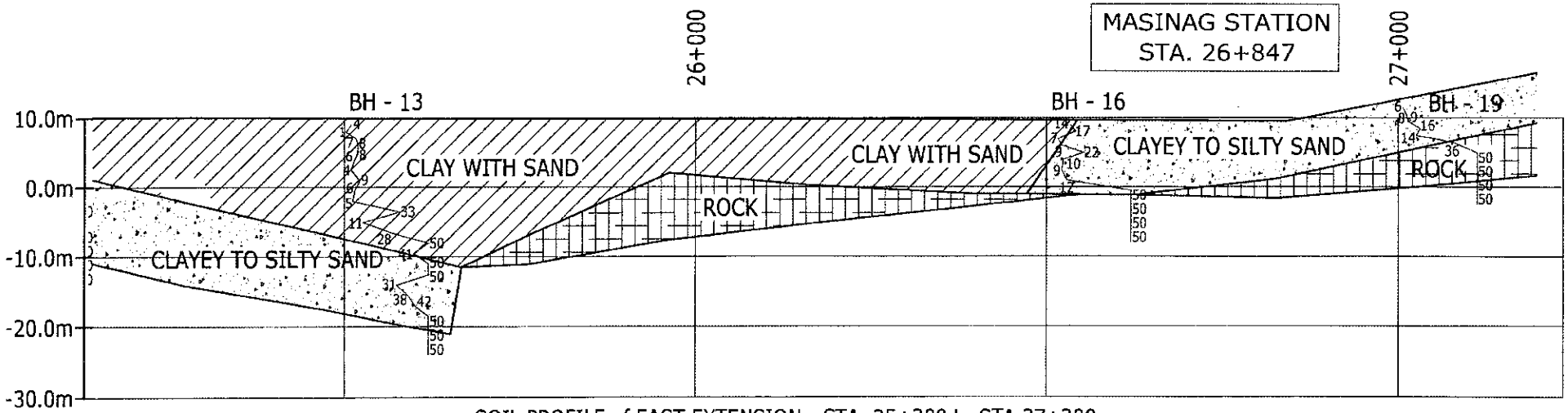
VIADUCT WALKWAY AND RAILING

SCALE 1 : 60

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)	REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : 1 : 60 FULL SIZE A3	DRAWING TITLE : EAST AND WEST EXTENSION VIADUCT WALKWAY AND RAILING	DRAWING NO : R - 2 SHEET NO : 39 / 41

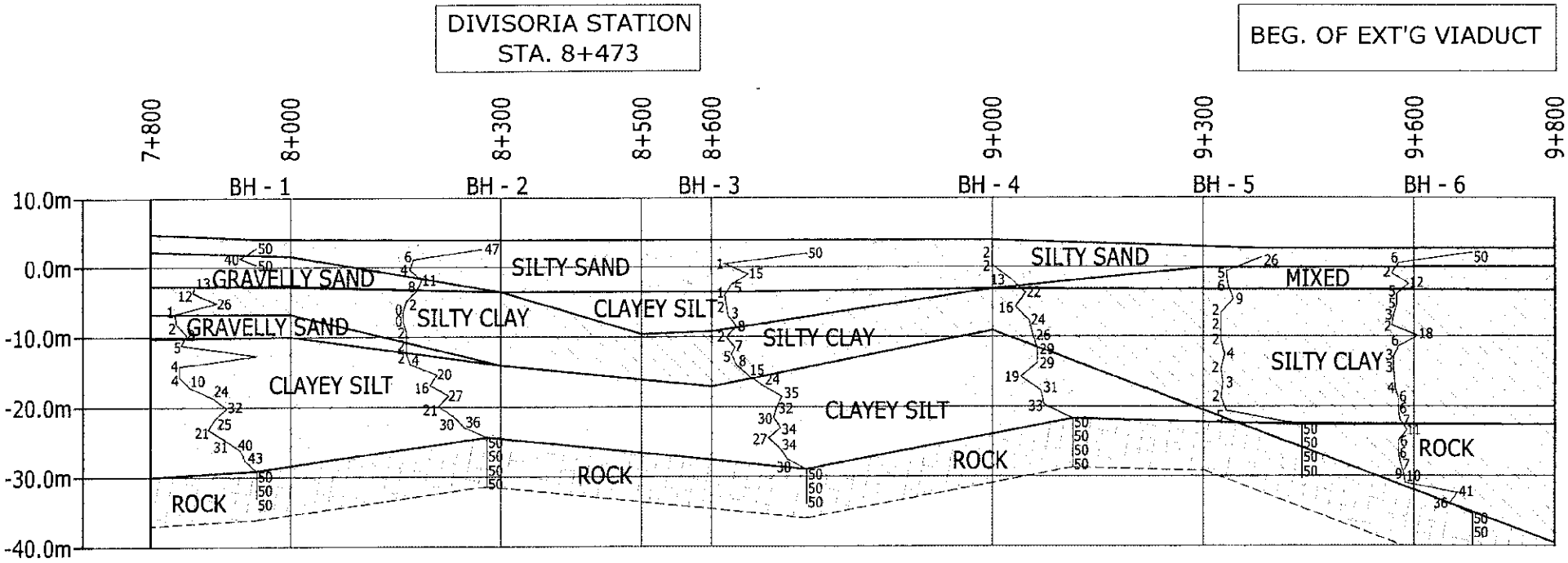


SOIL PROFILE of EAST EXTENSION - STA. 23+200 to STA 25+200



SOIL PROFILE of EAST EXTENSION - STA. 25+200 to STA 27+200

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : SOIL PROFILE OF EAST EXTENSION STA. 23 + 200 - STA. 27 + 200	DRAWING NO : BH-1 SHEET NO : 40 / 41



SOIL PROFILE of WEST EXTENSION - STA.7+800 to STA 9+800

Oriental Consultants (OC) / Katahira and Engineers International (KEI) / Tonichi Engineering Consultants, Inc. (TONICHI)		REPUBLIC OF THE PHILIPPINES LIGHT RAIL TRANSIT AUTHORITY	PROJECT AND LOCATION : PREPARATORY STUDY FOR LRT LINE 2 EXTENSION PROJECT	SCALE : FULL SIZE A3	DRAWING TITLE : SOIL PROFILE OF WEST EXTENSION STA. 7 + 800 - STA. 9 + 800	DRAWING NO : BH-2 SHEET NO : 41 / 41

APPENDIX.C

CASE STUDY- MRTA IN THAILAND AND PPP PROJECT

APPENDIX-C Case Study - Bangkok MRT and its PPP Projects

It shown as a case study lessons learned from the Bangkok MRTA. Lesson shown here has noted the exceptional nature that seek to prevent similar events in Bangkok MRTA for the private sector regulation and supervision, for the implementation management services of LRTA. In addition, also have recommendations for appropriate and responsible role as a study team for the LRTA.

C.1 Introduction to MRTA

LRTA is about to change its role and function from a Direct Operator to an Indirect Operator under the PPP project implementation. LRTA has accumulated its experience and expertise along with its LRT operations since its establishment and has started its “Streamlining Process” to be an Indirect Operator.

A JICA study was conducted in 2010 entitled as “Special Assistance on Project Implementation on Bangkok Mass Rapid Transit Development Project” (MRTA SAPI). Based on MRTA's reverse development history offers some lessons to be learned for LRTA that is about to substantially start its contracting out, outsourcing or concession activities under the PPP schemes. Some of the following descriptions are extracted from MRTA SAPI report. LRTA Study Team, two members of which are overlapping with this Thai MRTA SAPI have reviewed and revised the content to reflect LRTA situation.

This case study indicatively provides issues for LRTA on its future organizational, technical and operational activities, as the Regulator and Indirect Operator Lines under PPP Schemes. Some of the assessments lead to the Team's recommendations on the LRTA Organizational Strengths as well as how LRTA will maintain and reinforce its technical and operational knowledge and skills to be kept as LRTA's Core Expertise and avoiding from their fading-out.

C.2 Bangkok MRTA

Mass Rapid Transit Authority (MRTA) in Bangkok has rather a unique history experiencing a “Reverse Order Development” from the current BOT Net Cost Concession Scheme (BOT Net) on its current Blue Line operation to a new Purple Line under BOT Gross Cost Concession Scheme (BOT Gross) , where both are “Indirect Operations”. The former scheme has the most remote status of the MRTA vis-à-vis BMCL, its Concessionaire.

BMCL, under the current BOT Net Cost scheme, provides M&E equipment, including electrical trains, signaling systems, SCADA, communication platform screen door system, etc for the subway project and fully operates the system. BMCL gives concession contract on rolling stock, signaling and telecommunication, maintenance, and training to local staff on turn-key basis with the Supplier. BMCL is responsible for the entire O&M and thus they are responsible for the ridership increase. Under this

BOT Net Concession Contract, MRTA will receive annual fixed Concession Fee from BMCL during its Concession Term of 25 years.

The planned Purple Line, which is expected to start soon its new Concession tender, will be operated under the BOT Gross Cost scheme where MRTA is responsible for ridership and will collect fares from the passengers. A fixed amount of Service Fee is to be paid from MRTA to the Concessionaire. That implies that, based of what MRTA management strategy, it will make a one step forward in getting closer to the direct operations. In a medium term future, MRTA Management expressed their strong wish to be a Direct Operator of some of their lines so that they would be able to have full access and understanding on the railway operations.

C.3 MRTA - Organization Structure

MRTA, established in 1993 having a status of state enterprise under the Ministry of Transport, is responsible for the implementation of projects of Mass Rapid Transit System in the Greater Bangkok Area. The current total number of MRTA personnel including the top management is about 550.

MRTA currently has a structure headed by the Governor appointed by the council of Ministers. He is supported by four Deputy Governors. Each of Deputy Governors has its own supervising departments functionally divided; a) Strategy and Planning (71 staff), b) Engineering and Construction (137 staff), 3) Operations (264 staff) and 4) Administration (75 staff). Total staffing strength of 547 is deployed excluding the Governor.

Each department is headed by a department director who, in turn, reported by a few division chiefs. Further, each division often has two or more sections headed by section chiefs. The average size of the section, the smallest unit, is about 2-5 staff except the four security divisions having about 30 staff members each. The Organization Chart of MRTA is shown below.

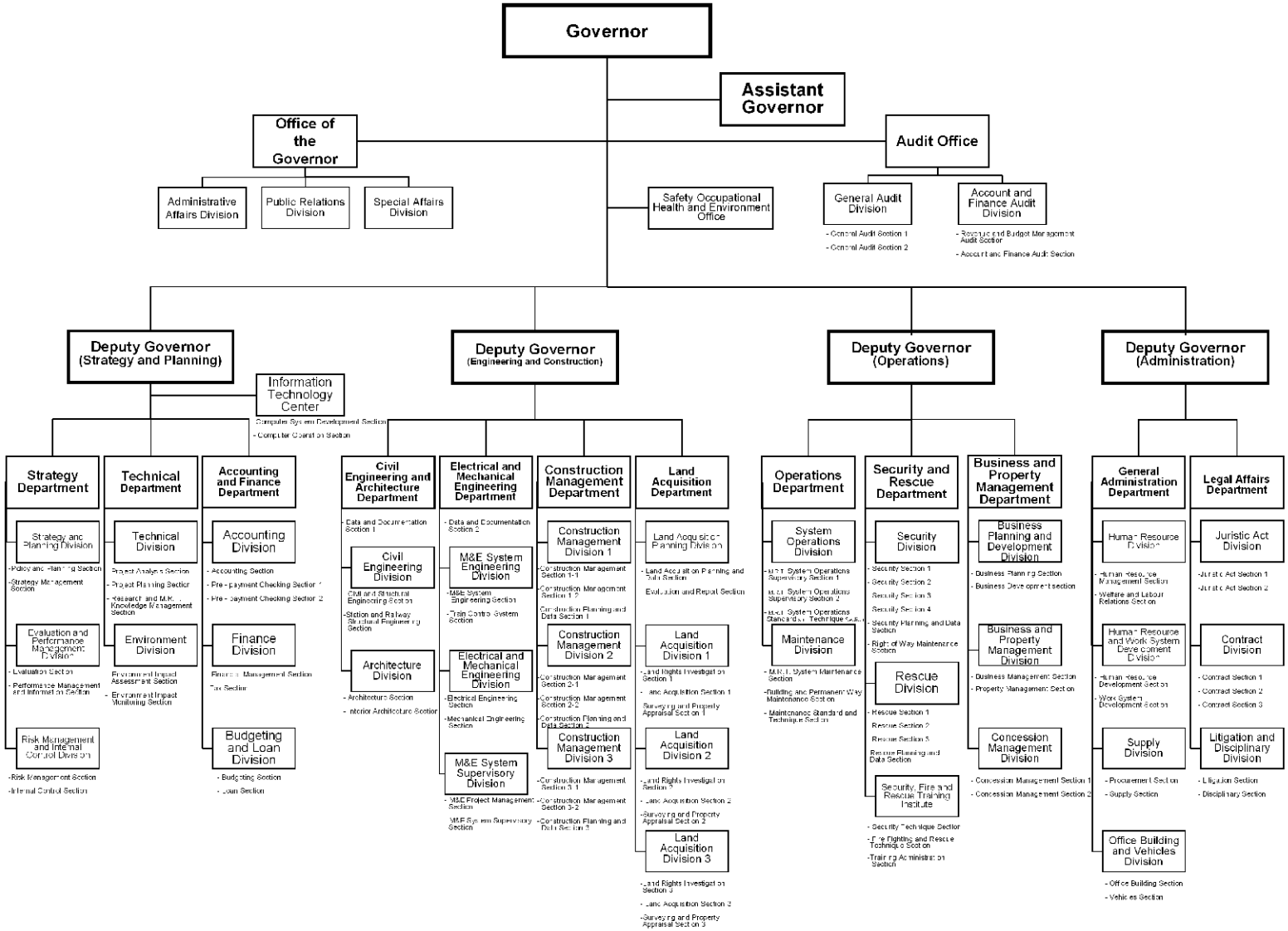


Figure 6.1-4 MRTA Organization Chart

C.4 Current Concession Contract

BMCL is the MRTA's Concessionaire and provides M&E equipment, including electrical trains, signaling systems, SCADA, communication, etc for the subway project and fully operates the system. BMCL gives concession contract on rolling stock, signaling and telecommunication, maintenance, and training to local staff on turn-key basis with the Supplier. The package comprises a Concession Contract of 25 years of railway system maintenance, 18 months of operation system (OPS) support plus 10 years of system maintenance.

C.5 Current Activities of Technical Personnel in MRTA

As the current Contracts between BMCL and its maintenance contractors have not been provided, the accurate description of the maintenance activities of the Concessionaire are not yet fully known. However, based on the interviews to some maintenance staff of MRTA, job descriptions of BMCL's staff, and on common practices on this type of contractual schemes, a basic assumed description is provided herein. Based on the comparison between railway system company tasks and duties and the result of survey on current O&M activities of Blue Line, it becomes clearer *what tasks MRTA is not able to perform* under current technical capabilities**.**

1) Construction and Engineering Activities

Construction and Engineering activities are handled by four departments.

- Construction Management Department
- Civil Engineering and Architecture Department
- Electrical and Mechanical Engineering Department, and
- Land Acquisition Department

They are responsible for the railway systems, currently dealing with Purple Line and Blue Line Extension Projects, are under those departments. Construction and Management looks after an overall construction management including the oversight and legal contractual matters on the particular projects. Civil Engineering and Architecture Department is responsible for the civil and structural engineering, station and railway structural engineering as well as interior architecture. Electrical and Mechanical Engineering Department works include two prominent fields of M&E system engineering on signaling, communication, rolling stock, train control system etc. and E&M system engineering on building service. Finally Land Acquisition Department devotes themselves

for the new land acquisition planning, land evaluation, property appraisals, and land rights investigation.

Technical Capacity - It is clear that the most significant issue that hinders MRTA's technical capacity development is *lack in technical and contractual considerations* taken in the tender documents of Blue Line. Better understanding of the installed system is essential for MRTA to become more responsible for future system procurement and eventually to manage the assets as the facility owner. The dependency of M&E systems in system expansion will promote the adequate appreciation for MRTA and eventually to *remove the sense of threats against "supplier monopoly"*. This sort of technical capacity is required in minimum for the MRTA staff particularly in M&E Department.

Tender Process Management - Main activities performed by these departments are the two projects at present, Blue Line and Purple line. They *control and supervise the works of consultants*. Intensive review and assessment works of draft tender documents of Purple Line Project are tasked to and being carried out by the officer-level staff of this department. Their working style is characterized by the slogan "working as a team". Most of the staff in the same section/department have common job functions, where clear task segregation is avoided.

Contractual Obligations with Concessionaire - In view of the variety of activities of what and how to monitor the activities of the Concessionaire, and what and how MRTA should carry out business in the future, it became clear that there is *not a full understanding of the contractual obligations* of each party in the Concession Agreement. Quite often they face difficulties when reviewing and negotiating with Concession agreements in detail for *not having sufficient legal knowledge, contractual understandings* as well as sometime not having enough negotiation skills.

Railway Engineering, a New Area in Thailand - This is probably because top managements of MRTA have an intention to let the engineering staff to have more opportunities to learn railway engineering in general, rather than to obtain an expertise in a certain field. In this connection "job rotation", particularly from Operation Department to E&M Department, had been done several months ago, though it did not seem an institutionally built-in system yet. Now many of the staff in E&M Department just started their career in this field, some of them are even not familiar with their scope of works.

No Access to Actual Operation - MRTA staff are highly capable to control and supervise the consultants' works of E&M (building service) systems mainly because of their *similar experiences*

in ex-jobs and facilities extended for their skill development and trainings. On the other hand, M&E system engineering, particularly in the field of *signaling and rolling stocks, is the weak point of their technical capacity*. This is natural, given the facts that MRTA has nearly *no access to the actual operation and maintenance service, technical transfer program from the concessionaire was not effectively carried out*, and there is no other opportunity to get the training in M&E systems. Learning resources are limited to lecture books, internet searching, or asking to senior management level staff, just helping them understand the fundamentals.

2) Operation Activities (Operation Department)

Operations activities are administered by three departments;

- Operations Department
- Security and Rescue Department
- Business and Property Management Department

Operations Department is responsible for MRT systems operation supervision, system standard and technique, and system maintenance as well as its standard and technique. Their operations include the tasks and duties of i) train operations, ii) station operations, iii) traffic control, and iv) automated fare collection system (AFC) services. Security and Rescue Department is responsible for all the station and ROW security and rescue planning and operations and manages the Training Institute of Security, Fire and Rescue. Business and Property Management Department is in charge of business planning and development, business and property management, and concession management.

BMCL has a contract with MRTA to operate and maintain the MRT Blue Line, and it has made 4 subcontracts for maintenance, namely: rolling stock and E&M equipment; civil works; station facilities; and track works. The contract for the rolling stock and E&M maintenance contract was signed with the OEM of the rolling stock and signaling system.

BMCL‘s Centeral Control Room (CCR) - There are 5 MRTA officers who work at BMCL’s building office taking care the operation in CCR room for the whole day. If there is any error or bad incident, they will get the report to his superior. These 5 persons have shifts (One shift per one officer). Besides, they also have responsibilities in the office. However, that time is usually used to monitor passenger stations.” BMCL‘s Station Operation Room (SOR) - MRTA staff can only monitor because it was written in the agreement that *MRTA will not interrupt BMCL tasks*. So the participation can be only to check the document, station checklist, take care public area and area around the station, etc and then to make a report. When the officer who makes the report realizes that

there is an error, he will report to his superior, and then higher level consequently.

Performance Evaluation using Key Performance Indicator (KPI) - Under Gross Cost, MRTA shall set KPI's and impose financial penalties or ultimately termination of contract if performance is not maintained at an acceptable level. Most KPI's will be "Direct Performance Monitored (DPM) where the systems shall report automatically in real time all failures and the MRTA shall have a "Shadow" system that monitors the Contractors reporting systems so that MRTA know what is going on at any time in their own O&M office. MRTA can change KPI's if they wish dependant on the performance of the Contractors Systems. Using KPIs as the benchmark indicators for evaluation of the concessionaire performance should be appreciated but MRTA staff tend to just monitor figures and simply check irregularities happening in some instance, but some of them mentioned, when interviewed, that they are *simply following figures and their variance without knowing what happened* on the ground and not able to make any good advice or instructions to the Concessionaire.

Timetabling - Timetabling on the existing Blue line is the responsibility of the Concessionaire, and *MRTA has no control over the timetable* since the concessionaire is solely responsible for ridership risks. MRTA will control and approve service hours including Peak and Off Peak hours in Purple Line operation when the Line is in operation. MRTA will have direct control and approval of the daily Timetable based on the Concessionaires yearly business plan under Gross Cost Scheme. Timetable shall initially be based on the forecast passenger numbers, then minimum train kilometer will be set by MRTA based on approved daily timetable. Train Km actual against the Timetable shall be performance monitored. Any change of the Timetable must be requested from MRTA to reduce or increase train availability dependant on actual patronage.

Setting the number of rolling stock - The initial number of rolling stock procured shall be in accordance to the forecast passenger numbers. However, actual number of trains running may be reduced or increased if actual patronage is not in line with forecast numbers, but only with MRTA approval.

System assurance - MRTA does *not have any control over the system assurance plan and safety plan* for Blue Line except the safety on the platform of stations. For Purple Line, MRTA will have a power to approve System Assurance Plan and Safety Plan. The railway system must function reliably and safely to attract patronage, therefore MRTA shall set quality & system performance targets and monitor directly to ensure the Concessionaire is providing an attractive service to passengers. System reliability, availability and maintainability shall be calculated by the supplier and declared in line with the Contract specifications.

RAMS – MRTA, *different from its current operation*, shall set and measure the systems on Reliability, Availability, Maintainability and Safety (RAMS) by Direct Performance Measurement (DPM) through the systems failure reporting systems. MRTA shall set the performance targets for each system and the actual performance shall be reported monthly. Any failure to achieve performance targets may be financially penalized or in the worse case terminated.

Level of Outsource - There are several types of outsourcing maintenance contracts, and they are best illustrated by the actual approach to three basic questions: what to maintain/repair; how to do be done, and when to do be done. The most probable approach used by BMCL-*Supplier is to contract all of the above steps, thus giving control over the development of equipment maintenance strategies* (i.e. Preventive and Corrective Maintenance programs) to the maintenance contractor. In this instance, the contract must be structured around the achievement of desired outcomes in terms of equipment performance, with the contractor being given latitude to achieve this to the best of his ability.

Supply, procurement and management of spare parts - According to the result of interviews with MRTA staff, the Maintenance Contractor is bound to provide a certain unknown stock of spare parts (both capital and consumables) for a certain period of time for the preventive maintenance. However, in case of rehabilitation or special repairs, the Contractor would request a reimbursement of the required spare parts. The specifications, volume, and cost of those parts are not for approval of BMCL, and *BMCL has only to purchase those parts, usually from the OEM*, which is in turn the Maintenance Contractor. This scheme does *not encourage the "localization" of spare parts* and/or the open canvassing of similar parts from different suppliers that could lead to cost savings. The experience in other railways systems is that the supply of spare parts for rehabilitation or special repairs should be bid out, where the incumbent Maintenance Contractor is allowed to bid. This scheme encourages cost savings by canvassing the parts from several reputable suppliers.

MRT System Maintenance - In the case of MRTA, except for buildings related to non-core business such as park-and-ride, the activities on maintenance of the railway system are restricted, where its engineers at BMCL are informed through monthly and annual reports, and daily by print outs of the Computerize Maintenance Monitoring System (CMMS), but for *MRTA with no possibility of having more access to information and control of the maintenance*. This is per-se not good or bad, it is correctly applied from the contractual conditions. However, in view of long term future role of MRTA, when system would be turned over to them, it is advisable that the level of knowledge and experience of its engineers would be considerable higher to take charge of the actual maintenance. MRTA could still sub-contract maintenance activities in the future, but with wider

attributions to monitor and supervise the Contractor

Maintenance Standard and Technique - The sections of Standard and Technique were *set up* 2 years ago to be technical supporting section. The staff members in these sections are so-called *"in-house consultants"* and have been giving advice to other maintenance sections when they face some difficult technical problems. MRTA staff is responsible for making a report for both E&M (building service and facilities) and M&E (Mechanical & Electrical: signaling, rolling stock, etc) and measuring BMCL's KPI (Key Performance Indicators).

Access to System - *Monitoring some systems requires permission from BMCL* first. Without a permission, MRTA staff can only walk around but cannot cross a yellow line. But if MRTA staff wants to go further inside the equipment area or wants people from MRTA to operate or test the equipments, it is necessary to ask BMCL an agreement or permission each time.

Authority to Issue Approval – Several MRTA staff suggested that *MRTA should have a right to approve or reject.* (MRTA can do nothing with BMCL decision.) To do so, the policy has to be approved by the cabinet or the high level. The provision of direct approval is made in draft tender document of purple line at present).