Annex N

Environmental Monitoring & Audit Manual

CONTENTS

1 INTRODUCTION

1.1 PURPOSE OF THE MANUAL

The Civil Engineering Department (CED) of the Hong Kong Special Administrative Region (SAR) is proposing to construct an international Theme Park in Penny's Bay of North Lantau and its essential associated infrastructure (hereafter referred to as the Project). Hongkong International Theme Parks Limited (HKITP) will construct and operate the Theme Park and related resort development of hotels and retail, dining and entertainment areas. The Theme Park concept is to transport guests into a world of imagination, fantasy and adventure bringing together the best of the rides, shows and attractions from theme parks around the world; the Theme Park is expected to become a core tourist attraction in the Hong Kong SAR.

Under a contract between CED and Scott Wilson (Hong Kong) Limited (the Lead Consultants), Environmental Resources Management - Hong Kong, Limited (ERM) has been commissioned to undertake an Environmental Impact Assessment (EIA) and associated Environmental monitoring and Audit (EM&A) Manual, and Shankland Cox Asia Limited and Wilbur Smith Associates have been commissioned to undertake Landscape and Visual Impact Assessment (LVIA) and traffic impact assessment, respectively, for the Project in accordance with the requirements of the *Environmental Impact Assessment Study Brief No. ESB-043/1999*, which was issued under Section 7(4)(a) of the *Environmental Impact Assessment Ordinance (EIAO)*

This EM&A Manual has been prepared by ERM-Hong Kong Ltd as part of the *Hong Kong International Theme Park Environmental Impact Assessment (EIA)* which is as an extension of the *Northshore Lantau Development Feasibility Study* (Agreement No. CE60/96).

The purpose of the EM&A Manual is to provide information, guidance and instruction to personnel charged with environmental duties and those responsible for undertaking environmental monitoring and auditing work during the construction and operational phases of *Hong Kong International Theme Park* and its associated infrastructure (the 'Project'). It provides systematic procedures for the monitoring and auditing of potential environmental impacts that may arise from the works.

1.2 BACKGROUND TO THE PROJECT

In 1989, the Port and Airport Development Strategy Study (PADS) identified North-East Lantau as the primary area for expanding the port facilities in Hong Kong. Subsequently, the Project area was earmarked for container terminals (CT10 and CT11) and port related uses, including container back-up

areas, business park and industrial uses under the Lantau Port and Western Harbour Development Studies (LAPH) which were conducted in 1993. Based on the findings and recommendations of the LAPH, the Outline Zoning Plan (OZP) for North-East Lantau was developed, with the main development theme evolving around the port development for North-East Lantau which was gazetted under the Town Planning Ordinance in March 1995 and has since had with minor amendments in 1996 and 1998.

The 1997/98 Port Cargo Forecast (PCF) indicated a general slowdown of the growth rate of cargo throughput in Hong Kong. On the basis of such findings, the planned development programme for port facilities has been subsequently reviewed. The 1998 Territorial Development Strategy Review (TDSR) identified North-East Lantau as having potential for a range of other land uses, such as tourism/recreation, housing, business estate and major transport interchange. As a follow up to the TDSR, an integrated planning and engineering feasibility study (the Northshore Lantau Development Feasibility Study (NLDFS)) was initiated by the Civil Engineering Department (CED) on 25 June 1999. In March 1999, the Financial Secretary announced that the Administration was in the process of negotiation with the Walt Disney Company with a view to determining whether a Disney project could be brought to fruition in Hong Kong.

The Committee on Planning and Land Development (CPLD), after considering initial findings of the NLDFS, agreed that the land use proposals for North-East Lantau should be drawn up on the basis of the tourism/ recreation development theme, with an intention to translate North-East Lantau into a "Tourist Paradise" comprising a world-class theme park and a range of other compatible tourist attractions. The findings of the NLDFS and a Preliminary Outline Development Plan (PODP) were presented to the Town Planning Board in July 1999 and it was agreed that the PODP was a suitable basis for the revision of the North-East Lantau OZP.

The land use of the proposed Project site was thus revised to incorporate a theme park and related resort development in accordance with the draft North-East Lantau OZP which was gazetted in August 1999. The two container terminals to the south-southeast of the Theme Park have not been amended.

On the 3 November 1999, the CED submitted an application for an Environmental Impact Assessment (EIA) Study Brief (*Project Profile No.PP066/1999*) under Section 5(1) of the EIAO. The EIA Study Brief (No. ESB-043/1999) was issued on the 6 December 1999 under Section 7(4)(a) of the EIAO.

Subsequently, CED commissioned Scott Wilson (Hong Kong) Limited, with ERM-Hong Kong Ltd as the Lead Environmental Consultants, to undertake the EIA for this Project. As part of the EIA Study requirements, this Project specific EM&A Manual has been prepared to provide further details of the

EM&A requirements that have been recommended in the EIA for the Projects construction and operational phases. In particular, the requirements for ensuring compliance with the mitigation measures specified for noise, dust, water quality, waste management, terrestrial and marine ecology, fisheries, cultural heritage and landscape and visual impacts are defined.

1.2.1 *Previous Reports*

The EIA reports that are relevant to this Project and have been endorsed by Environmental Pollution Advisory Committee (EPCOM) and the Advisory Council on the Environment (ACE) are as follows:

- *Lantau Port and Western Harbour Development (LAPH) Studies (1993) Final Report, Volume III, EIA Report*, CED, (EIA-021/BC) endorsed by the EPCOM on 7 June 1993;
- *Lantau Port Development Stage 1 - Container Terminals 10 and 11 Ancillary Works (Design) EIA Final Report*, CED, 1994 (EIA-049BC) endorsed by the ACE with conditions on 20 February 1995;
- *Lantau Port Development Stage 1 - Container Terminals 10 and 11 Preliminary Design, Final Report, Volume 2, Container Terminal EIA*, CED 1995 (EIA-057BC) endorsed by ACE with conditions on 20 February 1995; and
- *Lantau Port Development Stage 1 - Design of Reclamation and Edge Structures for Container Terminals 10 and 11 and Back-up Areas*, EIA Final Report, CED, 1995 (EIA-073/BC) endorsed by ACE with conditions on 18 December 1995.

1.2.2 *Proposed Works*

The proposed Project includes the following characteristics including 9 EIA Ordinance (EIAO) Schedule 2 Designated Projects (DPs). Based on current construction specifications, the Project shall include the following characteristics:

- Reclamation of about 280 ha of land (in two stages) within Penny's Bay (a DP) and 10 ha of land at Yam O (a DP), using marine sand and public filling materials and the construction of associated seawalls;
- Phased development of an international Theme Park (of about 126 ha for Phase I) together with RD&E complexes, hotels (with a final capacity of up to 7,000 rooms) and supporting infrastructure and services. The Theme Park is anticipated to have an opening annual capacity of 7.5 million visitors, rising to 20 million visitors with the completion of Phase II. The Theme Park comprises an EIA Ordinance Designated Project (DP);
- Construction of an approximately 32 ha Water Recreation Centre (WRC) with a 12 ha artificial lake (a DP);

- Construction of the following: a 1.5 km section of Chok Ko Wan Link Road (CKWLR) from the existing Yam O Interchange extending over the proposed Penny's Bay roundabout, a 4 km primary distributor, Road P2, a 3.5 km district distributor, Resort Road, around the Theme Park (all DPs) plus a 800 m central pedestrian walkway between Theme Parks;
- Construction of a 3.6 km long rail line, the Penny's Bay Rail Link (PBRL), linking the Tung Chung Line at Yam O to the Theme Park (a DP);
- Construction of a Public Transport Interchange (PTI) for the Theme Park close to the Penny's Bay Rail Station and a temporary PTI at Yam O rail station;
- Construction of two public ferry piers and a service quay on the southern waterfront;
- Construction of general service infrastructure and associated works, including the stormwater drainage system, including the eastern culvert (a DP), sewerage facilities, irrigation, water supply and utility services; and
- Proposed slope formation and stabilisation, screening and landscaping works.

The Project Area and elements are shown in *Figure 1.*2a.

1.2.3 *Project Construction*

CED will be the overall Project Applicant and will oversee the Project reclamation and the provision of the Theme Park's essential infrastructure. However, the construction and operation of the PBRL will be undertaken the intended railway operator, whilst the design and construction of the Theme Park, hotels and , RD&E elements will be carried out by Hongkong International Theme Parks Limited (HKITP).

The proposed Project comprises 9 individual elements which have been classified as DPs under Schedule 2, Part I of the EIAO; DPs require an EIA Report and Environmental Permit (EP) before the commencement of their construction and operation. In accordance with Clause 3.8.11 of the Study Brief, the DPs that have been identified are presented in *Table 1.2a.*

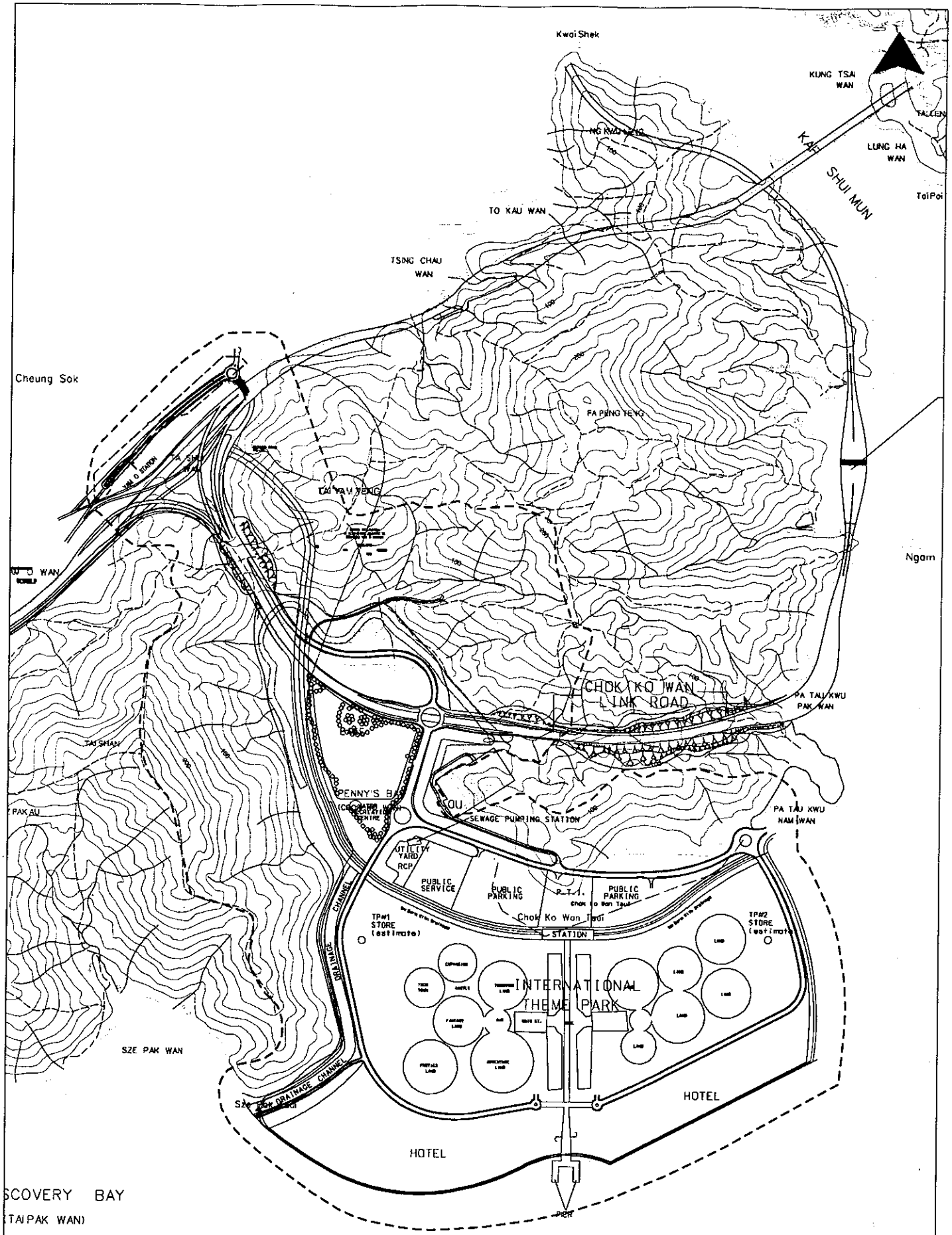

FIGURE 1.2a

INTERNATIONAL THEME PARK DEVELOPMENT AND ITS ASSOCIATED INFRASTRUCTURES

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DATE: 02/2000

Environmental Resources Management

ERM

Table1.2a *Schedule 2 Designated Projects*

Schedule 2, Part I Category	Description	Part I of Schedule 2 EIAO Reference
A - Roads, Railways and Depots	• Approx 1.5 km section of Chok Ko Wan Link Road (Expressway Standard)	A.1
	• Approx 4 km long Road P2 (Primary Distributor)	A.1
	• Approx 3.5 km long Resort Road (District Distributor)	A.1
	• 3.6 km Penny's Bay Rail Link and its 2 associated stations (including 850 m of tunnel)	A.2, A.4 and A.7
C - Reclamation, Hydraulic and Marine Facilities, Dredging and Dumping	• Penny's Bay reclamation (about 280 ha) using marine sand fill and public filling materials;	C.1, C.2, C.11 and C.12
	• A 10 ha reclamation at Yam O	C.1
I - Waterways and Drainage Works	• Water Recreation Centre with a 12 ha artificial lake	I.2 and O.8
	• Eastern stormwater drainage culvert (discharges within 300 m of the existing Pa Tau Kwu archaeological site).	I.1(b) (ii)
O - Tourist and Recreational Developments	• The Theme Park and associated developments with an area of about 180 ha	O.8

The Project area and extent of reclamation are shown in *Figure 1.2a.*

1.3 *OBJECTIVES OF THE ENVIRONMENTAL MONITORING AND AUDIT*

The construction and operational impacts resulting from the implementation of the Project are specified in the EIA Report. The Report also specifies the mitigation measures that need to be implemented to ensure compliance with the required environmental criteria; these mitigation measures and their implementation requirements, are presented is the Implementation Schedule contained in *Annex B* of this EM&A Manual. In order to ensure that these mitigation measures are fully and effectively implemented, the EIA Report recommends that EM&A should be undertaken for noise, air, water, waste, risk assessment, land contamination, terrestrial and marine ecology, fisheries, cultural heritage, archaeology and landscape and visual issues.

This Manual provides specific details of the EM&A requirements that have been recommended to ensure compliance with the mitigation measures specified in the EIA Report.

The main objectives of the EM&A programme are:

- to provide a database against which any short or long term environmental impacts of the project can be determined;

- to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards;
- to monitor the performance of the project and the effectiveness of mitigation measures;
- to verify the environmental impacts predicted in the EIA Study;
- to determine project compliance with regulatory requirements, standards and government policies;
- to take remedial action if unexpected problems or unacceptable impacts arise; and
- to provide data against which environmental audits may be undertaken.

1.4 *THE SCOPE OF THE ENVIRONMENTAL MONITORING AND AUDIT PROGRAMME*

The scope of this EM&A programme is to:

- establish baseline air, noise and water quality levels at specified locations and review these baseline levels every six months;
- implement impact monitoring and inspection programmes for air, noise, water quality, and marine and terrestrial ecology monitoring;
- implement inspection and audit requirements for waste management, landscape and visual, hazard assessment, heritage and fisheries issues;
- liaise with, and provide environmental advice (as requested or when otherwise necessary) to construction site staff on the comprehension and consequences of the environmental monitoring data;
- identify and resolve environmental issues and other functions as they may arise from the works;
- check and quantify the Contractor's overall environmental performance, the implementation of Event and Action Plans (EAPs), and remedial actions taken to mitigate adverse environmental effects as they may arise from the works;
- conduct monthly reviews of monitored impact data as the basis for assessing compliance with the defined criteria and to ensure that necessary mitigation measures are identified and implemented, and to undertake additional *ad hoc* monitoring and auditing as required by special circumstances;
- evaluate and interpret all environmental monitoring data to provide an early indication should any of the environmental control measures or practices fail to achieve the acceptable standards, and to verify the environmental impacts predicted in the EIA Report;
- manage and liaise with other individuals or parties concerning other environmental issues deemed to be relevant to the construction process;
- conduct regular site inspections of a formal or informal nature to assess:
  - the level of the Contractors' general environmental awareness,
  - the Contractors' implementation of the recommendations in the EIA Report;
  - the Contractors' performance as measured by the EM&A;

  - the need for specific mitigation measures to be implemented or the continued usage of those previously agreed; and
  - to advise the site staff of any identified potential environmental issues; and
- submit monthly EM&A reports which summarise project monitoring and auditing data, with full interpretation illustrating the acceptability or otherwise of any environmental impacts and identification or assessment of the implementation status of agreed mitigation measures.

1.5 *STRUCTURE OF THE EM&A MANUAL*

Following this introductory Section, the remainder of the Manual is set out as follows:

- *Section 2* outlines the wider aspects of Environmental Management which should be employed during the design, construction and operational phases to minimise environmental impacts;

- *Section 3* outlines the various parties involved in the EM&A process, and presents the proposed organisational structure of the organisations responsible implementing the EM&A programme and their key responsibilities;

- *Section 4* sets out the EM&A general requirements;

- *Section 5* details the requirements for baseline and impact monitoring for air quality, and lists relevant monitoring equipment, locations, compliance and EAPs;

- *Section 6* details the requirements for baseline and impact monitoring for noise, and lists relevant monitoring equipment, locations, compliance and Event and Action Plans (EAPs);

- *Section 7* details the requirements for baseline and impact monitoring for water quality, and lists relevant monitoring equipment, locations, compliance and EAPs;

- *Section 8* details the audit procedures with regard to waste management issues;

- Section 9 details sampling and audit procedures and key locations with regard to ecological issues;

- Section 10 details the audit procedures and key locations with regard to marine ecology;

- Section 11 details the audit procedures and key locations with regard to fisheries issues;
- Section 12 details audit procedures and key locations with regard to hazard issues;
- Section 13 details audit procedures and key locations with regard to culture and heritage issues;
- *Section 14* details the audit procedures and key locations with regard to landscape and visual issues;
- *Section 15* details sampling and audit procedures and key locations with regard to land contamination issues;
- *Section 16* describes the scope and frequency of site auditing;
- *Section 17* details the EM&A reporting requirements;
- *Annex A* contains the recommended Reporting Documentation, and
- *Annex B* contains the Implementation Schedules for each of the Schedule 2 Designated projects.

It should be noted that the EM&A Manual and Implementation Schedule for the Penny's Bay Rail Link in contained within Annex M of the EIA Report.

The EM&A Manual is an evolving document that should be updated to maintain its relevance as the Project progresses. It is suggested that the first revision to the EM&A Manual takes place when the monitoring locations have been agreed with the Engineer, the ENPO and the EPD, and when the proposed work processes and activities have been determined following any supplementary environmental reviews which may be required. The primary focus for these reviews of the EM&A Manual will be to ensure that the impacts predicted and the recommended mitigation measures remain consistent and appropriate to the manner in which the works are to be carried out.

2 *ENVIRONMENTAL MANAGEMENT SYSTEMS FOR THE DESIGN, CONSTRUCTION AND OPERATIONAL PHASES*

2.1 *INTRODUCTION*

This section sets out the proposed environmental management system approaches that will be implemented to ensure that the recommendations of the EIA are fully and effectively implemented during the Project's design, construction and operational phases.

2.2 *GENERAL*

2.2.1 *Schedule 2 Designated Project EIA Report*

The Schedule 2 Designated Project EIA Report provides an assessment of the predicted scope and extent of likely impacts resulting from the construction and operation of the Theme Park and associated development. Mitigation recommendations have been specified to ensure that the environmental quality objectives are met. The recommended mitigation measures from the Schedule 2 Designated Project EIA Report are summarised in the form of an Implementation Schedule (IS) *(In Annex B of this EM&A Manual)*. The IS provides the primary means by which the EIA Report recommendations are transferred from the planning phase to the design, construction and operational phases of the Project.

An integral part of these recommendations is the requirement to undertake an EM&A process to verify the level of environmental performance achieved and the effectiveness of the recommended mitigation measures.

2.2.2 *The EM&A Manual*

The EM&A programme provides the means by which feed-back on the project's compliance with the recommended mitigation measures and the environmental monitoring programme are provided to the Contractors, the Client (comprising CED and HKITP at different construction and operational phases) and the Environmental Protection Department (EPD).

A draft EM&A Manual is submitted at the time of the EIA and provides an outline of the likely monitoring and auditing protocols and requirements which will be necessary to achieve the objectives of the EM&A programme. For the construction and operational phases, this Manual provides a description of the organisational arrangements required for the EM&A programme, stipulation of the scope of monitoring (e.g. noise, air, water etc), the parameters to be measured (e.g. $L_{Aeq,30min}$, Total Suspended Particulates, Suspended Solids, etc.), the frequency of monitoring and the actions to be taken in the event of exceedances of the environmental criteria being recorded. This EM&A programme also outlines guidelines for construction

phase site inspections as a means of identifying and resolving problems, and the associated reporting requirements.

In addition to the construction and operational phase EM&A requirements, this EM&A Manual also makes recommendations on mechanisms for ensuring that the mitigation measures which have been recommended for the design stage are fully and effectively implemented.

This draft EM&A Manual should be reviewed (as necessary) during the detailed design stage of the Project if it is determined, or anticipated, that substantial changes to the extent or scope of the Project may occur which could have an influence on the Project's environmental performance. In this instance, it is customary that a revised assessment and EM&A Manual are produced to maintain the relevance of the EM&A process to the Works. The same process should also be followed on award of the project.

2.2.3 *Contractual Documentation*

In order to ensure that Contractors implement the recommended mitigation measures during the Project's design and construction phases, it is recommended that their contractual documentation should include clauses related to compliance with the appropriately recommended mitigation measures/environmental monitoring requirements. In addition, the contractual documentation should define appropriate contractual mechanisms to ensure compliance with these environmental requirements. The range of mechanisms available to the Engineer should reflect the priority that the Client gives to environmental issues although they may include provisions for suspending works pending the remediation of persistent environmental problems. Similarly, the inclusion of environmental performance milestone payments should be considered by the Client as a means of enhancing the environmental performance and encouraging the design and construction Contractors to meet these contractual obligations.

A key element to be included in the contractual documentation will be the requirement to prepare, implement and maintain an Environmental Management Plan (EMP) (see *Section 2.4.1* for details).

2.3 *DESIGN PHASE*

The development and implementation of a number of the recommended mitigation measures will have to be undertaken at the design stage. To ensure that these measures are adequately implemented it is recommended that the Environmental Management System be extended to include this phase of the Project.

As stated in *Section* 2.2.3 above the environmental requirements for the design phase should be included in the design contractors contractual documentation. To ensure compliance with these requirements it is

recommended that the design contractors are also required to report progress against these requirements. It is envisaged that progress will be reported in bi-monthly reports prepared by the design contractors and submitted to the Project Proponent (either CED or HKITP) and the EPD.

The Project Proponent's Environmental Manager (or other representative with responsibilities over environmental issues) will be responsible for ensuring that the recommended mitigation measures are complied with within the stated time periods. It is recommended that the Environmental Manager, or other organisation as appropriate, undertakes audits to ensure that the environmental requirements are being addressed during the design development phase, and to ensure that all proposed solutions achieve the required objective.

2.4 *CONSTRUCTION PHASE*

The management of the construction phase of the Theme Park and associated developments will be undertaken in line with an EM&A procedure which has been agreed with Government. The EM&A process will seek to ensure that the works are carried out in a manner which meets all legal, contractual and environmental commitments.

Past experience with projects of this nature has revealed that the implementation of EM&A procedures tends to result in an over-reliance on the process, and on mitigating impacts after they are identified. To complement the EM&A process, a level of proactivity is required which seeks to minimise the incidence of environmental problems. This can be referred to as an Environmental Management System (EMS) approach and is based upon the specification of a number of management mechanisms, processes and organisational arrangements including the EM&A programme. A wider environmental management system approach, if adopted, should draw upon all available documentation and particularly the following:

- previous environmental reports, assessments and reviews of the Project area;
- the Contracting Organisations ISO 9000 and 14000 (where appropriate) Standards;
- the project-specific Environmental Management Plan;
- the results of Environmental Performance Reviews and Site Inspections;
- the Construction Method Statements to be submitted to the Engineer for review prior to carrying out of works processes; and
- Contractual Documentation relating to the civil works packages.

A number of these elements have been discussed above. Those outstanding elements, and the role they play within the environmental management system is described below.

2.4.1 *Construction Phase EM&A Manual*

As stated in *Section* 2.2.2, this draft EM&A Manual is a dynamic document that will be reviewed and updated (as necessary) during later stage of the Project.

To ensure that this EM&A Manual remains current, it is recommended it is initially up-dated at the commencement of the construction phase to include contact details of the Contractors and management staff together with details of the monitoring locations that are agreed with the Engineer, the ENPO and the EPD. It will also update and clarify as necessary any information which may alter during the Project's development.

Assuming the ENPO system is adopted it is recommended that the update of the construction phase EM&A Manual is undertaken by the ENPO. Alternatively, the Environmental Auditing Team Leader shall update the Manual.

2.4.2 *Environmental Management Plans*

In order to ensure the effective contract specific implementation and reporting on compliance with the stated mitigation measures, as well as the monitoring and auditing requirements and remedial actions defined in the EIA Report, an appropriate contractual and supervisory framework needs to be established. During the construction phase, the basis of the framework within which implementation should be managed overall is through the preparation of Environmental Management Plans (EMPs) by the Contractor(s).

An EMP is similar in nature to a quality plan and provides details of the means by which the Contractors (and all subcontractors working to the Contractors) will implement the recommended mitigation measures and achieve the environmental performance standards defined in Hong Kong environmental legislation, the Contract and in the EIA documentation. The primary reason for adopting the EMP approach is to make the Contractors aware of his environmental responsibilities and to be pro-active about the commitment to achieve the standards specified, rather than relying on the EM&A programme.

The EMP also provides opportunities for the Contractors to draw upon the strength of other institutional processes such as ISO 9000/14000 to ensure that the achievement of the required standards and fulfilment of commitments are documented.

It is envisaged that the provision of EMPs will be contractual requirement, and that they will be approved by the Engineer following review/comment from the EATL.

The contractual requirement for an EMP would generally comprise appropriate extracts from (and references to) the Project EIA Report and EM&A Manual, and include such typical elements as the relevant statutory environmental standards, general environmental control clauses and specific environmental management clauses, as well as an outline of the scope and content of the EMP. In drafting the documentation, due consideration should be given to the predictive nature of the EIA process and the consequent need to manage and accommodate the actual impacts arising from the construction process. In particular, the Contractors must be placed under a clear obligation to identify and control any implications arising from changes to the working methods assumed in the EIA Report, or to the progress rates and other estimates made during the preliminary design phase.

2.4.3 *Environmental Performance Reviews*

The environmental performance review programme comprises the regular assessment of the effectiveness of the EMPs, site practices and procedures to ensure that the required mitigation measures are routinely implemented and that they are being effective in achieving the required environmental standards.

The criteria against which the review should be undertaken should be derived from the following:

- the approaches, procedures and commitments given by the Contractors in their EMPs;
- the clauses contained within the Contractors' Contractual Documentation; and
- those parts of the Contractors' method statements which relate to the minimisation of environmental impacts or other specified environmental protection measures.

The reviews should focus on the effectiveness of the implemented measures to achieve the purpose, not simply the fact that a measure has been implemented.
Review protocols should be developed prior to the commencement of works and it is suggested that the protocols should include inspection and auditing of the following:

- the allocation of responsibility for fulfilling environmental requirements, and agreed mitigation measures, and the effectiveness of lines of communication with regard to environmental issues;
- compliance with procedures established to enable an effective response to environmental incidents, exceedances or non-compliances;
- the extent and accuracy of record-keeping related to environmental performance indicators;

- the effectiveness of staff training in ensuring high levels of awareness with regard to environmental requirements; and
- the effectiveness of environmental management activities.

The protocols should comprise checklists of environmental requirements and should be amended, throughout the construction phase as necessary, to focus on areas of frequent non-compliance and to reflect the potential impacts associated with specific activities within the construction programme.

2.4.4 *Construction Method Statement*

It is common practice for the Contractors to submit details of forthcoming works to the Engineer to seek approval for the commencement of the works as well as the methodology and equipment proposed to be used.

It is recommended that this process be expanded, in line with the adoption of the Contractors' EMP, to require the signature of the Contractors' Environmental Manager who shall comment on deviations of the specific works from that assumed in the Project EIA and advise on the implications of the changes in construction methods for achieving the environmental performance criteria set out in the EIA documentation and the EMP.

This ongoing requirement for the Contractors to review proposed working methods, in terms of their potential to impact upon the environment, will reduce the time taken to implement the necessary environmental control measures and reduce the number of iterations a measure may have to go through before becoming effective.

Any changes in construction methods will need to be reflected in a revised EMP or the Contractors will be required to demonstrate the manner in which the existing EMP shall accommodate the proposed changes.

2.4.5 *Electronic Quality Performance Monitoring System*

The use of an electronic communication and data recording system for the construction phase would facilitate the rapid and effective communication of the site environmental status, as well as serving as a management tool for the Contractors. The system has the potential to interface with EPD's *Specialised Electronic Environmental Monitoring and Audit* (SEEMA) system (or another equivalent system) and so function as a database for the entry of all recorded monitoring and audit information. In addition, the system could:

- automatically issues Notifications of Exceedances and track their completion;
- action Event and Action Plans and track their completion;
- store details of complaints;
- store details of licenses/permits and notify of forthcoming expiry dates;

- store construction activity details and other relevant site information and link these to the EM&A Implementation Schedule; and
- allow retrieval of electronic versions of the EM&A Manual and other documents.

In the future, the SEEMA system (or another equivalent system) may be further developed to interface with the world wide web, improving the accessibility and availability of environmental monitoring information as 'real time' (within two weeks) as possible to the general public.

2.5 *OPERATIONAL PHASE*

2.5.1 *EM&A Manual*

Prior to the commencement of Theme Park operations, the HKITP shall review and update this EM&A Manual to make it specific to the Project's operational phase.

The operational phase EM&A Manual shall set out the detailed requirements for environmental monitoring and auditing, the organisational arrangement, the mechanisms for ensuring that the recommended mitigation measures are fully and effectively implemented, and the actions to be taken in the event of any exceedances of the event or action limits.

It is recommended that the operational phase EM&A Manual is regularly reviewed, and if required, updated (at least a year) to incorporate any amendments to the environmental monitoring and auditing requirements that may result from changes to operations of the Theme Park.

It is envisaged that the operational phase EM&A Manual will in effect act as a guide to personnel involved with implementing the environmental monitoring and auditing requirements.

2.5.2 *Environmental Management Plan*

In order to ensure compliance with the environmental requirements recommended for the operational phase it will be necessary to establish robust and specific environmental management procedures. In order to achieve this, it is recommended that the HKITP produces an EMP that details the environmental management mechanisms and procedures for that it will implement to effective compliance with the stated mitigation measures and environmental monitoring and auditing requirements. It is envisaged that this operational phase EMP will be similar in format to that recommended under *Section 2.4.1* for the construction phase, and that it will set out an appropriate supervisory framework for monitoring the effectiveness of the proposed procedures. The EMP should complement the operational phase EM&A Manual.

In order to ensure that the mechanisms in the EMP remain current throughout the operational lifetime of the Theme Park, it is recommended that the operational phase EMP is regularly reviewed, and if required, updated (at least a year) to incorporate an amendments to the operations of the Theme Park and to ensure that the most effective environmental management procedures are in place.

During the development of the EMP it is recommended that HKITP draws upon documentation such as ISO 9000/14000.

2.6 *SUMMARY*

The environmental management concepts described above have evolved from previous experiences in implementing large scale EM&As in Hong Kong. These experiences have shown that in order to harness the full potential of the EM&A process, a number of complementary procedures and tools should be adopted to fulfil the wider objectives of the process which include the preservation of the environment.

The uptake and specification of these procedures within the appropriate documents would facilitate a greater level of environmental management and responsibility to be achieved, however, the adoption of some or all of these practises must ultimately be directed by the Client before they can form part of the proposed EM&A programme.

3 ORGANISATION AND STRUCTURE OF THE EM&A

3.1 SCOPE OF WORK

The construction of the Project will comprise several large scale construction Contracts. Whilst the exact details and sequencing of the construction works are still being developed, preliminary information indicates that a number of the construction contracts may be undertaken concurrently.

The currently available information indicates the follows sequencing of the construction contracts:

3.1.1 *Reclamation Contracts*

Reclamation will be required to enable the planned construction of the Theme Park and associated infrastructure. This work will be undertaken by the CED.

It is envisaged that the reclamation works will be divided into three separate construction contracts, which will, at times, be undertaken concurrently. The currently envisaged construction periods are as follows (however, these periods will be more clearly defined as the development process progresses):

- Penny's Bay Stage I Reclamation, start 2nd quarter (Q2) 2000, complete Q3 2002;
- Penny's Bay Stage 2 Reclamation, start Q3 2001, complete Q4 2008, and
- Yam O reclamation, start Q4 2001, complete Q3 2003.

3.1.2 *Infrastructure Contracts*

The infrastructure works are envisaged to be divided into 3 or 4 construction contracts (which will at times be undertaken concurrently); with the first of these likely to commence in the Q3 2002 (ie about 15 months after the commencement of the Penny's Bay Stage I Reclamation Contract). In addition to the envisaged 3 or 4 infrastructure construction contracts, it is also likely that slope stabilisation works will be undertaken under a separate and concurrent construction contract. The operator of the Penny's Bay Rail Link and the HKITP will also have their own contracts, which may comprise multiple construction contracts. In addition, the infrastructure works for Phase II of the Theme Park may also be divided into several contracts.

As there are likely to be multiple construction contracts working concurrently within close proximity, concerns have been raised regarding the potential for impacts to arise as a result of cumulative impacts. Obviously, the magnitude of this problem will be related to the actual sequencing of the construction contracts, and the sequencing of the works within each contract. However, in order to ensure that such potential impacts are effectively managed, and that they do not give rise to any on-site problems, consideration needs to be given

to developing effective procedures for monitoring, and if necessary, responding to and rectifying any potential cumulative impacts.

3.2 *CUMULATIVE IMPACTS AND THE NEED FOR A CO-ORDINATED APPROACH TO EM&A*

In situations where numerous construction contracts are being undertaken concurrently, within close proximity, there is the potential for cumulative impacts to occur. In the event of an exceedance of the agreed action or limit levels there is also a tendency for each Contractor to blame the other, and at times it can be difficult to determine which party was responsible for the breach. There may also, potentially, be occasions on which each of the separate Contractors are working within their own acceptable environmental criteria, however the combined effect is causing an exceedance at a sensitive receivers position. In such situations, it is important to have an independent and impartial body which can adjudicate between the parties involved and assist in the swift determination of appropriate mitigation measures to rectify the situation. To work effectively this body needs to be suitably empowered and to receive support and recognition from the Project proponents, the Engineer and the Contractors.

The 'standard' approach to EM&A normally involves environmental monitoring being undertaken on an individual contract basis; normally by an Environmental Team employed by the Contractor. This approach is therefore focussed upon the impacts from individual Contractors, and there is no intentional consideration of the cumulative impacts which may result from other adjacent worksites. In addition, there is no incentive or requirement to implement a pro-active approach to the consideration of possible future impacts that may result from the combined execution of construction works on each of the adjacent work sites, and consequently, there are no mechanisms for implementing appropriate additional mitigation measures, or for re-scheduling of works activities, in order to prevent or mitigate cumulative impacts.

In order to overcome the above problems, and thereby implement a more proactive approach to EM&A, alternative mechanisms were established for the West Kowloon Reclamation Project, and for the Kwai Chung/Tsing Yi Project. For these multi-contract Projects, the EPD established Environmental Project Offices (ENPO) to act as umbrella organisations providing a unified approach to the EM&A process and the determination of cumulative impacts. Where necessary, the ENPO was responsible for identifying the source of any impacts, and for recommending timely and appropriate mitigation measures.

3.3 *SUITABILITY OF ENPO TO THE PROJECT*

The ENPO system provides an effective and proven mechanism for addressing and controlling potential cumulative impacts. However, in the two cases where the ENPO system has been used before, the construction works were being undertaken in close proximity to a large number of sensitive receivers, and there was a high potential for environmental impacts.

For the Project, few sensitive receivers have been identified, and of those that have, most are situated at some distance from the works. Consequently, with the implementation of the recommended mitigation measures, the potential for impacts is generally considered to be small.

For air and noise, only one and three monitoring stations, respectively, have been identified for the construction phase. It is therefore not envisaged that there will be a substantial amount of monitoring required for these media. Similarly, as the number of sensitive receivers likely to be affected by air and noise impacts is low, it can be assumed that the potential number of complaints may also be limited. It is therefore questionable whether it is necessary to establish an independent office to handle, what may be, a limited workload.

However, the limited number of monitoring sites means that it will not be practicable, or necessary, for each Contractor to monitor at each of the monitoring locations as this will result in duplication of results. It is therefore considered prudent to have an organisation that undertakes the monitoring and considers the data from a more 'global' perspective. It is considered that the ENPO provides a suitable means of achieving this aim, and of providing co-ordinated responses to any exceedances or complaints.

It is noted, however, that there are unlikely to be multiple contracts in operation until the Q3 2002 (ie about 15 months after the commencement of the Penny's Bay Stage I Reclamation Contract). As there will not be any cumulative impacts before this time, it is not necessary to implement the ENPO system at the commencement of the first construction contract. However, if it is practicable, within the current time constraints, to establish the necessary procedures and amend construction contracts etc, it is recommended that an ENPO should be used prior to the commencement of the second construction contract in order that the ENPO office can become established and develop robust procedures prior to there being multiple contracts. If this is not practicable, then it is suggested that the Engineer employs the EATL whilst the Contractor of the first construction contract employs the EMTL. Should this later system be adopted then the ENPO must be in place before the commencement of the second construction contract.

The advantages of having the ENPO on site from 'day one' are that the ENPO can undertake all the environmental monitoring from the commencement of the Works and thereby build up a solid data base of monitoring information

(in a standard format), and he can also identify and rectify any problems (eg in monitoring locations/protocols) at an early stages of the construction phase so that established monitoring mechanisms are in place, and being undertaken to the satisfaction of the ENPO, before the commencement of multiple contracts. Not only will the continuity of have an ENPO in place from day one prevent the alteration of, for example monitoring locations, when the ENPO takes over the monitoring role, but, it would also minimise the potential for problems to occur (due to unfamiliarity with the site and/or monitoring protocols) during the hand-over of the monitoring duties from the first Contractor's EMT to the ENPO.

3.4 *ROLE AND OBJECTIVES OF THE ENPO*

The Environmental Project Office (ENPO) will only be operational during the construction phase. The ENPO shall be established, managed and funded by CED. The ENPO shall undertake all the environmental monitoring and audit requirements defined in this EM&A Manual. The ENPO shall interpret the environmental monitoring data and determine whether there are any breaches of the agreed environmental criteria. In such cases, the ENPO shall investigate these exceedances and, if appropriate, assist in the specification of remediation action. The ENPO shall have particular regard to the potential for cumulative impacts.

To be effective, the ENPO must be suitably empowered, and must have influence over each of the Contractors working on site. It is envisaged that this will require the establishment of contractual obligations for each of the Contractors to implement the recommendations of the ENPO.

The objectives of the ENPO are as follows:

- to control pollution and reduce adverse environmental impacts and nuisances arising from the works;
- to identify sources of pollution, impacts or nuisance particularly of a cumulative nature (from multiple sources), which arise as a result of the works;
- to propose timely, cost effective, and practical solutions to problems through liaison with the site engineers, contractors and government works agencies;
- to ensure the implementation of appropriate mitigation measures;
- to collect and maintain an up-to-date database of monitoring information from the project area;
- to audit the results by determining baseline pollution levels for the area and to set Action and Limit levels;
- to provide regular notification of existing or predicted problems via regular public consultation and liaison, and
- to assist the Government in investigating complaints arising as a result of construction activities on the Penny's Bay.

3.5 PROJECT ORGANISATION

The roles and responsibilities of the various parties involved in the construction phase EM&A process outlined above are further expanded upon in the following sections. The organisation and lines of communication with respect to environmental works are shown in *Figure 3.5a*.

As it is envisaged that there will be multiple construction contracts undertaking works concurrently on-site, the term "Contractors" shall be taken to mean all Construction Contractors, and sub-contractors, working on site at any one time. The "Engineer" shall refer to the role undertaken by the "Engineer" and the "Engineer's Representative"(ER) to 'monitor' the works undertaken by the various Contractors.

The ENPO shall undertake all of the environmental monitoring, and the subsequent auditing and interpretation of the results. The Environmental Monitoring Team Leader, shall be responsible for and in charge of the Environmental Monitoring Team (EMT).

3.5.1 *Environmental Project Office (ENPO)*

Environmental Monitoring Team

Within the ENPO, an Environmental Monitoring Team (EMT) shall be appointed to undertake all the environmental monitoring requirements for each of the proposed construction contracts. An Environmental Monitoring Team Leader EMTL shall be appointed to plan and organise the implementation of the environmental monitoring programme, and to ensure that the environmental monitoring is undertaken to the required standards. The main objectives of the EMT will be to:

- to monitor the various environmental parameters as required by this or subsequent revisions to the EM&A Manual; and
- to adhere to the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

Environmental Auditing Team Leader

Within the ENPO, an Environmental Auditing Team Leader (EATL) shall be appointed to independently audit and interpret the monitoring data obtained by the EMT. The EATL shall also be responsible for undertaking site audits/inspections to verify the overall environmental performance of the works, and for assessing the effectiveness of the EMT in their duties. The main objectives of the EATL will be to:

- assess the EM&A data and review the success of the EM&A programme determining the adequacy of the mitigation measures implemented and

the validity of the EIA predictions as well as identify any adverse environmental impacts before they arise;
- to review and audit the environmental monitoring data obtained by the EMT;
- arrange and conduct regular site inspections and to investigate and inspect the Contractors' equipment and work methodologies with respect to pollution control and environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises;
- to report to the Engineer, the EPD and the Client regarding the environmental monitoring and audit results and, in particular, on compliance with the agreed environmental criteria, and on the general site environmental conditions and the implementation of mitigation measures resulting from site inspections; and
- provide specialist advice to the Engineer and/or the Client on environmental matters.

Whilst the members of the ENPO Team must be suitably empowered in order to be effective in their role, it is not envisaged that they will have the power to give instructions directly to the Contractors. Any instructions to effect change or to stop the construction Works must be made through the Engineer.

3.5.2 *Contractors*

Reporting to the Engineer, the Contractors shall:

- work within the scope of the construction contract and other tender conditions;
- participate in the site inspections undertaken by the EATL, as required, and undertake any corrective actions instructed by the Engineer;
- provide information/advice to the EATL regarding works activities which may contribute, or be contributing to the generation of adverse environmental conditions;
- implement measures to reduce impact where Action and Limit levels are exceeded; and
- take responsibility and strictly adhere to the guidelines of the EM&A programme and complementary protocols developed by their project staff.

3.5.3 *Engineer or Engineer's Representative*

The term Engineer, or Engineers Representative (ER), refers to the organisation responsible for overseeing the construction works and for ensuring that they are undertaken by the Contractors in accordance with the specification and Contractual requirements. The ER shall:

- monitor the Contractors' compliance with contract specifications, including the effective implementation and operation of environmental mitigation measures and other aspects of the EM&A programme;

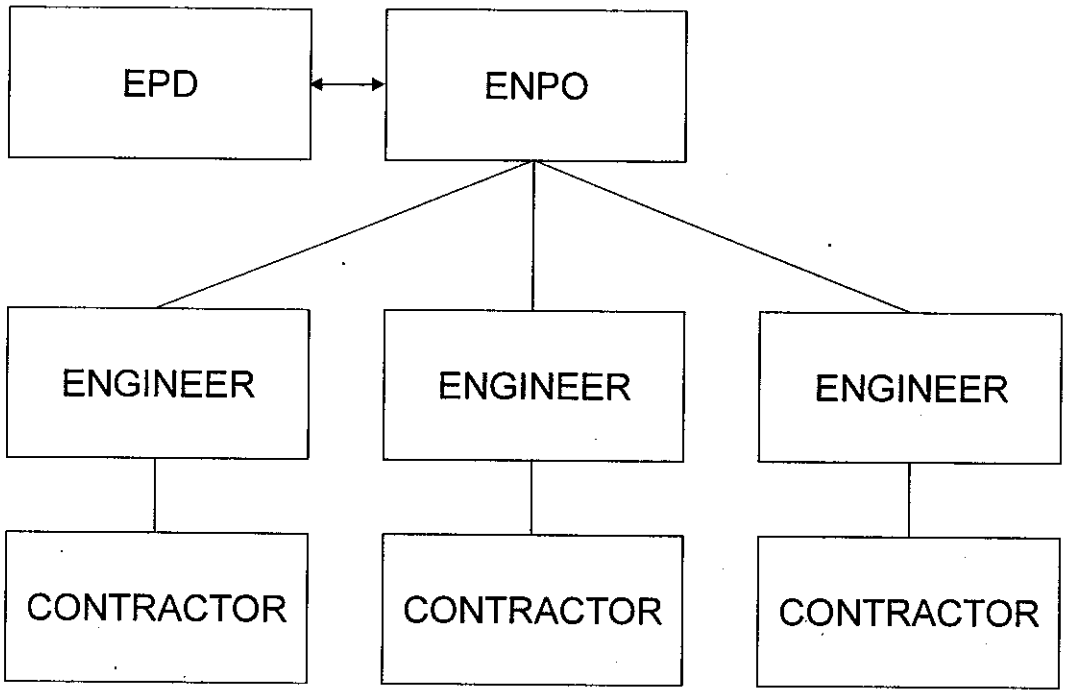

FIGURE 3.5a ORGANISATIONAL STRUCTURE & LINES OF COMMUNICATION

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Environmental Resources Management

ERM

- comply with the agreed Event and Action Plan in the event of any exceedance;
- liaise with the ENPO and assist as necessary in the implementation of the environmental monitoring and auditing programme; and
- instruct the Contractors to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

3.6 *OPERATIONAL EM&A REQUIREMENTS*

The ENPO system will not be extended to the CKWLR's operational phase. Any operational EM&A requirements will be undertaken by the agent identified within the Implementation Schedule.

Suitably qualified environmental practitioners shall be employ to undertake any operational environmental monitoring requirements.

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4 EM&A GENERAL REQUIREMENT

4.1 INTRODUCTION

In this Section, the general requirements of the EM&A programme for the CKWLR are presented with reference to the relevant findings from the EIA Report that have formed the basis of the scope and content of the programme.

4.2 SUMMARY OF THE SCHEDULE 2 DESIGNATED PROJECT ENVIRONMENTAL IMPACT ASSESSMENT

A summary of the key findings of the EIA Report that have a bearing on the objectives, scope and content of the EM&A programme are presented below. The recommended mitigation measures and schedule for their implementation are detailed in *Annex B* of this *EM&A Manual.*

4.2.1 *Air Quality*

Construction Phase

Impacts primarily relate to dust nuisance and gaseous emissions from the construction plant and vehicles, with dust generation being the major concern. The construction activities include, site formation, construction of the Theme Park and associated facilities including hotels and WRC; road and railway including track and station construction. With the incorporation of the recommended mitigation measures, it has been predicted that there will be no exceedances of the statutory Air Quality Objectives (AQOs) cumulative hourly and daily total suspended particulate (TSP) levels at any of the identified an sensitive receivers (ASRs) taking in account the construction of concurrent projects. However, to ensure no exceedance of the TSP level at the receivers, EM&A is recommended as prescribed in the Project EM&A Manual.

Operational Phase

Vehicular emissions from the adjacent road networks including CKWLR, Route 10 and road P2, and the emissions from the GTP are the major air quality concerns to the Theme Park. In addition, the vehicle emissions from the vehicle parking areas and emissions from fireworks displays, fuel combustion equipment and sewage pumping station are another air quality concerns to the adjacent ASRs. Potential air quality impacts during the operation of PBRL will be limited since the electric passenger trains will be used, no local air emissions will be produced.

All statutory AQOs will be satisfied at all ASRs at both low level (ground level and 10 m above ground) and high level (20-40 m above ground) due to the vehicular emission from road networks to and boiler emissions at the Theme

Park. Height restrictions have been incorporated into the Theme Park plans to avoid any potential air quality impact from the GTP and it has been assessed that the dispersion of the chimney emissions will not be affected by the Theme Park and associated developments.

Impact from fireworks displays has been assessed through literature review and dispersion modelling. Based on the available literature, fireworks displays will not be the source of atmospheric emissions of PCDD/Fs and VOC. The modelling results indicated emissions from fireworks would increase the predicted daily and annual RSP concentrations by 5. 6 and 0.38 μgm-3 respectively at the worst affected ASR. Based on the RSP modelling results and the low percentage of heavy metal compositions, impact from heavy metals is not expected. Potential odour impact from H2S has also been modelled and the results are within the acceptable criteria at ASRs. Firework emissions assessment predicts that fireworks would only contribute to marginal increase in the air pollutant levels in the atmosphere; operational monitoring is proposed for verification proposes.

4.2.2 *Noise*

Construction Noise

Powered Mechanical Equipment (PME) will be the primary source of construction noise. Noise exceedances at Noise Sensitive receivers (NSRs) have been predicted only for the evening time period. Mitigation measures including the use of quiet plant and the erection of movable noise barriers have been recommended for evening construction works. With the implementation of the recommended mitigation measures, noise impacts at the identified NSRs from construction works could be mitigated to comply with the statutory Noise Control Ordinance evening criterion. Regular monitoring of construction noise at adjacent NSRs is recommended, in order to ensure that the NSRs are not subject to adverse construction noise.

The proposed Lantau North Country Park has been considered as noise sensitive receiver. However, there are no established construction noise criteria associated with Country Parks. Nevertheless, the noise from the construction of the Theme Park and associated developments should not be perceptible at the Lantau North Country Park.

Operational Noise

No adverse impact on NSRs such as Peng Chau, Discovery Bay and Luk Keng Tsuen was identified during the operation of the Theme Park. Noise created by the evening fireworks displays at the Theme Park on the relevant NSRs is predicted to comply with the Leq, 15min 55 dB(A) limit. For other fixed plant noise sources, including the GTP, the proposed sewage pumping station at Penny's Bay, the public transport interchanges and the future Container

Terminal development, it is anticipated that their impacts on NSRs are likely to be minimal and within the relevant criteria.

For railway noise from the PBRL, predicted $L_{Aeq,30min}$ level at Luk Keng Tsuen was 45 dB, with L_{max} level at 55 dB(A) and the $L_{eq,24\ hour}$ noise level would be at least 1 dB(A) lower. Cumulative impact from Airport Express Line and Tung Chung Line was estimated to be 55 dB(A). The results indicated that the proposed PBRL will not impact upon the existing NSRs and will comply with the statutory requirements of the NCO and EIAO-TM.

There are no established operational noise criteria associated with Country Park. The operational noise of Theme Park and associated developments should not be perceptible at the Lantau North Country Park. However, at the Proposed Country Park Extension Area, a noise level of up to 67 dB(A) has been predicted from the operation of the Theme Park. The Lantau North Country Park is located at more than 7 km from the Theme Park. Adverse noise impacts from the operation of the Theme Park is not anticipated.

It is concluded that adverse noise impact due to the operation of the Theme Park and associated developments are not anticipated.

Noise monitoring is recommended during the operational phase to ensure compliance with the operational noise criteria. For the noise monitoring on the Theme Park operation, mainly from fixed plant, it is suggested that this should be carried out at the Theme Park perimeter to ensure compliance with the $L_{eq,30min}$ 75 dB(A) criterion. In addition, it is recommended that monitoring should be undertaken during the fireworks displays to ensure that the duration does not exceed the maximum limit of 5 minutes for mid-level shows and that they also do not exceed the maximum bursting height limit of 100 m.

4.2.3 *Water Quality*

Construction

Impacts were assessed by considering the potential impacts due to the formation of reclamations at Penny's Bay and Yam O and land based construction activities, including those for the Theme Park and road and rail links. The assessment determined that there would be no adverse impacts to water quality due to the reclamation formation provided that specified mitigation measures were implemented. The mitigation measures were specified in terms of operational constraints and 'best practice' construction methods. The potential impacts to water quality from land based construction activities could be readily controlled through a series a 'best practice' methods to control wastewater discharges from the construction sites. EM&A was recommended to ensure that no adverse impacts would occur during reclamation formation, while audit of the mitigation measures for the land based construction activities would be carried out.

Operation

The assessment determined that the operation of the Theme Park would have no adverse impacts on tidal current patterns and marine water quality. A number of operational measures were devised to ensure that water quality in the artificial lake would be maintained and thus its beneficial uses protected. It was determined that at the opening of the Theme Park in 2005 the Siu Ho Wan Sewage Treatment Works (STW) would have adequate capacity to cater for the increased flows due to the Theme Park. However, as flows increased up to 2011 and beyond it was determined that additional capacity would be required at the Siu Ho Wan STW.

4.2.4 *Waste Management*

Construction

The following quantities of waste are predicted to arise during the construction of the Theme Park and associated developments; dredged materials (approximately 46.3 M m3 or a maximum rate of 634,000 m^3 w^{-1}), construction and demolition material waste (a peak generation rate of approximately 45 m3 d-1); chemical waste (a few cubic metres per month); and general refuse (2.8 tpd during peak construction period). No surplus of excavated materials is envisaged.

The Theme Park and associated development reclamations offers a very good opportunity to utilise the public fill generated in the HK SAR. The use of public fill will not only alleviate the demand for virgin fill material but also reduce the pressure of disposing inert C&DM at the strategic landfills. The Penny Bay's Reclamation Stage I will utilise about 2 million m3 of public fill (the maximum capacity of the reclamation can accept) which is the maximum rate of public fill that could be supplied. Stage II of the Penny's Bay Reclamation will adopt maximum use of public fill given the available geometry of the reclamation (53 %) of the reclamation volume. For the Yam O reclamation about 58 % of the fill requirement will use public fill for the reclamation; in all cases the balance will be sand fill.

Based on the assessment, adverse waste management issues are not anticipated during the construction phase.

Operation

Based on the operation experience of other international theme parks, the amount of Municipal Solid Waste (MSW) to be generated from the operation of the Theme Park at Penny's Bay will increase from about 38 tpd in 2005 to 73.5 tpd in 2014, then to 174 tpd in 2024.

The quantity of recyclable materials potentially recovered by local recyclers under market driven conditions is estimated to be about 23 to 26% of the total

waste generated. These estimates are based on the market conditions in Hong Kong. The analysis on the markets show that the market for the major recyclables exists, especially when source separation programmes are in place to enhance the market value of the materials. It is recommended that the Theme Park should institute a source separation programme to recover recyclables from the remaining waste stream with a additional recycling target of 10% for remaining recyclable materials and 10% for compostable materials if composting facility is available, be adopted in the Waste Management Plan of the Theme Park. A waste avoidance and recycling programme, which forms a major part of the HKITP's Waste Management Plan for the operation of the Theme Park, should be implemented and annually monitored to determine the practical recycling rate that can be achieved based the recycling market. The assessment concludes that the North Lantau Transfer Station will be able to handle the waste arising from the Theme Park and associated developments until at least 2016. With regard to transfer an disposal, HKITP should closely liaise with the EPD regarding waste transfer and disposal arrangements when the handling capacity of the NLTS and strategic landfills are close to their maxima.

Based on the assessment, adverse waste management issues are not anticipated during the operation phase.

4.2.5 *Terrestrial Ecology*

Construction Phase

The proposed developments associated with the Project will generally lead to a loss of low ecological value terrestrial habitats with low ecological impact. Mitigation measures are recommended to avoid or reduce the potential impacts on habitats of moderate to high ecological value such as woodland compensation planting.

Noise and general disturbance effects associated with the construction of the Penny's Bay reclamation works the White-bellied Sea Eagle, would have low to moderate impact as quiet construction plant will be used for the Stage II reclamation, and the construction activities of Theme Park Phase I and II will be over 1 km and 500 m from their nest site, respectively. However, the assessment does indicate the potential worst case scenario of abandonment of the nest, although possible suitable habitats and nesting sites are available in the area. Additionally, the assessment identifies that the principal threat to these birds of prey comprises the threats from egg and young birds from human access to the nest area. Consequently, the mitigation measures to protect the White-bellied Sea Eagle from the principal threat comprise prohibiting human access to their nesting site during the construction phase via secure fencing and monitoring. Adopting the precautionary principle, EM&A before and during construction is recommended to monitor these birds. With the implementation of the recommended mitigation measures, no significant residual impact are expected to the White-bellied Sea Eagle,

although abandonment of the nest can not be ruled out, as possible suitable habitat and nesting sites are available in the vicinity of the Assessment Area.

Operation Phase

During operation of the Theme Park and associated developments, an identified impact comprises the possibility of the White-bellied Sea Eagles abandoning the existing nesting site due to noise from the remote (more than 2 km and 800 m from Phase I and II, respectively), nightly laser show and short duration fireworks displays. Human interference impact identified may be mitigated by the further prohibition of human access during Project operation by secure fencing of the nesting site. It is, thus, considered necessary to extend the EM&A programme during Theme Park operation to monitor the reaction of White-bellied Sea Eagle to the fireworks. In the worst case of abandonment of the pair from their nest during operation, possible suitable habitat and nesting sites are available in the vicinity of the Assessment Area and thus no residual impact is predicted.

4.2.6 *Marine Ecology*

Construction

Potential impacts to marine ecological resources from the proposed construction works may arise either indirectly, eg through perturbations of the surrounding water quality, or directly as a result of habitat loss. The natural intertidal and subtidal assemblages with the Penny's Bay and Yam O reclamations will be lost permanently due to the proposed reclamation works. However, it is anticipated that given adequate seawall design, assemblages typical of those lost will recolonise after reclamation. Indirect impacts during the reclamation process, such as an increase in suspended solids levels and decrease in dissolved oxygen in the water column may impact intertidal and subtidal filter feeders and other marine organisms. However, the effects are not expected to be severe and no unacceptable impacts are predicted to occur.

Operation

Operational impacts to marine ecological resources may occur through disturbances to water quality due to changes in the hydrodynamic regime of the area or due to polluted discharges into the marine environment. It is expected that all discharges will comply with the WPCO discharge standards and consequently marine ecological resources will be protected from impacts. Minor changes in the local hydrodynamic regime are predicted although these are not expected to alter water quality to an extent that marine ecological resources are affected. An increase in the number of vessels travelling to and from Victoria Harbour and the Theme Park is predicted to occur. However, as these vessels will not be high speed and this area is not regarded as critical habitat to the Indo-Pacific Humpback Dolphin unacceptable impacts are not predicted to occur with appropriate mitigation measures.

The impacts occurring as a result of construction and operation of the Theme Park and associated developments are the direct loss of 290 ha of the low ecological value soft benthic assemblages, 3.08 km of medium and low ecological value natural intertidal shores, 1.27 km sloping artificial seawalls, and 0.298 ha of high ecological value coral habitat. The loss of the habitat within the areas to be reclaimed can be mitigated through the provision of 3.9 km of rubble mound seawalls, of which 4.3 ha would be suitable for corals to colonise and grow. This mitigation measure reduces the magnitude of the residual impact to acceptable levels.

An ecological monitoring and audit programme involving the use of dive surveys will be conducted to report on the progress of colonisation of the rubble mound seawalls once construction works have ceased. As an additional habitat enhancement measure the Project proponent has undertaken to deploy Artificial Reefs in Hong Kong waters at a site (or sites) to be decided upon consultation with the Director of Agriculture, Fisheries and Conservation Department. Construction and operation phase dolphin/porpoise monitoring should be conducted by a qualified research team, to evaluate whether there have been any effects on the animals. The resulting data should be compatible with, and should be made available for, studies of small cetacean ecology in Hong Kong.

Mitigation Measures

Mitigation measures specific to marine ecology include the provision of rubble mound seawalls on the southern edges of the Penny's Bay reclamation, and at Yam O, to facilitate colonisation by intertidal organisms and corals which will be lost as a result of the construction of the reclamation. Mitigation measures designed to minimise impacts to the seasonal population of marine mammals that use the area include restrictions on vessel speed and the use of bubble curtains during underwater percussive piling work for construction of the two Theme Park ferry piers. Other mitigation measures designed to mitigate impacts to water quality to acceptable levels (compliance with WQO), including constraints on dredging and filling operations, are also expected to mitigate impacts to marine ecological resources. These mitigation measures reduce the magnitude of the residual impact to acceptable levels.

Ecological Monitoring and Audit Programme

An ecological monitoring and audit programme involving the use of dive surveys will be conducted to report on the progress of colonisation of the rubble mound seawalls once construction works have ceased. As an additional habitat enhancement measure the Project proponent has undertaken to deploy Artificial Reefs in Hong Kong waters at a site (or sites) to be decided upon consultation with the Director of Agriculture, Fisheries and Conservation Department. Construction and operation phase dolphin/porpoise monitoring should be conducted to evaluate whether there have been any effects on the animals.

4.2.7 *Fisheries*

A review of existing information on capture fisheries indicates that the adult fisheries resources in the marine areas close to the Assessment Area are in general low. Adult capture fisheries resources are unlikely to be adversely impacted by the Project as they will likely avoid the works areas. Although impacts to fish fry may occur through the permanent loss of habitat and/or elevated suspended sediment levels as a result of the proposed reclamation works, these impacts have been deemed acceptable as these waters are not an important nursery area for commercial fisheries species. Any impacts which are predicted can be mitigated through Project design. Any measures which are required to reduce impacts to water quality will also serve to protect against unacceptable impacts to capture fisheries resources. In terms of residual impacts to capture fisheries, the small loss of fishing grounds of the Hong Kong fishery is expected to be compensated for by the potential environmental benefits of the proposed rubble mound seawalls. Artificial Reefs have been recommended for deployment as an additional marine ecology and fisheries habitat enhancement measure. As a result, the residual impacts to capture fisheries through the construction and operation of the Theme Park and associated developments has been deemed acceptable.

In terms of impacts to the culture fisheries, the Ma Wan Fish Culture Zone (FCZ) is not predicted to be impacted by either suspended solids elevations, dissolved oxygen depletions or nutrient elevations as a result of the either the construction or operation. Discharges comply with WPCO standards and any potential impacts to water quality and, therefore, culture fisheries resources at the FCZ will be avoided. Project changes to the hydrodynamic regime are not expected to impact the water quality of the FCZ as current speeds are expected to be only minimally affected.

4.2.8 *Hazard Assessment of Dangerous Goods (Fireworks and Sodium Hypochlorite) Incidents Resulting in Loss of Life*

As part of the EIA, a hazard assessment of dangerous goods (fireworks and sodium hypochlorite) incidents resulting in loss of life was undertaken to evaluate the risks associated with storage, transport and use of dangerous goods at the Theme Park. With the incorporation of design and operating safety measures considered in the analysis, the risks due to fireworks and sodium hypochlorite storage, transport and use were found to be in the 'acceptable' region of the Hong Kong Risk Guidelines. Further risk mitigation measures have been suggested for the Theme Park operator to consider for implementation on a good practice basis.

4.2.9 *Cultural Heritage*

Potential impact to archaeological resources may arise from temporary or permanent landtake, ground compaction, topsoil or subsoil disturbance

during construction, change in watertable and a limitation on accessibility for future investigation, which may result in damage to, or loss of the archaeological remains. Mitigation measures to heritage resources including the usage of plastic sheets to cover the impacted area at Wan Tuk archaeological site (SA2) before the temporary access road construction; the avoidance and minimisation of potential impact to SA1 and SA2 required for ground level adjustment; if the impact is unavoidable, plastic sheets should be used to cover impacted area before the fill up work and avoidance of waterlogged site conditions through detail design of runoff diversion. The associated residual impact could be mitigated by the removal of the filled material and the plastic sheet covers when necessary for future investigation and design to allow the diversion of surface runoff to avoid the waterlogged site conditions.

Preservation by record prior to the reclamation of Chok Ko Wan archaeological site has been recommended to mitigate the impact to this site and therefore, a full rescue programme should be implemented.

As the CKWLR, Road P2 and PBRL comprise the preferred alignments, the impact to any archaeological deposit at the original coastal area can be mitigated by detailed design of structural support location of CKWLR and detailed design of Road P2 and PBRL to minimise the impact to the potential coastal archaeological deposit to an absolute minimum. The development of the area will provide an opportunity for an archaeological field evaluation to be undertaken at the original coastal area of existing CLS site, which will be considered under a separate Schedule 2 EIA of CLS site commissioning. If significant archaeological deposit is found under the Shipyard site and if preservation in situ is not possible, the impacted archaeological deposits could be mitigated by rescue excavation before the construction of these transport infrastructural elements associated with the Theme Park development.

In order to ensure the preservation of the heritage sites near the Study Area boundary not to be impacted by construction, the Pa Tau Kwu archaeological site and the two grave sites, which are outside the Study Area boundary, could be indicated on any construction plans as "temporary protection area"; the physical site boundaries, with the inclusion of 5 m buffer zone, could be marked on sites and drawn construction workers' attention to ensure no direct impact to the grave sites and no soil disturbance to the archaeological sites are allowed. Access to the grave sites could be possible during construction, if grave owners are informed so that special arrangements for the them to visit the sites is possible, when necessary. Operational access should also be retained to the grave sites for future visitors after the Project completion.

With mitigation recommended it is considered that the impacts to cultural heritage are acceptable.

4.2.10 *Landscape and Visual*

Grassland, shrub groups and woodland are affected primarily by the proposed transport infrastructure and in particular woodland shall be adversely affected by CKWLR and Road P2 proposals at Ngong Shuen Au. The Theme Park reclamation shall remove sections of natural coastline and is therefore a significant impact, although the proposal of an open channel along the western edge of the Penny's Bay reclamation has allowed the retention of an extensive length of natural coastline. There shall be a high level of change to the landscape character of the Study Area from a predominately rural type to a more semi-rural/urban type, whereas, the upland character zones are largely unaffected by development proposals. An expected high level of change to the local visual system of the Study Area is also predicted. The higher levels of adverse impact will result from a loss of a large area of bay and coastal waters, the temporary low visual quality associated with the undeveloped reclamation, and slope cutting associated with the CKWLR and Road P2. A range of mitigation measures have been proposed including the following: reclamation mitigation measures include temporary hydroseeding along the edge to improve its visual characteristics. The construction of the Theme Park shall be mitigated by the proposed advancement of construction and landscaping of the permanent soil berms. The operation phase is considered to be of a high visual value and not requiring mitigation. The mitigation for the slope cutting associated with the CKWLR and Road P2.includes slope landscaping and minimisation of the areas affected by slope cutting. The primary residual impacts that have been identified are the loss of bay and coastal waters and the adverse impact of the CKWLR on local topography, landscape character and the local visual system. In accordance with *Annex 10 of the EIAO TM*, the landscape and visual impact is considered acceptable with mitigation.

4.2.11 *Land Contamination*

To allow the Theme Park and associated developments EIA to 'stand alone' the relevant land contamination section of the Schedule 3 NLDFS EIA was included within this EIA, although it is not strictly a requirement of the Theme Park EIA Study Brief. As appropriate remediation will be performed for the CLS site by CED, in accordance with EPD guidelines for the decommissioning of the shipyard site, before construction of Theme Park road and rail elements, future potential negative land contamination impacts are judged to be minimal. The NLDFS assessment will be verified by CED in a separate, subsequent EIAO Schedule 2 EIA for the CLS site. Thus, it is considered there will be no potential residual negative impacts and no insurmountable conditions for the use of the site as for Theme Park and associated developments.

4.3 CONSTRUCTION PHASE EM&A

4.3.1 General

The environmental issues, which were identified during the EIA process and are associated with the construction phase of the Theme Park and associated developments, will be addressed through the monitoring and controls specified in this EM&A Manual and in the construction contracts.

During the construction phase noise, dust, water, waste, terrestrial and marine ecology, archaeology, hazard and landscape and visual issues will be subject to EM&A, with environmental monitoring being undertaken for noise, dust, water and terrestrial and marine ecology.

The monitoring of the effectiveness of the mitigation measures will be achieved through the environmental monitoring programme as well as through site inspections. The inspections will include within their scope, mechanisms to review and assess the Contractors' environmental performance, ensuring that the recommended mitigation measures have been properly implemented, and that the timely resolution of received complaints are managed and controlled in a manner consistent with the recommendations of the EIA Report.

4.3.2 *Environmental Monitoring*

The monitoring of environmental impacts during the construction phase shall be carried out by the ENPO; the monitoring work will comprise the quantitative assessment of noise, air and water quality impacts at representative sensitive receivers in the vicinity of the works, together with the assessment of terrestrial and marine ecology impacts.

4.3.3 *Action and Limit Levels*

Action and Limit (A/L) Levels are defined levels of impact recorded by the environmental monitoring activities which represent levels at which a prescribed response is required. These levels are quantitatively defined later in the relevant sections of this manual and described in principle below:

- *Action Limits:* beyond which there is a clear indication of a deteriorating ambient environment for which appropriate remedial actions are likely to be necessary to prevent environmental quality from falling outside the *Limit Levels*, which would be unacceptable; and

- *Limit Levels:* statutory and/or agreed contract limits stipulated in the relevant pollution control ordinances, HKPSG or *Environmental Quality Objectives* established by the EPD. If these are exceeded, works should not proceed without appropriate remedial action, including a critical review of plant and working methods.

4.3.4 *Event and Action Plans*

The purpose of the Event and Action Plans (EAPs) is to provide, in association with the monitoring and audit activities, procedures for ensuring that if any significant environmental incident (either accidental or through inadequate implementation of mitigation measures on the part of the Contractor) does occur, the cause will be quickly identified and remediated, and the risk of a similar event recurring is reduced. This also applies to the exceedances of A/L criteria identified in the EM&A programme.

4.3.5 *Site Inspections*

In addition, to monitoring noise, air and water quality levels as a means of assessing the ongoing performance of the Contractors, the EATL shall undertake regular site inspections and audits of on-site practices and procedures. The primary objective of the inspection and audit programme will be to assess the effectiveness of the environmental controls established by the Contractors and the implementation of the environmental mitigation measures recommended in the EIA Report.

Whilst the audit and inspection programme will undoubtedly complement the monitoring activity with regard to the effectiveness of dust suppression, noise attenuation measures and water quality control, the criteria against which the audits shall be undertaken shall be derived from the clauses within the Contract Documents which seek to enforce the recommendations of the EIA Report and the established management systems.

The findings of site inspections and audits shall be made known to the Contractors at the time of the inspection to enable the rapid resolution of identified non-compliances. Non-compliances, and the corrective actions undertaken, shall also be reported in the monthly EM&A Reports. *Section 16* of this Manual presents details of the scope and frequency of on-site inspections and defines the range of issues that the audit protocols should be designed to address.

4.3.6 *Enquiries, Complaints and Requests for Information*

Enquiries, complaints and requests for information can be expected from a wide range of individuals and organisations including members of the public, Government departments, the press and television media and community groups.

All enquiries concerning the environmental effects of the construction works, irrespective of how they are received, shall be reported to the Engineer and directed to the ENPO which shall set up procedures for the handling, investigation and storage of such information. The following steps shall then be followed:

1) The EATL shall ensure that the Engineer is notified of the nature of the enquiry.

2) An investigation shall be initiated to determine the validity of the complaint and to identify the source of the problem.

3) The following steps, as necessary:

- the EATL shall investigate and identify the source of the problem;
- if considered necessary by the EATL following consultation with the Engineer, the EMTL shall undertake additional monitoring to verify the existence and severity of the alleged complaint;
- the EATL shall liaise with the Contractor to identify remedial measures;
- the Contractor implement the agreed mitigation measures;
- the EMTL shall repeat the monitoring to verify the effectiveness of the mitigation measures; and
- if the repeat monitoring results continue to substantiate the complaint, the EATL, the Engineer and the Contractor shall repeat their review of the procedures to identify further possible areas of improvement.

4) The outcome of the investigation and the action taken shall be documented by the EATL on a complaint proforma. A formal response to each complaint received shall be prepared, by the EATL, within a maximum of five working days and submitted to the Engineer in order to notify the concerned person(s) that action has been taken, see *Annex A (1.1)*.

5) All enquiries which trigger this process shall be reported in the monthly reports which shall include results of inspections undertaken by the EATL, and details of the measures taken, and additional monitoring results (if deemed necessary). It should be noted that the receipt of complaints or enquiries will not, in itself, be sufficient reason to introduce additional mitigation measures.

In all cases the complainant shall be notified of the findings, and audit procedures shall be put in place to ensure that the problem does not recur.

4.3.7 Reporting

Monthly, annual and bi-annual reports shall be prepared by the EMTL and approved by the EATL. These reports shall be submitted to the Engineer and EPD. The monthly reports shall be prepared and submitted within 7 working days of the end of each calendar month. Additional details on reporting protocols are presented in *Section 17*.

4.3.8 *Cessation of EM&A*

The EMTL and the EATL shall continue to carry out environmental monitoring and site inspections until the completion of the Construction works.

4.4 *OPERATIONAL PHASE EM&A*

Environmental monitoring during the operational phase will be undertaken for air quality, noise, water and terrestrial and marine ecology. The suggested monitoring parameters and locations are outlined in the respective chapters of this report.

5 AIR QUALITY MONITORING

5.1 INTRODUCTION

In this section, the requirements, methodology, equipment, monitoring locations, criteria and protocols for the monitoring and audit of air quality impacts during the construction and operation of the Theme Park and associated development are presented.

5.2 CONSTRUCTION DUST MONITORING

5.2.1 *Introduction*

The objectives of the air quality monitoring for Total Suspended Particulates (TSP) shall be:

- to identify the extent of construction dust impacts on sensitive receivers;
- to determine the effectiveness of mitigation measures to control dust from construction activities;
- auditing the compliance of the Contractor with regard to dust control, contract conditions and the relevant dust impact criteria;
- to recommend further mitigation measures if found to be necessary; and
- to comply with Action and Limit (AL) Levels for air quality as defined in this Manual.

5.2.2 *Methodology and Criteria*

Monitoring and audit of the TSP levels shall be carried out by the EMTL to ensure that any deterioration in air quality can be readily detected and timely actions taken to rectify the situation.

The criteria against which air quality (measured as TSP) monitoring shall be assessed are:

- The Hong Kong *Air Quality Objectives* (AQOs) for TSP, 24-hour TSP levels of 260 mg m^{-3}; and
- The statutory 1-hour TSP limit of 500 mg m^{-3}.

These levels are not to be exceeded at Air Sensitive Receivers (ASRs).

The 1-hour and 24-hour TSP levels shall be measured to indicate the impacts of construction dust. The TSP levels shall be measured by following the standard high volume sampling method as set out in *High Volume Method for Total Suspended Particulates, Part 50 Chapter 1 Appendix B, Title 40 of the Code of Federal Regulations of the USEPA.*

24-hour average TSP concentrations should be measured by drawing air through a high volume sampler (HVS) fitted with a conditioned, pre-weighed filter paper, at a controlled rate. After sampling for 24-hours, the filter paper with retained particles is collected and returned to the laboratory for drying in a desiccator followed by accurate weighing. 24-hour average TSP levels are calculated from the ratio of the mass of particulates retained on the filter paper to the total volume of air sampled. The analysis process normally takes about two days to complete.

1-hour average TSP concentrations shall be measured using the same monitoring method as 24-hour average TSP (i.e. the HVS).

An alternative means of monitoring 1-hour average TSP concentrations is by undertaking real-time airborne particulate measurements undertaken using a direct reading meter such as the MIE Data-Ram Portable Real Time Aerosol Monitor (MIE). 1-hour average TSP concentrations measured by a hand held real-time aerosol monitor require no laboratory analysis and will give an instant reading of the dust levels. Air samples are drawn through the optically-sensitive area of the monitor for a continuous period of 1-hour and the monitor will calculate the time-average dust levels. Despite the advantages of using a real time monitor to measure particulate concentrations such as in response to dust complaints, results are not comparable with 24-hour HVS data. It is suggested that the real time monitoring technique be used to supplement the HVS sampling.

All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of sampler, identification and weight of the filter paper, and other special phenomena and work progress of the concerned site etc shall be recorded down in detail. A sample data sheet is shown in *Annex A (1.2)*.

5.2.3 *Monitoring Equipment*

A high volume sampler (HVS) in compliance with the following specifications shall be used for carrying out the 1-hr and 24-hr TSP monitoring:

- 0.6 - 1.7 m^3 min^{-1} (20-60 SCFM) adjustable flow range;
- equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
- installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
- capable of providing a minimum exposed area of 406 cm^2 (63 in^2);
- flow control accuracy: +/- 2.5% deviation over 24-hour sampling period;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with a peaked roof inlet;
- incorporated with a manometer;

- able to hold and seal the filter paper to the sampler housing at horizontal position;
- easy to change the filter; and
- capable of operating continuously for 24-hr period.

The EMTL shall be responsible for the provision of the monitoring equipment. He shall ensure that sufficient number of HVSs with an appropriate calibration kit are available for carrying out the baseline, regular impacts monitoring and *ad hoc* monitoring. The HVSs shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals, in accordance with requirements stated in the manufacturers operating manual and as described below. All the equipment, calibration kit, filter papers, etc shall be clearly labelled.

The flow rate of each HVS with mass flow controller shall be calibrated using an orifice calibrator. Initial calibration of the dust monitoring equipment shall be conducted upon installation and prior to commissioning. One point flow rate calibration shall be carried out every two months. Five point calibration shall be carried out every six months.

The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down on the data sheet as mentioned in a *Annex A(1.2)*.

If the EMTL proposes to use a direct reading dust meter to supplement the monitoring of 1-hour TSP, then this shall be capable of sampling in the range of 0.1-100 mg m^{-3}. The EMTL shall submit sufficient information to the Engineer and the EATL to prove that the instrument is acceptable for its intended use. The instrument shall also be calibrated regularly.

Wind monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The location of the equipment shall be determined by the EMTL and agreed with the Engineer and the EATL. For installation and operation of the wind data monitoring equipment, the following points shall be observed:

- the wind sensors should be installed on masts at an elevated level 10 m above the ground, so that they are clear of obstructions or turbulence caused by building(s);
- the wind data should be captured by a data logger and to be downloaded for processing at least once a month;
- the wind data monitoring equipment should be re-calibrated at least once every six months; and
- wind direction should be divided into 16 sectors of 22.5 degrees.

In exceptional situations, the EMTL may propose alternative methods to obtain representative wind data upon approval from the EATL and Engineer, and agreed with EPD.

Table 5.2a presents the recommended types and quantities of TSP monitoring equipment required, although the exact requirements will depend upon the final organisation of the EM&A programme, and the ENPO's manpower resources.

Table 5.2a ***TSP Recommended Monitoring Equipment***

Description	Quantity
High Volume sampler	1 unit
Hand-held direct reading dust meter	1 unit

5.2.4 *Laboratory Measurement/Analysis*

A clean laboratory with constant temperature and humidity control, and equipped with the necessary measuring and conditioning instruments to handle the dust samples, shall be available for sample analysis and equipment calibration and maintenance. The laboratory shall be either HOKLAS accredited or another internationally accredited laboratory.

If a site laboratory or a non-HOKLAS accredited laboratory is used, the laboratory equipment and measurements shall meet with the satisfaction of the Engineer in consultation with the EATL. The EATL shall conduct regular audits to determine the accuracy of the measurement results. The EMTL shall provide the Engineer and the EATL with one copy of the *Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Annex B* for reference.

5.2.5 *Monitoring Locations*

One air quality monitoring station has been identified in the locality of the Theme Park and associated development. The location of the monitoring station is presented in *Table 5.2b* and depicted in *Figure 5.2a.*

Table 5.2b ***EM&A Representative Air Quality Monitoring Station During Construction Phase***

ASR No.	Identity/Description
AM1	Penny's Bay Power Station

Prior to the commencement of the EM&A programme, the proposed air quality monitoring stations shall be discussed and agreed with the Engineer, the EATL and EPD. When positioning the samplers, the following points shall be noted:

- a horizontal platform with appropriate support to secure the samples against gusty wind shall be provided;

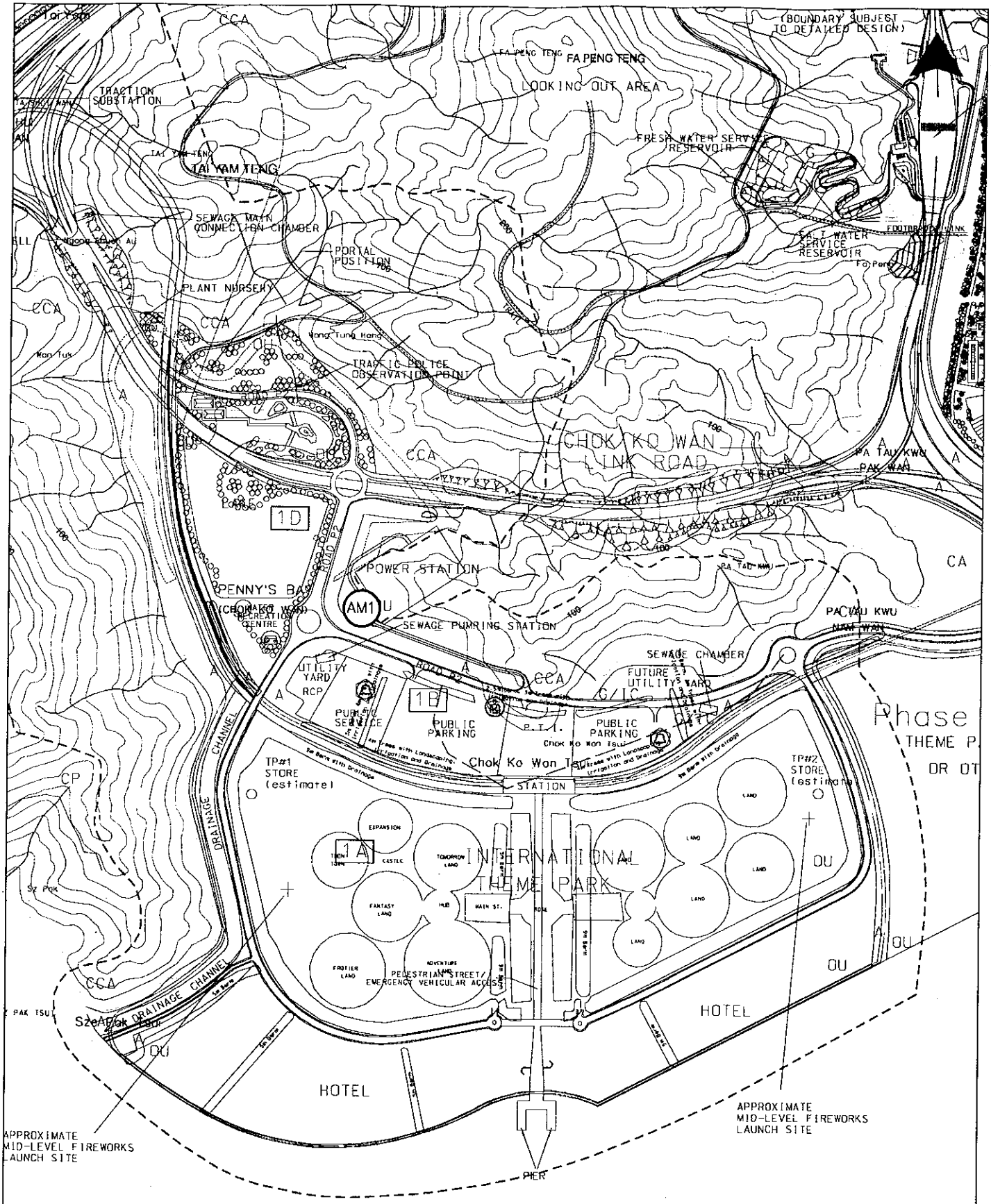

FIGURE 5.2a

LOCATION OF AIR MONITORING STATION DURING CONSTRUCTION

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- no two sampler shall be placed less than 2 m apart;
- the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;
- a minimum of 2 m separation from walls, parapets and penthouses is required for rooftops samplers;
- a minimum of 2 m separation from any supporting structure, measures horizontally is required;
- no furnace or incinerator flue is nearby;
- airflow around the sampler is unrestricted;
- the sampler is more than 20 m from the dripline;
- any wire fence and gate to protect the sampler, shall not cause any obstruction during monitoring;
- permission must be obtained to set up the samplers and to obtain access to the monitoring stations; and
- a secured supply of electricity is needed to operate the samplers.

5.2.6 *Baseline Monitoring*

Baseline monitoring shall be carried out to determine the ambient 24-hour TSP and 1-hour levels at the monitoring locations prior to the commencement of the construction works. During the baseline monitoring, there shall not be any construction or dust generating activities in the vicinity of the monitoring stations.

Baseline monitoring shall be carried out for a continuous period of at least two weeks under typical weather conditions with the 24-hour and three 1-hour ambient measurements taken daily at each monitoring location. As noted above, monitoring results of HVS and direct reading methods are not directly comparable and the same instrument must therefore be used for both baseline and impact monitoring in the case of 1-hour TSP. General meteorological conditions (wind speed, direction and precipitation) and notes regarding any significant adjacent dust producing sources shall also be recorded throughout the baseline monitoring period.

The baseline monitoring will provide data for the determination of the appropriate Action levels with the Limit levels set against statutory or otherwise agreed limits.

Baseline checking of ambient dust levels shall be carried out every six months at each monitoring location, when no dusty works activities are in operation. If the EMTL considers that significant changes in the ambient conditions have arisen, a repeat of the baseline monitoring may be carried out to update the baseline levels and air quality criteria, after consultation and agreement with the Engineer, the EATL and the EPD.

5.2.7 *Impact Monitoring*

The monthly schedule of the compliance and impact monitoring programme shall be drawn up by the EMTL one month prior to the commencement of the scheduled construction period. For regular impact monitoring, a sampling frequency of at least once in every six-days shall be strictly observed at all of the monitoring stations for 24-hour TSP monitoring. In case of complaints, 1-hour TSP monitoring shall be conducted at least three times in every six-days when the highest dust impacts are likely to occur. Before commencing the baseline monitoring, the EMTL shall inform the EATL of the impact monitoring programme such that the EATL can conduct an on-site audit to ensure the accuracy of the impact monitoring results.

The specific time to start and stop the 24-hour TSP monitoring shall be clearly defined for each location and shall be strictly followed by the operator.

5.2.8 *Compliance Assessment*

Action and Limit (A/L) levels provide an appropriate framework for the interpretation of monitoring results. The air quality monitoring data shall be checked against the agreed A/L levels as listed in *Tables 5.2c* and *5.2d*.

Table 5.2c ***Derivation of Action and Limit Levels for 24-Hour TSP Monitoring***

Level	Total Suspended Particulates (μg m^{-3})
Baseline	Numerical average of physical measurements prior to construction commencement
Action	For baseline <108 mg m^{-3}, average of 130% of baseline and the Limit level
	For 108 mg m^{-3} < baseline >154 mg m^{-3}, 200 mg m^{-3}
	For baseline >154 mg m^{-3}, 130% of baseline level
Limit	AQO for 24-hour TSP: 260 mg m^{-3}

Table 5.2d ***Derivation of Action and Limit Levels for 1-Hour TSP Monitoring***

Level	Total Suspended Particulates (μg m^{-3})
Baseline	Numerical average of physical measurements prior to construction commencement
Action	For baseline <154 mg m^{-3}, average of 130% of baseline and the Limit level
	For 154 mg m^{-3} < baseline > 269 mg m^{-3}, 350 mg m^{-3}
	For baseline > 269 mg m^{-3}, 130% of baseline level
Limit	EIAO Statutory Limit: 500 mg m^{-3}

5.2.9 *Event and Action Plan (EAP)*

The principle upon which the EAP is based is the prescription of procedures and actions associated with the measurement of certain defined levels of air pollution recorded by the environmental monitoring process and defined in

the tables above. The EMTL shall compare the impact monitoring results with the air quality criteria (*Tables 5.2c* and *5.2d*) established for 24-hour TSP and 1-hour TSP. In cases where exceedance of these criteria occurs, the EMTL, the EATL, the Engineer and the Contractor shall strictly observe the relevant actions of the EAP shown in *Table 5.2e* below.

Table 5.2e Event and Action Plan for Construction Phase Air Quality

EVENT	ENPO		Engineer	Contractor
	EMTL	EATL		
Action Level				
1. Exceedance for one sample	2. Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	4. Increase monitoring frequency to daily to assess efficacy of remedial measures.	3.Confirm receipt of notification of exceedance and notify the Engineer and Contractor in writing.		2.Amend proposals if required by the Engineer or the EATL.
		5.Check monitoring data trends and Contractors' working methods.		3.Implement the remedial actions immediately upon instruction from the Engineer.
2. Exceedance for two or more consecutive samples	2. Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	4. Increase monitoring frequency to daily to assess efficacy of remedial measures.	3.Confirm receipt of notification of exceedance and notify the Engineer and Contractor in writing.	2.Discuss remedial actions required with the EATL and the Contractor.	2.Amend proposals if required by the Engineer or the EATL.
	10.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5.Check monitoring data trends and Contractors' working methods.	3.Ensure agreed mitigation measures are fully implemented.	3.Implement the remedial actions immediately upon instruction from the Engineer.
		6.Discuss remedial actions required with the Engineer and the Contractor.		4.Liaise with the Engineer to optimise the effectiveness of the agreed mitigation.
		7.Ensure agreed mitigation measures are fully implemented.		
		8.Assess the efficacy of remedial actions and keep the Contractor informed.		
		9.If exceedance continues, arrange meeting with Engineer to review implementation and identify further appropriate mitigation measures		

Table 5.2e Event and Action Plan for Construction Phase Air Quality (Continued)

EVENT	EMTL	ENPO EATL	Engineer	Contractor
Limit Level				
	3.Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1.Take immediate action to avoid further exceedance.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2.Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2.Discuss remedial actions required with the EATL and the Contractor.	2.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
		5.Check monitoring data trends and Contractors' working methods.	3.Ensure agreed mitigation measures are fully implemented.	3.Amend proposals if required by the Engineer or the EATL.
		6.Discuss remedial actions required with EPD, the Engineer and the Contractor.		4.Implement remedial actions immediately upon instruction from the Engineer.
		7.Ensure agreed mitigation measures are fully implemented.		5.Liaise with the Engineer to optimise the effectiveness of the agreed mitigation.
		8.Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed.		
2. Exceedance for two or more consecutive samples	3.Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1.Take immediate action to avoid further exceedance.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2.Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2.Discuss remedial actions required with the EATL and the Contractor.	2.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	10.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5.Check monitoring data trends and Contractors' working methods.	3.Ensure agreed mitigation measures are fully implemented.	3.Amend proposals if required by the Engineer or the EATL.
		6.Discuss remedial actions required with EPD, the Engineer and the Contractor.		4.Implement remedial actions immediately upon instruction from the Engineer.
		7.Ensure agreed mitigation measures are fully implemented.		5.Resubmit proposal to EATL and Engineer if the problem is still not under control.

	8.Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed 9.If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	6.Stop the relevant portion of works as determined by the EATL and Engineer, until the exceedance is abated.

5.2.10 *Mitigation Measures*

The EIA Report has recommended air quality control and mitigation measures during the construction phases of the Project. These are outlined in the Implementation Schedule (in *Annex B* of this EM&A Manual). In the event of exceedances or complaints, the Contractor shall be responsible for reviewing the effectiveness of these measures and for proposing, designing and implementing alternative measures as appropriate.

5.3 *OPERATIONAL AIR QUALITY MONITORING*

5.3.1 *Introduction*

Fireworks display emissions impact on air quality has been assessed and it is predicted that fireworks would only contribute to marginal increase in the air pollutant levels in the atmosphere; operational monitoring is proposed for verification proposes, due to the paucity of published scientific data on this subject.

5.3.2 *Monitoring Locations*

The eastern and western of the Theme Park are bounded by hills. Consequently, pollutants from the fireworks displays are more likely to be dispersed either to the north or south. Two monitoring stations have been be proposed at the south and north boundaries of the Theme Park to provide information for verification purposes. The recommended monitoring locations are presented in *Table 5.3a* and shown in *Figure 5.2b*.

Table 5.3a ***EM&A Representative Air Quality Monitoring Locations During Operational Phase***

ASR No.	Identity/Description
A2	Roof Top of Police Station at the Entrance to the Theme Park
A3	Roof Top of Theme Park Resort

5.3.3 *Monitoring Parameters, Criteria and Methodology*

RSP, H_2S, heavy metals and dioxins shall be monitored to provide information for verification purposes. Daily RSP, heavy metals including barium (Ba) and copper (Cu) and dioxins and hourly H_2S shall be monitored at the designated monitoring stations. The methodologies for the monitoring of the above mentioned parameters are summarized in *Table 5.3b* below.

Table 5.3b ***Recommended Monitoring Methodology***

Monitoring Parameters	Sampling Time	Recommended Methodology
RSP	24 hours	High Volume Sampler
Heavy Metal (Ba and Cu)	24 hours	USEPA Method IO-2 and IO3.3 (XRF)
Dioxins	24 hours	USEPA Method TO-9A

Monitoring Parameters	Sampling Time	Recommended Methodology
Hydrogen Sulphide	During Fireworks Displays	Absorption - Methylene Blue - Spectrophotometric Analysis

5.3.4 *Baseline Monitoring*

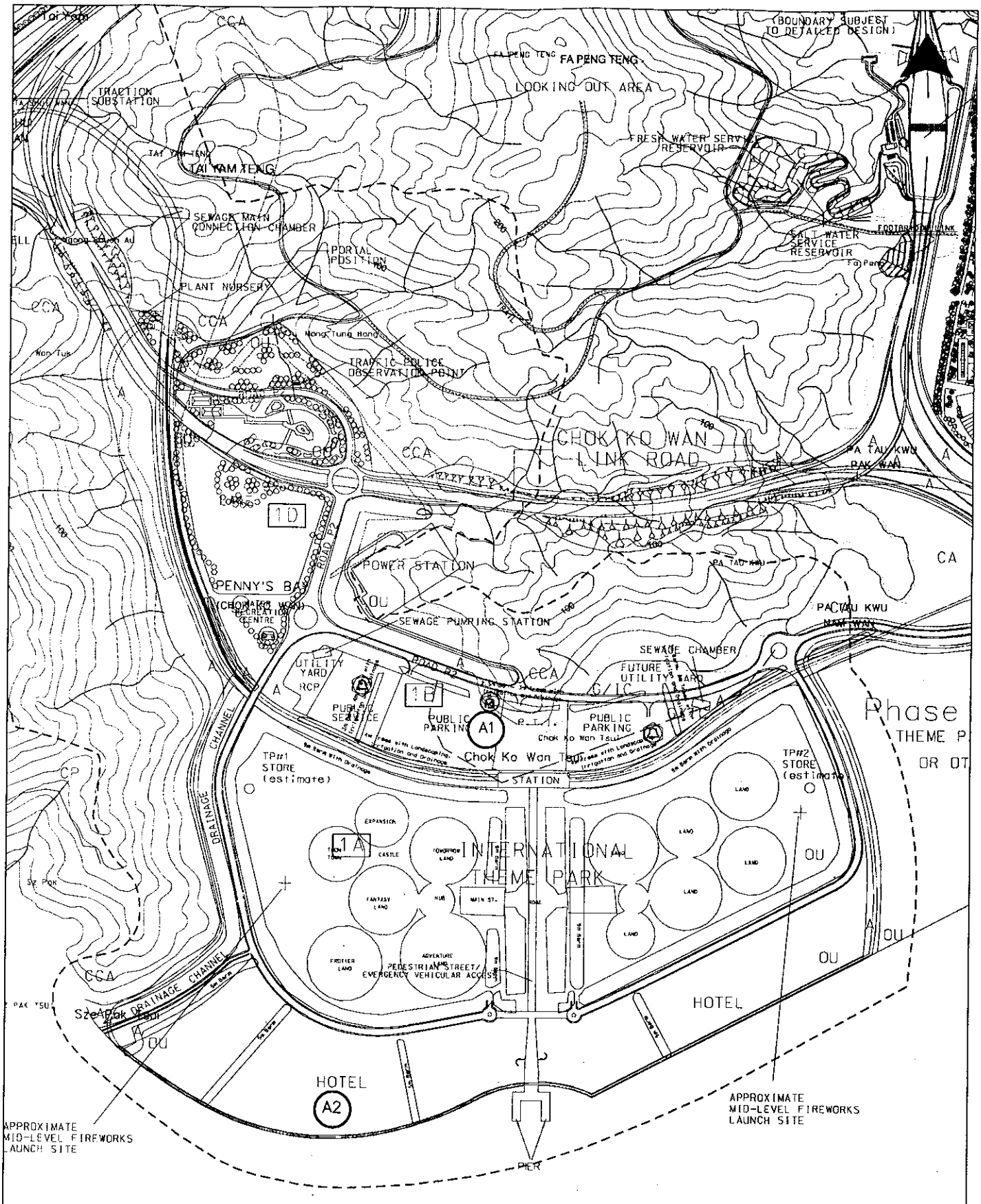
Baseline air quality monitoring of RSP, H_2S, heavy metals and dioxins shall be carried out at designated monitoring locations for at least 7 consecutive days prior to the commencement of the Theme Park's operations to ascertain the background concentration for the above mentioned pollutants.

5.3.5 *Impact Monitoring*

After commencement of the operations, impact monitoring shall be carried out at the designated monitoring locations during the fireworks displays, once every three months throughout the first operational year. The future monitoring programme after the first operation year shall be reviewed based on the monitoring results in the first year of operation.

5.4 *MITIGATION MEASURES*

The Project EIA has recommended mitigation measures that should be implemented during the construction and operational phases of the Project. Details of all the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).



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A1 ROOF TOP OF POLICE STATION

A2 ROOF TOP OF RESORT IN THEME PARK

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FIGURE 5.2b

LOCATION OF AIR MONITORING STATIONS DURING OPERATION

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6 NOISE MONITORING

6.1 INTRODUCTION

In this section, the requirements, methodology, equipment, monitoring locations and mitigation measures for the monitoring and audit of noise impacts associated with the construction and operational phases of Project are described.

6.2 CONSTRUCTION PHASE EM&A

6.2.1 *Methodology and Criteria*

Noise level measurements shall be carried out using the methodology set out in *Sub-section* 3 of the *Annex - General Calibration and Measurement Procedures,* as stated in the *Technical Memorandum on Noise from Construction Work other than Percussive Piling* (GW-TM).

The appropriate parameter for measuring construction noise impacts shall be the A-weighted equivalent continuous sound pressure level (L_{Aeq}) measured in decibels (dB). The two statistical sound levels L_{10} and L_{90}; the levels exceeded for 10 and 90 percent of the time respectively, shall also be recorded during the monitoring for reference. A sample data record sheet is shown in *Annex A (1.3)* for reference.

Whilst the *Noise Control Ordinance* (NCO) does not provide for the statutory control of construction activities occurring on weekdays during normal working hours (that is, Monday to Saturday inclusive 0700-1900), a daytime limit of $L_{Aeq\ (30\ minute)}$ 75dB, recommended in the *Practice Note for Professional Persons - Noise from Construction Activities - Non-statutory Controls, EPD, May 1993* (ProPECC PN2/93) was proposed in the EIA Report and agreed with EPD as the appropriate criterion for all residential dwellings; while a daytime limit of $L_{Aeq\ (30\ minute)}$ 70dB was proposed in the EIA Report as the appropriate criterion for all educational institutions during normal school days and $L_{Aeq\ (30\ minute)}$ 65dB during examination periods.

The NCO provides statutory controls on general construction works during restricted hours (ie 1900-0700 hours Monday to Saturday and at any time on Sundays and public holidays). The ANLs for evenings and holidays and for night-time are dependent on the Area Sensitivity Rating at the NSR. The relevant ANLs are provided in *Table 6.2a.*

Table 6.2a *Acceptable Noise Levels (ANLs)*

Time Period	Area Sensitivity Rating		
	A	B	C
All days during the evening (1900-2300 hours) and general holidays (including Sundays) during the day and evening (0700-2300 hours)	60	65	70
All days during the night-time (2300-0700)	45	50	55

6.2.2 *Monitoring Equipment*

The EMTL shall be responsible for providing and maintaining a sufficient number of sound level meters to conduct the necessary baseline monitoring, regular impact monitoring and *ad hoc* monitoring at the agreed monitoring locations.

Sound level meters and calibrators shall comply with the *International Electrotechnical Commission (IEC) Publication 651 : 1979 (Type 1) and 804 : 1985 (Type 1)* specification as referred to in the GW-TM. The sound level meters shall be supplied and used with the manufacturers recommended wind shield and with a tripod.

The calibration of the sound level meters shall be carried out in accordance with the manufacturer's requirements. The sound level meters, including the calibrators, shall be verified by the manufacturers once every two years to ensure that they perform to the same level of accuracy as stated in the manufacturers specifications. Calibrated hand-held anemometers capable of measuring the wind speed in ms^{-1} shall also be supplied for the measurement of wind speeds during noise monitoring periods. The anemometers shall be used and calibrated in accordance with the manufacturers recommendations.

Sound level meters shall be calibrated using a portable calibrator before and after each measurement. The calibration levels shall be noted with the measurement results and where the difference between the calibration levels is greater than 1 dB(A) the measurement shall be repeated.

The EMTL shall ensure the equipment shall be kept in a good state of repair in accordance with the manufacturer's recommendations and maintained in proper working order with sufficient spare equipment available in the event of breakdown to maintain the planned monitoring programme.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5 ms^{-1} or wind with gusts exceeding 10 ms^{-1}. The wind speed shall be checked with the hand-held anemometers. *Table 6.2b* lists the suggested quantities of noise monitoring equipment required for the Works, although the exact requirements will depend upon the final organisation of the EM&A programme, and the ENPO's manpower resources.

Table 6.2b *Noise Monitoring Equipment*

Description	Quantity
Noise meter	1 unit
Calibrator	1 unit
Hand-held anemometer	1 unit

6.2.3 *Monitoring Locations*

Based on the noise sensitive receivers identified and stated within the EIA Report, representative noise monitoring locations have been determined in the vicinity of the works associated with the construction of the Project. Their locations are listed below in *Table 6.2c* and depicted in *Figure 6.2a*. Prior to the commencement of the EM&A Programme, the proposed noise monitoring locations will be discussed and agreed with the Engineer, EATL and the EPD.

Table 6.2c *EM&A Representative Monitoring Locations*

NSR No	Identity/Description
NM1	Sea Crest Villa (Peng Chau)
NM2	Crestmont Villa (Discovery Bay)
NM3	Luk Keng Tsuen

If, due for example, there are difficulties obtaining access to the proposed noise monitoring locations, alternative monitoring locations may be proposed. The selection of these alternative monitoring locations shall be based on the following criteria:

- at locations close to the major site activities which are likely to have noise impacts;
- close to the NSRs (any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing arts centre shall be considered as a NSR); and
- for monitoring locations located in the vicinity of the NSRs, care shall be taken to cause minimal disturbance to the occupants during monitoring.

The monitoring locations shall normally be at a point 1 m from the exterior of the sensitive receiver building façade and at a height approximately 1.2 m above the ground or at the height that has the least obstructed view of the construction activity in relation to the receiver. If there is a problem with access to the normal monitoring position, an alternative position may be chosen, and a correction to the measurements shall be made. For reference, a correction of +3dB(A) shall be made to the free field measurements. The EMTL shall agree with the EATL and EPD on the monitoring positions and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and impact monitoring shall be carried out at the same positions.

6.2.4 *Baseline Monitoring*

The EMTL shall carry out the baseline noise monitoring prior to the commencement of the construction works. To obtain fully satisfactory baseline results, a waterproof sound level meter and noise logger shall be used. Baseline noise levels shall be measured over one consecutive 7-day calendar week at a minimum logging interval of 15 minutes. The L_{Aeq}, L_{10} and L_{90} shall be recorded at the specified interval. The survey period shall be selected prior to the commencement of construction activities and so as to avoid other atypical noise sources. The proper functioning of the logger shall be ensured during this period and shall be visited for a period of not less than one hour every two days to ensure its continued operation and to detail specifics of audible noise sources at the monitoring locations. The calibration of the logger kit shall be as recommended by the manufacturer. Measurements shall be recorded to the nearest 0.1 dB.

Checking for changes in the baseline noise levels throughout the construction of Project shall be carried out by taking "sample" noise measurements every six months, when no noisy construction activities are in progress. If significant changes that can be validated are observed to have arisen, the baseline may be adjusted accordingly after consultation and agreement with the Engineer, the EATL and the EPD.

6.2.5 *Impact Monitoring*

During normal construction working hours (0700-1900 Monday to Saturday), monitoring of $L_{Aeq, 30min}$ noise levels (as six consecutive $L_{Aeq, 5 min}$ readings) shall be carried out at the agreed monitoring locations once every six days in accordance with the methodology in the GW-TM. The six consecutive $L_{Aeq, 5 min}$ readings shall be used to calculate the $L_{Aeq, 30min}$ noise level and this shall be compared to the $L_{Aeq, 30min}$ noise criteria and reported against.

If restricted hours works are undertaken, monitoring of $L_{Aeq\ 5min}$ noise levels shall be carried out at the agreed monitoring stations at the same frequency as specified for normal working hours. Three consecutive $L_{Aeq, 5 min}$ readings shall be taken to ensure the validity of the results. Each of the $L_{Aeq, 5min}$ noise readings shall be compared to the $L_{Aeq, 5min}$ noise criteria and reported against.

In relation to the monitored noise levels, other noise sources such as road traffic or aircraft may make a significant contribution to the overall noise environment. Therefore, the results of the noise monitoring activities will take into account any such influencing factors which were not present during the baseline monitoring period. All measurements shall be recorded to the nearest 0.1 dB.

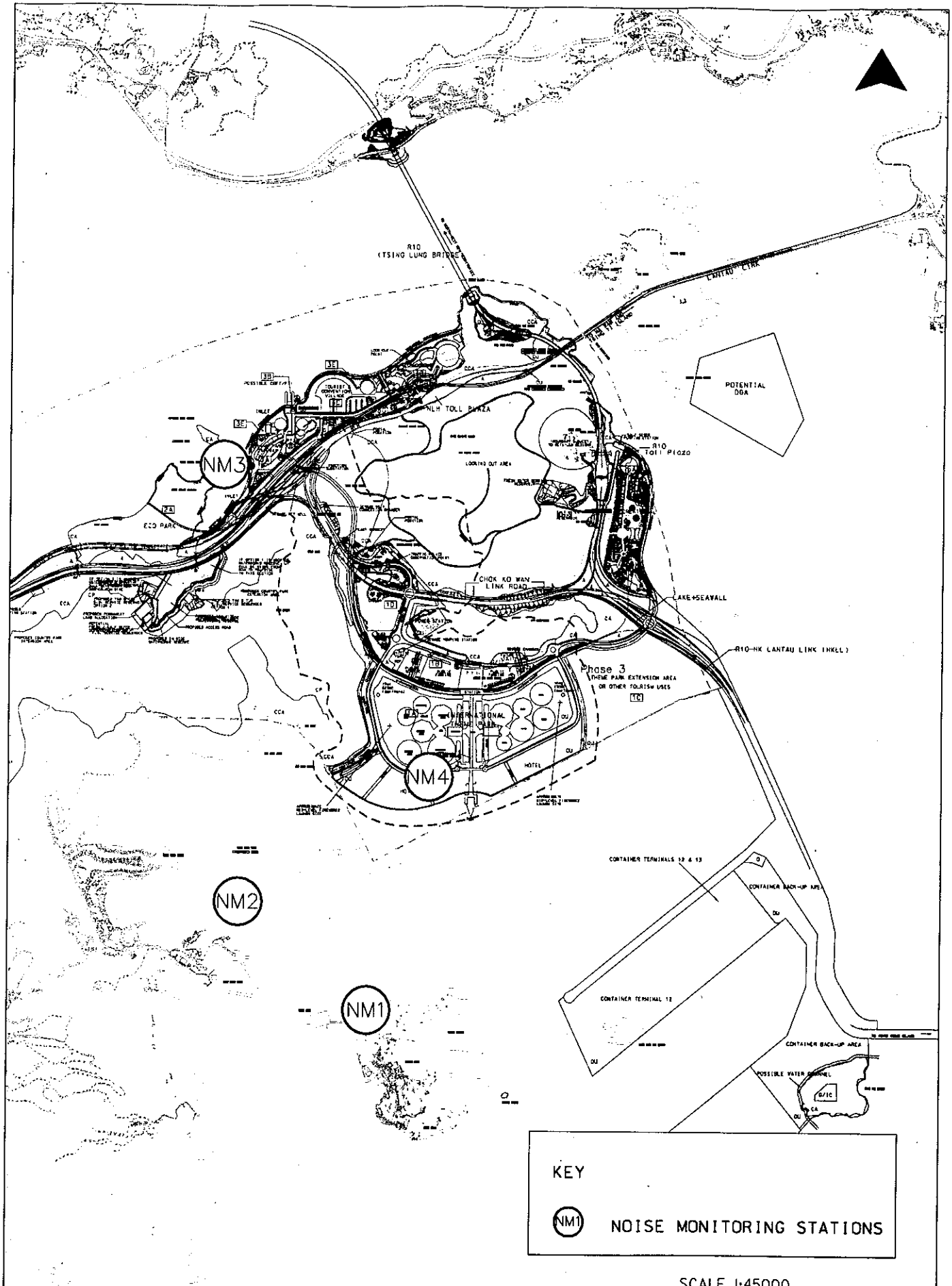

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FIGURE 6.2a

LOCATION OF NOISE MONITORING STATIONS

USTN FILE: C:\819\version5\asrnoplo4.dgn
DATE: 01/2000

Environmental
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Management

ERM

6.2.6 *Compliance Assessment*

Action and Limit (A/L) Levels provide an appropriate framework for the interpretation of monitoring results. As an Area Sensitivity Rating has been assigned to individual affected NSRs, it is proposed that the interpretation of monitoring results is undertaken through checking them against the Action and Limit (A/L) Levels defined in *Table 6.2d.*

Table 6.2d ***Action and Limit Levels for Construction Noise dB(A)***

Time Period	Action	Limit
0700-1900 on any day not being a Sunday or public holiday.	When one documented complaint is received	75 dB(A) (1)
1900-2300 on all days and 0700-2300 on general holidays (including Sundays) .	When one documented complaint is received	60/65/70 dB(A) (2) (3)
2300-0700 on all days.	When one documented complaint is received	45/50/55 dB(A) (2) (3)

(1) For educational establishments the limit level shall be 70 dB(A), reduced to 65 dB(A) during examination periods.

(2) Acceptable Noise Levels for Area Sensitivity Rating of A/B/C.

(3) NSR1 and 2 have been assigned an ASR of 'A' and NSR3 has been assigned an ASR of B

To account for cases where ambient noise levels, as identified by baseline monitoring, approach or exceed the stipulated Limit Level prior to commencement of construction, a Maximum Acceptable Impact Level, which incorporates the baseline noise level and the identified construction noise Limit Level, may be defined upon agreement with the EPD. This amended level will, therefore, be greater than 75 dB(A) and will represent the maximum acceptable noise level at a specific monitoring station. Correction factors for the effects of acoustic screening and / or architectural features of NSRs may also be applied for, from the EPD, as specified in the GW-TM.

For the purposes of compliance checking, after taking into account any adjustments agreed with EPD, comparison with either the Limit or the Maximum Acceptable Impact Level shall represent the governing criteria for noise impact assessment during the Project EM&A.

6.2.7 *Event and Action Plan (EAP)*

The principle on which the EAP is based is the prescription of procedures and actions associated with the measurement of defined levels of noise impact recorded by the environmental monitoring process and defined in the table above. In cases where exceedance of these criteria occurs, the EMTL, the

EATL, the Engineer and the Contractor shall strictly observe the relevant actions of the EAP shown in *Table 6.2e*.

Table 6.2e Event and Action Plan for Construction Noise

EVENT	ENPO		Engineer	Contractor
	EMTL	EATL		
Action Level				
1. Exceedance for one sample	2. Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	4. Increase monitoring frequency to daily to assess efficacy of remedial measures.	3.Confirm receipt of notification of exceedance and notify the Engineer and Contractor in writing.		2.Amend proposals if required by the Engineer or the EATL.
		5.Check monitoring data trends and Contractors' working methods.		3.Implement the remedial actions immediately upon instruction from the Engineer.
2. Exceedance for two or more consecutive samples	2. Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	4. Increase monitoring frequency to daily to assess efficacy of remedial measures.	3.Confirm receipt of notification of exceedance and notify the Engineer and Contractor in writing.	2.Discuss remedial actions required with the EATL and the Contractor.	2.Amend proposals if required by the Engineer or the EATL.
	10.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5.Check monitoring data trends and Contractors' working methods.	3.Ensure agreed mitigation measures are fully implemented.	3.Implement the remedial actions immediately upon instruction from the Engineer.
		6.Discuss remedial actions required with the Engineer and the Contractor.		4.Liaise with the Engineer to optimise the effectiveness of the agreed mitigation.
		7.Ensure agreed mitigation measures are fully implemented.		
		8.Assess the efficacy of remedial actions and keep the Contractor informed.		
		9.If exceedance continues, arrange meeting with Engineer to review implementation and identify further appropriate mitigation measures		

Table 6.2e Event and Action Plan for Construction Noise (Continued)

Limit Level				
	3.Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1.Take immediate action to avoid further exceedance.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2.Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2.Discuss remedial actions required with the EATL and the Contractor.	2.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
		5.Check monitoring data trends and Contractors' working methods.	3.Ensure agreed mitigation measures are fully implemented.	3.Amend proposals if required by the Engineer or the EATL.
		6.Discuss remedial actions required with EPD, the Engineer and the Contractor.		4.Implement remedial actions immediately upon instruction from the Engineer.
		7.Ensure agreed mitigation measures are fully implemented.		5.Liaise with the Engineer to optimise the effectiveness of the agreed mitigation.
		8.Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed.		
2. Exceedance for two or more consecutive samples	3.Repeat measurement to confirm findings.	1.Identify the source(s) of impact.	1.Remind the Contractor of his contractual obligations and discuss remedial actions to be implemented.	1.Take immediate action to avoid further exceedance.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	2.Confirm receipt of notification of exceedance and notify the Engineer, Contractor and EPD in writing.	2.Discuss remedial actions required with the EATL and the Contractor.	2.In consultation with the EATL and the Engineer, submit proposals for remedial actions to Engineer within three working days of notification.
	10.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.	5.Check monitoring data trends and Contractors' working methods.	3.Ensure agreed mitigation measures are fully implemented.	3.Amend proposals if required by the Engineer or the EATL.
		6.Discuss remedial actions required with EPD, the Engineer and the Contractor.		4.Implement remedial actions immediately upon instruction from the Engineer.
		7.Ensure agreed mitigation measures are fully implemented.		5.Resubmit proposal to EATL and Engineer if the problem is still not under control.
		8.Assess the efficacy of remedial actions and keep EPD, Engineer and Contractor informed		6.Stop the relevant portion of works as determined by the EATL and Engineer, until the exceedance is abated.

9.If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.

6.3 OPERATIONAL NOISE MONITORING

6.3.1 *Introduction*

The operational noise assessment did not predict any exceedance of the relevant noise criteria due to the operation of the Theme Park and associated developments. Despite this finding, noise monitoring requirements are recommended during the operational phase of the Theme Park in order to ensure compliance with the operational noise criteria. It is recommended that HKITP shall be responsible for the operational phase monitoring. A qualified monitoring contractor or laboratory shall be employed to carry out the proposed monitoring.

In addition, it is recommended that monitoring should be undertaken during the fireworks display to ensure that the resulting noise level does not exceed the required criteria, the duration does not exceed the maximum limit of 5 minutes for mid-level shows, and that the maximum bursting height limit of 100 m is not exceeded.

6.3.2 *Methodology and Criteria*

During the operational phase, it is recommended that noise monitoring is undertaken at three locations in order to assess both fixed plant noise and noise from the fireworks displays. For the monitoring of fixed plant noise, the monitoring methodology, parameters and criteria shall generally be as defined in *Section 6.2.1*. However, for the monitoring of fireworks noise, the appropriate parameter shall be the $L_{Aeq(15\ mins)}$ (measured as three consecutive $L_{Aeq,\ 5\ min}$ readings).

The monitoring frequencies shall also vary from those stated in *Section 6.2.1*. For the fixed plant noise and fire works noise, it is envisaged that following the opening of the park and following any significant changes to the park's operations or fireworks displays (such as the introduction of a new ride or a change in the type or number of fireworks included within the display) noise monitoring will be undertaken once every six days for one month to ensure compliance with the noise criteria. At all other times, throughout the operational lifetime of the Theme Park, noise monitoring of fixed plant and fireworks noise shall be undertaken once a month.

6.3.3 *Monitoring Equipment*

The same monitoring equipment shall be used as specified in *Section 6.2.2*, with the sound level meters in compliance with the *International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1)* specifications. Calibration procedures and other measurement conditions are also specified in *Section 6.2.2*.

6.3.4 *Monitoring Locations*

The three noise monitoring locations are shown in *Figure 6.3a* and summarised in *Table 6.3a*. Should the proposed noise monitoring locations be relocated, or other locations added, then prior approval shall be obtained from the EATL, the Engineer and the EPD.

Table 6.3a EM&A Operational Noise Monitoring Stations

NSR No.	Identity/Description
NM1	Sea Crest Villa, Peng Chau
NM2	Crestmont Villa, Discovery Bay
NM4	The Theme Park perimeter (At unshielded position along the top of the 9 m high perimeter earth berm)

6.3.5 *Baseline Monitoring*

A monitoring exercise shall be undertaken at NM1 and NM2, prior to the opening of the Theme Park in order establish the baseline conditions. The baseline monitoring survey period should be selected to ensure that it avoids other atypical noise sources. The baseline monitoring should be undertaken in accordance with the specification described in *Section 6.2.4* above. No baseline monitoring is required at NM3.

6.3.6 *Impact Monitoring*

The impact monitoring should be undertaken generally in accordance with the specification described in *Section 6.2.5* above. However, the $L_{Aeq(15\ mins)}$ (measured as three consecutive $L_{Aeq,\ 5\ min}$ readings) shall be measured when monitoring fireworks noise at NM1 and NM2, and the $L_{Aeq\ (30\ minute)}$ shall be monitored at NM3 regardless of the time of day when the monitoring is undertaken.

6.3.7 *Compliance Assessment - Fixed Plant Noise*

When assessing the fixed plant noise, the noise impact monitoring data shall be compared against agreed Action Levels and Limit Levels derived from the EIAO TM. As Area Sensitivity Ratings have been assigned to the affected NSRs it is proposed that the interpretation of the monitoring results for fixed plant noise is undertaken by checking them against the Action and Limit (A/L) Levels defined in *Table 6.3b* below.

Table 6.3b Action and Limit Levels for Operational Noise dB(A)

Time Period	Action	Limit
0700-2300 on all days	When one documented complaint is received	50 dB(A)
2300-0700 on all days	When one documented complaint is received	45 dB(A)

In addition to the above noise limits at 'off-site' NSR locations, the HKITP have agreed that they will adhere to a maximum fixed plant site perimeter noise level (ie Limit Level) of $L_{Aeq\ (30\ minute)}$ 75dB at the perimeter of the Theme Park (MN3).

Impact monitoring for fixed plant noise shall not be undertaken during fireworks displays.

6.3.8 *Event and Action Plan - Fixed Plant Noise*

In the event that the fixed plant noise exceeds the noise criteria identified in *Table 6.3b,* the HKITP, their Noise Monitoring Contractor and the Independent Checker shall strictly observe the relevant actions of the EAP as shown in *Table 6.3c.*

Table 6.3c Event and Action Plan for Fixed Plant Operational Noise

Exceedance	Noise Monitoring Contractor	Independent Checker	HKITP
Action Level			
1. Exceedance for one sample	1.Identify the source(s) of impact.	1.Remind the HKITP of his contractual obligations and discuss remedial actions to be implemented.	1.Take immediate action to avoid further exceedance.
	2. Issue notification of exceedance and notify the IEC and EPD in writing.	2.Check monitoring data trends and HKITP operations.	2.In consultation with the IEC, develop proposals for remedial actions within three working days of notification.
	3.Repeat measurement to confirm findings.		3.Amend proposals if required by the IEC.
	4. Increase monitoring frequency to assess efficacy of remedial measures.		4.Implement remedial actions immediately upon agreement with IEC.
2. Exceedance for two or more consecutive samples	1.Identify the source(s) of impact.	1.Confirm receipt of notification of exceedance and notify HKITP in writing.	1.Take immediate action to avoid further exceedance.
	2. Issue notification of exceedance and notify the IEC and EPD in writing.	2.Check monitoring data trends and HKITP operations.	2.In consultation with the IEC, submit proposals for remedial actions within three working days of notification.
	3.Repeat measurement to confirm findings.	3.Discuss remedial actions required with HKITP.	3.Amend proposals if required by the IEC.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	4.Ensure agreed mitigation measures are fully implemented	4.Implement remedial actions immediately upon agreement with IEC.
	5.Assess the efficacy of HKITP's remedial actions and keep EPD, and IEC informed. 6.If exceedance continues, arrange a meeting with IEC 7.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.		

Table 6.3c Event and Action Plan for Fixed Plant Operational Noise (Continued)

Exceedance Limit Level	Noise Monitoring Contractor	Independent Checker	HKITP
1. Exceedance for one sample	1.Identify the source(s) of impact.	1.Confirm receipt of notification of exceedance and notify HKITP in writing.	1.Take immediate action to avoid further exceedance.
	2. Issue notification of exceedance and notify the IEC and EPD in writing.	2.Check monitoring data trends and HKITP operations.	2.Agree remedial actions with the IEC within two working days of notification.
	3.Repeat measurement to confirm findings.	3.Discuss remedial actions required with HKITP.	3.Amend proposals if required by the IEC.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	4.Ensure agreed mitigation measures / remedial actions are fully implemented	4.Implement remedial actions immediately upon agreement with IEC.
	5.Assess the efficacy of HKITP's remedial actions and keep EPD and IEC informed.		
2. Exceedance for two or more consecutive samples	1.Identify the source(s) of impact.	1.Confirm receipt of notification of exceedance and notify HKITP in writing.	1.Take immediate action to avoid further exceedance.
	2. Issue notification of exceedance and notify the IEC and EPD in writing.	2.Check monitoring data trends and HKITP operations.	2.Submit proposals for remedial actions to the IEC within three working days of notification.
	3.Repeat measurement to confirm findings.	3.Discuss remedial actions required with HKITP.	3.Amend proposals if required by the IEC.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	4.Assess the efficacy of remedial actions and keep EPD, IEC and Contractor informed.	4.Implement remedial actions immediately upon agreement with IEC.
	5. Investigate the cause of the exceedance and inform EPD and the IEC.	5.If exceedance continues, consider what portion of the work is responsible and instruct HKITP to stop that portion of work until the exceedance is abated.	5.Resubmit proposal to IEC and Engineer if the problem is still not under control.
	6.Discuss remedial actions required with EPD and the IEC.		6.Stop the relevant portion of works as determined by the IEC, until the exceedance is abated.
	7. Assess the efficacy of HKITP's remedial actions and keep EPD, and IEC informed.		
	8.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.		

6.3.9 *Compliance Assessment - Fireworks Noise*

During fireworks displays, the HKITP have agreed to comply with a maximum noise level of $L_{Aeq\ (15\ minute)}$ 55dB at NM 1 and NM2.

6.3.10 *Event and Action Plan - Fireworks Displays*

In the event that the noise from the fireworks displays exceeds of the noise limit identified in *Section 6.3.9*, the HKITP, their Noise Monitoring Contractor and the Independent Checker shall strictly observe the relevant actions of the EAP as shown in *Table 6.3d*.

Appropriate remedial actions shall also be immediately implemented if the duration of the fireworks displays or maximum burst height exceeds the stated limits.

Table 6.3d Event and Action Plan for Operational Noise - Fireworks Displays

Exceedance Limit Level	Noise Monitoring Contractor	Independent Checker	HKITP
1. Exceedance for one sample	1. Issue notification of exceedance and notify the IEC and EPD in writing.	1.Confirm receipt of notification of exceedance and discuss with HKITP.	1.Take immediate action to avoid further exceedance.
	2. In combination with HKITP identify the exact reason for the exceedance.	2.Check monitoring data trends and HKITP operations.	2.Submit proposals for remedial actions to the IEC within three working days of notification.
	3.Repeat measurement to confirm findings.	3.Discuss remedial actions required with HKITP.	3.Amend proposals if required by the IEC.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	4.Ensure agreed mitigation measures are fully implemented	4.Implement remedial actions immediately upon agreement with IEC.
	5.Assess the efficacy of HKITP's remedial actions and keep EPD and IEC informed.		
2. Exceedance for two or more consecutive samples	1. Issue notification of exceedance and notify the IEC and EPD in writing.	1. Confirm receipt of notification of exceedance and discuss with HKITP.	1.Take immediate action to avoid further exceedance.
	2. In combination with HKITP identify the exact reason for the exceedance.	2.Check monitoring data trends and HKITP operations.	2.Advise IEC of remedial proposals within one working day of notification.
	3.Repeat measurement to confirm findings.	3.Discuss remedial actions required with HKITP.	3.Amend proposals if required by the IEC.
	4. Increase monitoring frequency to assess efficacy of remedial measures.	4.Assess the efficacy of remedial actions and keep EPD and noise monitoring Contractor informed.	4.Implement remedial actions immediately upon agreement with IEC.
	7. Assess the efficacy of HKITP's remedial actions and keep HKITP, EPD, and IEC informed.	5.If exceedance continues advise HKITP to immediately stop/refine fireworks display.	5.Instruct noise monitoring Contractor to assess efficiency of remedial actions.
	8.If exceedance stops after the implementation of the mitigation measures, cease additional monitoring.		6. If exceedance persists immediately stop /refine fireworks display.

6.4 *MITIGATION MEASURES*

The Project EIA has recommended noise control and mitigation measures for the construction and operational phases of the Project. Details of all the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

7 WATER QUALITY MONITORING

7.1 INTRODUCTION

In this section, the requirements, methodology, equipment, monitoring locations and mitigation measures for the monitoring and audit of water quality impacts from the construction of the Project are presented.

7.2 MARINE WATER QUALITY MONITORING

7.2.1 *Methodology and Criteria*

Marine water quality monitoring shall be carried out by the EMTL to ensure that any deteriorating water quality is readily detected and that timely action is taken to rectify the situation. The appropriate water quality mitigation measures are outlined in the Implementation Schedule (in *Annex B* of this EM&A Manual).

7.2.2 *Water Quality Monitoring*

The objectives of the water quality monitoring programme are as follows:

- to determine the effectiveness of the operational controls and mitigation measures employed, and the need for supplementary mitigation measures; and
- to check compliance with relevant WQOs;

Parameters to be measured *in situ* are:

- Dissolved oxygen (DO) (% saturation);
- Temperature (°C);
- Turbidity (NTU);
- Salinity (mg L^{-1});
- pH; and
- Water depth (m).

Parameters to be measured in the laboratory are:

- Dissolved oxygen (DO) (in mg L^{-1});
- suspended solids (mg L^{-1});
- total inorganic nitrogen (mg L^{-1}); and
- un-ionised ammonia (mg L^{-1}).

In addition to the water quality parameters, other relevant data shall also be measured and recorded, including monitoring location / position, time, weather conditions, sea conditions (where appropriate), tidal stage (where appropriate), special phenomena and work activities at the construction site.

A full listing of the water quality monitoring parameters to be monitored at each location is given in *Table 7.3d*, and a sample monitoring record sheet shown in *Annex A(1.4)*.

7.2.3 *Monitoring Equipment*

For water quality monitoring, the following equipment shall be supplied by the EMTL and approved by the EATL and the Engineer.

Dissolved Oxygen and Temperature Measuring Equipment

The instrument shall be a portable, weatherproof dissolved oxygen measuring instrument complete with cable, sensor, comprehensive operation manuals, and shall be operable from a DC power source. It shall be capable of measuring:

- dissolved oxygen levels in the range of 0 - 20 mg L^{-1} and 0 - 200% saturation; and
- a temperature of 0 - 45 degrees Celsius.

It shall have a membrane electrode with automatic temperature compensation complete with a cable of not less than 25 m in length. Sufficient stocks of spare electrodes and cables shall be available for replacement where necessary. (For example, YSI model 59 metre, YSI 5739 probe, YSI 5795A submersible stirrer with reel and cable or an approved similar instrument).

Turbidity Measurement Equipment

Turbidity within the water shall be measured in-situ by the nephelometric method. The instrument shall be a portable, weatherproof turbidity-measuring unit complete with cable, sensor and comprehensive operation manuals. The equipment shall be operated from a DC power source, it shall have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU and shall be complete with a cable with at least 25 m in length (Hach 2100P or an approved similar instrument).

The turbidity meter shall be calibrated to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg L^{-1}). After calibration, turbidity measurements shall be taken as a true representation of

levels of suspended solids only before laboratory test results for suspended solids are known.

Water Depth Gauge

A portable, battery-operated echo sounder (Seafarer 700 or a similar approved instrument) shall be used for the determination of water depth at each designated monitoring station. This unit shall either be hand-held or affixed to the bottom of the work boat if the same vessel is to be used throughout the monitoring programme.

Salinity Measurement Instrument

A portable salinometer capable of measuring salinity in the range of 0 - 40 mg L^{-1} shall be provided for measuring salinity of the water at each monitoring location.

pH Measuring Instrument

A portable pH meter shall be provided for measuring pH of the water at each monitoring location, which is approved by the EATL.

Water Sampling Equipment

A water sampler, consisting of a transparent PVC or glass cylinder of not less than two litres which can be effectively sealed with cups at both ends, shall be used (Kahlsico Water Sampler 13SWB203 or an approved similar instrument). The water sampler shall have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth.

Water samples for SS measurements shall be collected in high density polythene bottles, packed in ice (cooled to 4 ^{o}C without being frozen), and delivered to a HOKLAS laboratory as soon as possible after collection.

Positioning Device

A boat-fixed type digital Differential Global Positioning System (DGPS) shall be used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

7.2.4 *Testing Protocols*

All *in situ* monitoring instruments shall be checked, calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at 3-monthly intervals throughout all stages of the water quality monitoring. Responses of

sensors and electrodes shall be checked with certified standard solutions before each use. Wet bulb calibration for a DO meter shall be carried out before measurement at each monitoring location. The turbidity meter shall be calibrated to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg l^{-1}) where possible.

For the on-site calibration of field equipment, the *BS 1427 : 1993, Guide to Field and On-Site Test Methods for the Analysis of Waters* shall be observed. Sufficient stocks of spare parts shall be maintained for replacements when necessary. Backup monitoring equipment shall also be made available so that monitoring can proceed uninterrupted even when equipment is under maintenance, calibration etc.

7.2.5 *Laboratory Analysis*

All laboratory work shall be carried out in a HOKLAS accredited laboratory. Water samples of about 1,000 mL shall be collected at the monitoring and control stations for carrying out the laboratory determinations. The determination work shall start within 24 hours after collection of the water samples. The analyses shall follow the standard methods according to *Table 7.2a* and as described in APHA *Standard Methods for the Examination of Water and Wastewater, 19th Edition*, unless otherwise specified.

Table7.2a ***Analytical Methods to be Applied to Marine Water Quality Samples***

Determinant	Standard Method
Suspended solids	APHA 2540D
Total inorganic nitrogen	APHA 4500-N_{org} /NO_3; or equivalent methods subject to approval of DEP.
Ammonia	APHA 4500-NH_3G

For each of the testing methods details shall be submitted to the DEP for approval prior to the commencement of the monitoring programme. The submitted information should include pre-treatment procedures, instrument use, Quality Assurance/Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per-batch etc), detection limits and accuracy. The QA/QC details shall be in accordance with requirements of HOKLAS or another internationally accredited scheme. The QA/QC results shall be reported. EPD may request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. Additional duplicate samples may be required by EPD for inter-laboratory calibration. Remaining samples after analysis shall be kept by the laboratory for 3 months in case repeat analysis is required. If *in-house* or non-standard methods are proposed, details of the method verification should, if required, be submitted to the EPD. In any circumstances, the sample testing shall have comprehensive quality assurance and quality control programmes. The laboratory shall be prepared to demonstrate the quality control programmes to the EPD or their representative if and when required.

7.3 *MARINE WATER QUALITY MONITORING LOCATIONS*

The water quality monitoring stations are shown in *Figure 7.3a*. Six Sensitive Receiver (SR) Stations have been chosen on the basis of their proximity to the dredging and filling operations and thus the greatest potential for water quality impacts, as detailed in *Table 7.3a*. The six SR monitoring locations are:

- SR1: Kau Yi Chau;
- SR2: Discovery Bay;
- SR3: Sze Pak Wan;
- SR4: Ma Wan Fish Culture Zone South;
- SR5: Ma Wan Fish Culture Zone North; and
- SR6: Tung Wan Beach.

Table 7.3a ***Locations of Marine Water Quality Monitoring Stations***

Station	Easting	Northing
SR1	825 607	816 216
SR2	820 268	817 870
SR3	821 033	819 153
SR4	823 827	823 208
SR5	823 827	823 705
SR6	824 511	823 518

As detailed in *Table 7.3b*, six Control Stations have been chosen to facilitate comparison of the water quality of the SR stations with ambient water quality conditions.

Three of the control stations (C2, C3, and C6) are designed to monitor the ambient water quality in relation to other activities with potential water quality impacts in the Study Area (i.e. mud disposal at East Sha Chau & South Tsing Yi, sand winning at CT9 Marine Burrow Area (MBA), the Realignment of Northern Fairway into Victoria Harbour and the Tung Chung Reclamation). The other three control stations (C1, C4 and C5), are located in areas not expected to be affected by other projects and which lie within the path of water body movements affecting the SR's but are outside the predicted influence of the Theme Park reclamation works. Monitoring data from these control stations can be used as upstream and downstream controls for the SR stations. Locations of control stations shall be subject to change depending on the location and timing of dredging and other marine works projects in the Study Area. Any proposal for change to the locations of control/impact stations shall be subject to the EPD's approval.

Table 7.3b ***Locations of Marine Water Quality Control Stations***

Station	Easting	Northing
C1	818 678	823 526
C2	817 764	820 890
C3	826 137	822 377
C4	825 255	814 229
C5	821 055	814 210
C6	825 871	824 880

In addition to the SR and control stations detailed above, two gradient stations have been proposed to assist in the identification of the source of any impact. The locations of the gradient stations are as detailed in *Table 7.3c* and depicted in *Figure 7.3a*.

Table 7.3c ***Locations of Marine Water Gradient Stations***

Station	Easting	Northing
G1	824 506	821 250
G2	824 156	818 162

Water quality monitoring shall be undertaken by suitably qualified members of the EMT. Water quality monitoring results from both the control and SR stations shall be compared to EPD's Water Quality Objectives (WQO), for the Southern (SWCZ), North West(NWWCZ), and Western Water Control Zones (W WCZ), as follows:

- *Suspended Solids (SS):* SS should not be raised above ambient levels by an excess of 30% nor cause the accumulation of SS which may adversely affect aquatic communities.

- *Dissolved Oxygen (DO):* DO within 2m of the bottom should not be less than 2 mg l^{-1} for 90% of the samples; depth averaged DO should not be less than 4 mg l^{-1} for 90% of the samples during the whole year.

- *Ammonia (NH_3-N):* The unionised ammoniacal nitrogen level should not be more than 0.0021 mg L^{-1}, calculated as the annual average (arithmetic mean).

- *Nutrients (TIN):* TIN should not exceed 0.5 mg L^{-1} for the North Western WCZ and 0.4 for the Western Buffer WCZ, expressed as annual water column average.

Figure 7.3b shows the location of EPD's Water Control Zones (ECZ), as referred to in the above text.

Prior to the commencement of the EM&A programme, the EMTL shall seek approval of the proposed water monitoring stations from the EATL, the Engineer and the EPD.

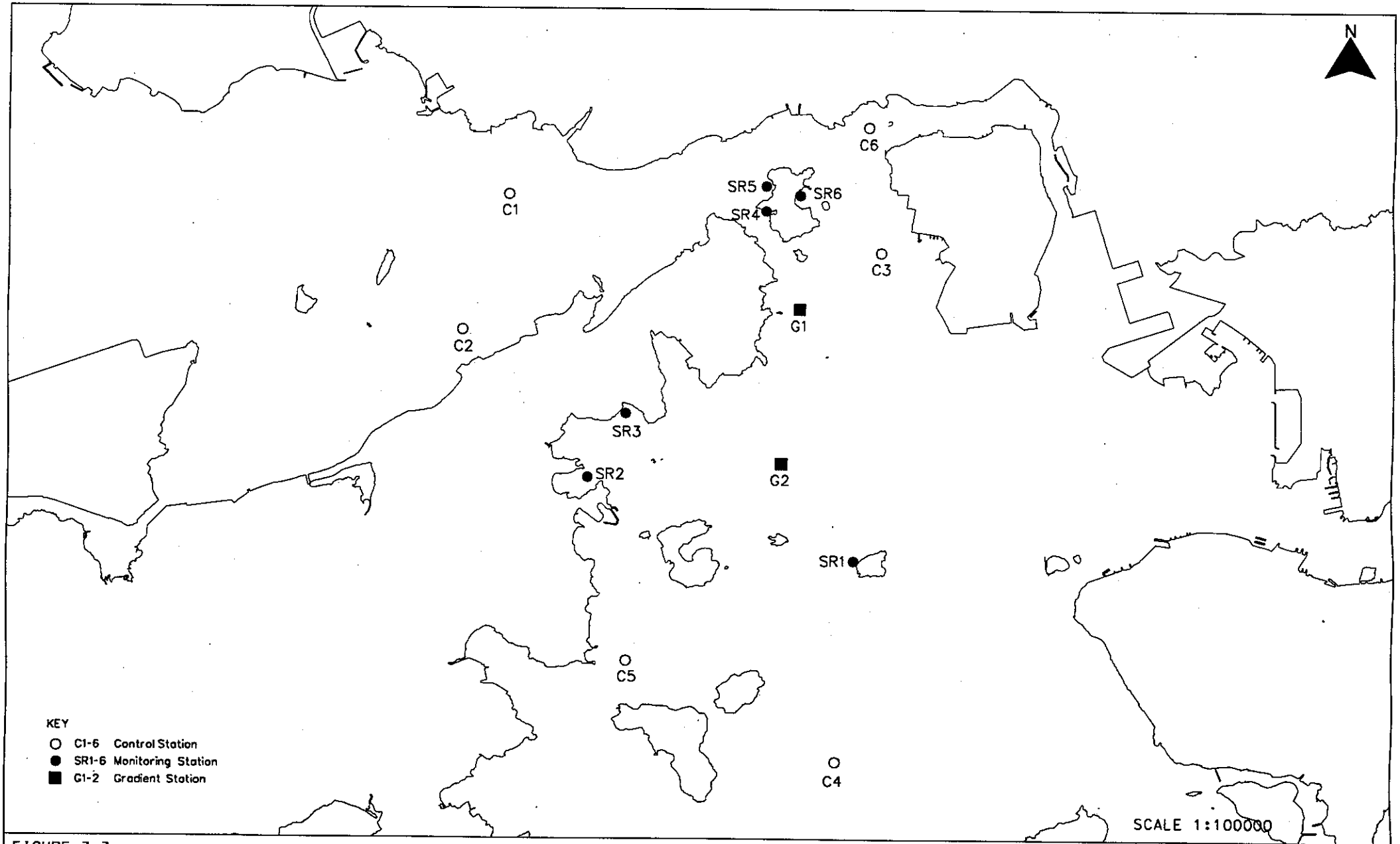

FIGURE 7.3a

LOCATION OF WATER QUALITY MONITORING STATIONS

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Environmental Resources Management

ERM

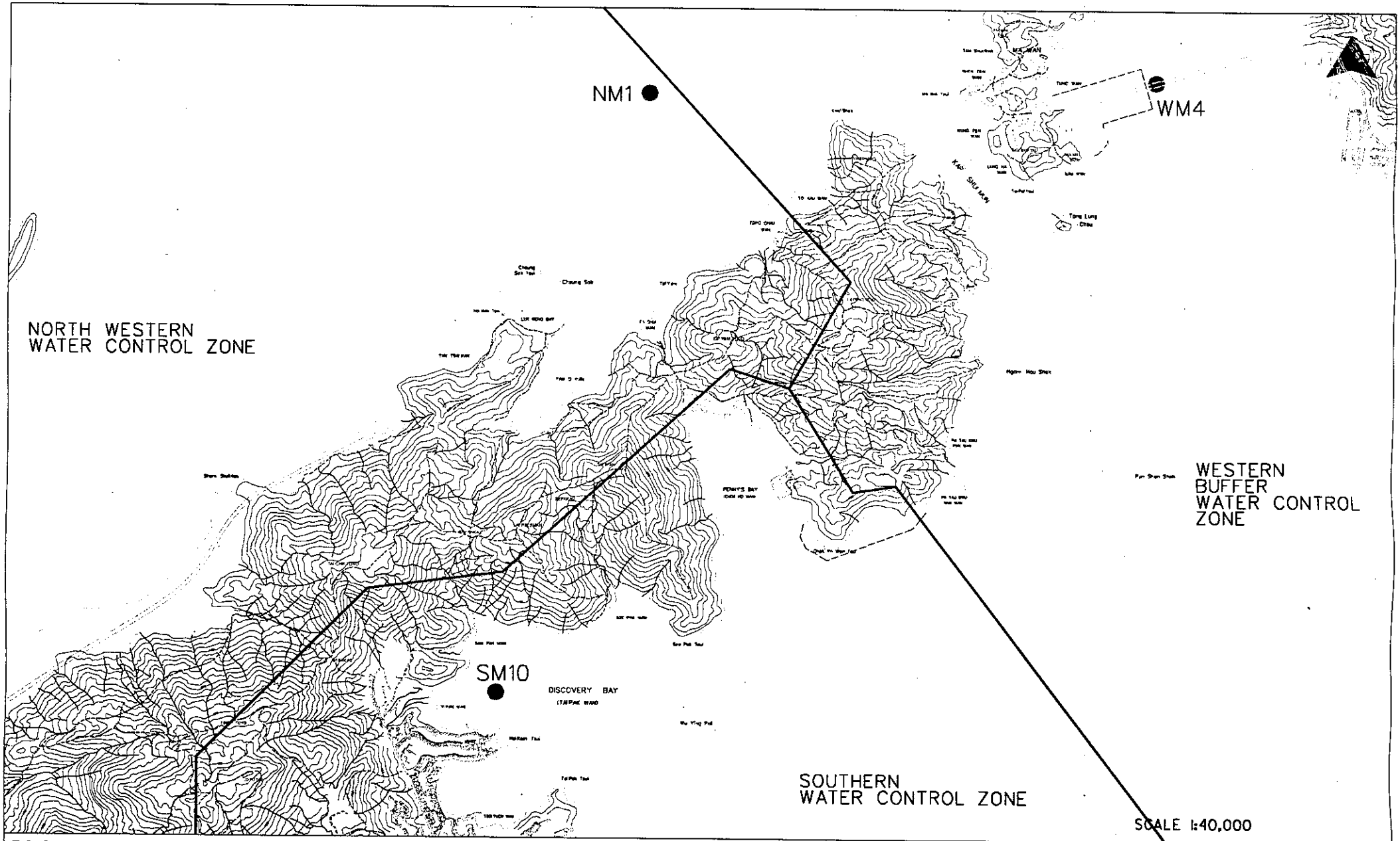

FIGURE 7.3b

LOCATIONS OF WATER CONTROL ZONES AND EPD ROUTINE WATER QUALITY MONITORING STATIONS

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DATE: 24/02/2000

Environmental Resources Management

ERM

When alternative monitoring locations are proposed, they should be chosen taking into regard the following criteria:

- at locations close to and preferably at the boundary of the mixing zone of the major site activities as indicated in the EIA Report, which are likely to have water quality impacts;
- close to sensitive receptors which are directly or likely to be affected;
- for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance during monitoring;
- at two or more control stations which shall be at locations representative of the project site in its undisturbed condition. Control stations should be outside the area of influence of the works and, as far as practicable, not affected by any other works.

7.3.1 *Baseline Monitoring*

The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of the works and to demonstrate the suitability of the proposed impact and control monitoring stations. The measurements shall be taken at all designated Control and SR stations, 3-days per week, at mid-flood and mid-ebb tides, for at least 4 consecutive weeks prior to the commencement of the reclamation works. The interval between two sets of monitoring shall not be less than 36 hours except where there are exceedances of Action and/or Limit levels, in which case the monitoring frequency will be increased.

Table 7.3d summarises the baseline monitoring programme for each water quality parameter.

Table7.3d Summary of Baseline Monitoring Programme for Water Quality

Parameter	Monitoring Stations	Frequency	Total Number of Sampling Days
Dissolved Oxygen	All	Three days per week at each monitoring station	12
Temperature	All	Three days per week at each monitoring station	12
Turbidity	All	Three days per week at each monitoring station	12
Suspended Solids	All	Three days per week at each monitoring station	12

Parameter	Monitoring Stations	Frequency	Total Number of Sampling Days
Salinity	All	Three days per week at each monitoring station	12
Ammoniacal Nitrogen	All	Three days per week at each monitoring station	12
Total inorganic nitrogen	All	Three days per week at each monitoring station	12

All measurements shall be carried out at three water depths, namely, 1 m below water surface, mid-water depth, and 1 m above sea bed as appropriate to the derivation of Action and Limit levels. If the water depth is less than 6 m, the mid-depth measurement may be omitted subject to the approval of the EATL and the Engineer. If the depth is less than 3 m, only the mid-depth measurement needs to the taken subject to the approval of the EATL and the Engineer. There shall not be any marine construction activities in the vicinity of the stations during the baseline monitoring. All parameters should be measured at the control stations on each monitoring day.

The Baseline monitoring results will be approved by the EATL.

7.3.2 *Impact Monitoring*

Construction Phase

During the course of the marine works, impact monitoring shall be undertaken on three working days per week. Monitoring at each station shall be undertaken at both mid-ebb and mid-flood tides on the same day. The interval between two sets of monitoring shall not be less than 36 hours. Two consecutive measurements of DO concentration (mg l^{-1}), DO saturation (%) and turbidity (NTU) will be taken *in situ* at 1 metre below the surface, mid-depth and 1 metre above the seabed at each station. The monitoring probes shall be retrieved out of water after the first measurement and then redeployed for the second measurement. Where the difference in value between the first and second measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading shall be discarded and further readings shall be taken. Water samples for SS(mg l^{-1}), NH_3-N(mg l^{-1}) and TIN (mg l^{-1}) measurements shall be collected at the same three depths. As for the *in situ* measurements, duplicates will be taken at both Control and SR Stations.

In addition to the above in-situ measurements temperature, salinity and pH will be determined at all Control and SR stations at the same three depths, as specified above.

For the purpose of evaluating water quality, the values obtained from individual water depths (i.e. surface, middle, bottom) will be assessed individually against specified WQOs criteria. Note that in addition to the monitoring location/position, time, water depth, water temperature, salinity, weather conditions, sea conditions, tidal stage, and any special phenomena and work underway at the dredging site shall be recorded.

Upon completion of all marine activities, a post project monitoring exercise water quality shall be carried out for four weeks, in the same manner as the monitoring during construction.

7.4 *COMPLIANCE ASSESSMENT*

Water quality monitoring results will be evaluated against Action and Limit levels as shown in *Table 7.4a*. For all other parameters, Action and Limit Levels shall be proposed by the EMTL for agreement with the EATL and the EPD following the completion of the baseline monitoring. Exceedances of the Action and Limit level may, as necessary, result in changes to the monitoring and dredging operations, potentially involving increased monitoring and implementation of appropriate mitigation measures.

Table 7.4 a Action and Limit levels for Water Quality

Parameters	Action	Limit
DO in mg L^{1}	Surface and Middle	Surface and Middle
(Surface, Middle and Bottom).	5th percentile of baseline data for surface and middle layer	For non-FCZ stations the limit level shall be 4 mg L^{-1} or 1% of baseline data for surface and middle layer, whereas for FCZ stations the limit level shall be 5 mg L^{-1}
	Bottom	Bottom
	5th percentile of baseline data for bottom layer	2 mg L^{-1} or 1% of baseline data for bottom layer
SS in mg L^{-1} (depth-averaged)	95th percentile of baseline data and 120% upstream control station's SS at the same tide of the same day	99th percentile of baseline, or 130% of upstream control station's SS at the same tide of the same day
Turbidity (Tby) in NTU (depth-averaged)	95th percentile of baseline data or 120% of upstream control station's Tby at the same tide on the same day	99th percentile of baseline data or 130% of upstream control station's Tby at the same tide on the same day
NH_3-N in mg L^{-1} (depth averaged)	95th percentile of baseline data	99th percentile of baseline data or 0.021 mg l^{-1} for unionised ammoniacal nitrogen, whichever is greater.

Parameters	Action	Limit
TIN in mg L^{-1} (depth averaged)	95th percentile of baseline data	99th percentile of baseline data or 0.5 mg L^{-1} for the North Western WCZ, 0.4 for the Western Buffer WCZ, and 0.1 Southern WCZ whichever is greater.

Notes:

- "Depth-averaged" is calculated by taking the arithmetic means of reading of all three depths;
- For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
- For SS and Tby, non-compliance of the water quality limits occurs when monitoring result is higher than the limits.
- All the figures given in the table are used for reference only and the EPD may amend the figures whenever it is considered necessary.
- Whichever of the two criteria is greater shall be used as the Action and Limit levels. subject to approval from EPD.
- Unionised ammoniacal nitrogen shall be calculated from the monitored ammoniacal nitrogen based on temperature, pH and salinity which are routinely monitored.

7.5 *EVENT AND ACTION PLAN*

Should the monitoring results of the water quality parameters at any designated monitoring stations indicate that the water quality criteria have been exceeded, the actions in accordance with the Event and Action Plan in *Table 7.5a* shall be carried out.

Table 7.5a Event and Action Plan for Construction Phase Water Quality

EVENT	ENPO		Engineer	Contractor
	EMTL	EATL		
Action Level				
1. Exceedance for one sample	2.Repeat in-situ measurement to confirm findings; 6.Repeat measurement on next day of exceedance.	1.Identify the source(s) of impact. 3.Inform Engineer and EPD and confirm notification of the non-compliance in writing; 4.Check monitoring data, all plant, equipment and Contractors' working methods; 5.Discuss mitigation measures with Engineer and Contractor; 7.Assess the effectiveness of the implemented mitigation measures.	1.Discuss proposed mitigation measures with EATL and Contractor; 2.Make agreement on the mitigation measures to be implemented; 3.Ensure mitigation measures are implemented.	1.Rectify unacceptable practice; Check all plant and equipment. 2.Consider changes of working methods; 3.Propose and discuss mitigation measures with Engineer and EATL; 4.Implement the agreed mitigation measures.
Action level exceeded on more than two consecutive sampling days	1.Repeat in-situ measurements to confirm findings; 7.Following the implementation of the mitigation measures increase the monitoring frequency to daily; 9.Repeat measurement on next day of exceedance.	2.Identify source(s) of impact; 3.Inform Engineer and EPD and confirm notification of the non-compliance in writing; 4.Check monitoring data, all plant, equipment and Contractors' working methods; 5.Discuss mitigation measure with Engineer and Contractor; 6.Ensure mitigation measures are implemented; 8.Assess the effectiveness of the implemented mitigation measures.	1.Discuss proposed mitigation measures with EATL and Contractor; 2.Make agreement on the mitigation measures to be implemented; 3.Ensure mitigation measures are implemented.	1.Rectify unacceptable practice; Check all plant and equipment; 2.Consider changes of working methods; 3.In consultation with the EATL and the Engineer, propose and agree mitigation measures within 3 working days; 4.Implement the agreed mitigation measures.

Table 7.5a Event and Action Plan for Construction Phase Water Quality (Continued)

EVENT	ENPO EMTL	ENPO EATL	Engineer	Contractor
Limit Level				
Limit level exceeded on one sampling day	1.Repeat in-situ measurement to confirm findings; 7.Increase the monitoring frequency to daily until no exceedance of Limit level.	2.Identify source(s) of impact; 3.Inform Engineer and EPD and confirm notification of the non-compliance in writing; 4.Check monitoring data, all plant, equipment and Contractors' working methods; 5.Discuss mitigation measure with Engineer and Contractor; 6.Ensure mitigation measures are implemented; 8.Assess the effectiveness of the implemented mitigation measures.	1.Discuss proposed mitigation measures with EATL and Contractor; 2.Request Contractor to critically review the working methods; 3.Make agreement on the mitigation measures to be implemented; 4.Ensure mitigation measures are implemented.	1.Rectify unacceptable practice; 2.In consultation with the EATL and the Engineer, propose and agree mitigation measures within 3 working days; 3.Implement the agreed mitigation measures.
	1.Repeat in-situ measurement to confirm findings; 7.Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days.	2.Identify source(s) of impact; 3.Inform Engineer and EPD and confirm notification of the non-compliance in writing; 4.Check monitoring data, all plant, equipment and Contractors' working methods; 5.Discuss mitigation measure with Engineer and Contractor; 6.Ensure mitigation measures are implemented; 8.Assess the effectiveness of the implemented mitigation measures.	1.Discuss proposed mitigation measures with EATL and Contractor; 2.Request Contractor to critically review the working methods; 3.Make agreement on the mitigation measures to be implemented; 4.Ensure mitigation measures are implemented. 5.Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the marine work until no exceedance of limit level.	1.Rectify unacceptable practice; 2.In consultation with the EATL and the Engineer, propose and agree mitigation measures within 3 working days; 3.Implement the agreed mitigation measures. 4. As directed by the Engineer, to slow down or to stop all or part of the marine work or construction activities.

7.6 *FRESHWATER QUALITY MONITORING*

In addition to the marine water quality monitoring defined above, it is recommended that freshwater water quality monitoring be undertaken as part of the EM&A programme to monitor the quality of the water within the Water Recreation Centre's artificial lake. It is recommended that the following parameters be measured:

In-situ monitoring parameters:

- Dissolved oxygen (DO) (% saturation);
- Water depth (m).
- pH value;
- Temperature (°C);
- Turbidity (NTU);

Laboratory analysis:

- Dissolved oxygen (DO) (in mg l-1);
- Conductivity;
- Salinity;
- Copper (Cu);
- Chromium (Cr);
- Lead (Pb);
- Zinc (Zn);
- Tributyltin (TBT);
- Suspended Solids(SS);
- total nitrogen;
- total phosphorous;
- total silica;
- 5-day BOD;
- COD;
- Ammonia;
- chlorophyll a; and
- E Coli.

In addition to the water quality parameters defined above, other relevant data shall also be recorded, such as monitoring location, time, weather conditions, special phenomena.

7.6.1 *Monitoring Equipment*

The HKITP shall employ qualified practitioners to undertake the water quality monitoring using the following equipment:

Dissolved Oxygen and Temperature Measuring Equipment

This equipment shall be as specified for the marine water quality monitoring in *Section 7.2.3.*

Turbidity Measurement Equipment

This equipment shall be as specified for the marine water quality monitoring in *Section 7.2.3.*

Water Sampling Equipment

This equipment shall be as specified for the marine water quality monitoring in *Section 7.2.3.*

Laboratory Analysis

All laboratory work shall be carried out in a HOKLAS accredited laboratory. Water samples of about 1,000 ml shall be collected at the monitoring stations for carrying out the laboratory determination of Dissolved Oxygen (in mg l-1) Copper, Chromium, Lead, Zinc, TBT, total nitrogen, total phosphorous, total silica, chlorophyll-a and E.Coli. The determination work shall start within 24 hours after the collection of the water samples.

The analyses of SS shall follow the standards described in APHA Standard Methods for the Examination of Water and Wastewater, 19th edition (SS: 2540D standard method).

In all circumstance the water sample testing shall have comprehensive quality assurance and quality control programmes.

7.6.2 *Monitoring Locations*

Five monitoring locations shall be established and agreed with the EPD prior to the commencement of the monitoring programme.

7.6.3 *Post Construction Monitoring*

During the first year following the filling and landscaping of the lake, water quality monitoring shall be undertaken at five locations once per week. The samples shall be taken 1m below the surface, at mid-depth and 1m above the bottom of the lake. The sampling locations shall be selected such that they include the deepest part of the lake.

The exact sampling and analytical methodology shall be agreed with the EPD prior to the commencement of sampling. In the event of deteriorating water quality, the HKITP will seek advice from EPD on the implementation of an Event Action Plan.

7.6.4 *Compliance Assessment*

Monitoring data shall be collected during the first year following the filling and landscaping of the artificial lake.

In order to maintain the identified uses for the lake it is necessary that the water quality be maintained above certain standards. Although the current water quality standards are not directly applicable to a man-made lake it is considered appropriate that the Water Quality (WQ) Criteria for inland waters of the Southern Water Control Zone (*see Table 7.6a*) be used as a guideline for protecting water quality to a standard sufficient to maintain the beneficial uses of the lake. For the remaining parameters without WQ criteria, they shall be assessed by trends analysis i.e, by comparing several consecutive monitoring results and determining whether a trend of increasing concentration is occurring over time.

If there are repeated low levels of pollution, the frequency and parameters may be reduced subject to agreement with the Director of Environmental Protection (DEP).

Table 7.6a ***Action and Limit Levels for Freshwater Quality***

Parameters	Action Levels*	Limit Levels (WQ Criteria)
Dissolved Oxygen	> 3.8 mg/L	> 4 mg/L
pH	within the range <6 and <9	within the range 6-9
Temperature	n/a	within a daily range of 2°C
SS in mg L^{-1}	< 23.75 mg/L, measured as annual median	< 25 mg/L, measured as annual median
Ammonia nitrogen	< 0.01995 mg/L for unionised form, as annual average	< 0.021 mg/L for unionised form, as annual average
E.Coli	< 171 cfu per 100mL, geometric mean for last 5 measurements	< 180 cfu per 100mL, geometric mean for last 5 measurements
5-day BOD	< 4.75 mg/L	< 5 mg/L
COD	< 28.5mg/L	< 30mg/L

* 95 percentile of limit levels

7.7 *MITIGATION MEASURES*

Details of all the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

7.8 *AUDITING REQUIREMENTS*

In order to ensure that water resources are adequately protected it will be necessary to undertake audits to ensure the effective implementation of the recommended mitigation measures. In particular, it will be necessary to ensure that dredging rates are regularly audited in order to ensure compliance with the EIA report's assumptions and recommendations.

Section 16 of this EM&A Manual sets out the requirements of the auditing programme.

8 WASTE MANAGEMENT

8.1 INTRODUCTION

This section sets out the handling ,recycling, storage, transportation and disposal measures which are recommended to avoid or minimise potential adverse impacts associated with waste arising from the construction of the Penny's Bay Reclamation and the associated Theme Park developments.

8.2 WASTE MANAGEMENT PRACTICES

8.2.1 *Construction Phase*

The construction Contractors should incorporate these recommendations into a Waste Management Plan for the construction works. Such a management plan should incorporate site specific factors, such as the designation of areas for the segregation and temporary storage of reusable and recyclable materials.

Possible waste arising during the construction phase will include dredged/excavated sediment, construction and demolition waste, chemical waste and general refuse. Excavated material will also be generated but it is expected that all of this can be re-used on-site and no off-site disposal is required.

The Implementation Schedule (*Section 16* of the EIA report) provides details on the appropriate mitigation measures for avoiding and preventing adverse environmental impacts associated with dredged/excavated sediment, construction and demolition waste, chemical waste and general refuse. The Waste Management Plan should be refined and updated as more detailed information is generated on the volume of dredged/excavated sediment. Similarly, it should be regularly reviewed, and updated as appropriate, throughout the course of the construction works to ensure that it remains current with the latest detailed information and works practices.

The Waste Management Plan should also outline the requirements for a waste audit programme to ensure the measures outlined in the plan are effectively implemented and adhered too.

8.2.2 *Operational Phase*

A Waste Management Plan should be developed for the Theme Park's operational phase. The plan, should include but not limited to the following issues:

- Waste Avoidance Measures;

- Material Recovery and Recycling Programme, includes:
  - Papers;
  - Glass Bottles and Glass Jars;
  - Aluminum Cans;
  - Plastics;
  - Kitchen Grease;
  - Scrap Metal;
  - Green Waste;
  - Scrap Lumber; and
  - Asphalt;

- Waste Management Audit Framework

The Waste Management Plan should also include a refined list of potential waste types arising from the operation of the Theme Park. For each waste type, detailed information on practical avoidance measures, recovery and recycling targets, collection, transportation and disposal options should be recorded and reported on an annual basis.

An annual review of the Waste Management Plan is also recommended to determine the performance of waste avoidance measures and recycling targets. This will ascertain whether the proposed measures and recycling rates can be achieved based on the recycling market as well as the potential change of recycling targets beyond the *Waste Reduction Framework Plan*'s 10-year planning period. This Waste Management Plan should be submitted by HKITP and endorsed by EPD during the detailed design stage.

During the construction and operational phases respectively, the Contractors' and the HKITP will be responsible for ensuring that only approved licensed waste collectors are used to collect and transport waste, and that appropriate measures are implemented to minimise adverse impacts, including windblown litter and dust during the transportation of these wastes. In addition, the Contractors must ensure that all necessary waste disposal permits are obtained.

8.3 *EM&A Recommendations*

In order to ensure that the construction Contractors have implemented the recommendations of the EIA Report, the EAT shall conduct regular site audits of each of the waste streams, to determine if wastes are being managed in accordance with the approved procedures and the site Waste Management Plan. The audits should look at all aspects of waste management including waste generation, storage, recycling, transport and disposal. An appropriate audit programme should be undertaken with the first audit conducted at the commencement of the construction works and then quarterly audit, thereafter. The scope of the waste management audits is presented below.

8.3.1 *Objectives of the Waste Audit*

The aims of the waste management audit will include, but are not limited to, the following:

- ensuring that the wastes arising from works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner and comply with the relevant requirements under the *Waste Disposal Ordinance (WDO)* and its regulations;
- ensuring that the Contractors properly implement the appropriate environmental protection and waste pollution control mitigation measures, as outlined in *Section 8.3* and the Implementation Schedule *(in Annex B of this EM&A Manual)* to minimise and control the potential for waste impacts;
- ensuring the effective implementation of the Contractors' Environmental Management System (EMS) and waste management plan; and
- to encourage the reuse and recycling of materials.

8.3.2 *Methodology and Criteria*

The construction Contractors should ensure that the necessary waste disposal permits or licences are obtained from appropriate authorities in accordance with the various Ordinances. In addition to the EAT audits, each construction Contractor should designate a member of staff as being responsible for inspecting and auditing the on-site waste management practices on a bi-weekly basis, with reference to the relevant legislation and guidelines as well as the recommendations given in the Implementation Schedule contained in *Annex B* of this EM&A Manual, and defined below:

General Legislation for Waste Management

- *Waste Disposal Ordinance* (Cap 354);
- *Waste Disposal (Chemical Waste) (General) Regulation* (Cap 354);
- *Land (Miscellaneous Provisions) Ordinance* (Cap 28);
- *Public Health and Municipal Services Ordinance* (Cap 132) - *Public Cleansing and Prevention of Nuisances (Urban Council) and (Regional Council) By-laws;*
- *Dumping at Sea Ordinance (1995).*
- the storage, handling and disposal of chemical waste should be audited with reference to the requirements of the *Code of Practice on the Package, Labelling and Storage of Chemical Wastes* published by the EPD.

Other Relevant Guidelines

- *Waste Disposal Plan for Hong Kong* (December 1989), Planning, Environment and Lands Branch Government Secretariat;

- *Environmental Guidelines for Planning In Hong Kong* (1990), Hong Kong Planning and Standards Guidelines, Hong Kong Government;
- *New Disposal Arrangements for Construction Waste* (1992), Environmental Protection Department & Civil Engineering Department;
- *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* (1992), Environmental Protection Department.
- *Works Branch Technical Circular No. 6/92, Fill Management*; Works Branch, Hong Kong Government;
- *Works Branch Technical Circular 22/92, Marine Disposal of Dredged Mud;*
- *Works Branch Technical Circular, 32/92, The Use of Tropical Hard Wood on Construction Site*; Works Branch, Hong Kong Government;
- *Technical Circular No 1-1-92 Classification of Dredged Sediments for Marine Disposal*, Environmental Protection Department;
- *Works Branch Technical Circular No. 2/93, Public Dumps*, Works Branch, Hong Kong Government;
- *Works Branch Technical Circular No. 16/96, Wet Soil in Public Dumps*; Works Branch, Hong Kong Government;
- *Works Bureau Technical Circular No. 4/98, Use of Public Fill in Reclamation and Earth Filling Projects*; Works Bureau, Hong Kong SAR Government;
- *Works Bureau Technical Circular No 5/98, On-site Sorting of Construction Waste on Demolition Site*; Works Bureau, Hong Kong SAR Government;
- *Waste Reduction Framework Plan, 1998 to 2007*, Planning, Environment and Lands Bureau, Government Secretariat, 5 November 1998;
- *Works Bureau Technical Circular No 5/99, Trip-ticket System for Disposal of Construction and Demolition Material*; Works Bureau, Hong Kong SAR Government; and
- *Work Bureau Technical Circular No. 25/99, Incorporation of Information on Construction and Demolition Material Management in Public Works Sub-committee Papers*; Works Bureau, Hong Kong SAR Government.

8.4 MITIGATION MEASURES

Details of the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

9 TERRESTRIAL ECOLOGY

This Section defines the EM&A requirements that have been recommended to ensure that the proposed terrestrial ecological mitigation measures are effective.

9.1 POTENTIAL IMPACTS

Potential impacts to terrestrial ecological resources are not expected to be high since most of the habitats impacted are generally of low ecological importance.

Whilst some rare plant *Schoenus falcatus* at Chok Ko Wan Tsui will be lost, the most significant potential ecological impact relates to the indirect impact to the locally rare White-bellied Sea Eagles *Haliaeetus leucogaster* . Indirect impacts to this species are expected to be moderate to high primarily due to noise disturbance.

To minimise the impact to the White Bellied Sea Eagle, a range of mitigation measures have been recommended these include:

- Prohibit human access to the nesting site of White-bellied Sea Eagles by fencing off the Pa Tau Kwu secondary woodland area where the pair of White-bellied Sea Eagles are present.

- Use quietened construction plant and equipment during Penny's Bay Stage II Reclamation (refer *Section 4.6 of the EIA Report*).

- Locate Theme Park fireworks launching site as far away from the nesting site as possible. However, it was considered not practicable for the Phase II launching site to locate elsewhere due to the limitation of the Theme Park design. The one for the Phase I has been located farthest possible from Pa Tau Kwu. A cantilevered noise barrier was considered as a potential mitigation measure to screen the fireworks noise from the White-bellied Sea Eagles nest but was considered not practicable as it will introduce temporary noisy construction disturbance in close proximity to the nesting site, and such structure will be large and instrusive, and may block the flight path and additionally may undermine the commanding position of the nesting site.

- Avoid directing any laser beams towards the Pa Tau Kwu area.

9.2 *RESIDUAL ENVIRONMENTAL IMPACTS*

Even with the implementation of the recommended mitigation measures, there remains the possibility that the White-bellied Sea Eagles may abandon their existing nesting site at the Pa Tau Kwu woodland.

9.3 *ENVIRONMENTAL MONITORING AND AUDIT REQUIREMENTS*

To monitor the effectiveness of the proposed mitigation measures, it is recommended that a specific EM&A programme is implemented for the White-bellied Sea Eagles on Pa Tau Kwu. The monitoring field work should be undertaken by an avian specialist with at least three years of local experience in ecological monitoring.

9.3.1 *Baseline Monitoring*

Monitoring should be undertaken for 3 months (February-April 2000) prior to the commencement of the works. The baseline monitoring should have as its primary focus, the provision of baseline data on the White-bellied Sea Eagles on Pa Tau Kwu, establishing whether or not the White-bellied Sea Eagles are still present, and if so, their activities on Pa Tau Kwu before the reclamation works start.

Field surveys of one days duration should be undertaken twice per month in order not to disrupt the birds' breeding activity. Information should be collected on behaviour, breeding activity, and responses to any disturbances.

9.3.2 *Monitoring During the Construction Phase*

During construction, field surveys should be undertaken twice per month during periods of breeding activity (October to April), and once per month at other times of the year. Information should be collected on behaviour, breeding activity, and any responses to disturbances. Any disturbance of the breeding pair should be examined in conjunction with the construction noise monitoring and other events related to the works.

An Event and Action Plan is recommended in *Table 9.3a*. Whilst the presence of the White-bellied Sea Eagles will be verified during the baseline monitoring, the Event and Action plan assumes that the are seldom absent from their territory on Pa Tau Kwu, if this is found not to be the case, then the Event and Action plan will need to be revised accordingly.

Table9.3a *Event and Action Plan for Construction Phase*

Event	Action		
	ENPO Environmental Monitoring Team	ENPO Environmental Auditing Team	Contractor
White-bellied Sea Eagle absence for a whole day during the monitoring period	1. Increase monitoring to daily frequency	1. Notify Site Engineer 2. If absence persists, review construction activities, within 1 km from nest site, and noise monitoring results from the previous week 3. Submit recommendations for remedial action, such as adjustment of construction method. 4. Discuss remedial actions with Site Engineer and Contractors 5. Liaise with Environmental Monitoring Team regarding the effectiveness of the remedial actions	1. Implement agreed remedial action

9.3.3 *Monitoring During the Operational Phase*

During the operation of Theme Park Phase I and Phase II, field surveys should be undertaken twice per month during periods of breeding activity for a period of two years. At other times of the year (outside of periods of breeding activity) the field surveys should be undertaken once per month. Information should be collected on behaviour, breeding activity, and any responses to disturbances. Any disturbance of the White-bellied Sea Eagles should be examined in conjunction with the fireworks noise monitoring and other events related to the operation of Theme Park.

An Event and Action Plan for the operational phase is recommended in *Table 9.3b*. Whilst the presence of the White-bellied Sea Eagles will be verified during the baseline monitoring, the Event and Action Plan assumes that the are seldom absent from their territory on Pa Tau Kwu, if this is found not to be the case, then the Event and Action Plan will need to be revised accordingly.

Table 9.3b *Event and Action Plan during Operation*

Event	Action	
	Ecological Monitoring Contractor	**HKITP**
Absence of White-bellied Sea Eagle during whole day monitoring period	1. Notify Theme Park Operator	1. Instruct Ecological Monitoring Contractor to increase frequency of monitoring.
	2. Increase monitoring to daily frequency	2. If absence persists, review all Theme Park operations from the previous week to try and identify possible source of disturbance to the White-bellied Sea Eagle
	3. Discuss remedial actions with Theme Park Operator	3. Prepare proposals for remedial action to prevent the White-bellied Sea Eagles abandoning the existing nesting site
	4. Report to HKITP on any sighting of the White-bellied Sea Eagle following the implementation of the remedial actions.	4. Implement remedial action
		5. Liaise with Ecological Monitoring Contractor regarding effectiveness of remedial actions

9.3.4 *Rare/Restricted/Protected Plant*

Before the works commence, the affected rare plant species, *Schoenus falcatus,* will be transplanted to a suitably selected site (see *Section 7.7.1* of the EIA Report). After transplantation of the restricted plants is complete, monitoring shall be undertaken to check the performance, health and condition of the plants and to ensure that they are experiencing no adverse effects. The monitoring shall be undertaken at monthly intervals for a period of three years. The field monitoring should be evenly spread over the duration of the monitoring programme. A remedial action should be undertaken for the unsuccessful transplantation. When the transplantation failures assessed, the seed stocks of the species *Schoenus falcatus* could be used for second trial in the same site or other suitable site depending on the reasons of first trial failure.

9.4 *MITIGATION MEASURES*

Details of the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

9.5 *AUDITING REQUIREMENTS*

The implementation of the mitigation measures recommended in the Implementation Schedule should be assessed as part of the EM&A programme. The assessment should evaluate the effectiveness and suitability of the mitigation measures rather than simply verifying their implementation.

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10 MARINE ECOLOGY

10.1 ECOLOGICAL MONITORING AND AUDIT REQUIREMENTS

10.1.1 Construction EM&A Requirements

General

The constraints on dredging and filling operations defined within the water quality section of the EIA Report will act as appropriate mitigation measures to control the environmental impacts to marine ecological resources to within acceptable levels. Actual impacts of construction activities will be monitored through impacts to water quality (see *Section 7 of this EM&A Manual*). EM&A activities designed to detect and mitigate any unacceptable impacts to water quality will serve to proactively protect against unacceptable impacts to marine ecological resources. Should any impacts be detected, the procedures outlined in the water quality Event and Action Plan for implementing appropriate mitigation will serve to protect against unacceptable impacts to marine ecological resources, thereby ensuring the environmental acceptability of the project.

According to the *EIAO TM Section 8.3 (c)* an EM&A programme would be required in a situation where:

- "the project involves mitigation measures of which the effectiveness may require a long period to establish"

This *Section 8.3 (c)* of the *EIAO TM* is applicable in this situation as the effectiveness of providing rubble mound seawalls for the recolonisation of corals will take time to evaluate. In response to this it is recommended that an ecological monitoring and audit programme be conducted to monitor the process of recolonisation of the area once the construction works have been completed. Before monitoring can begin, details of the monitoring programme should be agreed with AFCD and EPD.

The objective of the ecological monitoring programme is to determine the rate and effectiveness of colonisation of the rubble mound seawall by coral assemblages. Ecological monitoring and audit will consist of subtidal dive surveys after reclamation works have ceased. Once the seawalls are constructed the frequency of monitoring should be at six monthly intervals for a period of three years. This monitoring and audit will be used to assess the extent of recolonisation of rubble mound seawalls by corals. Results of these surveys are to be reported to EPD and AFCD and will form the basis for deciding whether any further mitigation measures are necessary.

Marine Mammals

Construction-phase dolphin/porpoise monitoring should be conducted by a qualified research team, to evaluate whether there have been any effects on the animals. The resulting data should be compatible with, and should be made available for, long-term studies of small cetacean ecology in Hong Kong.

10.1.2 *Operation EM&A Requirements*

General

No unacceptable impacts to marine ecological resources are predicted to occur as a result of the operational activities. Nevertheless, the following EM&A requirements have been specified.

Marine Mammals

Operation-phase dolphin/porpoise monitoring should be conducted by a qualified research team, to evaluate whether there have been any effects on the animals. The resulting data should be compatible with, and should be made available for, long-term studies of small cetacean ecology in Hong Kong.

Recolonisation of Rubble Mound Seawalls

Although the marine ecological monitoring to assess the effectiveness of the recolonisation of rubble mound seawalls by corals will be undertaken post construction, the need for this monitoring requirement is brought about by the construction works, hence the details of this monitoring requirement are discussed within the preceding section.

10.2 *MITIGATION MEASURES*

Details of the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

11 FISHERIES

11.1 THE EM&A RECOMMENDATIONS

The impacts of the reclamation activities on fisheries resources will be monitored indirectly through the water quality EM&A programme. The mitigation measures recommended to protect fisheries resources are identified in the Implementation Schedule (in *Annex B* of this EM&A Manual).

11.2 ENVIRONMENTAL MONITORING AND AUDIT

11.2.1 *Construction Phase*

The constraints on dredging and filling operations defined within the water quality section of the EIA Report will act as appropriate mitigation measures to control the environmental impacts to fisheries resources to within acceptable levels. Actual impacts of construction activities will be monitored through impacts to water quality (see *Section 7 of this EM&A Manual*). EM&A activities designed to detect and mitigate any unacceptable impacts to water quality will serve to proactively protect against unacceptable impacts to fisheries resources. Should any impacts be detected, the procedures outlined in the water quality Event and Action Plan for implementing appropriate mitigation will serve to protect against unacceptable impacts to fisheries resources, thereby ensuring the environmental acceptability of the project. Consequently, the development and implementation of a monitoring and audit programme specifically designed to assess the effects of construction activities on fisheries resources is not deemed necessary.

11.2.2 *Operational Phase*

As no unacceptable impacts to fisheries resources are predicted to occur, the development and implementation of a monitoring and audit programme specifically designed to assess the effects of operational activities on fisheries resources is not deemed necessary.

11.3 MITIGATION MEASURES

No fisheries-specific mitigation measures are required during construction or operational phases.

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12 HAZARD ASSESSMENT

This section identifies the measures which have been recommended in the EIA Report to mitigate the potential hazard related impacts arising from the operation of the Theme Park. The main recommended mitigation measures, details of which are included within the Implementation Schedule *(in Annex B of this EM&A Manual)*, are included within this section.

12.1 GENERAL

As part of the EIA, a 'Hazard to Life assessment' was undertaken to evaluate the risks associated with the dangerous goods that are planned to be handled at the Theme Park. The dangerous goods comprise fireworks and sodium hypochlorite.

With the implementation of the recommended mitigation measures and precautionary measures, the risks due to fireworks storage, transport and display were found to be in the 'acceptable' region of the Hong Kong Risk Guidelines.

The risks due to storage of sodium hypochlorite were found to be in the ALARP (as low as reasonably practicable) region. A number of procedural and design mitigation measures were therefore recommended to reduce risks. The mitigated risk results are found to be in the 'acceptable region'.

The Hazard to Life assessment concluded that no EM&A requirements were necessary.

12.2 MITIGATION MEASURES

Details of the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

12.3 AUDITING REQUIREMENTS

The fireworks and sodium hypochlorite storage and handling operations will be licensed by the Mines & Quarries Division and the Fire Services Department respectively. It is envisaged that, as part of their routine inspections and procedures, these two agencies will ensure that the measures recommended within the EIA are fully implemented. Nevertheless, it is recommended that HKITP ensure that a safety audit is conducted by an independent and qualified consultant once each year. Any non-compliances identified during this audit shall be rectified within the time-frame agreed with the auditor.

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13 CULTURAL HERITAGE IMPACT

13.1 INTRODUCTION

The EIA Report assessed the potential impacts to cultural and heritage resources from the Project's implementation. Whilst no specific environmental monitoring and auditing activities have been recommended, the EIA Report did specify a number of mitigation measures that should be implemented to minimise the potential impacts to cultural and heritage resources.

In order to ensure that these mitigation measures are fully and effectively implemented during the construction phase, it is recommended that the Contractors' compliance with these requirements is assessed as part of the regular auditing programme defined in *Section 16* of this Manual.

No operational phase mitigation measures have been recommended, and there is therefore no requirement to include cultural and heritage considerations within the operational phase EM&A Programme.

13.2 AUDITING REQUIREMENTS

In order to ensure that heritage resources are adequately protected it will be necessary to undertake audits to ensure the effective implementation of the recommended mitigation measures. *Section 16* of this EM&A Manual sets out the requirements of the auditing programme.

13.3 MITIGATION MEASURES

Details of the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

13.4 AUDITING REQUIREMENTS

The implementation of the mitigation measures recommended in the Implementation Schedule should be assessed as part of the EM&A programme. The assessment should evaluate the effectiveness and suitability of the mitigation measures rather than simply verifying their implementation.

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14 LANDSCAPE AND VISUAL

14.1 INTRODUCTION

This Section defines the EM&A requirements that have been recommended to ensure that the proposed landscape and visual mitigation measures are effectively implemented.

14.2 GENERAL

The implementation of the project will result in high level of change to the local visual system. In particular, high levels of adverse impact will result from a loss of a large area of bay and coastal waters and the slope cutting associated with the CKWLR and Road P2. A range of mitigation measures have been proposed including the following: reclamation mitigation measures include temporary hydroseeding along the edge to improve its visual characteristics. The construction of the Theme Park shall be mitigated by the proposed advancement of construction and landscaping of the permanent soil berms. The operation phase is considered to be of a high visual value and not requiring mitigation. The mitigation for the slope cutting associated with the CKWLR and Road P2 includes slope landscaping and minimisation of the areas affected by slope cutting. The primary residual impacts that have been identified are the loss of bay and coastal waters and the adverse impact of the CKWLR on local topography, landscape character and the local visual system.

14.3 MITIGATION MEASURES

Details of all the recommended mitigation measures are included within the Implementation Schedule (in *Annex B* of this EM&A Manual).

14.4 AUDITING REQUIREMENTS

In order to ensure that landscape and visual resources are adequately protected it will be necessary to undertake audits to ensure the effective implementation of the recommended mitigation measures. *Section 16* of this EM&A Manual sets out the requirements of the auditing programme.

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15 LAND CONTAMINATION

15.1 INTRODUCTION

Although not included within the scope of the original Study Brief issued by the EPD for the Theme Park and associated developments, a review has been undertaken as part of the EIA Study to determine whether there are likely to be any potential land contamination impacts as a result of the Project's implementation. As no contamination concerns have been identified for the Schedule 2 Designated Projects that have been considered within this EIA Report, no specific environmental monitoring and auditing activities have been recommended.

However, the Cheoy Lee Shipyard will need to be appropriately remediated prior to the implementation of the Road P2, the Chok Ko Wan Link Road and the Penny's Bay Rail Link. The detailed requirements for the remediation of this site will be assessed later as part of the Schedule 2 EIA for the Decommissioning of the Cheoy Lee Shipyard, and an Environmental Permit will need to be obtained before the decommissioning works are commenced.

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16 ENVIRONMENTAL AUDITING

16.1 SITE INSPECTIONS

Site inspections provide a direct means to track and ensure the enforcement of specified environmental protection and pollution control measures. The inspections should be undertaken routinely by the EATL to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented. Additionally, the EATL shall be responsible for defining the scope of the inspections, detailing any deficiencies that are identified, and reporting any necessary action or mitigation measures that were implemented as a result of the inspection.

Site inspections shall be carried out at least once per week. The areas of inspection should include the general environmental conditions in the vicinity of the site and the pollution control and mitigation measures within the site; it should also review the environmental conditions outside the site area which are likely to be affected, directly or indirectly, by site activities. The EATL shall make reference to the following information in conducting the inspections:

- the EIA and EM&A recommendations on environmental protection and pollution control mitigation measures;
- ongoing results of the EM&A programme;
- works progress and programme;
- individual works method statements which shall include proposals on associated pollution control measures;
- the contract specifications on environmental protection;
- the relevant environmental protection and pollution control laws; and
- previous site inspection results undertaken by the EATL.

The inspection results and their associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the Engineer and the Contractor , as appropriate, within 24 hours, for reference and for taking immediate action. They shall also be presented, along with the remedial actions taken, in the monthly EM&A report. The Contractor shall follow the procedures and time-frames stipulated in the environmental site inspection for the implementation of mitigation proposals and the resolution of deficiencies in the Contractors' EMS. An action reporting system shall be formulated and implemented to report on any remedial measures implemented subsequent to the site inspections.

Ad hoc site inspections shall also be carried out by the EATL if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the associated investigation work.

16.2 *COMPLIANCE WITH LEGAL AND CONTRACTUAL REQUIREMENTS*

There shall be contractual environmental protection and pollution control requirements, which the Contractor shall comply with, in addition to Hong Kong's environmental protection and pollution control laws.

The EATL shall review the progress and programme of the works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating the laws can be prevented.

The Contractors shall also regularly copy relevant to the EATL so that the checking and auditing process can be carried out. The relevant documents are expected to include the updated Work Progress Reports, the updated Works Programme, the application letters for different licences/permits under the environmental protection laws, and all the valid licences/permit. The site diary shall also be available, upon request, to the EATL during his site inspection.

After reviewing the documentation, the EATL shall advise the Engineer and the Contractors of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the EATL's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works is incompatible with the works programme or may result in a potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Contractors and the Engineer accordingly.

Upon receipt of the advice, the Contractors shall undertake immediate action to remedy the situation. The Engineer shall follow up to ensure that appropriate action has been taken by the Contractors in order that the environmental protection and pollution control requirements are fulfilled.

16.3 *ENVIRONMENTAL COMPLAINT*

Complaints shall be referred to, and investigations co-ordinated by the ENPO. The EATL shall implement the complaint investigation procedures; which shall comprise the following upon receipt of a complaint:

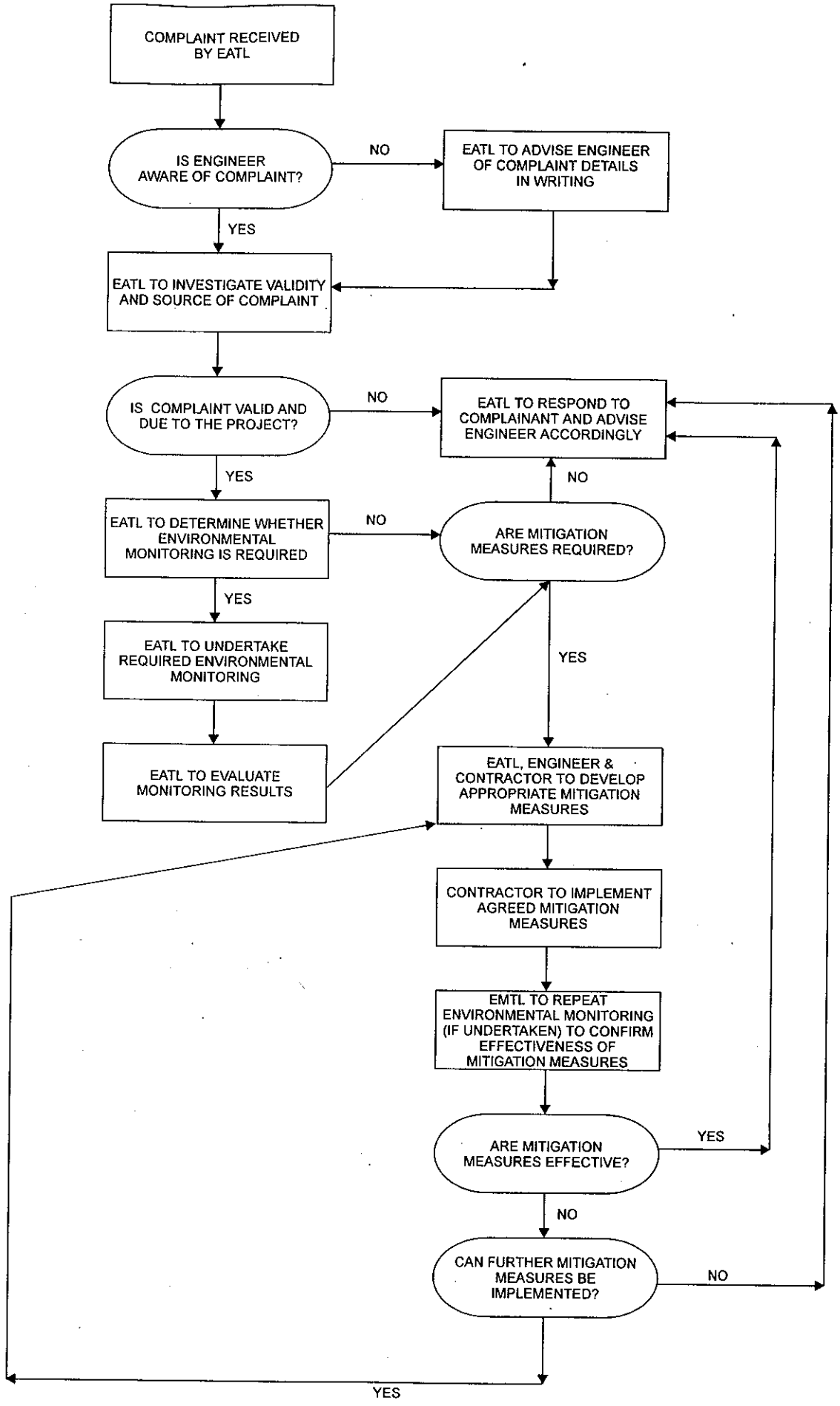

FIGURE 16.3a

COMPLAINTS RESPONSE PROCEDURES

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Environmental Resources Management

ERM

- log complaint and date of receipt onto the complaint database;
- investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities;
- if considered necessary following consultation the Engineer, liaise with the EMTL so that the EMT undertake monitoring to verify the existence and severity of the alleged complaint;
- if a complaint is valid and due to works, identify mitigation measures;
- if mitigation measures are required, advise the Engineer and Contractor accordingly;
- review the Contractors' response on the identified mitigation measures, and the updated situation;
- if the complaint is transferred from the EPD, submit interim report to the EPD on status of the complaint investigation and follow-up action within the time frame assigned by the EPD;
- undertake additional audits and/or inspections, and if necessary co-ordinate with the EMTL so that the EMT undertake additional monitoring to verify the effectiveness of the mitigation measures;
- report the investigation results and the subsequent actions to the complaint for responding to the complainant (if the source of complaint is EPD, the results should be reported within the time frame assigned by EPD); and
- record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports and filing system.

During the complaint investigation work, the Contractor and Engineer shall cooperate with the EATL in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor shall promptly carry out the mitigation works. The Engineer shall ensure that the measures have been carried out by the Contractor.

A flow chart of the complaint response procedures is shown in *Figure 16.3a,* with a suggested format for a complaint proforma shown in *Annex A(1.1).*

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17 REPORTING

17.1 GENERAL

The primary reporting function, undertaken within the EM&A programme, will be the issuance of formal exceedance notifications, corrective actions and ongoing feedback between the EATL, the Contractor and the Engineer. Reporting will be driven by the results of the monitoring and audit programme and will be recorded through written correspondence, site inspections and minutes and notes of meetings.

In addition, periodic reviews of the EM&A process and subsequent revisions to the EM&A Manual, as appropriate, will be prepared and circulated to relevant personnel within the Contractors' Project Team as a means of gauging site staff and contractor performance. The periodic reviews will comprise Monthly, Biannual and Annual EM&A Reports; these reports will be copied to the EPD for comment. The exact details of the frequency, distribution and time frame for submission shall be agreed with the EPD prior to the commencement of the works.

The following reporting requirements are based upon a paper documented approach. However, the same information can be provided in an electronic medium (such as the EPD's *Specialised Electronic Environmental Monitoring and Audit* (SEEMA) software (or a similar alternative)) upon agreeing the format with the Engineer, the EATL and the EPD. All the monitoring data (baseline and impact) shall also be submitted to diskettes in an agreed format.

17.2 BASELINE MONITORING REPORT

The EATL shall prepare and submit a draft Baseline Environmental Monitoring Report within 10 working days of the completion of the baseline monitoring. Copies of the Baseline Report shall be submitted to the Engineer and the EPD for their agreement. Copies shall also be provided to the Contractors for their information. The exact number of copies required by each party will be established through liaison. The draft report will be supported by the baseline monitoring data in electronic format, along with information covering the monitoring locations and conditions, equipment and protocols. The agreed baseline report will then be reissued as a stand alone report.

The form and content of the report and the representation of baseline monitoring data shall be in a format to the satisfaction of EPD and include, but not limited to the following:

(a) up to half a page executive summary;

(b) brief project background information;

(c) drawings showing locations of the baseline monitoring stations;

(d) an updated construction programme with milestones of environmental protection/mitigation activities annotated;

(e) monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
- name of laboratory and types of equipment used and calibration details;
- parameters monitored;
- monitoring locations (and depth);
- monitoring date, time, frequency and duration;
- QA/QC results and detection limits.

(f) details on influencing factors, including:
- major activities, if any, being carried out on the Site during the period;
- weather conditions during the period;
- other factors which might affect the results;

(g) determination of the Action and Limit Levels (AL levels) for each monitoring parameter and statistical analysis of the baseline data; the analysis shall conclude if there is any significant difference between control and impact stations for the parameters monitored;

(h) revisions for inclusion in the EM&A Manual; and

(i) comments and conclusions.

17.3 *EM&A REPORTS*

The results and findings of all EM&A work required in the Manual shall be recorded in the monthly EM&A reports prepared by the EMTL and EATL. The reports shall be submitted to the EPD within 10 working days of the end of each calendar month, with the first report due in the month after construction works commence. Copies shall also be submitted to the Contractor and Engineer for information. The EATL shall liaise with the relevant parties to confirm the exact number and format of monthly reports in both hard copy and electronic format. However, it is envisaged that each party will receive no more than a maximum 4 copies of each monthly EM&A report. The EATL shall review the number and location of monitoring stations

and parameters to monitor every 6 months or on an as needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

The report shall include, but not be limited to, the following elements:

17.3.1 *First Monthly EM&A Report*

The first monthly EM&A report shall include at least but not be limited to the following :

(a) Executive Summary (1-2 pages);
- Breaches of AL levels;
- Complaint Log;
- Notifications of any summons and successful prosecutions;
- Reporting Changes;
- Future key issues.

(b) Basic Project Information

- Project organisation including key personnel contact names and telephone numbers;
- Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;
- Management structure; and
- Works undertaken during the month;

(c) Environmental Status

- Works undertaken during the month with illustrations (such as location of works, daily dredging/filling rates, percentage fines in the fill material used); and

- Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

(d) Summary of EM&A requirements including:

- All monitoring parameters;
- Environmental quality performance limits (Action and Limit levels);
- Event-Action Plans;
- Environmental mitigation measures, as recommended in the project EIA study final report;
- Environmental requirements in contract documents;

(e) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the project EIA study report, summarised in the updated implementation schedule.

(f) Monitoring Results

To provide monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Parameters monitored;
- Monitoring locations (and depth);
- Monitoring date, time, frequency, and duration;
- Weather conditions during the period;
- Graphical plots of trends of monitored parameters in the month annotated against;
- The major activities being carried out on site during the period;
- Weather conditions that may affect the results; and
- Any other factors which might affect the monitoring results;
- QA/QC results and detection limits.

(g) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- Record of all noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

- Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;

- Record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;

- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and

- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

(h) Others

- An account of the future key issues as reviewed from the works programme and work method statements;

- Advice on the solid and liquid waste management status; and

- Submission of implementation status proforma, proactive environmental protection proforma, regulatory compliance proforma, site inspection proforma, data recovery schedule and complaint log summarising the EM&A of the period.

17.3.2 *Subsequent Monthly EM&A Reports*

The subsequent monthly EM&A reports shall include the following:

(a) Executive Summary (1-2 pages)

- Breaches of AL levels
- Complaint Log
- Notifications of any summons and successful prosecutions;
- Reporting Changes
- Future key issues

(b) Environmental Status

- Construction Programme with fine tuning of construction activities showing the inter-relationship with environmental protection/mitigation measures for the month;

- Works undertaken during the month with illustrations including key personnel contact names and telephone numbers; and
- Drawing showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations.

(c) Implementation Status

Advice on the implementation status of environmental protection and pollution control/mitigation measures including measures for ecological and visual impacts, as recommended in the project EIA study report, summarised in the updated implementation schedule.

(d) Monitoring Results

To provide monitoring results (in both hard and diskette copies) together with the following information:

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details;
- Parameters monitored;
- Monitoring locations (and depth);
- Monitoring date, time, frequency, and duration;
- Weather conditions during the period;
- Graphical plots of trends of monitored parameters in the month annotated against;
- The major activities being carried out on site during the period;
- Weather conditions that may affect the results; and
- Any other factors which might affect the monitoring results;
- QA/QC results and detection limits.

(e) Report on Non-compliance, Complaints, Notifications of Summons and Successful Prosecutions

- Record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

- Record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigation, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;

- Record of notifications of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, including locations and nature of the breaches, investigation, follow-up actions taken, results and summary;

- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and

- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

(f) Others

- An account of the future key issues as reviewed from the works programme and work method statements; and

- Advice on the solid and liquid waste management status.

(g) Appendix

- AL levels
- Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations annotated against the following:
  i) major activities being carried out on site during the period;
  ii) weather conditions during the period; and
  iii) any other factors which might affect the monitoring results
  - Monitoring schedule for the present and next reporting period
  - Cumulative statistics on complaints, notifications of summons and successful prosecutions
  - Outstanding issues and deficiencies

17.4 *QUARTERLY EM&A SUMMARY REPORTS*

The quarterly EM&A summary report, which shall be produced by the EMTL/EATL, should generally be around 5 pages (including about 3 of text and tables and 2 of figures) should contain at least the following information. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the works.

(a) up to half a page executive summary;

(b) basic project information including a synopsis of the project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter;

(c) a brief summary of EM&A requirements including:

- monitoring parameters;
- environmental quality performance limits (Action and Limit levels); and
- environmental mitigation measures, as recommended in the project EIA study final report;

(d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;

(e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

(f) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against;

- the major activities being carried out on site during the period;
- weather conditions during the period; and
- any other factors which might affect the monitoring results;

(g) advice on the solid and liquid waste management status;

(h) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

(i) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

(j) for project where measurement of suspended solids is required, an quarterly assessment of construction impacts on suspended solids at the project site, including, but not limited to, a comparison of the difference between the quarterly mean and 1.3 times of the ambient mean, which is defined as 30% increase of the baseline data or EPD data, of the related parameters by using appropriate statistical procedures. Suggestion of appropriate mitigation measures if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the 1.3 on water quality times of the ambient mean ($p<0.05$).

(k) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(l) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(m) a summary record of notification of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, locations and nature of the breaches, investigation, follow-up actions taken and results;

(n) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and

(o) proponents' contacts and any hotline telephone number for the public to make enquiries.

17.5 FINAL EM&A SUMMARY REPORT

The EM&A programme shall be terminated upon completion of those construction activities that have the potential to result in a significant environmental impact.

Prior to the proposed termination, it may be advisable to consult relevant local communities (such as village representatives/committees and/or District Boards). The proposed termination should only be implemented after the proposal has been endorsed by the EATL, the Engineer and the project proponent, and following final approval from the Director of Environmental Protection.

The final EM&A summary report shall include, inter alia, the following:

(a) an executive summary;

(b) basic project information including a synopsis of the project organisation, programme, contracts of key management, and a synopsis of work undertaken during the entire construction period;

(c) a brief summary of EM&A requirements including:

- monitoring parameters;
- environmental quality performance limits (Action and Limit levels); and
- environmental mitigation measures, as recommended in the project EIA study final report;

(d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the project EIA study report, summarised in the updated implementation schedule;

(e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

(f) graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against;

- the major activities being carried out on site during the period;
- weather conditions during the period; and
- any other factors which might affect the monitoring results; and
- the return of ambient environmental conditions in comparison with baseline data;

(g) compare and contrast the EM&A data with the EIA predictions and annotate with explanation for any discrepancies;

(h) provide clear-cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;

(i) advice on the solid and liquid waste management status;

(j) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);

(k) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;

(l) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;

(m) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;

(n) review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);

(o) a summary record of notification of summons and successful prosecutions for breaches of the current environmental protection/pollution control legislation's, locations and nature of the breaches, investigation, follow-up actions taken and results;

(p) review the practicality and effectiveness of the EIA process and EM&A programme (e.g. effectiveness and efficiency of the mitigation measures) recommend any improvement in the EM&A programme; and

(q) a conclusion to state the return of ambient and/or the predicted scenario as per EIA findings.

17.6 DATAKEEPING

Documentation such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the monthly EM&A reports for submission. However, such documents shall be well kept by the EMTL/EATL, as appropriate, and shall be available for inspection upon request. All relevant information shall be clearly and systematically recorded in the documents. The monitoring data shall also be recorded in magnetic media form, and the software copy can be available upon request. The water quality data software format shall be agreed with EPD. All the documents and data shall be kept for at least one year after completion of the construction contract.

17.7 INTERIM NOTIFICATION OF ENVIRONMENTAL QUALITY LIMIT EXCEEDANCES

Interim notifications of exceedances of Limit levels will be issued to the EPD within 24 hours of the identification of an exceedance. The Monthly Reports will contain all available details concerning measures, exceedances and

complaints, their causes and those steps taken to control and prevent their recurrence. A suggested format for a complaints proforma is in *Annex A (1.1)*.

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Annex A

Reporting Documentation

1.1 *Complaints Proforma*

Report Form for Complaints	Sheet_____ of _____ Unit Reference_____
RECIPIENT Name: Location: Tel:	
COMPLAINANT Name: Address:	Tel: Fax:
COMPLAINT Type: Noise/Dust/Water/ Other Date: Time: Location: Description:	
Copy fax to: _____ Date: _____	Original to: _____ Date: _____
REVIEW RESULTS Signed: Date:	
RECOMMENDATIONS Signed: Date:	
ATTACHMENTS Copy to: PR Manager:	Date/Time: Date: Time:
Engineer	Date: Time:
EATL	Date: Time:

1.2 *Construction Phase TSP Monitoring Field Record Sheet*

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Tine of Sampling		
Elapsed-time Meter Reading	Start (min.)	
	Stop (min.)	
Total Sampling Time (min.)		
Weather Conditions		
Site Conditions		
Initial FlowRate, Qsi	Pi (mmHg)	
	TI (°C)	
	Hi (in.)	
	Qsi (Std.m^3)	
Final Flow Rate, Qsi	Pf (mmHg)	
	Tf (°C)	
	Hf (in.)	
	Qsf (Std.m^3)	
Average Flow Rate	(Std.m^3)	
Total Volume	(Std.m^3)	
Filter Identification No.		
Initial Wt.. of Filter	(g)	
Final Wt.. of Filter	(g)	
Measured TSP Level	(g/ m^3)	

	Name & Designation	Signature	Date
Field Operator :	_____	_____	_____
Laboratory Technician :	_____	_____	_____
Checked by :	_____	_____	_____

1.3 *Construction Phase Noise Monitoring Field Record Sheet*

Monitoring Location		
Details of Location		
Date of Monitoring		
Measurement Start Time (hh:mm)		
Measurement Time Length (min.)		
Noise Meter Model/Identification		
Calibrator Model/Identification		
Measurement Results	L_{90} (dB(A))	
	L_{10} (dB(A))	
	L_{eq} (dB(A))	
Major Construction Noise Source(s) During Monitoring		
Other Noise Source(s) During Monitoring		
Remarks		

		Name & Designation	Signature	Date
Recorded By	:	_____	_____	_____
Checked by	:	_____	_____	_____

1.4 *Construction Phase Water Quality Monitoring Field Record Sheet*

Monitoring Location				
Date of Monitoring				
Start Time (hh.mm)				
Weather				
Sea Conditions				
Tidal Mode				
Monitoring Depth		Surface	Middle	Bottom
Salinity				
Temperature	(°C)			
DO Saturation	(%)			
DO	(mg/l)			
Turbidity	(NTU)			
SS Sample Identification				
SS	(mg/l)			
Observed Construction Activities	<100m from location			
	>100m from location			
Other Observations				

	Name & Designation	Signature	Date
Recorded By :	_____	_____	_____
Laboratory Technician :	_____	_____	_____
Checked by :	_____	_____	_____

Note: The SS results are to be completed once they are available from the laboratory

Annex B

Implementation Schedules

This Annex should comprise the Implementation Schedules for the Project (*Section 16* of the EIA Report) for operational purposes.