1. INTRODUCTION

1.1 Purpose of the Manual

The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme to be undertaken for the upgrading on the Improvement to Road P2 and Interchange T1/P1/P2. It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the construction works.

Hong Kong environmental regulations for air, noise and waste, the Technical Memorandum on Environmental Impact Assessment Process, and recommendations in the EIA study final report on Grade Separated Interchange T1/P1/P2 have served as environmental standards and guidelines in the preparation of this Manual.

This Manual contains the following :

(a) duties of the Environmental Team (ET) and Independent Checker (Environment) IC(E) with respect to the environmental monitoring and audit requirements during construction;

(b) information on project organisation and programming of construction activities for the project;

(c) requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;

(d) definition of Action and Limit levels;

(e) establishment of event and action plans;

(f) requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria;

(g) requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.

For the purpose of this manual, the "Engineer" shall refer to the Engineer as defined in the Contract and the Engineer's Representative (ER), in cases where the Engineer's powers have been delegated to the ER, in accordance with the Contract. The ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the environmental monitoring and audit requirements.

1.2 Background

The Tseung Kwan O Feasibility Study of Opportunity for Further Development (TKOOFD), completed in 1990 and endorsed by the then LDPC for implementation, identified amongst other infrastructure works the widening of Road P2 between Roads D1 and D2 and the construction of grade separation of road junction T1/P1/P2. The TKO Town Centre Traffic Review (1997) has also confirmed that the capacity of the existing roundabout would be exceeded by 2001 as a result of increasing traffic flows. Therefore, Project Manager/NT East of Territory Development Department further commissioned Maunsell Consultants Asia Limited under Agreement No. CE 13/90 to undertake the design of Contract F – Grade Separated Interchange T1/P1/P2 (hereinafter called the "Project"). Figure 1-1 shows the location of the study site.

Road P2 is one of the primary distributor roads in Tseung Kwan O. Construction of P2 is being implemented in stages in line with the development of the New Town. Road T1 is the major access to Tseung Kwan O via Tseung Kwan O Tunnel and the road junction. The southern portion of Tseung Kwan O New Town is developing and population is increasing. The resulting increase in traffic will overload the existing road system. It is therefore necessary to upgrade the existing at-grade interchange at Roads T1/P1/P2 junction to a grade-separated interchange, and to widen the section of Road P2 between Roads D1 and D2.

The Project may generate noise and air impact during construction and operation stage given the close proximity of the sensitive receivers (e.g. On Ning Garden, Chung Ming Court, Sheung Tak Estate, King Lam Estate and others) along the Project alignment. As the proposed works may have adverse impacts on the environment, an Environmental Monitoring and Audit (EM&A) programme is considered necessary during both the construction and operation period.

1.3 Environmental Monitoring and Audit Requirements

It is recommended that that monitoring to be undertaken for the following stages of the Project:

- *Baseline Monitoring* refers to the measurement of environmental parameters, such as existing noise and dust levels, to determine the nature and ranges of natural variation and to establish, where appropriate, the nature of change. This information is useful for assessing the short and long term environmental impacts of the Project activities.

- *Impact Monitoring* involves the measurement of environmental parameters during the Project activities in order to determine the impacts of the activities and the effectiveness of the mitigation measures proposed in the EIA Report, and any further remedial measures which are needed.

- *Compliance Monitoring* involves periodic sampling and/or continuous measurement of environmental parameters and the determination of their compliance with regulatory requirements and standards.

The environmental monitoring programme should be subject to environmental audit. The aim is to determine whether satisfactory compliance with the legislative requirements has been met, and to ensure that no annoyance is caused to sensitive receivers or else the remedial action plan will be initiated, if required. This will require information on the standards for parameters of concern and monitoring data.

Each audit will consist of a review of the monitoring data and comparison with the relevant legislative requirements and environmental performance standards specified in the Contract Document.

The monitoring and audit requirements for the Project will be as follows:

- *Pre-Construction Phase* Including all baseline monitoring prior to any Project activity occurring on site.
- *Construction Phase* Including impact/compliance monitoring and audit during all construction activities.
- *Post Construction Phase* including road traffic noise impact/compliance monitoring for a 12-month period upon Project operation.

1.4 Project Organization

The project organisation and lines of communication for the EM&A programme is presented in Figure 1.2. Their responsibilities are listed below. In this Manual, the Engineer (E) refers to the Engineer as defined in the Contract and the Engineer's Representative (ER) in cases the Engineer's powers have been delegated to the ER in accordance with the Contract.

Appropriate staff shall be included in the Environmental Team (ET) under the supervision of the ET Leader to fulfill the EM&A duties specified in this manual. Basically, the duties of each roles comprise the following:

The **Contractors** shall be responsible for:

- Implement good site practice and recommend mitigation measures;
- working within the scope of the construction contract and other tender conditions;
- provide assistance to ET in carrying out monitoring;
- following any reasonable directions given by the Engineer or the Engineer Representative ER(s) particularly as the result of the implementation of event/action plan;
- complying with all Ordinances, by-laws, regulations and rules for the time being in force in Hong Kong governing the control of any form of pollution, including air, noise, water and waste pollution;
- adhering to the procedures for carrying out complaint investigation in accordance with Section 6; and
- Implement action in accordance with Event/Action plan.

The **Engineer (E) / (ER)** shall be responsible for:

- engaging an Environmental Team (ET) and appointing an Environmental Team leader from within the resident site staff;
- reviewing the monitoring and audit reports submitted by the ET and follow up the recommendations;
- ensuring that the EM&A programme is fully implemented in accordance with the requirements set out in this Manual;
- ensuring that the Contractor is implementing environmental controls and mitigation as set out in this Manual as well as any additional measures necessary for compliance with the environmental standards;
- ensuring that the Contractor is implementing in accordance with the event/action plans when exceedances of Action and Limit levels occur; and
- implementing a "stop work" action if repeated exceedance of limit levels justifies this action.
- undertaking an engineering audit of environmental reports;
- conducting site liaison; and
- implementing and enforcing event/action plans under the Contract when exceedances of Action Limit levels occur.

The Environmental Team (ET) shall not be in any way an associated body of the Contractor. The ET leader shall have relevant professional qualifications and have at least 7 years EM&A experience subject to approval of the ER. Environmental Team Leader is responsible for and in charge of the Environmental Team (ET) refers to the person delegated the role of executing the EM&A. Appropriate staff shall be included in the ET, under the supervision of the ET leader to fulfill the EM&A duties specified in this manual. In general, ET is comprised of an ET leader, an Environmental Scientist and technicians. A minimum of 4 staff shall be employed is discretionary and depends on cost and the work load.

The **Environmental Team (ET)** shall be responsible for:

- monitoring the various environmental parameters as required in the EIA Report and collecting/ monitoring all necessary data by following the procedures outlined in this Manual;
- investigating and auditing the Contractors' equipment and work methodologies with respect to pollution control and environmental mitigation, and anticipate environmental issues for proactive action before problems arise;
- auditing and preparing EM&A reports on the environmental monitoring data and the site environmental conditions;
- undertaking regular maintenance and calibration of equipment to ensure precision of the data acquired;
- ensuring that EM&A results are reported timely to ER, IC(E) and EPD;
- complete Environmental Checklists and Schedule of Recommended Mitigation Measures implementation status. The checklist should include items such as
  i) construction activity item names, equipment, any night time activity;
  ii) any mitigation measures to be implemented; and

iii) any affected sensitive receivers, any school nearby, any examination period.

The **Independent Checker (Environmental)** shall be appointed by the Project proponent to audit and verify the overall environmental performance of all the work sites and to assess the effectiveness of the ET in their duties. The IC(E) shall not be an associate body of the Contractor, ER & ET. The IC(E) is responsible for:

- Reviewing EM&A reports and make recommendations for improvement;
- Arranging and conducting monthly general site inspections / audits of the different works areas;
- Reviewing the programme of works, in order to anticipate any potential environmental impacts before they arise;
- Ensuring that impact monitoring is conducted at the recommended locations at the recommended frequency as identified in the EM&A Manual;
- Checking that mitigation measures that have been recommended in the EIA report , the EM&A Manual and Contract documents, or as required, are properly implemented, in a timely manner; and
- Reporting the findings of site inspections / audits and other environmental performance reviews to the EPD and Project Proponent.

1.5 Construction Programme

The Contract comprises mainly the upgrading of the existing at-grade interchange at Roads T1/P1/P2 junction to a grade separated interchange and the widening of the section of Road P2 between Roads D1 and D2 to cope with the increasing traffic demand as the southern portion of the new town is developed and populated.

The proposed construction works comprise the following main activities:

- Construction of widened Road P2 between Road D1 and D2, modified Tseung Kwan O Tunnel Road and P1 near Road P2 and Slip Road A to G, together with all associated footpaths, cycle tracks or amenity strips and retaining walls;

- Provision of necessary surface drainage systems in the form of gullies, channels, catpits, pipes and manholes to collect road runoff which will be diverted to Western Box Culvert under Road P2;

- Construction of three vehicular bridge and extension of existing underpass to carry Tseung Kwan O Tunnel Road above Road P2 (Bridge B); Slip Road C from Tseung Kwan O Tunnel Road (Bridge C) to Road P2 and Slip Road A from Road P2 and T1 (Bridge A);

- Construction of a pedestrian subway under Slip Road B and extension of two existing pedestrian/cyclist subways under Road P2;

- Erection of noise barriers/canopies and enclosure along Slip Road A, Slip Road C and Road P2 as recommended in this report;

- Provision of all necessary services including Cable TV, water, electricity gas and telephone etc.

Figure 1-3 shows the limit of proposed road works, and Figure 1-4 shows a preliminary construction programme for the improvement works. According to this programme, the works would commence in October 2000 and complete by March 2003.

This programme is for information of the ET Leader and IC(E) to get an initial idea of the projection of the works. The ET Leader and IC(E) shall make reference to the actual works progress, the tentative works programme, and the implementation schedule (see Appendix A) during the construction stage to schedule the EM&A works, and the Contractor shall provide the respective information to the ET Leader and IC(E) for formulating the EM&A schedule.