

Socialist Republic of Viet Nam
TA7892-VIE: Sustainable Urban Transport for Ho Chi Minh City Metro Line 2
Project

Draft Initial Environmental Examination

Prepared by the People's Committee of Ho Chi Minh City for the Asian Development Bank
(July 2013)

NOTE

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Acronyms and Abbreviations

ADB	Asian Development Bank
AMP	Asphalt Mixing Plant
CEAP	Construction Environmental Action Plan
CO	Carbon Monoxide
dBA	Decibel
DONRE	Department of Natural Resources and Environment
DOT	Department of Transport
EA	Executing Agency
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMP	Environmental Management Plan
EHSO	Environmental Health and Safety Officer
ES	Executive Summary
FS	Feasibility Study
GDP	Gross Domestic Product
GHG	Greenhouse Gases
HCMC	Ho Chi Minh City
IFI	International Financing Institution
IEE	Initial Environmental Examination
KfW	Kreditanstalt für Wiederaufbau
km	Kilometer
LARP	Land Acquisition and Resettlement Plan
LIEC	Loan Implementation Environmental Consultant
MONRE	Ministry of Natural Resources and Environment
MRT2	Mass Rapid Transport Line 2
NGO	Non-Governmental Organization
NO ₂	Nitrogen Dioxide
NO _x	Nitrogen Oxides
PC	Peoples Committee
PMU	Project Managing Unit
PMU-SU	PMU Safeguards Unit
PPTA	Project Preparatory Technical Assistance (Concept Paper)
QCVN	Vietnamese Standard
RoW	Right of Way
SO ₂	Sulphur Dioxide
SO _x	Sulphur Oxides
SPS 2009	Safeguard Policy Statement 2009 of the Asian Development Bank
STD	Sexually transmitted diseases (such as HIV/AIDS)
ToR	Terms of Reference
TSP	Total Suspended Particulates
WB	World Bank

1 Executive Summary

1.1 Introduction

1. This initial environmental examination (IEE) is part of the process of compliance with the Safeguard Policy Statement 2009 (SPS 2009) of the Asian Development Bank (ADB) in relation to the Sustainable Urban Transport Project for Ho Chi Minh City (HCMC) Metro Line 2 under ADB Grant No. TA-8052.

2. The IEE provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the Project and provides a detailed description of the direct and indirect environmental effects associated with the proposed Project during key periods of work.

3. More specifically, the IEE:

- Describes the extent, duration and severity of the impacts;
- Analyzes all potential impacts, both positive and negative;
- Formulates the mitigation and monitoring actions and presents it all in the form of an Environmental Management Plan (EMP).

1.2 Description of the Project

4. The project preparatory technical assistance (PPTA) for the Sustainable Urban Transport for Ho Chi Minh City (HCMC) MRT Line 2 Project (“the Project”) supports the development of sustainable low carbon urban transport measures and programs in HCMC. The objective of the PPTA is to ensure integration of public transport occurs in six districts along Mass Rapid Transit (MRT) Line 2. The outcome of the PPTA will be the identification of energy efficient urban transport solutions which, in conjunction with the HCMC Urban Mass Rapid Transit Line 2 Investment Program, will lead to significant greenhouse gas (GHG) emission reductions for HCMC. The assistance will focus on identifying and developing a series of innovative and transformational interventions, which enhance the quality of public transport systems and significantly increase the modal share of public transport in HCMC.

1.3 Impact Identification & Mitigation

5. The following summarizes the key environmental impacts identified by the IEE and the required mitigation measures.

- **Trees** – A number of mature trees will need to be cut to make way for the station box construction works and for areas accommodating bus stops and other Project related infrastructure. To mitigate this issue a Tree Removal and Replanting Plan will be prepared by the Contractor for approval by Project Management Unit 1 (PMU1) and the Loan Implementation Environmental Consultant (LIEC). The Plan will specify replanting of specific species and their numbers and locations.
- **Sensitive Receptors** – Several schools, hospitals and places of worship are located within the vicinity of the Station boxes and could be negatively affected by noise levels, emissions to air, etc. The mitigation measures provided by the EMP, such as limiting construction activities in these areas to specific times to reduce noise impacts, take into account the potential impacts on sensitive receptors. As such disruption to these areas should be minimal.
- **Climate change** – HCMC has been identified as a city that maybe impacted significantly by climate change in the future. Extreme flood events, caused by climate change, may occur within the city and potentially impact negatively upon the infrastructure of the city including the MRT. Although it is noted that most of the Project interventions occur on the surface and that the MRT2 line traverses areas between 4 – 8 meters above sea level, it is still recommended that designs consider the possibility of extreme flood events occurring during the next 50 years and as such designing Project related drainage to account for this issue.
- **Asbestos** – Demolition of properties may require the removal of asbestos containing materials. Poor management and disposal of the materials can have serious health impacts. If any asbestos containing materials are identified within properties (or possibly in water pipes), the Contractor should follow the asbestos management guidelines

recommended by the Vietnamese Health and Safety Executive and included as an Appendix to this report.

- **Contaminated Land** – Several petrol filling stations may be demolished to make way for station park-and-ride facilities. It is possible that these areas comprise contaminated soils, which will need to be removed from the site. Poor management and disposal of contaminated soils can have serious health and environmental impacts. Soil sampling at the petrol filling stations should be undertaken to assess the nature and extent of any contamination. Should results reveal any significant levels of soil contamination measures should be taken to excavate and dispose of the soils according to Vietnamese regulations.
- **Resettlement** – Construction works in the Station boxes will necessitate the demolition of properties. Compensation will be required for these actions. Accordingly a Resettlement and Land Acquisition Plan (LARP) will be prepared as part of the Project.
- **General construction related impacts** – These include a number of short term construction issues such as spills and leaks of waste liquids and chemicals, health and safety issues, noise and air quality impacts. Most of these issues will be short term and limited to specific construction sites and can be appropriately managed by the standard construction mitigation measures outlined in the EMP herewith.

6. To manage these issues a complete Environmental Management Plan has been prepared, with tables listing mitigative measures to be undertaken during the pre-construction, detailed design, construction and operating period of the project.

1.4 Monitoring Actions

7. To ensure that all of the above mitigation actions are completed according to the requirements of the EMP, monitoring shall be undertaken of Project works by the PMU Safeguards Unit(PMU-SU) and by independent monitoring specialists. Specifically both observational monitoring and instrumental monitoring shall be undertaken to ensure compliance with national standards as follows:

- Instrumental Monitoring – This shall be completed by independent specialists and will include monitoring of air quality (CO, TSP and NOx) and noise during the construction phase and monitoring of potential spoil contamination prior to the commencement of construction activities at selected station locations.
- Observational Monitoring – The Contractors actions shall be continually monitored by the PMU-SU throughout the Projects Construction phase. This will be achieved through weekly inspections of the Contractors environmental performance by the PMU-SU throughout the construction period. Contract documents shall specify that PMU1 shall have the right to suspend works or payments if the Contractor is in violation of any of his obligations under the EMP and this IEE.

1.5 Consultations

8. Stakeholder consultations were undertaken in December 2012 and March 2013. The consultations with local residents, businesses, local officials and government representatives in the Project Area did not reveal any environmental impacts that could not be mitigated by this IEE. In addition, consultations with HCMC DONRE did not reveal any specific environmental issues that would result from Project works. It is noted however, that this IEE should be submitted to DONRE for their review.

1.6 Conclusions and Recommendations

9. Based on the existing ADB SPS 2009 this Project falls under ADB's project **Category B**. This means that the project's potential adverse environmental impacts are site-specific, and in most cases mitigation measures can be designed. An IEE, including an EMP, is required for a Category B Project. Accordingly this report fulfills these ADB requirements.

10. The IEE established that there were no significant environmental issues that could not be either totally prevented or adequately mitigated to levels acceptable Vietnamese and international standards using the Environmental Management Plan included herewith. The EMP, its mitigation and monitoring programs, shall be included within the Project Bidding documents for project works. The Bid documents will state that the Contractor shall be

responsible for the implementation of the requirements of the EMP through his own Construction Environmental Management Plan (CEMP) which will adopt all of the conditions of the EMP. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

11. The EMP and all its requirements will then be added to the Contractors Contract, thereby making implementation of the EMP a legal requirement according to the Contract. He shall then prepare his CEMP which will be approved and monitored by the PMU-SU and its LIEC. Should the PMU-SU note any non-conformance with the CEMP the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the CEMP the Contractor should employ an environmental, health and safety specialist to monitor and report Project activities throughout the Project Construction phase.

2 Initial Environmental Examination Report

2.1 Purpose and Objectives of the Report

12. This initial environmental examination (IEE) is part of the process of compliance with the ADB SPS 2009 in relation to ADB Grant No. TA-8052 for the Sustainable Urban Transport for Ho Chi Minh City Metro Line 2 Project.

13. The IEE provides a road map to the environmental measures needed to prevent and/or mitigate negative environmental effects associated with the development and operation of project. The general objectives of this IEE are to:

- Provide necessary baseline data about the project;
- Provide understanding on potential impacts of the project;
- Provide information on potential mitigation measures to minimize negative impacts including mitigation costs;
- Provide information on the public consultation process undertaken, and the project level Grievance Redress Mechanism (GRM) established; and
- Formulate Environmental Management and Monitoring Plans (including definition of institutional responsibilities, capacity building and training plans, and budgeting).

2.2 Project Proponent

14. HCMC People's Committee (HCMC PC) will be the executing agency for the Project, with overall responsibility for project implementation. The Department of Transport (DOT) will be the implementing agency for the project, with Project Management Unit No. 1 being the focal agency and responsible for day to day management of the consulting services. The Project will be supported by international and national consultants provided through this Grant.

2.3 Nature and Category of the Project

15. The project preparatory technical assistance (PPTA) for the Sustainable Urban Transport for Ho Chi Minh City (HCMC) MRT Line 2 Project ("the Project") will support the development of sustainable low carbon urban transport measures and programs in HCMC. The objective of the PPTA is to ensure integration of public transport occurs in six districts along Mass Rapid Transit (MRT) Line 2. The outcome of the PPTA will be the identification of energy efficient urban transport solutions which, in conjunction with the HCMC Urban Mass Rapid Transit Line 2 Investment Program, will lead to significant greenhouse gas (GHG) emission reductions for HCMC. The assistance will focus on identifying and developing a series of innovative and transformational interventions, which enhance the quality of public transport systems and significantly increase the modal share of public transport in HCMC.

16. Based on the existing ADB Environmental Safeguards Policy (2009), this Project falls under ADB's project Category B. This category is defined as:

"Projects with potential to cause less significant fewer environmental impacts than Category A, yet still require a prescribed level of environmental management to protect the environment. For these projects an initial environmental examination (IEE) could be considered as final environmental assessment report if the stated document determines that an environmental impact assessment (EIA) is not required for the project under examination".

17. Considering the type and magnitude of activities no significant impacts that will warrant the conduct of an EIA are foreseen.

2.4 Methodology Applied

18. The methodology is based on the ADB, Safeguard Policy Statement (2009) and the joint experience of the International and National environmental consultants involved in the IEE. Background data and information was obtained from published and unpublished sources, e.g., on: climate, topography, geology and soils, natural resources, flora and fauna,

agriculture, and socio-economic data. Several site inspections were conducted jointly by the International Environmental Specialist and National Counterpart during December 2012 and March 2013. The Project Area was observed in detail and areas of potential environmental significance assessed carefully. Discussions were held with a number of stakeholders and a face-to-face surveys were conducted with people living and working in the Project area in order to determine their perceptions of the level of impact from road works. Data and information obtained have been included where appropriate in the IEE Report.

2.5 Structure of the Report

19. The report is organized to comply with ADB Safeguard Policies (2009) as follows:

- **Section A: Introduction** – The section in hand provides the introductory information and a detailed description of the legal and policy framework within which the Project will operate during the design, construction and operational phases of the Project.
- **Section B: Description of the Project** – Section B describes the Category of the Project, the Project need and its environmental setting. A detailed scope of works is also provided indicating the type of interventions required. The final portion of this section discusses Project alternatives.
- **Section C: Legal, Policy and Administrative Framework** - This section presents an overview of the policy/legislative framework as well as the environmental assessment guidelines of Vietnam that apply to the proposed project. The section also identifies relevant Asian Development Bank Safeguard Policies that will apply.
- **Section D: Description of the Environment** – defines the project's area of influence, and provides a description of the potentially affected environment. The description is based on reviews of available documentation, statistical data, meetings with experts in the field and field surveys and investigations. The assessment will address three aspects of the environment: (i) Physical Resources, including topography and soils, air and water quality, noise etc.; (ii) Ecological Resources – flora, fauna, and protected areas; (iii) Other Environmental Aspects, such as waste management, noise, health and safety, etc.
- **Section E: Screening of Potential Environmental Impacts and Mitigation Measures** – Section E provides an assessment of potential impacts of the proposed development in light of the existing conditions. It assesses environmental impacts on soil, surface water, noise, flora, fauna, cultural heritage and health and safety, during design, construction and operation. It also defines mitigation actions to prevent and/or otherwise mitigate unavoidable impacts expected to be incorporated as integral parts of the project.
- **Section F: Public Consultation and Information Disclosure** - Section G provides a summary of all of the stakeholder consultation activities undertaken along with information regarding the disclosure process
- **Section : Grievance Mechanism** –A grievance mechanism for project affected persons is provided.
- **Section H: Environmental Management Plan & Institutional Requirements** – This section provides the EMP for the design, construction and operational phases of the Project.
- **Section I: Conclusions and Recommendations** – The final section of the report provides the report conclusions and any necessary recommendations.

3 Project Description

3.1 Project Objective and Approach

3.1.1 General

20. The 2020 Urban Transport Master Plan (UTM) for HCMC sets out recommendations for future transport development of the city, which envisages high priority for public transport development. Modal share of travel in HCMC urban areas by public transport is targeted to be 40~50% by the year 2025, compared with only around 5% today and the development of an urban rail network will be the backbone to achieve this target. However, for these targets to be achieved, all public transport modes must be well integrated and efficiently operated.

21. The ADB have decided to finance the Sustainable Urban Transport for Ho Chi Minh City (MCMC) Metro Line 2 Project (the "Project") which will support the development of integrated low carbon urban transport measures. More specifically, the Project will design and construct sustainable urban transport facilities, services and measures along the 10km corridor of the HCMC MRT line 2 (MRT2) corridor, primarily at the proposed 11 MRT2 stations, and will propose the necessary policy and regulatory measures to encourage public transport usage. The MRT2 corridor is shown in **Figure B-1**. The MRT2 project, which covers construction of the depot; track; and stations, includes ADB financing of \$540 million (Tranche 1 under Loan 2731 was approved in 2010 while Tranche 2 under Loan 2956 was approved in 2013) and is co-financed with Kreditanstalt für Wiederaufbau (KfW) and European Investment Bank (EIB).

3.1.2 PPTA

22. As part of the Project the ADB is funding Project Preparatory Technical Assistance (PPTA). The objective of the PPTA is to ensure integration of public transport occurs in six districts along Metro Line 2. The outcome of the PPTA will be the identification of energy efficient sustainable urban transport solutions which, in conjunction with the HCMC Urban Mass Rapid Transit Line 2 Investment Program, will lead to significant greenhouse gas (GHG) emission reductions for HCMC. The assistance will focus on identifying and developing a series of innovative and transformational interventions, which enhance the quality of public transport systems and significantly increase the modal share of public transport in HCMC. The PPTA has been conducted in two phases:

Phase 1 - Project Concept to evaluate and determine suitable sustainable urban transport measures.

Phase 2 - Project Feasibility, to develop and design the agreed measures.

23. The overall approach by Phase is discussed below.

24. **Phase 1 – Project Concept Study (completed in October 2012):** Assessment of the existing public transport situation, review of proposed measures, and conceptualization of public transport measures to be implemented under the Project in these three main areas of interest:

1. Improved accessibility in and around Metro Line 2 stations.
2. Integrated and innovative public transport services and measures connecting to Metro Line 2 stations.
3. Support for transformational policies and regulatory measures to encourage modal shift to public transportation modes (e.g. (a) better enforcement program, (b) parking and demand management, and (c) integrated fares and ticketing).

25. **Phase 2 – Project Feasibility Study (anticipated completion July 2013):** Preparation of concept or feasibility designs for Metro Line 2 priority measures that have been identified under Phase 1, which will include:

1. Preparation of design concept and conceptual design of multi-modal interchange with other public transport or MRT lines for five MRT2 stations (Tao Dan, Hoa Hung, Bay Hien, Ba Queo and Tham Luong), including their surrounds.

2. Preparation of design for the remaining five regular MRT2 stations (Dan Chu, Le Thi Rieng, Pham Van Hai, Nguyen Hong Dao and Pham Van Bach) and their surrounding areas' accessibility.
3. Development of a program of innovative public transport technologies, measures and facilities to be piloted or adopted for all stations.

3.2 Sustainable Transport

3.2.1 Definition

26. As the economy and population grows in HCMC there is an increased demand for travel. To be able to fight the challenges created by increased private vehicle ownership (such as congestion leading to poor air quality and high carbon emissions) it is necessary that a sustainable alternative to private transport is developed. A sustainable public transport system is important to meet the demand for travel in HCMC and improve the quality of urban living and the environment. A sustainable transport system can be defined as:

- Access and movement of people and goods in a way that promotes healthy living and economic and social growth;
- Affordable, efficient travel with choices of mode;
- A transport system that is energy efficient and space saving with low impact on the environment.
- A transport system that is financially sustainable

27. A sustainable transport system is important because more people will be encouraged to use public transport and non-motorized modes of travel resulting in:

- Less traffic congestion therefore a reduction in carbon emissions from private vehicles (compared with business as usual scenario) which will reduce greenhouse gas emissions and damage to the environment (The GHC assessment has been presented in detail in Chapter 9 (entitled economic and emission assessment) of the draft Final Report);
- Improved personal health (through exercise and less exposure to vehicle emissions);
- Greater accessibility for all to public services, employment opportunities, education etc resulting in increased social and economic growth; and
- A safe urban travel experience.

3.2.2 Methods to Achieve Sustainability

28. The most effective way of maximizing the benefits of Line 2 will be to maximize its ridership, thereby reducing travel on the road-based transport system, resulting in reduced fuel consumption, emissions, travel time, accidents, etc. The sustainable transport initiatives that have been identified by the PPTA as most effective in achieving this can be grouped in the following order of priority:

1. Demand management.
 - a. Controls on private vehicle ownership, parking and use (fiscal, capacity and enforcement), and
 - b. Public transport subsidies and fare levels.
2. Promoting lower carbon choices.
 - a. Enhance accessibility to stations (especially by sustainable transport modes, such as walking, cycling and buses);
 - b. Integration of metro with other transport modes; and
 - c. Travel Information.
3. Land use planning.
 - a. Reviewing planning and development controls around stations; and
4. New technologies and fuels.
5. Low carbon emission bus feeder network.
6. Park and ride priority to green transport modes (e.g. electric motorcycles).

3.3 Project Location

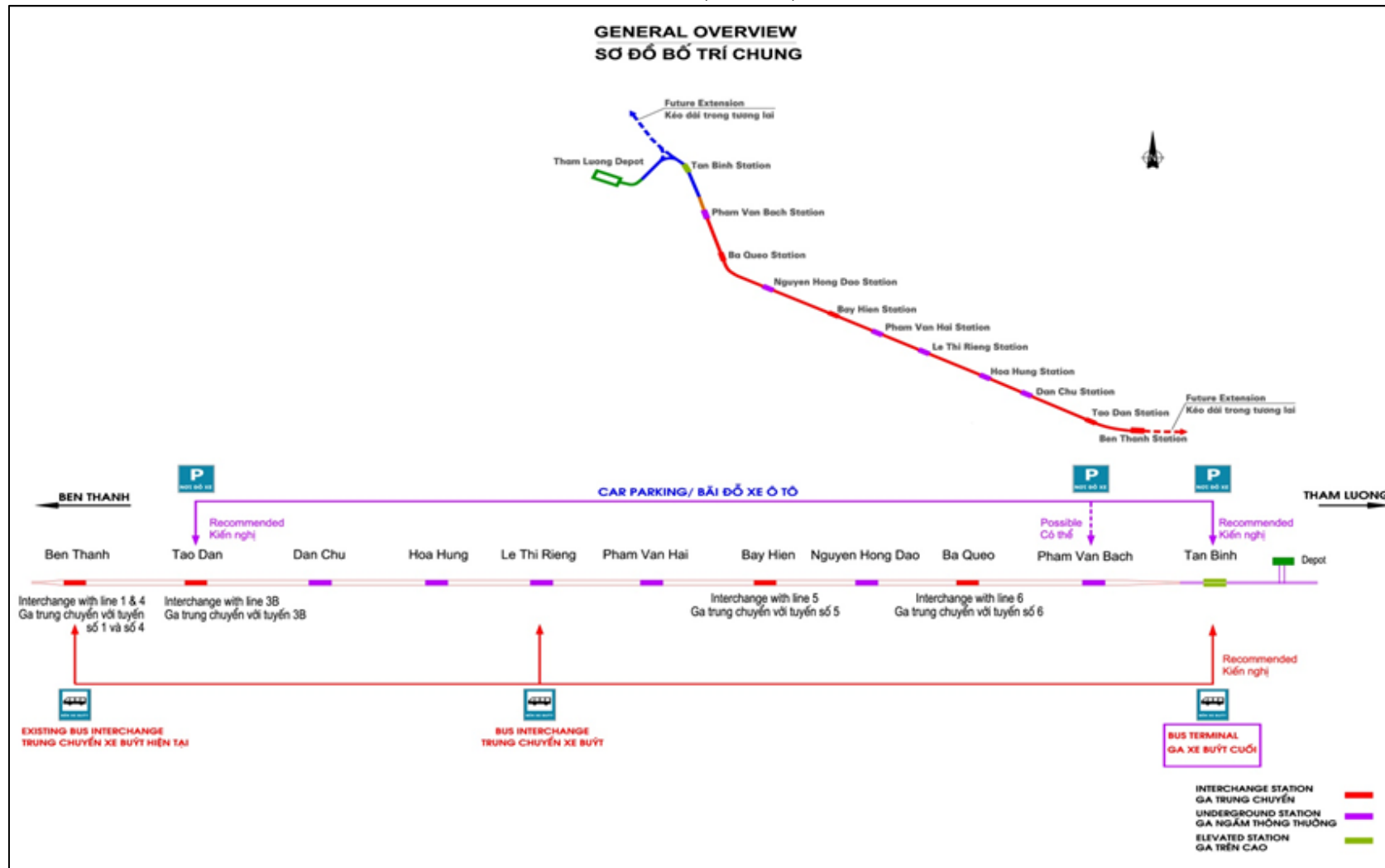
29. The MRT Line 2 has a total distance of 11.2 kilometers. It runs from Tham Luong in the northwestern part of the city to Ben Thanh Market in the city centre (see **Exhibit B-1**).

The route comprises 9.3km of underground section, including 10 underground stations, and 1km of elevated track, including 1 elevated station and 0.3 km of transition track.

30. It follows the routes of roads Duong Truong Chinh, Duong Cash Mang Thang Tam, Pham Hong Thai, and Dai Lo Ham Nghi. It will include a spur of about 1.1 kilometers to a depot complex in Tham Luong (none of the Project interventions will occur in this area which has been the subject of a separate EIA). From Tham Luong Line 2 will be elevated, on the median of Duong Truong Chinh. It will continue elevated on Duong Truong Chinh until it reaches the vicinity of Tan Son Nhat airport. A transition section will take it underground just before the intersection with Pham Van Bach. Between Pham Van Bach and the end of the line it will be underground. The majority of the Project interventions will take place within the MRT 2 corridor and specifically in the areas of the proposed station locations which are provided as **Appendix A. Section D1** below provides a more detailed definition of the Project Area and **Exhibit B-2** provides a summary of the Station locations.

Exhibit B-2: Summary Location and Administrative Information	
Tao Dan	Tao Dan is the second station of Metro Line 2 Phase 1 (from Ben Thanh to Tham Luong). The first underground station is Ben Thanh. The top track elevation is about -15.3m. The station consists of 3 levels: platform, intermediate and concourse levels. Tao Dan station is located beneath Cach Mang Thang Tam, immediately to the north of its junction with Nguyen Thi Minh Khai, and opposite Tao Dan Cultural Park. The 1km area around the station includes parts of Districts 1 and 3, and 7 wards (Ben Thanh, Pham Ngu Lao and Thai Binh Nguyen of District 1; and Wards 4, 5, 6, 7 of District 3).
Dan Chu	Dan Chu is the third station of Metro Line 2 Phase 1. The top track elevation is at about -11.3m. The station consists of 2 levels: platform, and concourse levels. Dan Chu station is located at the 6-leg intersection between Cach Mang Thang Tam, Ly Chinh Thang, Vo Thi Sau, Nguyen Thuong Hien, 3/2 Road and Nguyen Phuc Nguyen. Dan Chu station is arranged right beneath the existing roundabout and along the alignment of Cach Mang Thang Tam. The 1km area around the station includes parts of Districts 3 and 10 and 3 wards (Ward 12 of District 10; and Wards 7, 9 of District 3).

Exhibit B-1: MRT2, HCMC, Vietnam



Hao Hung	Hoa Hung is the fourth station of Metro Line 2. The top track elevation is about -12.5m. The station consists of 2 levels: platform, and concourse levels. Hoa Hung station is located under Cach Mang Thang Tam near the Indian Muslim Cemetery and the existing Thanh Van Theatre (at 358 Cach Mang Thang Tam). Hoa Hung station is located between the junctions of Cach Mang Thang Tam with Hoa Hung and To Hien Thanh. The 1km area around the station includes parts of Districts 3 and 10 and 8 wards (including Wards 12, 13, 15 of District 10; and Wards 9, 10, 11, 12, 13 of District 3).
Le Thi Rieng	Le Thi Rieng is the fifth station of Metro Line 2. The top track elevation is about -13.4m. The station consists of 2 levels: platform, and concourse levels. Le Thi Rieng station is located underground beneath Cach Mang Thang Tam, opposite the existing Le Thi Rieng Park (at 540 Cach Mang Thang Tam). Le Thi Rieng station is close to the junction between Cach Mang Thang Tam and Truong Son – District 10. The 1km area around the station includes parts of Districts 3, 10 and Tan Binh and 9 wards (including Wards 3, 5, 11, 12, 14 of District 3; and Wards 13, 15 of District 10, and Ward 7 of Tan Binh District).
Pham Van Hai	Pham Van Hai is the sixth station of Metro Line 2. The top track elevation is at about -12.65m. The station consists of 2 levels: platform, and concourse levels. Pham Van Hai station is located underground beneath Cach Mang Thang Tam at the junction of Pham Van Hai and Cach Mang Thang Tam and the T-junction with Binh Van Tran. The 1km area around the station includes parts of Districts 3, 10 and Tan Binh and 9 wards (Wards 1 and 11 of District 3; and Ward 15 of District 10; and Wards 3, 5, 6, 7, 11 of Tan Binh).
Bay Hien	Bay Hien is the seventh station of Metro Line 2 and is the interchange station with Metro Line 5. The top track elevation is at about -11.6m. The station consists of 2 levels: platform, and concourse levels. Bay Hien station is located at the 4-leg junction of Cach Mang Thang Tam with Ly Thuong Kiet and Hoang Van Thu. Bay Hien underground station is located beneath this junction and along Cach Mang Thang Tam. The 1km area around the station includes parts of Tan Binh District and 5 wards (including Wards 3, 5, 7, 11, and 12).
Nguyen Hong Dao	Nguyen Hong Dao is the seventh station of Metro Line 2. The top track elevation is at about -11.58m. The station consists of 2 levels: platform, and concourse levels. Nguyen Hong Dao station is located underground beneath Truong Chinh, between the junctions of Truong Chinh with Nguyen Hong Dao and Truong Cong Dinh. The 1km area around the station includes parts of Districts Tan Binh and Tan Phu, and 6 wards (Wards 11, 12, 13, and 14 of Tan Binh District; and Wards Tan Son Nhi and Tan Thanh of Tan Phu District).
Ba Queo	Ba Queo is the 8 th station of Metro Line 2 and is the interchange station with Metro Line 6. The top track elevation is at about -12.3m consisting of 2 levels: platform, and concourse levels. Ba Queo station is located at the 3-leg junction between Truong Chinh with Cong Hoa. Ba Queo underground station is located beneath this junction and along Truong Chinh. The 1km area around the station includes parts of Tan Phu and Tan Binh Districts and 6 wards (including wards 13, 14, 15 of Tan Binh District; wards Tay Thanh, Son Ky, Tan Son Nhat of Tan Phu District).
Pham Van Bach	Pham Van Bach is the last underground station of Metro Line 2. The top track elevation is at about -10.98m. The station consists of 2 levels: platform, and concourse levels. Pham Van Bach station is located underground beneath Truong Chinh near the junction with Pham Van Bach and Che Lan Vien, and at the alignment section approaching the transition link from underground to elevated sections (the next station is Tham Luong elevated station). The 1km area around the station includes parts of Districts Tan Binh and Tan Phu, and 3 wards (Wards 13 and 15 of Tan Binh District; and Ward Tay Thanh of Tan Phu District).

Tan Binh	Tan Binh is the last station of Metro Line 2 and is the first elevated station after 10 underground stations. The top track elevation is at about +12.70m. The station consists of 2 levels: platform, and concourse levels. Tan Binh station is the first elevated station and located within the 60m wide right of way of Truong Chinh. The station is located right at the junction between Truong Chinh and the street to Tan Binh Industrial Zone. The 1km area around the station includes parts of Districts 12, Tan Binh and Tan Phu, and 4 wards (Wards 15 of Tan Binh District; Tay Thanh ward of Tan Phu District; and Wards Tan Thoi Nhat and Tan Hung Thuan of District 12).
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3.4 Station Concept Layouts

3.4.1 Solutions

31. For each station, concept layouts have been developed that include how the proposed urban transport measures can be incorporated. The approach taken in the development of these solutions is set out below and summarized in the table below. **Solution 1** (Drawings can be found as **Appendix A**) consists of basic facilities, and some are indispensable to the seamless operation of the MRT2 and its integration with other transport modes. These consist of station entrances, vents, bus stops, and footpath improvements. It also includes a bus bay and three motorbike / bicycle park and ride facilities (Ba Queo: total area 6000m², capacity: 2200 MC/BI, Pham Van Bach: total area 6700m², capacity: 1400 MC/BI and Tan Binh: total 2000 m², 300 lots. These parking facilities comprise a roof and fences surrounding). Geographically, these will be implemented within the 200 meter radius of the station box. Some of these basic facilities such as the vents are located within the approved station box measuring 35 x 150 meters.

Solution	Purpose	Application	Cost
Solution 1	Provide facilities and accessibilities for the most basic solution	Applied for all stations	Basic investment cost to improve accessibility to Metro stations
Solution 2	Provide a fuller addition provision.	Only applied for Tao Dan, Ba Queo, Pham Van Bach and Tan Binh	Consider to choose some options or all based on the project's total investment cost
Future Development Concept	Based on land-use planning and transport-oriented development, propose ideas to further promote the ability to integrate the stations to maximize integration between the MRT routes and other other public transport modes.	Applied for all stations. The future development concepts are not required for submission and approval.	Not defined within this project scope

32. A small bus interchange is proposed adjacent to Le Thi Rieng Station in front of the park to accommodate 7 new local/feeder bus routes. This is included in Solution 1 as it is essential to the operation of the proposed new routes.

33. **Solution 2** (See **Appendix G** for Drawings) aims to achieve a fuller provision for integration. The solution 2 consists of park and ride facilities and subway or footbridge. The table below summarizes the descriptions of the subways and footpaths.

DESCRIPTIONS FOR SUBWAYS

Station	Width (m)	Height (m)	Length (m)	Depth to Top cover (m)	Main Steps in Construction
Subway for Tao Dan Station	6	2.7	100	12.38	1. Land Clearance 2. Excavation for guide wall 3. Construction of diaphragm wall 4. sheeting to surface 5. Forward excavation to the level of bottom edge slab 6. Foundation Enhancement 7. Erection of pre-cast subway segment 8. Land Recovery
Subway nearby Pham Van Bach station	4	2.7	58	2.5	1. Division of the road 2. Traffic Diversion 3. Land Clearance 4. Excavation for guide wall 5. Construction of diaphragm wall 6. sheeting to surface 7. Forward excavation to the level of bottom edge slab 8. Foundation Enhancement 9. Erection of pre-cast subway segment 10. Land Recovery

DESCRIPTIONS FOR FOOTBRIDGE

Station	Width (m)	Height (m)	Length (m)	Height to bottom of girder (m)	Main Steps in Construction
Ba Queo Footbridge	4	3.2	115	5.75	1. Division of the road 2. Traffic Diversion 3. Land Clearance 4. Foundation Construction 5. Erection of Piers 6. Erection of Deck 8. Erection of Roof 9. Land recovery
Subway nearby Pham Van Bach station	3	3.2	118	6	1. Division of the road 2. Traffic Diversion 3. Land Clearance 4. Foundation Construction 5. Erection of Piers 6. Erection of Deck 8. Erection of Roof 9. Land recovery

34. Solution 2 therefore builds on Solution 1 and has subway links to commercial areas as its main major additional scheme component. Such larger development components can further facilitate passengers transfer between MRT2, other MRT lines and other transport modes

35. **Future Development Concepts** (formerly known as Solution 3) have also been developed, which is expected to further boost the station integration to take full advantage of integrating MRT2 and other MRT lines and other transport modes.

36. The Future Development Concept typically involves building a bus terminus or Public Transport Interchange to facilitate passenger transfers between bus and rail and provide bus access to commercial areas.

37. **Exhibits B-3** provides a more detailed assessment of the types of activities considered at each station location.

3.5 Public Transport Integration

38. The current bus patronage in the corridor is very low compared to private motor vehicle flows and the capacity to be provided by MRT Line 2. For many good reasons related to community economics, social equity, local air quality and climate change, it is desirable to raise the use of public transport and non-motorized travel modes (NMT) in cities, and reduce the dependence on private motorized travel. In the case of HCMC, where motorbike travel is extremely dominant, and very convenient for the individual user, the public transport system needs to be much improved in order to encourage individuals to use it, and/or to make restraints on private vehicle use politically acceptable. The objective of proposed service integration and improvements are:

- To improve travel opportunities in the corridor and at the same time to make use of MRT's speed and capacity and so facilitate an economic use of available transport capacity.
- To encourage bus passengers and others to shift to metro where this can reduce their overall travel time by facilitating such transfers.
- To minimise the time, inconvenience, uncertainty and cost incurred in interchange and thereby to facilitate what is often referred to as 'seamless' travel.
- To increase the economic and financial viability of the metro network by facilitating the effective expansion of the metro catchment area through feeder bus routes. Details of feeder bus routes can be found in the public transport chapter in the draft final report.
- To provide facilities for private motorcycles (and, increasingly private cars) to serve as feeder modes to metro, particularly from the lower density catchment areas around the outer northern stations of Line 2. These facilities refer to conveniently located motor cycle parking and drop-off areas
- To reduce bus system operating costs
- To maximise the usage and value-for-money for the huge investment in metro and significant investment in buses (143 new buses are anticipated to be deployed)
- To promote and help maintain environmental sustainability at local and global scales

Exhibit B-3: Project Actions		
Solution	Items	Items
Solution 1	Station integration proposals: various facilities parkings and drop-off/pick up for " On street" vehicles	
	Footpath improvement design proposal: designs related to replace and widen the footpaths accessing the stations for pedestrian	
	Traffic management schemes: traffic circulation, control. Install traffic signal priority, etc.	
	Integrated public transport: Propose new bus feeder routes and restructure the existing bus routes together with supporting services	
Solution 2	Connect different grades to stations (subway/footbridge)	Tao Dan subway link to Trong Dong car parking, L100m, B=6m
		Ba Queo footbridge link to BQ parking to station, L115m, B=4m
		Pham Van Bach footbridge, over pass Truong Chinh Road, L=55m, B=4m
		Tay Thanh footbridge, link from Tan Binh elevated station to Tay Thanh road, L=120m, B=3m
	New parking	Ba Queo M/C Outdoor-Parking, 6000 m2, 2200 lots
		Pham Van Bach M/C Outdoor-Parking, 6700m2, 1200 lots
		Tan Binh M/C Outdoor Parking, 2000m2, 300 lots
Future development concept*	Propose locations for transport oriented development.	All stations
	Connect to areas of transport oriented development.	All stations
	Connect to other Metro Lines	Interchange stations
	Parkings	All stations
	Bus terminals	Interchange stations

3.5.1 Bus Network Restructuring

39. A major feature of an integrated network is that there should be a “hierarchy” of services, whereby

- a) Rail services or BRT provide the “trunk” movements in the major corridors, whilst
- b) Conventional bus services serve the secondary corridors, and
- c) Shorter local bus services (often using smaller buses) provide access from major hubs in the trunk network to and from many local destinations, and provide for local connectivity not served by the higher modes in the hierarchy.

40. Proposals for restructuring of the bus network related to introduction of Metro Line 2 consist of four types, namely

- a) Modification, truncation or cancellation of pre-existing bus routes that will lose significant patronage when Metro Line 2 opens.
- b) Local re-routing of pre-existing bus services to provide more convenient interchange opportunities with Line 2 stations
- c) Adjustments of bus service frequencies to match changed demands.
- d) Addition of new local routes serving an MRT feeder role

41. Prior to opening of Metro Line 2 in approximately 5 to 6 years time it is proposed that the following City-wide improvements to the existing bus system are made:

- a) Review bus stop locations and pedestrian crossing facilities near all bus stops, and where necessary adjust the location of the bus stop and/or move existing pedestrian crossings or introduce new ones, such that all bus stops have a safe and convenient pedestrian crossing of the road along which they operate available within 50 metres.
- b) Provide shelters at bus stops wherever practical. Remove vehicle parking or commercial activities on footways if this is an impediment to provision of a bus shelter.
- c) Improve the service information provided to passengers at all bus stops, and in general via all means.
- d) Introduce smart-card based ticketing throughout the urban bus network.
- e) Amend the bus fare structure to be distance-based (with taper) with “free” interchange between services available to passengers using pre-paid smart cards.

42. It is recommended that the proposed “Type C” local/feeder services should use new buses of modern design incorporating:

- Low floors
- Low emissions
- Fuel efficiency
- Smart card ticketing
- Zero fare penalty for interchanging

3.5.2 Interchange facilities for Taxis

43. While the primary need for interchange is to accommodate transfers between fixed route bus and rail modes, a strategy to develop a hierarchy of transport services requires that taxis also be included in interchange facilities. In terms of their speed and convenience, and their ability to carry large luggage items, taxis offer a personalized service similar to that of a private car so it is important that facilities for taxis are included in an interchange. Apart from ensuring that pick-up and set-down facilities are as close as possible to a metro entrance, care must be given to such requirements as:

- Adequate space for taxis to form an orderly queue in order of arrival;
- Provision for two or more taxis to pick up passengers simultaneously;
- Comfortable and convenient queuing facilities for passengers, covered and preferably air-conditioned;
- Separate facilities for picking up and setting down at all but the smallest interchanges, and
- The provision of road layouts to ensure that taxis queuing to enter the pick-up zone do not obstruct traffic on adjacent roads

3.5.3 Motor Cycle Taxis (Xe-om)

44. Catering for short trips to and from Metro stations is a natural role for xe om market niche. The percentage of road traffic volume that can be attributed to motor cycle taxis is shown in **Exhibit B-4**. Since no legal framework currently exists for regulating xe om, the proposed xe om strategy is to provide facilities for xe om to pick-up, set down and wait at Metro stations, but to give preferential access to these facilities to xe om drivers who meet basic safety requirements:

- Wear a vest with the driver's name and identification numbers of the driver and motorcycle
- Subject the motorcycle to a periodic roadworthiness check
- Passenger is insured for injury
- Driver is warranted free of conviction for a serious offence
- Periodic spot checks for alcohol or drug use
- Effective sanctions for dangerous driving or breach of safety rules.
- Wear Helmets and restrict capacity to two adults and one child.

Exhibit B-4: Motorized Ride in Percentages for HCMC Line 2

Year	Motorised Ride in Mode	Station Type	2	3
		1		
2018	4	5	6	7
8	Bus	40	30	40
9	Car	4	5	1
10	MC	26	30	14
11	Taxi	5	6	5
12	Xe Om	25	29	40
13	Total	100	100	100

Type 1: Tan Binh, Bay Hien, Dan Chu, Ben Thanh

Type 2: Pham Van Bach

Type 3: Ba Queo, Nguyen Hong Dao, Pan Van Hai, Le Thi Rieng, Hoa Hung, Tao Dan

45. These requirements address many of the risks to passengers of the current unregulated xe om system. Xe om fares would not be regulated, but the rate per km and fares to the main local destinations would be displayed at each stand. All xe om at each station would charge the same fares, but fares might vary between stations.

46. A parking charge may be imposed onto the motor-bike parking that is not related to metro use so as to help retain the provided designated parking spaces to the actual metro users and also to discourage excessive modal competition from direct motor-bike travel.

13.1.1 “Park and Ride” and “Kiss and Ride”

47. Facilities for parking cars and motorcycles at Line 2 stations could greatly assist in reducing road motor traffic in the city Centre and elsewhere if combined with restrictions on City Centre parking.

48. Land availability for such facilities near Line 2 stations is very limited apart from at the north end of the line near Pham Van Bach and Tan Binh Stations.

49. Drop off facilities for private motor vehicles will be provided at all stations, but provision of pick up facilities is more difficult. It is important that drop off facilities are managed properly and don't become occupied by private vehicles waiting to pick up passengers leaving the metro station.

13.1.2 Traffic Management

50. Traffic management in the vicinity of MRT stations will need to ensure good conditions for the movement of buses and pedestrians in particular. Traffic management measures have been developed for the MRT2 stations based on the following principles:

- Diversionary traffic management to reduce car and lorry traffic passing near station entrances at peak times, hence leaving more road and kerb spaces for general station traffic access purposes.
- Junction signal improvements to accord more road crossing priority to buses and pedestrians with MRT2 in place, hence promoting public transport priority and integration for HCMC.

13.2 Land Acquisition and Resettlement

51. Based on the preliminary design, the project will entail recovery, change in use, acquisition of land and physical displacement of occupants the vicinity of six of the ten stations of MRT2. The land is for (i) subway link, footbridge; (ii) motorcycle parking; and (iv) bus lay-bys and parking. Total land requirement is estimated at 1.6 hectares, distributed as follows:

Station	Design	Solutions	Land area	owner	land acquisition out side of MRT2 R.O.W
Tao Đàn	Subway link to Trong Dong car parking	Solution 2	Tao Dan Park	PMU1 - DOT	250 m2
Lê Thị Riêng	Bus interchange	Solution 1	Le thi Rieng Park	District 10	1300 m2
Bà Quẹo	MC&Bicycle parking	Solution 2	Temporary shop/ retail stall	Army	6000 m2
Phạm Văn Bạch	MC&Bicycle parking	Solution 2	Temporary shop & 2 gas stations	Army	6700 m2
Tân Bình	MC&Bicycle parking	Solution 2	Empty land near by Truong Chinh road	Tân Binh district	2000 m2

Total **16250m2**

52. The acquisition will impact warehouses, a bus parking lot, gas stations, licensed temporary stalls, a restaurant, mixed use residential and commercial structures, business establishments, an open parking lot and the frontage and garage of a two storey house and a multi-storey apartment as follows:

Station	Structures
Tan Binh	Empty land

Pham Van Bach	2 Gas stations, stalls selling landscaping and ornamental plots, pet animals, clothes, motorcycle spare parts and accessories
Ba Queo	stalls selling landscaping and ornamental plots, pet animals, clothes, motorcycle spare parts and accessories
Le Thi Rieng	Trees, fence/gate, concrete, brick lighting pole in the park
Tao Dan	Trees, fence in the park

53. A resettlement plan will be prepared spelling out the entitlements that displaced persons can receive in conformity with ADB's Safeguard Policy Statement and Vietnamese law.

14 Legal, Policy and Administrative Framework

14.1 General

54. This section presents an overview of the policy/legislative framework as well as the environmental assessment guidelines of Vietnam that apply to the proposed project. The section also identifies relevant Asian Development Bank Safeguard Policies that will apply. The project will be required to comply with all relevant national and international environmental and social policies / guidelines.

14.2 Vietnamese Environmental Regulations

14.2.1 Vietnamese Environmental Law

55. Environmental impact assessment and management in Vietnam is addressed by the Environment Protection Law No. 52/2005/QH11 adopted on 29th November 2005 which became effective from 1st July 2006. The EPL is supported by six Decrees, seven Circulars and one Decision as follows:

Exhibit C-1: Vietnamese Environmental Laws	
Law	Description
Environment Protection Law 52/2005/QH11 Date issued: 29/11/2005	Regulates environmental protection activities; policies, measures and resources for protection of the environment; and the rights and obligations of organizations, family households and individuals with respect to protection of the environment.
Biodiversity Law, No. 20/2008/QH12, 2009	Pursuant to the 1992 Constitution of the Socialist Republic of Vietnam, which was amended and supplemented under Resolution 51/2001/QH10 dated on December 25, 2001 of the Xth National Assembly, the 10th session; this Law stipulates biodiversity conservation and sustainable development.
Decrees	
Decree 29/2011/ND-CP Date issued: 18/04/2011	Regulation on the strategic environmental assessment, environmental impact assessment and environmental protection commitment. This Decree takes effect on June 5, 2011, and replaces Articles 6 thru 17 of the Government's Decree No. 80/2006/ND-CP of August 9, 2006, detailing and guiding a number of articles of the Environmental Protection Law; and Clauses 3 thru 10, Article 1 of the Government's Decree No.21/2008/ND-CP of February 28, 2008, amending and supplementing a number of articles of Decree No. 80/2006/ND-CP of August 9, 2006, detailing and guiding a number of articles

	of the Environmental Protection Law.
Decree 04/2009/ND-CP Date issued: 14/01/2009	Incentives and support for environment protection activities.
Decree 117/2009/ND-CP Date issued: 31/12/2009	Regulation on sanctioning administrative violations in environmental protection
Decree 21/2008/ND-CP Date issued: 28/02/2008	Amending and supplementing some articles of Decree 80/2006/ND-CP detailing the guidelines in the implementation of Environment Protection Law.
Decree 59/2006/ND-CP Date issued: 09/4/2007	Regulation on solid waste management
Decree 80/2006/ND-CP Date issued: 09/08/2006	Detailing the guidelines in the implementation of a number of articles of the Environmental Protection Law regarding environmental standards; strategic environmental assessment; environmental impact assessment and environmental protection commitments; environmental protection in production, business and services; hazardous waste management; and disclosure of environmental information and data.
Circulars	
MoNRE Circular No. 26/2011/TT-BTNMT Date issued: 18/7/2011	Detailing the guidelines on the implementation of a number of articles of the Decree 29/2011/ND-CP. Dated 18/04/2011 regarding strategic environmental assessment; environmental impact assessment and environmental protection commitments.
MoNRE Circular No. 12/2011/TT-BTNMT Date issued: 14/14/2011	Regulation on hazardous waste management
MoNRE Circular 39/2010/TT-BTNMT Date issued: 16/12/2010	National Technical Regulation on Noise (QCVN 26:2010/BTNMT) and Vibration (QCVN 27:2010/BTNMT).
MoNRE Circular 25/2009/TT-BTNMT Date issued: 16/11/2009	National Technical Regulation on hazardous waste threshold (QCVN 07: 2009/BTNMT), among others.
MoNRE Circular No. 16/2009/TT-BTNMT Date issued: 07/10/2009	National Technical Regulation on air quality (QCVN 05: 2009/BTNMT) and hazardous substance in ambient air (QCVN 06: 2009/BTNMT)
MoNRE Circular 05/2008/TT-BTNMT Date issued: 08/12/2008	Guiding strategic environment assessment, environmental impact assessment, and environment protection commitment
MONRE Circular No. 04/2008/TT-BTNMT Date issued: 18/09/2008	Guidance on preparation, approval or certification of environment protection proposal, checking and inspection on implementation of environment protection proposal.
Decisions	
MoNRE Decision No. 16/2008/QĐ-BTNMT Date issued: 31/12/2008	National Technical Regulation on environment regarding surface water quality (QCVN 08: 2008/BTNMT), underground water quality (QCVN 09: 2008/BTNMT, and domestic wastewater (QCVN 14: 2008/BTNMT), among others.

14.2.2 Vietnamese EIA Regulations

56. The environmental regulations of GOV for environmental assessment rules are set out in the Guidelines on Implementation of Law on Environmental Protection 2006 (under Law on Environmental Protection 2005 as amended by Decree 21-2008) that requires Environmental Impact Assessment (EIA) for listed projects. Decree 21-2008 dated 28 February 2008 is an amendment to Decree 80-2006-ND-CP dated 9 August 2006 providing detailed regulations for implementation of the Law on Protection of the Environment. MONRE has delegated powers to Department of Natural Resources and Environment (DONRE) to approve the environmental assessments and MONRE will receive a copy of the environmental assessment before construction commences.

14.2.3 Vietnamese Environmental Standards

57. Many (but not all) of the Vietnamese “TCVN” environmental standards first developed in the mid-1990s have been replaced by “QCVN” environmental technical regulations as per Decision No. 04/2008/QĐ-BTNMT dated 18/07/2008 and Decision No. 16/2008/QĐ-BTNMT dated 31/12/2008 by the Minister of MONRE on issuing environmental technical regulations. In general, relevant standards and regulations include:

Exhibit C-2: Vietnamese Environmental Standards	
Noise	
QCVN 26:2010	Limiting the maximum noise level in working area.
QCVN 26:2010	Limiting the maximum noise level for public and residential areas.
TCVN 6962:2001	Allowable Vibration Limits In Constructive And Industrial Production For Surrounding Environment.
Air Quality	
QCVN 05:2009/BTNMT	The National Technical Regulation on hazardous substances in ambient air quality (replaced TCVN 5937: 2005 – Air Quality – Standards for Quality of Ambient Air).
QCVN 06:2009/BTNMT	The National Technical Regulation on hazardous substances in ambient air (replaced TCVN 5938: 2005 - Air Quality – Permitted maximum level of a number of toxic and hazardous substances in surrounding air).
QCVN 07: 2009/BTNMT	The National Technical Regulation on Hazardous Waste Thresholds.
QCVN 19: 2009/BTNMT	(replaced TCVN 5939: 2005 - Air Quality – industrial production emission gas standards for dusts and inorganic substances).
QCVN 20: 2009/BTNMT	The National Technical Regulation on industrial emission of organic substances (replaced TCVN 5940: 2005 - Air Quality – industrial production emission gas standards for a number of organic substances).
Soil	
QCVN 03/2008/TNMT	The National Technical Regulation on heavy metals in soil.
	Water and Wastewater
QCVN 08/2008/TNMT	The National Technical Regulation on surface water quality.
QCVN 09/2008/TNMT	The National Technical Regulation on ground water quality.
Hazardous Waste	
QCVN 07: 2009/BTNMT	The National Technical Regulation on hazardous waste thresholds.

14.2.4 Other Relevant Vietnamese Policies& Regulations

58. **Law on Cultural Heritage No. 28/2001/QH10 of June 29, 2001.** This law aims to protect and promote the cultural heritage value, meet the people’s increasing cultural demands, contribute to the building and development of the progressive Vietnamese culture deeply imbued with national identity and contribute to the world cultural heritage treasure; to enhance the State management effectiveness and raise the people’s sense of responsibility for taking part in the protection and promotion of the cultural heritage value; 45. Law amending and supplementing a number of articles of the Law on Cultural Heritage (Law No. 32/2009/QH12). The National Assembly promulgates the Law Amending and Supplementing a Number of Articles of Law No. 28/2001/QH10 on Cultural Heritage.

59. **Vietnamese Labour Code - 23 June 1994 (as amended 2 April 2002 and effective 1 January 2003).** The Labour Code protects the right to work, the interests and other rights of the labourer. At the same time it protects the rights and lawful interests of the labour user. Therefore creating conditions for the establishment of harmonious and stable labour relations, helping to develop the creativeness and talent of the intellectual and manual workers, of the labour managers in order to achieve productivity, quality and social progress in labour, production, service, efficiency in the use and management of labour, thus contributing to the

industrialization and modernization of the country in the cause of bringing prosperity to the people and strength to the nation and building a just and civilized society. 42. Conditions of the Code are relevant to the health and safety of workers employed during construction and are reflected in the IEE.

14.2.5 International Agreements and Protocols

60. Vietnam is a party to the following conventions:

- The UNESCO World Heritage Convention;
- Ramsar Convention on Protection of Wetlands;
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, also known as the Washington Convention);
- Convention on Biological Diversity (known informally as the Biodiversity Convention);
- Cartagena Protocol on Biosafety; and
- Kyoto Protocol (on climate change).

14.2.6 Administrative Issues

61. Environmental management in Vietnam is administered on the national level by the MONRE. The environmental arm of MONRE, the National Environmental Agency (NEA), is the body specifically tasked with environmental protection. Aside from MONRE, environment divisions in the various line Ministries are tasked with environmental management functions related to the specific sectors.

62. At the provincial level, the relevant management authorities are the Departments of Natural Resources and Environment (DONRE) which carry out their environmental protection activities through their respective environment divisions. In the case of HCMC DONRE, an Environment Protection Center is responsible for monitoring environment quality and providing technical solutions. The DONREs come under the purview of the central MONRE only in relation to administrative matters and technical guidance. For all other purposes, the DONREs operate under the direct control of their respective provincial governments, through the People's Committees.

14.2.7 Other Completed Environmental Assessments and IEEs.

63. As part of the MRT2 project other EIAs and IEEs have been completed. They included the following:

- EIA for Ho Chi Minh City Urban Mass Rapid Transit Line 2 - PFR 2 (Tan Binh Depot to Ben Thanh Station) – ADB, 2012
- IEE of MRT2 Depot, ADB, 2011

64. These documents were prepared for the physical works associated with construction of the MRT2 Line and Depot.

14.3 Asian Development Bank Safeguard Policies 2009

65. Asian Development Bank (ADB) has three safeguard policies that seek to avoid, minimize or mitigate adverse environmental impacts and social costs to third parties, or vulnerable groups as a result of development projects¹. The current generation of safeguard policies was designed when direct project lending was the dominant modality for development assistance. New lending modalities and financing instruments, such as the multi-tranche financing facility (MFF), have increased the complexity of applying safeguard policies and ensuring compliance. The new modalities and the likelihood of continued innovation, as well as changing client circumstances, suggest a need to enhance the relevance and effectiveness of ADB's safeguards, which has been reflected in an update of the Safeguard Policy by 2009, announced through the Safeguard Policy Statement 2009.

¹ ADB. 2009. Safeguard Policy Statement, Manila

66. According to the newly revised and published Safeguard Policies in 2009 (SPS 2009) of ADB, ADB's overarching statement on its commitment and policy principles are:

ADB affirms that environmental and social sustainability is a cornerstone of economic growth and poverty reduction in Asia and the Pacific. ADB's Strategy 2020 therefore emphasizes assisting Developing Member Countries (DMCs) to pursue environmentally sustainable and inclusive economic growth. In addition, ADB is committed to ensuring the social and environmental sustainability of the projects it supports. In this context, the goal of the SPS is to promote the sustainability of project outcomes by protecting the environment and people from projects' potential adverse impacts.

The objectives of ADB's safeguards are to:

1. avoid adverse impacts of projects on the environment and affected people, where possible;
2. minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
3. help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

67. Since the ADB Safeguard Policy Statement had been approved it supersedes the Involuntary Resettlement Policy (1995), the Policy on Indigenous Peoples (1998), the Environment Policy (2002), and the second sentence of para. 73, and paras. 77–85, and 92 of the Public Communications Policy (2005).

68. **Safeguard Requirements 1: Environment.** The objectives are to ensure the environmental soundness and sustainability of projects, and to support the integration of environmental considerations into the project decision-making process.

69. The requirements apply to all ADB-financed and/or ADB-administered sovereign and non-sovereign projects, and their components regardless of the source of financing, including investment projects funded by a loan; and/or a grant; and/or other means, such as equity and/or guarantees. Mechanisms such as Public Consultation, Identification of potential impacts, elaboration of adequate mitigation measures and impact monitoring as well as implementation of an appropriate environmental management plan remained mainly unchanged referring to the former Environmental Safeguard Policy. The document in hand ensures compliance with the environmental safeguard.

70. Special attention has been put on the **Grievance Redress Mechanism**, securing that the borrower/client will establish a mechanism to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance. The grievance mechanism should be scaled to the risks and adverse impacts of the project. It should address affected people's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. The mechanism should not impede access to the country's judicial or administrative remedies. The affected people will be appropriately informed about the mechanism.

71. Guidelines provide a rational approach for determining environmental category of the Project, the need for public consultation and disclosure, environmental management planning, and resolving involuntary resettlement, indigenous people and gender issues.

72. **Safeguard Requirements 2: Involuntary Resettlement.** The objectives are to avoid involuntary resettlement wherever possible; to minimize involuntary resettlement by exploring project and design alternatives; to enhance, or at least restore, the livelihoods of all displaced persons¹ in real terms relative to pre-project levels; and to improve the standards of living of the displaced poor and other vulnerable groups. The safeguard requirements underscores the requirements for undertaking the social impact assessment and resettlement planning process, preparing social impact assessment reports and resettlement planning documents, exploring negotiated land acquisition, disclosing information and engaging in consultations, establishing a grievance mechanism, and resettlement monitoring and reporting.

73. The involuntary resettlement requirements apply to full or partial, permanent or

temporary physical displacement (relocation, loss of residential land, or loss of shelter) and economic displacement (loss of land, assets, access to assets, income sources, or means of livelihoods) resulting from (i) involuntary acquisition of land, or (ii) involuntary restrictions on land use or on access to legally designated parks and protected areas. Resettlement is considered involuntary when displaced individuals or communities do not have the right to refuse land acquisition that results in displacement. A Resettlement and Land Acquisition Plan (LARP) has been prepared as part of the Project, a summary of the LARP can be found in **Section B.7** above.

74. **Safeguard Requirements 3: Indigenous Peoples.** The objective is to design and implement projects in a way that fosters full respect for Indigenous Peoples' identity, dignity, human rights, livelihood systems, and cultural uniqueness as defined by the Indigenous Peoples themselves so that they (i) receive culturally appropriate social and economic benefits, (ii) do not suffer adverse impacts as a result of projects, and (iii) can participate actively in projects that affect them.

75. For operational purposes, the term Indigenous Peoples is used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:

1. self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
2. collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;
3. customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
4. a distinct language, often different from the official language of the country or region.

76. No indigenous people have been identified within the Project Area that require specific attention according to this safeguard.

15 Description of the Environment

77. This section of the report discusses the existing environmental conditions within the Project corridor under the following headings:

- Physical Resources (air quality, hydrology, topography, etc)
- Ecological Resources (flora, fauna, protected areas)
- Other Environmental Issues (infrastructure, transport, land use, noise, cultural resources, etc)

78. A Social Impact Assessment (SIA) has been prepared as part of the Project, as such socio-economic issues are assessed separately within the SIA.

15.1 Project Area of Influence

15.1.1 General Area of Influence

79. The Project is located in HCMC which is divided into nineteen districts, with the Project traversing five of those nineteen districts as illustrated by **Exhibit B-1**.

80. The potentially affected environment in the project area is defined principally in regard to two factors: (i) the nature and scale of the proposed action; and (ii) the sensitivity and circumstances of the environment in which the proposed action will occur or issues of special concern (such as induced and cumulative impacts, etc.).

81. The nature of the actions proposed within the context of the current project is largely construction of point and linear objects within and adjacent to the station boxes (an area 150 meters long and 35 meters wide which contains the main elements of the stations infrastructure – See **Appendix A**). The physical and ecological environment in which these actions will occur can be confined largely to the Station boxes and linear objects (such as sidewalks) and immediately adjacent areas. In addition, indirect and cumulative impacts could take place over a larger area, such as air quality impacts, and the conceptual limits of the project area will be expanded in accordance with the circumstances of the particular environmental attribute under discussion. Figure D-1 provides the assessment boundaries for the Project.

Exhibit D-1: Assessment Boundaries adopted for this IEE

Terrestrial Environment	Aquatic Environment	Air Shed	Acoustic Environment
250 m radius from the station boxes.	Adjacent to the Nhieu Loc Canal associated with footpath upgrading from Pham Van Hai Station	250 m radius from the station boxes.	250 m radius from the station boxes.

Note: Impacts arising outside of the station boxes will be relatively minor and short term, they include impacts associated with upgrading of footpaths. Works outside of the station boxes, such as bus stop improvements and connecting subways will be almost adjacent to station boxes and as such contained within the 250 meter assessment radius.

15.2 Sensitive Receptors

82. Site investigations have identified numerous sensitive receptors that may be subject to impacts from Project works. Sensitive receptors include: health and education facilities, cultural heritage sites, amenity areas and environmental resources. The sensitive receptors identified within the Projects area of influence have been mapped and included within **Appendix B**.

15.3 Physical Resources

15.3.1 Air quality & Climate

15.3.1.1 Air Quality

83. Air quality in HCMC is poor, but has improved since the banning of lead fuel in 2001. The main cause of air pollution in HCMC is vehicular and industrial emissions which have led the City to be ranked among the world's top ten cities for the worst air pollution in the world.² Air quality monitoring of several parameters has been undertaken within the Project corridor in 2011 and 2012. The CACs (common air contaminants) that are created and emitted by motor vehicles and regulated under GOV guidelines and are relevant to this study are: Carbon Monoxide (CO), Total Suspended Particulates (TSP) and Nitrogen Oxides (NOx)³.

84. **Carbon Monoxide** - Carbon monoxide is produced by incomplete combustion of fossil fuels. It is the most widely distributed and commonly occurring air pollutant and comes primarily from motor vehicle emissions. Short-term health effects related to CO exposure include headache, dizziness, light-headedness and fainting. Exposure to high CO concentrations can decrease the ability of the blood to carry oxygen and can lead to respiratory failure and death.

85. **Nitrogen dioxide** - Nitrogen dioxide is produced when fossil fuels are burned at high temperatures. NO₂ can also combine with other air contaminants to form fine particulates, which can reduce visibility. It can be further oxidized to form nitric acid, a component of acid rain. NO₂ also plays a major role in the secondary formation of ozone. In humans, NO₂ acts as an irritant affecting the mucous membranes of the eyes, nose, throat, and respiratory tract. Continued exposure to NO₂ can irritate the lungs and lower resistance to respiratory infection, especially for people with pre-existing asthma and bronchitis.

86. **TSP** - Particulate matter originates from a variety of sources, including diesel trucks, power plants, wood stoves and industrial processes. The chemical and physical composition of these various particles vary widely. While individual particles cannot be seen with the naked eye, collectively they can appear as black soot, dust clouds, or grey hazes. Those particles that are less than 2.5 micrometers in diameter are known as "fine" particles; those larger than 2.5 micrometers are known as "coarse" particles. Fine particles can be formed in the atmosphere from gases such as sulfur dioxide, nitrogen oxides, and volatile organic compounds. Coarse particles are generally emitted from sources such as vehicles traveling on unpaved roads, materials handling, and crushing and grinding operations, and windblown dust. The adverse health effects from particulate matter exposure are often not immediately noticed. Particulates can accumulate in the lungs after repeated, long-term exposure causing respiratory distress and other health problems.

87. The results, presented by **Exhibit D-2**, show that levels of total suspended particle matter (TSP) exceeded maximum allowable concentrations in fifteen out of eighteen samples. NOx monitoring revealed that levels exceed maximum concentrations in nearly all samples in 2012, but that they were within the threshold limits for all 2011 samples. CO results show that levels are well within the Vietnamese threshold limits. TSP levels are lower in 2012 than 2011, this may be a result of weather conditions with 2012 monitoring being undertaken during the rainy season.

88. The effects of inhaling particulate matter that have been widely studied in humans now include asthma, lung cancer, cardiovascular issues, respiratory diseases, birth defects, and premature death. A recent study in HCMC has linked combustion sourced emissions with an increase in hospital admissions of children with respiratory diseases, although it is unclear to what extent transport related emissions contribute to the issue.⁴

² <http://en.news.vn/science-and-education/environment/81729-hcm-city-in-top-10-for-worlds-most-air-polluted-cities.html>

³ NO_x is a generic term for mono-nitrogen oxides NO and NO₂

⁴ Effects of short-term exposure to air pollution on hospital admissions of young children for acute lower respiratory infections in Ho Chi Minh City, Vietnam. Research Report Health Effect Inst. 2012 Jun;(169):5-72; discussion 73-83.

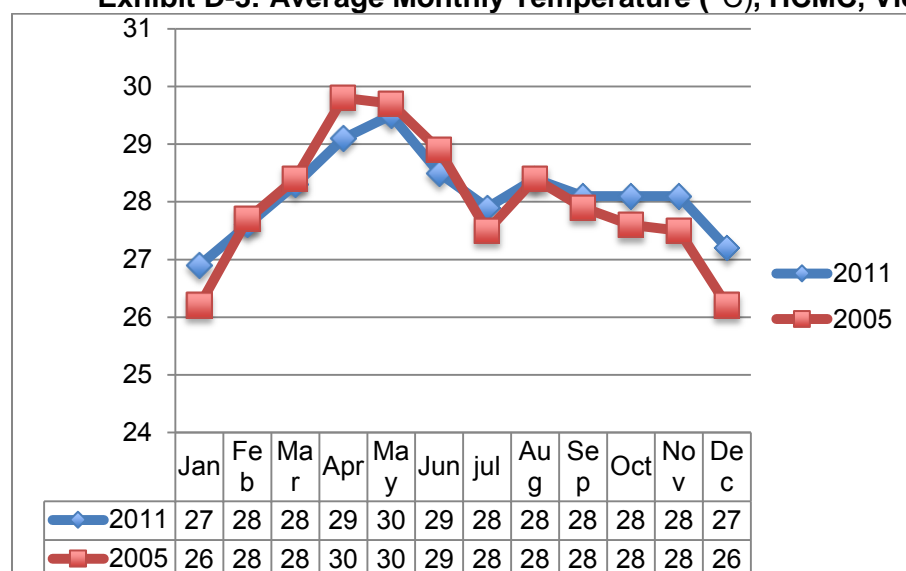
Exhibit D-2: Air Quality Monitoring in the Project Corridor						
Location	Total Suspended particle matter (mg/m ³)		NO _x (mg/m ³)		CO (mg/m ³)	
	2012	2011 (17.00-18.00)	2012	2011 (17.00-18.00)	2012	2011 (17.00-18.00)
Tao Dan station	0.4	0.48	0.23	0.13	7.00	8.4
Dan Chu station	0.4		0.27		8.99	
Hoa Hung station	0.4	0.50	0.20	0.14	7.58	8.6
Le Thi Rieng station	0.4	0.48	0.25	0.13	8.00	8.8
Pham Van Hai Station	0.4	0.53	0.21	0.13	7.51	9.1
Bay Hien Station	0.4		0.25		12.70	
Nguyen Hong Dao Station	0.3	0.49	0.18	0.13	6.10	8.7
Ba Queo Station	0.5	0.45	0.28	0.13	10.06	8.1
Pham Van Bach Station	0.4	0.47	0.24	0.13	9.01	8.4
Tan Binh Station	0.3		0.20		6.52	
Maximum allowable concentrations (<i>National technical regulation on ambient air quality- QCVN 05:2009/BTNMT</i>)	0.3		0.2		30	

Source: 2012 Data prepared for TA7892 IEE.

15.3.1.2 General Climate

89. HCMC's climate is subequatorial, characterized by a strong monsoon influence. The mean temperature is 27°C, the peak temperature 40°C and the lowest temperature 13.8°C. April has the highest temperature on average, at 28.8°C. The time between mid-December and January has the lowest temperature on average, at 25.7°C. Average monthly Temperatures are shown in **Exhibit D-3**.

Exhibit D-3: Average Monthly Temperature (°C), HCMC, Vietnam



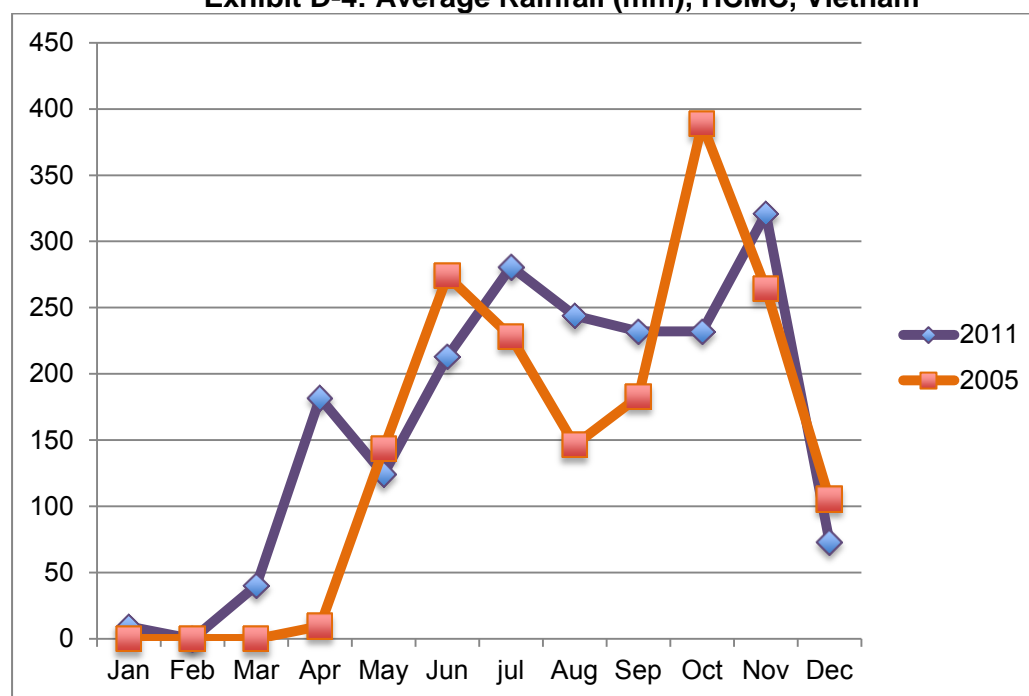
Source: Weatherspark.com

15.3.1.3 Rainfall

90. The average annual rainfall in HCMC is 1,798 mm. There are 159 rainy days/year and ninety percent of the rainfall occurs in the rainy season - May to November, with the highest rainfall occurring in June and September. There is very little rainfall in January, February and March. Most districts in the inner city and in the north experience higher amounts of rainfall than districts in the south and southwest. Average monthly rainfall is

shown in **Exhibit D-4**.

Exhibit D-4: Average Rainfall (mm), HCMC, Vietnam



Source: Weatherspark.com

15.3.1.4 Wind

91. The two main annual wind directions are: west - southwest and north - northeast. The west -southwest winds originates from the Indian Ocean during the rainy season (June to October), average velocity is 3 to 6 m/s with peak velocities of 4 to 5 m/s in August. The north - northeast winds originate from the South China Sea in the dry season (November to February), average velocity of these winds is 2 to 4 m/s. There is also a south to southwest wind (March to May) with average velocities of 3 to 7 m/s.

15.3.1.5 Climate Change

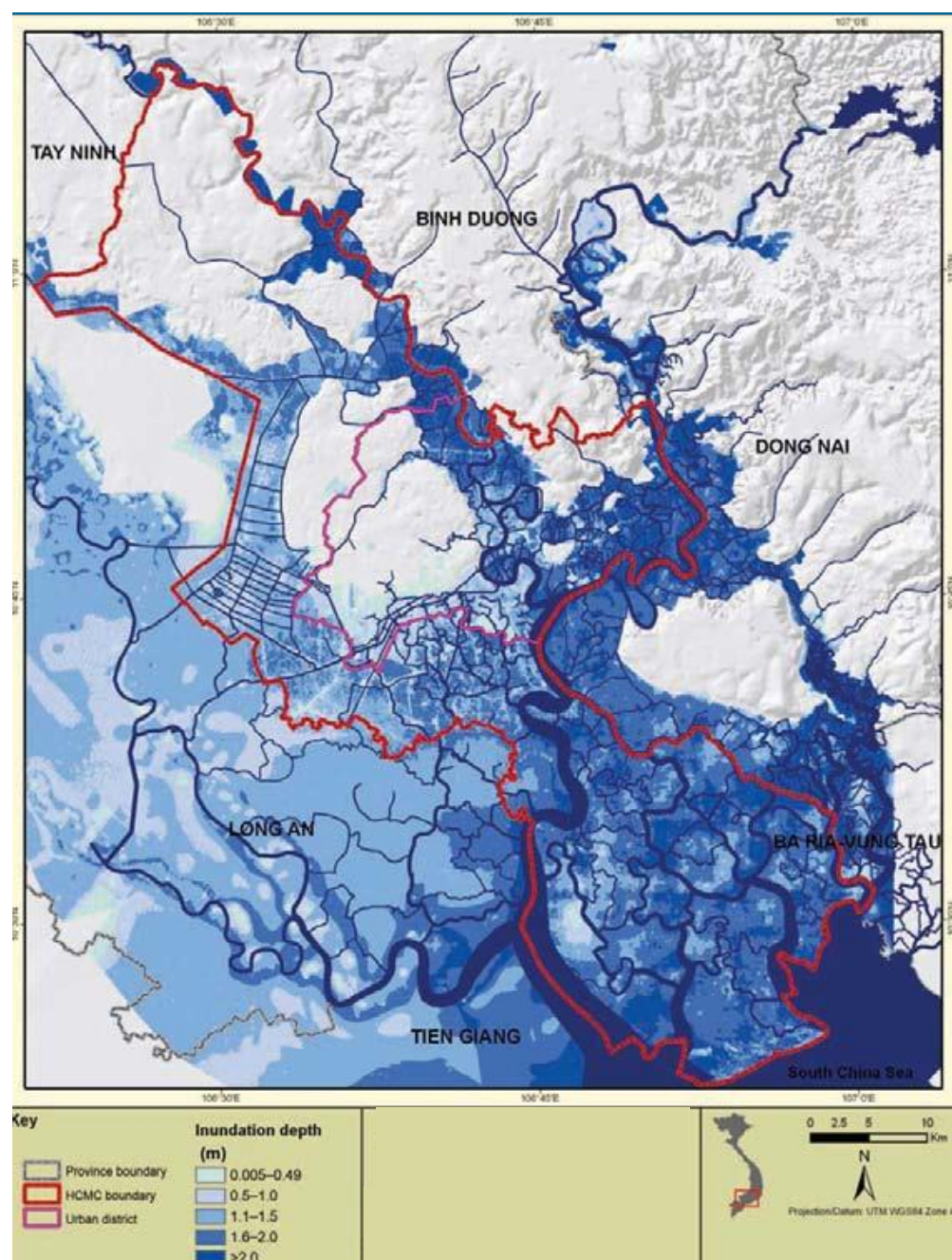
92. Ho Chi Minh City (HCMC) ranks among the top ten cities in the world with populations most likely to be severely affected by climate change. In recent years, the annual average temperature has increased at a rate nearly double that of the increase in the surrounding Mekong Delta region. Significant warming has already taken place in HCMC. In the last 50 years, the annual average temperature in the rainy season has risen by 2°C. This vulnerability is of particular concern because it strongly influences Viet Nam's development: HCMC accounts for 23% of national gross domestic product (GDP) and 20% of foreign direct investment. HCMC is vulnerable because:

- It is barely above sea level—40%–45% of land cover in HCMC is 0–1 meter (m) in elevation, 15%–20% is 1–2 m, and very little land sits above 4 m;
- It has a large and growing population—residents number more than 6.3 million and the dynamic economy draws migrants from all over the country;
- Local development patterns are also affecting vulnerability and the local climate—urban development, for example, has decreased infiltration and causes localized flooding; and
- Current climate and hydrodynamics are already extreme and are expected to intensify, so there will be more severe storms, storm surges, and tidal flooding.

93. According to recent ADB studies, about 187 km of railway, 33 km of monorail and elevated railway, and 36 km of metro line will lie within the projected inundation zone for an extreme flood by 2050⁵. **Exhibit D-5** illustrates the potential extent of extreme flood events in HCMC in 2050 without implementation of adequate flood control measures.

⁵HCMC – Adaptation to Climate Change Summary Report, ADB, 2010.

Exhibit D-5: Projected Extent of Flooding Extreme Events by 2050 without Flood Control



CMC = Ho Chi Minh City.

Extreme floods occur during tropical storms and storm surge with tidal influence and monsoon rainfall.

Source: ADB, Adaptation to Climate Change Summary Report, ADB, 2010

15.3.2 Topography

94. The topography of HCMC is typical of the area north of the Mekong Delta, generally a flat landscape with some slight variations in topography. The terrain is slightly higher in altitude in the north than in the south and from west to east. There are three types of terrain. The higher terrain lies in the northern-northeastern area and part of the northwestern area

encompassing northern Cu Chi, northeastern Thu Duc and District 9. This is a rolling terrain with an average height of 10-25 meters above sea level (masl). Long Binh Hill in District 9 is the highest at 32 masl. The depression terrain lies in the southern-southwestern and southeastern part encompassing districts 9, 8, 7, Binh Chanh, Nha Be and Can Gio. The area's height is in the range of 0.5 to 2 masl. The medium-height terrain lies in the middle of the city, encompassing most of the old residential areas, part of District 2 and the districts Thu Duc and Hoc Mon. Ground elevation at the MRT2 alignment is about 3-7 masl as shown by **Exhibit D-6**.

Exhibit D-6: Elevations (Meters above sea level)⁶			
#	Station	Surface	Track Level
2	Tao Dan	5	-14.6
3	Dan Chu	4	-11
4	Hao Hung	4	-11
5	Le Thi Rieng	3	-13
6	Pham Van Hai	4	-13
7	Bay Hien	4	-12
8	Nguyen Hong Dao	3	-11
9	Ba Queo	7	-13
10	Pham Van Bach	5	-11
11	Tan Binh	3	15.5

15.3.3 Soils & Geology

15.3.3.1 Soils

95. The soil of HCM City was formed upon two sediment classes: Pleistocene and Holocene.

96. *The Pleistocene sediment:* This ancient alluvial sediment covers most of the northern, northwestern and northeastern parts of the city, encompassing Cu Chi, Hoc Mon, northern Binh Chanh and Thu Duc districts, north and northeastern District 9, and old inner-city areas. Main characteristics of the sediment class are hilly terrain, with a depth range of three to 25 meters, and oscillation in the southeastern direction. Due to the combined effects of natural factors, including creatures, climate, time and human activities, and erosion and decomposition, the sediment class has developed into grey soil. Grey soil makes up 45,000 hectares or 23.4% of the city's total soil area. In the city, there are three types of grey soil: highlands grey soil with some impoverished places, grey soil with red and yellow-speckled layers, and gley grey soil. Soils of the two first types make up most of the total area. In general, the main mechanical constituents of grey soil are sandy soil mixed with heavy soil. The grey soil therefore has a poor water-containing ability. The underground water levels change from place to place and from season to season with a range of one to 15 meters. This is acid soil, as it has a pH of around 4.0 to 5.0. The grey soil is of low fertility but has thick layers which are suitable for growing agricultural and forestry trees with high yielding and economic efficiency if rotational and intensive cultivation is implemented properly. Also, the foundation of grey soil is appropriate for infrastructure constructions.

97. *The Holocene sediment:* This new alluvial sediment of HCMC had its origin in coastal areas, bays, riverbeds and alluvial plains and consequently formed different types of soil. Specifically, alluvial soil makes up 15,100 hectares or 7.8% of the total area; aluminum soil is 40,800 hectares or 21.2%; and alkaline soil is 45,500 hectares or 23.6%. The remaining area, 400 hectares or 0.2%, is made of sandy soil near the ocean and yellow-brown feralite soil on hills that have eroded.

98. It is also possible that excavated soils around petrol filling stations may be contaminated. This issue is discussed in more detail below under hazardous materials.

⁶HCMC MRT2 Project Final Report, Volume 3 Drawings, February 2013, MVA Asia.

15.3.3.2 Geology

99. The surface geology along the MRT2 alignment consists of sediments of Late Pleistocene. The result of the geological investigation at the MRT2 location indicated that the upper fine-grain sediments has a thickness of about 5 m to 16 m (MVA Asia Limited, 2010). Most of the Project interventions will occur on the surface, with little requirement for deep foundation work. The possible exception are some of the Solution 2 interventions such as subways.

15.3.4 Hydrology - Surface water & Flooding

100. **Surface Water** - HCMC lies in the Mekong Delta and is bordered by two main river systems: Dong Nai and Sai Gon Rivers. Dong Nai River originates in the Lang Biang Highland Region (Da Lat) and is fed by the La Nga River, and Be River, to create a basin area of about 45,000 km². During the dry season, flow in river/channel is strongly affected by the ocean tide. Salty seawater can go deep inland. In wet season, upstream discharge and local rainfall raises the surface water level. Therefore, the magnitude of tidal effect and water salinity are reduced.

101. No surface water courses are located within 250 meters of any of the intervention zones with the exception of Pham Van Hai Station where upgrading of footpaths is recommended on the roadside adjacent to the Nhieu Loc Canal (see **Exhibit D-7**).

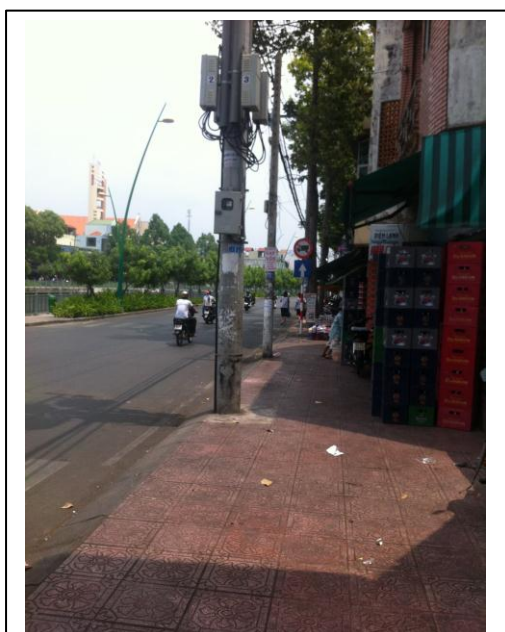


Exhibit D-7: Footpath adjacent to Nhieu Loc Canal

102. **Flooding** - Minor flooding events are common in HCMC after heavy rain events. Flooding is caused by the low elevation of the land, poor drainage and storm water infrastructure, which becomes overloaded in rain events greater than 100 mm/hr. The changing land use patterns (extensive urban development), has resulted in the loss of many low-lying undeveloped areas that previously formed retarding basins or flood channels. Minor and localized flood events occur throughout the rainy season.

103. The Project area is situated amid a highly dense urban area characterized by large areas of impermeable landscape. Impermeable landscapes combined with extreme daily or weekly rainfall have the capacity to induce local flooding events that may have an adverse effect on the Project infrastructure. In addition to the effect of flood water on the stability of the

ground, mentioned above, pooling of water may affect the operation of street-level activities. Significant accumulations of water have the potential to interfere with electrical and mechanical aspects of the metro technology.

104. Flooding, when, it occurs is particularly severe in newly developed parts of District 6, 11, and Tan Binh. The MRT 2 alignment is not located in District 6 or 11, but is in Tan Binh District. Two underground stations (Ba Queo and Pham Van Bach) are in the district. Based on letter No. 383 /TTCN-QLTN issued to MAUR by the Steering Center of the Urban Flood Control Program of HCMC, none of the sections of the MRT2 alignment are located in areas inundated due to rains and tides.

15.3.5 Hydrology - Groundwater

105. Results of groundwater monitoring undertaken within the Project Area in 2008 indicated that groundwater quality was acceptable to Vietnamese standards with the exception of coliforms where elevated concentrations were found in nearly all samples.

15.4 Ecological Resources

15.4.1 Flora

15.4.1.1 General

106. The MRT2 project alignment is located entirely within developed urban areas, thus natural animal and vegetation resources are fairly insignificant. Trees (arboricultural resources) planted in urban parks or in the roadway and median constitute the only biological resources. The project area includes some typical urban tree and shrub species. These are found mostly within the parks adjacent to the alignment; Tao Dan Park and Le Thi Rieng Park. There are trees planted in the sidewalk along the sides of Cach Mang Tang and Truong Chinh streets. On the northern section of Truong Chinh Street there are trees and shrubs within the road median. Construction of the stations will require the removal of a number of these trees, but shall be replaced following construction according to the measures outlined in **Section E**.

15.4.1.2 Tree Survey

107. A survey of the number and types of trees within 50 meter radius of the station boxes was undertaken in December 2012 for this IEE. The results of the survey are summarized in **Exhibit D-8**.

Exhibit D-8: Tree Survey Summary Results					
Station	Tree Types	Total Number	Average Age (years)	Average Height (m)	Average Girth (cm)
Tao Dan	<i>Dipterocarpus alatus</i> , <i>Khaya senegalensis</i> , <i>Peltophorum pterocarpum</i> , <i>Hopea odorata</i> , <i>Baunhinia curtisii</i> , <i>Terminalia bellirica</i> , <i>Lagerstromia speciosa</i> , <i>Tamarindus indica</i>	64	24	17	172
Dan Chu	<i>Dipterocarpus alatus</i> , <i>Khaya senegalensis</i> , <i>Mimusops elengi</i> , <i>Sterculia cochinchinensis</i> , <i>Peltophorum pterocarpum</i> , <i>Hopea odorata</i> , <i>Samanea saman</i> , <i>Lagerstromia speciosa</i>	58	26	19	176
Hao Hung	<i>Mimusops elengi</i>	9	<5	-	-
Le Thi Rieng	<i>Mimusops elengi</i> , <i>Cassia fistula</i> , <i>Ficus elastic</i> , <i>Delonix regia</i> , <i>Casuarina equisetifolia</i> , <i>Areca catechu</i> , <i>Cocos nucifera</i> , <i>Peltophorum pterocarpum</i> , <i>Swietenia macrophylla</i>	62	12	13	138
Pham Van Hai	<i>Mimusops elengi</i> , <i>Lagerstromia speciosa</i>	44	<5	-	-
Bay Hien	<i>Delonix regia</i> , <i>Mimusops elengi</i> , <i>Diospyros mollis</i> , <i>Tamarindus indica</i> , <i>Finus bejamina</i> , <i>Hopea odorata</i>	40	<5	-	-
Nguyen Hong Dao	<i>Tamarindus indica</i>	69	10	11	68
Ba Queo	<i>Mangifera indica</i> , <i>Terminalia bellirica</i>	2	20	15	100
Pham Van Bach	<i>Hopea odorata</i> , <i>Tamarindus indica</i> , <i>Khaya senegalensis</i>	116	9	12	102
Tan Binh	<i>Hopea odorata</i> , <i>Mimusops elengi</i>	69	6	9	98

	<i>Muntingia calabura, Finus elastic, Delonix regia</i>				
Total		533	11		

108. The survey indicates that the most mature trees can be found around the parks of Tan Dao and Le Thi Rieng, closer to the city center. As the Project corridor moves away from the city center, species variety diminishes along with age.

15.4.2 Fauna

109. Given the urban nature of the Project Area no fauna of specific scientific interest has been observed or is anticipated to exist.

15.4.3 Aquatic biology

110. As noted above, the only significant surface water resource within the vicinity of the Project is the Nhieu Loc Canal. The World Bank has spent more than USD300 million cleaning up the canal and reducing pollution levels, although according to recent newspaper reports⁷ the river still remains heavily polluted with household garbage. However, recreational fishing was noted two kilometers downstream of the Pham Van Bach area.

15.4.4 Forests & Protected Areas

111. There are no forests or Protected Areas within the vicinity of the Project Area.

15.5 Other Environmental Aspects

15.5.1 Historical and Archeological Areas of Significance

112. Within the Project Corridor little historical or archeological areas of significance can be observed. Several pagodas and churches are located within 250 meters of the station sites, but none (with the one exception discussed below) are anticipated to be directly impacted by Project works. **Appendix B** provides mapping of sensitive receptors within 250 meters of the stations including historical and cultural sites. The only site that has been identified that may be affected by Project works is the Muslim Cemetery to the west of Hoa Hung Station, the location of which is illustrated in **Appendix B**.

15.5.2 Noise

113. The acoustic environment in HCMC is characterized by high noise levels arising from vehicle movements, construction activities, industry and daily living activities. Noise levels are elevated throughout the day and night. Typical daytime noise levels in residential areas are 75 - 78 dB(A), and can reach 80 – 85 dB (A) in the vicinity of major road corridors. Increasing number of vehicles and excessive use of horns are major source of noise emissions. It has been estimated that 60 to 80% of noise in urban areas is generated by traffic movements. Maximum noise level limits have been set by the GoV as shown by **Exhibit D-9**.

Exhibit D-9: Vietnamese Noise Standards (QCVN 26:2010)			
#	Area	dBA (06.00 – 21.00)	dBA (21.00 – 06.00)
1	Special Area (hospital, school, church, etc)	55	45
2	Normal Area (residential, commercial, etc)	70	55

114. Monitoring of noise levels within the Project corridor was undertaken in December 2012 for this Project and compared with data from 2008 and 2011 (taken from the MRT2 Project EIA – 4862 VIE). The results (**Exhibit D-10**) show elevated noise levels for every station sampled in each year.

Exhibit D-10: Noise Levels in the Project Corridor

⁷<http://english.thesaigontimes.vn/Home/society/hcmc/22224/>

Location	2012(08.00 – 17.00)	2011 (06.00 – 18.00)	2011 (18.00 – 19.00)	2008
Tao Dan station	80,3	75.4	80.0	
Dan Chu station	83,9	72.8	79.7	
Hoa Hung station	80,5	71.6	77.3	77.9
Le Thi Rieng station	83,7	74.2	86.3	79.2
Pham Van Hai Station	79,4	75.8	84.1	78.8
Bay Hien Station	81,2	74.5	78.6	
Nguyen Hong Dao Station	75,6	76.4	80.1	79.1
Ba Queo Station	81,0	78.2	80.7	80.1
Pham Van Bach Station	81,8	76.4	86.9	
Tan Binh Station	78,6	78.6	87.2	
Methods of sampling and analysing	TCVN 7878-2:2010			TCVN 5949-1998

15.5.3 Waste Management

115. Waste management in the Project Area is controlled by DONRE. Regular collections of waste material are undertaken by the Urban and District Sanitary Companies and as such levels of visible waste within the Project Area are quite low.

15.5.4 Hazardous Materials

15.5.4.1 Asbestos

116. Vietnam is described as having one of the world's highest per-capita consumption rates of asbestos and has more than 40 factories making asbestos roofing according to the Vietnamese Construction Materials Department.⁸ From the 1970s, asbestos imported from Russia, Canada, China and Zimbabwe has been used in Vietnam principally for the manufacture of asbestos-cement (AC) roofing tiles, insulations and friction materials.⁹ In 2005 Vietnam imported over 74,000 tonnes of asbestos and in 2009 it produced 74,000m² of asbestos roof tiling, the type of tiling favoured by the poorest parts of the community. Asbestos roofing, known as *fibro*, is heat resistant and cheaper than other materials. It has been widely used throughout the country for urban dwellings, industrial parks and in rural and remote communities.

117. In June, 2011, Vietnam voted with Canada to block the inclusion of asbestos on the hazardous materials list for a United Nations treaty known as the Rotterdam Convention.¹⁰ However, Ministry of Health Guidelines have been produced specifying exposure limits for workers during the production of asbestos containing materials (TC 3733 / BYT). In addition, the Health and Safety Executive of Vietnam provide guidelines for managing asbestos during construction works. These guidelines have been adopted from South Korea's Ministry of Environment guidelines for management of asbestos. These guidelines are provided as **Appendix C**.

118. It is possible that asbestos containing material may be present in buildings (from the 1970s onwards) that will require full or partial demolition as part of the Project works. In addition, it is possible that sub-surface water pipes within the Project area may also be constructed from asbestos containing materials.

15.5.4.2 Hazardous Spoil Material

119. The demolition of small petrol filling stations will be required during the development of certain stations (Pham Van Bach (two stations), Ba Queo, Nguyen Hong Dao & Bay Hien). It is likely that these sites have suffered some form of soil contamination from spills or leaks of fuel during day to day operational activities. The potential also exists for leaks of fuel from underground fuel storage tanks. Demolition and excavation works at these sites will most

⁸<http://www.lookatvietnam.com/2009/04/why-deadly-asbestos-is-not-banned.html>

⁹http://worldasbestosreport.org/articles/killing_future/Vietnam_experience.php

¹⁰<http://www.cbc.ca/news/canada/story/2012/03/01/asbestos-wikileaks-vietnam.html>

likely lead to the production of contaminated spoil which will require suitable management and disposal.

15.5.5 Infrastructure and Transportation facilities

15.5.5.1 Transport

120. Currently the city's transportation infrastructure does not facilitate an efficient flow of traffic. Congestion is commonplace at intersections during rush hours and average traffic speeds vary between 10-30 kph. Together with low quality roads and a significant number of poorly maintained vehicles and low quality fuels, the large volumes of slow moving, frequent stop and start traffic contributes significantly to the city's air pollution problems.

121. A rapid growing urban transportation requires a considerable improvement in public transport in order to achieve an acceptable transport efficiency, reduced congestion and improved ambient air quality in urban centers. Currently, HCMC's public transport system is comprised of public buses running on set routes between specified hours of the day. Despite the recent improvements to the bus system and increases in bus network patronage, the current share of total motorised trips by public transport is still extremely low for a major international city, at less than 5%. The vast majority of trips are made by motorcycle. Car and taxi trips, whilst still a tiny proportion of the total, are increasing rapidly, and roads are becoming more congested and dangerous due to the mix of traffic and pedestrians.

122. In 2007, private vehicles represented an abnormally high proportion (93%) of total journeys (19.1 million non-pedestrian journeys per day), broken down between motorcycles 78%, cars 1.2%, and bicycles 14%. Historically, car ownership has been lower than in comparable economies in the region. With continued growth of the economy expected in the medium term, there is significant potential for household incomes to rise, enabling many more families to be able to afford to purchase cars. Between 2004 and 2007, motorcycle ownership in Ho Chi Minh Province has grown at an annual rate of 8.4% to almost 3.1 million motorcycles. Private car ownership has increased even faster, at 20.7% per year to more than 200,000 vehicles and total car numbers (including taxis, other non-private owners) have grown to almost 400,000.

15.5.5.2 Infrastructure

123. The Project Area of influence is dominated by residential and commercial property. The main infrastructure in these areas are roads, water supply, waste water system, electrical supply and telecoms. All of these elements may be disrupted during project works. Water and waste water systems may be impacted during any excavation works and diversions and traffic control measures may be imposed on the road network during development of the station box areas.

15.5.6 Land use

124. The current land use situation within the proximity of the station boxes is summarized by **Exhibit D-11**.

Exhibit D-11: Summary of Land Use Conditions	
Tao Dan	<p>Tao Dan Station of Metro Line 2 is located in the CBD area of Ho Chi Minh City with a high density of shopping centers, service centers and bustling shops and services. Also within 500 meters there are other high-rise office buildings and two schools (Nguyen Du Secondary School and Le Ngoc Han Primary School which mainly serve pupils of 7 wards of District 1 and District 3). Tao Dan Station of Metro Line 2 is located adjacent to Tao Dan Cultural Park - home of the city's major festivals with numerous participants. Within 500m around Tao Dan station of Metro Line 2, there is also the Trong Dong Music Stage (nightly operations having from 500 to 600 seats) which is particularly crowded at festivals and weekends. The Trong Dong Music Stage is planned to be expanded in the future with 2 aboveground floors, 8 underground floors combined with shopping services, music stage and parking lots. The Galaxy cinema with 650 seats (belonging to Nguyen Du sports center) is also within 500m from Tao Dan station of Metro Line 2. Currently around Tao Dan station (within a radius of 500m), there are only 2 small public</p>

	parkings at Tao Dan Park and Galaxy Nguyen Du cinema.
Dan Chu	Dan Chu Station is located in the District Centre of Ho Chi Minh City District 3 with a high density of shopping centers, service centers and other bustling shops and services. Also within 500 meters there are high-rise office buildings and a school (Le Loi Secondary school, mostly serving pupils of the nearby wards of District 10 and District 3). Maximark supermarket, and District 3 Cultural Center are also within the 500m radius. Dan Chu Station is close to the District 3 Cultural Center - home of the city's major festivals with numerous participants. The Music Stage 126 (nightly operations having from 500 to 600 seats) and particularly crowded at festivals or weekends is located with the District 3 Cultural Center, adjacent to Dan Chu roundabout. Within 500m to 1000m around Dan Chu station, there are also an Eye Hospital, Lan Anh Sports Center and other public works. Currently around Dan Chu station (within a radius of 500m), there are only 3 small public vehicle parking facilities at the District 3 Cultural Center, Maximark supermarket and Lan Anh sports center.
Hao Hung	Hoa Hung Station of Metro Line 2 is located in District 3 and District 10 of Ho Chi Minh City with a high density of shopping centers, service centers and the bustling shops and some banks. Also within 500 meters are Hoa Hung Market, the Indian Muslim Cemetery and Sai Gon national railway station. Within the 500m radius from Hoa Hung station, there are many narrow paths intersecting with Cach Mang Thang Tam. At present, surrounding Hoa Hung Station, there are only two small public vehicle parking facilities at Sai Gon national railway station, but these could not have direct pedestrian connections with Cach Mang Thang Tam or Hoa Hung station of Metro Line 2. A long detour through Dan Chu roundabout via Nguyen Phuc Nguyen is required.
Le Thi Rieng	Le Thi Rieng Station of Metro Line 2 is located parts of Districts 3, 10, and Tan Binh of Ho Chi Minh City with the high density of the individual shopping centers, service centers and the bustling shops, banks, Cho Lon Electronics Center, primary and secondary schools. Also within 500 meters, there is the Depot of Sai Gon station. Within the 500m radius from Le Thi Rieng station of Metro Line 2, there are many small paths intersecting with Cach Mang Thang Tam and 3 main roads Truong Son (District 10), Bac Hai and Chan Hung. At present, surrounding Le Thi Rieng Station (within a 500m radius), there are only two public parkings at small scales in front of Le Thi Rieng Park. The station is adjacent to Le Thi Rieng Park.
Pham Van Hai	Pham Van Hai Station is located in Districts 3, 10 and Tan Binh of Ho Chi Minh City with a high density of shopping centers, bustling shops, Pham Van Hai Primary School, Tan Binh Secondary School, Tan Binh District Sports Cultural Center, and Cong Hoa Swimming Pool. Currently around Pham Van Hai station (within a radius of 500m), there is only one small public vehicle parking facilities at Tan Binh District Sports Cultural Center.
Bay Hien	Bay Hien Station is located in the center of Tan Binh District of Ho Chi Minh City with a high density of big shopping centers, bustling shops and services. Moreover, within a 500m radius, there are the Ho Chi Minh City International Exhibition and Convention Center (one of the 4 biggest exhibition centers in Ho Chi Minh City), Tan Binh Exhibition Park, Tan Binh Sports Center and Thong Nhat Hospital (the big scale hospital in the City with about 600 beds). Currently around Bay Hien station (within a radius of 500m), there are two medium sized public vehicle-parking facilities within and in front of the Ho Chi Minh City International Exhibition and Convention Center. The parking inside Thong Nhat Hospital mainly serves hospital activities.
Nguyen Hong Dao	Nguyen Hong Dao Station is located in Districts Tan Binh and Tan Phu of Ho Chi Minh City with a high density of shopping centers, bustling shops, Yen The Primary School, Truong Chinh Secondary School. Within the attraction catchment of the station, there is E.Town Office Complex where many people come to work and live. Currently around Nguyen Hong Dao station (within a radius of 500m), there is one sheltered car park of a reasonable scale, but it is not convenient to access from Truong Chinh.
Ba Queo	Ba Queo Station is located in Tan Binh District Tan Phu District of Ho Chi Minh City with a high density of big shopping centers, bustling shops and services. Moreover, within a 500m radius, there are some commercial plazas, supermarket (under construction near the junction of Truong Chinh and Cong Hoa), Hong Duc Secondary School, Food Technology 2 College and Banks' Buildings. Currently around Ba Queo station (within a radius of 500m), there is no public parking

	available
Pham Van Bach	Pham Van Bach Station is located in Districts Tan Binh and Tan Phu of Ho Chi Minh City with medium density shopping centers, bustling shops, offices and schools (Hung Vuong University, primary and secondary schools), plus car maintenance workshops. The right side of Pham Van Bach is the protection land for takeoff and landing clearance of Tan Son Nhat Airport (fence-protected and there are only back gates for maintenance/ operation related purposes of the airport – not for passengers access). At present, around Pham Van Bach station (within a radius of 500m), there is a sizeable Tan Tien parking area - but this parking area is not fully completed and is only being temporarily used.
Tan Binh	Tan Binh Station is located in Districts 12, Tan Binh and Tan Phu of Ho Chi Minh City with medium density shopping centers, bustling shops, 4-6 floors apartment buildings. Coop-mart supermarket is located within the 500m radius from the station. Especially, within 500m, Tan Binh Industrial Zone directly accesses to Tan Binh station with high density of workers for the demand to use Metro Line 2.

15.5.7 Tourism facilities

125. Within the Project Area there are several areas that could be described as facilities for tourism, namely Tao Dan Park and Le Thi Rieng Park. Tao Dan Station will sit adjacent to the east side of Tao Dan park and as such project works may have some minor impacts during the construction phase. Tao Dan Park is a popular area for tourists being located within a short walk from Ben Thanh Market in District 1. Le Thi Rieng station will be located adjacent to the west side of Le Thi Rieng Park. The park is more popular with locals than tourists due to its location some four kilometers north of District 1, the main tourist hub of HCMC. The remaining portions of the Project corridor are almost exclusively commercial and residential areas with little tourism value.

16 Assessment of Alternatives

16.1 General

126. An alternative analysis was conducted to justify the project based on a with and without-project basis and to assess the potential alternative project solutions at each station.

16.1.1 The No Action Alternative

127. The no action alternative involves construction of MRT2 without consideration and adoption of the Projects proposed sustainable interventions. MRT2 would still be built and this would help reduce, to some extent, the growth in private vehicle ownership and overloading of the road network and the existing public transport systems which would otherwise reach their practical capacity limits. However, without the Project consideration should be given to how sustainable MRT2 will be in the future.

128. Firstly, the Project aims to develop station layouts to encourage sustainable transport, i.e. parking and drop off facilities to encourage use of MRT2, footpath upgrading to encourage walking to stations, improvements to bus stops and possibilities for cycle share schemes. Without these interventions, access to the station becomes difficult and the public may choose to continue with their existing modes of transport and not switch to the MRT.

129. In addition the Project will develop new bus routes to service the station and the surrounding neighborhoods. Without these new routes access to the stations for those living beyond 500 meters (the maximum distance considered acceptable to walk to a station) will be problematic and again, they may decide to continue with their existing modes of transport. If accessibility to the stations is not integrated with other transport modes ridership levels may not reach the HCMCPC goal of 50% ridership by 2020.

130. Traffic congestion and road safety in HCMC may continue to worsen resulting in social and economic impacts as travel speeds decrease with a corresponding increase in travel times.

131. Accordingly, the no action alternative is not considered a suitable option given the objectives of creating a sustainable transport network in HCMC.

16.1.2 Assessment of Station Solutions

132. As part of the Project three potential design concepts have been prepared for each station, Solution 1, Solution 2 and Future Development Concepts.

133. **Solution 1** – This solution presents the base case, and includes the interventions discussed in detail in Section 2. The interventions were limited to the areas within a one kilometer radius of the station boxes that were fixed by the station designers. Accordingly, no fixed-point interventions have been considered outside of this area. Potential interventions were carefully studied at each station. Consultations with Project stakeholders were undertaken and site visits and surveys were performed. Based on the results of the surveys and consultations a preliminary set of concept designs were prepared which were discussed extensively with PMU1.

134. Alternatives assessed during this phase mainly related to items such as which footpaths to be upgraded and where to site potential parking areas and bus stops. These actions are considered generally to have a low environmental impact, and as such, the inclusion of one footpath over another, or the siting of a bus stop in a particular location does not really warrant a detailed assessment of the various environmental impacts that may or may not arise from each action.

135. **Solution 2** – These solutions mainly relate to access to station facilities via subways and footpaths and potential improved parking areas. The potential impacts from Solution 2 activities are mainly short-term construction impacts and are limited to the areas adjacent to the station boxes. Different locations have been considered as part of the Solution 2, but in general their impacts will be of a similar size and scale.

136. **Future Development Concept** – These options included improved access to areas beyond those considered under Solution 2. The budget for these items is beyond that

provided for by the Project, and as such all future development concepts will not be considered further by this report.

17 Anticipated Environmental Impacts and Mitigation Measures

17.1 Introduction

137. This section of the IEE details the Projects potential impacts and proposes mitigation measures to limit any negative impacts identified. The first items discuss the Project impact screening methodology, and then presents an impacts matrix summarizing the potential impacts of the Project during its three phases; pre-construction, construction and operation. The report then presents the impacts and mitigation in detail in the subsections as follows:

- Physical Resources
 - Air quality&Climate Change
 - Topography
 - Soils& Geology
 - Hydrology
- Ecological Resources
 - Flora
 - Fauna
 - Protected areas
- Other Environmental Aspects
 - Infrastructure, Utilities& Transportation Facilities
 - Land use
 - Tourism facilities
 - Waste and Spoil
 - Hazardous Materials
 - Historical and Archeological Areas of Significance
 - Noise
 - Health and safety (public and occupational)

17.2 Physical Resources

17.2.1 Air quality& Climate Change

Potential Impacts

138. The potential impacts of the Project to air quality are described as follows:

Pre-construction Phase

139. Air Quality - The Station Concept designs have been prepared to encourage low carbon transport options to the stations. These options include cycling, walking and the use of buses. All of these options will have positive impacts to local air quality by helping reduce the use of emissions intensive transport modes, such as motorbikes and cars. More specifically it is recommended that the proposed new local feeder bus routes should use new buses of modern design incorporating low emissions. As such, it is aspired that all of the 143 new buses to be deployed will use low emission technologies. Appendix 3 of the draft Final Report gives a technical review of low carbon transport options, which includes a comparison of environmental characteristics by transport option, and concluded that Euro IV/V ULSD diesel bus and Euro IV/V CNG bus are applicable low-emission technologies in HCMC. Such diesel and CNG buses can cut down carbon dioxide emission by 30% when compared to Euro III diesel bus. In addition the reduction in the use of intensive transport modes, such as motorbikes and cars, has been analyzed as part of the GHC modeling as presented in Chapter 7 (entitled economic and emission assessment) of the draft Final Report. Assumed former modes for years 2018 and 2038 respectively can be consulted in Tables 9.6.2 and 9.6.3. These refer to consultant estimates made with reference to the relevant studies in Bangkok tracking pre-rail former modes.

140. Climate Change - As noted in **Section E**, HCMC ranks among the top ten cities in the world with a population likely to be severely affected by climate change. Recent reports by the

ADB have indicated that infrastructure (including Metro systems) in the city could suffer from increased flooding due to sea level rises. Review of mapping provided by the report suggests that the lower lying areas of the city and those adjacent to the main rivers are most likely to be susceptible to flooding below 2 masl, however, the route of MRT2 appears to be located in a slightly elevated area (4-8 masl) that may not be significantly affected by flood events.

Construction Phase

141. Any construction work will be generally intermittent and not permanent in a specific site, the works will most likely move along the Project corridor as work progresses on the MRT stations and as such air quality impacts will be short term in specific locations.

142. Air quality is however likely to be degraded on a short term localized basis by a range of operational activities including:

- Exhaust emissions from the operation of construction machinery;
- Potential open burning of waste materials;
- Emissions from concrete batch plants, casting yards and generators at the stations;
- Dust generated from haul roads, exposed soils and material stock piles. The dust may impact upon roadside businesses and residents, and may cause some degree of respiratory stress for nearby residents.
- Additional vehicle emissions, including particulate matter, CO, SO₂, NO_x from movements and operation of construction vehicles which are predominantly diesel fuelled, will occur during construction at the stations.

Operational Phase

143. Air Quality - The results of the air quality monitoring undertaken in December 2012 indicate that NO_x and TSP levels exceed Vietnamese air quality standards. Exposure to elevated levels of NO_x and TSP are known to cause short term and long term health impacts. As stated above, implementation of the Project is anticipated to result in the reduction of air emissions, primarily a result of increasing the ridership on the MRT and thereby reducing the amount of emissions intensive vehicles on the road. This in turn should result in positive impacts to the health of those working and living in close proximity to the Project corridor.

144. Climate Change - CO₂ reductions resulting directly from Project activities, when operational, have been initially estimated at 8,600 tonnes of CO₂ per annum. As an indicator this is equivalent of the annual CO₂ emissions generated by approximately 500 people in the United States or 0.00007% of Vietnams annual total CO₂ emissions. As such, the Project will not contribute significantly to CO₂ emissions reductions and unless significant emissions reductions occur globally, HCMC may still suffer significantly from climate change induced impacts. However, as noted above MRT2 may be one of the least affected infrastructure components in the city.

Mitigation Actions

Pre-construction Phase

145. Air Quality - To adequately manage air quality impacts, the Contractor shall be responsible for the preparation of an Air Quality Plan, submitted to the PMU-1 as part of the CEMP. The plan will detail the action to be taken to minimize dust generation (e.g. spraying un-surfaced roads with water, covering stock-piles, etc) and will identify the type, age and standard of machinery and equipment to be used. The Plan shall also include contingencies for the accidental release of toxic air pollutants.

146. Climate Change - Although climate change impacts are not anticipated to have significant impacts to MRT2, based on mapping provided by ADB reports, it is recommended that station layout designs account for potential increased levels of flooding in the project area. This will include designing adequate drainage around subways and parking areas.

Construction Phase

147. Air Quality - The Contractor shall be responsible, through compliance with this EMP and his CEMP, for the following;

- Construction equipment and vehicles shall be well-maintained and shall meet national QCVN emission standards.
- Position any stationary emission sources (e.g., portable diesel generators, compressors, etc.) as far as is practical from sensitive receptors;
- Wherever possible, use grid rather than generator set electrical power for construction equipment.
- Use only vehicles and equipment that are registered and have necessary permits.
- Open burning of waste materials - No burning of debris or other materials will be allowed.
- Dust generated from haul roads, material stock piles, etc - The Contractor shall ensure and that material stockpiles shall be located in sheltered areas and be covered with tarpaulins or other such suitable covering to prevent material becoming airborne. All trucks used for transporting materials to and from the site will be covered with canvas tarpaulins, or other acceptable type cover (which shall be properly secured) to prevent debris and/or materials from falling from or being blown off the vehicle(s).
- Specify the use of clean fuels such as ultra-low sulphur diesel in dump trucks and other heavy-duty diesel vehicles and/or equipment, in conjunction with the use of particulate trap control devices, as well as catalytic converters, to avoid excessive diesel emissions.
- Install temporary fencing or barriers around particularly dusty activities in vicinity of sensitive receivers
- Impose speed limits on construction vehicles to minimize road dust in areas where sensitive receptors are located.
- Hard surfaces will be required in construction areas with regular movements of vehicles. Effective use of water sprays will be implemented (e.g., all roads within the construction areas of the Site shall be sprayed at least twice each day during days of no rainfall, and more if necessary to control dust to the satisfaction of the PMU-SU).

148. The Contractor shall also be responsible for the preparation of a health and safety plan (HSP). The Plan, required as part of the CEMP, shall include contingencies for the accidental release of toxic air pollutants.

Operational Phase.

149. As stated above, the Project intends to increase ridership on the MRT and introduce the use of low carbon transport measures to the stations. Accordingly there should be no increase in air pollution as a result of the Project. No mitigation measures required.

Instrumental Monitoring

150. The potential for significant impacts to air quality from the Project is low when compared to construction of the MRT itself. However, a program of air quality monitoring should be undertaken to ensure the Project is in compliance with Vietnamese air quality standards. In addition, it is recommended that the periodic monitoring of air quality around the station areas is undertaken during the operational phase of the Project to assess if the Project has achieved any reduction in pollution levels.

17.2.2 Topography

Potential Impacts

151. All project actions will occur on the surface of the project corridor, or potentially below (underpasses). The topography of the Project corridor is relatively flat (between 8 and 4

meters above mean sea level) and as such no impacts to topography are considered likely. All construction materials will be sourced from licensed suppliers and locations.

Mitigation Actions

152. None required.

17.2.3 F.2.3 Soils & Geology

Potential Impacts

Pre-construction Phase

153. Soils - The potential exists for areas adjacent to the Station boxes to be contaminated from potentially polluting activities, such as re-fuelling of vehicles. Although it is unlikely that Solution 1 activities will require the use of land used for such activities, it is possible that Solution 2 activities may encroach on such areas, especially at the petrol filling stations at Pham Van Back, Ba Queo and Bay Hien. Fuel may have leaked into the soils from cracks in the surface concrete, poor surface drainage or through leaks in underground bulk fuel storage tanks. It is therefore recommended that prior to construction works in these areas, soil samples are undertaken to assess if any soil contamination has occurred.

154. Geology – No impacts identified.

Construction Phase

155. Soils - The fact the Project construction works are restricted predominantly to the station box and an area within 250 meters of the box will keep soils related construction impacts to a minimum. Potential impacts are limited to those relating to contamination of soils via spills resulting from poorly managed fuels, oils and other hazardous liquids used during the project works. Excavated spoil material will however be generated (approximately 2,500 cubic meters (by comparison approximately 1,400,000 cubic meters will be generated by the MRT2 project)) during the construction of the subways.

156. Geology – No impacts identified.

Operational Phase

157. No impacts anticipated.

Mitigation Actions

Pre-construction Phase

158. Soils - If soil sampling indicates elevated concentrations of pollutants in the soil the material will need to be managed appropriately, most likely by excavation and then disposal at a licensed site. Excavation of this material during Project works may be a health hazard to workers if the appropriate PPE is not used. Any contaminated spoil will also need to be stored and disposed of in a manner consistent with Vietnamese laws for contaminated land.

159. In addition, the Contractor will be responsible for preparation of a Health and Safety Plan (HSP), which will cover containment of hazardous materials, oil spills, and work-site accidents. The plan will detail the process for handling, and subsequently reporting, emergencies, and specify the organizational structure (including responsibilities of nominated personnel). The plan will be submitted to the PMU for approval. Implementation of the plan will be monitored by the PMU-SU. Any emergencies, and how they were handled, will be reported in monthly progress reports by the Contractor to PMU1.

Construction Phase

160. Soils - The Contractor, with oversight from the PMU-SU, shall ensure that:

- All fuel and chemical storage (if any) shall be sited on an impervious base within a bund and secured by fencing. The storage area shall be located away from any sensitive

receptor as identified by **Appendix B**. The base and bund walls shall be impermeable and of sufficient capacity to contain 110 percent of the volume of tanks;

- Staff are trained in emergency spill response procedures;
- Spill cleanup measures and equipment are provided at each construction site;
- The contents of any tank or drum shall be clearly marked. Measures shall be taken to ensure that no contaminated discharges enter any soils.
- Remove all construction wastes from the site to approved waste disposal sites. Excavated soils from subway construction will be disposed of at the same spoil disposal sites as MRT2, and as such the PMU should ensure that the Contractor for MRT2 coordinates with the Project Contractor and Engineer to ensure the correct disposal locations are identified and used.

Instrumental Monitoring

161. A program of soil sampling should be undertaken prior to the excavation of materials at the sites identified for development by Solution 2 designs. The EMP (**Section I**) provides the necessary monitoring plan.

17.2.4 Hydrology – Surface water & Flooding

Potential Impacts

162. Surface Water – There are no surface water-courses within the vicinity of the Project that are likely to be significantly affected by the Project interventions. Footpath upgrading will occur close to the Nhieu Loc Canal, but these relatively minor construction works are unlikely to impact upon the canal.

163. Flooding – The potential exists for Project works to have an impact on the issue of flooding if construction works are not adequately designed and constructed.

164. Groundwater – Construction activities have the potential to impact subsurface hydrology via pollution from construction works. In addition, due to high groundwater levels it may be likely that wastewater will need to be disposed of from the excavation of subways.

Mitigation Actions

Pre-construction Phase

165. Flooding – Consideration in the design phase will be given to the issue of drainage to ensure that drainage patterns are not altered thereby resulting in flooding of areas previously undisturbed.

Construction Phase

166. Flooding – During the construction phase the Contractor is required to construct, maintain, remove and reinstate as necessary any temporary drainage works and take all other precautions necessary for the avoidance of damage by flooding from the Works.

167. Surface Water – In addition, to ensure there are no impacts to the Nhieu Loc Canal, regular observational monitoring of the Contractors works will be undertaken to ensure that no waste materials are disposed of into the canal.

168. Groundwater – The mitigation measures outlined in **Section F.2.3, Soils**, should limit impacts to groundwater. For example, the conditions relating to accidental spills will also prevent impacts to groundwater. In addition, waste water may need to be pumped from subway construction areas and disposed of at a suitable licensed waste water disposal site.

17.3 Ecological Resources

17.3.1 Flora

Potential Impacts

169. No special status flora have been identified within the vicinity of the Project Road that

maybe adversely affected.

170. According to the MRT2 EIA approximately 155 trees will be lost as a result of the construction of MRT2. The estimated number of trees that will need to be cut specifically for the SUT project is about 70 trees. The following indicates the approximate numbers at the specific station areas:

- Tao dan: 5
- Dan chu : 3
- Le thi Rieng: 50
- Bay Hien: 2
- Ba Queo: 2
- Pham van Bach : 7
- Tan Binh : 1

Mitigation Actions

171. The Contractor shall be responsible for the preparation of a *Tree removal and replanting plan* to be approved by the DoT department responsible for management of parks. The plan should adhere to the following principles:

- Minimal tree removal. Where possible, protect existing trees during road widening, removing only those that are absolutely necessary;
- Sound timing. Remove trees in early spring in order to ensure no nesting birds are disturbed;
- Replacement. For every one tree removed, replant at least one in suitable city locations after construction. The selection of species, location and period of planting will be identified during detailed design;
- Monitoring and Maintenance. Implement a tree and vegetation monitoring and maintenance plan.

17.3.2 Fauna

Potential Impacts

172. Due to the urban location of the Project no fauna have been identified that maybe impacted by the Project works with the possible exception of nesting birds in the trees adjacent to the Project stations. As stated above, it is possible that trees will be felled in the vicinity of the station boxes, and birds maybe nesting in these trees.

Mitigation Actions

173. None required other than adoption of the mitigation measures outlined for flora above to mitigate impacts to nesting birds.

17.3.3 Forests & Specially Protected areas

Potential Impacts

174. There are no forests or protected areas within the vicinity of the Project due to its central location within HCMC.

Mitigation Actions

175. None required.

17.4 Other Environmental Related Aspects

17.4.1 Historical and Archaeological Areas of Significance.

Potential Impacts

176. No historical, cultural or archeological areas of significance have been identified that may be affected negatively by the Project with the possible exception of the Muslim cemetery close to Hoa Hung Station. Development of the station may require encroachment into this area.

Mitigation Actions

177. The potential issue of encroachment into the Muslim cemetery is discussed in detail within the SIA and a procedure to manage this issue is outlined.

178. In addition, there could be as yet undiscovered archaeological relics associated with construction works specifically relating to items such as the proposed subways of Solution 2. According to the Department of Culture and Information (DCI), relics are likely to be located to a maximum depth of 5 to 6 m. The following 'chance-find' principles will be implemented by the contractor throughout the construction works to account for any undiscovered items identified during construction works:

- Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance
- Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area
- If the site supervisor determines that the item is of potential significance, an officer from DCI will be invited to inspect the site and work will be stopped until DCI has responded to this invitation
- Work will not re-commence in this location until agreement has been reached between DCI and MAUR as to any required mitigation measures, which may include excavation and recovery of the item
- A precautionary approach will be adopted in the application of these procedures.

17.4.2 Noise & Vibration

Potential Impacts

Construction Phase

179. Noise during the construction works will mostly come from the operation of construction equipment. Typical noise signatures of the different equipment for different construction activities are enumerated below.

Exhibit F-1: Construction Noise Examples					
Site Clearing		Excavation and Earth Moving		Structure Construction	
Equipment	Noise Level	Equipment	Noise Level	Equipment	Noise Level
Bulldozer	80	Bulldozer	80	Pneumatic drill	81-98
Front end loader	72-80	Backhoe	72-93	Crane	75-77
Dump Truck	83-94	Dump Truck	83-94	Welding Machine	71-82
Grading and compacting		Jack Hammer	80-93	Concrete Mixer	74-88
Grader	80-93	Landscaping and Clean Up		Concrete Pump	81-84
Roller	73-75	Bulldozer	80	Concrete Vibrator	76
Paving		Excavator	72	Air Compressor	74-87
Paver	86-88	Truck	83-94	Bulldozer	80
Truck	83-94	Paver	86-88	Cement and Dump trucks	83-94
Tamper	74-77				

180. The noise levels are dependent on the model and the maintenance status of the equipment. Construction noise can be a nuisance to residents living in proximity to the construction areas. Noise attenuation based on the doubling distance rule shows that residents living close to construction areas will occasionally be exposed to high noise levels if no mitigation measures are implemented, however these noise levels from project interventions are unlikely to exceed those associated with construction of MRT2 which will be the main source of noise and vibration impacts during the construction period. There are several schools and health clinics located along the route which are classified as noise sensitive receptors and as such these receptors should be protected from excessive noise levels where practical. Vibration impacts may result from the excavation works associated with subways and foundation works for footbridges. However, due to the fact that Project works will occur at the same time as MRT2 works it will be difficult to determine if the minor excavation works associated with the Project or the major excavation works associated with the MRT2 project are the cause of any vibration related impacts.

Operational Phase

181. In general the actions of the Project are intended to increase ridership on the MRT2, in the short term this may decrease the numbers of vehicles within the MRT2 corridor which will have beneficial noise impacts. The project also intends to improve facilities for walking and cycling to stations which will further reduce operational noise levels. More bus routes may become operational once the MRT2 is operational and this should further reduce the number of motorcycles on the dense residential areas. In the longer term traffic volumes may start to increase again, and accordingly noise levels. But this will not be a direct result of the Project actions, but more of an indirect impact resulting from induced growth brought about mainly by the MRT rather than the Project itself.

Mitigation Actions

182. To mitigate noise and vibration impacts during the construction phases the following measures are recommended:

- Source Controls, i.e., requirements that all exhaust systems will be maintained in good working order; properly designed engine enclosures and intake silencers will be employed; and regular equipment maintenance will be undertaken;
- Site Controls, i.e., requirements that stationary equipment will be placed as far from sensitive land uses as practical; selected to minimize objectionable noise impacts; and provided with shielding mechanisms where possible;
- No construction activities shall be allowed within 300 meters of sensitive receptors without express permission of the Engineer. In this instance noise reduction measures shall be implemented by the Contractor and approved by the Engineer to ensure noise levels are compliant with Vietnamese requirements for Special Areas;
- Time and Activity Constraints, i.e., operations will be scheduled to coincide with periods when people would least likely be affected by noise and vibration; work hours and work days will be limited to less noise-sensitive times. Hours-of-work will be approved by the site PMU-SU having due regard for possible noise disturbance to the local residents or other activities. Construction activities will be strictly prohibited between 10 PM and 6 AM in the residential areas. When operating close to sensitive areas such as residential, nursery, or medical facilities, the Sub-Contractor's hours of working shall be limited to 8 AM to 6 PM; and
- Community Awareness, i.e., public notification of construction operations will incorporate noise considerations; methods to handle complaints will be specified. Sensitive receptors will be avoided as possible. Disposal sites and haul routes will be coordinated with PMU-1.
- Provision of noise barriers in construction areas.

Instrumental Monitoring

183. Routine Noise Monitoring – Noise shall be monitored not less than once per month during the course of the Works. Monitoring results shall be submitted to the PMU-SU two

working days of the completion of the monitoring period for analysis and review. Actions taken in response to the monitoring results shall also be required. Additional monitoring shall be undertaken as deemed warranted by the PMU-SU. The reporting requirements are outlined within the EMP.

17.4.3 Health and Safety

Potential Impacts

184. Occupational Health and Safety– Due to its nature the construction industry is considered to be one of the most hazardous industries where a number of potentially hazardous operations and materials are used. Intensive use of heavy construction machinery, tools, and materials poses risk of physical hazards such as noise and vibration, dust, handling heavy materials and equipment, falling objects, work on slippery surfaces, fire hazards, chemical hazards, toxic fumes and vapors etc.

185. Public Health and Safety –The most significant potential impacts to public health and safety will occur during the excavation and construction works associated with the MRT itself. Construction works associated with the Projects will be fairly minor in comparison, but may still pose potential impacts due to the fact works will occur on the densely populated surface where most interaction with humans will occur.

Mitigation Actions

186. Occupational Health and Safety– To ensure health and safety of workers, the following measures shall be implemented by the contractor:

- Prior to commencement of site works, the following plans shall be prepared by the contractor, reviewed by the PMU-SU and LIEC, and approved by ADB:
 - Health and Safety Plan consistent with international standards (e.g., the World Bank Group's Environment, Health and Safety Guidelines of 2007) and Labor Code of Vietnam. The Plan shall address health and safety hazards associated with working in confined space and compressed air, etc., working at heights, electrocution, excavations, establishment and operation of construction/worker's camps, use of heavy equipment, transport of materials and other hazards associated with various construction activities.
- Appoint an environment, health and safety manager to look after implementation of required environmental mitigation measures, and to ensure that health and safety precautions are strictly implemented for the protection of workers and the general public in the vicinity of construction areas.
- Conduct workshop for all workers on health, safety and environmental measures.
- Provide first aid facilities that are readily accessible by workers.
- Provide fire-fighting equipment at the work areas, where appropriate, and at construction camps.
- Provide adequate drainage in workers camps to prevent water logging and formation of breeding sites for mosquitoes.
- Provide potable water, hygienic sanitation facilities/toilets with sufficient water supply
- Ensure that all wastewater emanating from workers camps, construction camps and other project-related activities and facilities are treated consistent with national regulations.
- Establish clean canteen/rest area.
- Provide fencing on all areas of excavation greater than 2 m deep.
- Provide appropriate personnel safety equipment such as safety boots, helmets, gloves, protective clothes, breathing mask, goggles, and ear protection
- Implement precautions to ensure that objects (e.g., equipment, tool, debris, precast sections, etc.) do not fall onto or hit construction workers.
- Implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery or through an opening in a work surface. Based on a case- specific basis, fall prevention/protection

measures may include installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area, proper use of ladders and scaffolds by trained employees, use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard, fall protection devices such as full body harnesses, etc.

- Provide emergency lighting system of adequate intensity that is automatically activated upon failure of the principal artificial light source to ensure safe equipment operation, safe shut-down, evacuation, etc.
- Ensure that sufficient fresh air is supplied at confined work spaces. Re-circulation of contaminated air is not acceptable. Air inlet filters shall be kept clean and free of dust and microorganisms; and,
- Confined spaces shall be provided with safety measures for venting, monitoring, and rescue operations, to the extent possible.
- Provide adequate and clean housing / accommodation for workers with sufficient ventilation.

187. **Public Health and safety-** The following mitigation measures to ensure public safety shall be implemented by the contractor:

- Implement precautions to ensure that objects (e.g., equipment, tool, debris, precast sections, etc.) do not fall onto or hit people, vehicle, and properties in adjoining areas.
- Fencing of construction sites and excavation sites and guarding such areas to restrict public access.
- Provide warning signs at the periphery of the construction site.
- Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located.
- Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials during transport.

17.4.4 Infrastructure, Utilities& Transportation Facilities

Potential Impacts

188. **Infrastructure** – Project works may include the demolition or rehabilitation of existing infrastructure, such as drainage, footpaths, etc.

189. **Utilities** – Transport of materials and spoils, operation of construction equipment and various construction activities may damage community utilities.

190. **Transportation** – Impacts to transportation relate primarily to road users, within the vicinity of the Project Stations. The main impacts resulting from Project works will be potential road closure, diversions and some temporary blocking of access routes.

Mitigation Actions

191. **Infrastructure** –The contractor shall be responsible for preparing a traffic control plan which will also include elements to ensure that alternative footpaths are provided during the rehabilitation of existing footpaths. The Contractor will also be responsible for ensuring that all drainage facilities remain operational during the project works and that no short term flooding of properties or land occurs.

192. **Utilities** – The contractor shall implement the following measures to address this impact:

- The contractor shall immediately repair any damage caused by the Project to properties (e.g., houses, other types of structures, etc.) community facilities such as water supply, power supply, communication facilities and the like.
- Access roads damaged during transport of construction materials and other project-related activities shall be repaired and maintained to ensure that these remain in passable condition to motorists and pedestrian. Such roads shall be fully restored upon completion of construction works.

193. **Transportation** –The following measures shall be implemented by the contractor to

address impacts to traffic flow and access to properties:

- Before site works commence, a Traffic Management Plan for the construction phase shall be prepared by the contractor and shall be reviewed by PMU1 prior to approval by ADB. The plan shall be designed to ensure that traffic congestion due to construction activities and movement of construction vehicles, trucks transporting excavation spoils and other construction wastes, haulage trucks, and equipment is minimized. The plan shall be prepared in consultation with local traffic officials and People's Committees at the district and commune levels. The plan shall identify traffic diversion and management, transport mode for spoils disposal (e.g., truck, truck and barge, etc.), define routes for construction traffic from materials storage/parking areas to construction site and from construction site to waste disposal locations, traffic schedules, traffic arrangements showing all detours/lane diversions, modifications to signaling at intersections, necessary barricades, warning/advisory signs, road signs, lighting, and other provisions to ensure that adequate and safe access is provided to motorists in the affected areas.
- Locate construction support facilities such that generation of construction traffic trip numbers and lengths are minimized.
- To allow one side of the road to be open to two-way traffic.
- Provide signs advising road users that construction is in progress and that the road narrows to one lane using cones.
- Employ flag persons to control traffic at the station sites for safety reasons when construction equipment is entering or leaving the work area.
- Lanes through the work site created by rope or flagging, shall be developed to minimize risks and injuries from falling objects.
- Post traffic advisory signs (to minimize traffic build-up) in coordination with local authorities
- Provide road signs indicating the lane is closed 500 m before the worksite.
- Use traffic cones to direct traffic to move to the open lane.
- Provide sufficient lighting at night within and in the vicinity of construction sites.
- Regularly monitor traffic conditions along access roads to ensure that project vehicles are not causing congestion.
- Define and observe schedules for different types of construction traffic trips (e.g., transport of pre-cast sections, haulage of spoils, delivery of construction materials, etc.).
- As much as possible, schedule delivery of construction materials and equipment as well as transport of spoils during non-peak hours.
- Avoid movements of noisy vehicles during night time in vicinity of sensitive receivers.
- Implement suitable safety measures to minimize risk of adverse interactions between construction works and traffic flows through provision of temporary signals or flag controls, adequate lighting, fencing, signage and road diversions.
- Ensure relocation of any affected public transport infrastructure (but stops, shelters etc.) prior to commencement of works
- Provide advance notification to the community regarding changes to public transport facilities or routes.
- Schedule construction works to minimize extent of activity along linear construction site at any one time
- Comply with traffic regulations and avoid, where possible, roads with the highest traffic volumes, high density of sensitive receivers or capacity constraints are not used as access to and from the construction areas and spoils disposal sites.
- Install temporary accesses to properties affected by disruption to their permanent accesses.
- Reinstate good quality permanent accesses following completion of construction.

17.4.5 Land use

Potential Impacts

Pre-Construction Phase.

194. Land acquisition will be required to accommodate specific elements of the Project, particularly within and adjacent to the station boxes.

Construction Phase

195. Potential impacts to land use include improper storage and siting of equipment and materials during the construction phase, specifically on private property.

Operational Phase

196. The project itself is not anticipated to result in significant induced growth around the stations as this will be driven primarily by the construction of MRT2.

Mitigation Actions

Pre-Construction Phase

197. A Land Acquisition and Resettlement Plan (LARP) has been prepared for the Project. For specific details of land acquisition, refer to the Project LARP.

Construction Phase.

198. No mitigation is warranted other than ensuring that construction equipment and materials are not stored on private land without express permission of the owners.

17.4.6 Tourism Facilities

Potential Impacts

199. Impacts to Tao Dan Park and Li Thi Rieng Park will be limited to short term construction related impacts such as elevated noise levels. No trees will be felled within the park and access to these areas will remain open. No construction works associated with the Project will occur in the park areas.

Mitigation Actions

200. Impacts to tourism will be beneficial, as such no mitigation is warranted with the exception of ensuring construction storage areas and equipment are located correctly and adequate access to the parks remain.

17.4.7 Waste and Spoil

Potential Impacts

201. If not properly handled and disposed of, solid wastes pose health and safety hazards and are likely to cause nuisance to the surrounding communities and the workforce.

Mitigation Actions

202. To avoid such impacts, the contractor shall implement the following at the construction sites:

- Provide garbage bins and facilities within the project site for temporary storage of construction waste and domestic solid waste.
- Separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on site in secure facilities with weatherproof flooring and roofing, security fencing and access control and drainage/ wastewater collection systems.
- Ensure that wastes are not haphazardly dumped within the project site and adjacent areas
- Undertake regular collection and disposal of wastes to sites approved by local authorities.
- In addition, the Contractor shall be responsible for the completion of a waste management and disposal plan compliant with Vietnamese regulations.

17.4.8 Hazardous Materials

Potential Impacts

203. Potential contamination of surrounding areas and groundwater may occur due to spills of fuel and other hazardous substances. Asbestos containing materials may be present within properties that will be demolished. Poor management of these materials, including

disposal, can have serious impacts to the health of workers and residents.

Mitigation Actions

204. These impacts will be addressed through implementation of the following measures by the contractors:

- Before site works commence, a Spill Management Plan shall be prepared by the contractor and shall be reviewed by PMU-SU and the LIEC prior to approval by ADB. The plan shall provide details of procedures, responsibilities, resources, documentation and reporting requirements, training provisions for relevant staff, etc. to avoid spills of hazardous substances and to effectively respond to such incidents, in case these occur.
- Store fuel and hazardous substances in paved areas with embankment. If spills or leaks do occur, undertake immediate clean up.
- Ensure availability of spill clean-up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored and used.
- Train relevant construction personnel in handling of fuels and spill control procedures.
- Ensure all storage containers are in good condition with proper labeling.
- Regularly check containers for leakage and undertake necessary repair or replacement.
- Store hazardous materials above flood level.
- Equipment maintenance areas shall be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency. Discharge of oil contaminated water shall be prohibited.
- Store waste oil, used lubricant and other hazardous wastes in tightly sealed containers to avoid contamination of soil and water resources. Transport to off-site disposal of such wastes shall be consistent with national and local regulations.

205. Regarding Asbestos containing materials, it is recommended that the Contractor follows the 'Guide to Deal with Asbestos in Buildings' prepared by the Vietnamese Health and Safety Executive and reproduced herewith as **Appendix C**.

18 Consultation and Information Disclosure

18.1 Public Consultations

206. According to the ADB Safeguard Policy Statement (2009):

“The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that:

- 1. Begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;*
- 2. Provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people;*
- 3. Is undertaken in an atmosphere free of intimidation or coercion;*
- 4. Is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and*
- 5. Enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.*

Consultation will be carried out in a manner commensurate with the impacts on affected communities. The consultation process and its results are to be documented and reflected in the environmental assessment report.”

207. As such, three levels of consultations have been undertaken during the preparation of this IEE, they included:

- Interviews with members of the public, including shop owners and residents in areas within and adjacent to the station boxes;
- Meetings with Government agencies and departments; and
- Formal public meetings.

208. The following section provides a summary of the consultations.

18.1.1 Interviews

209. Interviews were undertaken with 100 residents and business owners within the station box areas to assess their thoughts on the projects and the potential environmental issues. The following summarizes the results of the interviews undertaken in December 2012.

210. More than 50% of those interviewed indicated that they would be prepared to use the metro and a bus to travel to work rather than a motorcycle, however most people felt that better quality buses were needed as they were often overcrowded and dirty. Around ten percent of residents felt that low emission buses should be provided to reduce environmental impacts.

211. When asked if there were any specific issues that affected walking in the Project corridor there were mixed replies ranging from the need for wider footpaths to provide better access, restriction on motorcycles use on footpaths, the need for improved road crossings and a better quality of footpaths. Thirty percent of respondents stated that they did not cycle because they felt it was too unsafe. Nearly all those surveyed responded that the Project would have multiple benefits including reduced noise, improved air quality, reduced journey times and better connectivity between transport modes. Impacts to air quality, noise and traffic delays were indicated as the main issue arising from the construction phase of the Project.

18.1.2 Government Departments

212. Meetings with various government departments were undertaken during December 2012 to discuss the Projects potential environmental issues. **Exhibit G-1** summarizes the key points of the meetings.

Exhibit G-1: Officials Consultations		
Date	Person Met (Name, position)	Topics Discussed
7 th December 2012 18.1.3 18.1.4 18.1.5 18.1.6	PMU1	As part of a wider Project Progress meeting between the Consultants and PMU1, the issue of environmental aspects of the Project was discussed. PMU1 had no specific environmental concern regarding the Project. However, they did mention that there were currently no staff within the PMU responsible for environmental management issues, and as such, development of the PMU-SU would require recruitment of staff and an element of capacity building within the Unit. The Consultant informed PMU1 of the meetings and information that would be required to complete the IEE and PMU1 agreed to help facilitate the meetings and provide all the required information.
13 th December 2012 18.1.7 18.1.8 18.1.9 18.1.10 18.1.11	PMU1	An additional meeting was undertaken with PMU1 to discuss the issue of tree felling. According to PMU1 there is a process whereby any person cutting trees within the Project Area should make an application to the Department of Transport (DoT) for permission to cut the trees, including any within the parks of Tao Dan park and Le Thi Rieng. A unit within the DoT then makes a decision on the cutting based on the specific need to cut the tree, its age, location and type. The owners of any felled tree will be compensated and allowed to keep the wood, which is an important issue given the value of the trees (Dipterocarpus) predominant around Tao Dan and Dan Chu.
14 th December 2012 18.1.12 18.1.13 18.1.14 18.1.15 18.1.16	PMU2	A meeting with PMU2 was held to discuss how the environmental issues were being managed on the MRT2 project. PMU2 stated that an international environmental specialist had been engaged to train a local environmental specialist as part of the new PMU2 environmental team. A discussion was held regarding the possibility of combining the PMU2 environmental team with the PMU1 safeguards unit, but it was deemed not possible due to the fact it may be difficult to determine a structure to fund such a unit.
13 th December 2012 18.1.17 18.1.18 18.1.19 18.1.20 18.1.21 18.1.22	DONRE	A meeting with DONRE was undertaken to discuss the requirements for EIA. DONRE mentioned that the IEE should be submitted to DONRE for review, they would then make an assessment as to whether the document was sufficient or more detail environmental assessment studies would be required. DONRE raised no specific concerns regarding potential environmental impacts of the Project.

18.1.23 Public Meetings

213. A public meeting was held in HCMC to discuss the social and environmental impacts of the Project. The meeting, coordinated by PMU1, was attended by 45 stakeholders,

including residents, government officials, and veterans. A full list of attendees is provided by **Appendix D**.

214. The Consultants provided an overview of the Project and its potential environmental issues and then invited questions. The stakeholders were mainly concerned with issues relating to resettlement and compensation issues, and as such there were only two specific questions relating to environmental issues. The following summarizes these questions and answers.

215. Question – HCMC DONRE (Ms Hoa): In this project, DONRE had reminded to the investor that all environmental procedure should be compliance, especially in circular 26 and decree 29. The Consultants had mentioned to DONRE previously that the PMU would send information to DONRE about the scale of the project, but until now DONRE has not receive any information yet.

216. Answer – Consultants(MVA Asia: Mr Tuan): The MRT2 project had started one step ahead of this Project which has just started. In December of 2012, PC of HCMC had organized the meeting for the midterm report; there were participants from different departments of Ho Chi Minh City who listened to the project description and scale. Currently, we are in the period of the feasibility study under leadership of PMU1. In coming April, there will be more meetings to discuss formal information on project scale and investment. After we finish the IEE, we will submit it to DONRE according to Vietnamese law.

217. Question – Resident: According to your environmental impact assessment, we are affected by the project; we have to receive the compensation from these effects. But this morning I do not hear anything yet about this type of compensation. The project also effect to our business activities.

218. Answer – Consultants (MVA Asia: Mr Tuan): We will discuss this issue in more detail with PMU1, although it is unlikely that compensation will be paid for these impacts.



Exhibit G-2: Public Meeting, HCMC, 29th March 2013

219. In addition to the general environmental and social presentation and discussions the Consultants invited the attendees to answer some questions specific to the environment. The following summarizes their answers:

220. Question: 1. How would you rate the noise levels within the station areas (or road corridor) at present, during construction and during operations? Most people believed that noise levels would be the same or lower once the Project had been completed and that noise levels would be highest during construction.

221. Question 2. Which facilities are likely to suffer the most from high noise levels from construction works? Residents were identified as the group likely to suffer the most significant impacts, followed by hospitals and schools.

222. Question 3. How would you rate the air quality within the station areas (or road corridor) currently, during construction and during the operational period? Nobody believed that air quality levels were currently good with most respondents stating that current air quality is bad and construction air quality levels would also be poor. However over 95% believed that air quality would be average or better when the project became operational.

223. Question 4. Which facilities are likely to suffer the most from poor air quality during construction works? The respondents stated that schools were most likely to suffer air quality impacts, closely followed by residents.

224. Question 5. What is the main impact of air emissions? The majority of stakeholders felt that impacts to health and odor were the main air quality impacts.

225. Question 6. If trees are to be cut, how do you think they should be replaced? Nobody felt that trees should not be replaced, with the majority of respondents stating that they should be replaced on a one to one basis.

226. Question 7. What is the most dangerous road related activity? The majority of respondents stated that crossing the road on foot was the most dangerous followed by cycling a bike. The safest activity was considered travelling by motorcycle.

227. Question 8. During the construction phase what do you think will be the most likely impact to health and safety? The majority of respondents stated that poor traffic management and insufficient signage and safety barriers would be the most significant issues.

18.2 Planned Information Disclosure

228. It is anticipated that in compliance with ADB's requirements for IEEs (Category B environmental analyses), the document will be provided for disclosure on the ADB website prior to Board consideration of the Project.

229. The Contractor will be contractually obligated to notify and inform the public of construction operations prior to construction works, publish an emergency response plan disclosing his intentions to deal with accidents and emergencies, including environmental/public health emergencies associated with hazardous material spills and similar events, etc.

19 Grievance Mechanism

19.1 ADB Requirements

230. According to the ADB Safeguard Policy Statement (2009) *“The borrower/client will establish a mechanism to receive and facilitate resolution of affected peoples’ concerns, complaints, and grievances about the project’s environmental performance. The grievance mechanism should be scaled to the risks and adverse impacts of the project. It should address affected people’s concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. The mechanism should not impede access to the country’s judicial or administrative remedies. The affected people will be appropriately informed about the mechanism.”*

19.2 Grievance Process

19.2.1 General

231. As the Project will involve civil works within a densely populated city center, it is likely that there will be some complaints (e.g., due to high noise levels, excessive dust emission, etc.) if appropriate environmental mitigation measures are not properly implemented. Prior to commencement of site works, the contractor will be required to develop a system that will allow for receiving/recording and immediate (within 24 hours) response to an issue. Such issues will also be reported by the contractor to PMU1 within 24 hours. Likewise, if the complaint is reported by the affected person(s) to PMU1, it shall be recorded and passed on within 24 hours to the contractor for immediate resolution. Through installation of notice boards at the construction sites, the contractor will publicize the name and telephone numbers (hotline) of their personnel who are designated to receive and document complaints. If the complaint is not resolved at the level of the contractor within two (2) days from filing of the complaint, this will be dealt with through the grievance redress committee (GRC) at the District PC level that will be publicized by PMU1 and the District PC prior to site works.

19.2.2 Grievance Resolution – Project Level

232. Based on the the Law on Environmental Protection of Viet Nam, specifically under Article 122, the District-level People’s Committee (PC) is the authorized agency that will receive and solve the environmental issues from affected persons. The tasks of the District PCs in grievance resolution are: *“To direct the supervision, inspection and handling of violations of the environmental protection law; settle disputes, complaints, denunciations and petitions related to environment in accordance with the provisions of law on complaints and denunciations and other relevant laws”*. PMU1 will coordinate closely with the District PCs and DONRE in the implementation of the project and resolution of environmental issues. The affected peoples’ concerns and complaints will be addressed by the GRC. The GRC shall be chaired by the District PCs (PMU1 will participate in GRC meetings). Grievances can be filed in writing or verbally with any member of the GRC. The GRC members may include the District PCs administrative office, Division of Natural Resources and Environment, Division of Urban Management as well as the Commune PCs. The committee will have 15 days to respond with a resolution. If unsatisfied with the decision, the existence of the GRC shall not impede the complainant’s access to the Government’s judicial or administrative remedies.

233. The grievance redress mechanism (GRM) described below will be employed by the GRC to resolve complaints. This mechanism has been developed based on GOV’s legal guidelines (Chapter XIV in the Law on Environmental Protection (LEP) passed by the National Assembly on 29 November 2005). The GRM shall be publicized by the District PCs and PMU1 to ensure local residents and other stakeholders are aware of its existence. Information dissemination shall be through the public consultation program identified in the EMP. As part of the GRM, PMU1 shall also set-up a hotline for complaints and the hotline shall be publicized through the media and numbers placed on the notice boards outside the construction site. PMU1 will ensure that the contractors keep a record of complaints and related documents. Following are the steps in filing and resolution of grievances related to environmental impacts of the Project.

19.2.3 Prepare a complaint

234. Based on the legal guidelines any individual, household or organization (business unit, production unit, government or private office, etc.) can complain to PMU1 or its contractors, if her/his or their properties/ life/ business/health or public environment has been damaged or adversely affected by project activities due to noise or dust pollution, strong vibration that caused damages to housing and other structures, etc. Claims can be initiated as follows:

- Verbal: direct expression of their complaint to representatives of PMU1's contractors or GRC through face-to-face meetings. Verbal witness of village representatives and neighbors is important under this process.
- Written form: express their complaint to the contractor of project implementing agency (PMU1) in a written form. In this case witness and confirmation of their neighbors and representatives of commune's PC or FFC is not compulsory but important for further resolution by GRC or PMU1's contractors.
- Use public media: the complainant can provide evidence of impact caused by the project activities to a local or central newspaper or TV and to ask the media for support.

235. To obtain a fast resolution of complaints, the complainant may ask local commune officers (PC, FFC or Police) to prepare a written record of the complaint ((prepared in Vietnamese) with a documentation of evidences of damages caused by the project activities. The signature of three groups is required: PMU1 or the contractor who is responsible for the damage, the complainant and a representative of local PC or FFC or witnesses.

19.2.4 Receive and register a complaint

236. The complainant can directly submit their claims to representatives of the contractor and/or GRC (in case of verbal complaint) or send their grievance letter to offices of GRC and/or contractor and a copy to the local commune PC (in case grievance is in written form). If the complainant does not know how to send their letter they can ask the local PC, FFC or the media to help them send their letter to the contractor and/or GRC.

237. Once a complaint has been received, it shall be registered by GRC/contractor and local PC. Within 2 weeks a reply in written form from GRC/contractor will be sent back to the complainant with a copy to the local PC. The reply letter shall include the following information:

- Proposal by PMU1/contractor on how they plan to assess the damage;
- Schedule to carry out damage assessment, negotiation and resolution.

19.2.5 Assess the eligibility and validity of the complaint

238. It is the responsibility of the project owner/contractor to:

- Determine whether a complaint is eligible (if it is due to the project) or ineligible (if it is not project-related). This step is important because in some cases the damage may not be due to the project.
- Determine who will conduct the damage assessment. Depending on the complaint, some outside agencies may be asked to assist the project implementing agency in assessing the impacts and damages. These outside agencies maybe an environmental monitoring unit or an economic evaluation unit through DONRE.

239. According to the Law, assessment unit should be mutually agreed to by both sides (the complainant and PMU1 or its contractor).

19.2.6 Assess the damages caused by the project activities

240. If the complaint is related to the project activities, representatives of PMU1/contractor, with the selected assessment unit, shall visit the complainant and the site. The assessment shall be implemented with the participation of the complainant and witnesses from the commune's PC or FFC. The results of the assessment shall be agreed to by the complainant and shall be signed off by the complainant, representatives of project implementing agency/contractor, assessment unit and commune PC.

241. If one side is not satisfied with the assessment results then they can propose another method or other assessment units to come in and re-assess the impacts until the assessment is satisfactory to both sides. If the complainant requests, the District PC may help them find a suitable assessment unit.

19.2.7 Select grievance resolution approaches and resolution of the complaint

242. Depending on the claims of the complainant and degree of adverse impact, PMU1/contractor may select a reasonable way to resolve the complaint. Some common ways suggested below.

- The complainant proposes a solution, based on self-evaluation of their damages.
- PMU1/contractor proposes a solution, based on the legal regulation and their assessment of the damages.
- The complainant and PMU1 /contractor negotiate.
- Both sides defer to a third party (local mediation committee – Ban Hoà *Giai* in Vietnamese) or to concerned government agencies with environmental management units. In case of failure in finding a solution, by these bodies, both sides may request a court to decide.

19.2.8 Resolution of damages caused by project activities and response to all parties involved

243. After obtaining agreement of the complainant and the representatives of PMU1/contractor on the degree of damages related to environmental impacts of the project, PMU1 or its contractor will immediately implement compensation to the complainant. The compensation may be in the form of money and/or property provision by (land, construction materials, house, apartment etc.), depending on the negotiation between both sides or by decision of the courts. Compensation also includes restoration of the damaged environment or properties caused by project activities, if the complainant requires (re-construct damaged house or road, etc.).

244. The compensation, when implemented, shall be witnessed by representatives of the local communes' PC.

245. Documentation or recording the results of the grievance redress shall be prepared and signed by the complainant, representatives of the project implementing agency/contractor and District/Commune. A summary of this documentation shall be provided to all the relevant parties: i.e., local PC, complainant, PMU1/contractor as well as the media and court, in case they are involved in the resolution.

246. In case the complainant is not satisfied with the resolution and/or compensation proposed by PMU1/contractor, he/she can implement the following:

- Re-calculate the loss or provide more evidence of the damages.
- Refer to a third party (mediator, lawyers to find other approach).

19.2.9 Monitoring of GRM

247. To ensure that compensation for damages are properly implemented they will be monitored by the following agencies where a particular complaint has been filed:

- Commune PCs
- Fatherland Front Committee (FFCs)

248. To achieve better results in grievance redress monitoring, the above agencies may invite other government agencies, e.g., the Provincial DONRE and Environmental Police or DOJ (in complicated cases) to participate in the monitoring.

20 Environmental Management Plan

20.1 EMP Objectives

249. An Environmental Management Plan (EMP) has been developed for the Project. The EMP defines all potential impacts of the Project components and the mitigation and protection measures with the objective of avoiding or reducing these impacts to acceptable levels, meeting international and Vietnamese standards. The EMP also defines the institutional arrangements and mechanisms, the roles and responsibilities of different institutions, procedures and budgets for implementation of the EMP. The EMP seeks to ensure continuously improving environmental protection activities during preconstruction, construction, and operation in order to prevent, reduce, or mitigate adverse impacts and risks. The EMP defines:

- EMP objectives;
- Responsibilities and authorities for EMP implementation;
- Summary of impacts and mitigation measures;
- Environmental monitoring and inspection plan;
- Institutional strengthening and training plan;
- Reporting requirements;
- Cost estimates, and
- Mechanism for feedback and adjustment.

20.2 Implementing Organizations and Their Responsibilities

20.2.1 EA, IA & PMU.

250. HCMC People's Committee (HCMC PC) will be the executing agency (EA) for the Project, with overall responsibility for project implementation. HCMC PC will ensure collaboration with DONRE through providing the department a copy EMP following detailed design and allowing time for comment. The Department of Transport (DoT) will be the implementing agency (IA) for the Project. A project management unit (PMU1) will be responsible for the project implementation. The PMU will: (i) be responsible for overall management of project implementation; (ii) ensure adequate organization and agency coordination; (iii) monitor the progress of project implementation; and (iv) coordinate communication with ADB and other agencies concerned. The PMU will include a Safeguards Unit, including capacities in environmental management.

20.2.2 Safeguards Unit.

251. Under the PMU, a Safeguards Unit (PMU SU) will be established during the detailed Project design and at least a month prior to the preparation of the Project tender documents. The Unit shall comprise one full time environmental and social impact specialist (ESIS). The ESIS shall have at least 5 years experience of EIA preparation and EMP implementation for infrastructure projects and shall be degree qualified in an environmental related discipline. The ESIS will have responsibility for day-to-day EMP implementation and supervision, and provision of reports to the PMU. Working in collaboration with the IA the responsibilities of the environmental specialist include:

- EMP update after detailed project design;
- Support the PMU and tendering companies in preparing tender documents;
- Implementation and monitoring of the EMP;
- Monitoring contractors to ensure adherence to the EMP;
- Providing overall planning and coordination and supervision of the EMP activities;
- Providing budgets for EMP activities;
- Monthly reporting to the PMU on progress of the implementation of the EMP;
- Conducting consultation meetings with local stakeholders as required, informing them of imminent construction works, updating them on the latest project development activities, GRM, etc.
- Supporting the Loan Implementation Environmental Consultants in conducting training, EMP compliance reviews, annual reporting, etc.

20.2.3 Loan Implementation Environmental Consultants (LIEC).

252. Under the loan implementation consultancy services, one International LIEC will support the project for two person-months per year with (i) project preparation; (ii) training (a summary of the training program is provided by Appendix I), (iii) yearly environmental progress and compliance monitoring (iv) annual environmental monitoring and progress reporting; (v) identifying environment-related implementation issues and necessary corrective actions to be reflected in an action plan; and (vi) undertaking site visits as required. A summary scope of works for the LIEC is included as Appendix

20.2.4 Contractors.

253. Contractors will be required to appoint an Environment, Health and Safety Officer (EHSO) responsible for daily monitoring and supervision, and evaluation of mitigation measures' implementation. Each contractor will be required to develop an Construction Environmental Management Plan (CEMP). To ensure that the contractors comply with the EMP provisions, the PMU with the help and technical support of Loan Implementation Environmental Consultants (LIEC), will prepare and provide the following specification clauses for incorporation into the bidding procedures:

- A list of environmental management requirements to be budgeted by the bidders in their proposals;
- Environmental clauses for contractual terms and conditions; and
- EMP provisions (environmental mitigation measures) that should be complied with by the Contractor.

254. In addition the PMU will prepare semi-annual environmental monitoring report on EMP implementation and submit them to ADB.

20.2.5 Licensed laboratory.

255. A licensed laboratory will be engaged (and financed) by the Contractor to conduct quarterly environmental monitoring during the construction and operation phase, following the approved monitoring plan. The licensed institute will comply with Vietnamese Quality Assurance/Control procedures and regulations for sampling and monitoring of environmental media, and assess compliance with Vietnamese environmental quality standards for ambient air and noise quality.

Exhibit I-1: Summary of Environmental Responsibilities		
Phase	Responsible Agency	Responsibility
Detailed Design	PMU	Incorporation of environmental mitigation measures in detailed designs, and bidding documents.
Tendering	PMU & LIEC	Incorporate mitigation measures and the EMP clauses in tendering documents and civil contracts.
	Contractor	Preparation of contractors' construction management plans.
Construction	Contractor	Implementation of mitigation measures and conduct internal monitoring/supervision
	PMU	Supervise EMP implementation; conduct regular site inspections; prepare monthly EMP progress reports; conduct training; support LIEC in preparing semi-annual environmental monitoring report.
	Licensed Laboratory	Conduct quarterly environmental monitoring, prepare monitoring report.
	LIEC	Advise on the mitigation measures; provide comprehensive technical support to PMU, EA and IA for environmental management; conduct training; conduct annual EMP compliance review; prepare annual environmental progress reports.
	ADB	Conduct review missions; review semi-annual environmental monitoring reports, disclose

		environmental monitoring reports on ADB's website upon receipt.
Operation	PMU	Conduct EMP compliance review.
	IA	Implementation of mitigation measures as defined in EMP.
	Licensed Laboratory	Conduct environmental monitoring following approved monitoring plan.

20.3 Summary of Potential Impacts and Mitigation Measures

256. Potential environmental issues and impacts during the detailed design, pre-construction, construction and operation phases of the Project, as identified during the IEE, as well as corresponding mitigation measures designed to minimize the impacts, are summarized in **Exhibit I-2**. Environmental protection and mitigation measures will (i) mitigate environmental impacts to acceptable levels, (ii) achieve compliance with national environmental regulations, and (iii) provide compensation for lost environmental resources. The mitigation measures will be incorporated into tender documents, construction contracts, and operational management plans. Design consultants, contractors, the PMU Safeguards Unit and the project implementing agency (IA) will implement these measures. DONRE will be provided with a copy of the mitigation measures in the EMP prior to construction for approval, and yearly thereafter.

257. The effectiveness of these measures will be evaluated based on the results of the environmental monitoring and inspection to determine whether they should be continued or improvements should be made. Improvements need to be confirmed through stipulated environmental management procedures.

258. A Land Acquisition and Resettlement Plan (LARP) has been prepared to ensure that the affected persons will be made better off or at least not worse off because of the project. Details of the required actions are given in the LARP.

20.3.1
Exhibit I-2: Environmental Mitigation Measures

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Issue / Impact	Mitigation	Location	Schedule	Responsibilities	
				Implementer	Supervisor / Approver
Design Phase					
Air Quality– General Project related emissions to air.	• Preparation of an Air Quality Plan	Entire project areas.	Prior to the commencement of works.	Contractor EHSO	PMU-SU / LIEC
Climate Change– Climate change induced flooding.	• Review potential climate change induced flood levels and ensure designs account for increased flood water levels.	Entire project areas.	Prior to the commencement of works.	Contractor	PMU-SU / LIEC
Air Quality – Emissions from hazardous chemicals	• Preparation of a health and safety plan.	Entire project areas.	Prior to the commencement of works.	Contractor EHSO	PMU-SU / LIEC
Soils – Potential soil contamination from petrol stations.	• Soil sampling to assess contamination levels	At all petrol stations schedule to be demolished.	Prior to the commencement of works.	Independent Laboratory.	PMU-SU / LIEC
Hydrology – Disruption and damage to drainage.	• Ensure that designs specify drainage patterns are not altered thereby resulting in flooding of areas previously undisturbed.	Entire project areas.	Prior to the commencement of works.	Contractor EHSO	PMU-SU / LIEC
Flora and Fauna – Cutting of Trees	• Preparation of a Tree removal and replanting plan. • Permits secured from appropriate government agencies for any tree removal prior to the start of construction.	For all areas where tree removal is planned.	Prior to the commencement of works.	Contractor EHSO	PMU-SU / LIEC
Occupational Health and Safety – impacts to workers.	To ensure health and safety of workers, the following measures shall be implemented by the contractor: • Prior to commencement of site works, the following plan shall be prepared by the contractor, reviewed	Entire project areas.	Prior to the commencement of works.	Contractor	PMU-SU / LIEC

	<p>by the PMU-SU and LIEC, and approved by ADB:</p> <ul style="list-style-type: none"> Health and Safety Plan consistent with international standards (e.g., the World Bank Group's Environment, Health and Safety Guidelines of 2007) and Labor Code of Vietnam. The Plan shall address health and safety hazards associated with working in confined space and compressed air, etc., working at heights, electrocution, excavations, establishment and operation of construction/worker's camps, use of heavy equipment, transport of materials and other hazards associated with various construction activities. Appoint an environment, health and safety manager to look after implementation of required environmental mitigation measures, and to ensure that health and safety precautions are strictly implemented for the protection of workers and the general public in the vicinity of construction areas. 				
Infrastructure – impacts to drainage, roads and footpaths.	<p>The following measures shall be implemented by the contractor to address impacts to traffic flow and access to properties:</p> <ul style="list-style-type: none"> Before site works commence, a Traffic Management Plan for the construction phase shall be prepared by the contractor and shall be reviewed by PMU1 prior to approval by ADB. The plan shall be designed to ensure that traffic congestion due to construction activities and movement of construction vehicles, trucks transporting excavation spoils and other construction wastes, haulage trucks, and equipment is minimized. The plan shall be prepared in consultation with local traffic officials and People's Committees at the district and 	Entire project areas.	Prior to the commencement of works.	Contractor	PMU-SU / LIEC

	<p>commune levels. The plan shall identify traffic diversion and management, transport mode for spoils disposal (e.g., truck, truck and barge, etc.), define routes for construction traffic from materials storage/parking areas to construction site and from construction site to waste disposal locations, traffic schedules, traffic arrangements showing all detours/lane diversions, modifications to signaling at intersections, necessary barricades, warning/advisory signs, road signs, lighting, and other provisions to ensure that adequate and safe access is provided to motorists in the affected areas.</p> <ul style="list-style-type: none"> • Locate construction support facilities such that generation of construction traffic trip numbers and lengths are minimized. • To allow one side of the road to be open to two-way traffic. • Provide signs advising road users that construction is in progress and that the road narrows to one lane using cones. • Employ flag persons to control traffic at the station sites for safety reasons when construction equipment is entering or leaving the work area. • Lanes through the work site created by rope or flagging, shall be developed to minimize risks and injuries from falling objects. • Post traffic advisory signs (to minimize traffic build-up) in coordination with local authorities • Provide road signs indicating the lane is closed 500 m before the worksite. • Use traffic cones to direct traffic to move to the open lane. • Provide sufficient lighting at night within and in the vicinity of construction sites. 				
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	<ul style="list-style-type: none"> • Regularly monitor traffic conditions along access roads to ensure that project vehicles are not causing congestion. • Define and observe schedules for different types of construction traffic trips (e.g., transport of pre-cast sections, haulage of spoils, delivery of construction materials, etc.). • As much as possible, schedule delivery of construction materials and equipment as well as transport of spoils during non-peak hours. • Avoid movements of noisy vehicles during night time in vicinity of sensitive receivers. • Implement suitable safety measures to minimize risk of adverse interactions between construction works and traffic flows through provision of temporary signals or flag controls, adequate lighting, fencing, signage and road diversions. • Ensure relocation of any affected public transport infrastructure (but stops, shelters etc.) prior to commencement of works • Provide advance notification to the community regarding changes to public transport facilities or routes. • Schedule construction works to minimize extent of activity along linear construction site at any one time • Comply with traffic regulations and avoid, where possible, roads with the highest traffic volumes, high density of sensitive receivers or capacity constraints are not used as access to and from the construction areas and spoils disposal sites. • Install temporary accesses to properties affected by disruption to their permanent accesses. • Reinstate good quality permanent accesses following completion of construction. 				
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	<p>21.1.1</p> <p>The Contractor will also be responsible for ensuring that all drainage facilities remain operational during the project works and that no short term flooding of properties or land occurs</p>				
Land Use – Resettlement and compensation.	<ul style="list-style-type: none"> A project LARP has been prepared and will be implemented by the PMU. 	As specified by the LARP.	Prior to the commencement of works.	PMU1	ADB
Hazardous Materials – spills and leaks	<ul style="list-style-type: none"> Before site works commence, a Spill Management Plan shall be prepared by the contractor and shall be reviewed by PMU-SU and the LIEC prior to approval by ADB. The plan shall provide details of procedures, responsibilities, resources, documentation and reporting requirements, training provisions for relevant staff, etc. to avoid spills of hazardous substances and to effectively respond to such incidents, in case these occur. 	Entire project areas.	Prior to the commencement of works.	Contractor	PMU-SU / LIEC
Waste Management	<ul style="list-style-type: none"> Contractor to prepare a waste management plan compliant with Vietnamese regulations. 	Entire project areas.	Prior to the commencement of works.	Contractor	PMU-SU / LIEC
Construction Phase					
Air Quality –Construction related emissions.	<ul style="list-style-type: none"> Construction equipment and vehicles shall be well-maintained and shall meet national QCVN emission standards. Position any stationary emission sources (e.g., portable diesel generators, compressors, etc.) as far as is practical from sensitive receptors; Wherever possible, use grid rather than generator set electrical power for construction equipment. Use only vehicles and equipment that are registered and have necessary permits. No burning of debris or other materials will occur on the Site without permission of the Engineer. Dust generated from haul roads, material stock 	Construction and storage areas.	During construction period.	Contractor & Contractor EHSO	PMU-SU

	<p>piles, etc – The Contractor shall ensure and that material stockpiles shall be located in sheltered areas and be covered with tarpaulins or other such suitable covering to prevent material becoming airborne. All trucks used for transporting materials to and from the site will be covered with canvas tarpaulins, or other acceptable type cover (which shall be properly secured) to prevent debris and/or materials from falling from or being blown off the vehicle(s).</p> <ul style="list-style-type: none"> • Specify the use of clean fuels such as ultra-low sulphur diesel in dump trucks and other heavy-duty diesel vehicles and/or equipment, in conjunction with the use of particulate trap control devices, as well as catalytic converters, to avoid excessive diesel emissions. • Install temporary fencing or barriers around particularly dusty activities in vicinity of sensitive receivers • Impose speed limits on construction vehicles to minimize road dust in areas where sensitive receptors are located. • Hard surfaces will be required in construction areas with regular movements of vehicles. Effective use of water sprays will be implemented (e.g., all roads within the construction areas of the Site shall be sprayed at least twice each day during days of no rainfall, and more if necessary to control dust to the satisfaction of the Engineer). 				
Soils – Impacts to workers excavating and removing contaminated soils	<ul style="list-style-type: none"> • Preparation and implementation of a Health and Safety Plan. 	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU
Soils – excavated spoil from subways	<ul style="list-style-type: none"> • Ensure excavated material is disposed of at MRT2 spoil location sites. 	At the subway locations.	During construction period.	Contractor & Contractor EHSO	PMU-SU

Soils – Impacts to workers excavating and removing contaminated soils	<ul style="list-style-type: none"> • Ensure appropriate PPE is used during excavation and handling. • Ensure disposal by a licensed waste management company. 	At any site identified with contaminated soils.	During construction period.	Contractor & Contractor EHSO	PMU-SU
Soils – general construction related impacts	<ul style="list-style-type: none"> • All fuel and chemical storage (if any) shall be sited on an impervious base within a bund and secured by fencing. The storage area shall be located away from any sensitive receptor. The base and bund walls shall be impermeable and of sufficient capacity to contain 110 percent of the volume of tanks; • Staff are trained in emergency spill response procedures; • Spill cleanup measures and equipment are provided at each construction site; • The contents of any tank or drum shall be clearly marked. Measures shall be taken to ensure that no contaminated discharges enter any soils. • Remove all construction wastes from the site to approved waste disposal sites. 	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU
Hydrology – Impacts to surface drainage.	<ul style="list-style-type: none"> • During the construction phase the Contractor is required to construct, maintain, remove and reinstate as necessary any temporary drainage works and take all other precautions necessary for the avoidance of damage by flooding from the Works. 	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU
Hydrology – Disposal of waste water from subway excavation.	<ul style="list-style-type: none"> • The Contractor shall be responsible for ensuring waste water is collected and disposed of at a suitable licensed facility. Periodic water quality testing should be undertaken to assess if the water is contaminated. 	At subway locations	During construction period.	Contractor & Contractor EHSO 21.1.2	PMU-SU
Hydrology - Impacts to the Nhieu Loc Canal.	<ul style="list-style-type: none"> • Regular observational monitoring of the Contractors works will be undertaken to ensure that no waste materials are disposed of into the canal. 	At locations adjacent to the Nhieu Loc Canal.	During construction period.	Contractor & Contractor EHSO	PMU-SU

Historical and Cultural Heritage – Impacts to the Muslim Cemetery.	<ul style="list-style-type: none"> Compliance with the Social Impact Assessment regulations on this issue. 	At the Muslim Cemetery.	During construction period.	Contractor & Contractor EHSO	PMU-SU
Historical and Cultural Heritage – chance finds.	<ul style="list-style-type: none"> The following ‘chance-find’ principles will be implemented by the contractor throughout the construction works to account for any undiscovered items identified during construction works: <ul style="list-style-type: none"> Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area If the site supervisor determines that the item is of potential significance, an officer from DCI will be invited to inspect the site and work will be stopped until DCI has responded to this invitation Work will not re-commence in this location until agreement has been reached between DCI and MAUR as to any required mitigation measures, which may include excavation and recovery of the item A precautionary approach will be adopted in the application of these procedures. 	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU
Noise – General construction noise.	<ul style="list-style-type: none"> Source Controls, i.e., requirements that all exhaust systems will be maintained in good working order; properly designed engine enclosures and intake silencers will be employed; and regular equipment maintenance will be undertaken; Site Controls, i.e., requirements that stationary equipment will be placed as far from sensitive land uses as practical; selected to minimize objectionable noise impacts; and provided with shielding 	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU

	<p>mechanisms where possible;</p> <ul style="list-style-type: none"> • Work near Sensitive Receptors shall be limited to short term activities. No long term generators of significant noise shall be allowed within 300 meters of sensitive receptors; • Time and Activity Constraints, i.e., operations will be scheduled to coincide with periods when people would least likely be affected; work hours and work days will be limited to less noise-sensitive times. Hours-of-work will be approved by the site PMU-SU having due regard for possible noise disturbance to the local residents or other activities. Construction activities will be strictly prohibited between 10 PM and 6 AM in the residential areas. When operating close to sensitive areas such as residential, nursery, or medical facilities, the Sub-Contractor's hours of working shall be limited to 8 AM to 6 PM; and • Community Awareness, i.e., public notification of construction operations will incorporate noise considerations; methods to handle complaints will be specified. Sensitive receptors will be avoided as possible. Disposal sites and haul routes will be coordinated with PMU-1. • Provision of noise barriers in residential areas where elevated noise levels are likely. 				
Occupational Health and Safety – Impacts to workers.	<p>To ensure health and safety of workers, the following measures shall be implemented by the contractor:</p> <ul style="list-style-type: none"> • Conduct workshop for all workers on health, safety and environmental measures. • Provide first aid facilities that are readily accessible by workers. • Provide fire-fighting equipment at the work areas, where appropriate, and at construction camps. • Provide potable water, hygienic sanitation facilities/toilets with sufficient water supply. 	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU

	<ul style="list-style-type: none"> • Ensure that all wastewater emanating from project-related activities and facilities are treated consistent with national regulations. • Establish clean canteen/rest area. • Provide fencing on all areas of excavation greater than 2 m deep. • Provide appropriate personnel safety equipment such as safety boots, helmets, gloves, protective clothes, breathing mask, goggles, and ear protection • Implement precautions to ensure that objects (e.g., equipment, tool, debris, precast sections, etc.) do not fall onto or hit construction workers. • Implement fall prevention and protection measures whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery or through an opening in a work surface. Based on a case-specific basis, fall prevention/protection measures may include installation of guardrails with mid-rails and toe boards at the edge of any fall hazard area, proper use of ladders and scaffolds by trained employees, use of fall prevention devices, including safety belt and lanyard travel limiting devices to prevent access to fall hazard, fall protection devices such as full body harnesses, etc. • Provide emergency lighting system of adequate intensity that is automatically activated upon failure of the principal artificial light source to ensure safe equipment operation, safe shut-down, evacuation, etc. • Ensure that sufficient fresh air is supplied at confined workspaces. Re-circulation of contaminated air is not acceptable. Air inlet filters shall be kept clean and free of dust and microorganisms; and, • Confined spaces shall be provided with safety 				
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	<p>measures for venting, monitoring, and rescue operations, to the extent possible.</p> <ul style="list-style-type: none"> • Provide adequate and clean housing / accommodation with sufficient ventilation. 				
Public Health and Safety – General construction related impacts to members of the public.	<ul style="list-style-type: none"> • Implement precautions to ensure that objects (e.g., equipment, tool, debris, precast sections, etc.) do not fall onto or hit people, vehicle, and properties in adjoining areas. • Fencing of construction sites and excavation sites and guarding such areas to restrict public access. • Provide warning signs at the periphery of the construction site. • Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located. • Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials during transport. 	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU
Utilities – General construction impacts to utilities.	<p>The contractor shall implement the following measures to address this impact:</p> <ul style="list-style-type: none"> • The contractor shall immediately repair any damage caused by the Project to properties (e.g., houses, other types of structures, etc.) community facilities such as water supply, power supply, communication facilities and the like. • Access roads damaged during transport of construction materials and other project-related activities shall be repaired and maintained to ensure that these remain in passable condition to motorists and pedestrian. Such roads shall be fully restored upon completion of construction works. 	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU
Waste – improper disposal of waste materials.	<ul style="list-style-type: none"> • Provide garbage bins and facilities within the project site for temporary storage of construction 	For the entire Project Area	During construction	Contractor & Contractor	PMU-SU

	<p>waste and domestic solid waste.</p> <ul style="list-style-type: none"> • Separate solid waste into hazardous, non-hazardous and reusable waste streams and store temporarily on site in secure facilities with weatherproof flooring and roofing, security fencing and access control and drainage/ wastewater collection systems. • Ensure that wastes are not haphazardly dumped within the project site and adjacent areas • Undertake regular collection and disposal of wastes to sites approved by local authorities. 		period.	EHSO	
Hazardous Materials – spills and leaks	<ul style="list-style-type: none"> • Store fuel and hazardous substances in paved areas with embankment. If spills or leaks do occur, undertake immediate clean up. • Ensure availability of spill clean-up materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored and used. • Train relevant construction personnel in handling of fuels and spill control procedures. • Ensure all storage containers are in good condition with proper labeling. • Regularly check containers for leakage and undertake necessary repair or replacement. • Store hazardous materials above flood level. • Equipment maintenance areas shall be provided with drainage leading to an oil-water separator that will be regularly skimmed of oil and maintained to ensure efficiency. Discharge of oil contaminated water shall be prohibited. • Store waste oil, used lubricant and other hazardous wastes in tightly sealed containers to avoid contamination of soil and water resources. Transport to off-site disposal of such wastes shall 	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU

	be consistent with national and local regulations.				
Other Impacts arising from construction-related activities 21.1.3	In addition to the above environmental mitigation measures, the Contractor shall implement corrective and/or additional measures to avoid, mitigate or compensate for other adverse environmental impacts due to construction works and project-related activities performed by the Contractor and its subcontractors.	For the entire Project Area	During construction period.	Contractor & Contractor EHSO	PMU-SU
	The Contractor shall be required to pay for any extra cost for collecting/processing/analyzing environmental monitoring samples to validate adverse environmental impacts (e.g., high dust levels, water pollution, etc.) due to the Contractor's failure to properly implement the provisions of the EMP and CEMPs.	For the entire Project Area	During construction period.	Contractor	PMU-SU

21.2 Environmental Monitoring and Inspection

259. An environmental monitoring and inspection program was developed and is presented in **Exhibit I-3**. The program considers the scope of monitoring and supervision, environmental media, monitoring parameters, time and frequency, implementing and supervising agencies. Environmental monitoring will follow the methodology provided in the national standard methods for monitoring pollutants. Other associated standards are national environmental quality standards and pollutant discharge/emission standards. The results of the environmental monitoring will be used to evaluate the extent and severity of actual environmental impacts against the predicted impacts and the performance of the environmental protection measures, and compliance with the EMP and relevant regulations and standards.

21.2.1 Environmental monitoring and inspection Plan.

260. The monitoring and inspection plan aims to ensure all aspects of the EMP are adhered to and that the Contractor is in compliance with the EMP. The environmental monitoring and inspection plan includes the following:

- **Internal supervision and inspection:** Regular and frequent supervision and inspection will be undertaken by the Environment, Health and Safety Officer (EHSO) hired by the Contractors, and by the PMU's Safeguards Unit on a daily and bi-weekly basis, respectively;
- **Environmental Quality Monitoring:** Air, surface water and noise quality monitoring will be undertaken by a licensed laboratory six times per year during construction, and twice during the first year of operation;
- **Periodic EMP Compliance Monitoring:** Compliance to the project's environmental safeguard requirements, as defined in the EMP and loan covenants, will be undertaken prior to construction (to confirm the project's readiness) and annually during construction by the Loan Implementation Environmental Consultant (LIEC), with the support of the PMU-SU;
- **Legal Compliance Inspections:** Compliance to construction standards legislation will be undertaken by the Specialized Controlling Agency for the National and Municipal Governments in Vietnam, as appropriate.

261. The results of environmental monitoring and inspection activities will be used to assess: (i) the extent and severity of actual environmental impacts against the predicted impacts and baseline before the project implementation; (ii) performance or effectiveness of environmental mitigation measures; (iii) trends in impacts; (iv) overall effectiveness of EMP implementation; and (v) the need for additional mitigation measures and corrective actions. Annual LIEC reporting will be provided to DONRE. The Environmental Monitoring Plan and estimated costs is shown in **Exhibit I-3**.

Exhibit I-3: Environmental Monitoring and Inspection Plan			
Environmental Issue	Location, Parameters	Responsibility & Frequency	Cost
Pre-construction Phase			
CEMP, including Health and Safety Plan, Air Quality Plan, Traffic Management Plan, Spill Management Plan and Tree Removal and Replanting Plan	Review and approval of CEMP.	<ul style="list-style-type: none"> PMU-SU, LIEC & ADB. 21.2.2 <ul style="list-style-type: none"> Once. 	Included in LIEC and PMU-SU Costs (Exhibit I-4).
Construction Phase			
Soil Contamination	At petrol stations slated for demolition. 21.2.3 21.2.4	<ul style="list-style-type: none"> Licensed Laboratory 21.2.5 <ul style="list-style-type: none"> Once at each site. 	Included in costs for Licensed Laboratory (Exhibit I-4).
Air Quality	At the baseline monitoring locations within the station boxes. 21.2.6 TSP, NOx & CO 21.2.7	<ul style="list-style-type: none"> Licensed Laboratory 21.2.8 <ul style="list-style-type: none"> Monthly during construction. 	Included in costs for Licensed Laboratory (Exhibit I-4).
Noise	At the baseline monitoring locations within the station boxes. 21.2.9 dBA Daytime, dBA night time. 21.2.10	<ul style="list-style-type: none"> Licensed Laboratory 21.2.11 <ul style="list-style-type: none"> Monthly during construction. 	Included in costs for Licensed Laboratory (Exhibit I-4).
General Construction Impacts	The entire Project area per Exhibit I-2.	<ul style="list-style-type: none"> Contractor EHSO & PMU-SU 21.2.12 <ul style="list-style-type: none"> Continuous through construction period. 	Included in Contractor EHSO and PMU-SU costs (Exhibit I-4).
Operational Phase			
Air Quality	At the baseline monitoring locations within the station boxes. 21.2.13 TSP, NOx & CO 21.2.14	<ul style="list-style-type: none"> Licensed Laboratory 21.2.15 <ul style="list-style-type: none"> Once every six months for three years. 	Included in costs for Licensed Laboratory (Exhibit I-4).
Noise	At the baseline monitoring	<ul style="list-style-type: none"> Licensed Laboratory 	Included in costs for Licensed Laboratory

	locations within the station boxes. 21.2.16 dBA Daytime, dBA night time. 21.2.17	21.2.18 • Once every six months for three years. 21.2.19 21.2.20	(Exhibit I-4).
Groundwater Quality	At each subway location.	• Once prior to the start of excavation works	Included in costs for Licensed Laboratory (Exhibit I-4).

21.2.21 Environmental monitoring and supervision cost estimates.

262. Costs for environmental monitoring and supervision include salaries and consultancy fees for the PMU-SU, the LIEC and the EHSO, as well as costs for the environmental monitoring performed by a licensed laboratory. The salary costs of the PMU-SU and LIEC will be covered by the EA; the salaries of the EHSO will be covered by the Contractors and budgeted in their contracts. Air and noise monitoring costs will amount to approximately \$15,000 over 5 years (including three years of operational monitoring). These expenses will be covered by the IA and included in the overall project budget.

Exhibit I-4: Environmental Costs				
Item Description	Unit Cost (USD)	No. of Units	Total Cost (USD)	
PMU-SU Environmental Specialist	1,000 per month	24 months	24,000	
LIEC	25,000 per month	4 months	100,000	
Licensed Laboratory (including monitoring costs)	500 per month	30 months	15,000	
EHSO	1,000 per month	24 months	24,000	
Total	21.2.22	21.2.23	163,000	

263. In addition to the above costs, there may be the requirement for the removal of contaminated soils and asbestos containing materials. The costs of these items will remain unknown until the full nature and extent of any contamination is known. As such it is recommended that contingency for these items be included within the Project construction budget.

21.3 Assessment of project readiness.

264. Before construction, the LIEC will assess the project's readiness in terms of environmental management based on a set of indicators (**Exhibit I-5**), and report it to ADB and the PMU. This assessment will demonstrate that environmental commitments are being carried and environmental management systems are in place before construction starts, or suggest corrective actions to ensure that all requirements are met.

Exhibit I-5: Assessment of Project Rediness			
Indicator	Criteria	Assessment	
		Yes	No
EMP update	• The EMP was updated after detailed design, and approved by ADB and MONRE (if relevant)	21.3.1	21.3.2
Compliance with loan covenants	• The borrower complies with loan covenants related to project design and environmental management planning	21.3.3	21.3.4

Public involvement effectiveness	<ul style="list-style-type: none"> The completion and agreements to resettlement plans before the construction Meaningful consultation completed GRM established 	21.3.5	21.3.6
Environmental Supervision in place	<ul style="list-style-type: none"> Safeguards Unit established within PMU 	21.3.7	21.3.8
Bidding documents and contracts with environmental safeguards	<ul style="list-style-type: none"> Bidding documents and contracts incorporating the environmental activities and safeguards listed as loan assurances Bidding documents and contracts incorporating the impact mitigation and environmental management provisions of the EMP Bid documents specifying suspending of works or payments for non-compliance with the IEE. 	21.3.9	21.3.10
Contractor readiness	<ul style="list-style-type: none"> EHSO contracted for project duration. CEMP Completed and approved by PMU. 	21.3.11	21.3.12
EMP financial support 21.3.13	<ul style="list-style-type: none"> The required funds have been set aside to support the EMP implementation according to the financial plan. 	21.3.14	21.3.15

21.4 Institutional Strengthening and Training

265. An assessment undertaken during the PPTA showed that the EA and IA lacked expertise and capacities to ensure adequate environmental management of the project. To ensure effective implementation of the EMP and undertake the responsibilities in **Exhibit I-5**, the capacity of the PMU, Implementing Agencies and contractors' staff responsible for EMP implementation and supervision must be strengthened. All parties involved in implementing and supervising the EMP must have an understanding of the goals, methods, and practices of project environmental management. The project will address the lack of capacities and expertise in environmental management through (i) institutional strengthening, and (ii) training.

21.4.1 Institutional strengthening.

266. The lack of capacities of the EA and PMU to coordinate environmental management will be resolved by establishing a Safeguards Unit under the PMU, comprising at least one environmental specialist and one resettlement specialist. The appointment of one international environmental consultant under the loan implementation consultancy will further strengthen the EA's and PMU's environmental management and supervision capacities, and ensure compliance with ADB's Safeguard Policy Statement (SPS 2009). The outsourcing of periodic monitoring of air and noise to a licensed laboratory will ensure adherence to QA/QC standards. The obligation of contractors to hire external Environment, Health and Safety Officers (EHSO) and to establish Environmental, Health and Safety Management Plans (EHSMP) for construction sites will help ensuring community and occupational health and safety. The proposed institutional strengthening plan is presented in **Exhibit I-6**. It is believed that these institutional strengthening measures, combined with clearly assigned responsibilities and roles, will allow adequate environmental management.

Exhibit I-6: Proposed Institutional Strengthening Measures		
Target Agencies	Institutional strengthening measures	Timing
PMU	Appointing and recruiting PMU-SU	During project preparation 21.4.2
Licensed laboratory	Recruiting and contracting licensed laboratory for environmental monitoring before, during and after	Prior to project implementation.

	construction	21.4.3
LIEC	Recruiting and contracting one International LIEC for environmental management, environmental training, EMP compliance review, and reporting	Prior to project implementation. 21.4.4
Contractor	Hire Environment, Health and Safety Officers for each construction site. Develop CEMP.	Prior to project implementation. 21.4.5

21.4.6 Training.

267. The PMU and the contractors will be provided with training in environmental management, environmental monitoring and supervision, mitigation planning, emergency response, public consultation and Grievance Redress Mechanism, occupational and community health and safety, and other environmental management techniques. Training will be facilitated by the LIEC. Training format will include workshops and seminars. In particular, due to the prevalence of construction projects in the City, on-site training will be used extensively, giving staff firsthand experience on how to identify and correct adverse environmental impacts. Of particular importance for the project is to build confidence and expertise within the PMU-SU, when dealing with contractors who are not adhering to the EMP. Training in this area will need to include the steps taken to address non-compliance and penalties that could be included in project contracts

21.5 Environmental Reporting

21.5.1 Monthly compliance and progress reports.

268. The PMU-SU will produce brief monthly reports on EMP implementation progress and compliance for the PMU, and will report any issues immediately to the PMU. The monthly project progress report will present: (i) project implementation status and current locations for activities; (ii) environmental mitigation measures implemented; (iii) non-compliances with EMP; (iv) environmental training conducted; (v) unpredicted events or issues occurring during the reporting period and follow-up actions needed; (vi) findings of public consultation activities (informal interviews); and (vii) complaints received through the GRM process and resolutions found.

21.5.2 Quarterly environmental monitoring quality reports.

269. The licensed laboratory will prepare concise reports presenting the results of the monitoring of air and noise, with a short assessment of compliance/non-compliance with Vietnamese ambient environmental standards. The quarterly environmental monitoring reports will be incorporated in the semi-annual environmental monitoring report to be submitted by PMU1 to ADB for review and disclosure on ADB's website upon receipt.

21.5.3 Semi annual environmental monitoring reports.

270. To ensure proper and timely implementation of the EMP and adherence to the agreed environmental covenants, the PMU shall submit to ADB semi annual environmental monitoring reports, based on monthly progress reports of the PMU-SU and the quarterly reports of the licensed laboratory. The LIEC will support the PMU in developing these reports. The report should confirm the project's compliance with the EMP, local legislation such as EIA requirements, and identify any environment related implementation issues and necessary corrective actions, and reflect these in a corrective action plan. The performance of the contractors will also be reported on with respect to environmental protection and impact mitigation. The operation and performance of the project GRM, environmental institutional strengthening and training will also be included in the quarterly environmental performance report. **Exhibit I-7** summarizes the reporting requirements and **Appendix J** provides an outline of the monitoring report (the outline will be used by PMU1 and LIEC in preparing the semi-annual environmental monitoring reports).

Exhibit I-7: Reporting Requirements			
Report	Frequency	From	To
Contractor's Progress Report	Weekly	Contractor	PMU-SU
EMP Progress and Compliance Report	Monthly	PMU-SU	PMU
Environmental Quality Monitoring Report	Quarterly	Licensed Laboratory	PMU-SU & PMU
Environmental Monitoring Report*	Semi-annually	PMU	ADB

**The quarterly environmental quality monitoring reports will be incorporated in this report*
cvfgffg

21.6 Mechanisms for Feedback and Adjustment

271. Based on environmental monitoring and reporting systems in place, the PMU shall assess whether further mitigation measures are required as corrective action, or improvement in environmental management practices are required. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. The PMU will play a critical role in the feedback and adjustment mechanism. If the PMU identifies a substantial deviation from the EMP, or if any changes are made to the project scope that may cause significant adverse environmental impacts or increase the number of affected people, then the PMU shall immediately consult ADB to get their approval and identify EMP adjustment requirements.

22 Conclusions and Recommendations

22.1 Conclusions

272. The IEE established that there were no significant environmental issues that could not be either totally prevented or adequately mitigated to levels acceptable to Vietnamese and international standards. As such, based on the existing ADB Safeguards Policy (2009), this Project falls under ADB's **Category B**.

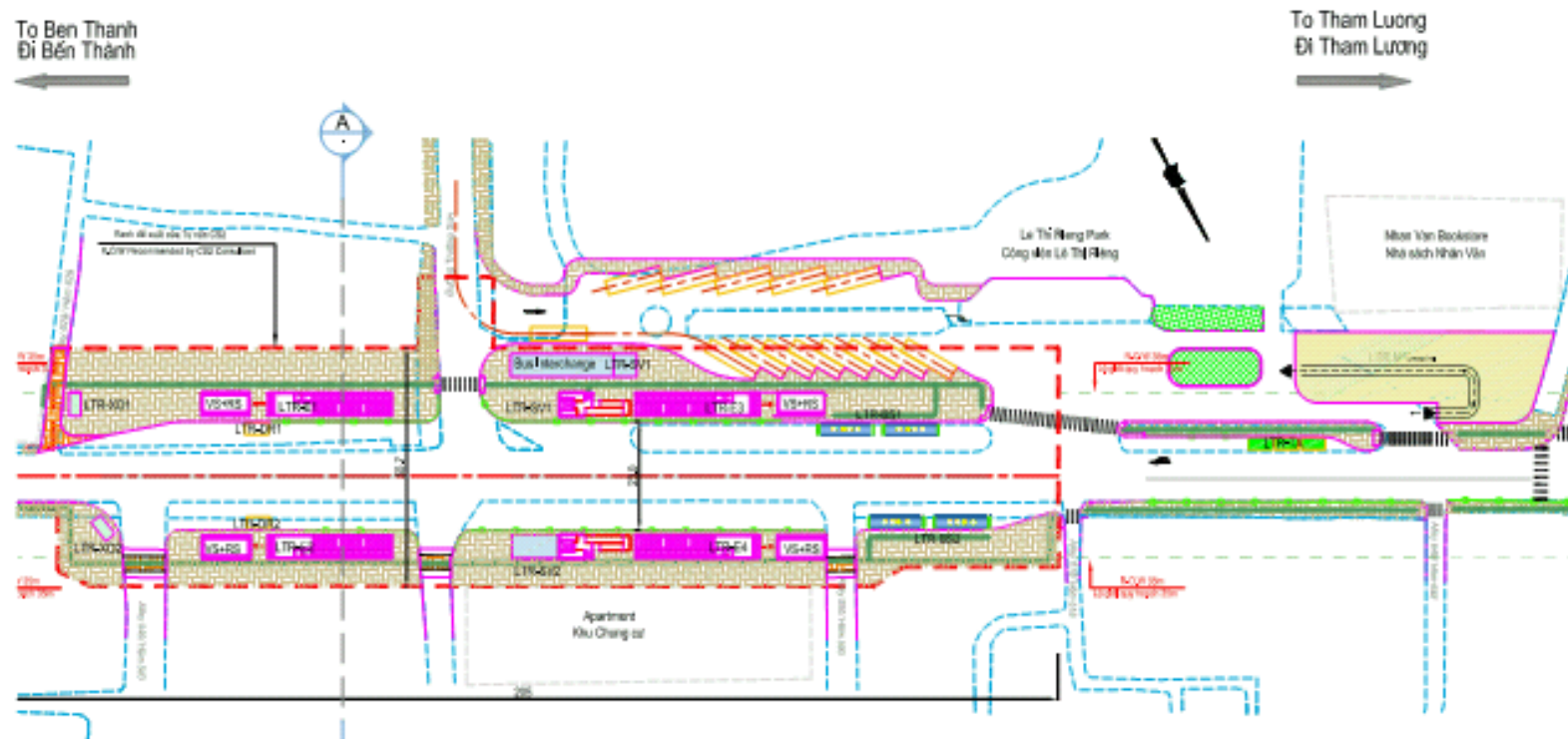
22.2 Recommendations

273. The EMP, its mitigation and monitoring programs, contained herewith shall be included within the Bidding documents for project works. The Bid documents state that the Contractor shall be responsible for the implementation of the requirements of the EMP through his own Construction Environmental Management Plan which will adopt all of the conditions of the EMP. This ensures that all potential bidders are aware of the environmental requirements of the Project and its associated environmental costs.

274. The EMP and all its requirements shall then be added to the Contractors Contract, thereby making implementation of the EMP a legal requirement according to the Contract. He shall then prepare his CEMP which will be approved and monitored by the PMU-SU. Should the PMU-SU note any non-conformance with the CEMP the Contractor can be held liable for breach of the contractual obligations of the EMP. To ensure compliance with the CEMP the Contractor should employ an environmental specialist to monitor and report Project activities throughout the Project Construction phase.

Appendix A – Example of Solution 1 Drawings

LÊ THỊ RIENG STATION LAYOUT- SOLUTION 1
MẶT BẰNG THIẾT KẾ GA LÊ THỊ RIENG - GIẢI PHÁP 1



Appendix B – Sensitive Receptors

Appendix C – Asbestos Guidelines

Guide to deal with Asbestos in existing building www.hsevn.com

1. Notifications when use, maintenance and preparing architecture building

*Mapping of Asbestos

- The owner of the building should investigate equipment and material that contain asbestos in the building and mapping all of them about the position, type and areas of uses.

- The owner of the building has to evaluation every 3 year do correction of this asbestos map and supplementing when it is necessary.

*Người sở hữu công trình kiến trúc phải công bố bản đồ amiăng đã được thiết lập cho người quản lý hoặc người thuê lại công trình được biết, và trong trường hợp cần thiết phải biểu thị kèm theo giấy tờ cảnh báo.

*Người sở hữu công trình kiến trúc hoặc người quản lý, cứ 6 tháng một lần phải đánh giá trạng thái của các thiết bị và nguyên vật liệu có chứa hàm lượng amiăng. Trường hợp có khả năng bị tan chảy hoặc bị phá hủy thì tùy theo quy định mà phải nhanh chóng tiến hành các biện pháp xử lý thích hợp như: cố định bề mặt, bao kín hoặc sửa chữa, trừ khử

*Trong trường hợp bảo dưỡng, sửa chữa các công trình kiến trúc với quy mô nhỏ như sửa chữa lắp đặt đường điện, người sở hữu hoặc người quản lý công trình kiến trúc phải đưa bản đồ amiăng cho người phụ trách sửa chữa. Đồng thời, người phụ trách sửa chữa phải làm sao cho các thiết bị hoặc nguyên vật liệu có hàm lượng amiăng không bị phá hủy hoặc bị phân tán.

*Khuyến khích người sở hữu hoặc người quản lý công trình kiến trúc được bồi dưỡng thêm về cách thức quản lý amiăng và phương pháp chống phân tán amiăng.

3. Things to note when conducting dissolution, elimination of asbestos in architecture works

* Things to note when dissolving, and eliminating asbestos in architecture works are applied to the architectural use of equipment or materials containing asbestos.

* The air surrounding the dissolution of the elimination of asbestos in architecture works shall not exceed 0.01 units / cc.

* To prevent the dispersal of asbestos when carrying out dissolution, elimination of asbestos in architecture works, should comply with the followings:

- Make Nm for devices or materials having asbestos prior to elimination and continuous maintenance of this work for the rest of the process.

- Due to the use of paper (sheet) polyethylene is not likely to disappear, so the site for dissolution of asbestos removal must be completely covered and isolated.

- During the proceeding, the site for dissolution and elimination of asbestos need to maintain a negative pressure (pressure change in the sound of the audio in it). Therefore, to maintain, it is required to use high performance HEPA Filter in a negative pressure machine.

Filter HEPA is the high performance Filter that can get rid of 99.7% particles with 0.3µm size

Need to verify the functionality of the negative pressure machine and HEPA tubes mounted in it.

In the time of the dissolution of the elimination of asbestos, it is necessary to measure the concentration of asbestos in the air around it and check if the site is enclosed or asbestos have been caught out or not.

After the dissolution of asbestos elimination, to use a vacuum with high features HEPA tube or cleaning by spraying Nm water to completely get rid of asbestos.

Other notes about the dissolution and elimination of asbestos can follow the "Guidelines for the elimination of asbestos" set out by the Ministry of Labour.

* After the dissolution for asbestos removal and cleanup is complete, need to measure the concentration of asbestos at the site and check if the concentration of less than 0.01 units / cc or not.

4. Things to note about the site management where dissolution and elimination of asbestos occur

* Owners of buildings (or others) to specify who has the experience and knowledge of asbestos and the dissolution and elimination of asbestos is the supervisor of the dissolution of the elimination of asbestos (referred is the supervisor).

* The supervisor acts as follows.

- Evaluate the suitability of the plan to get rid of asbestos.
- Supervise the site if the work to get rid of asbestos has complied with environmental standards or not, and if necessary, an order to stop work and improve the site is required to prevent the dispersal of asbestos.
- In charge of compliance assessment and the degree of completion of the work plan of dissolution for asbestos removal.
- Manage and supervise the proper handling of asbestos waste.

* The supervisor must take responsibility when following problems arise.

- Generate ambient pollution problem because the supervisor is absent in the field works.
- Issues arising as waste disposal problems and not get rid of the equipment and materials containing asbestos.
- Generating pollution by asbestos after the completion of the dissolution and elimination of asbestos.
- Generate an accident due to the dispersion of asbestos pollution in the air in the surrounding area.

5. Things to note when handling asbestos waste

Asbestos waste arising upon the dissolution of the elimination of asbestos or asbestos-contaminated waste by, after having been Nm, need appropriate treatment according to the "Law on waste management" and can not be reused.

The pipe (filter) used in the negative pressure machine and the vacuum should be classified and treated as asbestos waste and not used again.

Asbestos waste after it is wrapped two times in the polyethylene must be stored in the appropriate box.

When transporting asbestos waste must take action Nm for asbestos not dispersed and must be treated as measures to shield cover for car transportation of asbestos waste.

(Nguồn: Bộ Môi trường Hàn Quốc - <http://www.me.go.kr>)

Appendix D – Public Consultations

MINUTES Public Consultation for Project TA 872 MRT HO CHI MINH: BEN THANH – TAN BINH

I. Time

Start from 8h00 date 29 March 2013

II. Place

Hotel EPORCH, 120 Cach Mang Thang Tam Street, District 10, HCMC

III. Participants

No	Name	Address or office	Tel
1	Nguyen Van Son	239 CMT8, Ward 4, District 3	23
2	Nguyen Kim Duc	District 1 Youth Union	0909511533
3	Nguyen Ngoc Quynh Tien	District 10 Youth Union	0938440266
4	Huynh Kim Thien	625 Truong Chinh, Tan Son Nhat ward	
5	Tran Thi Ngoc Tien	355 Nguyen Thuong Hien, W11, D10	0903801247
6	Quach Hung Cuong	Division of compensation for clearing the ground – District 1	0907188864
7	Le Duc Dung	491 A CMT8, W13, D10	
8	Nguyen Thi Phung	491 A CMT8, W13, D10	
9	Nguyen Thi Loi	Department of Architecture and Planning	0949439580
10	Le Duc Toan	491 A CMT8, W13, D10	0968500260
11	Dang Tran Nguyen	District3 Youth Union	0919444326
12	Nguyen Van Manh	District 10	
13	Le Thi Ngoc Yen	503 B CMT8, W13, D10	0909676716
14	Le Thi Phuong	Division of Labor, wounded soldier and society, District 3	0908277779
15	Vu Thi Quynh Hoa	DONRE of Ho Chi Minh city	0903911638
16	Nguyen Kha Ha Mai	Department of Health	0908189095
17	Huynh Thi Hong Hanh	Phong Vu Computer company	0913669779

18	Hoang Nguen Lich Sa	Saenco Environmental company	0989215062
19	Bui Thi Kim Lieu	569 Truong Chinh	0908806247
20	Nguyen Huu Toan	555 Truong Chinh	0908876869
21	Vu Chi Ben	Veteran association of D1	0904814514
22	Bui Thi Xuan	TT 20 Tam Dao, W15, D10	0908289266
23	Nguyen Thi Anh Nguyet	Women Union of D3	0918325661
24	Dang Thi Xuan Trinh	Division of Labor, wounded soldier and society, District 1	0983370639
25	Huynh Quang Nghia	Division of compensation for clearing the ground – District 10	0938589866
26	Vo Anh Tuan	Department of Culture	0908356738
27	Nguyen Duy Bao	DONRE of district 12	0976603780
28	Nguyen Thi Minh Phuong	D 10	0949117637
29	Nguyen Thanh Truc	507 CMT8, W13, D1	
30	Nguyen Thanh Minh	Division of compensation for clearing the ground – Tan Binh District	0903181311
31	Le Vu Bao Dung	457 Pham Van Bach, W12, D Tan Binh	
32	Tran Ngoc Anh	Environmental company	
33	Le Xuan Tan	Division of Labor, wounded soldier and society, District 10	
34	Nguyen Van Son	Veteran association of D 10	
35	Le Thi Tu	Women Union of District 1	0903106981
36	Tran Quang Lung	Division of compensation for clearing the ground of District 1	0913715422
37	Nguyen Minh Hien	Division of Labor, wounded soldier and society, District Tan Binh	0913918724
38	Vo Thi Thanh Tam	Women Union District 10	0908644970
39	Nguyen Thi Minh Thu	Women Union of Tan Binh District	0909608939
40	Dang Khac Di	Youth Union of Tan Binh District	0906644554
41	Tran Cam Linh	160 CMT8, D3	0903695067

42	Nguyen Binh Minh	89B2 CMT8, D1	0913903199
43	Vu Thi Su	6 H 9P Tan Son Nhi, Tan Phu District	0902305697
44	Nguyen Tien Nam	241 C CMT8, W4, D3	
45	Tang Huynh Long	91/6 Tran Quoc Hoan, W4, Tan Binh District	0919559919

IV. PROGRAM

Time	Content	Presentation
8h00 – 8h25	Registration	23.1.1
8h25 – 8h30	Introduction	MVA
8h30 – 8h45	Opening	PMU 1 representative – Mr Ninh
8h45 – 9h15	Project Introduction	Mr Can Vu Tuan Director of MVA
9h15 – 9h35	Environmental Impact Assessment	Dr. Phạm Thị Anh
9h35 – 9h55	Findings in Social impact assessment study	MSc.Dương Hiền Hạnh
9h55 – 10h15	Issues on Resettlement	Dr. Nguyễn Thị Hồng Xoan
10h15 – 10h45	Discussion	MVA Consultants
10h45 – 11h00	Closing	Mr Ninh – PMU1

V. DISCUSSIONS

1. Resident in district 10 - if Hoa Hung station will have some more land clearance, → Mr Tuan said no more land clearance happens apart from inside the box.
2. DONRE HCMC – Ms Hoa
In this project, DONRE had reminded to the investor that all environmental procedure should be compliance, especially in circular 26 and decree 29. MVA consultants had mentioned that the investor will send to DONRE about the scale of the project, but until now DONRE has not receive any information yet.

→ Answered by Mr Tuan: The Metro line-2 project had started one step forward, and this project was just started. In December of 2012, PC of HCMC had organized the meeting for midterm report; there are the participations from different departments of Ho Chi Minh City to listen to the project description and scale. Currently, we are in the period of the feasibility study under leadership of Transportation's Department. In coming April, there will be the meeting between 3 sides, then it will inform about formal information on project scale and investment. After we finish the IEE, we will submit to DONRE according to Vietnamese law.

3. Local resident (Affect: I am very upset that with the long distance that related to project, but very few invited residents. We had participated on 2 meetings only, we do not know about the price for compensation, we lost money, and our houses become back side of the street.
 - ➔ Now it just in the first period of the project, therefore we only invite representatives of the residents. It is possibly in the second phase we will continue to have public consultant to each household.
4. Resident: Please minimize the ground clearance. I knew that in the world, at the metro station, all of facilitation construction such as public areas, ticket counter, waiting room,... are installed underground. Why also should do like that. The individual beneficial constructions should be build underground. If the Metro is free to the resident we are willing to cooperate.
 - ➔ Mr Tuan explained: we affirm that there is no individual beneficial construction is located on the ground after the clearance. We only set the services, waiting room for bus, walking pavement, ...The ticket price for metro estimate about 1300 VND extra compare to the bus price at current. The City government have to compenstate for the short cut, there is no benefit from the public transport. Up to now, the border for land recovery is still in adjustment by Germany consultants; therefore it is sure that there will be more public consultations when there is the result of the project's border.
5. Resident: In the environmental impact assessment, we are affected by the project; we have to be receive the compensation from these effects. But this morning I do not hear anything yet about this type of compensation. The project also effect to our business activities. One lady from ward 13, District 10 complained that affected people in the boxes only got two consultations and not much information about MRT2 they are given. Affected people (AP) only want the authorities to inform about the affected land when the final design gets approval. They do not want to get informed when things still not fixed.
6. Authorities should think about reasonable price of tickets because if too expensive poor people cannot afford to travel with MRT.

The consultation team explains to people that if the TA 782 project get approval, we will try to provide more consultations to affected people and will make sure that 100% AP are informed. Related to consultations, APs want to invite the husbands and wives to the consultation because both of them need to get information before deciding to avoid unclear information. Authorities should listen to APs' opinions along the MRT2. When starting some construction such as extending the road, building bus interchanges... in one area should do it at once to avoid disturb people many times so that they can stabilize their lives.

7. The head of women union in district 3 said, next consultations should organize in the ward and invite more APs to come and invite representatives from more departments such as Vietnamese Father Land Front.

Mr Ninh Representative of PMU 1 explains that the consultation team already worked with all districts representatives and in the future we will give more people informed about the project TA 782.

Appendix E – Photos



B-1: Station 2 - Tao Dan



B-2: Station 2 - Tao Dan



B-3: Station 3 - Dan Chu



B-4: Station 3 - Dan Chu



B-5: Station 3 - Dan Chu



B-6: Station 3 - Dan Chu



B-7: Station 4 - Hoa Hung



B-8: Station 4 - Hoa Hung



B-9: Station 5 - Li Thi Rieng



B-10: Station 5 - Li Thi Rieng



B-11: Station 5 - Li Thi Rieng (Pond in the Park)



B-12: Station 6 - Pham Van Hai



B-13: Station 6 – Pham Van Hai



B-14: Station 7 - Bay Hien



B-15: Station 8: Nguyen Hong Dao



B-15: Station 8 - Nguyen Hong Dao



B-16: Station 9 – Ba Queo



B-17: Station 9 – Ba Queo



B-18: Station 10 – Pham Van Bach



B-19: Station 10 – Pham Van Bach



B-20: Station 11 – Tan Binh

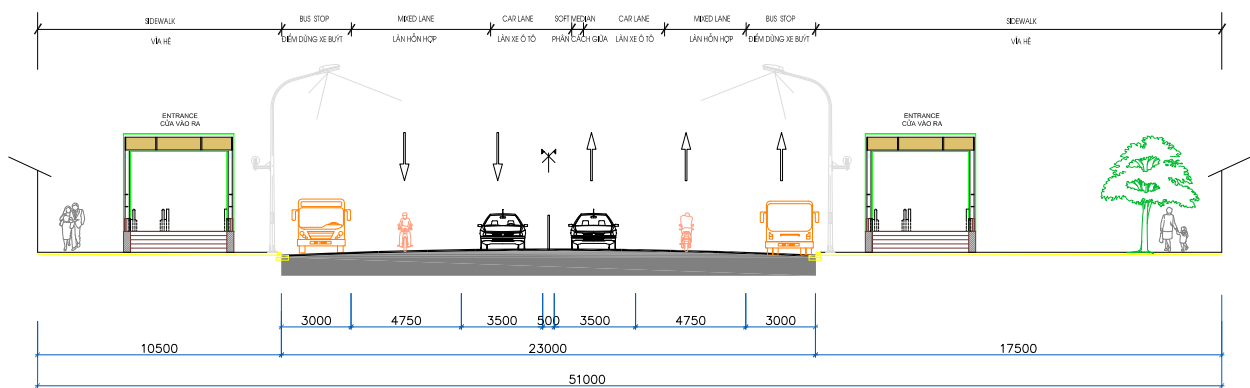


B-21: Station 11 – Tan Binh

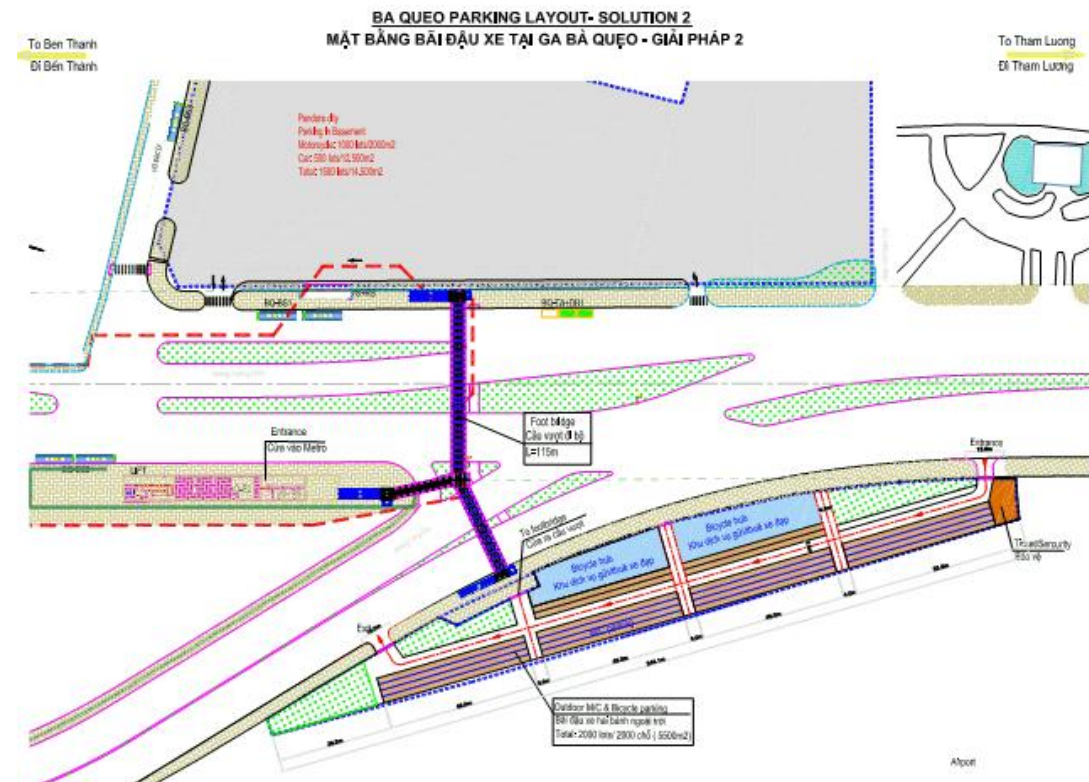
Appendix F – Typical Station Cross Section

TAO DAN STATION: TYPICAL CROSS-SECTION GA TAO ĐÀN: MẶT CẮT NGANG ĐIỂN HÌNH

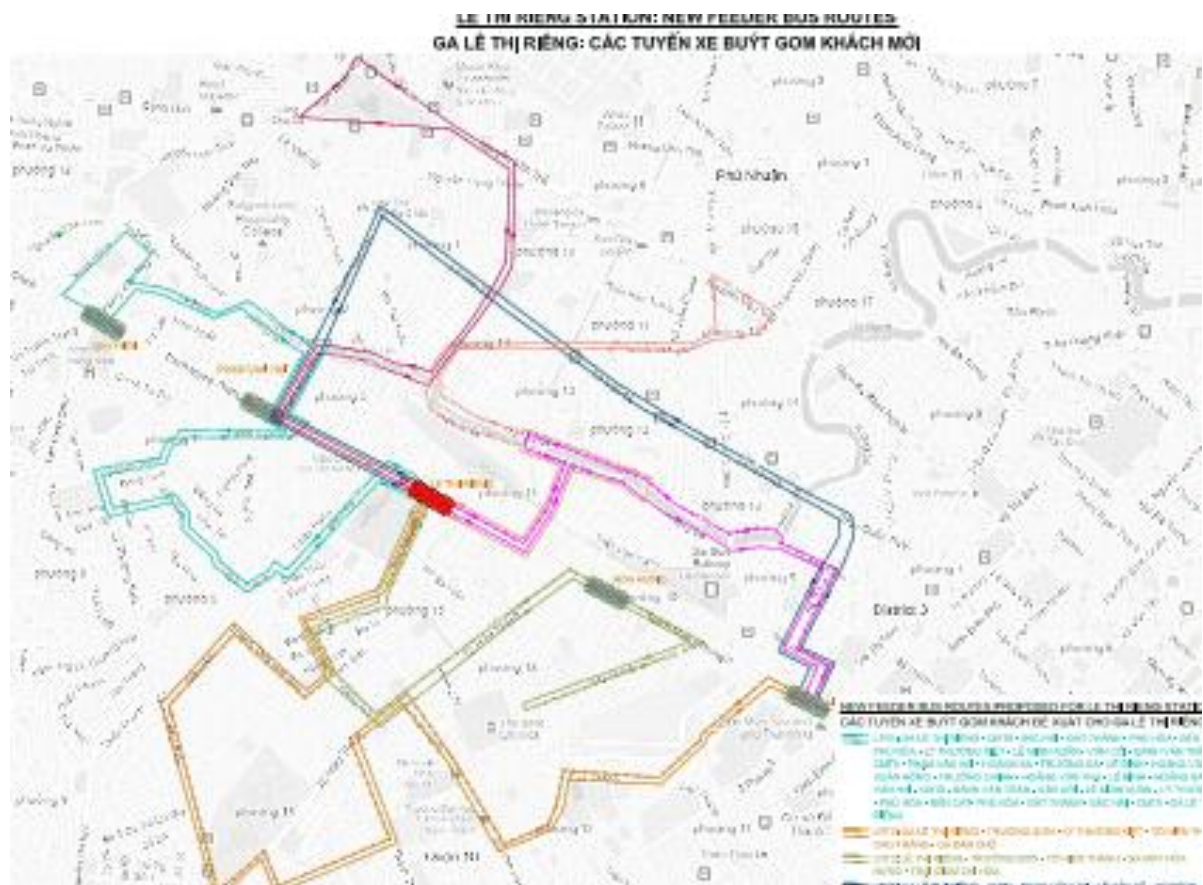
TYPICAL CROSS SECTION A-A MẶT CẮT NGANG ĐIỂN HÌNH A-A



Appendix G – Example of Solution 2 Drawings



Appendix H – Example of New Bus Routes



Appendix I – Summary of LIEC Training Program

1. Timeframe

Training shall be on-going throughout the Project, but shall include an intensive two week training period prior to the start of construction works for both the PMU SU and the Contractors EHSO.

2. Scope

The PMU and the contractors will be provided with training in environmental management, environmental monitoring and supervision, mitigation planning, emergency response, public consultation and Grievance Redress Mechanism, occupational and community health and safety, and other environmental management techniques.

Training format will include workshops and seminars. In particular, due to the prevalence of construction projects in the City, on-site training will be used extensively, giving staff first hand experience on how to identify and correct adverse environmental impacts. Of particular importance for the project is to build confidence and expertise within the PMU-SU, when dealing with contractors who are not adhering to the EMP. Training in this area will need to include the steps taken to address non-compliance and penalties that could be included in project contracts

3. Participants/trainees

The participants of the training shall be the PMU SU staff member and the Contractors EHSO.

4. Trainor

Training will be facilitated by the LIEC.

5. Budget and source

The PMU shall fund the training program. The estimated budget is approximately USD 25,000, or one man month of the LIEC level of Effort.

Appendix J – Semi annual environmental monitoring report template

Environmental Monitoring Report

Semi-Annual Report
{Month Year}

{Short Country Name}: {Project Title }

Prepared by {complete and accurate name of implementing agency or external monitoring agency} for the {complete name of the borrower} and the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of {Day Month Year})

{The date of the currency equivalents must be within 2 months from the date on the cover.}

Currency unit	–	{currency name in lowercase (Symbol)}
{Symbol} 1.00	=	\$()
\$1.00	=	{Symbol_____}

ABBREVIATIONS

{AAA}	–	{spell out (capitalize only proper names)}
{BBB}	–	{spell out}
{CCC}	–	{spell out}

{WEIGHTS AND MEASURES}

{symbol 1 (full name 1)}	–	{Definition 1}
{symbol 2 (full name 2)}	–	{Definition 2}
{symbol 3 (full name 3)}	–	{Definition 3}

{GLOSSARY}

{Term 1}	–	{Definition 1}
{Term 2}	–	{Definition 2}
{Term 3}	–	{Definition 3}

NOTE(S)

- (i) The fiscal year (FY) of the Government of {name of borrower} {and its agencies} ends on {day month}. FY before a calendar year denotes the year in which the fiscal year ends, e.g., FY2011 ends on {day month} 2011. {Note: If FYs are not referred to within the text, delete the entire note and change NOTES to NOTE.}
- (ii) In this report, "\$" refers to US dollars. {Note: If a second \$ currency is referred to in the text, e.g., NZ\$ or S\$, add: unless otherwise stated. In the text, use "\$" for US dollars and the appropriate modifier, e.g., NZ\$ or S\$, for other currencies that use the "\$" symbol.}

This environmental monitoring report is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

CONTENTS

I.	{INSERT FIRST LEVEL 1 HEAD}	4
	A. {Insert Level 2 Head and other levels of heads using the Reports toolbar.}	4
	1. {Insert Level 3 Head}	4
	2. {Insert Level 3 Head}	4
	B. {Insert Level 2 Head}	4
II.	{INSERT SECOND LEVEL 1 HEAD}	4
	A. {Insert Level 2 Head}	4
	B. {Insert Level 2 Head}	4
	1. {Insert Level 3 Head}	4
	2. {Insert Level 3 Head}	5
III.	{INSERT LEVEL 1 HEAD}	5
IV.	{INSERT LEVEL 1 HEAD}	5

I. {INSERT FIRST LEVEL 1 HEAD}

1. {Insert report text. Number new paragraphs using the ParaNum facility on the **Reports** toolbar. Place one line space (one enter) before each head.¹ Please read the footnotes.²}

A. {Insert Level 2 Head and other levels of heads using the **Reports** toolbar.}

1. {Insert Level 3 Head}

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2. {Insert Level 3 Head}

B. {Insert Level 2 Head}

2. {To insert a list within the text, click on the (i), (ii), (iii) buttons on the **Reports** toolbar.}

II. {INSERT SECOND LEVEL 1 HEAD}

A. {Insert Level 2 Head}

B. {Insert Level 2 Head}

1. {Insert Level 3 Head}

a. {Insert Level 4 Head}

b. {Insert Level 4 Head}

c. {Insert Level 4 Head}

i. {Insert Level 5 Head}

ii. {Insert Level 5 Head}

iii. {Insert Level 5 Head}

¹ {Begin your footnote text here. The font size is Arial 9 point. A hanging indent is set for you in this template.}

² {Begin your second footnote here. Footnotes are numbered sequentially throughout the main text. Do not place a line space between footnotes.}

2. {Insert Level 3 Head}

III. {INSERT LEVEL 1 HEAD}

IV. {INSERT LEVEL 1 HEAD}

Project Semi-Annual Environmental Monitoring Report Outline

The borrower/client is required to prepare periodic monitoring reports that describe progress with implementation of the project EMP and site-specific EMP (SEMP) and compliance issues and corrective actions. A sample outline which can be adapted as necessary is provided below. Not all sections will be relevant in all cases. Ranking systems for compliance, mitigation effectiveness, etc., are indicative examples only, and can be modified as appropriate.

1. Introduction

- 1.1. Report Purpose
- 1.2. Project Implementation Progress
 - 1.2.1. On-going Site Works (description of current site works, location and target completion)
 - 1.2.2. Previous Activities (description of construction activities during the previous months: provide details of specific activities such as earthworks, vegetation clearing, spoils disposal, establishment of construction camp and other construction related facilities (e.g., concrete mixing plant, asphalt batching plant, crushing plant, etc.), establishment and operation of quarry/borrow areas, etc., including locations, schedules, dates, etc.)
 - 1.2.3. Schedule of construction activities for the subsequent months (provide details similar to above)

2. Compliance with ADB loan covenants and applicable government laws, regulations and requirements

- 2.1. Status of compliance with ADB loan covenants: *provide a list of environmental loan covenants and specify level of compliance*
- 2.2. Status of compliance with government environmental requirements: *provide a list of government environmental requirements (permits, etc.) for the project as well as construction-related facilities/ activities and specify level of compliance, indicate any required environmental permit/license/consent obtained to date and to be obtained (including schedule) for the project and construction related facilities/activities*

3. Changes in project scope

Such as change in alignment or footprint in case of horizontal infrastructure, implementation of additional Project component/s, etc. (with reference to the Project scope identified in the ADB-cleared environmental assessment report, i.e., IEE or EIA) and corresponding safeguard measures undertaken, if applicable

4. Incorporation of Environmental Requirements into Project Contractual Arrangements

Manner by which EMP requirements are incorporated into contractual arrangements, such as with contractors or other parties.

5. Summary of Environmental Mitigations and Compensation Measures Implemented

Based on EMP; may include measures related to air quality, water quality, noise quality, pollution prevention, biodiversity and natural resources, health and safety, physical cultural resources, capacity building, and others. *Provide a table/matrix showing a summary of each environmental mitigation measure specified in the EMP.*

<i>EMP Requirement (list all mitigation measures specified in the EMP and SEMP)</i>	<i>Compliance Attained (Yes, No, Partial)</i>	<i>Comment on Reasons for Partial or Non-Compliance</i>	<i>Issues for Further Action and Target Dates</i>
1.			
2.			
3.			
etc.			

6. Summary of Environmental Monitoring

6.1. Compliance Inspections

6.1.1. Summary of Inspection Activities

6.1.2. Mitigation Compliance¹

6.1.3. Mitigation Effectiveness²

6.2. Emission/Wastewater Discharge (Source) Monitoring Program (if relevant or required in the EMP)

6.2.1. Summary of Monitoring

6.2.2. Results

6.2.3. Assessment³

¹ Overall compliance with mitigation implementation requirements could be described in qualitative terms or be evaluated based on a ranking system, such as the following:

1. Very Good (all required mitigations implemented)
2. Good (the majority of required mitigations implemented)
3. Fair (some mitigations implemented)
4. Poor (few mitigations implemented)
5. Very Poor (very few or no mitigations implemented)

Additional explanatory comments should be provided as necessary.

² Effectiveness of mitigation implementation could be described in qualitative terms or be evaluated based on a ranking system, such as the following:

1. Very Good (mitigations are fully effective)
2. Good (mitigations are generally effective)
3. Fair (mitigations are partially effective)
4. Poor (mitigations are generally ineffective)
5. Very Poor (mitigations are completely ineffective)

Additional explanatory comments should be provided as necessary.

³ Discharge levels should be compared to the relevant discharge standards and/or performance indicators noted in the EMP. Any exceedences should be highlighted for attention and follow-up. In addition, discharge levels could be compared to baseline conditions (if baseline data is available) and described in qualitative terms or be evaluated based on a ranking system, such as the following:

1. Very Good (overall conditions are generally improved)
2. Good (conditions are maintained or slightly improved)
3. Fair (conditions are unchanged)
4. Poor (conditions are moderately degraded)
5. Very Poor (conditions are significantly degraded)

6.3. Ambient Monitoring Program, i.e., air quality, noise, water quality, etc. (if relevant or required in the EMP)

6.3.1. Summary of Monitoring

6.3.2. Results

6.3.3. Assessment⁴

7. Key Environmental Issues

7.1. Key Issues Identified (e.g., non-compliance to loan covenants, EMP and/or government environmental requirements, insufficient mitigation measures to address Project impacts, incidents, accidents, etc.)

7.2. Actions Taken and Corrective Action Plan (specify actions taken and corrective action plans to be implemented to address non-compliance and other identified issues. Such action plan should provide details of specific actions to be undertaken to resolve identified issues, responsible persons who will carry out such actions and timeframe/target date to carry out and complete required actions. The action plan could be presented in a tabular/matrix form (see below). Timeframe and responsibilities for reporting to ADB on the progress of implementation of corrective action plan should also be specified under this section.

Issue	Cause	Required Action	Responsibility	Timing (Target Dates)	Description of Resolution and Timing (Actual)
Old Issues from Previous Reports					
1.					
2.					
New Issues from this Report					
1.					
2.					

7.3. Additional Action Required

Additional explanatory comments should be provided as necessary.

⁴ Ambient environmental conditions should be compared to the relevant ambient standards and/or performance indicators noted in the EMP. Any exceedences should be highlighted for attention and follow-up. In addition, ambient environmental conditions could be compared to the baseline conditions (if baseline data is available) and described in qualitative terms or be evaluated based on a ranking system, such as the following:

1. Very Good (overall conditions are generally improved)
2. Good (conditions are maintained or slightly improved)
3. Fair (conditions are unchanged)
4. Poor (conditions are moderately degraded)
5. Very Poor (conditions are significantly degraded)

Additional explanatory comments should be provided as necessary.

8. Complaints

8.1. Details of Complaint/s (Provide details of any complaints that have been raised by the local population and other stakeholders regarding environmental performance and environmental impacts (complainant, nature of complaint, date complaint was filed, which office received the complaint, etc.)

8.2. Action Taken (Document how the complaints were addressed or will be addressed by indicating the following:

- i. names and designation of specific staff or officials within the Grievance Redress Committee, executing agency, project management unit, local government, contractor and/or supervision consultant involved in receiving, documenting, and resolving the complaint (s).
- ii. specific actions taken to be taken to resolve the complaint and corresponding timeframe

9. Conclusion and Recommendation

- 9.1. Overall Progress of Implementation of Environmental Management Measures⁵
- 9.2. Problems Identified and Actions Recommended
- 9.3. Monitoring adjustment (recommended monitoring modifications based on monitoring experience/trends and stakeholders response)

Appendices

1. Site Inspection / Monitoring Reports
2. Source and Ambient Monitoring Results (Laboratory Analysis)
3. Photographs
4. Location Map of Sampling Stations
5. Copies of Environmental Permits/Approvals
6. Filled-out Grievance Intake Forms
7. Minutes of meetings (as applicable)
8. Other relevant information/documents

⁵ Overall sector environmental management progress could be described in qualitative terms or be evaluated based on a ranking system, such as the following:

1. Very Good
2. Good
3. Fair
4. Poor
5. Very Poor

Additional explanatory comments should be provided as necessary.

Grievance Intake Form

Name of Project

Project ____ welcomes complaints, suggestions, comments and queries regarding the project implementation and its stakeholders. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback.

Should you choose to include your personal details but want that information to remain confidential, please inform us by writing/typing "(CONFIDENTIAL)" above your name.

Thank you.

Contact Information

Name		Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female
Home Address		Age	
		Phone No.	
City/Province		Email	

Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below:

How do you want us to reach you for feedback or update on your comment/grievance?

Portion to be filled in by the staff:

Date received:	
Received through:	<input type="checkbox"/> In person <input type="checkbox"/> mail <input type="checkbox"/> email <input type="checkbox"/> fax <input type="checkbox"/> phone <input type="checkbox"/> sms
Name of staff who receive comment/ complaint	
Position of staff:	
Type of Grievance:	
Remarks	
Signature of staff	

Update on the case:

Date:	Update

Appendix K – LIEC Scope of Works

1. Timeframe

The LIEC shall be engaged for a period of four months (two person-months per year).

2. Scope

(i) project preparation; (ii) training (a summary of the training program is provided by Appendix I), (iii) yearly environmental progress and compliance monitoring (iv) annual environmental monitoring and progress reporting; (v) identifying environment-related implementation issues and necessary corrective actions to be reflected in an action plan; and (v) undertaking site visits as required.

3. Budget and source

The PMU shall finance the LIEC at a cost of approximately USD100,000