

1 INTRODUCTION

Purpose of the Manual

- 1.1 The purpose of this Environmental Monitoring and Audit (EM&A) Manual is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme to be undertaken for the construction and operation of Peng Chau Sewage Treatment Works Upgrade (hereinafter referred as “the Project”). It aims to provide systematic procedures for monitoring, auditing and minimising of the environmental impacts associated with the construction works and follow-on operations period.
- 1.2 Hong Kong environmental regulations for air and water quality, noise and waste, the Hong Kong Planning Standards and Guidelines, Annex 21 of the Technical Memorandum on the EIA Process (TMEIAP) and recommendations in the EIA study of the Project have served as environmental standards and guidelines in the preparation of this Manual.
- 1.3 This Manual contains the following :
 - (a) Duties of the Contractor, the Engineer or Engineer’s Representative (ER), the Environmental Team (ET) and the Independent Checker ((Environment) IC(E)) with respect to the environmental monitoring and audit requirements during the course of the Project;
 - (b) Information on project organisation and programming of construction activities for the project;
 - (c) Requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impact;
 - (d) Details of the methodologies to be adopted, including all field laboratories and analytical procedures, and details on quality assurance and quality control programme;
 - (e) The rationale on which the environmental monitoring data will be evaluated and interpreted;
 - (f) Definition of Action and Limit levels;
 - (g) Establishment of event and action plans;
 - (h) Requirements of reviewing pollution sources and working procedures required in the event of non-compliance of the environmental criteria;

- (i) Requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.
- 1.4 For the purpose of this manual, the ET leader, who shall be responsible for and in charge of the ET, shall refer to the person delegated the role of executing the EM&A requirements.

Project Description

Project Background

- 1.5 In December 1994, the Environmental Protection Department (EPD) completed the Outlying Islands Sewerage Master Plan (OISMP) Study. The areas studied in the OISMP include Lantau Island, Lamma Island, Cheung Chau, Peng Chau and some other smaller islands to the west and south of Hong Kong. Recommendations on the improvements and extensions to the existing sewerage infrastructures were made.
- 1.6 The OISMP identified the need for improvement of the water quality of waters close to Peng Chau. Further to the OISMP, the Environmental Protection Department (EPD) completed the Preliminary Project Feasibility Study (PPFS) for Package K – Peng Chau Sewage Treatment Works Upgrade. The study concluded that the existing capacity of the Peng Chau Sewage Treatment Works (STW) is inadequate to meet the increase in flow due to the proposed developments at Peng Chau. An upgrading and expanding of the existing Peng Chau STW with an oceanic submarine outfall is therefore required. The study also recommended to include Package K in the Outlying Islands Sewerage Stage 1 Phase 2 Works.

Project Location and Scope

- 1.7 The Project aims to upgrade and reconstruct the existing Peng Chau Sewage Treatment Works (STW) as a secondary treatment works incorporating nitrification, de-nitrification and disinfection to match up with the strengthened effluent criteria and future development.
- 1.8 The project also involves the construction of an emergency overflow, storm tanks, and a submarine outfall, which will extend with a short distance offshore from the boundary of the STW site. **Figure 1-1** shows the location of proposed works in Tai Lei Island and Peng Chau.
- 1.9 Two working phases were recommended in the Preliminary Project Feasibility Studies (PPFS) for Peng Chau Sewage Treatment Works Upgrade and the detailed scopes are:

Phase 1 Works:

- (a) Construction of a new sewage treatment works adjacent to the existing sewage treatment works comprising secondary treatment with nitrification, denitrification and disinfection;
- (b) Construction of new submarine outfall and emergency overflow;

- (c) Provision of de-odourization facilities;
- (d) Provision of associated sludge treatment facilities;
- (e) Extension of inlet pumping mains; and
- (f) Construction of equalisation tank.

Phase 2 Works:

- (a) Demolition of the existing treatment facilities;
- (b) Construction of sludge drying bed; and
- (c) Construction of remaining works.

1.10 The marine submarine outfall component of this Project is a “designated project” category F.6 under Schedule 2 of the Environmental Impact Assessment (EIA) Ordinance (Cap. 499), and an environmental permit is required for the Project. An EIA report in accordance with the requirements under the EIA Ordinance and the Technical Memorandum on the EIA Process and the EIA Study Brief No. ESB-093/2001 is needed.

1.11 The purpose of the EIA Study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and related activities that take place concurrently, and to contribute to decisions on the overall environmental acceptability of the Project, after the implementation of environmental mitigation measures.

Works Programme

1.12 The key dates of the implementation programme of the Project are shown below. **Figure 1-2** show the implementation programme of the construction activities.

Detailed Design April 2004 to December 2004

Tendering December 2004 to April 2005

Construction April 2005 to November 2007

Related Project

1.13 Related project to the Peng Chau STW Upgrade is the Outlying Island Sewerage Stage I Phase 2 – Construction of Village Sewerage at Peng Chau and Cheung Chau Phase 1 (Package H). Package H consists of the construction of about 1.7-km of sewers, 400m of twin 250mm rising mains, a new sewage pumping station and temporary pump pit to replace the existing Kam Peng Estate sewage pumping station (which will also be demolished under Package H) and rehabilitation of some 300m of existing sewers. Package H (Peng Chau section) would be completed in early 2005. The collected sewage would be treated in the existing Peng Chau STW before the commissioning of the Upgraded STW in 2007.

Environmental Monitoring and Audit Requirements

Air Quality Impact

Construction Phase

- 1.14 Construction of Peng Chau Sewage Treatment Works and demolition of the existing old structures, especially from excavation and material handling, would have elevated dust emissions on the nearest identified sensitive receivers. The predicted dust level would exceed the hourly and daily criteria of $500\mu\text{g}/\text{m}^3$ and $260\mu\text{g}/\text{m}^3$, respectively.
- 1.15 Mitigation measures have been recommended. With the implementation of the proposed dust suppression measures such as watering, and good site practice, the TSP levels at all ASRs would comply with the dust criteria. Dust monitoring requirements are recommended in section 2 of this EM&A Manual to ensure the efficacy of the control measures.

Operational Phase

- 1.16 The predicted air quality during operational phase of the STW Upgrade would satisfy with the odour criteria, with the implementation of the proposed mitigation measures. Environmental monitoring is therefore considered not necessary during the operational phase.

Noise Impact

Construction Phase

- 1.17 Elevated construction noise impacts from this Project alone are not anticipated at the identified NSR. However the Project construction is to be started at the same time as the construction of Peng Chau Helipad when most noisy equipment plants are scheduled to be operated, mitigation measures are required to reduce the cumulative noise impact to an acceptable level. Noise monitoring would have to be carried out to ensure that recommended mitigation measures be implemented effectively.
- 1.18 The construction activities of the Project would be carried out during daytime (between 0700 and 1900 hours). It is recommended to carry out noise measurements at the same periods.
- 1.19 Noise measurement should be undertaken at the worst identified NSR for a 30 minute period during the daytime. Type 1 sound level meters, which comply with the International Electrochemical Commission (Publications 651:1979 and 804:1985), must be used for carrying out the noise measurement.
- 1.20 To establish the prevailing background noise level, one $L_{\text{eq}} (30 \text{ minutes})$ measurement, obtained between 0700 and 1900 hours of a normal weekdays is required.

- 1.21 Baseline monitoring to establish the background noise environment will be required and should be carried out for at least 14 consecutive days prior to the commencement of the construction works. As the current programme of the Peng Chau Helipad project will be commenced 1 to 2 months before this Project and both projects are using the same noise monitoring location, it is therefore recommended to adopt the baseline monitoring results from the Helipad project without repeating the works unless a further delay is observed from the Helipad project. During the construction phase impact monitoring will be required in order to assess whether operations of PME on site are in compliance with construction noise criteria stipulated in TMEIAP.

Operational Phase

- 1.22 It is predicted that no adverse impact from the Project is expected on the identified NSRs with the implementation of mitigation measures. EM&A for operational noise impact is not required.

Water Quality Impact

Construction Phase

- 1.23 Monitoring and auditing for marine water quality is considered necessary during the dredging activities of the Project to ensure that the released Suspended Solid (SS) concentrations from the dredging activities would not adversely affect the sensitive receivers. This monitoring programme would be required to ensure the implementation of the recommended water quality mitigation measures and to assess the effectiveness of these measures during the construction works. If monitoring results indicate that the dredging activities have exceeded the predicted elevated SS concentrations even after the implementation of the recommended mitigation measures, the construction programme should be carefully reviewed to slow down production rates.

Operational Phase

- 1.24 After the commissioning of the upgraded STW plant, it is recommended to monitor the Total Inorganic Nitrogen (TIN) concentration in the vicinity of the outfall discharge since exceedances of TIN WQO limit were predicted. Water quality monitoring every quarter in the first year after the commissioning of the STW would be required. Details of the water quality monitoring procedures are given in Chapter 4 of this report.

Solid Waste Management

- 1.25 Waste management during construction phase will be the Contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and EPD's regulations and requirements. The mitigation measures recommended should form the basis of the site waste management plan to be developed by the Contractor at the detailed design stage.

- 1.26 It is recommended that the waste generated during the construction activities should be audited periodically to determine if wastes are being managed in accordance with 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 would be to undertake a first audit near the commencement of the construction works, and then to audit monthly thereafter.
- 1.27 With the implementation of the mitigation measures such as use of closed grab dredger for all dredging, use of silt curtain and reduction in dredging rate as recommended to alleviate water quality impact, no adverse impact on subtidal ecology would be anticipated. Due to the limited scale of the Project and the minor degree of impacts caused, no ecological monitoring would be required.

Project Organisation

- 1.28 The proposed project organization and lines of communication with respect to environmental protection works are shown in **Figure 1-3**.
- 1.29 The project proponent is the Drainage Services Department and is represented by the Engineer's Representative (ER).

The responsibilities of the **Engineer** or **Engineer's Representative** are:

- (a) Supervise the Contractor's activities and ensure that the requirements in the EM&A Manual are fully complied with;
 - (b) Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans;
 - (c) Employ an IC(E) to audit the results of the EM&A works carried out by the ET; and adhere to the procedures for carrying out complaint investigation in accordance with Section 7.12.
- 1.30 Leader of the ET shall be an independent party from the Contractor and have relevant professional qualifications, or have sufficient relevant EM&A experience subject to approval of the ER and the EPD.

The responsibilities of the **Contractor** are:

- (a) Employ an ET to undertake monitoring, laboratory analysis and reporting environmental monitoring and audit;
- (b) Provides assistance to ET in carrying out monitoring;
- (c) Submit proposals on mitigation measures in case of exceedances of Action and Limit levels in accordance with the Event and Action Plans.
- (d) Implement measures to reduce impact where Action and Limit levels are exceeded; and

- (e) Adhere to the procedures for carrying out compliant investigation in accordance with Section 7.12.

The ET shall be employed to conduct the EM&A programme and ensure the Contractor's compliance with the project's environmental performance requirements during construction. The responsibilities of the Environmental Team are:

- (a) Sampling, analysis and statistical evaluation of various monitoring parameters as required in the EM&A Manual;
- (b) Environmental site surveillance;
- (c) Audit of compliance with environmental protection, and pollution prevention and control regulations;
- (d) Monitor the implementation of environmental mitigation measures;
- (e) Monitor compliance with the environmental protection clauses/specifications in the Contract;
- (f) Review construction programme and comment as necessary;
- (g) Review construction methodology and comment as necessary;
- (h) Adhere to the procedures for carrying out complaint investigation, evaluation and identification of corrective measures in accordance with Section 7.12;
- (i) Liaison with Independent Checker (Environment) on all environmental performance matters, and timely submission of all relevant EM&A proforma for IC(E)'s approval;
- (j) Advice to the Contractor on environmental improvement, awareness, enhancement matters, etc., on site; and
- (k) Timely submission of the EM&A report to the Project Proponent and the Director of Environmental Protection.

The **Independent Checker (Environment)** shall advise the Engineer's Representative on environmental issues related to the project. The duties are:

- (a) Review and audit all aspects of the EM&A programme;
- (b) Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers;
- (c) Carry out random sample check and audit on monitoring data and sampling procedures, etc (at not less than monthly intervals);
- (d) Conduct random site inspection (at not less than monthly intervals);
- (e) Audit the monitoring activities and results against the status of implementation of environmental protection measures on site (at not less than monthly intervals);

- (f) Review the effectiveness of environmental mitigation measures and project environmental performance;
- (g) On a need basis, audit the Contractor's construction methodology and agree the least impact alternative in consultation with the ET leader and the Contractor;
- (h) Adhere to the procedures to check complaint cases and the effectiveness of corrective measures in accordance with Section 7.12;
- (i) Review EM&A report submitted by the ET leader; and
- (j) Feedback audit results to ET by signing off relevant EM&A proformas.

The Independent Checker (Environment) shall have project management experience in addition to the requirements of the ET leader stated above.

- 1.31 Sufficient and suitably qualified professional and technical staff shall be employed by the respective parties to ensure full compliance with their duties and responsibilities, as required under the EM&A programme for the duration of the Project.

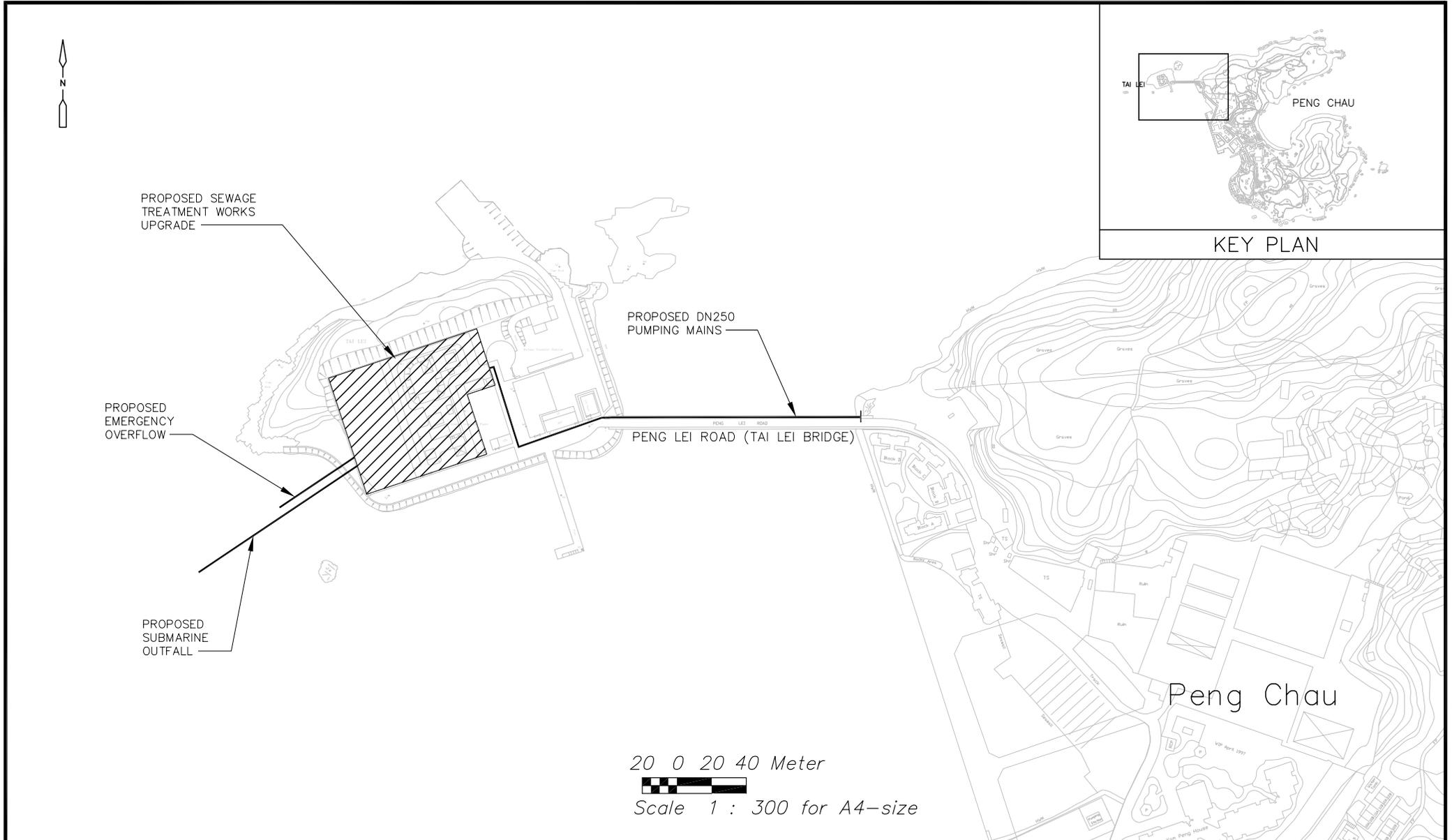
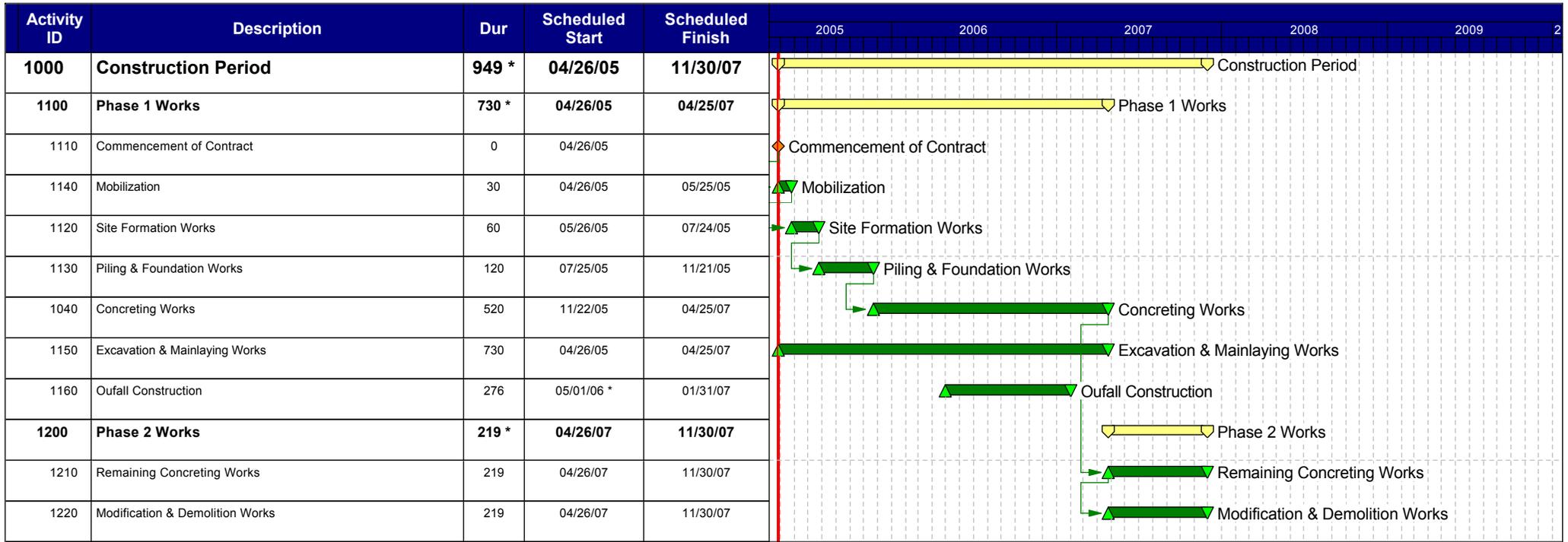


Figure 1-1
Location of the Proposed Peng Chau Sewage Treatment Works Upgrade on Tai Lei Island



	Start date	04/26/05	<p style="text-align: center;">Agreement No. CE83/2001 (DS) Peng Chau STW Upgrade</p> <p style="text-align: center;">Preliminary Construction Works Programme</p>	<p>Figure 1-2</p>	▲ Early start point	▼ Early finish point	■ Early bar	○ Summary bar	◀ Summary point
	Finish date	11/30/07			◆ Start milestone point				
	Run date	08/13/04			◆ Finish milestone point				
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