

**Baseline Environmental Monitoring for
Hong Kong – Zhuhai – Macao Bridge
Tuen Mun – Chek Lap Kok Link –
Investigation**

**Updated EM&A Manual
(for Tuen Mun – Chek Lap Kok Link)**


(Version 1.0)

Highways Department of HKSAR

Agreement No. CE35/2011 EP
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Hong Kong – Zhuhai – Macao Bridge
Tuen Mun – Chek Lap Kok Link –
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(for **Tuen Mun – Chek Lap Kok Link**)

(Version 1.0)

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REMARKS:

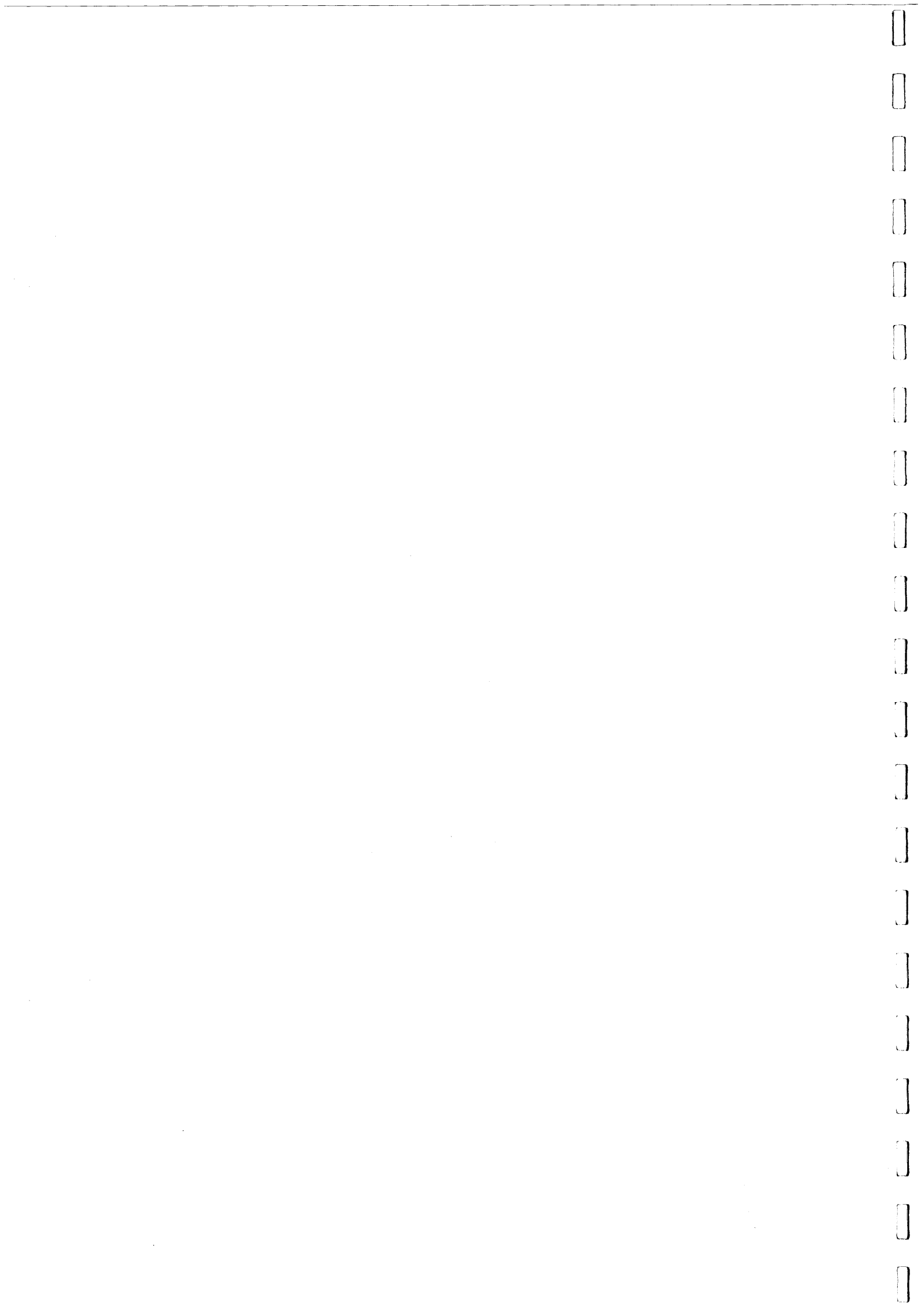
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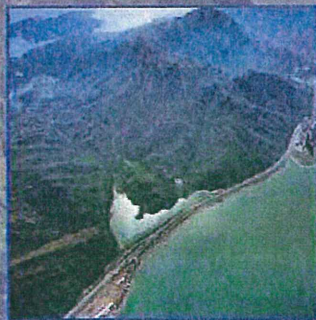
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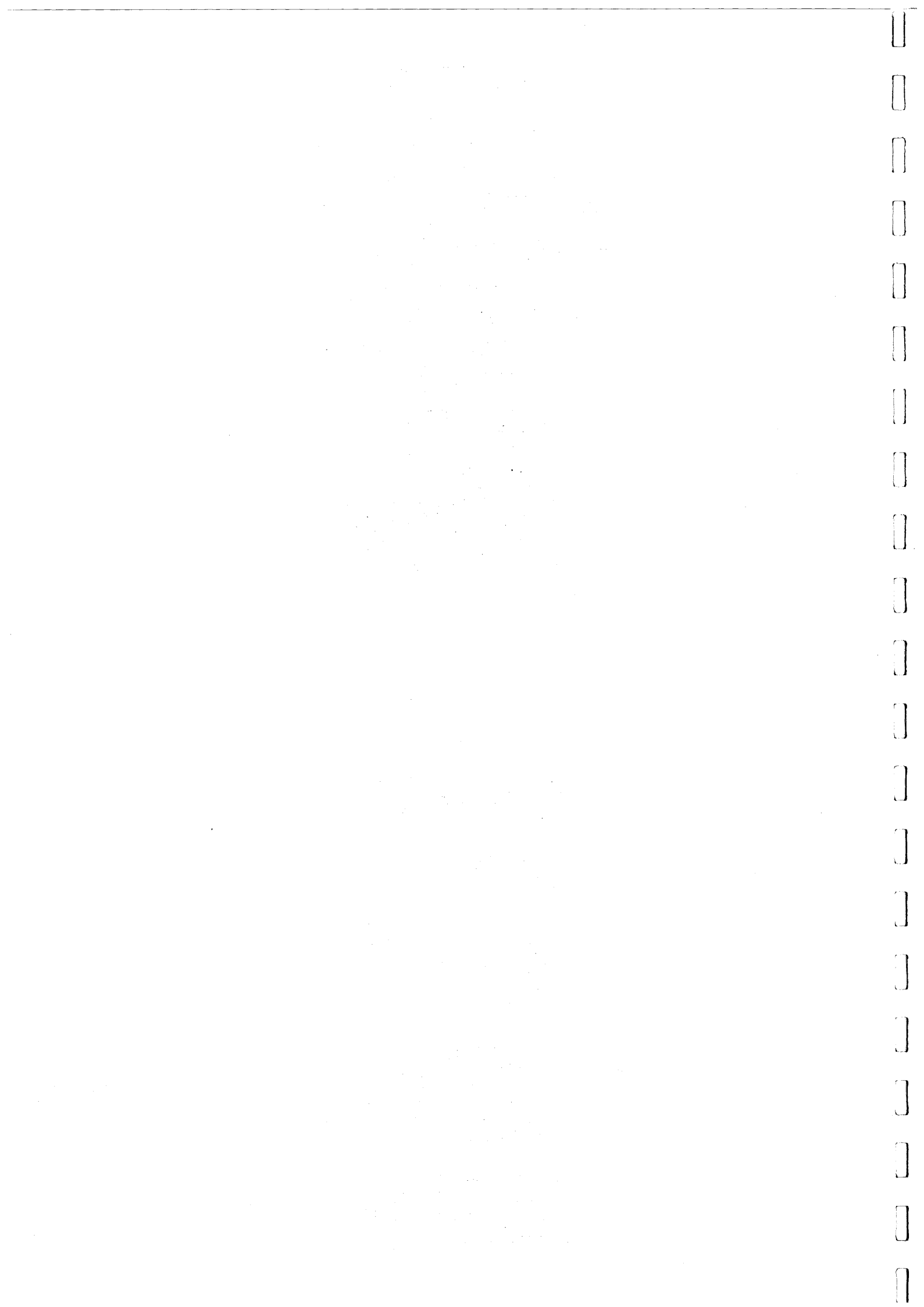
Tuen Mun – Chek Lap Kok Link - Investigation

EM&A Manual

August 2009



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Agreement No. CE 52/2007 (HY)
Tuen Mun – Chek Lap Kok Link – Investigation

Environmental Monitoring and Audit Manual

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Note:

All informations regarding the Mf Related Monitoring are no longer applicable as recommended in Supporting Document of Variation of EP for TM-CLKL (EP354/2009).

1 INTRODUCTION

1.1 Background Information

- 1.1.1.1 According to the findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway (NLH) will be operating beyond capacity after 2016 due to the increase in cross boundary traffic, developments in the NWNT, and possible developments in North Lantau, including the Airport developments, the Lantau Logistics Park (LLP) and the Hong Kong – Zhuhai – Macao Bridge (HZMB). In order to cope with the anticipated traffic demand, two new connections between NWNT and North Lantau – Tuen Mun – Chek Lap Kok Link (TM-CLKL) and Tuen Mun Western Bypass (TMWB) are proposed.
- 1.1.1.2 The proposed TM-CLKL if combined with the TMWB will provide a direct route linking NWNT and North Lantau, from north to south, the Kong Sham Western Highway (KSWH), port back-up areas in NWNT, Tuen Mun River Trade Terminal, the existing EcoPark in Tuen Mun Area 38, the Airport, the proposed LLP, HZMB and North Lantau developments. The new connection will significantly reduce the travelling time between the KSWH and the NWNT region at its northern side, and North Lantau at its southern side.
- 1.1.1.3 In 2005, Highways Department (HyD) commissioned an engineering feasibility study (FS), namely Tuen Mun Chek Lap Kok Link and Tuen Mun Western Bypass – Feasibility Study (Agreement No. CE 28/2005 (HY)), to evaluate the technical feasibility and impacts of the Project. The FS recommended that the TM-CLKL should be a dual 2-lane road with a total length of about 9 km with about 4 km long submarine tunnel and 5 km long elevated structure.
- 1.1.1.4 In order to progress this project, Maunsell Consultants Asia Ltd. were appointed by HyD to carry out the Assignment on Tuen Mun – Chek Lap Kok Link - Investigation under Agreement No. CE 52/2007 (HY). The Assignment commenced on 19 May 2008 and shall be completed within 24 months, i.e. by mid-May 2010.
- 1.1.1.5 The Feasibility Study initially proposed an alignment of the TM-CLKL comprising a toll plaza island at Tai Mo To and this alignment formed the basis of the EIA Study Brief (ESB 175/2007). However, subsequent to these documents being prepared and based upon the proposed schemes for the Hong Kong-Zhuhai-Macao Bridge (HZMB) and Hong Kong Boundary Crossing Facilities (HKBCF), it was decided to integrate the TM-CLKL southern landfall reclamation with the HKBCF reclamation. It was considered that this arrangement would also provide a cost-effective connection between the HKBCF and North Lantau. Following a full option assessment, the preferred scheme was selected, as detailed in Section 2 of this EM&A Manual.
- 1.1.1.6 The project is a designated project under Section A.1 of Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO). As such, the statutory procedures under the EIAO need to be followed and an environmental permit (EP)

will be required prior to the commencement of construction. Thus, as part of this assignment, an Environmental Impact Assessment (EIA) has been undertaken.

1.1.1.7 The EIA for the project has recommended comprehensive Environmental Monitoring and Audit requirements to be undertaken during the design, construction and operational stages of the project. This Report constitutes the Environmental Monitoring and Audit (EM&A) Manual for the proposed Tuen Mun - Chek Lap Kok Link (TM-CLKL) Project, providing details of the EM&A recommendations.

1.1.1.8 The Hong Kong SAR Government's applicable environmental regulations for noise, air quality, ecology, water quality, landscape and visual resources and waste management and heritage protection, the Hong Kong Planning Standards and Guidelines and recommendations in the TM-CLKL EIA Report have served as guidance documents in the preparation of this Manual. This EM&A Manual fulfills the requirements of the Study Agreement and follows the approach recommended in EPD's Generic EM&A Manual, Annex 21 of the Technical Memorandum on the EIA Process and EM&A Guidelines for Development Projects in Hong Kong.

1.2 Policy

1.2.1.1 The Engineer's Representative (ER) and the Contractor shall adopt Environmental Policy Statements in accordance with the requirements of this Manual in order to foster a sound EM&A programme to protect the environment. The following policy statements shall be adopted:

- establish a commitment to environmental excellence in all activities arising from the development project;
- encourage the adoption of environmental management principles to prevent potential impacts and minimise adverse impacts; and
- commit to the recommendations in the EIA study report and related EIA process requirements.

1.3 EM&A Programme Objectives

1.3.1.1 The broad objective of this EM&A Manual is to define the procedures of the EM&A programme for monitoring the environmental performance of the TM-CLKL project during design, construction and implementation.

1.3.1.2 The manual provides details of the environmental monitoring requirements arising from the EIA including air, noise and water quality, as well as audit recommendations for the noise, air, water quality, ecology, landscape and visual, waste and cultural heritage. The purposes of the defined EM&A programme are as follows:

- to ensure the specified mitigation recommendations of the EIA are included in the design of the project;

- to clarify and identify sources of pollution, impact and nuisance arising from the works;
- to confirm compliance with legal, contract specifications and EIA study recommendations;
- to provide an early warning system for impact prevention;
- to provide a database of environmental parameters against which to determine any short term or long term environmental impacts;
- to propose timely, cost-effective and viable solutions to actual or potential environmental issues;
- to monitor performance of the mitigation measures and to assess their effectiveness and, whenever necessary, identify any further need for additional measures;
- to verify the EIA predicted impacts;
- to collate information and evidence for use in public, District Council and Government consultation; and
- to audit environmental performance.

1.3.1.3 EM&A procedures are required during the design, construction and operational phases of the project implementation and a summary of the requirements for each of the environmental parameters is detailed in **Table 1.1** below.

Table 1.1 Summary of EM&A Requirements

Parameter	EM&A Phase		
	Design	Construction Phase	Operational Phase
Air Quality		Y	
Noise		Y	
Ecology	Y	Y	Y
Water Quality		Y	Y
Landscape and Visual	Y	Y	Y
Waste/Contaminated Land		Y	
Cultural Heritage	Y	Y	

1.4 Scope of the EM&A Programme

1.4.1.1 The scope of the EM&A programme is to undertake the following:

- a) Implement monitoring and audit activities for each environmental parameter as follows:
 - Dust:
 - i) Establish baseline dust levels at specified locations and review these levels on a regular basis.

- ii) Implement construction dust impact monitoring programme.
- Noise:
 - i) Establish baseline noise, levels at specified locations and review these levels on a regular basis.
 - ii) Implement construction noise impact monitoring programme.
- Ecology:
 - i) Implement design phase audit for ecological dolphin protection specifications, ecological translocation specifications and design integrated ecological mitigation measures.
 - ii) Implement baseline survey to establish existing ecological conditions.
 - iii) Implement construction phase monitoring and audit requirements for ecology resources.
 - iv) Implement operational phase monitoring.
- Water Quality:
 - i) Establish baseline water quality levels at specified locations and review these levels on a regular basis.
 - ii) Implement construction water quality impact monitoring programme.
 - iii) Implement operational phase water quality impact monitoring programme.
 - iv) Implement silt curtain efficiency test.
- Landscape and Visual
 - i) Design detailed landscape specifications.
 - ii) Implement baseline survey to establish/confirm existing landscape and visual conditions.
 - iii) Implement construction phase audit requirements for landscape and visual resources.
 - iv) Implement operational phase audit requirements for landscape and visual aspects.
- Waste
 - i) Implement construction phase audit requirements for waste aspects.
- Heritage
 - i) Implement design phase audit for toll plaza design to ensure set back from grave as been integrated.
 - ii) Implement walkover survey to confirm existing conditions.
 - iii) Implement construction phase audit requirements for historical resources.
- b) Liaison and provision of advice to construction site staff on the purposes and implementation of the EM&A programme.
- c) Identify and resolve environmental issues that may arise from the project.

- d) Check and quantify the Contractor's overall performance, implement Event/Action Plans and recommend and implement remedial actions to mitigate adverse environmental effects as identified by the EM&A programme and EIA.
- e) Conduct monthly reviews of monitored impact data during the construction phase and bi-monthly reviews during the operational phase as the basis for assessing compliance with defined criteria and ensuring that necessary mitigation measures are identified, designed and implemented and to undertake additional ad hoc monitoring and audit as required by particular circumstances.
- f) 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.
- g) Manage and liaise with other individuals or parties concerning any relevant environmental issues.
- h) Audit the effectiveness of the Environmental Management System (EMS) practices and procedures and implement any changes as appropriate.
- i) Conduct regular site audits of formal or informal nature to assess:
 - the level of the Contractor's general environmental awareness;
 - the Contractor's implementation of the recommendations in the EIA;
 - the Contractor's 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.
- j) Submit 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.

1.4.1.2 Thus, this EM&A Manual provides the following information:

- a) Description of the project.
- b) Identification and recommendations for monitoring requirements for all phases of development, including:
 - identification of sensitive receivers;
 - monitoring locations;
 - monitoring parameters and frequencies;
 - monitoring equipment to be used;
 - programmes for baseline monitoring and impact monitoring; and
 - data management of monitoring results.

- c) The organisation management structure, and procedures for auditing of the Project and implementation of mitigation measures that are recommended for the Project.
- d) The environmental quality performance limits for compliance auditing for each of the recommended monitoring parameters to ensure compliance with relevant environmental quality objectives, statutory or planning standards.
- e) Organisation and management structure, and procedures for reviewing the design submissions, monitoring results and auditing the compliance of the monitoring data with the environmental quality performance limits, contractual and regulatory requirements, and environmental policies and standards.
- f) Event and Action plans for impact and compliance procedures.
- g) Complaints handling, liaison and consultation procedures.
- h) Interim notification of exceedances, reporting procedures, report formats and reporting frequency including periodical quarterly summary reports and annual reviews to cover all construction, post-Project and operational phases of the development.
- i) Implementation schedules, summarising all recommended mitigation measures.

1.4.1.3 This Manual is considered to be a working document and should be reviewed periodically and revised once substantial changes have been made.

1.5 Project Organisation

1.5.1.1 For the purpose of this EM&A Manual, the Highways Department of the Hong Kong SAR Government is referred to as the “Employer” and the Project “Engineer” defined as the Engineer’s Representative (ER), who will be responsible for the supervision of the construction of the Project.

1.5.1.2 The mitigation/enhancement measures recommended by the TM-CLKL EIA that will require a design audit or preparation of specifications during the detailed design phase of the project will include:

- bored piling monitoring programme;
- pre, during and post construction dolphin monitoring;
- 250m dolphin exclusion zone for use during dredging, reclamation, sheet and bored piling works;
- acoustic decoupling methods for use during reclamation and dredging works;
- marine vessel control specifications;
- deployment of an artificial reef;
- installation of hoarding for the protection of the pitcher plants and surrounding habitat;

- coral translocation;
- design of toll plaza for grave G1 set back and protection; and
- landscape design drawings.

1.5.1.3 In respect of the design phase EM&A, the Consultant commissioned to undertake the Detailed Design contract will be required to designate an auditor(s) to undertake the preparation of the design specifications as detailed above, in addition to an environmental audit of the design of the specified landscape measures in order to ensure that the recommendations of the EIA have been fully and properly specified. The Consultant shall use suitably qualified staff to undertake the audit requirements to the satisfaction of the EPD and the AFCD as appropriate. A flow chart of the design phase EM&A procedures is shown in **Figure 1.1**.

1.5.1.4 During the construction and operational phases of the project, an Environmental Team (ET) is to be employed by the Contractor. The ET will be headed by an Environmental Team Leader (ETL). He shall ensure the Contractor's compliance with the project's environmental performance requirements during construction and undertake the post construction EM&A works and his responsibilities will include field measurements, sampling, analysis of monitoring results, reporting and auditing. The ETL shall be approved by the ER and the Director of Environmental Protection (DEP) and shall be competent and shall have at least 7 years relevant environmental monitoring and audit experience on projects of a similar scale and nature.

1.5.1.5 The ET will comprise suitably qualified support staff to carrying out the EM&A programme. The ET shall be independent and shall not be in any way connected to the Contractor's company. Due to the specialist nature of some of the EM&A works required for this project, the ET should comprise professionals proficient to undertake the tasks involved. Thus, the ET should include personnel experienced in noise, dust and water quality monitoring and mitigation, supervision of waste management, compensatory tree planting, coral relocation and dolphin monitoring and supervision.

1.5.1.6 Accordingly, a qualified dolphin specialist(s), together with a suitably experienced team of dolphin spotters, and a coral specialist, to the satisfaction of AFCD, will be required as part of the ET to undertake the dolphin abundance monitoring, implement the dolphin exclusion zones and undertake the coral relocation process. In addition, a Registered Landscape Architect, as defined by the Landscape Architect's Registration Board, will be required on the ET to monitor and audit the landscaping installation works and assist in the audit of the ecological transplantation and restoration works.

1.5.1.7 The overall duties of ETL and the team are as follows:

- Sampling, analysis and statistical evaluation of monitoring parameters with reference to the EIA study recommendations and requirements in respect of noise, dust and water quality.
- Environmental site surveillance.

- Audit of compliance with environmental protection and pollution prevention and control regulations.
- Monitor the implementation of environmental mitigation measures.
- Monitor compliance with the environmental protection clauses/specifications in the Contract.
- Review construction programme and comment as necessary.
- Review construction methodology and comment as necessary.
- Complaint investigation, evaluation and identification of corrective measures.
- Audit of the EMS and recommend and implement any changes as appropriate.
- Liaison with the Independent Environmental Checker (IEC) on all environmental performance matters.
- Advice to the Contractor on environmental improvement, awareness, enhancement matter, etc., on site.
- Timely submission of the designated EM&A reports to the ER, the IEC, the DEP, the AFCD and the AMO as appropriate.

1.5.1.8 In addition to the ETL and ET, an Independent Environmental Checker (IEC) shall be employed to advise the ER on environmental issues related to the project. The role of the IEC shall be independent from the management of construction works, but the IEC shall be empowered to audit the environmental performance of the construction activities and operational mitigation. The IEC shall have project management experience in addition to the requirements of the ET specified above and the appointment of the IEC will be subject to the approval of the ER and the DEP. The IEC may require specialist support staff in order to properly carry out his duties, which shall include the following:

- Review and audit all aspects of the EM&A programme.
- Validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers.
- Carry out random sample check and audit on monitoring data and sampling procedures, etc.
- Conduct random site inspection.
- Audit the EIA recommendations and requirements against the status of implementation of environmental protection measures on site.
- Review the effectiveness of environmental mitigation measures and project environmental performance.
- Audit the Contractor's construction methodology and agree the least impact alternative in consultation with the ET and the Contractor.
- Check complaint cases and the effectiveness of corrective measures.

- Review EM&A report submitted by the ET.
- Feedback audit results to ET by signing off relevant EM&A proformas.

1.5.1.9 An organisation chart showing the lines of communication between the key parties with respect to the EM&A works is provided on **Figure 1.2**. Both the ET and IEC shall be retained for the duration of the EM&A works which will span both the construction phase and one year into the operational phase of the project. The operational EM&A works will be the responsibility of the Contractor and will be undertaken in parallel to the maintenance period after the completion of construction.

1.5.1.10 Notwithstanding the above, given that the TM-CLKL, HKBCF and HKLR will be constructed concurrently, an Environmental Protection Office (ENPO) or equivalent to oversee the cumulative construction projects in North Lantau area will be established by the Project Proponent. The responsibility of the ENPO would be similar to that of the IEC but should also include:

- coordination of the monitoring and auditing works for all the on-going projects in the area in order to identify possible sources/causes of exceedances and recommend suitable remedial actions where appropriate;
- identify and assess cumulative impacts including possible sources/causes of exceedance and recommending suitable remedial actions;
- undertake liaison with the mainland project teams counterparts to identify and assess any cross-boundary cumulative impacts; and
- coordinate the assessment and response to complaints/enquires from locals, green groups, district councils or the public at large.

1.5.1.11 The exact responsibilities and organisation of the ENPO will be defined during the detailed design stage.

1.6 Terminology

1.6.1.1 To clarify the terminology for impact monitoring and audit, key definitions are specified below and are used throughout this Manual.

1.6.1.2 Monitoring refers to the systematic collection of data through a series of repetitive measurements. The stages of monitoring are defined in this document as follows:

- a) Baseline Monitoring refers to the measurement of parameters, such as noise and air quality impact parameters, during a representative pre-project period for the purpose of determining the nature and ranges of natural variation and to establish, where appropriate, the nature of change.
- b) Impact Monitoring involves the measurement of environmental impact parameters, such as noise and air quality, during Project construction and implementation so as to detect changes in these parameters which can be attributed to the Project.

1.6.1.3 Audit is a term that infers the verification of a practice and certification of data. The types of audit are defined below:

- a) Compliance audit is defined as follows:
 - the process of verification that all or selected parameters measured by a noise or air quality impact monitoring programme or levels of an operation are in compliance with regulatory requirements and internal policies and standards; and
 - the determination of the degree and scope of any necessary remediation in the event of exceedance of compliance.
- b) Post Project Audit is carried out after the implementation and commissioning of a Project.

1.6.1.4 For the purpose of noise, air and water quality impact monitoring and audit, the Action and Limit Levels are defined as follows:

- a) The Action Level is the level defined in which there is an indication of a deteriorating ambient level for which a typical response could be an increase in the monitoring frequency.
- b) The Limit Level is the level beyond the appropriate remedial pollution control ordinances, noise and air quality impact objectives or Hong Kong Planning Standards and Guidelines established by the EPD for a particular project, such that the works should not proceed without appropriate remedial action, including a critical review of plant and work methods.

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2 PROJECT DESCRIPTION

2.1 Scope of the Project

2.1.1.1 Further to the recommendations of the Option Assessment and subsequent alignment developments detailed in Section 2 of the EIA report, the preferred TM-CLKL scheme comprises Northern Connection Option N1b, Main Connection Option M3 and Southern Connection Option S1. This preferred alignment is shown in **Figure 2.1** and will comprise:

- (a) construction of approximately 5.0km long dual 2-lane road tunnel between Tuen Mun Area 40 and the HZMB HKBCF at north-east of HKIA;
- (b) construction of approximately 4.2km seawalls and approximately 35.6ha of reclamation to the Government foreshore and sea-bed at Tuen Mun Area 40 and Lantau for the tunnel portals and the associated roads, as shown in **Figures 2.2a** and **2.2b**;
- (c) construction of approximately 1.6km long dual 2-lane viaduct between HZMB HKBCF and NLH and the associated roads at Tai Ho;
- (d) construction of a toll plaza at Tuen Mun Area 46 and the associated roads at Tuen Mun;
- (e) construction of footpaths areas;
- (f) construction of administration building, ventilation buildings and other ancillary buildings to facilitate ventilation and tunnel control operation serving the proposed road tunnel in (a) above and toll plaza in (d) above;
- (g) modification and realignment of sections of Lung Fu Road and Lung Mun Road at Tuen Mun;
- (h) modification and realignment of sections of North Lantau Highway and Cheung Tung Road at Tai Ho;
- (i) permanent closure and demolition of sections of existing at-grade carriageways, footpaths and central median/refuge islands;
- (j) temporary closure and reconstruction/modifications of sections of existing at-grade carriageways, footpaths and central median/refuge islands; and
- (k) ancillary works including site formation, slope, drainage, utilities, footbridge, noise barriers, retaining walls, berths and temporary pontoon.

2.1.1.2 Details of the various elements of the selected TM-CLKL alignment are detailed in the sections below.

2.2 Northern Section in Tuen Mun

2.2.1 Northern Reclamation

2.2.1.1 At the northern landfall in Tuen Mun, adjacent to the River Trade Terminal at Pillar Point, the construction of TM-CLKL requires a reclamation of about 16.5ha of land area when calculated to the cope line, or 21.1ha of land for the footprint area to the bottom of the seawall where it intersects the seabed. The general

layout and typical sections of the proposed reclamation scheme in this location are shown in **Figures 2.3a to 2.3c**.

- 2.2.1.2 Unlike the southern landfall reclamation where sand fill is proposed below +2.5mPD, public fill will be used for the entire reclamation to maximize the use of public fill. Though this may result in worse impact to water quality during construction, in view of its relatively smaller scale in comparison with the HKBCF reclamation, the type of fill material is adopted to achieve an overall balance among environmental, technical and other aspects.
- 2.2.1.3 The northern landfall reclamation is essentially required to provide a land area for construction of the launching shaft for the tunnel boring machine (TBM) and ultimately, protection to the tunnel structure when constructed.
- 2.2.1.4 The construction of the portion of reclamation adjacent to the TBM launching shaft, Portion N-c, is critical to the overall programme, as the TBM is planned to be launched from the northern reclamation southward. Therefore, land is required to be formed earlier for the construction and operation of the launching shaft, as well as for the stockpile of tunnel lining segments, a slurry treatment plant to de-water the extracted alluvium arising from the tunnel construction so that it would then be suitable as public fill and other operations. Sand Compaction Piles (SCP), in association with a non-dredged seawall foundation, have been considered for the construction in order to minimise the amount of marine sediment to be dredged, as described in Section 2. However, these techniques require a much longer construction time for the seawall which would not be quick enough to allow the land to be formed on time to allow the TBM to commence tunnel construction. Therefore, a fully dredged method is required for the seawall foundation construction. The southern tip of the reclamation will house the TBM tunnel shaft and the deeper portion of the cut-and-cover tunnel section. The marine deposits located above these deep structures would inevitably have been removed during excavation for the construction of these structures. Fully dredged method is therefore also proposed for this section of the reclamation in conjunction with the seawall construction.
- 2.2.1.5 Notwithstanding, a non-dredged reclamation is proposed for the inner portions of the reclamation denoted by N-a and N-b (**Figures 2.3a and 2.3b**). In these sections of the alignment, the cut-and-cover tunnel and open ramp will lie above the marine deposits layer and, in order to minimise the sediment removal and disposal quantities, it is proposed that the marine deposits underneath the cut-and-cover tunnel and ramp be left in place, with the tunnel structures supported by deep foundation and diaphragm walls, where necessary. Band drains and sand blankets will be installed and surcharging will be applied to reduce the residual ground settlement associated with the non-dredged reclamation.
- 2.2.1.6 Construction of the northern reclamation, which partly abuts the existing seawall at Pillar Point, will affect the marine operations of the Government Berths at Tuen Mun River Trade Terminal, including Customs and Excise (C&E) and Immigration (ImmD) Departments and Fire Services Department's (FSD) Fire Boat Station. Provisions have been made to relocate these facilities to the new reclamation alongside the eastern seawall (see **Figure 2.2a**).

2.2.2 *Viaduct Connection and Slip Roads*

2.2.2.1 An elevated viaduct at the northern section of TM-CLKL connects the submarine tunnel as it emerges on the northern landfall to the south of the TMWB alignment at the north. Commencing from the reclamation for the tunnel landfall, the viaduct curves up and over Lung Mun Road, crossing above a sawmill factory and then abuts to the retaining wall structures at the western side of the proposed toll plaza in Area 46, as described in Section 2.2.3 below. Layout of the viaduct is shown in **Figure 2.4**.

2.2.2.2 The structural form of the viaduct will consist of a pair of pre-stressed concrete box girders supported on reinforced concrete piers. Each box girder commences at around 14.6m wide at the reclamation to accommodate a 2-lane carriageway, before widening out to accommodate additional lanes for connection with the toll plaza. Span lengths will typically be 60m using a constant structural deck depth of 3.2m. In order to cross over the Lung Mun Road and the existing fire station, slightly longer spans of around 75m are used with a haunched deck of a depth of around 6m at the piers. The piers supporting the viaducts will sit on bored piles founded on rock at some 20m below ground level, with pile caps below ground level.

2.2.3 *Toll Plaza*

2.2.3.1 A toll plaza at Tuen Mun Area 46 is proposed for the TM-CLKL, as shown in detail in **Figure 2.4**. The toll plaza is also considered as a co-location to accommodate the tolling provision for the interface project, TMWB. In order to facilitate the tunnel operator(s) applying different toll levels to TM-CLKL and TMWB road users, the following 3 separate groups of toll booths are proposed to be provided at the toll plaza:

- travelling from/to TM-CLKL only;
- travelling from/to TMWB only; and
- travelling from/to both TM-CLKL and TMWB.

2.2.3.2 The proposed toll plaza is approximately 190m x 680m in size, with tunnel operation facilities located at the northern side of the site. With reference to the latest traffic forecast at year 2031, the required number of tolling lanes for different travelling trips are summarised in **Table 2.1** below:

Table 2.1 Proposed Tolling Arrangements at Toll Plaza

Travelling Trip	Northbound		Southbound		Sub-total
	Auto-toll Lane	Manual-toll Lane	Auto-toll Lane	Manual-toll Lane	
TM-CLKL only	2	2	2	2	8
TMWB only	2	2	2	2	8
Both TM-CLKL & TMWB	2	2	2	3	9
Total:					25

- 2.2.3.3 The nearside tolling lane for each direction is proposed to be 6.2m wide, for the passage of exceptionally wide vehicles and special vehicles such as tunnel operator's vehicles or other authorised vehicles. The other tolling lanes are proposed to be 3.65m wide in order to allow the flexibility of switching between manual-toll and auto-toll if necessary. A 1.6m wide physical island will be provided to accommodate the toll booth, the access staircase landing and the concrete median barriers.
- 2.2.3.4 The following facilities are required at the toll plaza area for tunnel operations:
- an administration building which could cater for 2 tunnel operators (including individual workshops, garage and maintenance buildings);
 - a weigh station;
 - a vehicle recovery area;
 - turnaround facilities;
 - vehicle cross-over area;
 - a petrol filling station;
 - bus lay-bys with footbridge links; and
 - parking spaces for employees, visitors, recovery, operation and maintenance vehicles.
- 2.2.3.5 The southwest end of the toll plaza will connect with both northbound and southbound of the TM-CLKL. In order to tie in with the lane configuration of TM-CLKL, both 3-lane and 2-lane carriageways will be provided at the toll plaza for TM-CLKL northbound and southbound traffic respectively. Roads connecting traffic heading to or coming from the TMWB will, also, be provided between the toll plaza and TMWB tunnel portal.
- 2.2.3.6 A dual single-lane carriageway linking the proposed enlarged roundabout at the junction of Lung Mun Road / Mong Tat Street and the TMWB mainline tunnel will be provided in between the northbound and southbound carriageways of the TM-CLKL.
- 2.2.3.7 Traffic from the Tuen Mun south road network destined for TM-CLKL will use the approach single carriageway slip road branching from the proposed roundabout at Lung Mun Road and Lung Fu Road. The traffic from TM-CLKL leading to the Tuen Mun south road network will use the exit slip road after leaving the toll booth. The slip road, which takes the form of a single carriageway tunnel, will connect with the proposed roundabout at Lung Mun Road and Lung Fu Road.
- 2.2.3.8 An internal 7.3m wide 2-way service road providing the turnaround service route around the portal area will also be provided, with a 2.0m wide footpath provided on one side of the road. An ingress/egress is proposed at both ends of the toll plaza to allow for access of tunnel operation, recovery and emergency vehicles.
- 2.2.3.9 The toll plaza will be formed as a raised platform above the general existing ground. It will be partly constructed on fill supported by retaining walls, and

partly constructed on elevated structures. Cut slopes will also be required, which will mostly be along the northern edge of the toll plaza, with some isolated ones associated with the formation of the various slip roads connecting the toll plaza to the local roads in Tuen Mun. The excavated materials from the cut slopes will be re-used for the filling as part of the earthwork balancing exercise.

- 2.2.3.10 In order to cope with the proposed layout of the toll plaza, the existing Lung Mun Road will have to be realigned sideway to the south by about 30m to suit. An alternative option of providing a decking support for the portion of the toll plaza overhanging the existing Lung Mun Road has, also, been considered as viable.
- 2.2.3.11 The current layout of the toll plaza, on the basis of co-locating the tolling provision for both the TM-CLKL and TMWB, represents the worst cases scenario for the EIA purposes in so far as the scale and extent of works are concerned, as the combined toll plaza requires a larger land take than a single, TM-CLKL only, toll plaza. The option remain, however, to separate the tolling facilities and/or to adopt “non tolling” for TMWB, which could result in a “single” toll plaza of a smaller scale.
- 2.2.3.12 As described in Section 1 and 2, the EIA Study Brief (ESB 175/2007), was based upon a toll plaza being located on either the northern or southern landfall reclamation and, therefore, did not interface with the 250m Consultation Zone of the Pillar Point Valley Landfill and, therefore, no specific requirements for a landfill gas hazard assessment were included in the EIA Study Brief. However, as shown in **Figure 2.4**, the proposed location of the combined toll plaza will encroach into the 250m consultation zone of the Pillar Point Valley Landfill and, as such, could be affected by the migration of landfill gas. Notwithstanding the scope of the EIA Study Brief, this issue should be assessed as part of the EIA and, therefore, a Landfill Gas Hazard Assessment has been undertaken as part of this Assignment.

2.2.4 *Other Construction Works*

- 2.2.4.1 Site formation and associated slopes and retaining walls will be required to form the toll plaza and associated road carriageways. In general, soil and rock cut slopes would be involved. All slopes will be formed in a stable slope angle with proper maintenance access and drainage surface channels. If necessary, soil nails will be installed to ensure adequate current safety standard. Fill slope formation will unlikely be required according to the current road alignment. The feasible retaining wall structures could be mass concrete, reinforced concrete L-shape or crib walls and reinforced earth for road embankment.

2.3 **Submarine Tunnel**

2.3.1 *Alignment and Construction*

- 2.3.1.1 The preferred horizontal alignment of the proposed submarine tunnel, shown in **Figure 2.1**, is 5km long and crosses the Urmston Road sea channel, connecting Tuen Mun to the TM-CLKL southern landfall at the HKBCF reclamation, east of the airport island. As described in Section 2, the tunnel is proposed to be constructed using a TBM in order to avoid disturbance to the seabed and minimise

the amount of dredged material too be removed.

- 2.3.1.2 The tunnel begins at the northern portal situated at the northern landfall where the ground level will be approximately +6.0mPD. The submarine tunnel then runs southward under Urmston Road, where the lowest tunnel bottom level will reach approximately -49mPD, towards the reclamation attached to the east of the proposed HKBCF where it ends at the southern portal. Reclamation works for the TM-CLKL southern landfall will bring the new ground level to around +6mPD. The vertical alignment of the tunnel is shown in **Figures 2.5a to 2.5c**. As shown in these figures, as the tunnel rises up to the portals, any seabed disturbance will be contained within the reclamation areas at either end of the tunnel and, as such, further seabed loss and disturbance will not occur from the tunnel itself. Construction of the TBM tunnel will commence at the northern landfall reclamation where a land area is required for construction of the launching shaft for the TBM. The TBM will start boring from the launching shaft towards the southern reclamation adjacent to HKBCF where a TBM retrieval shaft will be constructed for the removal of the TBM.

2.3.2 Ventilation Buildings

- 2.3.2.1 Two ventilation buildings have been proposed at either end of the submarine tunnel to discharge the polluted tunnel air. Location of the north and south ventilation buildings are shown in **Figures 2.2a and 2.2b** and described below.

- 2.3.2.2 The North Ventilation Building (NVB) will be located at the southern end of the northern landfall reclamation of the TM-CLKL tunnel, and will be used to extract polluted tunnel air from the northbound tunnel. The cross-sectional area of stack will be about 94m², and the exit velocity of the emissions will be about 4m/s. The building has three storeys above ground and two levels of basement. The mid-discharge height from the stack is 16.15m above ground, which equates to between 14.15m and 18.15m high. The exhaust direction will be towards the sea and is proposed to be inclined at 45 degree upward.

- 2.3.2.3 The South Ventilation Building (SVB) will be located at the northern end of the southern landfall reclamation of the TM-CLKL tunnel, adjoining the HKBCF island. The ventilation system will be used to extract the tunnel's southbound pollution. The cross-sectional area of stack is slightly larger than the NVB at about 102m², but the exit velocity is the same at 4m/s. The mid-discharge height, exhaust direction and inclination will be the same as the NVB.

2.4 Southern Section at HKBCF / North Lantau

2.4.1 Southern Reclamation

- 2.4.1.1 At the southern landfall, the construction of TM-CLKL requires the reclamation of about 19.1ha of land area when calculated to the cope line, or 25.4ha of land for the footprint area to the bottom of the seawall where it intersects the seabed. The southern landfall reclamation forms an integrated part of the HKBCF reclamation and interfaces with the latter at a temporary seawall along its eastern edge. Reclamation works sequence and programme have been planned to match those of the HKBCF for both its targeted Phase 1 commissioning at 2014 and ultimate

commissioning at 2016. Consideration of options for the construction sequence of the reclamation works for HKBCF and their effect on this EIA study is discussed in Section 2.7. The general layout and typical sections of the proposed scheme of reclamation are shown in **Figures 2.6a to 2.6c**.

2.4.1.2 Public fill and sand fill are used above and below +2.5mPD (approx. sea level) respectively with the following consideration:

- a) to control residual settlement to less than 500mm as stated in Port Works Design Manual (Part 3, P.45) published by CEDD;
- b) to be consistent with the adjacent HKBCF reclamation, as the southern landfall reclamation is likely to be constructed together with the former under a single contract;
- c) environmentally, use of public fill below +2.5mPD will adversely affect the water quality.

2.4.1.3 Notwithstanding, a maximum proportion of up to 30% of public fill will be used for reclamation below +2.5mPD in line with the current policy on earthwork balancing.

2.4.1.4 The use of SCP for the seawall foundations have been explored (see Section 2) but, again, has been deemed not to be applicable, in this case because of excessive upheaval of the existing seabed induced by SCP installation. The existing seabed at the location of the southern landfall is at approximately -4mPD to -11mPD and thickness of marine deposits is about 14m. The seabed would be expected to rise up by about 4m after installation of the SCP, and such heaving would adversely affect the operation of the barges for construction of the seawall. In addition, the “heaved” material would require to be dredged away to allow marine access during the operational phase, and this will increase the disposal quantities of marine sediment and cause more disturbance. Based upon this, the fully dredged method has also been proposed for the seawall foundation construction at the southern landfall.

2.4.1.5 Similar to the northern landfall, the southern landfall is an elongated shape and can be subdivided into three portions from north to south, namely portions S-a, S-b and S-c, as shown in **Figure 2.6a**, and accommodating the TBM tunnel and shaft, cut-and-cover tunnel and the open ramp as well as the connecting above ground road system, respectively. In order to minimise the quantities of marine sediment removal and, therefore, disposal, construction methods which minimise the dredging for the reclamation have been considered where possible. At portion S-a and part of the portion S-b where deep excavation will be required for constructing the TBM shaft and the deeper section of the cut-and-cover tunnel, which would inevitably have removed the marine deposits located above the proposed structures, the fully dredged method is required in conjunction with the seawall construction for the same reasons detailed for the northern landfall above. However, for the remaining portions where marine deposits are expected to be located underneath the cut-and-cover tunnel and ramp, in line with the principle of minimising the sediment disposal quantities, it is proposed that the marine deposits shall be left in place, with the tunnel structures supported by deep foundation and diaphragm wall, where necessary. Similar to the northern

reclamation, band drains and sand blankets will also be installed, and the surcharge will, again, be applied to reduce the residual ground settlement associated with the non-dredged reclamation.

2.4.2 *Viaduct Connection and Slip Roads*

Marine Viaduct

- 2.4.2.1 The marine viaduct comprises a dual 2-lane carriageway with a straight alignment connecting the TM-CLKL southern landfall to North Lantau, connecting at Tai Ho Wan, as shown in **Figure 2.7**. The structural form will consist of a pair of prestressed concrete box girders supported on reinforced concrete piers. Each box girder will be around 14.6m wide. The vertical profile will involve rising gradients from both ends of the viaduct to a high point above the navigation channel.
- 2.4.2.2 Span lengths will typically be 60m using a constant structural deck depth of 3.2m. At the navigation channel off the south-east corner of the southern landfall, a 160m span with a haunched deck will be used to achieve the minimum navigation clearance of 100m horizontally and a minimum of +26.25mPD vertically. The haunched segment at pier will be about 11m deep. The spans adjacent to the navigation span will be 100m long to provide a transition to the typical 60m spans. In total about 50 piers will be constructed in the marine environment, with a predicted loss of seabed of about 0.2ha. The piers supporting the viaduct will sit on bored piles founded on rock at some 40m below seabed level. Pile caps will be positioned above the high water level for marine safety.

Land Connections and Slip Roads

- 2.4.2.3 There are four slip roads connecting the marine viaduct to the North Lantau Highway (NLH) for eastbound and westbound traffic on the highway connecting to and from the marine crossing. The slip roads comprise four viaducts curving out from the marine viaduct and crossing over the MTR Airport Express Railway before ramping down to connect with the North Lantau Highway. The two viaducts on the west provide for a 1-lane carriageway and the two viaducts on the east provide for 2-lane carriageways.
- 2.4.2.4 The viaducts are all prestressed concrete box girders supported on reinforced concrete piers. The viaducts for a 1-lane carriageway will each be around 11.3m wide, and the viaducts for the 2-lane carriageways, around 14.6m wide. Span lengths will typically be 60m using a constant structural deck depth of 3.2m, while for crossings over the MTR Airport Express Railway and the North Lantau Highway, larger spans of 90m are required, together with a haunched deck of a depth of around 6m at piers.
- 2.4.2.5 The piers supporting the viaducts will all be constructed within the disturbed area of the NLH transport corridor, and sit on bored piles founded on rock at some 20m below ground level, or deeper if underground cavities are encountered (as the site falls within the Designated Area of Northshore Lantau with regards to foundation works). In order to accommodate the viaduct connections to the North Lantau Highway, diversion of Cheung Tung Road including some of the existing utilities

below this road will be required, with associated slope cutting works at the west.

2.4.3 *Slope Works*

2.4.3.1 Diversion of the existing Cheung Tung Road will require cutting back the road side slope features 9SE-B/C8 and 9SE-B/C9. The features comprise soil and rock cut slopes, and a similar cut slope profile to the existing would be proposed. If necessary, soil nails will be installed to ensure adequate current safety standard. Some streams pass through the existing slopes works in the form of U shaped channels, and these existing channels will need to be extended up hill to accommodate the new slope extent and profile.

2.5 Works Areas

2.5.1.1 Six works areas have been identified for use during the construction period of TM-CLKL, and will be used for locating site offices and for storage of materials and viaduct segments, etc. The locations of the works areas are shown in Figures 2.8a and 2.8b and described in Table 2.2 below.

Table 2.2 Details of TM-CLKL Proposed Works Areas

Works Area	Location	Proposed Use
Lantau		
WA4	At the existing reclaimed land near Tai Ho Offtake and Piggling Station at Cheung Tung Road in Lantau	Works area for storage of materials and viaduct segment and site office
WA5	At the existing site offices for Yam O Road Watermains near Yam O Wan at Cheung Tung Road in Lantau	Works area for storage of materials and viaduct segment and site office
WA6	At the existing site offices and storage yard for Penny's bay Reclamation near Yam O Wan at Cheung Tung Road in Lantau	Works area for storage of materials and viaduct segment and site office
WA23	At the existing reclaimed land at Wok Tai Wan in Tsing Yi	Casting yard for fabrication of precast units, storage of work boats, materials and site office
Tuen Mun		
WA18	At the existing River Trade Golf at Pillar Point in Tuen Mun	Works area for storage of materials and viaduct segment and site office
WA19	At the existing closed Pillar Point Valley Landfill at Pillar Point in Tuen Mun	Works area for storage of materials and viaduct segment and site office

2.5.1.2 All the works areas are currently formed on developed land, with some already being used as works areas for on-going construction projects. The exception to this is WA19 which is within the Pillar Point landfill area, and the site as a whole is largely covered with vegetation with only a relatively small portion formed and utilised. However, the terms for use of this site during the TM-CLKL construction requires that no trees will be removed and therefore, only the already formed areas will be utilised. In addition, all the sites are located away from any residential areas.

2.6 Sewage and Drainage

- 2.6.1.1 Stormwater drainage systems will be provided to collect stormwater from the carriageway surfaces. The stormwater will enter into gullies along the kerb lines. The gullies will be fitted with sumps to trap silt and grit prior to discharging the stormwater into the stormwater drainage systems. The drainage systems will eventually discharge the stormwater into the sea at discrete locations. Similar systems will be provided along the marine viaduct. Sump traps will be built into the deck structure, and the collected stormwater will discharge into the sea at the column locations.
- 2.6.1.2 Operational sewage will be generated but, again, in relatively small quantities as summarised in **Table 2.3** below, based upon the staffing estimates required for the TM-CLKL project.

Table 2.3 Estimated Sewage Generation

Location	Staff	Average Dry Weather Flow (m ³ /day)
Southern Landfall	10	3.5 m ³ /day
Northern Landfall	400	140 m ³ /day
Toll Plaza	110	38.5 m ³ /day

- 2.6.1.3 In Tuen Mun, the sewage (Average Dry Weather Flow (ADWF)) from the toll plaza and northern ventilation building is estimated to be about 178m³ per day and with about 510 personnel on site in total. The sewage will be discharged to the existing sewerage system and it is expected that that adequate capacity in the local system to accommodate this amount is available
- 2.6.1.4 For the southern landfall ventilation building, the estimated sewage generation is very small at 3.5m³ per day (ADWF). As the quantity is so small, the sewage will be collected and pumped to the on-site HKBCF sewage treatment works located in the south-east corner of the HKBCF reclamation. The sewage treatment works will have a daily capacity of 1300m³ and an estimated throughput from the HKBCF of 700m³/day ADWF. As such, it has been confirmed that there is adequate spare capacity for the limited amount of sewage generated by the TM-CLKL to be treated at this plant. The HKBCF sewage treatment plant will treat the sewage to a secondary level before discharge via a box culvert into the marine environment.

2.7 Project Programme

- 2.7.1.1 It is anticipated that construction for the TM-CLKL will commence in late 2011, with a target opening date for the entire road link at the end of 2016. An indicative construction programme showing the key activities in different major construction areas is shown in **Figures 2.9a** and **2.9b**. Locations of the construction areas referenced in the construction programme are shown in **Figures 2.9c** and **2.9d**. This is based upon working 12 hours per day for all land works and 16 hours per day for the marine works, although piling works for the marine sheet piled wall will, also, be restricted to 12 hours per day.

- 2.7.1.2 Notwithstanding the above, critical slip road links of the southern viaduct section are planned to be completed at end 2014, in advance of the overall project completion date, in order to match the targeted Phase 1 commissioning of the HKBCF in 2014. The southern viaduct will serve as an alternative route to connect the HKBCF via North Lantau Highway to urban Kowloon when the HKBCF is opened at that time.
- 2.7.1.3 The following activity sequences are critical to the determination of the overall construction programme:
- (a) the southern most portion (Portion N-c) of the northern reclamation must be formed first to allow for the TBM tunnel launching pit to be built and subsequently tunnel boring to commence southward from that end;
 - (b) viaduct connection and slip roads of the Northern Section are planned to commence in early 2014 after the completion of the northern reclamation; and
 - (c) construction of the southern landfall reclamation will commence in late 2011 and be scheduled for completion in early 2014, to match the reclamation programme of the HKBCF for targeted Phase 1 commissioning in 2014.
- 2.7.1.4 Notwithstanding the targeted Phase 1 commissioning of HKBCF in 2014 described in Section 2.7.1.2 above and adopted in this EIA study, two options, referred to as Sequence A and Sequence B, have been formulated for the construction sequence of the reclamation works for HKBCF. Sequence A, adopting a series of interim/temporary seawalls and the full-dredging around local programme critical areas, will enable Phase 1 to be completed by 2014. Sequence B involves no interim seawalls and adopts the non-dredge method for reclamation together with more extensive surcharging. The corresponding target commissioning date for Phase 1 will be 2015. From environmental considerations, Sequence A involves more dredging and more reclamation filling, and will result in larger water quality impacts. Sequence B, in comparison, involves less dredging and reclamation filling, and will result in less water quality impacts.
- 2.7.1.5 In view of the above, Sequence B should have been adopted, as it is environmentally more advantageous and as it can still meet the vital programming target for HKBCF. Nevertheless, for such a complicated project as HKBCF, there may be a possibility to change to Sequence A, for example in the case of unforeseen delays in the earlier tasks, the change from Sequence B to Sequence A will enable the project to gain back time to compensate for any programme delays. On this basis, although the planning of HKBCF will be based on Sequence B, the assessment of water quality impacts (and, therefore, the associated marine ecology and fisheries assessments), together with the generation of traffic figures for the air and noise assessments have been based on Sequence A, which is on the conservative side as explained above. Notwithstanding, the assessment of waste disposal and requirement for fill material described under Section 12 have been based on the Sequence B programme in formulating the targeted quantities under the more favourable planning programme.

2.8 Concurrent Projects

2.8.1 *Interface with HKBCF and HZMB HKLR*

2.8.1.1 The southern landfall reclamation of the TM-CLKL forms an integrated part of the HKBCF reclamation and interfaces with the latter at a temporary seawall along its eastern edge. Reclamation works sequencing and programme have been planned to match those of the HKBCF in order to achieve its Phase 1 commissioning date target in 2014. HKLR is also scheduled to open in 2014 in matching the Phase 1 commissioning date of HKBCF. Detailed coordination of the interfacing construction activities will be required, including construction access, layout of mitigation measures to control water quality during the construction stage, joint water quality monitoring system, and engineering and construction details at the interface. The layout of the TM-CLKL, HKBCF and HKLR in relation to each other is shown in **Figure 2.1**.

2.8.1.2 As the projects are proposed to be constructed concurrently and will be operational at the same time, cumulative impacts are possible and have been assessed.

2.8.2 *Interface with Tuen Mun Western By-pass*

2.8.2.1 The construction of the TMWB is tentatively planned to commence in late 2011 and be completed by late 2016. The TMWB southern tunnel and its portal will abut with the toll plaza and will interface with the TM-CLKL (see **Figure 2.4**). Interface of construction activities, including construction access, temporary stockpile area within the toll plaza site for processing, sorting, stockpiling of excavated material from the TMWB tunnel, and any blasting impacts from the drill and blast tunnelling method of the TMWB southern tunnel, will require detailed coordination during the construction phase. As the projects are proposed to be constructed concurrently and will be operational at the same time, cumulative impacts are possible and have been assessed.

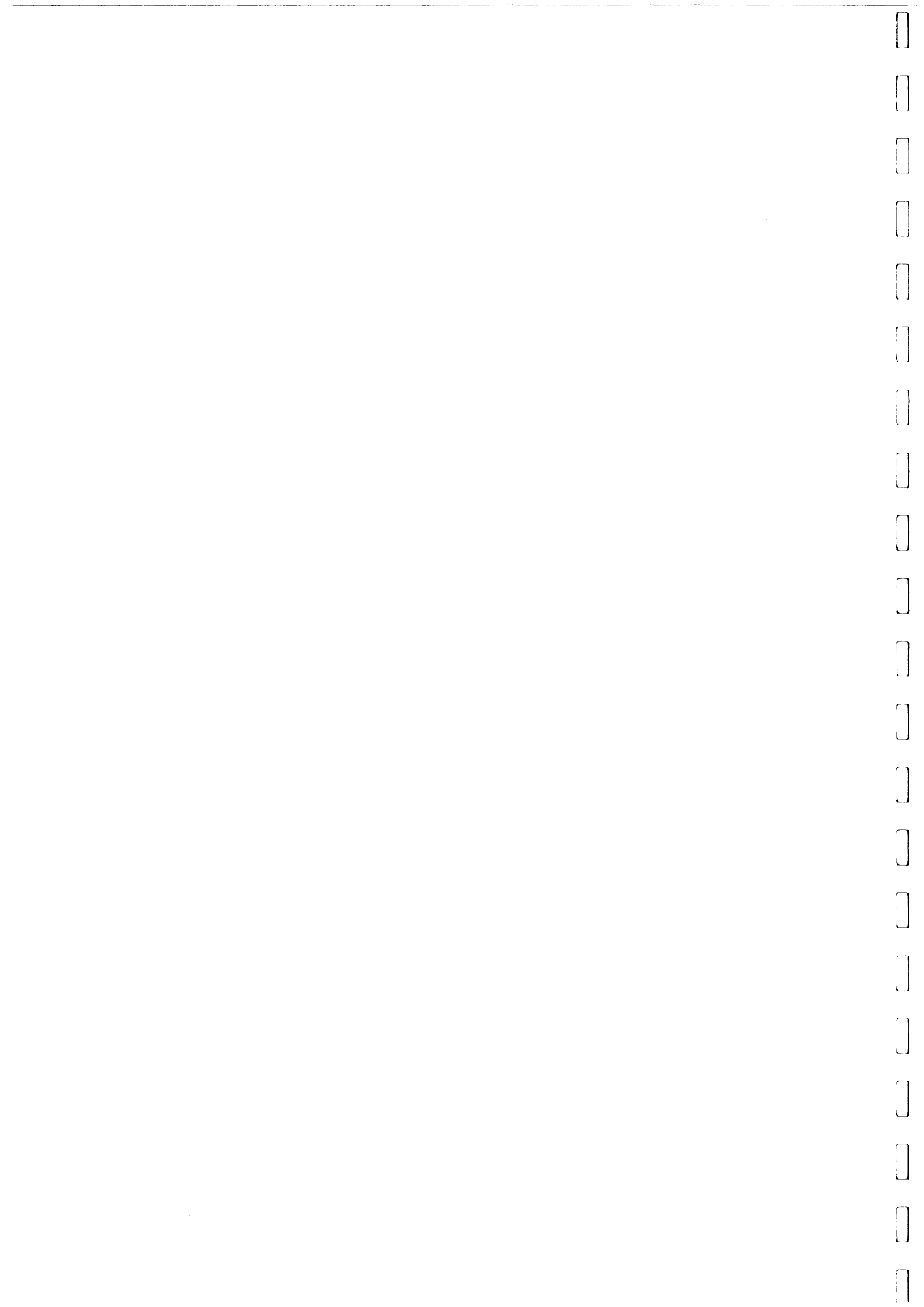
2.8.3 *Other Concurrent Projects*

2.8.3.1 In addition to the interface with the major concurrent projects described above, details of other concurrent projects during either the construction and/or the operational phases, together with details of how these are assessed in the EIA, are described in the summary table of concurrent projects included as **Appendix A2** of the EIA report.

2.9 Traffic Data and Assumptions

2.9.1.1 A Local Area Model was developed to provide traffic forecasts for EIA purposes. The EIA requires cumulative traffic forecasts and, hence, EIA flows were produced assuming the HZMB, HKLR, HKBCF, TMWB and TM-CLKL were all in place. In order to achieve consistency, a consistent set of model input assumptions have been adopted for the interfacing studies of TM-CLKL, HKBCF, HKLR and TMWB.

- 2.9.1.2 The TMWB was assumed to be “non tolled” for the purposes of the TM-CLKL EIA forecasts. This would make a marginal difference to the predicted TM-CLKL traffic forecasts, increasing the traffic flows slightly and, therefore, would represent a potentially worst case for assessing the environmental impacts. The traffic flows have been divided into the 16 vehicle classes required to determine the emissions of the traffic.
- 2.9.1.3 The opening year for the whole TM-CLKL, i.e. both northern and southern sections, is 2016. Design year peak hour traffic forecasts have, therefore, been prepared for the years 2016, 2021 and 2031 which reflect the full operation of the TM-CLKL. In addition, to assess the environmental impacts at the interim year of 2014, when the southern section will be opened to form part of the new road network servicing the HKBCF Phase 1 commissioning, the relevant traffic forecasts for this year have also been prepared. A summary of the traffic data for the prevailing year of 2007 and the future years of 2014, 2016, 2021 and 2031 and the road links are included in the EIA Report.



3 AIR QUALITY

3.1 Air Quality Parameters

3.1.1.1 Monitoring of the Total Suspended Particulates (TSP) levels shall be carried out by the Environmental Specialist (ET) (see Section 1) to ensure that construction works are not generating dust which exceeds the acceptable level. Timely action should be taken to rectify the situation if an exceedance is detected.

3.1.1.2 1-hour and 24-hour TSP levels shall be measured to indicate the impacts of construction dust on air quality. The TSP levels shall be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B. Upon approval by the Engineer's Representative (ER) and the Environmental Protection Department (DEP), 1-hour TSP levels may be measured by direct reading methods for ad hoc measurements.

3.1.1.3 All relevant data including temperature, pressure, weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, any other special phenomena and work progress of the concerned site shall be recorded in detail by the ET. A sample data sheet is shown in **Figure 3.1**.

3.2 Monitoring Equipment

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

- (i) 0.6-1.7 m³/min (20-60 SCFM) adjustable flow range;
- (ii) equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
- (iii) installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
- (iv) capable of providing a minimum exposed area of 406 cm² (63 in²);
- (v) flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
- (vi) equipped with a shelter to protect the filter and sampler;
- (vii) incorporated with an electronic mass flow rate controller or other equivalent devices;
- (viii) equipped with a flow recorder for continuous monitoring;
- (ix) provided with a peaked roof inlet;
- (x) equipped with a manometer;
- (xi) able to hold and seal the filter paper to the sampler housing in a horizontal position;
- (xii) easy to change the filter; and
- (xiii) capable of operating continuously for 24-hr period.

- 3.2.1.2 The Contractor is responsible for provision of the monitoring equipment and shall ensure that sufficient number of high volume samplers with an appropriate calibration kit are available for carrying out the baseline monitoring, impact monitoring and ad hoc monitoring. The high volume samplers shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled by the ET.
- 3.2.1.3 Calibration of dust monitoring equipment shall be conducted by the ET upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference by concerned parties, such as the IEC. All the data shall be converted into standard temperature and pressure condition.
- 3.2.1.4 The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and recorded in the data sheet as described in Section 3.1.
- 3.2.1.5 If the ET proposes to use a direct reading dust meter to measure 1-hr TSP levels on an ad hoc basis, he shall submit sufficient information to the IEC to prove that the instrument is capable of achieving a comparable result as that the High Volume Sampler (HVS) and may be used for the 1-hr sampling. The instrument should also be calibrated regularly and the 1-hr sampling shall be checked periodically by the HVS to check the validity and accuracy of the results measured by the direct reading method.
- 3.2.1.6 Wind data monitoring equipment shall also be provided and set up at suitable locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location shall be proposed by the ET and agreed with the ER, in consultation with the IEC.
- 3.2.1.7 For installation and operation of wind data monitoring equipment, the following points shall be observed:
- (i) the wind sensors should be installed on masts at an elevated level 10 m above ground so that they are clear of obstructions or turbulence caused by the buildings;
 - (ii) the wind data should be captured by a data logger to be down-loaded for processing at least once a month;
 - (iii) the wind data monitoring equipment should be re-calibrated at least once every six months; and
 - (iv) wind direction should be divided into 16 sectors of 22.5 degrees each.
- 3.2.1.8 In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the ER and agreement from the IEC.

3.3 Laboratory Measurement/Analysis

- 3.3.1.1 A clean laboratory with constant temperature and humidity control and equipped with necessary measuring and conditioning instruments shall be used for sample analysis and equipment calibration and maintenance. The laboratory shall be HOKLAS accredited.
- 3.3.1.2 If a site laboratory is set up or a non-HOKLAS accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the ER, in consultation with the IEC. Measurement performed by the laboratory shall be demonstrated to the satisfaction of the ER and the IEC. The IEC shall conduct regular audits of the measurements performed by the laboratory to ensure the accuracy of the results. The ES shall provide the ER and the IEC with one copy each of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for reference.
- 3.3.1.3 Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.
- 3.3.1.4 After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard.
- 3.3.1.5 All the collected samples shall be kept in a good condition for 6 months before disposal.

3.4 Monitoring Locations

- 3.4.1.1 The air quality sensitive receivers, as determined by the EIA, are shown in **Figure 3.2** and these will also form the recommended dust monitoring locations. The status and locations of dust sensitive receivers may change after issue of this manual. If this happens, the ET shall propose updated monitoring locations and seek approval from the ER and agreement from IEC.
- 3.4.1.2 When alternative monitoring locations are proposed, the following preferred locations and factors shall be considered:
- (i) the site boundary or locations close to the major dust emission source;
 - (ii) close to the sensitive receptors; and
 - (iii) the prevailing meteorological conditions.
- 3.4.1.3 The ET shall agree with the ER, in consultation with the IEC, the position of the high volume samplers. When positioning the samplers, the following points shall be noted:

- (i) a horizontal platform with appropriate support to secure the samplers against gusty wind shall be provided;
- (ii) the distance between the sampler and an obstacle, such as buildings, shall be at least twice the height that the obstacle protrudes above the sampler;
- (iii) a minimum of 2 metres of separation from walls, parapets and penthouses is required for rooftop samplers;
- (iv) a minimum of 2 metres separation from any supporting structure, measured horizontally is required;
- (v) no furnace or incinerator flue is nearby;
- (vi) airflow around the sampler is unrestricted;
- (vii) the sampler is more than 20 metres from the dripline;
- (viii) any wire fence and gate, to protect the sampler, shall not cause any obstruction during monitoring;
- (ix) permission must be obtained to set up the samplers and to obtain access to the monitoring stations;
- (x) a secured supply of electricity is needed to operate the samplers; and
- (xi) no two samplers should be placed less than 2 metres apart.

3.4.1.4 Prior to construction, the dust monitoring schedule shall be developed by the ET based upon the construction schedule supplied by the Contractor. The ET shall inform the IEC of the impact monitoring programme such that he can conduct on-site audits to ensure accuracy of the impact monitoring results. The environmental monitoring schedule shall be approved by the ER.

3.5 Baseline Monitoring

3.5.1.1 The ET shall carry out baseline monitoring at all the representative dust monitoring locations. The monitoring at these locations shall be undertaken for at least 14 consecutive days prior to the start of the construction works to obtain daily 24-hr TSP samples. 1-hr sampling shall also be carried out at least 3 times per day during the same period. Monitoring shall take place within a 3 week period prior to the commencement of construction works.

3.5.1.2 During the baseline monitoring, there should not be any construction or dust generation activities in the vicinity of the monitoring stations.

3.5.1.3 In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the ET shall carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall be approved by the ER, IEC and agreed with DEP.

3.5.1.4 In the event that insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the DEP to agree on an appropriate set of data to be used as a baseline reference and submit this data to the ER and IEC for approval.

3.5.1.5 Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the ET considers that the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining updated baseline levels, the monitoring should be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should a change in ambient conditions be determined, the baseline levels and, in turn, the air quality criteria, shall be revised. The revised baseline levels and air quality criteria shall be agreed with the DEP and supplied to the IEC.

3.6 Impact Monitoring

3.6.1.1 The ET shall carry out impact monitoring during the course of the works. For regular impact monitoring, the sampling frequency of at least once in every six days shall be strictly observed at six of the designated monitoring stations for 24-hr TSP monitoring. For 1-hr TSP monitoring, the sampling frequency of at least three times in every six days should be undertaken at six locations when the highest dust impact occurs. The stations to be monitored should be selected based on the prevailing wind direction and their proximity to the active construction works.

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

3.6.1.3 In case of non-compliance with the air quality criteria, more frequent monitoring, as specified in the Action Plan in Section 3.7, shall be conducted within 24 hours after the non-compliance is detected. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified.

3.7 Event and Action Plan for Air Quality

3.7.1.1 The baseline monitoring results will form the basis for determining the air quality criteria for the impact monitoring. The ET shall compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP. **Table 3.1** shows the air quality criteria, namely Action and Limit levels to be used. Should non-compliance with the air quality criteria occur, the ET, the IEC and the ER and the Contractor shall undertake their specified actions in accordance with the Action Plan shown in **Table 3.2**.

Table 3.1 Action and Limit Levels for Air Quality

Parameters	Action	Limit
24 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $200 \mu\text{g}/\text{m}^3$, Action level = (Baseline * 1.3 + Limit level) / 2; For baseline level $>200 \mu\text{g}/\text{m}^3$, Action level = Limit level	260
1 Hour TSP Level in $\mu\text{g}/\text{m}^3$	For baseline level $384 \mu\text{g}/\text{m}^3$, Action level = (Baseline * 1.3 + Limit level) / 2; For baseline level $>384 \mu\text{g}/\text{m}^3$, Action level = Limit level	500

3.7.1.2 In case of non-compliance with the air quality criteria, more frequent monitoring exercise, shall be conducted within 24 hours after the result is obtained. This additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified. The Event/Action Plan for air quality is given in the attached **Table 3.2**.

3.7.1.3 The Independent Environmental Checker (IEC) shall be empowered to audit the environmental performance of construction, all aspects of the EM&A programme, validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations and procedures. If any exceedances occur, the IEC shall follow the actions stated in the Event and Action Plan in **Table 3.2**.

3.8 Dust Mitigation Measures

3.8.1.1 The EIA report has recommended dust control and mitigation measures. The Contractor shall be responsible for the design and implementation of the following measures. The recommended construction dust mitigation measures are summarised in the Air Quality Environmental Mitigation Implementation Schedule provided in **Appendix A**.

- (i) all unpaved roads/exposed area shall be watered which results in dust suppression by forming moist cohesive films among the discrete grains of road surface material. An effective watering programme of twice daily watering with complete coverage, is estimated to reduce by 50%. This is recommended for all areas in order to reduce dust levels to a minimum;
- (i) watering of the construction area 8 times per day is recommended to reduce dust emissions by 87.5% and shall be undertaken;
- (ii) The Contractor shall, to the satisfaction of the Engineer, install effective dust suppression measures and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver, dust levels are kept to acceptable levels;
- (iii) The Contractor shall not burn debris or other materials on the works areas;
- (iv) in hot, dry or windy weather, the watering programme shall maintain all exposed road surfaces and dust sources wet;
- (v) where breaking of oversize rock/concrete is required, watering shall be implemented to control dust. Water spray shall be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created;
- (vi) open dropping heights for excavated materials shall be controlled to a maximum height of 2m to minimise the fugitive dust arising from unloading;

- (vii) during transportation by truck, materials shall not be loaded to a level higher than the side and tail boards, and shall be dampened or covered before transport. Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards;
- (viii) no earth, mud, debris, dust and the like shall be deposited on public roads. Wheel washing facility shall be usable prior to any earthworks excavation activity on the site;
- (ix) areas of exposed soil shall be minimised to areas in which works have been completed shall be restored as soon as is practicable; and
- (x) all stockpiles of aggregate or spoil shall be enclosed or covered and water applied in dry or windy condition.

3.8.1.2 If the above measures are not sufficient to restore the air quality to acceptable levels upon the advice of the ET, the Contractor shall liaise with the ET regarding other mitigation measures and consult the IEC for their effectiveness, and then propose these measures to the ER for approval prior to the implementation of the measures.

Table 3.2 Event / Action Plan for Air Quality

EVENT	ACTION			
	ET ⁽¹⁾	IEC ⁽¹⁾	ER ⁽¹⁾	Contractor
<p><i>Action Level</i></p> <p>1. Exceedance for one sample</p>	<ol style="list-style-type: none"> Identify the source. Inform the IEC and the ER. Repeat measurement to confirm finding. Increase monitoring frequency to daily. 	<ol style="list-style-type: none"> Check monitoring data submitted by the ET. Check Contractor's working method. 	<ol style="list-style-type: none"> Notify Contractor. 	<ol style="list-style-type: none"> Rectify any unacceptable practice Amend working methods if appropriate
<ol style="list-style-type: none"> Exceedance for two or more consecutive samples 	<ol style="list-style-type: none"> Identify the source. Inform the IEC and the ER. Repeat measurements to confirm findings. Increase monitoring frequency to daily. Discuss with the IEC and the Contractor on remedial actions required. If exceedance continues, arrange meeting with the IEC and the ER. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> Check monitoring data submitted by the ET. Check the Contractor's working method. Discuss with the ET and the Contractor on possible remedial measures. Advise the ER on the effectiveness of the proposed remedial measures. Supervisor implementation of remedial measures. 	<ol style="list-style-type: none"> Confirm receipt of notification of failure in writing. Notify the Contractor. Ensure remedial measures properly implemented. 	<ol style="list-style-type: none"> Submit proposals for remedial actions to IEC within 3 working days of notification Implement the agreed proposals Amend proposal if appropriate

EVENT	ACTION			Contractor
	ET ⁽¹⁾	IEC ⁽¹⁾	ER ⁽¹⁾	
<i>Limit Level</i>				
1. Exceedance for one sample	<ol style="list-style-type: none"> 1. Identify the source. 2. Inform the ER and the DEP. 3. Repeat measurement to confirm finding. 4. Increase monitoring frequency to daily. 5. Assess effectiveness of Contractor's remedial actions and keep the IEC, the DEP and the ER informed of the results. 	<ol style="list-style-type: none"> 1. Check monitoring data submitted by the ET. 2. Check Contractor's working method. 3. Discuss with the ET and the Contractor on possible remedial measures. 4. Advise the ER on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures are properly implemented. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Amend proposal if appropriate
2. Exceedance for two or more consecutive samples	<ol style="list-style-type: none"> 1. Notify the IEC, the ER, the DEP and the Contractor. 2. Identify the source. 3. Repeat measurements to confirm findings. 4. Increase monitoring frequency to daily. 5. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. 6. Arrange meeting with the IEC and the ER to discuss the remedial actions to be taken. 7. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the ER informed of the results. 8. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Discuss amongst the ER, ET and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly. 3. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. In consultation with the IEC, agree with the Contractor on the remedial measures to be implemented. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance. 2. Submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Resubmit proposals if problem still not under control. 5. Stop the relevant activity of works as determined by the ER until the exceedance is abated.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, ER – Engineer's Representative

Figure 3.1 Data Sheet for TSP Monitoring

Monitoring Location:	
Details of Location:	
Sampler Identification:	
Date & Time of Sampling:	
Elapsed-time	Start (min.)
Meter Reading	Stop (min.)
Total Sampling Time (min.):	
Weather Conditions:	
Site Conditions:	
Initial Flow Rate, Qsi	Pi (mmHg):
	Ti (°C):
	Hi (in.):
	Qsi (Std. m ³):
Final Flow Rate, Qsf	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 ($\mu\text{g}/\text{m}^3$):	

	<u>Name & Designation</u>	<u>Signature</u>	<u>Date</u>
Field Operator :	_____	_____	_____
Laboratory Staff :	_____	_____	_____
Checked by :	_____	_____	_____

4 NOISE

4.1 Introduction

4.1.1.1 Based upon the EIA Report, while impacts are not predicted, as the results are marginally within the criteria, EM&A is recommended at existing Noise Sensitive Receivers (NSRs) in North Lantau during the construction phase to ensure the noise levels are reduced to acceptable levels.

4.2 Noise Parameters

4.2.1.1 The construction noise level shall be monitored by the ET and shall be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). L_{eq} (30 min) shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. In respect of all other time periods, L_{eq} (5 min) shall be employed for comparison with the Noise Control Ordinance criteria.

4.2.1.2 As supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference and shall be recorded by the ES. A sample data record sheet is shown in **Figure 4.1** for reference.

4.3 Monitoring Equipment

4.3.1.1 As referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications shall be used for carrying out the noise monitoring.

4.3.1.2 Immediately prior to and following each noise measurement the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0dB.

4.3.1.3 Noise measurements shall not be made in fog, rain, wind with a steady speed exceeding 5m/s or wind with gusts exceeding 10m/s. The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.

4.3.1.4 The Contractor shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the baseline monitoring, construction phase impact monitoring and ad hoc monitoring. All the equipment and associated instrumentation shall be clearly labelled.

4.4 Monitoring Locations

4.4.1.1 The representative noise monitoring stations/sensitive receivers are shown in **Figure 4.2**. If the status or locations of noise sensitive receivers change after issuing this manual, the ET shall propose the updated monitoring locations and seek approval from the Engineer's Representative (ER) and agreement from the

Independent Environmental Checker (IEC) and Environmental Protection Department (DEP) of the proposal to amend the monitoring locations.

4.4.1.2 When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:

- a) monitoring at sensitive receivers close to the major site activities which are likely to have noise impacts;
- b) monitoring at the noise sensitive receivers as defined in the Technical Memorandum; and
- c) assurance of minimal disturbance to the occupants during monitoring.

4.4.1.3 The monitoring station shall normally be at a point 1m from the exterior of the sensitive receivers building facade and, in the case the measurement is not being carried out at a building, be at a position 1.2m above the ground. If there is problem with access to the normal monitoring position, an alternative position may be chosen and a correction to the measurements shall be made.

4.4.1.4 For reference, a correction of +3dB(A) shall be made to the free field measurements. Noise levels shall be corrected in accordance with Section 2.10, 2.11 and 2.13 of the “*Technical Memorandum on Noise From Construction Works Other Than Percussive Piling*”. The ET shall agree with the IEC on the monitoring position and the corrections adopted prior to the commencement of the works.

4.4.1.5 Once the positions for the monitoring stations are chosen, the baseline monitoring and the construction phase impact monitoring shall be carried out at the same positions.

4.4.1.6 The Contractor shall establish the construction equipment list and construction schedule which shall be checked and approved by the ER and agreed by the IEC. The timing of the noise impact monitoring work shall be developed by the ES based upon the construction schedule prepared by the Contractor. The monitoring programme shall be approved by the ER, the IEC and the DEP and shall be reviewed on a regular basis in light of any changes to the Contractor’s construction schedule.

4.5 Baseline Monitoring

4.5.1.1 The ET shall carry out baseline noise measurements at each monitoring stations shown in **Figure 4.2** prior to the commencement of the construction work over a 24 hour period. The baseline monitoring shall be carried out daily for a period of at least two weeks and shall be undertaken no earlier than three weeks prior to construction works being carried out. In no circumstance should construction works be carried out within the range of the monitoring stations during the two weeks of baseline monitoring.

4.5.1.2 Before commencing the baseline monitoring, the ET shall submit the monitoring schedule to the ER for approval. The IEC shall also be informed of the baseline

monitoring programme such that the IEC can conduct on-site audits to ensure the accuracy of the monitoring results.

4.5.1.3 Any non project related construction activities in the vicinity of the stations during the baseline monitoring shall be noted and the source and location recorded.

4.6 Construction Phase Impact Monitoring

4.6.1.1 Noise monitoring shall be carried out at each of the designated monitoring stations directly affected by the construction works once every 6 days after the commencement of construction. During construction works between 0700-1900 hours, one set of $L_{eq(30\text{ mins})}$ measurements on normal weekdays shall be taken. If construction works are extended to include works during the hours of 1900-0700, additional weekly impact monitoring comprising 3 consecutive $L_{eq(5\text{ mins})}$ shall be carried out during evening and nighttime works and applicable permits shall be obtained by the Contractor in accordance with the NCO.

4.6.1.2 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in **Table 4.2** shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be unrelated to the construction activities.

4.7 Event and Action Plan for Construction Noise

4.7.1.1 The Action and Limit levels for construction noise are defined in **Table 4.1**. Should non-compliance of the criteria occur, the ET, the IEC, the ER and the Contractor shall undertake their specified actions in accordance with the Action Plan shown in **Table 4.2**.

Table 4.1 Action and Limit Levels for Construction Noise

Time Period	Action	Limit
0700-1900 hrs on normal weekdays	When one documented complaint is received	75* dB(A)

* reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.

4.8 Noise Mitigation Measures

4.8.1.1 As no impacts are predicted during the construction stage at the existing NSRs in north Lantau, no specific mitigation measures have been recommended. However, the Contractor will be responsible for ensuring noise levels are minimized as far as possible through the application of good site practices, including maintenance of equipment. During the operational phase, no mitigation is required.

Table 4.2 Event / Action Plan for Construction Noise

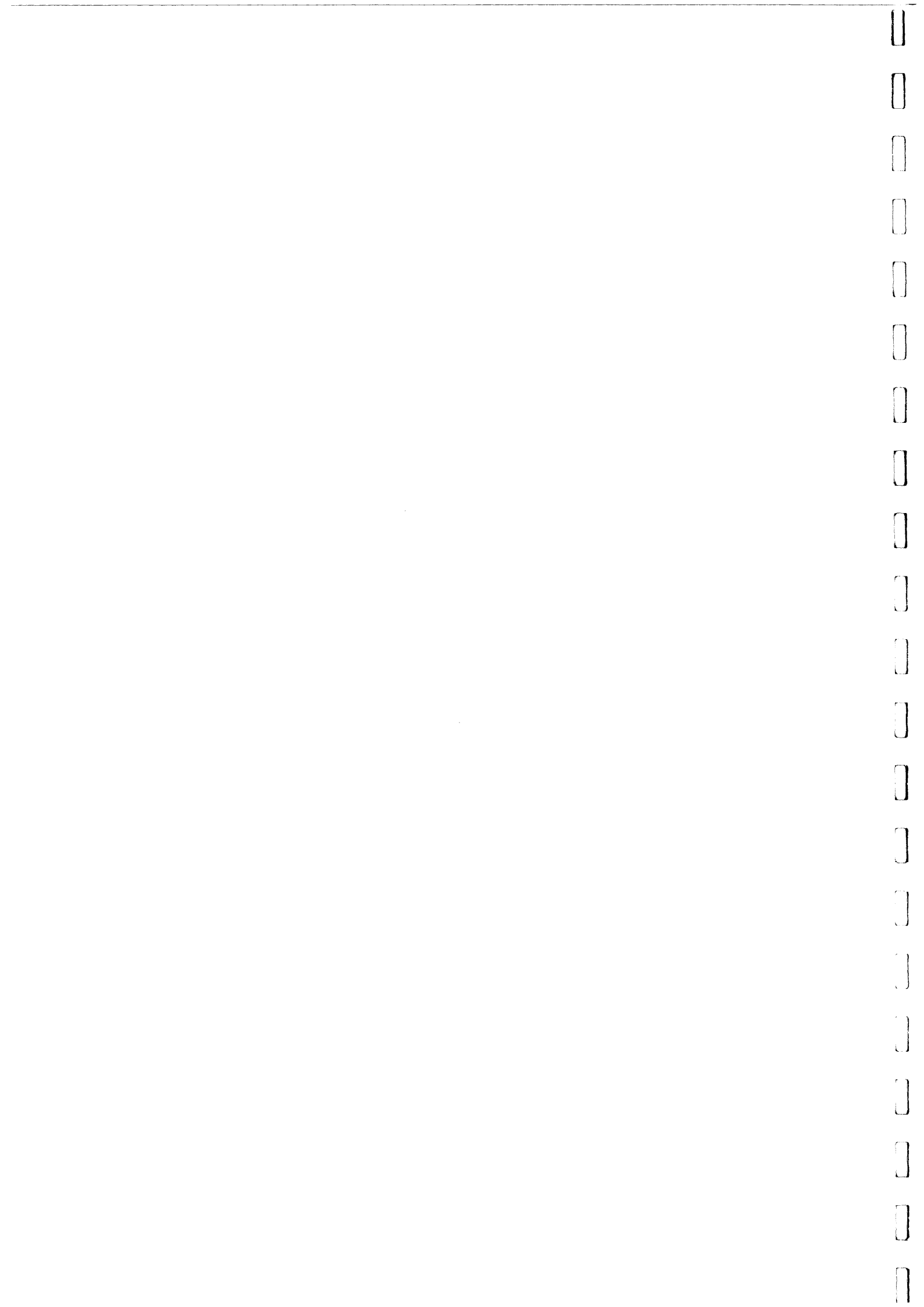
EVENT	ACTION			
	ET	IEC	ER	Contractor
Action Level	<ol style="list-style-type: none"> 1. Notify the IEC and the Contractor. Carry out investigation. 2. Report the results of investigation to the IEC and the Contractor. 3. Discuss with the Contractor and formulate remedial measures. 4. Increase monitoring frequency to check mitigation effectiveness. 	<ol style="list-style-type: none"> 1. Review the analysed results submitted by the ET. 2. Review the proposed remedial measures by the Contractor and advise the ER accordingly. 3. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented. 	<ol style="list-style-type: none"> 1. Submit noise mitigation proposals to IEC 2. Implement noise mitigation proposals
Limit Level	<ol style="list-style-type: none"> 1. Notify the IEC, the ER, the DEP and the Contractor. 2. Identify the source. 3. Repeat measurement to confirm findings. 4. Increase monitoring frequency. 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented. 6. Inform the IEC, the ER and the DEP the causes & actions taken for the exceedances. 7. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the ER informed of the results. 8. If exceedance stops, cease additional monitoring. 	<ol style="list-style-type: none"> 1. Discuss amongst the ER, the ET and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ER accordingly. 3. Supervise the implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed noise problem. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated. 	<ol style="list-style-type: none"> 1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to IEC within 3 working days of notification 3. Implement the agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop the relevant activity of works as determined by the ER until the exceedance is abated.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, ER – Engineer's Representative

Figure 4.1 Noise Monitoring Field Record Sheet

Monitoring Location:	
Description 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)):
	Leq (dB(A)):
Major Construction Noise Source(s) During Monitoring:	
Other Noise Source(s) During Monitoring:	
Remarks:	

		<u>Name & Designation</u>	<u>Signature</u>	<u>Date</u>
Recorded By	:	_____	_____	_____
Checked By	:	_____	_____	_____



5 WATER QUALITY

5.1 Introduction

5.1.1.1 Since the marine works of TM-CLKL will be concurrent with HKBCF and HKLR and the southern landfall of TM-CLKL is indeed an integrated part of the HKBCF. The potential water quality impacts of TM-CLKL has been assessed jointly with HKBCF and HKLR. The EIA has, therefore, recommended that the water quality monitoring works of the three concurrent projects, also by the same project proponent, be conducted as a whole to enhance the efficiency and cost-effectiveness of the monitoring programme. Based on this, the water quality monitoring scheme designed assuming the monitoring will be implemented jointly and be coordinated with a project ENPO office.

5.2 Mitigation Measures

5.2.1.1 The reclamation layout of TM-CLKL, HKBCF and HKLR are presented in **Figures 5.1 to 5.4**. For HKBCF+TM-CLKL southern landfall, the layout of the two alternate construction sequences are presented in **Figure 5.2** (Sequence A) and **Figure 5.3** (Sequence B). The overall combined maximum daily production rates, the maximum number of plant (dredging and filling) trips and the number of active plants (dredging and filling) on sites for marine works below +2.5mPD are summarised in **Figure 5.5a, 5.5b and 5.5c** for Sequence A. The corresponding summaries for Sequence B are presented in **Figure 5.6a, 5.6b and 5.6c**, respectively. The EIA Report has assessed the water quality impacts caused by the construction and operation stages. Mitigation measures have been recommended in the EIA to ensure compliance with the relevant legislative requirements. These mitigation measures are summarised below.

- Closed grabs should be used for sediment dredging to reduce sediment loss when lifting the grabs to the barges.
- The decks of dredging barges should be clean and tidy to avoid any sediment to be washed into the sea.
- Loading of the dredged sediments to the barges should be carried out carefully to minimise splashing of sediments.
- Overloading of barge is not allowed and sufficient freeboard should be maintained to ensure no spill over of the dredged sediments during lifting and transport.
- The moving speed of construction vessels in the dredging area should be reduced to prevent disturbance to the seabed generating sediment plumes.
- A cage type silt curtain is proposed to be installed to enclose local pollution caused by the grab dredging. The grab dredging work should be carried out within the cage type silt curtain. Apart from the cage type silt curtain, it is recommended to deploy a floating type silt curtain around the site. Silt curtains can be effectively applied when the current speeds are lower than 0.5 m/s. The velocity of current near the northern edge of reclamation site of HKBCF Phase 2 / TM-CLKL southern landfall is

higher than 0.5 m/s, thus a sheet pile wall is proposed to protect the silt curtain along the northern edge. The proposed floating type silt curtain would be installed within the site area of TM-CLKL southern landfall, near shore section of TM-CLKL northern landfall (portion N-a), HKBCF and HKLR as far as practicable. For construction Sequence B, specially designed cage type silt curtain (with steel enclosure) is also proposed for the grab dredging at HKBCF and TM-CLKL southern landfall where localised flow can reach 0.5 m/s. The typical arrangement of the silt curtains are shown in Figures 25308/041/307, 308a and 309 of **Annex A**.

- Pilot tests should be carried out during the early stage of seawall construction to confirm whether the silt removal efficiency of the cage type silt curtain and the floating type silt curtain can respectively achieve 80% and 45% silt removal efficiency for dredging and filling activities when deployed separately, and a combined reduction of 95% and 61% when the two type of silt curtains are used jointly. Pilot tests for cage type silt curtain (with steel enclosure) should be carried out in a similar time frame should Sequence B be implemented to see if the cage type silt curtain (with steel enclosure) can achieve 80% reduction when applied singly under current above 0.5 m/s.
- The pilot tests shall be conducted during the initial months of dredging and filling works of either TM-CLKL, HKBCF or HKLR. The silt-removal efficiency of the silt curtains shall be verified by examining the results of water quality monitoring points. The water quality monitoring points to be selected for the above shall be those close to the locations of the initial period of dredging work. Details of this pilot study shall be determined by the ENPO and agreed by EPD before the commencement of the monitoring, taking account of the Contractor's proposed actual locations of his initial period of dredging work. ET shall submit the pilot test proposal detailing the layout of silt curtains, monitoring location and testing arrangement for EPD's agreement before conducting the pilot tests.
- A sheet piled wall shall be constructed to the north of the TM-CLKL southern landfall / HKBCF island, and also in the main HKBCF reclamation in order to allow the use of silt curtains during Phase 2 works before the re-deposition the Mf materials;
- Figures 25308/041/301 to 304 of **Annex A** illustrates different stages of the arrangement of silt curtains and shows the typical seawall sections of Sequence A, and that for Sequence B are presented in Figures 25308/041/301A to 304A of **Annex A**. The hanging-type silt curtain should allow access of vessels to enter into or exit from the reclamation area. The vessel access opening would be formed by two piece of silt curtain with overlapping length of 150m minimum and a separation distance of about 50m. The indicative position and details of the above openings for HKBCF and HKLR are also shown in these figures;
- The dredging and filling works shall be scheduled to spread the works evenly over a working day; and
- The silt curtains should be maintained in good condition to ensure the

sediment plume generated from dredging and filling be confined effectively within the site boundary.

5.2.1.2 Prior to the commencement of the construction work, a detailed site drainage management plan should be submitted to EPD. The plan should cover measures to minimize all potential water quality impact arising from the surface runoffs of all the related constructions.

5.2.1.3 The guidelines outlined in the Practice Note for Professional Persons (ProPECC), Construction Site Drainage (PN 1/94) should be adopted to control construction site runoff. Mitigation measures to minimise water quality impacts from construction site runoff and wastewater and sewage generated from construction activities are:

- Provision of site drainage systems over the entire construction site with sediment control facilities. Regular inspection and maintenance of the site drainage systems are required to ensure proper and efficient operation at all times.
- Sedimentation tanks or package treatment systems are required to treat the large amount of sediment-laden wastewater generated from foundation construction work, wheel washing, site runoff. Any construction activities that generate wastewater with high concentrations of SS should also be collected to these facilities for proper treatment prior to disposal. Treated wastewater can be reused for vehicle washing, dust suppression and general cleaning. Bentonite slurry used in bore-pile construction should be reconditioned and reused to minimise the disposal volume of the used slurry.
- The construction programme should be properly planned to avoid soil excavation in rainy seasons. Exposed stockpiles of excavated soils or construction materials should be covered with tarpaulin or impervious sheets to avoid release of pollutants into the drainage channels.
- Sewage generated from site toilets and canteen should be collected using a temporary storage system. Chemical toilets should be provided at different locations for use by the workers on site. Licensed waste collectors should be employed for collection and disposal of the sewage. The drainage system for collection of wastewater generated from canteen, if any, should be equipped with grease trap capable of providing at least 20 minutes retention during peak flow.
- Wheel washing facilities should be installed at all site entrances/exits.
- An emergency plan should be developed by the contractors to deal with accidental spillage of chemicals.

5.2.1.4 Upon completion of the TM-CLKL / HKLR / HKBCF development, stormwater drainage systems would be completed to collect stormwater generated from the whole area including new roads. Sewage generated from the TM-CLKL southern landfall and HKBCF development would be treated on site to fulfill effluent limit for discharge. Additional mitigation measures would not be required.

5.2.1.5 As identified in the EIA Report, key water quality issues during construction phase will be dredging and filling works for the reclamation, backfilling of Mf sediment within the reclamation sites (handing of Mf sediment is not predicted for TM-CLKL, but HKBCF and HKLR would require handing of Mf sediment and the proposed locations are shown in **Figures 5.9 and 5.10**) (Noted: As per the Variation of an Environmental Permits, this is not applicable based on the latest construction method) and TSHD dredging overflow process for the construction of artificial islands within the mainland water boundary but so close to Hong Kong. Marine water quality monitoring shall be carried out during the construction phase to ensure that any unacceptable increase in suspended solids / turbidity and decrease in dissolved oxygen due to dredging and filling activities could be readily detected and timely action be taken to rectify the situation.

5.2.1.6 The EIA Report has recommended construction and operational phase mitigation measures. All the prepared mitigation measures are summarised in the Environmental Mitigation Implementation Schedules in **Appendix A**.

5.3 Water Quality Parameters

5.3.1.1 As identified in the EIA Report, key water quality issues during construction phase will be dredging and filling works for the reclamation. Marine water quality monitoring shall be carried out during the construction phase to ensure that any unacceptable increase in suspended solids / turbidity and decrease in dissolved oxygen due to dredging and filling activities could be readily detected and timely action be taken to rectify the situation.

5.3.1.2 Dissolved oxygen (DO), turbidity (NTU), suspended solids (SS) levels and other general in-situ parameters shall be monitored at all designated marine water quality monitoring stations during the whole construction phase. DO and turbidity should be measured in-situ whereas SS should be determined by an accredited laboratory.

5.3.1.3 Other relevant data shall also be recorded in a Water Quality Monitoring Logs, including monitoring location / position, time, water depth, pH value, salinity, temperature, tidal stages, weather conditions and any special phenomena or work underway at the construction site. A sample monitoring record sheet is shown in **Figure 5.7**.

5.3.1.4 According to the EIA report, there is low concentration for PAH, PCB, TBT, and chlorinated pesticides. Monitoring of these chemicals would not be required during the construction stage.

5.3.1.5 The proposed water quality monitoring schedule shall be submitted to EPD at least 2 weeks before the first day of the monitoring month. EPD shall also be notified immediately for any changes in schedule by fax.

5.3.1.6 For TM-CLKL southern viaducts, surveys of the watercourse NL1 in North Lantau (**Figure 6.4**) which may be affected by slope works or gabion wall construction shall, also, be undertaken. The surveys shall include a description

of the stream course/bay, influencing factors, photographs and a map showing areas of active project construction works and areas of stockpiled materials.

5.4 Monitoring Equipment

5.4.1 *Dissolved Oxygen and Temperature Measuring Equipment*

5.4.1.1 The instrument should be a portable and weatherproof dissolved oxygen (DO) measuring instrument complete with cable and sensor, and use a DC power source. The equipment should be capable of measuring:

- a DO level in the range of 0 - 20 mg/ L and 0 - 200% saturation; and
- a temperature of 0 - 45 degree Celsius.

5.4.1.2 It should have a membrane electrode with automatic temperature compensation complete with a cable.

5.4.1.3 Should salinity compensation not be built-in to the DO equipment, in-situ salinity should be measured to calibrate the DO equipment prior to each DO measurement.

5.4.2 *Turbidity Measurement Instrument*

5.4.2.1 The instrument should be a portable and weatherproof turbidity measuring instrument using a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0 - 1000 NTU (for example, Hach model 2100P or an approved similar instrument).

5.4.3 *Sampler*

5.4.3.1 A water sampler is required. It should comprise a transparent PVC cylinder, with a capacity of not less than 2 litres, which can be effectively sealed with latex cups at both ends. The sampler should 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 (for example, Kahlsico Water Sampler or an approved similar instrument).

5.4.4 *Water Depth Detector*

5.4.4.1 A portable, battery-operated echo sounder should be used for the determination of water depth at each designated monitoring station. This unit can 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.

5.4.5 *Salinity*

5.4.5.1 A portable salinometer capable of measuring salinity in the range of 0 - 40 parts per thousand (ppt) should be provided for measuring salinity of the water at each monitoring location.

5.4.6 *pH Measuring Equipment*

- 5.4.6.1 A portable pH meter capable of measuring a range between 0.0 and 14.0 shall be provided to measure pH under the specified conditions (e.g., Orion Model 250A or an approved similar instrument).

5.4.7 *Sample Containers and Storage*

- 5.4.7.1 Water samples for SS should be stored in high density polythene bottles, packed in ice (cooled to 4°C without being frozen) and keep in dark during both on-site temporary storage and shipment to the testing laboratory. The samples shall be delivered to the laboratory within 24 hours of collection and be analysed as soon as possible after collection.

5.4.8 *Monitoring Position Equipment*

- 5.4.8.1 A hand-held or boat-fixed type digital Differential Global Positioning System (DGPS) with way point bearing indication and Radio Technical Commission for maritime (RTCM) Type 16 error message ‘screen pop-up’ facilities (for real-time auto-display of error messages and DGPS corrections from the Hong Kong Hydrographic Office), or other equipment instrument of similar accuracy, should be provided and used during marine water monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

5.4.9 *Calibration of In-Situ Instruments*

- 5.4.9.1 The pH meter, DO meter and turbidimeter shall be checked and calibrated before use. DO meter and turbidimeter shall be certified by a laboratory accredited under HOKLAS or any other international accreditation scheme, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring. Responses of sensors and electrodes should 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.

5.4.10 *Back-up Equipment and Vessels*

- 5.4.10.1 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 some equipment is under maintenance, calibration, etc. For the on site calibration of field equipment, the BS127:1993, "Guide to Field and on-site test methods for the analysis of waters" shall be observed.
- 5.4.10.2 The Water Quality Monitoring will involve a large number of monitoring stations and measurements should be conducted within the prescribed tidal conditions (within ± 1.75 hour of the predicted mid-ebb or mid-flood tides) in order to ensure the measurement/samples are representative. A multi-probe monitoring equipment set integrated with water sampler(s) is highly recommended to improve the monitoring efficiency. It is, also, likely that more than one field survey vessels will be required simultaneously to ensure the monitoring are conducted within the acceptable monitoring windows. The ET shall also consider the use of unattended

5.4.10.2 The Water Quality Monitoring will involve a large number of monitoring stations and measurements should be conducted within the prescribed tidal conditions (within ± 1.75 hour of the predicted mid-ebb or mid-flood tides) in order to ensure the measurement/samples are representative. A multi-probe monitoring equipment set integrated with water sampler(s) is highly recommended to improve the monitoring efficiency. It is, also, likely that more than one field survey vessels will be required simultaneously to ensure the monitoring are conducted within the acceptable monitoring windows. The ET shall also consider the use of unattended automatic sampling/monitoring devices at fixed stations where monitoring are required throughout the construction period. The use of such unattended automatic devices, however, shall be subject to the approval of the ER, IEC and EPD.

5.5 Laboratory Measurement / Analysis

5.5.1.1 Duplicate samples from each independent sampling event are required for all the suspended solids measurement, which shall be carried in a HOKLAS or other international accredited laboratory. Sufficient water samples shall be collected at the monitoring stations for carrying out the laboratory measurement and analysis. The laboratory determination work shall start within 24 hours after collection of the water samples. The analysis for SS is summarized in **Table 5.1**.

Table 5.1 Laboratory analysis for SS

Parameters	Instrumentation	Reference Method	Reporting Limit	Detection Limit
Suspended Solid (SS)	Weighting	APHA 2540-D	0.5 mg/L	0.5 mg/L

5.5.1.2 If a site laboratory is set up or a non-HOKLAS and non-international accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment, analytical procedures, and quality control shall be approved by sEPD. All the analysis shall be witnessed by the ER. The ET Leader shall provide the ER with one copy of the relevant chapters of the “APHA Standard Methods for the Examination of Water and Wastewater” 19th edition and any other relevant document for his reference.

5.6 Monitoring Locations

5.6.1.1 The water quality monitoring stations, control stations and locations for during the construction and operation phases of HKBCF, TMCLKL and HKLR are shown in **Figure 5.8**. The demarcation of the monitoring stations for different projects will be further determined by the ENPO before the commencement of the construction. The selection of these stations are based on the following criteria:

- (i) Impact stations (IS/GG) within 250m – 500m envelope of the construction works and within the Mf sediment backfilling sites (i.e., 19 impact locations).
- (ii) Sensitive receiver (SR) stations near to key sensitive receivers (i.e.11 impact stations).

- (iii) Control / Far Field (CS) stations at representative locations with less influence by the projects (i.e. 7 Control / Far Field stations). Control / Far Field stations should be located, as far as practicable, both upstream and downstream of the works area.
- (iv) Stations for sensitivity test (ST) result, which are located close to the HKSAR boundary (i.e., 3 sensitivity test stations).
- (v) Not used.
- (vi) Mf receiving pit are not required based on the supporting documents for application for variation of environmental permit (EP 354/2009). Therefore, monitoring of nutrients and heavy metals of Mf Stations are no longer required.

5.6.1.2 The co-ordinates of the proposed monitoring stations during construction, post-construction and operation phases are listed in **Tables 5.2a and 5.2b** and their distribution shown in **Figure 5.8**. As shown in **Figure 5.8**, the proposed locations for the sensitive receiver monitoring stations represent the typical sensitive receivers around the project works.

Table 5.2a Proposed Water Quality Monitoring Stations (Construction and Post-construction Phases)

Station	Description	East	North	Parameters to be measured
IS1	Impact Station (Close to HKLR construction site)	803474	815060	DO, Turbidity, SS
IS2	Impact Station (Close to HKLR construction site)	804851	815715	DO, Turbidity, SS
IS3	Impact Station (Close to HKLR construction site)	806502	815743	DO, Turbidity, SS
IS4	Impact Station (Close to HKLR construction site)	807008	816986	DO, Turbidity, SS
IS5	Impact Station (Close to HKLR construction site)	811579	817106	DO, Turbidity, SS
IS(Mf)6	Impact Station (Close to HKLR construction site)	812101	817873	DO, Turbidity, SS
IS7	Impact Station (Close to HKBCF construction site)	812244	818777	DO, Turbidity, SS
IS8	Impact Station (Close to HKBCF construction site)	814251	818412	DO, Turbidity, SS
IS(Mf)9	Impact Station (Close to HKBCF construction site)	813273	818850	DO, Turbidity, SS
IS10	Impact Station (Close to HKBCF construction site)	812577	820670	DO, Turbidity, SS
IS(Mf)11	Impact Station (Close to HKBCF construction site)	813562	820716	DO, Turbidity, SS
IS12	Impact Station (Close to TMCLKL construction site)	813218	823681	DO, Turbidity, SS
IS13	Impact Station (Close to TMCLKL construction site)	813667	824325	DO, Turbidity, SS
IS14	Impact Station (Close to TMCLKL construction site)	812592	824172	DO, Turbidity, SS

Station	Description	East	North	Parameters to be measured
SR3	Sensitive receiver (San Tau Beach SSSI)	810525	816456	DO, Turbidity, SS
SR4	Sensitive receiver (Tai Ho Inlet)	814760	817867	DO, Turbidity, SS
SR5	Sensitive receiver (Artificial Reef in NE Airport)	811489	820455	DO, Turbidity, SS
SR6	Sensitive receiver (Sha Chau and Lung Kwu Chau Marine Park)	805837	821818	DO, Turbidity, SS
SR7	Sensitive receiver (Tai Mo To)	814293	821431	DO, Turbidity, SS
SR8	Sensitive receiver (Gazettal beaches in Tuen Mun)	816306	825715	DO, Turbidity, SS
SR9	Sensitive receiver (Butterfly Beach)	813601	825858	DO, Turbidity, SS
SR10A	Sensitive receiver (Ma Wan FCZ)	823741	823495	DO, Turbidity, SS
SR10B	Sensitive receivers (Ma Wan FCZ)	823686	823213	DO, Turbidity, SS
CS1	Control Station	801784	812711	DO, Turbidity, SS
CS2	Control Station	805849	818780	DO, Turbidity, SS
CS(Mf)3	Control Station	809989	821117	DO, Turbidity, SS
CS4	Control Station	810025	824004	DO, Turbidity, SS
CS(Mf)5	Control Station	817990	821129	DO, Turbidity, SS
CS6	Control Station	817028	823992	DO, Turbidity, SS
ST1	Locations for sensitivity test result (Close to Sha Chau and Lung Kwu Chau Marine Park)	802677	816006	DO, Turbidity, SS
ST2	Locations for sensitivity test result (Close to Chinese White Dolphin area near HKSAR boundary)	804055	818840	DO, Turbidity, SS
ST3	Locations for sensitivity test result (Close to Chinese White Dolphin area near HKSAR boundary)	800667	810126	DO, Turbidity, SS
CSA	Control Station	818103	823064	DO, Turbidity, SS
GG1	Impact Station for Lateral Flow Direction	814318	820928	DO, Turbidity, SS

Table 5.2b Proposed Water Quality Monitoring Stations (Operation Phase)

Station	Description	East	North	Parameters to be measured
SR3	Sensitive receivers (San Tau Beach SSSI)	810525	816456	DO, Turbidity, SS, pH, salinity, temperature
SR4	Sensitive receivers (Tai Ho Inlet)	814760	817867	DO, Turbidity, SS, pH, salinity, temperature
CS2	Control Station	805849	818780	DO, Turbidity, SS, pH, salinity, temperature
CS(Mf)5	Control Station	817990	821129	DO, Turbidity, SS, pH, salinity, temperature

- 5.6.1.3 Control stations (CS1, CS2, CS(Mf)3, CS4, CS(Mf)5 and CS6) are necessary to compare the water quality from potentially impacted sites with the ambient water quality. Control stations shall be located within the same body of water as the impact monitoring stations but should be outside the area of influence of the works and, as far as practicable, not affected by any other works. The Control stations shown in **Figure 5.8** are indicative subject to further review before construction phase. During the review, the location of the Impact stations for boundary of mixing zones will also be re-visited. If there are any changes to the monitoring locations, these shall be submitted 4 weeks before commencement of baseline monitoring for EPD approval.
- 5.6.1.4 In-situ monitoring (DO, temperature, turbidity, pH, salinity) and water sample for SS shall be taken at 3 water depths, namely, 1 m below water surface, mid-depth and 1 m above sea bed, except where the water depth is less than 6 m, in which case the mid-depth station may be omitted. Should the water depth be less than 3 m, only the mid-depth station will be monitored. No marine construction activities should be conducted in the vicinity of the stations during the Baseline Monitoring period. The status and locations of water sensitive receivers and the marine activities may change after issuing this Manual. If such cases exist, the ET Leader shall propose with justification for changes to monitoring locations or other requirements of the EM&A programme, and seek approval from the IEC and EPD.
- 5.6.1.5 The ENPO may, depending on site conditions and monitoring results, decides whether additional monitoring locations shall be included or any monitoring locations could be removed/relocated during any stage of the construction phase, after getting approval from EPD.

5.7 Baseline Monitoring for Water Quality

- 5.7.1.1 Baseline conditions for marine water quality shall be established and agreed with EPD prior to the commencement of works. 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 baseline conditions shall normally be established by measuring the DO, temperature, turbidity, pH, salinity and SS at all designated locations specified in **Section 5.6** above. The measurements shall be taken at all designated monitoring stations including control stations, 3 days per week, at mid-flood (within ± 1.75 hour of the predicted time) and mid-ebb (within ± 1.75 hour of the predicted time) tides, for at least 4 weeks prior to the commencement of marine works. Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database.
- 5.7.1.2 Baseline monitoring programme may overlap with other reclamation activities. The monitoring exercise should be scheduled as far as possible to avoid concurrent dredging / backfilling activities around the monitoring stations such that representative ambient data could be sampled.

- 5.7.1.3 Other relevant data shall also be recorded, such as monitoring location / position, time, water depth, tidal stages, weather conditions and any special phenomena underway near the monitoring station. There shall not be any marine construction activities in the vicinity of the stations during the baseline monitoring.
- 5.7.1.4 As this project will last for a few years, the ET Leader should seek approval from the IEC and EPD on an appropriate set of data to be used with the baseline data collected by this study to establish two set of AL levels respectively for the wet and dry season.
- 5.7.1.5 Baseline monitoring schedule shall be faxed to EPD 2 weeks prior to the commencement of baseline monitoring. The interval between two sets of monitoring shall not be less than 36 hours.

5.8 Efficiency of Silt Curtains

- 5.8.1.1 The ET shall be responsible for conducting tests to confirm that their silt curtain systems to be adopted would satisfy the requirements in the EIA Report.
- 5.8.1.2 Pilot tests should be carried out during the early stage of construction to confirm whether the silt removal efficiency of the cage type silt curtain and the floating type silt curtains can achieve 80% and 45% silt removal efficiency for dredging and filling activities respectively when deployed separately, and a combined reduction of 95% and 61% when the two type of silt curtains are used jointly. Pilot tests for cage type silt curtain (with steel enclosure) should be carried out in a similar time frame should Sequence B be implemented to see if the cage type silt curtain (with steel enclosure) can achieve 80% reduction when applied singly under current above 0.5 m/s.
- 5.8.1.3 The pilot test shall include basic measurements such as turbidity and suspended solids as well as current speed and direction. Where testing of cage type silt curtain (with steel enclosure) to is to be conducted at relatively fast current, supplementary Acoustic Doppler Current Profiler (ADCP) measurement of the plumes shall be considered to provide a better characterization of instant suspended solids plumes. A method statement shall be submitted by the ET Leader to seek approval from the IEC and EPD.
- 5.8.1.4 Cage type silt curtains will be applied round all grab dredgers during the HKBCF, HKLR and TM-CLKL southern reclamation works. Cage type silt curtain (with steel enclosure) shall be used for grab dredgers working in the site of HKBCF and TM-CLKL southern reclamation.
- 5.8.1.5 The pilot tests shall be conducted during the initial period of dredging and filling works of either TM-CLKL, HKBCF or HKLR. The silt-removal efficiency of the silt curtains shall be verified by examining the results of water quality monitoring points. The water quality monitoring points to be selected for the above shall be those close to the locations of the initial period of dredging work. The details for the pilot study shall be determined by the ENPO and agreed with EPD, taking account of the Contractor's proposed actual locations of his initial period of dredging work. ET shall submit the pilot test proposal detailing the

layout of silt curtains, monitoring location and testing arrangement for EPD's agreement before conducting the pilot tests.

- 5.8.1.6 Regardless of the measured efficiency of the silt curtain system, the event and action plan shall only be based on the monitoring results at the designed monitoring stations.

5.9 Impact Monitoring for Water Quality

5.9.1 Reclamation

- 5.9.1.1 Reclamation would require dredging and filling activities during the construction. During this period, silt curtains would be installed enclosing the whole project site to control sediment loss. Figures 25308/041/301 to 304 and 25308/041/301A to 304A of **Annex A** shows the arrangement of the silt curtains for Sequence A and Sequence B, respectively. During the construction period, monitoring shall be undertaken 3 days per week, at mid-flood (within ± 1.75 hour of the predicted time) and mid-ebb (within ± 1.75 hour of the predicted time) tides, with sampling / measurement at the designated monitoring stations. Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. 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. Two consecutive measures of DO concentration, DO saturation, pH, salinity, temperature, turbidity and water samples for SS will be taken in situ at 1 m below the surface, mid-depth and 1 m above the seabed at each location. If the water depth is less than 6 m, the mid-depth measurement may be omitted subject to the approval of the ER. If the depth is less than 3 m, only the mid-depth measurements need to be taken subject to the approval of the ER. 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 readings 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.

- 5.9.1.2 Not used.

- 5.9.1.3 If the Impact Monitoring results indicate that dredging / filling works have caused adverse impacts on water quality at the monitoring stations, appropriate actions (including the lowering of production rates for dredging and filling) should be taken and additional mitigation measures should be implemented as necessary. Under this circumstance, water quality monitoring frequency has to be increased to once per day when dredging / filling is undertaken. 24-hour monitoring of turbidity should be implemented as and when necessary. The monitoring results should be made available within a reasonable short period to be agreed with the EPD, ER and IEC.

5.9.2 Relocation of Mf Sediment with Reclamation Area

- 5.9.2.1 The preliminary ground investigation conducted for TM-CLKL did not detected

Mf material (ie. Category M Sediment which fails the biological test as per ETWB TC 34/2002) in the project site and no handling of Mf has been predicted. Therefore, this sub-section is only relevant to HKBCF and HKLR projects.

5.9.2.2 Not used.

5.9.2.3 Not used,

5.9.3 *Water Quality Monitoring along the Water Boundary of Hong Kong and Mainland*

5.9.3.1 Stations for sensitivity test result shall be provided along the HKSAR Boundary to identify and assess any cross-boundary cumulative water quality impacts in order to establish suitable remedial actions where necessary.

5.10 Post-construction Monitoring

5.10.1.1 Upon completion of all marine-based construction activities, a post-project monitoring exercise on water quality shall be carried out for 4 weeks in the same manner as the Baseline Monitoring. Replicate in-situ measurements and samples collected from each independent sampling event shall be collected to ensure a robust statistically interpretable database. The measurement parameters for Post-construction monitoring shall include DO, temperature, turbidity, pH, salinity and SS. The measurement shall be taken at all designated monitoring stations including control stations, 3 days per week, at mid-flood (within ± 1.75 hour of the predicted time) and mid-ebb (within ± 1.75 hour of the predicted time) tides, for at least 4 weeks.

5.10.1.2 Since the southern and northern landfalls of TM-CLKL are distant from each other and based on the tentatively programme available during the EIA stage the two landfall has a different construction time frame, the Post-construction monitoring for each landfalls may conducted separately. The ET should review the actual implantation programme and recommend if a separate post-construction monitoring for each landfall is required.

5.11 Operational Phase Monitoring

5.11.1.1 The marine water quality monitoring shall be performed monthly during the first year of Project operation at all designated monitoring stations including control stations. Each monthly monitoring event shall consist of one monitoring and sampling event during both mid-ebb (within ± 1.75 hour of the predicted time) and mid-flood (within ± 1.75 hour of the predicted time) tides of the same monitoring day.. The operation phase monitoring shall be ceased after the first year of operation of the Project subject to the first year review. No marine construction activities should be conducted in the vicinity of the stations during the Operational Phase monitoring period.

5.11.1.2 Sampling shall be taken at three water depths, namely, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth is less than 6m, in which case the mid-depth station may be omitted. If the water depth be less than 3m, only the mid-depth station will be monitored. In-situ measurements at DO,

turbidity, SS, pH, salinity and temperature shall be taken at all the monitoring stations SR2, SR3, CS2 and CS(Mf)5 (refer to **Table 5.2b**). A full set of in duplicated situ measurement and water samples shall be collected during each of the mid-ebb (within ± 1.75 hour of the predicted time) and mid-flood (within ± 1.75 hour of the predicted time) tides.

5.12 Event and Action Plan

5.12.1.1 The Action and Limit levels for water quality are defined in **Table 5.3**. Should non-compliance of the criteria occur, action in accordance with the Action Plan in **Table 5.4** shall be carried out.

Table 5.3 Action and Limit Levels for Water Quality

Parameters	Action	Limit
DO in mg L ⁻¹ (Surface, Middle & Bottom)	<p><u>Surface and Middle</u> 5 percentile of baseline data for surface and middle layer</p> <p><u>Bottom</u> 5 percentile of baseline data for bottom layer</p>	<p><u>Surface and Middle</u> 4 mg L⁻¹ except 5 mg/l for FCZ or 1%-ile of baseline data for surface and middle layer</p> <p><u>Bottom</u> 2 mg L⁻¹ or 1%-ile of baseline data for bottom layer</p>
SS in mg L ⁻¹ (depth-averaged) at all monitoring stations and control stations	95 percentile of baseline data or 120% of upstream control station's SS at the same tide of the same day	99 percentile of baseline or 130% of upstream control station's SS at the same tide of the same day and 10mg/L for WSD Seawater intakes
Turbidity in NTU (depth-averaged)	95 percentile of baseline data or 120% of upstream control station's Turbidity at the same tide of the same day	99 percentile of baseline or 130% of upstream control station's Turbidity at the same tide of the same day

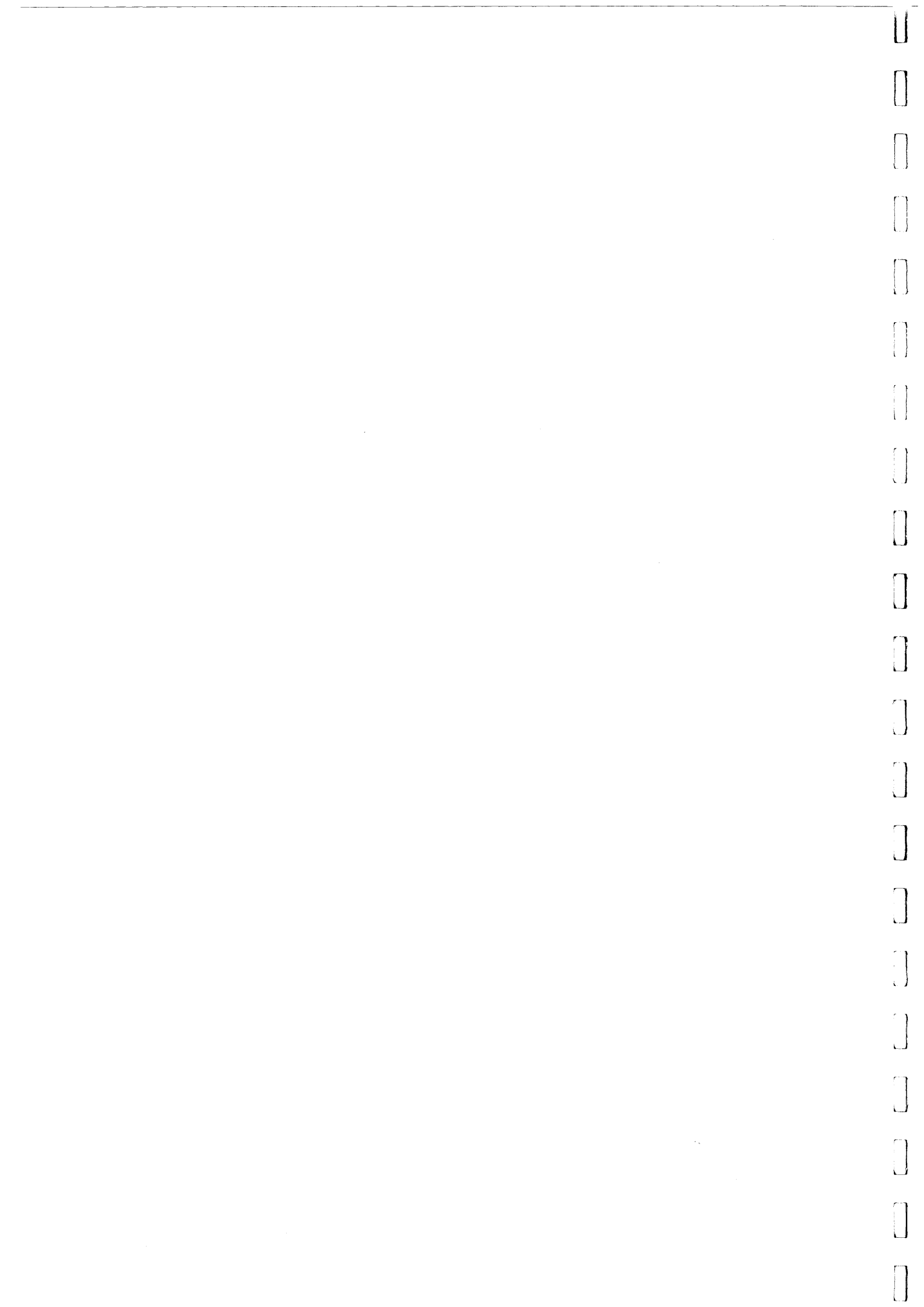
- Notes:
- "depth-averaged" is calculated by taking the arithmetic means of reading of all three depths.
 - For DO, non-compliance of the water quality limits occurs when monitoring result is lower than the limits.
 - For turbidity, SS, non-compliance of the water quality limits occurs when monitoring 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 as necessary.

5.12.1.2 Not used.

Table 5.4 Event and Action Plan for Water Quality

Event	ET Leader	IEC	ER	Contractor
Action level being exceeded by one sampling day	Repeat <i>in situ</i> measurement on next day of exceedance to confirm findings; Identify source(s) of impact; Inform IEC, contractor and ER; Check monitoring data, all plant, equipment and Contractor's working methods.	Check monitoring data submitted by ET and Contractor's working methods.	Confirm receipt of notification of non-compliance in writing; Notify Contractor.	Inform the ER and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Amend working methods if appropriate.
Action level being exceeded by two or more consecutive sampling days	Repeat measurement on next day of exceedance to confirm findings; Identify source(s) of impact; Inform IEC, contractor, ER and EPD; Check monitoring data, all plant, equipment and Contractor's working methods; Discuss mitigation measures with IEC, ER and Contractor; Ensure mitigation measures are implemented; Increase the monitoring frequency to daily until no exceedance of Action level;	Check monitoring data submitted by ET and Contractor's working method; Discuss with ET and Contractor on possible remedial actions; Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly; Supervise the implementation of mitigation measures.	Discuss with IEC on the proposed mitigation measures; Ensure mitigation measures are properly implemented; Assess the effectiveness of the implemented mitigation measures.	Inform the Engineer and confirm notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment and consider changes of working methods; Submit proposal of additional mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER; Implement the agreed mitigation measures.
Limit level being exceeded by	Repeat measurement on next day	Check monitoring data	Confirm receipt of notification of	Inform the ER and confirm

Event	ET Leader	IEC	ER	Contractor
one sampling day	<p>of exceedance to confirm findings; Identify source(s) of impact; Inform IEC, contractor, ER and EPD; Check monitoring data, all plant, equipment and Contractor's working methods; Discuss mitigation measures with IEC, ER and Contractor;</p>	<p>submitted by ET and Contractor's working method; Discuss with ET and Contractor on possible remedial actions; Review the proposed mitigation measures submitted by Contractor and advise the ER accordingly.</p>	<p>failure in writing; Discuss with IEC, ET and Contractor on the proposed mitigation measures; Request Contractor to review the working methods.</p>	<p>notification of the non-compliance in writing; Rectify unacceptable practice; Check all plant and equipment and consider changes of working methods; Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER.</p>
Limit level being exceeded by two or more consecutive sampling days	<p>Repeat measurement on next day of exceedance to confirm findings; Identify source(s) of impact; Inform IEC, contractor, ER and EPD; Check monitoring data, all plant, equipment and Contractor's working methods; Discuss mitigation measures with IEC, ER and Contractor; Ensure mitigation measures are implemented; Increase the monitoring frequency to daily until no exceedance of Limit level for two consecutive days;</p>	<p>Check monitoring data submitted by ET and Contractor's working method; Discuss with ET and Contractor on possible remedial actions; Review the Contractor's mitigation measures whenever necessary to assure their effectiveness and advise the ER accordingly; Supervise the implementation of mitigation measures.</p>	<p>Discuss with IEC, ET and Contractor on the proposed mitigation measures; Request Contractor to critically review the working methods; Make agreement on the mitigation measures to be implemented; Ensure mitigation measures are properly implemented; Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</p>	<p>Take immediate action to avoid further exceedance; Submit proposal of mitigation measures to ER within 3 working days of notification and discuss with ET, IEC and ER; Implement the agreed mitigation measures; Resubmit proposals of mitigation measures if problem still not under control; As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.</p>



6 ECOLOGY

6.1 Introduction

6.1.1.1 The EIA has recommended that an EM&A for ecology is undertaken during the design, construction and operational phases of the project. The objectives of the design phase EM&A are to prepare detailed specifications for translocation works to be undertaken prior to construction. The construction and operational EM&A objectives are to ensure that the ecological contract works and construction mitigation procedures recommended in the EIA are carried out as specified and are effective. The construction and operational phase EM&A will be carried out as part of the site monitoring and audit programme.

6.2 Ecology EM&A Procedures

6.2.1.1 The design phase audit procedures are detailed in Section 1.5.3 and **Figure 1.1**. Ecological specifications for species translocation will be designed as part of the project detailed design phase. The specifications and designs will be reviewed as and when they are produced. The final ecological specifications and designs shall be signed off by the design auditor(s) using the appropriate proforma (see **Appendix B**).

6.2.1.2 The construction phase ecological audit is concerned with checking the effectiveness of the implementation of the ecology contract works, together with auditing the effectiveness of site mitigation. Operational phase EM&A will comprise the audit of the reestablishment of habitat areas and the on-going effectiveness of mitigation measures as appropriate. The operational phase EM&A shall be undertaken during the Contractor's one year maintenance period. The overall procedures for the ecological EM&A during construction and operation are shown in **Figures 1.2 and 6.1**.

6.3 Design Phase Audit

6.3.1.1 Ecological measures proposed by the EIA to mitigate the ecology impacts of the scheme will be incorporated into the detailed design of the project. In particular, ecology specifications will be produced for the elements detailed in **Table 6.1** below.

Table 6.1 Ecological Design Specifications

Number	Specification
1	Hoarding along the works boundary for protecting the pitcher plants and its surrounding habitat.
2	Translocation specifications for corals
3	Pre, during and post construction dolphin monitoring.
4	Vessel speed limits and restrictions specification
5	Bored piling monitoring programme specification
6	Design of dredging and reclamation works acoustic decoupling methods
7	Specification for dolphin exclusion zone during dredging, reclamation, sheet and bored piling

Number	Specification
8	Artificial reef deployment

6.3.1.2 The specifications should be issued to the EPD and AFCD and other relevant Authorities for approval before being implemented prior to construction.

6.3.1.3 Designs and specifications will be prepared during the detailed design stage by suitably qualified staff on the design team. The designs will be checked by a design auditor(s) to ensure that the measures are fully incorporated and that potential conflicts with the engineering are resolved prior to construction. In the event of a non conformity, the Event/Action plan detailed in **Table 6.2** below shall be followed by the relevant parties.

Table 6.2 *Event / Action Plan for Design Phase*

Action Level	Ecology Auditor	Project Engineer (PE)	Project Ecologist (PEC)
Non Conformity (with Design Standards and Specification)	<ul style="list-style-type: none"> ● Identify Source ● Inform PE and PEC ● Discuss remedial actions with PE, and PEC ● Verify remedial actions when complete 	<ul style="list-style-type: none"> ● Notify PEC ● Discuss remedial actions with PEC ● Ensure remedial designs are fully incorporated 	<ul style="list-style-type: none"> ● Amend designs ● Discuss remedial actions with PE

6.4 Baseline Monitoring

6.4.1 Background

6.4.1.1 Ecological baseline EM&A will consist of undertaking the following:

- a walk-over survey, prior to construction works, of the land and streams where works will be undertaken. It may be necessary to rope off and protect specific habitats or species of special interest identified during the ecological surveys;
- audit of species translocation works (corals);
- pre-construction dolphin monitoring; and
- bored piling monitoring.

6.4.2 Baseline Walkover Survey

6.4.2.1 The purpose of the walk over survey will be to confirm the existing ecological conditions, with reference to the habitat maps included in the EIA Report and the established baseline conditions, in relation to the extent and condition of the habitats and species noted during the walkover survey. No detailed ecological surveys of flora and fauna will be required at this stage.

6.4.3 *Baseline Translocation Works*

6.4.3.1 In respect of translocation works, the ET will be required to audit the effectiveness of the implementation of the ecology translocation contract works, item 2 detailed in **Table 6.1** above. Prior to the translocation works, the ET shall arrange to conduct a pre-construction survey of corals at Pillar Point and potential receptor site(s). The EIA has proposed feasible receptor site(s) although the ET shall review and verify their suitability and propose alternate site(s) if necessary. The ET shall submit a Coral Translocation Proposal, which shall including the finding of the pre-construction survey, for AFCD's agreement. The implementation of the specification for translocation of the corals should be undertaken prior to any major relevant construction works and thus, the EM&A for these will be undertaken early in the Contract. The audit will continue into the construction phase after the translocations have been completed.

6.4.3.2 A qualified ecologist(s), as part of the ET, will carry out the audit. The ecological contract works, detailed in **Table 6.1**, shall be audited with reference to the audit schedule detailed in **Table 6.3** below.

Table 6.3 *Audit Schedule for Ecological Contract Works*

Specification Number (Table 6.1)	Baseline Phase	Construction Phase
2	Audit compliance at least once per week during implementation which will be prior to the start of the main construction activities. After translocation is complete, carry out audit survey to determine if all corals have been moved.	Audit success of translocation once every 3 months after completion by assessing survival of transplanted species. Continue for a period of 12 months.

6.4.4 *Baseline Dolphin Monitoring*

6.4.4.1 Perhaps the most important ecological measure of all is to conduct surveys to monitor the density and behaviour of the animals before, during, and after the period of the potential disturbance. This objective is to determine if the other mitigation measures have been effective in protecting the animals from disturbance and maintaining their habitat quality. In addition, it is necessary to monitor the effects of the construction works on the use of dolphin travelling corridors. While there is not expected to be a complete physical blockage of the travelling corridors, the works may have some impacts in terms of reducing dolphin use of these corridors. As data on this is scarce, dolphin monitoring is, also, required to monitor the use of the travel corridors and if the dolphins stop using the corridors, then it will be necessary to provide some remediation to deal with this, in the form of adaptive management.

6.4.4.2 In order for such monitoring to be effective, it needs to be divided into three phases: pre-disturbance (i.e., baseline phase), disturbance (i.e, construction phase), and post-disturbance (i.e., operational phase). Survey techniques must be held constant from phase to phase and survey equipment and personnel should ideally be the same as well.

- 6.4.4.3 Project-specific dolphin monitoring using line transect surveys combined with photo-identification studies, also, have the advantage of being able to provide evaluation of dolphin fine-scale habitat use patterns. This includes 1 km² grid densities and grid-based patterns of feeding, socializing and calving, as well as individual ranging patterns, allowing the detection of any smaller-scale impacts and changes in core area use (see Hung 2008).
- 6.4.4.4 Considering that AFCD monitoring provides useful data, the monitoring programme should comprise undertaking surveys, 2 days per month for a period of 12 months during each phase. Notwithstanding, as 9 months of baseline surveys have been undertaken for the purposes of this EIA, a further 3 months only would be required for the pre-construction phase. In summary, the following monitoring would be required:
- six, one-day survey events to be undertaken at a frequency of 2 per month over a period of 3 months before commencement of construction;
 - one-day survey events to be undertaken at a frequency of 2 per month for the duration of the marine works construction period; and
 - forty-eight, one-day survey events to be undertaken at a frequency of 2 per month over a period of 24 months following cessation of the construction.
- 6.4.4.5 The period required for the monitoring is considered to be adequate to derive a reasonably large amount of data, thereby allowing any significant trends in dolphin distribution to be detected (Jefferson pers. comm.).
- 6.4.4.6 The monitoring should also be undertaken by a suitably qualified person (in biology) and should be independent of the construction contractor and should form part of the independent Environmental Team (ET). The IEC may audit the work of the ET if deemed necessary. Monitoring should be conducted following the methodology detailed below:

Vessel-based Observations

- 6.4.4.7 Line transect surveying techniques have now been standardised in Hong Kong Special Administrative Region Waters so that data from all surveys are directly comparable. The study area with line transects is presented in **Figure 6.3**. In order to provide a suitable long-term dataset for comparison, pre-, during and post-construction phase dolphin monitoring will employ an identical methodology and follow the same line transects as those presented in Figure 8.7 of the EIA Report.
- 6.4.4.8 On each survey day, the survey vessel will depart from Tung Chung New Pier. Observation for incidental sighting will begin immediately on departure from the assigned pier and continue until the vessel reaches the survey area. The survey vessel shall have an open upper deck, allowing for observer eye heights of 4 to 5m above water level and relatively unobstructed forward visibility between 270° and 90°. When on-effort, the vessel shall travel along the survey lines at a speed of approximately 7 to 8 knots (13 to 15 km/hr). The direction of the survey shall be alternated on different days to avoid possible biases related to the timing of the

survey coverage.

- 6.4.4.9 Vessel-based transect observations by a three-person team shall be conducted by searching the 180° swath in front of the survey vessel (270° to 90°). The area behind the vessel need not be searched, although dolphins observed in this area should be recorded as off-effort sightings. The primary observer will scan the entire search path (270° to 90°) continuously with Fujinon 7x50 marine binoculars or equivalent as the second member of the team, designated the data “recorder”, scans the same area with the naked eye and occasional binocular check. The third observer on the boat is required to rotate into the observation team after half an hour, thus relieving one of the initial team. Observers should rotate every half an hour. While on-effort, observers shall ignore potential sighting cues that could bias the sighting distance calibration (eg pair-trawl fishing vessels).
- 6.4.4.10 A critical consideration in the survey will be to ensure a strict timed quantification of “sighting effort” in order to maximise the comparative value of the field survey results. The time and position for the start and end of a period of intensive, uninterrupted effort, and the sighting conditions such as visibility range and Beaufort scale associated with it shall be recorded. The collection of effort data allows comparisons within a single study as well as between studies. Strict recording of time and speed travelling along the assigned transect (“on-effort”) shall, therefore, be recorded. Time spent during any deviation from the transect will be recorded as “off-effort”.
- 6.4.4.11 During periods of poor weather, when visibility is hindered (e.g., below 1km) or when a Beaufort force 5 is reached, the survey should normally be postponed.
- 6.4.4.12 Sightings distant to 500m perpendicular distance and sightings of single dolphins that were hard to track should not be pursued (although those distant to 500m ahead of the vessel should be pursued). The initial sighting distance between the dolphin and the survey vessel and sighting angle shall be recorded in order to estimate the positions of the dolphins. These and other details of the sighting, including the exact location of the sighting and number of individuals should be agreed among the observation team and recorded immediately. Distances and angles shall be as accurate as possible.
- 6.4.4.13 A global positioning system shall be used during the surveys. A sighting record shall be filled out at the initial sighting with time, position, distance and angle data filled in immediately and verified between primary observer and recorder. All other information on sea state, weather conditions (Beaufort Scale), as well as notes on dolphin appearance, behaviour, and any other information shall also be completed.
- 6.4.4.14 A summary of equipment requirement is summarized in **Table 6.5** below.

Table 6.5 Summary of Dolphin Monitoring Equipment Requirements

Equipment	Type
Vessel for Monitoring	A monitoring boat which should have a flying bridge or upper deck with a relatively unobstructed forward visibility (270° – 90°) allowing for observer eye height of 4-5m above water
Observation	Fujinon 7x50 marine binoculars (or similar) with compass/reticule
Calibration	Leica Geovid laser range finder binnacles or equivalent
Navigation and Positioning	Global Positioning System Device (Magellen NAV 5000D or similar approved) (+ spare batteries)

6.4.5 Bored Piling Monitoring Programme

6.4.5.1 Based upon the specification prepared during the detailed design phase (Item 5 in Table 6.1 above), a comprehensive monitoring plan be implemented before, during and after the bored piling works is proposed. The monitoring plan would include both underwater acoustic monitoring, the study the acoustic behaviour of dolphins near the bored piling works site and theodolite tracking of dolphin movement from land in order to determine the actual magnitude of impacts.

Acoustic Monitoring

6.4.5.2 In order to ensure that bored piling noise will not affect the Chinese White Dolphins, noise levels from bored piling activities should be measured, with details of frequency/intensity spectra to be evaluated. The acoustic results of the monitoring should be analysed in terms of both the Broadband range (100 Hz to 25.6 kHz) and, also, the dolphin sensitive range (400 Hz to 12.6 kHz). The monitoring will study the acoustic behaviour of dolphins near the bored piling works site and at a control site for comparison, to determine whether foraging behaviour is affected by the bored piling activities and whether dolphin echolocation clicks are masked by bored piling activity noise.

6.4.5.3 The specification and detailed methodology for the bored piling acoustic monitoring should be prepared as part of the detailed design and submitted to the EPD and AFCD for approval.

6.4.5.4 The acoustic monitoring will be undertaken during the construction phase and commence at the start of the bored piling works. The exact monitoring period will be determined and detailed in the specification to be prepared during the detailed design stage but is likely to comprise as a minimum:

- underwater noise levels measurements from bored piling activities for 10 days from the start of bored piling activities; and
- study the acoustic behaviour of dolphins from a small boat during periods with and without bored piling for 30 days from the start of bored piling activities.

6.4.5.5 The monitoring works will consist of data acquisition and analysis of sound to be gathered by an experienced bio-acoustician with specialised experience in processing of appropriate low frequency (to infrasound, down to 20 Hz) and high frequency (into ultrasound, to at least 100 kHz) hydrophone and digital recording

equipment, as well as the appropriate analysis devices and programmes. The bio-acoustician should have at least ten years of dolphin sound data gathering and analysis experience, at least three technical publications related to dolphin sounds.

- 6.4.5.6 As bored piling will also be undertaken for the HKLR project, it is possible that a combined monitoring could be undertaken. The monitoring should be conducted at a location at which significant impacts on dolphins are unlikely.

Land-based Theodolite Tracking

- 6.4.5.7 The objective of the land-based theodolite tracking of dolphins is to monitor their movements and behaviour near the bored piling works site before, during and after the works and record and note any changes in response to the bored piling noise. The details of the land-based dolphin tracking methodology and frequency will be defined in a specification prepared during detailed design phase. However, as a minimum the monitoring is likely to comprise 30 days before, 30 days during and 30 days after bored piling works

- 6.4.5.8 This monitoring would consist of data acquisition and analyses of movement and behavioural information of CWD, as gained from a 5-sec. resolution conventional theodolite and a 5-sec. resolution “total station” theodolite with laser range-finding capability, appropriate hand-held range finders, binoculars with distance-measuring reticles and built-in compass, recording gear of digital voice recorder, data sheets, and computer slaved to theodolites.

- 6.4.5.9 Two experienced theodolite/behavioural data gathering operators should undertake the monitoring. The primary and secondary theodolite operators should have at least ten years of theodolite and behavioural data gathering and analysis experience, at least three technical publications to cover the subject, and appropriate long-term familiarity with the latest version of the tracking program “Pythagoras”. These experienced operators need to have further experience in detailed power analyses for efficient evaluation of number of samples and time/energy needed for statistical evaluations.

6.5 Construction and Operational Phase EM&A

6.5.1 Background

- 6.5.1.1 During the construction and operational phases the ET will be required to undertake the following:

- continued audit of the translocation works as per the requirements in **Table 6.3** above;
- audit of habitat protection measures as follows:
 - in order to avoid damage and disturbance to the protected Pitcher Plant species and surrounding natural habitat,
 - ensure placement of hoarding along the works boundary of the Project Site before commencement of works to prevent vehicle movements and encroachment of personnel into adjacent areas. No openings in the

- hoarding should be provided on the north of the Toll Plaza work areas to avoid access to the uphill area where the Pitcher Plants are located;
 - ensure that work site boundaries are not breached and that damage does not occur to surrounding areas;
 - provided and scheduled environmental briefing/training sessions for site staff to raise their awareness on environmental protection;
 - ensure placement of equipment is within designated areas within the existing disturbed land;
 - ensure construction activities are restricted to within the proposed works boundary;
 - ensure spoil heaps are covered at all times;
 - ensure that disturbed areas are reinstated immediately after completion of the works;
 - ensure temporary disturbance and gabion wall works of stream NL1 in North Lantau (if required) are undertaken during the dry season (**Figure 6.4**); and
 - ensure enhancement planting works undertaken.
- audit of acoustic decoupling for dredging and reclamation work and the vessel restrictions requirements, as specified by the specifications prepared during the design stage (items 4 and 6 in **Table 6.1** above);
 - implement any further recommendations, if any, of the bored piling monitoring;
 - implementation of the artificial reef deployment;
 - implementation of the dolphin exclusion zone during dredging, reclamation, sheet and piling works;
 - audit the avoidance of peak CWD calving season in May and June for driving of metal caissons during bored piling works; and
 - audit the pre-construction, construction and operational phase dolphin monitoring.

6.5.2 *Construction Ecological Audit*

- 6.5.2.1 A dolphin exclusion zone within a radius of 250m around the dredging, reclamation, sheet and bored piling works should be implemented and the area visually inspected for dolphins prior to commencement of the marine works. The principles of the exclusion zone are that, during daylight hours, the area should be visually inspected for dolphins prior to commencement of dredging, reclamation or sheet piling works. The sheet piling works will be restricted to 12 hours a day and visual inspection will be possible. However, it is possible that the other marine works for the TM-CLKL would continue for 16 hours per day. As such, as the visual exclusion zone relies on the visual detection of dolphins, it would not be suitable during evening or nighttime periods. Based upon this, an alternative method using Passive Acoustic Monitoring (PAM) would be required for any dredging and reclamation works undertaken outside daylight hours.

PAM involves the use of hydrophones or cetacean detectors. The specification prepared during the detailed design should further specify the use of PAM.

6.5.2.2 The dolphin exclusion zone should be monitored by independent dolphin observers with an unobstructed, elevated view of the area. Piling should not begin until the observer certifies that the area is continuously clear of dolphins for a period of 30 minutes (thereby adequately spanning the approximate maximum dive time of the dolphins of 4 minutes). The observers must be suitably trained in biology and should be independent of the construction contractor and should form part of the independent Environmental Team (ET) to be employed by the Contractor. An Independent Environmental Checker (IEC) would be required to audit the work of the ET.

6.5.2.3 For the overall audit of habitat protection, acoustic decoupling, dolphin exclusion zone and the vessel restrictions requirements, in the event of non-compliance, the Event /Action plan detailed in **Table 6.6** below should be implemented.

Table 6.6 Event / Action Plan for General Ecology

Action Level	ET	IEC	ER	Contractor
Non-conformity on one occasion	Identify Source Inform the IEC and the ER Discuss remedial actions with the IEC, the ER and the Contractor Monitor remedial actions until rectification has been completed	Check report Check the Contractor's working method Discuss with the ET and the Contractor on possible remedial measures Advise the ER on effectiveness of proposed remedial measures. Check implementation of remedial measures.	Notify Contractor Ensure remedial measures are properly implemented Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the works in the case of a serious non-conformity until situation rectified.	Amend working methods Rectify damage and undertake any necessary replacement
Repeated Non conformity	Identify Source Inform the IC(E) and the ER Increase monitoring frequency Discuss remedial actions with the IC(E), the ER and the Contractor Monitor remedial actions until rectification has been completed If exceedance stops, cease additional monitoring	Check monitoring report Check the Contractor's working method Discuss with the ES and the Contractor on possible remedial measures Advise the ER on effectiveness of proposed remedial measures Supervise implementation of remedial measures	Notify the Contractor Ensure remedial measures are properly implemented Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the works in the case of a serious non-conformity until situation rectified.	Amend working methods Rectify damage and undertake any necessary replacement

Note: ET – Environmental Specialist, IC(E) – Independent Checker (Environmental), ER – Engineer's Representative

6.5.3 *Construction and Operational Phase Dolphin Monitoring*

6.5.3.1 The dolphin monitoring methodology is described in Section 6.4 above and this should be continued both during construction and post construction (operational) phase based using the same transect, method and survey techniques, based upon the following frequency:

- one-day surveys to be undertaken at a frequency of 2 per month for the duration of the marine works construction; and
- forty-eight, one-day survey events to be undertaken at a frequency of 2 per month over a period of 24 months following cessation of the construction.

6.5.3.2 The data after each phase should be compared the pre-construction baseline findings. Any apparent differences in density among survey phases should be analysed for trends and the statistical power of the analysis to detect effects of the desired size should be tested. Comparison of the during and post construction dolphin monitoring with that of over the pre-construction dolphin monitoring will allow the assessment of the overall efficacy of the project-specific mitigation measures through the implementation of an Action Plan detailed in the **Table 6.9** below. Statistical procedures shall be used for data comparison. A range of applicable statistical procedures exist (e.g., t-test, ANOVA and ANCOVA, etc.) and the ET shall propose the procedure to be applied as part of the during and post-construction phase dolphin monitoring programme design to be agreed with AFCD prior to the monitoring being undertaken.

6.5.3.3 Should dolphin sighting numbers in the construction or post-construction phases be significantly different (taking into account naturally occurring alterations to distribution patterns such as due to seasonal change) to the pre-construction activity, recommendations for a further post-construction monitoring survey will be made. Data should then be re-assessed and the need for any further monitoring established. Comparison of the pre-construction dolphin monitoring with that of the during and post- construction dolphin monitoring will allow the assessment of the overall efficacy of the project-specific mitigation measures and an Action Plan for the dolphin is provided in **Table 6.9** below.

6.5.3.4 An action plan has been defined to indicate that should dolphin numbers be significantly different (taking into account naturally occurring alterations to distribution patterns such as due to seasonal change) to the pre-construction activity following the during and post-construction monitoring, recommendations for further monitoring will be required. The action plan should be undertaken within a period of 1 month after a significant difference has been determined. For the purpose of the EM&A works, the “significance” level which will trigger the action plan shall be proposed by the ET as part of the post-construction monitoring programme design to be agreed with AFCD prior to the monitoring being undertaken.

Table 6.9 Event / Action Plan for During and Post Construction Dolphin Monitoring

EVENT	ACTION*			
	ET	IEC	ER	Contractor
Dolphin numbers and behaviour patterns recorded in the pre and post-construction monitoring are significantly lower or different than those recorded in the pre-construction monitoring	Repeat statistical data analysis to confirm findings; Review historical data to ensure differences are as a result of natural variation or previously observed seasonal differences; Identify source(s) of impact; Inform the IEC, ER and Contractor; Check monitoring data; Discuss additional dolphin monitoring and any other measures, with the IEC and Contractor.	Discuss monitoring with the ET and the Contractor; Review proposals for repeat monitoring and any other measures submitted by the Contractor and advise the ER accordingly.	Discuss with the IEC the repeat monitoring and any other measures proposed by the ET; Make agreement on the measures to be implemented.	Inform the FSR and confirm notification of the non-compliance in writing; Discuss with the ET and the IEC and propose measures to the IEC and the ER; Implement the agreed measures.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, ER – Engineer’s Representative
*Action to be instigated within 1 month of an event.

6.6 Mitigation and Enhancement Measures

6.6.1.1 Ecological mitigation and enhancement measures recommended by the EIA are largely related to the protection of key floral and fauna species and are summarized below. In addition, measures recommended to minimise impacts on water quality will, also, reduce impacts on marine ecological resources. The ecological mitigation and enhancement measures to be implemented during the construction phase are as follows:

- use acoustic decoupling methods to minimise noise being transmitted through the dredging and reclamation barges;
- 250m dolphin exclusion zone during dredging, reclamation, sheet and bored piling works;
- avoidance of the peak calving season of May and June for installation of metal caisson during bored piling works;
- deployment of an artificial reef of equivalent size as mitigation and deployment of an AR of twice the size to be affected as an enhancement measure;
- survey and translocation of corals as an enhancement measure;
- reconstruction of seawalls at southern and northern landfall reclamations;
- use of hoarding along the works boundary to avoid disturbance to the protected Pitcher Plant species and the surrounding habitat;
- regularly check the work site boundaries to ensure that they are not breached and that damage does not occur to surrounding areas;
- provided environmental briefing/training sessions for site staff;

- planting of approximately 33ha as an enhancement measure for vegetation loss; and
- gabion wall works in steam NL1 in Lantau to be undertaken in the dry season.

6.6.1.2 The mitigation measures shall be audited at least once every week as part of the site audit programme. In the event of a non-compliance, the Event /Action plan detailed above shall be followed by the relevant parties.

6.6.1.3 In addition, in order to address the cumulative impacts from all the projects and compensate for the cumulative Chinese White Dolphin and fisheries habitat loss, the Government has made a firm commitment to seek to designate the Brothers Islands as a marine park for enhancing the CWD habitat in accordance with the statutory process stipulated in the Marine Parks Ordinance. The designation of the proposed marine park would proceed after the completion of these projects. A study will be conducted to confirm the details of the proposed marine park before the commencement of the statutory procedures as stipulated in the Marine Parks Ordinance. The Government's commitment to the marine park and its control and management in accordance with the Marine Parks Ordinance, as well as the Marine Parks and Marine Reserves Regulations, would significantly help conserve the CWD, and hence serves as an effective mitigation measure for the loss of CWD habitat arising from these projects. With this committed measures, the residual cumulative impacts to the CWD in terms of permanent habitat loss would be acceptable.

7. LANDSCAPE AND VISUAL ASSESSMENT (MAUNSELL)

7.1 Introduction

7.1.1.1 The EIA has recommended landscape and visual mitigation measures to be undertaken during both the construction and operational phases of the project. This section outlines the monitoring and audit of these measures.

7.1.1.2 The sensitive receivers are shown in **Figure 7.1.1.1 to 7.1.1.5, 7.2.1.1 to 7.2.1.5, 7.3.1.1 to 7.3.1.4 and 7.3.2.1.**

7.2 Relevant Legislation

7.2.1.1 The following legislation, standards and guidelines are applicable to landscape and visual impact assessment associated with the construction and operation of the project:

- Environmental Impact Assessment Ordinance (Cap.499.S.16) and the Technical Memorandum on EIA Process (EIAO TM), particularly Annexes 10 and 18
- Environmental Impact Assessment Ordinance Guidance Note 8/2002
- ETWB No. 36/ 2004 - Advisory Committee on the Appearance of Bridges and Associated Structures (ACABAS)
- ETWB TCW No. 10/2005 - Planting on Footbridges and Flyovers
- ETWB TCW No. 2/2004 - Maintenance of Vegetation and Hard Landscape Features
- ETWB TCW No. 29/2004 - Registration of Old and Valuable Trees, and Guidelines for their Preservation
- ETWB TCW No. 3/2006 - Tree Preservation
- ETWB TCW No. 5/2005 on Protection of natural streams/ rivers from adverse impacts arising from construction works
- Hong Kong International Airport Approved Plant Species List (Revision 3: June 2007)
- Hong Kong Planning Standards and Guidelines, particular Chapter 4, Chapter 8, Chapter 10 and Chapter 11
- HQ/GN/13 - Interim Guidelines for Tree Transplanting Works under Highways Department's Vegetation Maintenance Ambit
- HyDTC No. 3/2008 - Independent Vetting of Tree Works under the Maintenance of Highways Department
- HyDTC No. 5/2000 on Control in the Use of Shotcrete (Sprayed Concrete) in Slope Works

- Protection of Endangered Species of Animals And Plants Ordinance (Cap 586)
- Study on Landscape Value Mapping of Hong Kong
- Town Planning Ordinance (Cap 131)
- WBTC No. 17/2000 on Improvement to the Appearance of Slopes
- WBTC No. 25/92 - Allocation of Space for Urban Street Trees
- WBTC No. 25/93 on Control of Visual Impact of Slopes
- WBTC No. 7/2002 - Tree Planting in Public Works

7.3 Methodology and Criteria

7.3.1.1 The design, implementation and maintenance of landscape and visual mitigation measures should be checked to ensure that they are fully realised and that potential conflicts between the proposed landscape measures and any other project works and operational requirements are resolved at the earliest possible date and without compromise to the intention of the mitigation measures.

7.3.1.2 Site inspection and audit is necessary in the operation stage.

Table 7.1 Monitoring Programme

Stage	Monitoring Task	Monitoring Report	Form of Approval	Frequency
Design	Monitoring of design works against the recommendations of the landscape and visual impact assessments within the EIA should be undertaken during detailed design and tender stages, to ensure that they fulfil the intentions of the mitigation measures. Any changes to the design, including design changes on site should also be checked.	Report by ER confirming that the design conforms to requirements of EP	Approved by Client	At Completion of Design Stage
Construction	Monitoring of the contractor's operations during the construction period.	Report on Contractor's compliance, by ET	Counter-signature of report by IEC	Weekly
Establishment Works	Monitoring of the planting works during the 24-month Establishment period after completion of the construction works.	Report on Contractor's compliance, by ET	Counter-signature of report by IEC	3 months

Design Phase

- 7.3.1.3 The mitigation measures proposed within the EIA to mitigate the landscape and visual impacts of the scheme should be embodied into the detailed engineering design and landscape design drawings and contract documents. Detailed landscaping drawings and specification should be checked during detailed design stage and before tender stage by a Registered Landscape Architect to ensure that the measures are fully incorporated and that potential conflicts with civil engineering, geo-technical, structural, lighting, signage, drainage, underground utility and operational requirements are resolved prior to construction. Monitoring of design works against the recommendations of the landscape and visual impact assessments within the EIA should be undertaken when the designs are produced to ensure that they fulfil the intentions of mitigation measures.

Construction & Establishment Period

- 7.3.1.4 The implementation of landscape construction works and subsequent maintenance operations during the 12-month establishment period must be supervised by fully qualified Landscape Resident Site Staff (Registered Landscape Architect or Professional Member of the Hong Kong Institute of landscape Architects).
- 7.3.1.5 Measures to mitigate landscape and visual impacts during construction should be checked and monitored by a Registered Landscape Architect to ensure compliance with the intended aims of the mitigation measures.
- 7.3.1.6 The progress of the engineering works shall be regularly reviewed on site to identify the earliest practical opportunities for the landscape works to be undertaken.

7.4 Baseline Monitoring

- 7.4.1.1 A one off survey shall be conducted prior to commencement of any construction works. A photographic record of the site at the time of the contractor's possession of the site shall be prepared by the Contractor and approved by the ER. The approved photographic Record shall be submitted to the Project proponent, ET, IEC and EPD for record.

7.5 Event and Action Plan

- 7.5.1.1 Should non-compliance of the landscape and visual impacts occur, actions in accordance with the action plan stated in Table 7.2 should be carried out.

Table 7.2 Event and Action Plan for Landscape and Visual Impact

EVENT ACTION LEVEL	ACTION			
	ET	IEC	ER	CONTRACTOR
Design Check	<ul style="list-style-type: none"> • Check final design conforms to the requirements of EP and prepare report. 	<ul style="list-style-type: none"> • Check report. • Recommend remedial design if necessary 	<ul style="list-style-type: none"> • Undertake remedial design if necessary 	
Non-conformity on one occasion	<ul style="list-style-type: none"> • Identify Source • Inform IEC and ER • Discuss remedial actions with IEC, ER and Contractor • Monitor remedial actions until rectification has been completed 	<ul style="list-style-type: none"> • Check report • Check Contractor's working method • Discuss with ET and Contractor on possible remedial measures • Advise ER on effectiveness of proposed remedial measures. • Check implementation of remedial measures. 	<ul style="list-style-type: none"> • Notify Contractor • Ensure remedial measures are properly implemented 	<ul style="list-style-type: none"> • Amend working methods • Rectify damage and undertake any necessary replacement
Repeated Non-conformity	<ul style="list-style-type: none"> • Identify Source • Inform IEC and ER • Increase monitoring frequency • Discuss remedial actions with IEC, ER and Contractor • Monitor remedial actions until rectification has been completed • If non-conformity stops, cease additional monitoring 	<ul style="list-style-type: none"> • Check monitoring report • Check Contractor's working method • Discuss with ET and Contractor on possible remedial measures • Advise ER on effectiveness of proposed remedial measures • Supervise implementation of remedial measures. 	<ul style="list-style-type: none"> • Notify Contractor • Ensure remedial measures are properly implemented 	<ul style="list-style-type: none"> • Amend working methods • Rectify damage and undertake any necessary replacement

7.6 Mitigation Measures

7.6.1.1 The landscape and visual impact assessment of the EIA recommends a series on mitigation measures, as noted below:

Design Landscape and Visual Mitigation Measures

- The large surface of the retaining wall along the toll plaza area shall adopt a patterned/ smoother finishes and texture design to break the large surface. Climber treatment is proposed to soften the structures (DM1),
- The colour and shape of the toll control buildings, ventilation building and administration building shall adopt a design which could blend it into the vicinity elements, and the details will be developed in detailed design stage (DM2),
- Round angle, patterned finishes, and oval shaped pier were considered in the viaduct design, and further details will be developed under ACABAS submission (DM3),
- Details of the street furniture will be developed in the detailed design stage (DM4),
- Aesthetic design of the viaduct, retaining wall and other structures will be developed under ACABAS submission (DM5).

Landscape and Visual Mitigation Measures during Construction Phase

- Existing trees on boundary of the Project Area shall be carefully protected during construction. Detailed Tree Protection Specification shall be provided in the Contract Specification. Under this specification, the Contractor shall be required to submit, for approval, a detailed working method statement for the protection of trees prior to undertaking any works adjacent to all retained trees, including trees in contractor's works areas. (Tree protection measures will be detailed at Tree Removal Application stage) (CM1),
- Trees unavoidably affected by the works shall be transplanted where practical. Trees will be transplanted straight to their final receptor site and not held in a temporary nursery. A detailed Tree Transplanting Specification shall be provided in the Contract Specification. Sufficient time for necessary tree root and crown preparation periods shall be allowed in the project programme (CM2),
- Hillside and roadside screen planting to proposed roads, associated structures and slope works (CM3),
- Hydroseeding or sheeting of soil stockpiles with visually unobtrusive material (in earth tone) (CM4),
- Screening of construction works by hoardings around works area in visually unobtrusive colours, to screen works (CM5),

- Control night-time lighting and glare by hooding all lights (CM6),
- Ensure no run-off into water body adjacent to the Project Area (CM7),
- Avoidance of excessive height and bulk of buildings and structures (CM8),
- Recycle/Reuse all felled trees and vegetation, e.g. mulching (CM9),
- Compensatory tree planting shall be provided to the satisfaction of relevant Government departments. Required numbers and locations of compensatory trees shall be determined and agreed separately with Government during the Tree Felling Application process under ETWBTC 3/2006 (CM10).

Landscape and Visual Mitigation Measures during Operation Phase

- Re-vegetation of affected woodland/shrubland with native species (OM1),
- Tall buffer screen tree / shrub / climber planting should be incorporated to soften hard engineering structures and facilities (OM2),
- Streetscape elements (e.g. paving, signage, street furniture, lighting etc.) shall be sensitively designed in a manner that responds to the local context, and minimises potential negative landscape and visual impacts. Lighting units should be directional and minimise unnecessary light spill (OM3),
- Structure, ornamental tree / shrub / climber planting should be provided along roadside amenity strips, central dividers and newly formed slopes to enhance the townscape quality and further greenery enhancement (OM4),
- Aesthetically pleasing design (visually unobtrusive and non-reflective) as regard to the form, material and finishes shall be incorporated to all buildings, engineering structures and associated infrastructure facilities (OM5),
- Avoidance of excessive height and bulk of buildings and structures (OM6).

8 WASTE MANAGEMENT AND CONTAMINATED LAND

8.1 Waste Issues

8.1.1 *Summary of Waste Arisings*

8.1.1.1 The Contractor is responsible for waste control within the construction site, removal of waste material produced from the site and to implement any mitigation measures to minimise waste or redress problems arising from the waste from the site. Activities during the construction phase will result in the generation of a variety of wastes which can broadly be classified into distinct categories based on their nature and the options for their disposal. These include:

- Marine dredged sediment;
- Excavated construction and demolition (C&D) materials suitable for public fill, including the alluvium from the tunnel construction;
- Construction and demolition waste, including cleared vegetation, which is not suitable for public fill;
- Chemical waste;
- Sewage; and
- General refuse.

8.1.1.2 Marine dredged sediment represents the largest quantity of material to be generated by the project, although the use of both non-dredged and fully dredged methods for the construction of the southern and northern tunnel landfall reclamations have been considered in order to minimize the amounts of material generated where possible.

8.1.1.3 In order to determine the nature of the sediment to be excavated, a marine ground investigation (GI) including sediment sampling and laboratory testing has been undertaken, in accordance with the requirements in ETWB TC(W) No.34/2002. In summary, two classifications of sediment material were identified, comprising Category L and Category M, that passes the biological testing (Mp) and the material is suitable for disposal in Type 1 open sea and Type 1 Open Sea (Dedicated) disposal.

8.1.1.4 A total of 5.24Mm³ of dredged material is predicted to be generated. It is proposed to dispose of all the Category Mp (0.73Mm³) and about 68% of the Category L material (3.05Mm³) to China, with the remaining Category L (1.46Mm³) being proposed to be disposed of in a Type I Open Sea Disposal site in Hong Kong.

8.1.1.5 The Construction and Demolition (C&D) materials generated from the TM-CLKL project will comprise the following:

- Alluvium and CDG from the submarine tunnel and deep sections of the marine viaduct bridge piers and building foundations;
- Excavation of reclamation materials for cut and cover tunnel, portal and ventilation building;

- Surplus surcharge from the reclamation works;
- Excavation materials from the land viaduct construction, slope cutting, utility diversions, site formation of the toll plaza and administration buildings formation; and
- Road and pavement demolition waste from the modification of the existing roads for new roads connections.

8.1.1.6 In accordance with the waste hierarchy, the amounts of materials to be generated has been minimised by optimizing the tunnel and slope profiles. However, a total of 2.85Mm³ of soft C&D material (generated from TBM submerged tunnel, deep marine viaduct foundations and removal of material for the cut and cover tunnel, portal and ventilation buildings at the landfalls) and 1.17Mm³ of materials generated from removal of surcharge at landfalls will be generated and will require off site disposal. However, all the material will be suitable for public fill, although alluvium and small amounts of CDG generated by the TBM tunnelling and deeper sections of the marine viaduct piles, will require to be treated at a slurry treatment plant and suitably dried before transfer to a fill bank. The by-product of the treatment comprises both a coarser, dry material and a wet spoil, and, where required, the spoil material shall be scarified to ensure it is "suitably" dried before it can be disposed of to the fill bank. This principle of disposal has been agreed by the Public Fill Committee.

8.1.1.7 Some 0.59Mm³ of C&D materials, from slope works and road pavement removal will be reused on site. In addition, 12.47Mm³ of various new material will, also, required importing. The onsite transfer and off site removal of the material has the potential for impacting any local residents associated with the possible dust generation from the exported fill, deposition of material on public roads and emissions and noise from the construction vehicles. However, the additional traffic is not expected to cause any additional impacts to sensitive receivers along this route.

8.1.1.8 The volumes C&D waste, are expected to be limited but the material, not being suitable for public fill, will require disposal to landfill. It is, also, unlikely that any large quantities of chemical wastes will be generated during the construction of this project but any materials should be handled, stored, transported and disposed of in an appropriate manner. Other wastes including sewage and general refuse will be generated and these will also need to be collected and disposed offsite appropriately.

8.1.2 *Mitigation Measures*

8.1.2.1 Based on the mitigation measures recommended in the EIA Report, the following measures, as summarized in the Environmental Mitigation Implementation Schedule in **Appendix A**, shall be undertaken when handling waste material during construction phase:

- (i) The requirements as stipulated in the ETWB TC(W) No.19/2005 Environmental Management on Construction Sites and the other relevant guidelines should be included in the Particular Specification for the Contractor as appropriate.

- (ii) The TM-CLKL Contractor should be requested to submit an outline Waste Management Plan (WMP) prior to the commencement of construction work, in accordance with the ETWB TC(W) No.19/2005 so as to provide an overall framework of waste management and reduction. The WMP should include:
- Waste management policy;
 - Record of generated waste;
 - Waste reduction target;
 - Waste reduction programme;
 - Role and responsibility of waste management team;
 - Benefit of waste management;
 - Analysis of waste materials;
 - Reuse, recycling and disposal plans;
 - Transportation process of waste products; and
 - Monitoring and action plan.
- (iii) The waste management hierarchy below should be strictly followed. This hierarchy should be adopted to evaluate the waste management options in order to maximise the extent of waste reduction and cost reduction. The records of quantities of waste generated, recycled and disposed (locations) should be properly documented.
- (iv) A trip-ticket system should be established in accordance with ETWB(W) 31/2004 and Waste Disposal (Charges for Disposal of Construction Waste) Regulation to monitor the disposal of public fill and solid wastes at public filling facilities and landfills, and to control fly-tipping. A trip-ticket system would be included as one of the contractual requirements for the Contractor to strictly implement. The Engineer would also regularly audit the effectiveness of the system.
- (v) A recording system for the amount of waste generated, recycled and disposed (locations) should be established. The future Contractor should also provide proper training to workers regarding the appropriate concepts of site cleanliness and waste management procedures, e.g. waste reduction, reuse and recycling all the time.
- (vi) The CEDD should be timely notified of the estimated spoil volumes to be generated and the Public Fill Committee should be notified and agreement sort on the disposal of surplus inert C&D materials e.g. good quality rock during detailed design of the TM-CLKL project. Wherever practicable, C&D materials should be segregated from other wastes to avoid contamination and to ensure acceptability at public filling areas or reclamation sites.

- (vii) The extent of cutting operation should be optimised where possible. Earth retaining structures and bored pile walls should be proposed to minimise the extent of cutting.
- (viii) Inert C&D materials from slopes and road pavement will be reused for construction of the raised platform for the toll plaza.
- (ix) C&D materials generated by construction of cut slopes along NLH at North Lantau shall be reused in reclamation works where possible.
- (x) The surplus surcharge should be transferred to a fill bank.
- (xi) TMB generated alluvium and CDG material should be treated at a slurry treatment plant prior to transfer to a fill bank.
- (xii) Rock armour from the existing seawall should be reused on the new sloping seawall as far as possible.
- (xiii) The site and surroundings shall be kept tidy and litter free.
- (xiv) No waste shall be burnt on site.
- (xv) Make provisions in contract documents to allow and promote the use of recycled aggregates where appropriate.
- (xvi) Prohibit the Contractor to dispose of C&D materials at any sensitive locations e.g. natural habitat,, etc. The Contractor should propose the final disposal sites in the EMP and WMP for approval before implementation.
- (xvii) Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust and surface run off.
- (xviii) Excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation.
- (xix) Wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads.
- (xx) Dredged marine mud shall be disposed of in a gazetted marine disposal ground under the requirements of the Dumping at Seas Ordinance.
- (xxi) Standard formwork or pre-fabrication should be used as far as practicable so as to minimise the C&D materials arising. The use of more durable formwork or plastic facing for construction works should also be considered. The use of wooden hoardings should be avoided and metal hoarding should be used to facilitate recycling. Purchasing of construction materials should be carefully planned in order to avoid over-ordering and wastage.
- (xxii) The Contractor should recycle as many C&D materials (this is a waste section) as possible on-site. The public fill and C&D waste should be

segregated and stored in separate containers or skips to facilitate the reuse or recycling of materials and proper disposal. Where practicable, the concrete and masonry should be crushed and used as fill materials. Steel reinforcement bar should be collected for use by scrap steel mills. Different areas of the sites should be considered for segregation and storage activities.

- (xxiii) All falsework will be steel instead of wood.
- (xxiv) Chemical waste producers should register with the EPD. Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows:
 - Suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed;
 - Having a capacity of <450L unless the specifications have been approved by the EPD; and
 - Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations.
 - Clearly labelled and used solely for the storage of chemical wastes;
 - Enclosed with at least 3 sides;
 - Impermeable floor and bund with capacity to accommodate 110% of the volume of the largest container or 20% by volume of the chemical waste stored in the area, whichever is greatest;
 - Adequate ventilation;
 - Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and
 - Incompatible materials are adequately separated.
- (xxv) Waste oils, chemicals or solvents shall not be disposed of to drain;
- (xxvi) Adequate numbers of portable toilets should be provided for on-site workers. Portable toilets should be maintained in reasonable states, which will not deter the workers from utilising them. Night soil should be regularly collected by licensed collectors.
- (xxvii) General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention of Nuisances By-laws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited.
- (xxviii) All waste containers shall be in a secure area on hardstanding;

- (xxix) Aluminum cans are usually collected and recovered from the waste stream by individual collectors if they are segregated and easily accessible. Separately labelled bins for their deposition should be provided as far as practicable.
- (xxx) Office wastes can be reduced by recycling of paper if such volume is sufficiently large to warrant collection. Participation in a local collection scheme by the Contractor should be advocated. Waste separation facilities for paper, aluminum cans, plastic bottles, etc should be provided on-site.
- (xxxi) Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.

8.1.3 Waste Disposal Recommendations

8.1.3.1 The recommended disposal sites for the different types of waste are detailed in **Table 8.1** below:

Table 8.1 Recommended Waste Disposal Sites

Type of Waste	Disposal Site
Marine Dredged Mud	All Category M _p and a portion of Category L material to Open Sea or Open Seas Dedicated sites in Mainland China. Remaining Category L materials to Ninepins or South of Cheung Chau ⁽¹⁾
C&D materials	Tuen Mun Areas 38 public fill bank
C&D waste (plastics, glass, wood, including cleared vegetation etc.)	North Lantau Refuse Transfer Station; or NWNT Refuse Transfer Station
Chemical waste (as defined under Schedule 1 of the Waste Disposal (Chemical Waste) Regulation)	Chemical Treatment Facility at Tsing Yi: or Other approved facility
General refuse	North Lantau Refuse Transfer Station; or NWNT Refuse Transfer Station

Note (1) Subject to DASO application

8.2 Contaminated Land

8.2.1.1 The results of the contaminated land assessment did not reveal any contamination hotspots that might be affected by the proposed TM-CLKL works and as such no mitigation measures in the form of contaminated land remediation is required. Therefore, no EM&A activities for the construction nor operational phases have been recommended as no significant impacts are predicted.

8.3 Waste EM&A Requirements

8.3.1.1 EM&A requirements are required for waste management during the construction phase only and the effective management of waste arisings during the construction

phase will be monitored through the site audit programme. The aims of the waste audit are:

- to ensure the waste arising from the works are handled, stored, collected, transferred and disposed of in an environmentally acceptable manner; and
- to encourage the reuse and recycling of material.

8.3.1.2 The Contractor shall be required to pay attention to the environmental standard and guidelines and carry out appropriate waste management and obtain the relevant licence/permits for waste disposal. The Environmental Team (ET) shall ensure that the Contractor has obtained from the appropriate authorities the necessary waste disposal permits or licences including:

- Chemical Waste Permits/licenses under the Waste Disposal Ordinance (Cap 354);
- Public Dumping Licence under the Land (Miscellaneous Provisions) Ordinance (Cap 28);
- Marine Dumping Permit under the Dumping at Sea Ordinance (Cap 466); and
- Effluent Discharge Licence under the Water Pollution Control Ordinance.

8.3.1.3 The Contractor shall refer to the relevant booklets issued by the DEP when applying for the licence/permit and the Environmental Team (ET) (see Section 1) shall refer to these booklets for auditing purposes.

8.3.1.4 During the site inspections and the document review procedures as mentioned in Chapter 10 of this Manual, the ET shall pay special attention to the issues relating to waste management and check whether the Contractor has followed the relevant contract specifications and the procedures specified under the laws of Hong Kong. In addition to the site inspections, the ET shall review the documentation procedures prepared by the Waste Coordinator once a week to ensure proper records are being maintained and procedures undertaken in accordance with the Waste Management Plan.

8.3.1.5 The Contractor's waste management practices should be audited with reference to the checklist detailed in **Table 8.2** below:

Table 8.2 Waste Management Checklist

Activities	Timing	Monitoring Frequency	If non-compliance, Action Required
All necessary waste disposal permits or licences have been obtained	Before the commencement of demolition works	Once	Apply for the necessary permits/ licences prior to disposal of the waste. The ET shall ensure that corrective action has been taken.

Activities	Timing	Monitoring Frequency	If non-compliance, Action Required
Only licensed waste haulier are used for waste collection.	Throughout the works	Weekly	The ET shall inform the ER and IEC of the non-compliance. The ER shall instruct the Contractor to use a licensed waste haulier. The Contractor shall temporarily suspend waste collection of that particular waste until a licensed waste haulier is used. Corrective action shall be undertaken within 48 hours.
Records of quantities of wastes generated, recycled and disposed are properly kept. For demolition material/waste, the number of loads for each day shall be recorded (quantity of waste can then be estimated based on average truck load. Should landfill charging be implemented, the receipts of the charge could be used for estimating the quantity).	Throughout the works	Weekly	The Contractor shall estimate the missing data based on previous records and the activities carried out. The ET shall audit the results and forward to the ER and IEC for approval.
Wastes are removed from site in a timely manner. General refuse is collected on a daily basis.	Throughout the works	Weekly	The ET shall inform the ER and IEC of the non-compliance. The ER shall instruct the Contractor to remove waste accordingly.
Waste storage areas are properly cleaned and do not cause windblown litter and dust nuisance.	Throughout the works	Weekly	The ET shall inform the ER and IEC of the non-compliance. The ER shall instruct the Contractor to clean the storage area and/or cover the waste.
Different types of waste are segregated in different containers or skip to enhance recycling of material and proper disposal of waste.	Throughout the works	Weekly	The ET shall inform the ER and IEC of the non-compliance. The ER shall instruct the Contractor to provide separate skips/containers. The Contractor shall ensure the workers place the waste in the appropriate containers.

Activities	Timing	Monitoring Frequency	If non-compliance, Action Required
Chemical wastes are stored, handled and disposed of in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes, published by the EPD.	Throughout the works	Weekly	The ET shall inform the ER and IEC of the non-compliance. The ER shall instruct the Contractor to rectify the problems immediately. Warning shall be given to the Contractor if corrective actions are not taken within 24 hrs and the Waste Control Group of the EPD shall be identified.
Demolition material/waste in dump trucks are properly covered before leaving the site.	Throughout the works	Weekly	The ET shall inform the ER and IEC of the non-compliance. The ER shall instruct the Contractor to comply. The Contractor shall prevent trucks shall leaving the site until the waste are properly covered.
Wastes are disposal of at licensed sites.	Throughout the works	Weekly	The ET shall inform the ER and IEC of the non-compliance. The ER shall warn the Contractor and instruct the Contractor to ensure the wastes are disposed of at the licensed sites. Should it involve chemical waste, the Waste Control Group of EPD shall be notified.

Note: ET – Environmental Team, IEC – Independent Environmental Checker, ER – Engineer's Representative



9 CULTURAL HERITAGE

9.1 Introduction

9.1.1.1 The EIA has recommended that EM&A for cultural heritage resources is undertaken during construction phase of the project. Implementation of the mitigation measures recommended by the EIA will be monitored through the site audit programme.

9.2 Mitigation Measures

9.2.1.1 The identified areas of archaeological potential highlighted by the EIA are limited to areas where existing impacts would have damaged or destroyed any existing archaeological material. As such, no further investigation is recommended for these archaeological resources. However, as a precautionary measure it should be a requirement during the construction works that if any antiquity or supposed antiquity is discovered during the course of the excavation works undertaken by the Contractor, the discovery shall be reported to the AMO immediately and all necessary action taken to preserve it.

9.2.1.2 Also, no mitigation measures are required for marine archaeology as no impacts were predicted on any archaeological resources as a result of the project.

9.2.1.3 Therefore, the mitigation is restricted to the built heritage resources, Grave G1 at the proposed toll plaza in Tuen Mun. Grave G1 is situated near the toll plaza, as shown in **Figure 9.1**. The design of the toll plaza has been arranged so as to preserve the grave in-situ, with a minimum 1.0m permanent setback provided. With the 1.0m set back of the permanent structure, a minimum of 0.7m clearance from the grave can be maintained during construction. This will be achieved with the adoption of special precautionary measures for working adjacent to the grave, including the deployment of simple-to-erect formwork and falsework systems, the provision of construction access and the bulky components of the falsework support system being designed at locations away from the grave. The required construction clearance and the precautionary measures shall be stipulated in the construction specifications. The footpath connection from the adjacent Lung Mun Road to the grave will, also, be maintained during construction and reprovided after the works have been completed. No mitigation will be required during the operational phase.

9.3 Design Phase Audit

9.3.1.1 Measures proposed by the EIA to create a 1.0m permanent set back in order to mitigate any impacts on Grave G1 which is within the works boundary of the toll plaza at Tuen Mun, will be incorporated into the detailed design of the project. Designs and specifications will be prepared during the detailed design stage by suitably qualified staff on the design team. The designs will be checked by a design auditor(s) to ensure that the measures are fully incorporated and that potential conflicts with the engineering are resolved prior to construction. In the event of a non conformity, the Event/Action plan detailed in **Table 9.1** below shall be followed by the relevant parties.

Table 9.1 Event / Action Plan for Design Phase

Action Level	Ecology Auditor	Project Engineer (PE)	Project Ecologist (PEC)
Non Conformity (with Design Standards and Specification)	<ul style="list-style-type: none"> ● Identify Source ● Inform PE and PEC ● Discuss remedial actions with PE, and PEC ● Verify remedial actions when complete 	<ul style="list-style-type: none"> ● Notify PEC ● Discuss remedial actions with PEC ● Ensure remedial designs are fully incorporated 	<ul style="list-style-type: none"> ● Amend designs ● Discuss remedial actions with PE

9.4 Baseline Monitoring

9.4.1.1 The implementation of the above mitigation measures will need to be audited as part of the EM&A programme during the toll plaza works. Prior to construction, a baseline survey of the grave should be undertaken to establish the existing condition.

9.5 Construction Phase Audit

9.5.1.1 All measures undertaken by the Contractor during the construction phase in the vicinity of the grave shall be audited by the Environmental Team (ET), on a regular basis to ensure compliance with the intended aims of the recommended mitigation measures. Site inspections should be undertaken at least once per week throughout the construction period adjacent to these properties. The main aim of the survey is prevention of any possible damage to the grave and to ensure that the proposed mitigation measures are implemented. The broad scope of the audit will involve supervision of the following:

- non-contact effects of the engineering works, such as vibration from pneumatic drills which could cause damage, such as foundation or wall cracks and loosening of tiles or fixtures; and
- contact between the historic structures and equipment and materials associated with the engineering works.

9.5.1.2 Specifically, the monitoring programme will entail the following tasks:

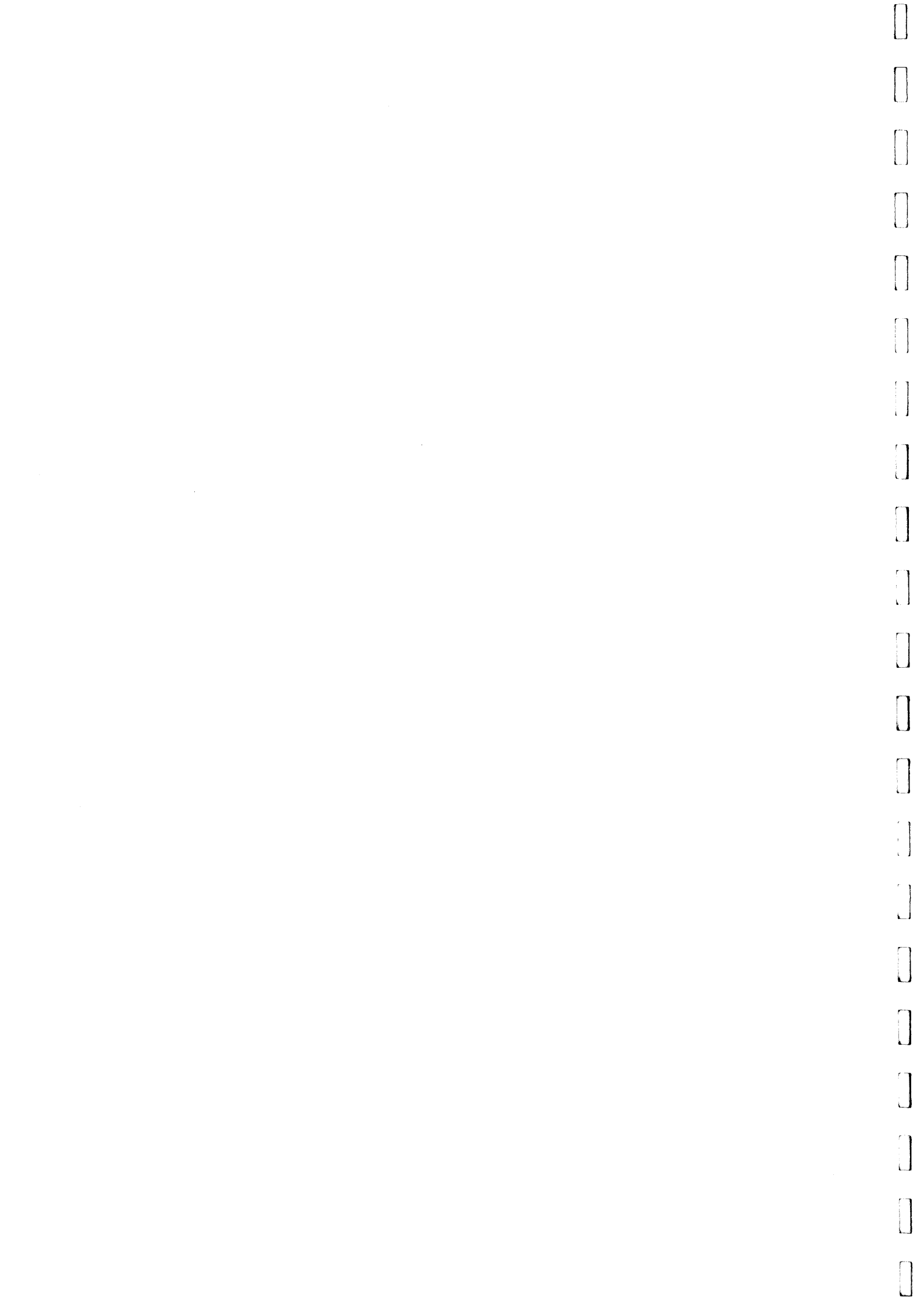
- the extent of the agreed works areas should be regularly checked during the construction phase to ensure the buffer is being maintained; and
- ensure no stockpiling or equipment storage is affecting the structures.

9.5.1.3 In the event of non compliance the responsibilities of the relevant parties is detailed in the Event /Action plan provided on **Table 9.2**.

Table 9.2 Event / Action Plan for Construction Phase

Action Level	ET	IC (E)	ER	Contractor
Non-conformity on one occasion	<ol style="list-style-type: none"> 1. Identify Source 2. Inform the IEC and the ER 3. Discuss remedial actions with the IEC, the ER and the Contractor 4. Monitor remedial actions until rectification has been completed 	<ol style="list-style-type: none"> 1. Check report 2. Check the Contractor's working method 3. Discuss with the ET and the Contractor on possible remedial measures 4. Advise the ER on effectiveness of proposed remedial measures. 5. Check implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Notify Contractor 2. Ensure remedial measures are properly implemented 	<ol style="list-style-type: none"> 1. Amend working methods 2. Rectify damage and undertake any necessary replacement
Repeated Non-conformity	<ol style="list-style-type: none"> 1. Identify Source 2. Inform the IC(E) and the ER 3. Increase monitoring frequency 4. Discuss remedial actions with the IC(E), the ER and the Contractor 5. Monitor remedial actions until rectification has been completed 6. If exceedance stops, cease additional monitoring 	<ol style="list-style-type: none"> 1. Check monitoring report 2. Check the Contractor's working method 3. Discuss with the ES and the Contractor on possible remedial measures 4. Advise the ER on effectiveness of proposed remedial measures 6. Supervise implementation of remedial measures. 	<ol style="list-style-type: none"> 1. Notify the Contractor 2. Ensure remedial measures are properly implemented 	<ol style="list-style-type: none"> 1. Amend working methods 2. Rectify damage and undertake any necessary replacement

Note: ET – Environmental Specialist, IEC – Independent Environmental Checker, ER – Engineer's Representative



10 Landfill Gas Hazard Assessment

10.1 Introduction

10.1.1.1 The landfill gas hazard assessment undertaken in the EIA identified the hazards that are likely to be generated from the Pillar Point Valley (PPV) Landfill, during the construction and operation phases of this Project and evaluate the associated risk. The EIA Report recommended that some precautionary measures are required to protect the proposed Tuen Mun – Chek Lap Kok Link (TMCLKL) toll plaza from the landfill gas risk due to the PPV Landfill. Use of “semi active” or “enhanced passive” gas control protection system referenced from the EPD’s Landfill Gas Hazard Assessment Guidance Note were recommended. Regular monitoring during construction and operation phases was also recommended.

10.2 Monitoring and Measurement of Landfill Gas

10.2.1.1 During construction, a Safety Officer should be appointed to carry out the monitoring works. The monitoring frequency and areas to be monitored should be set down prior to commencement of ground-works either by the Safety Officer or an approved and appropriated qualified person. The routine monitoring should be carried out in all excavations, manholes, chambers, relocation of monitoring wells and any other confined spaces that may have been created. All measurements in excavations should be made with the extended monitoring tube located not more than 10 mm from the exposed ground surface. Monitoring should be performed properly to make sure that the area is free of landfill gas before any man enters in the area.

10.2.1.2 For excavations deeper than 1m, measurements should be carried out:

- at the ground surface before excavation commences;
- immediately before any worker enters the excavation;
- at the beginning of each working day for the entire period the excavation remains open; and
- periodically through the working day whilst workers are in the excavation.

10.2.1.3 For excavations between 300mm and 1m deep, measurements should be carried out:

- directly after the excavation has been completed; and
- periodically whilst the excavation remains open

10.2.1.4 For excavations less than 300mm deep, monitoring may be omitted, at the discretion of the Safety Officer or other appropriately qualified person.

10.2.1.5 Depending on the results of the measurements, actions required will vary and should be set down by the Safety Officer or other appropriately qualified person. As a minimum these should encompass those actions specified as follow:

Table 10.1 Actions in the Event of Landfill Gas being Detected in Excavation / Confined Area

Parameter	Measurement	Action
Oxygen	< 19%	- Ventilate to restore oxygen to > 19%
	< 18%	- Stop work - Evacuate personnel / prohibit entry - Increase ventilation to restore to > 19%
Methane	> 10% LEL (> 0.5% v/v)	- Prohibit hot work - Ventilate to restore methane to < 10% LEL
	> 20% LEL (>1% v/v)	- Stop work - Evacuate personnel / prohibit entry - Increase ventilation to restore to < 10%
Carbon Dioxide	> 0.5%	- Ventilate to restore oxygen to < 0.5%
	> 1.5%	- Stop work - Evacuate personnel / prohibit entry - Increase ventilation to restore to < 0.5%

- 10.2.1.6 During operation, regular monitoring of landfill gas should be done at the tunnel, subway, and any other underground structures within the landfill consultation zone. Monitoring is required to verify the effectiveness and to ensure the continued performance of the implemented protection measures.
- 10.2.1.7 Inspection and LFG monitoring should be carried out at buildings and enclosures (eg. toll control building, toll booths, tunnel, subway, service manholes, etc) prior to the operation to ensure the design measures and functioning properly. The monitoring should be continued through the operation of the Project. In particular for the first year of operation, monthly monitoring is recommended, and quarterly (or at a frequency agreed by EPD) for second year on. Should the monitoring reveal the presence of landfill gas within the tunnel, subway, or other confined area, the seal of the joints shall be inspected and consideration shall be given to seal the cracks. Action level can refer to **Table 10.1**, and should abnormality is observed, it should be reported to EPD and the PPV Landfill operator.
- 10.2.1.8 In addition, if any construction is required for the maintenance work during operation stage, the responsible party should follow the protective measures and monitoring works as recommended in Clause 10.2.1.1~10.2.1.5 of this report.
- 10.2.1.9 The monitoring programme and detailed actions should be included in the detailed assessment (to be carried out in the designed design stage) and submitted to EPD for approval.

11 SITE ENVIRONMENTAL AUDIT

11.1 Site Inspections

- 11.1.1.1 Site inspections provide a direct means to assess and ensure the Contractor's environmental protection and pollution control measures are in compliance with the contract specifications. Site inspections shall be undertaken routinely by the Environmental Team (ET) (see Section 1) to inspect the construction activities in order to ensure that appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the EIA.
- 11.1.1.2 The ET is responsible for the formulation of an environmental site inspection, deficiency and remedial action reporting system and for carrying out the site inspection works. In consultation with the Independent Environmental Checker (IEC), the ET shall prepare a procedure for the site inspection, deficiency and remedial action reporting requirements and submit this to the Contractor for agreement and to the Engineer's Representative (ER) for approval within 21 days of commencement to the construction contract.
- 11.1.1.3 Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the site area and should also include the environmental conditions outside the site which are likely to be affected, directly or indirectly, by the site activities.
- 11.1.1.4 The ET shall make reference to the following information while conducting the inspections:
- (i) the EIA recommendations on environmental protection and pollution control mitigation measures as stated in the EIA report;
 - (ii) work progress and programme;
 - (iii) individual works methodology proposals;
 - (iv) the contract specifications on environmental protection;
 - (v) the relevant environmental protection and pollution control laws;
 - (vi) previous site inspection results; and
 - (vii) environmental monitoring data.
- 11.1.1.5 The Contractor shall update the ET with all relevant information on the construction works prior to carrying out the site inspections. The site inspection results and associated recommendations on improvements to the environmental protection and pollution control works shall be submitted, in a site inspection proforma (see **Appendix B**), by the ET to the IEC, the ER and the Contractor within 24 hours for reference and for taking immediate action. The Contractor shall follow the procedures and time-frame, as stipulated in the environmental site inspection, deficiency and remedial action reporting system to report on any remedial measures subsequent to site inspections.

11.1.1.6 Ad hoc site inspections shall also be carried out by the ET and IEC if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint (an example of the complaint log is provided in **Appendix B**) or as part of the investigation work as specified in the Action Plan for environmental monitoring and audit.

11.2 Compliance with Legal and Contractual Requirements

11.2.1.1 There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in Hong Kong with which the construction activities shall comply.

11.2.1.2 In order that the works are in compliance with the contractual requirements, all the works method statements submitted by the Contractor to the ER for approval shall be sent to the ET for vetting to see whether sufficient environmental protection and pollution control measures have been included.

11.2.1.3 The ET shall also 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.

11.2.1.4 The Contractor shall regularly copy relevant documents to the ET so that the checking work can be carried out. The documents shall include at minimum the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws and all valid licence/permit. The site diaries shall also be available for the ET's inspection upon request.

11.2.1.5 After reviewing the document, the ET shall advise the IEC, the ER and the Contractor of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. The ET shall also advise the IEC, the Contractor and the ER on the current status on licence/permit applications and any environmental protection and pollution control preparation works that may not be suitable for the works programme or may result in potential violation of environmental protection and pollution control requirements.

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

11.3 Environmental Complaints

11.3.1.1 Complaints shall be referred to the ET for carrying out complaint investigation procedures. The ET shall prepare a flow chart of the complaint response procedures that addresses, complaint receiving channels, responsible parties/contacts for information, the investigation process, procedures for the implementation of mitigation/remedial action, guidelines for communication and public relation with the complainant etc. The flow chart should be agreed by all parties and issued to the Contractor, ER and IEC for reference.

11.3.1.2 The ET shall undertake the following procedures upon receipt of a complaint:

- (i) log complaint and date of receipt into the complaint database and inform the IEC immediately;
- (ii) investigate the complaint and discuss with the Contractor to determine its validity and to assess whether the source of the problem is due to works activities;
- (iii) if a complaint is considered valid by the ER or EPD and due to the works, the ET shall identify mitigation measures in consultation with the IEC;
- (iv) if mitigation measures are required, the ET shall advise the Contractor accordingly;
- (v) review the Contractor's response on the identified mitigation measures and the updated situation;
- (vi) if the complaint is transferred from EPD, an interim report shall be submitted to EPD on the status of the complaint investigation and follow-up action within the time frame assigned by EPD;
- (vii) undertake additional monitoring and audit to verify the situation if necessary and ensure that any valid reason for complaint does not recur;
- (viii) report the investigation results and the subsequent actions on the source of the complaint for responding to complainant. If the source of complaint is EPD, the results should be reported within the time frame assigned by EPD; and
- (ix) record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

11.3.1.3 During the complaint investigation work, the Contractor and ER shall cooperate with the ET in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation by the ET, in consultation with the IEC, the Contractor shall promptly carry out the mitigation measures. The ET and ER shall approve the proposed mitigation measures and check that the measures have been carried out by the Contractor.

11.4 Choice of Construction Method

11.4.1.1 At times during the construction phase the Contractor may submit method statements for various aspects of construction. This state of affairs would only apply to those construction methods that the EIA has not imposed conditions while for construction methods that have been assessed in the EIA, the Contractor is bound to follow the requirements and recommendations in the EIA study. The Contractor's options for alternative construction methods may introduce adverse environmental impacts into the project. It is the responsibility of the ET, in accordance with established standards, guidelines and EIA study recommendations and requirements, to review and determine the adequacy of the environmental protection and pollution control measures in the Contractor's proposal in order to ensure no unacceptable impacts would result. To achieve this end, the ET shall provide a copy of the Proactive Environmental Protection

Proforma as shown in **Appendix B** to the IEC for approval. The IEC should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts.

12 REPORTING

12.1 General

12.1.1.1 The following reporting requirements are based upon a paper documented approach. However, the same information can be provided in an electronic medium upon agreeing the format with the Engineer's Representative (ER). The reports are required to be prepared by the Environmental Team (ET).

12.2 Documentation

12.2.1.1 All documentation is required to be filed in a traceable and systematically manner. Site documentation, including monitoring field records, laboratory analysis records, meeting minutes, correspondences etc.(some examples are provided in **Appendix B**) shall be cross-referenced by the ET and be ready for inspection upon request. All EM&A results and findings shall be documented in the respective construction and operational phase EM&A reports prepared by the ET and endorsed by the Independent Environmental Checker (IEC) prior to dissemination to the Contractor, the ER and EPD. All reports including details of water quality monitoring, ecology, landscape and visual and archaeological EM&A shall also be issued to the the AFCD and the AMO as appropriate.

12.2.1.2 All documentation shall be in paper form and/or electronic (in an agreed format) upon request. All documents and data shall be kept for at least one year after the completion of the operational phase EM&A works. All submissions (reports, data and correspondences etc.) shall be liable to free use for the purposes of communicating environmental data and the owner of information shall claim no copyright. Any request to treat all or part of a submission in confidence will be respected, but if no such request is made it will be assumed that the submission is not intended to be confidential.

12.3 Design Audit Report

12.3.1.1 The Design Audit Report shall provide the means for the Consultant undertaking the detailed design of the project to certify that environmental design elements and specifications have been completed in accordance with the EIA requirements. The Consultant shall include in the report a signed off proforma (see **Appendix B**) to confirm that there are no outstanding environmental measures, identified as requiring design phase audit, that require further action. The Design Audit Report and specifications shall be prepared by the Consultants and issued to EPD, the AFCD and the PlanD, as appropriate, prior to the commencement of the tendering period.

12.4 Baseline Monitoring Report

12.4.1.1 In respect of the construction phase EM&A works, the ET shall prepare and submit a Baseline Environmental Monitoring Report within 10 working days of completion of baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to the following: the Contractor, the IEC, the ER, EPD, the AFCD and the AMO as appropriate. The ET shall liaise with the relevant parties on the exact number of copies required.

- 12.4.1.2 The baseline monitoring reports for both the construction and operational phases shall include at least the following:
- (i) Up to half a page executive summary.
 - (ii) Background information.
 - (iii) Drawings showing locations of the baseline monitoring stations.
 - (iv) An updated construction programme with milestones of environmental protection/mitigation activities annotated.
 - (v) Monitoring results (in both hard and diskette copies) together with the following information:
 - monitoring methodology;
 - name of laboratory and equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency and duration; and
 - QA/QC results and detection limits.
 - (vi) Details on influencing factors, including:
 - major activities, if any, being carried out on the site during the period;
 - weather conditions during the period; and
 - other factors which might affect the results.
 - (vii) Determination of the Action and Limit Levels for each monitoring parameter and statistical analysis of the baseline data.
 - (viii) Revisions for inclusion in the EM&A Manual.
 - (ix) Comments and conclusions.

12.5 EM&A Reports

- 12.5.1.1 The results and findings of all construction phase EM&A work required in this Manual shall be recorded in the EM&A Reports prepared by the ET on a monthly basis and endorsed by the IEC. The EM&A Reports shall be prepared and submitted within 10 working days of the end of each reporting month, with the first report due one month and 10 days after construction commences.

- 12.5.1.2 A maximum of 4 copies of each EM&A Report shall be submitted to each of the following parties: the Contractor, the IEC, the ER, EPD, the AFCD, the AMO and the PlanD, as appropriate. Before submission of the first EM&A Report, the ET shall liaise with the parties on the exact number of copies and format of the reports in both hard copy and electronic medium.
- 12.5.1.3 The operational phase EM&A works will be undertaken on a two monthly basis for a period of one year after the commission of the project. The ET shall prepare operational phase EM&A Reports on a bi-monthly basis to be submitted within 10 working days of the end of the reporting period. The reports shall be submitted to the Contractor, the IEC, the ER, EPD and the AFCD as appropriate.
- 12.5.1.4 The ET shall review the monitoring programme every 6 months or on an as needed basis in order to cater for any changes in the surrounding environment and nature of works in progress and shall document all observations in the monthly/bi-monthly reports.

12.6 First EM&A Report

- 12.6.1.1 The first EM&A report for both the construction and operational phases shall include at least the following:
- (i) 1-2 pages executive summary, comprising:
 - breaches of AL levels;
 - complaint Log;
 - notifications of any summons and successful prosecutions;
 - reporting Changes; and
 - future key issues.
 - (ii) Basic Project information including a synopsis of the Project organisation (including key personnel, contact names and telephone numbers), a drawing of the Project area showing the environmentally sensitive receivers and the locations of monitoring and control stations, programme, management structure and the work undertaken during the month.
 - (iii) Environmental Status, comprising:
 - 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.
 - (iv) A brief 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; and

- environmental requirements in contract documents.
- (v) Advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the Project EIA study report and summarised in the updated implementation schedule.
- (vi) Monitoring results (in both hard and diskette copies) together with the following information:
- monitoring methodology;
 - name of laboratory and equipment used and calibration details;
 - parameters monitored;
 - monitoring locations (and depth);
 - monitoring date, time, frequency, and duration; and
 - QA/QC results and detection limits.
- (vii) Graphical plots of trends of monitored parameters at the representative monitoring stations annotated against the following:
- 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;
 - QA/QC results and detection limits.
- (viii) Advice on the solid and liquid waste management status.
- (ix) A summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- (x) A review of the reasons for and the implications of noncompliance including a review of pollution sources and working procedures.
- (xi) A description of the actions taken in the event of noncompliance and deficiency reporting and any follow-up procedures related to earlier noncompliance.
- (xii) A summary record of all complaints received (written or verbal) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints.
- (xiii) A summary of notifications of summons, successful prosecutions for breaches of environmental protection/pollution control legislation and actions to rectify such breaches.
- (xiv) An account of the future key issues as assessed from the works programme and work method statements.
- (xv) Advice on the solid and liquid waste management status.
- (xvi) Comments, recommendations and conclusions for the monitoring period.

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

12.7 Subsequent EM&A Reports

12.7.1.1 The subsequent EM&A reports prepared by the ES for both the construction and operational phases shall include the following:

- (i) Title page.
- (ii) Executive summary (1-2 pages), including:
- breaches of all Action and Limit levels;
 - complaint log;
 - notifications of any summons and successful prosecutions;
 - reporting changes; and
 - future key issues.
- (iii) Contents page.
- (iv) Environmental status, comprising:
- drawing showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
 - summary of non-compliance with the environmental quality performance limits; and
 - summary of complaints.
- (v) Environmental issues and actions, comprising:
- review issues carried forward and any follow-up procedures related to earlier non-compliance (complaints and deficiencies);
 - description of the actions taken in the event of noncompliance and deficiency reporting;
 - recommendations (should be specific and target the appropriate party for action); and
 - implementation status of the mitigatory measures and the corresponding effectiveness of the measures.
- (vi) Future key issues.
- (vii) Appendices, including:
- action and limit 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: 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;
- monitoring schedule for the present and next reporting period;
- cumulative complaints statistics; and
- details of complaints, outstanding issues and deficiencies.

12.8 Quarterly EM&A Summary Reports

12.8.1.1 The ET shall submit Quarterly EM&A Summary Reports for the construction phase EM&A works only. These reports should be around 5 pages (including about three pages of text and tables and two pages of figures) and shall contain at minimum the following information:

- (i) Up to half a page executive summary.
- (ii) Basic Project information including a synopsis of the Project organisation, programme, contacts of key management, and a synopsis of work undertaken during the quarter.
- (iii) 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.
- (iv) Advice on the implementation status of environmental protection and pollution control/mitigation measures as recommended in the Project EIA study report and summarised in the updated implementation schedule.
- (v) Drawings showing the Project area, any environmental sensitive receivers and the locations of the monitoring and control stations.
- (vi) 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.
- (vii) Advice on the solid and liquid waste management status.
- (viii) A summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- (ix) A brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures.

- (x) An assessment of the construction impacts on suspended solids, including but not limited to, a comparison of the difference between the quarterly mean and the 1.3 times the ambient mean value, the latter being defined as a 30% increase of the baseline data or EPD data, using appropriate statistical procedures. Suggestions of appropriate mitigation measures shall be made if the quarterly assessment analytical results demonstrate that the quarterly mean is significantly higher than the 1.3 ambient mean value ($p < 0.05$).
- (xi) A summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance.
- (xii) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken.
- (xiii) 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.
- (xiv) Proponents' contacts and any hotline telephone number for the public to make enquiries.

12.9 Annual/Final EM&A Review Reports

12.9.1.1 An annual EM&A report should be prepared by the ET at the end of each construction year during the course of the project. A final EM&A report should be prepared by the ET at the end of both the construction and operational phases. The annual/final EM&A reports should contain at least the following information:

- (i) Executive Summary (1-2 pages).
- (ii) Drawings showing the project area any environmental sensitive receivers and the locations of the monitoring and control stations.
- (iii) Basic project information including a synopsis of the project organization, contacts for key management staff and a synopsis of work undertaken during the course of the project or past twelve months.
- (iv) A brief summary of EM&A requirements including:
 - environmental mitigation measures as recommended in the project EIA study final report;
 - environmental impact hypotheses tested;
 - environmental quality performance limits (Action and Limit Levels);
 - all monitoring parameters; and
 - Event-Action Plans.

- (v) A summary of the implementation status of environmental protection and pollution control/mitigation measures as recommended in the project EIA study report and summarised in the updated implementation schedule.
- (vi) Graphical plots and the statistical analysis of the trends of monitored parameters over the course of the projects including the post-project monitoring (or the past twelve months for annual reports) for all monitoring stations annotated against the following:
 - the major activities being carried out on site during the period;
 - weather conditions during the period;
 - any other factors which might affect the monitoring results; and
 - the return of ambient environmental conditions in comparison with baseline data.
- (vii) A summary of noncompliance (exceedances) of the environmental quality performance limits (Action and Limit levels).
- (viii) A review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate.
- (ix) A description of the actions taken in the event of non-compliance.
- (x) A summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken.
- (xi) A summary record of notifications of summonses and successful prosecutions for breaches of the current environmental protection/pollution control legislations, locations and nature of the breaches investigation, follow-up actions taken and results.
- (xii) A comparison of the EM&A data with the EIA predictions with annotations and explanations for any discrepancies, including a review of the validity of EIA predictions and identification of shortcomings in the EIA recommendations.
- (xiii) A review of the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness, including cost effectiveness;
- (xiv) A review of the success of the EM&A programme, including a review of the effectiveness and efficiency of the mitigation measures, and recommendations for any improvements in the EM&A programme.
- (xv) A clear cut statement on the environmental acceptability of the project with reference to specific impact hypotheses and a conclusion to state the return to ambient and/or the predicted scenario as the EIA findings.

12.10 Data Keeping

12.10.1.1 The site documents such as the monitoring field records, laboratory analysis records, site inspection forms, etc. are not required to be included in the EM&A Reports for submission. However, the documents shall be kept by the ET and be ready 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, and the software copy shall be available upon request. All the documents and data shall be kept for at least one year after the completion of the operational phase EM&A works.

12.11 Interim Notifications of Environmental Quality Limit Exceedances

12.11.1.1 With reference to Event/Action Plans, when the environmental quality limits are exceeded, the ET shall immediately notify the Contractor, the ER, EPD and the AFCD as appropriate. The notification shall be followed up with advice to each party on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in **Figure 12.1**.

Figure 12.1 Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

Incident Report on Action Level or Limit Level Non-compliance

Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

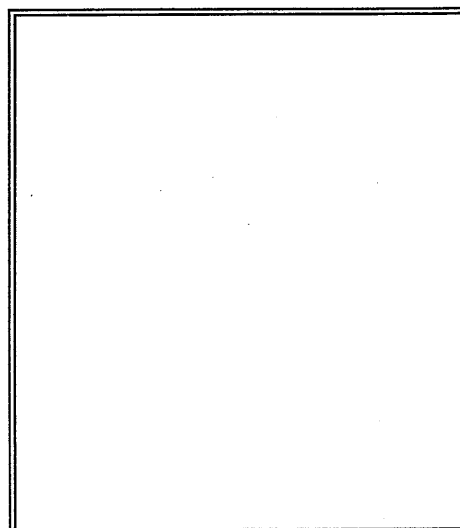
Location Plan

Prepared by : _____

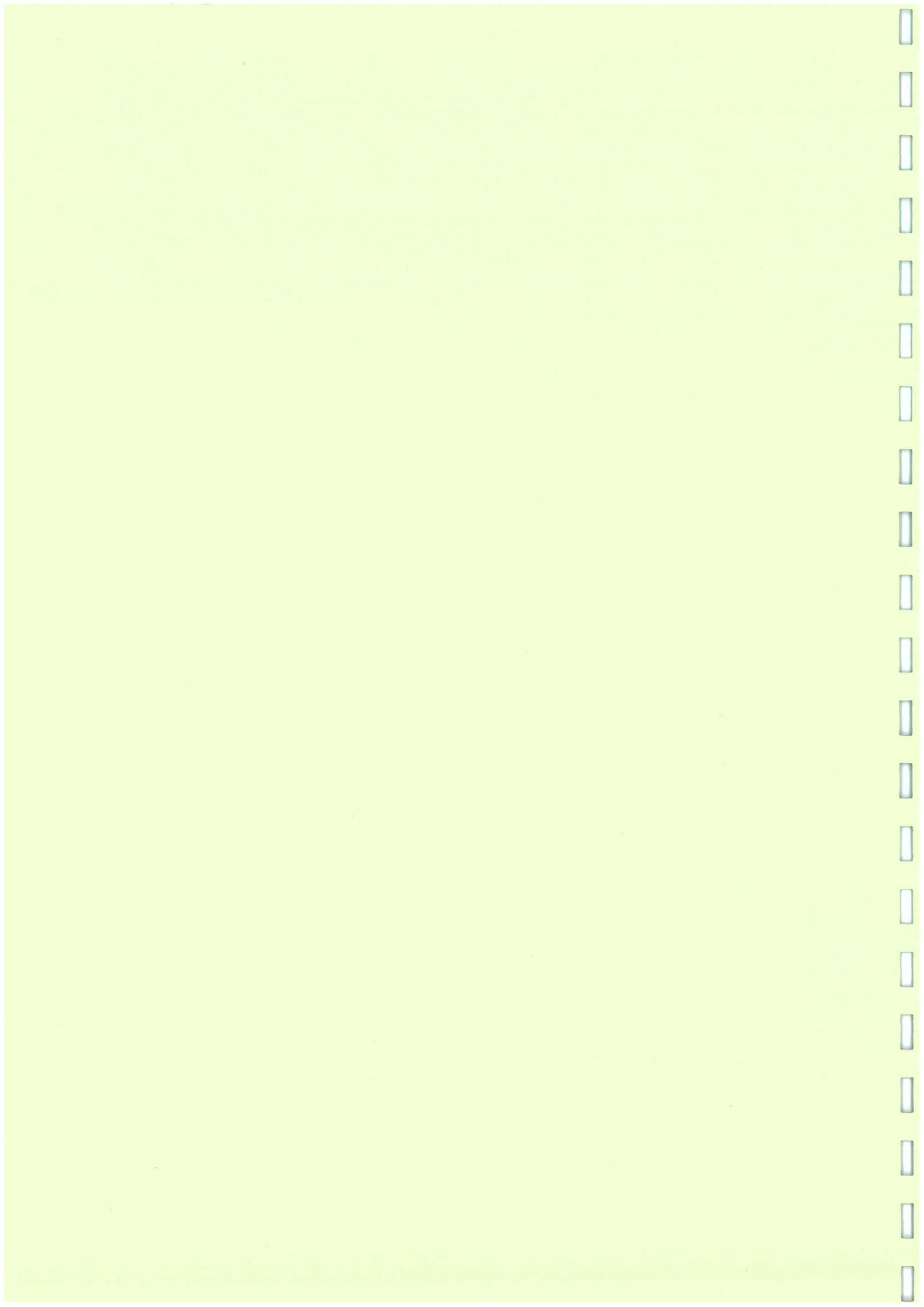
Designation : _____

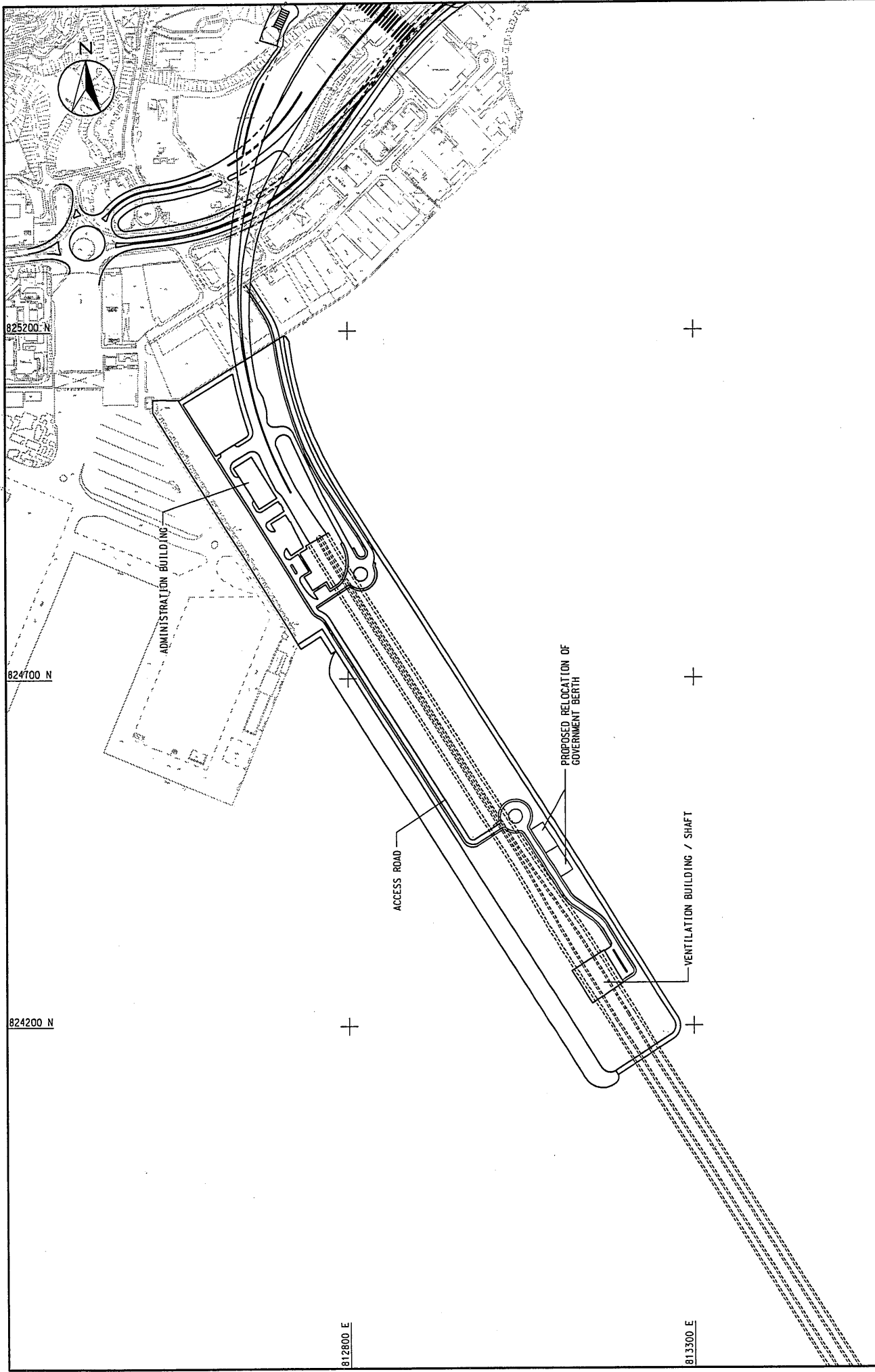
Signature : _____

Date : _____

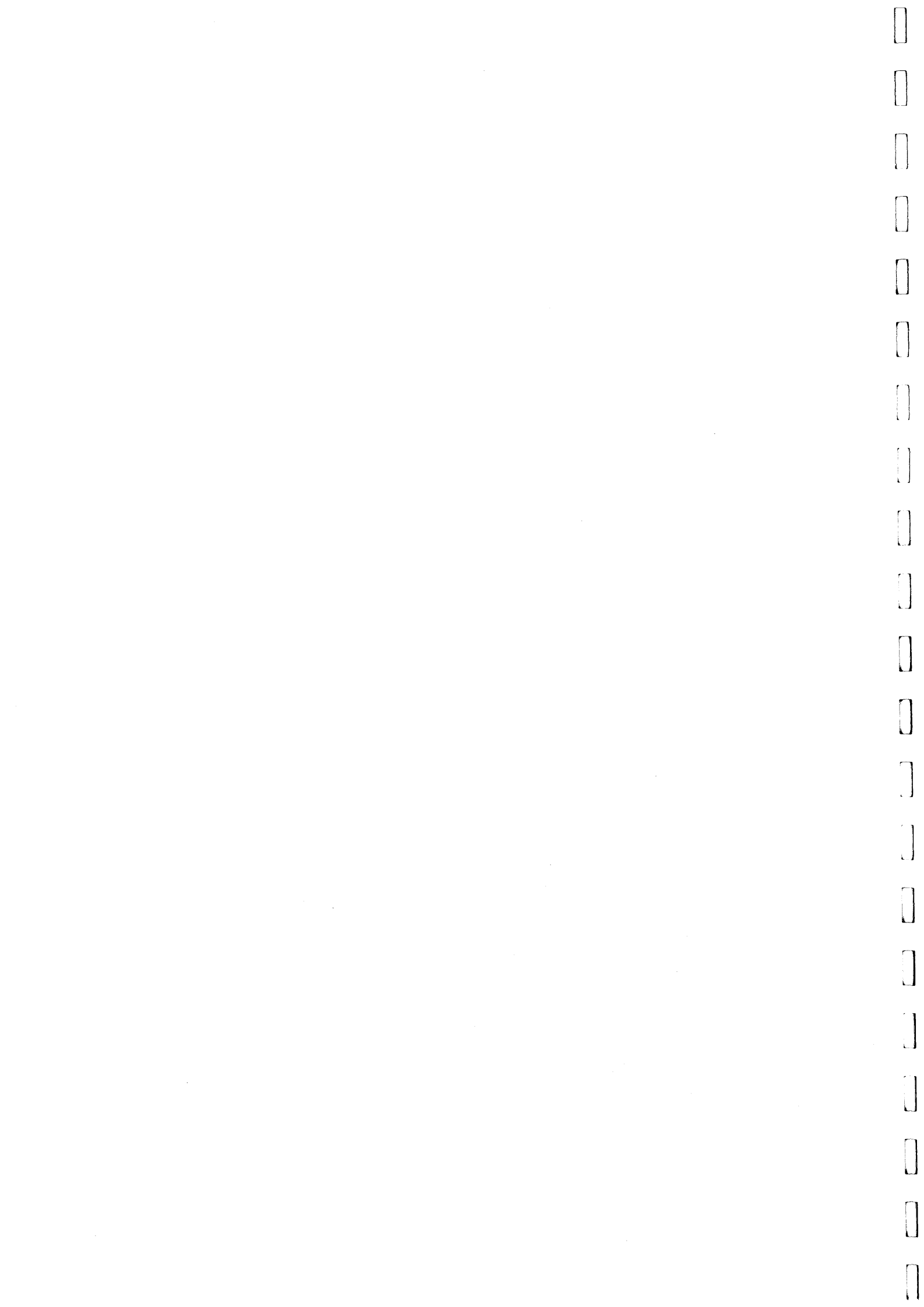


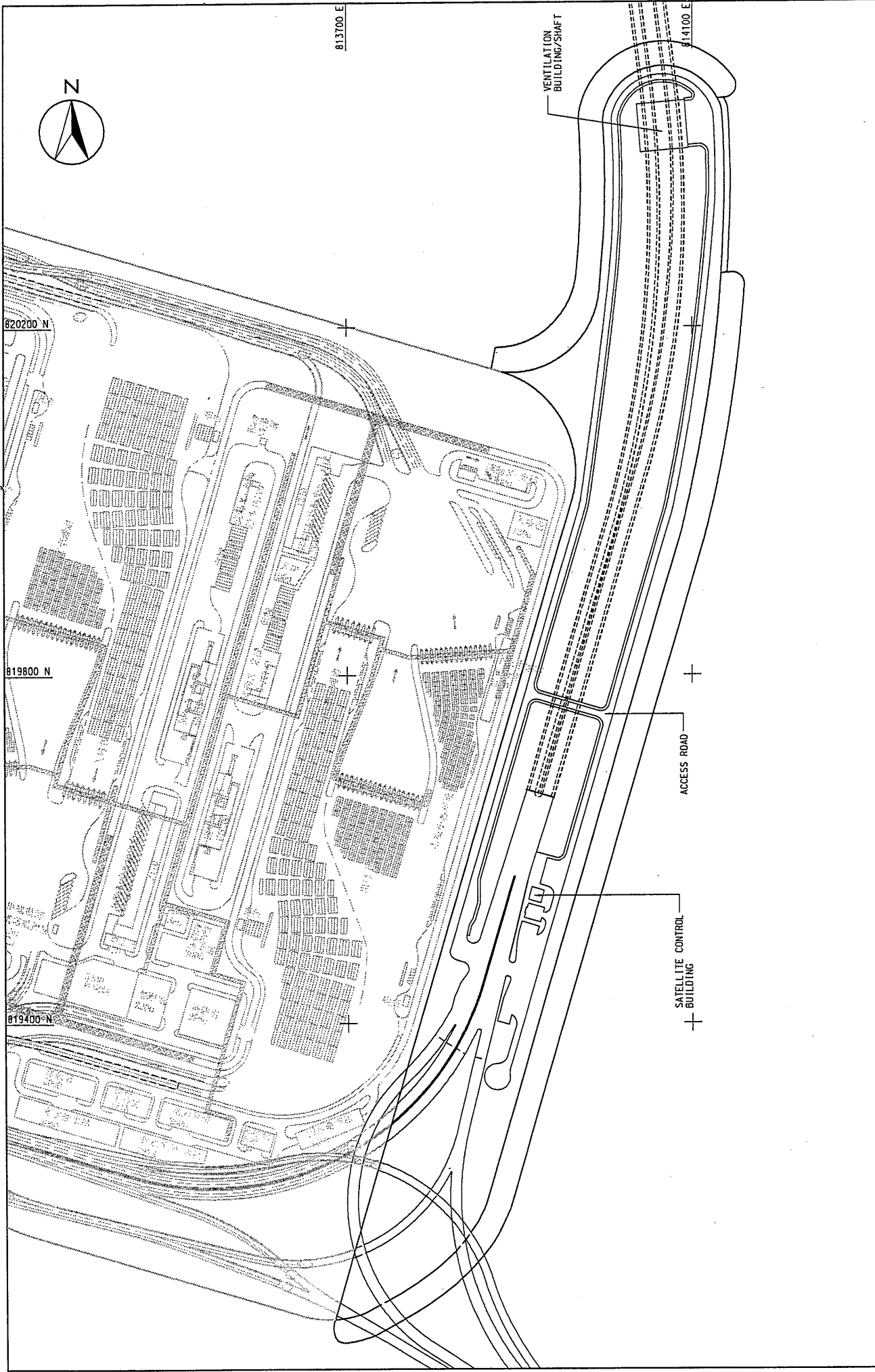
FIGURES



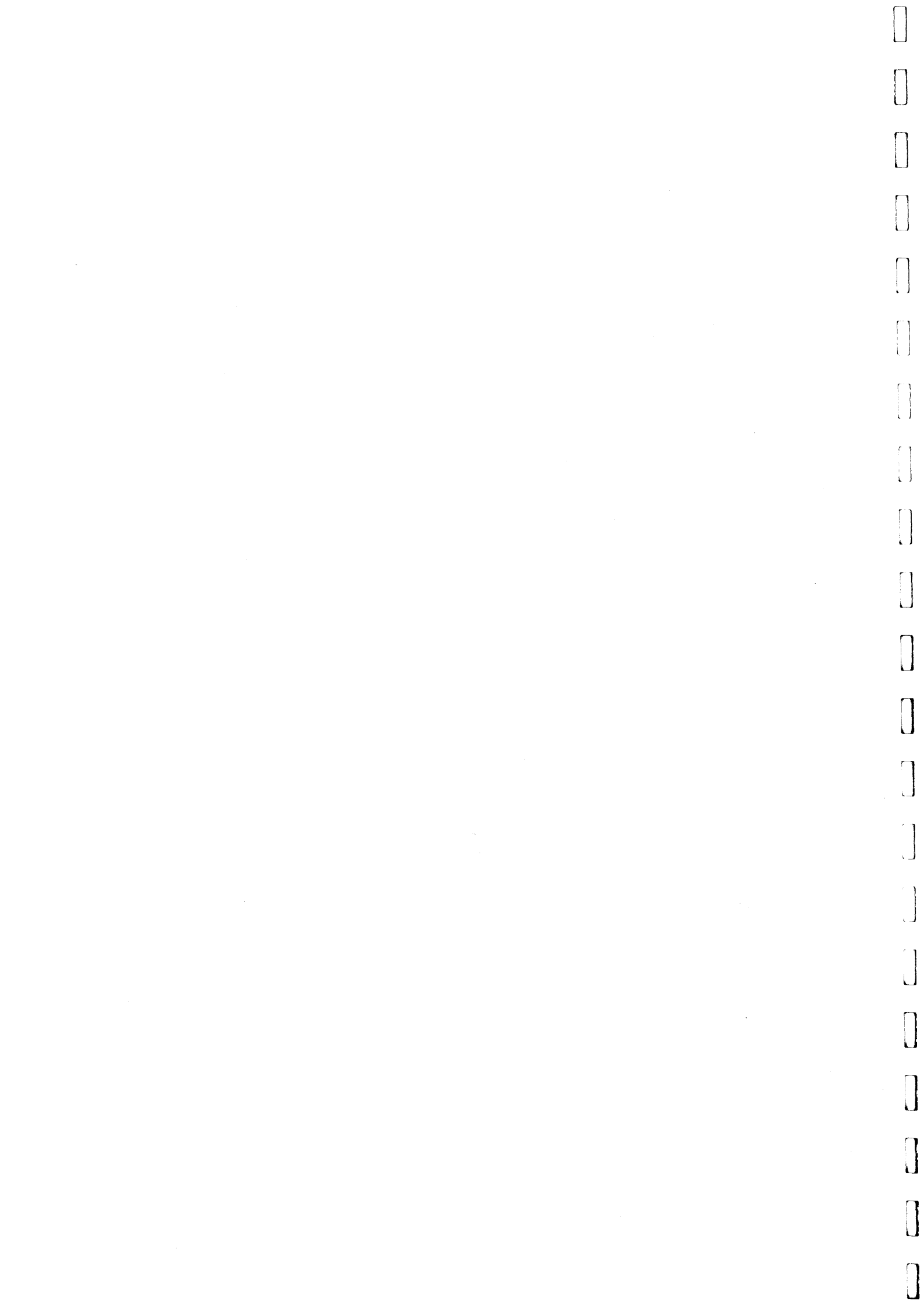


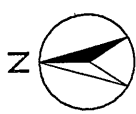
<p style="text-align: center;">AGREEMENT NO. CE 52/2007(HY) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION</p> <p style="text-align: center;">LAYOUT PLAN OF NORTHERN LANDFALL</p>		SCALE	A3 1:5000	DATE	JUN. 2009
		CHECK JOB No.	---	DRAWN	CXH
<p style="text-align: center;">AECOM</p>		JOB No.	60044963	DRAWING No.	Fig 2.2a
		REV	---	REV	---





AECOM	AGREEMENT NO. CE 52/2007 (HY) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION		DATE	JUL. 2009
	LAYOUT PLAN OF SOUTHERN LANDFALL		SCALE	A3 1:4000
P:\PROJECTS\60044963\DRAWING\FIGURE\EIA REPORT\CHEN\FIGURE 3-2b.dgn		CHECK JOB No.	60044963	DRAWING No.
PRINT SCALE 1:8000		JOB No.	Fig 2.2b	REV
				A





813600 E

813100 E

812600 E

812100 E

811600 E

811100 E

810600 E

TUEN MUN

824900 N

824400 N

PORTION N-a

PORTION N-b

PORTION N-c

OPEN RAMP

CUT & COVER TUNNEL

SHAFT

TBM TUNNEL

REQUIREMENT OF SEAWALL/RECLAMATION

PORTION	SEAWALL	RECLAMATION
N-a	FULLY DREDGED	NON-DREDGED (WITH BAND DRAINS)
N-b	FULLY DREDGED	PARTIALLY DREDGED (SUBSTANTIAL PORTION OF MD WILL BE DREDGED FOR C&C TUNNEL BELOW MD)
N-c	FULLY DREDGED	FULLY DREDGED (SUBSTANTIAL PORTION OF MD WILL BE DREDGED FOR C&C TUNNEL BELOW MD)

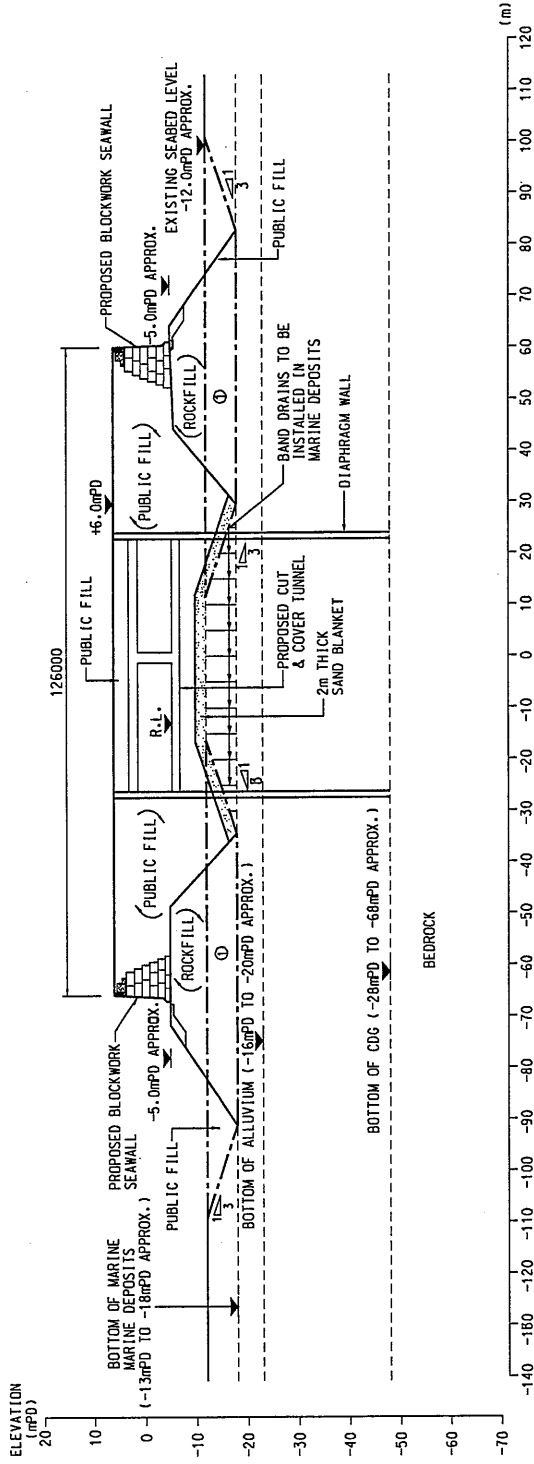
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- PROPOSED TMLK/L RECLAMATION
- PROPOSED SLOPING SEAWALL
- PROPOSED BLOCKWORK SEAWALL

SCALE	A3 1:5000	DATE	JUN. 2009
CHECK	---	DRAWN	LCC
JOB NO.	60044963	DRAWING NO.	Fig 2.3a
REV	---	REV	---

AECOM
 AGREEMENT NO. CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
NORTHERN LANDFALL - GENERAL LAYOUT





LEGEND:

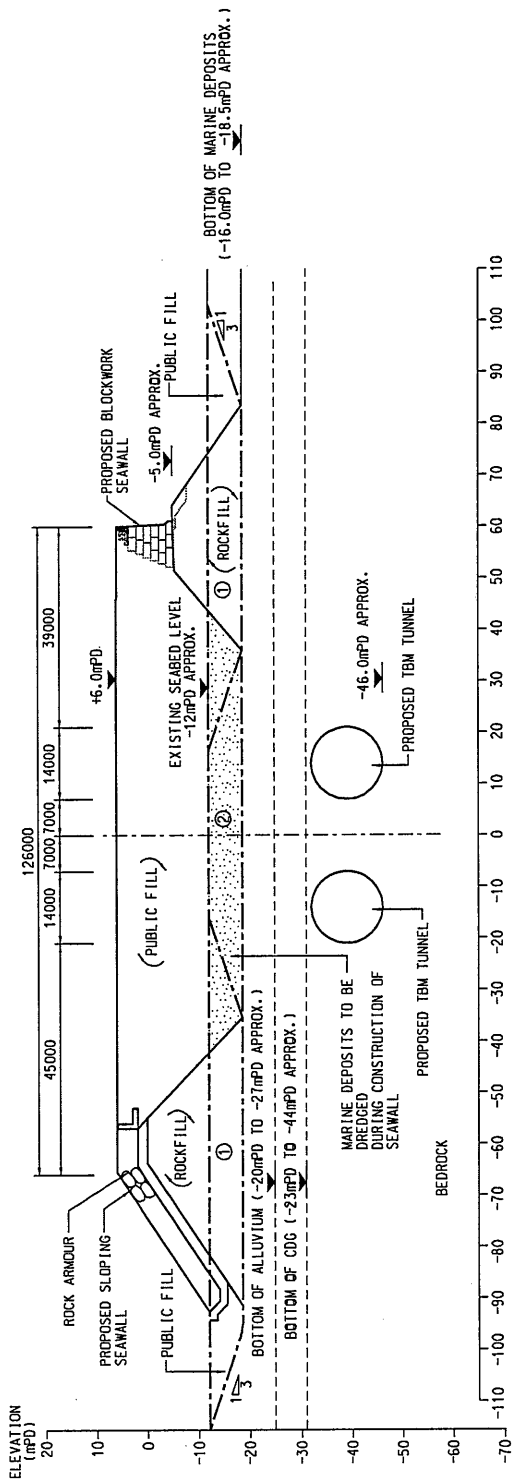
- ⊖ EXTENT OF MARINE DEPOSITS TO BE DREDGED
- ⊕ DREDGING DURING CONSTRUCTION OF SEAWALL

SCALE	A3 1:1000	DATE	JUN. 2009
CHECK	---	DRAWN	LCG
JOB NO.	60044963	DRAWING NO.	Fig 2.3b
REV	---	REV	---

AGREEMENT NO. CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
 NORTHERN LANDFALL - SECTION B - B

AECOM





LEGEND:

- EXTENT OF MARINE DEPOSITS TO BE DREDGED
- ① DREDGING DURING CONSTRUCTION OF SEAWALL AT RECLAMATION SIDE EDGES
- ② DREDGING DURING CONSTRUCTION OF SEAWALL AT RECLAMATION FRONT EDGE
- SAND FILL

SCALE	A3 1:1000	DATE	JUN 2009
CHECK	---	DRAWN	MZG
TUBE No.	60044963	DRAWING No.	Fig 2.3c
REV			

AGREEMENT NO. CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
NORTHERN LANDFALL - SECTION D - D

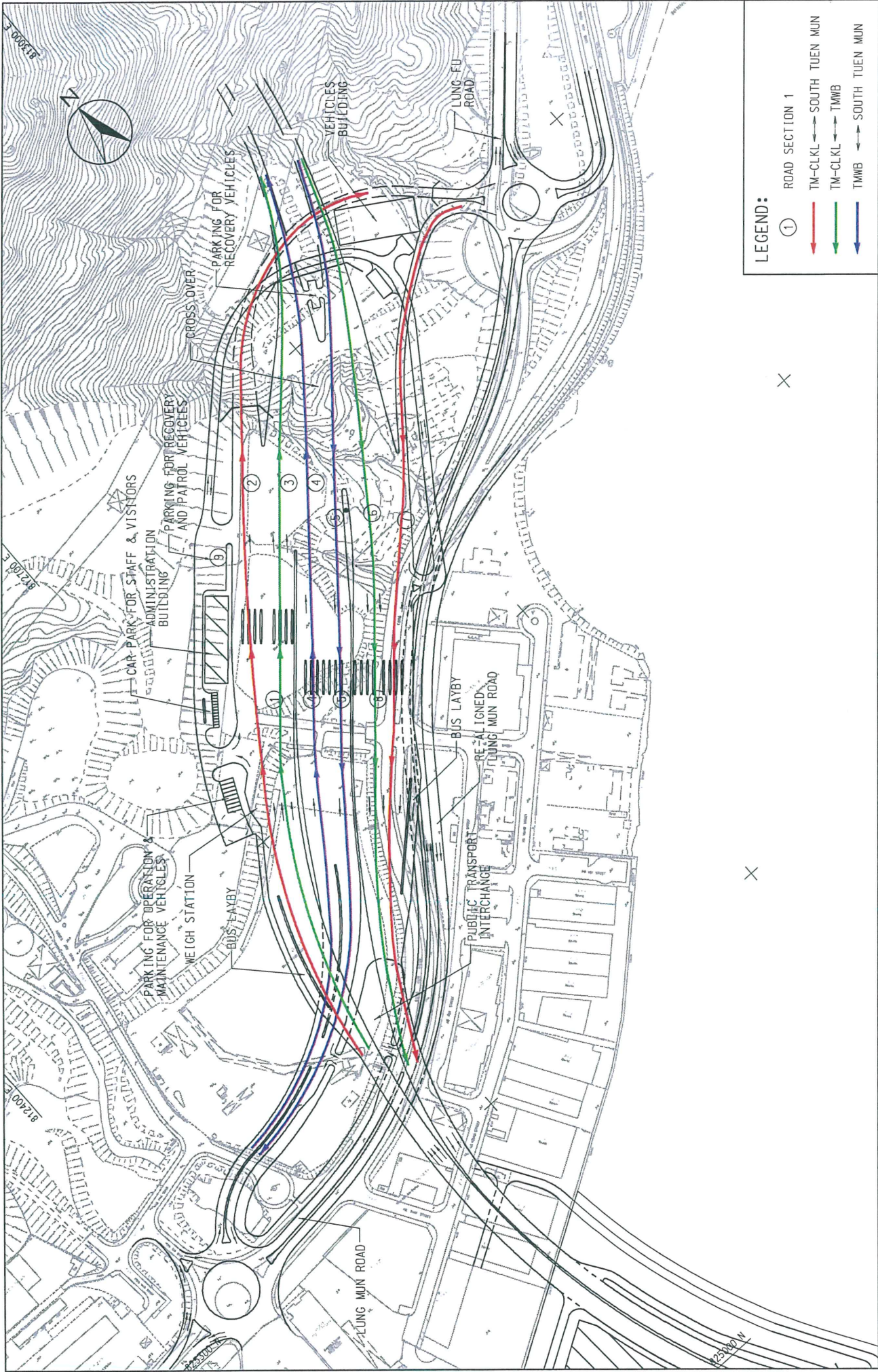
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AECOM	AGREEMENT NO. CE 52/2007(RY1)		DATE	JUL. 2009
	TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION		DRAWN	YHS
NORTHERN VIADUCT CONNECTION, SLIP ROADS AND TOLL PLAZA		SCALE	A3 1:5000	DRAWING No.
		CHECK	--	
		JOB No.	60044963	REV
				Fig 2.4a
				--





LEGEND:

- ① ROAD SECTION 1
- TM-CLKL → SOUTH TUEN MUN
- TM-CLKL ← TMWB
- TMWB → SOUTH TUEN MUN

X

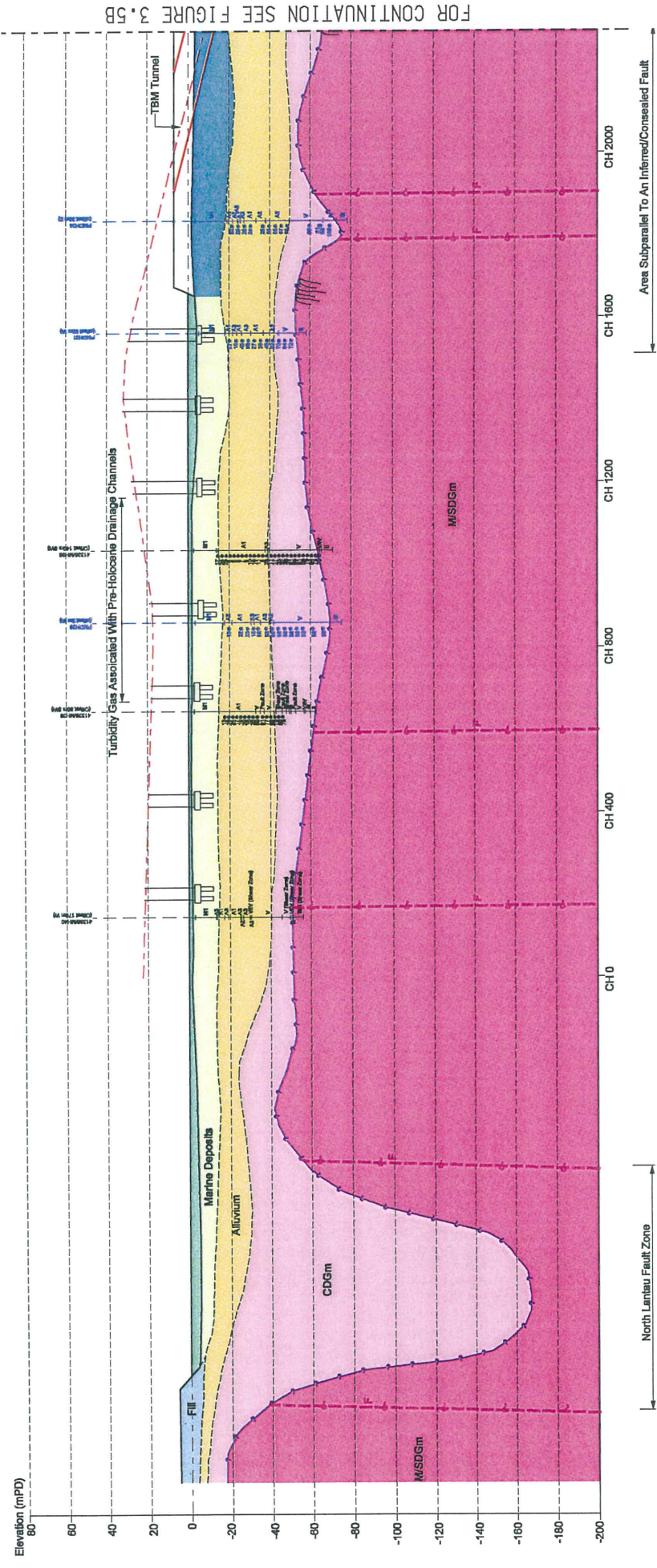
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AGREEMENT NO. CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
TRAFFIC FLOWS AT TOLL PLAZA

SCALE	DATE
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CHECK	DRAWN
JOB NO.	DRAWING NO.
6004963	Fig 2.4b
REV	---

AECOM





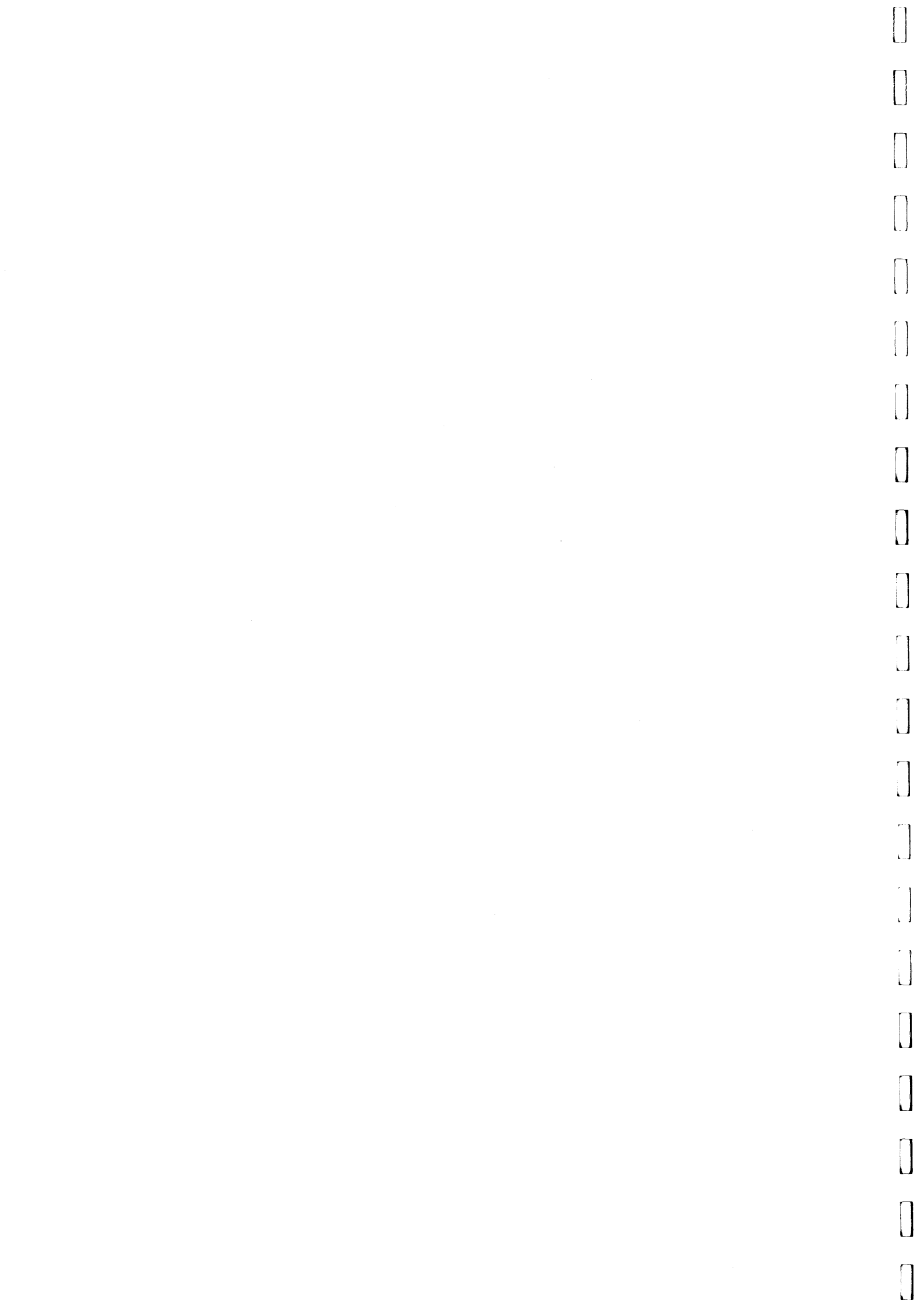
FOR CONTINUATION SEE FIGURE 3.5B

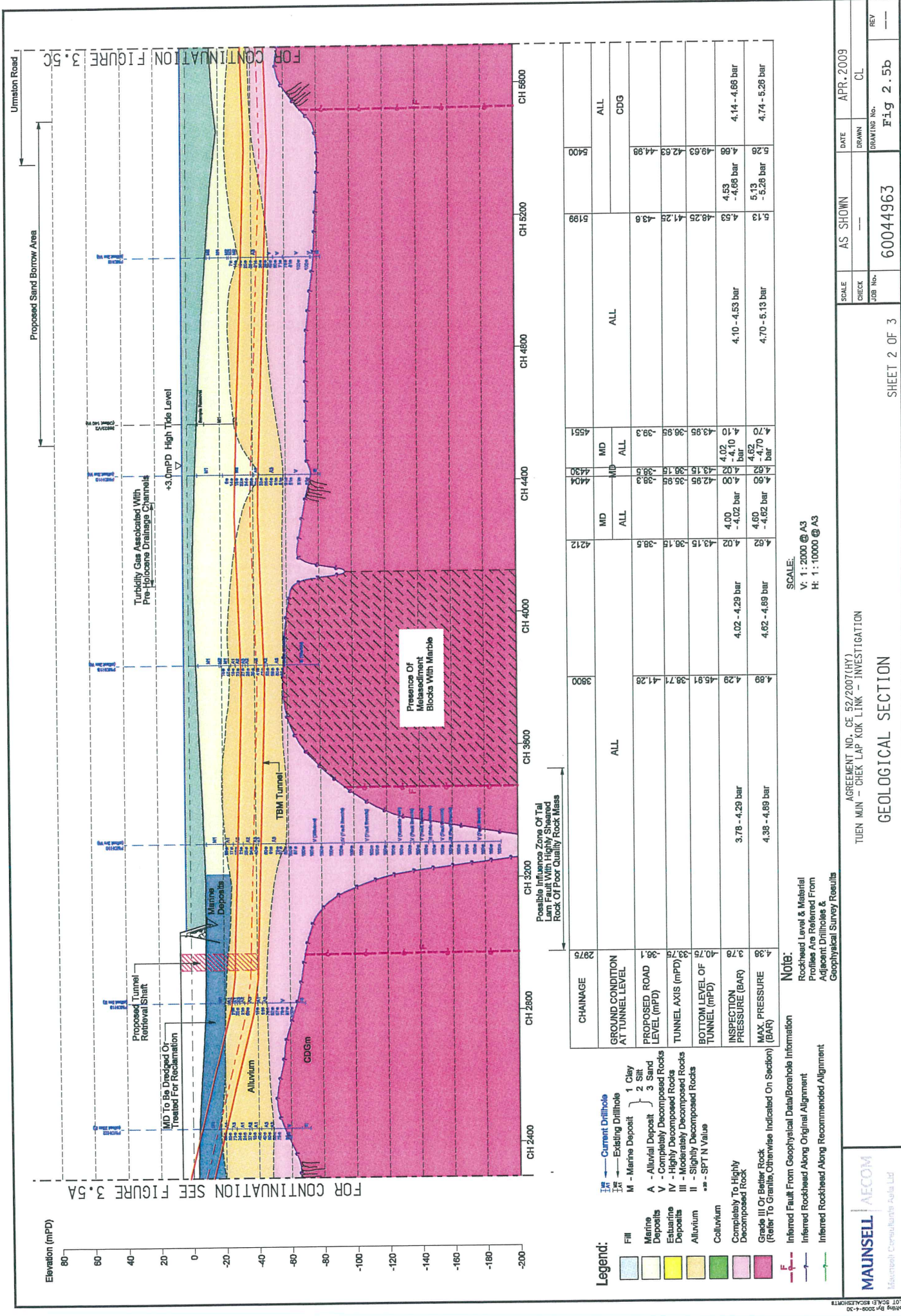
- Legend:**
- Fill
 - Marine Deposits
 - Estuarine Deposits
 - Alluvium
 - Colluvium
 - Completely To Highly Decomposed Rock
 - Grade III Or Better Rock (Refer To Granites, Otherwise Indicated On Section)
 - Inferred Fault From Geophysical Data/Borehole Information
 - Inferred Rockhead Along Original Alignment
 - Inferred Rockhead Along Recommended Alignment
 - Current Drillinghole
 - Existing Drillinghole
 - Marine Deposit
 - 1 Clay
 - 2 Silt
 - 3 Sand
 - Alluvial Deposit
 - Completely Decomposed Rocks
 - Highly Decomposed Rocks
 - Moderately Decomposed Rocks
 - Slightly Decomposed Rocks
 - SPT N Value

SCALE:
 V: 1 : 2000 @ A3
 H: 1 : 10000 @ A3

Note:
 Rockhead Level & Material Profile Are Referenced From Adjacent Drillingholes & Geophysical Survey Results

		AGREEMENT NO. CE 52/2007(HY) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION		SCALE AS SHOWN	DATE APR. 2009
SHEET 1 OF 3		CHECK JOB No.	DRAWING NO. 60044963	DRAWN Fig 2.5a	REV ---





- Legend:**
- Fill
 - Marine Deposits
 - Estuarine Deposits
 - Alluvium
 - Colluvium
 - Completely To Highly Decomposed Rock
 - Grade III Or Better Rock (Refer To Granitic, Otherwise Indicated On Section)
 - Inferred Fault From Geophysical Data/Borehole Information
 - Inferred Rockhead Along Original Alignment
 - Inferred Rockhead Along Recommended Alignment
- Note:**
 Rockhead Level & Material Profiles Are Referred From Adjacent Drillholes & Geophysical Survey Results

Scale: V: 1:2000 @ A3, H: 1:10000 @ A3

MAUNSELL AECOM
 MaunSELL Consulting Asia Ltd

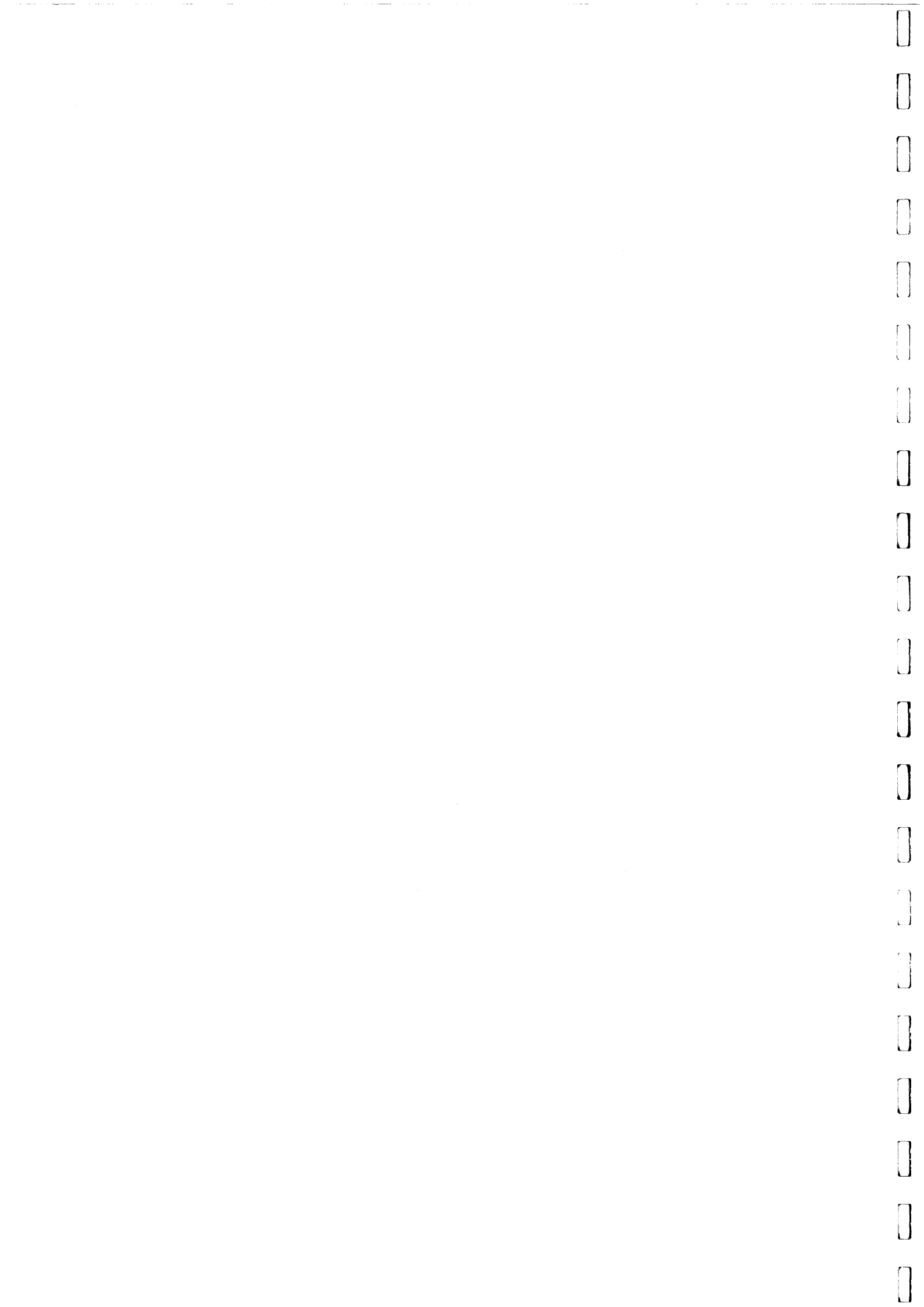
AGREEMENT NO. CE 62/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

AS SHOWN
 CHECK JOB No. 60044963

DATE APR. 2009
 DRAWN CL
 DRAWING No. Fig 2.5b

SHEET 2 OF 3

REVISION



Urmston Road

Elevation (mPD)



FOR CONTINUATION SEE FIGURE 3.5B

SCALE:
V: 1 : 2000 @ A3
H: 1 : 10000 @ A3

Legend:

- Current Drillhole
- Existing Drillhole
- M - Marine Deposit
 - 1 Clay
 - 2 Silt
 - 3 Sand
- A - Alluvial Deposit
- V - Completely Decomposed Rocks
- IV - Highly Decomposed Rocks
- III - Moderately Decomposed Rocks
- II - Slightly Decomposed Rocks
- ± - SPT N Value
- Fill
- Marine Deposits
- Estuarine Deposits
- Alluvium
- Colluvium
- Completely To Highly Decomposed Rock
- Grade III Or Better Rock (Rater To Granite, Otherwise Indicated On Section)
- Inferred Fault From Geophysical Data/Borehole Information
- Inferred Rockhead Along Original Alignment
- Inferred Rockhead Along Recommended Alignment

Note:
Rockhead Level & Material Profiles Are Refered From Adjacent Drillholes & Geophysical Survey Results

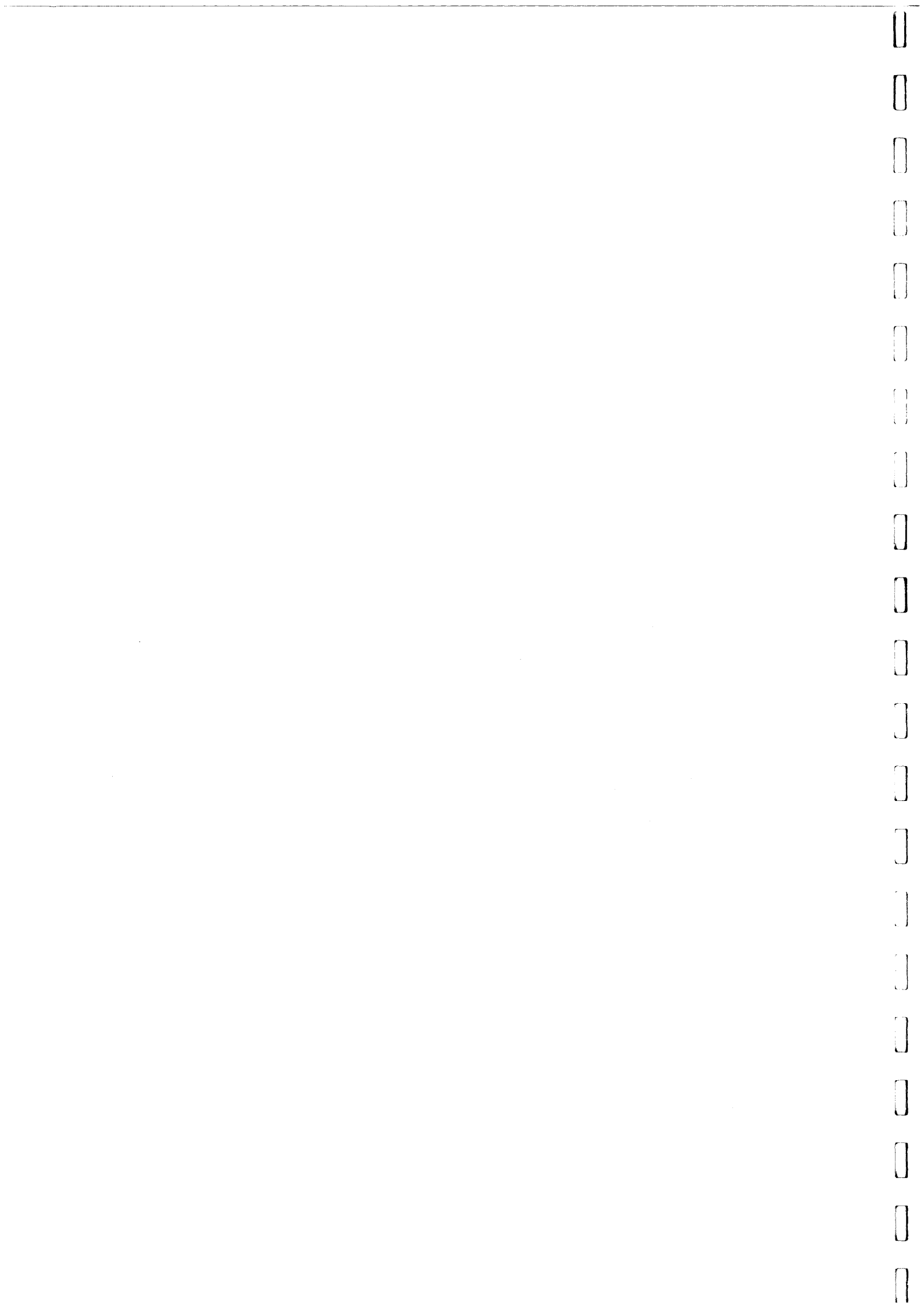
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	ALL	CDG	ALL	CDG	ALL	CDG
GROUND CONDITION AT TUNNEL LEVEL	6910	6796	6500	6309	CH 6400	CH 6800
PROPOSED ROAD LEVEL (mPD)						
TUNNEL AXIS (mPD)						
BOTTOM LEVEL OF TUNNEL (mPD)						
INSPECTION PRESSURE (BAR)						
MAX. PRESSURE (BAR)						

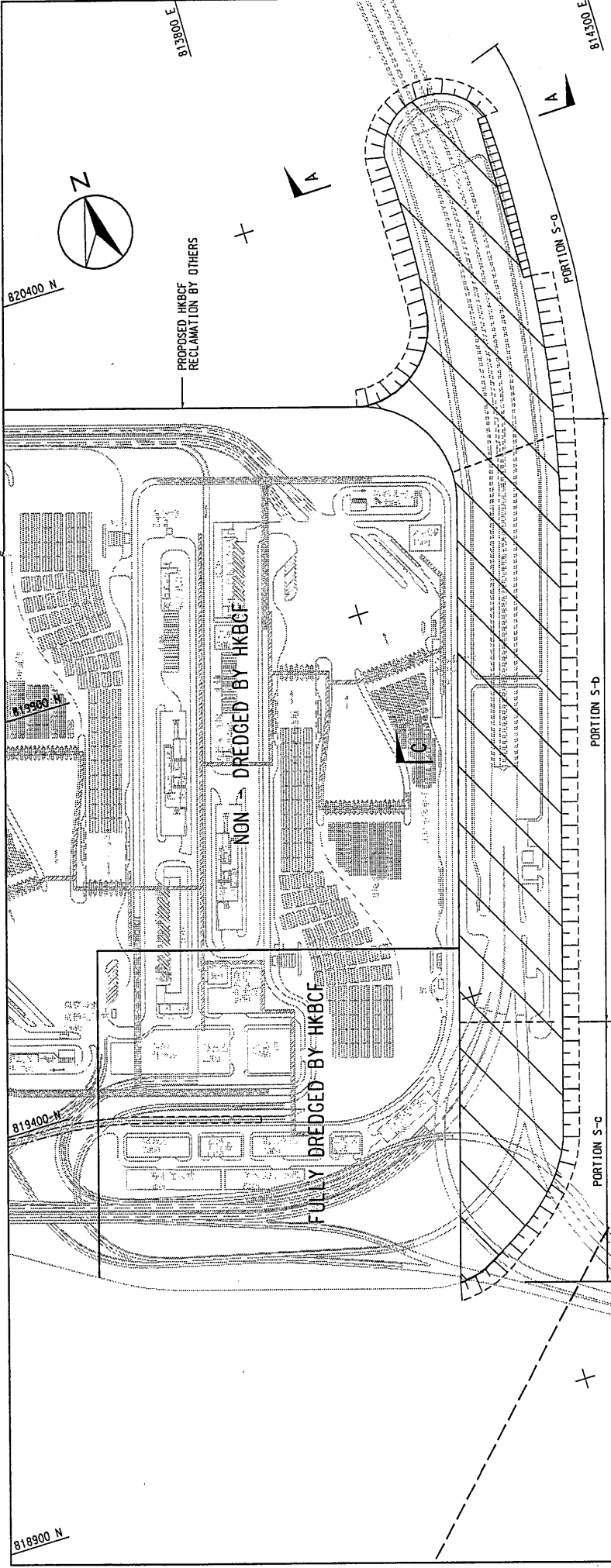
AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
GEOLOGICAL SECTION

MAUNSELL AECOM
Maunsell Consulting Asia Ltd

SCALE AS SHOWN
DATE APR. 2009
DRAWING No. 60044963
JOB No. Fig 2.5c
REV

SHEET 3 OF 3





REQUIREMENT OF SEAWALL/RECLAMATION

PORTION	SEAWALL	RECLAMATION
S-a	FULLY DREDGED	FULLY DREDGED (SUBSTANTIAL PORTION OF MD WILL BE DREDGED FOR C&C TUNNEL BELOW MD)
S-b	FULLY DREDGED	PARTIALLY DREDGED (SUBSTANTIAL PORTION OF MD WILL BE DREDGED FOR C&C TUNNEL BELOW MD). PARTIALLY NON-DREDGED (WITH BAND DRAINS)
S-c	FULLY DREDGED	NON-DREDGED (WITH BAND DRAINS)

LEGEND:

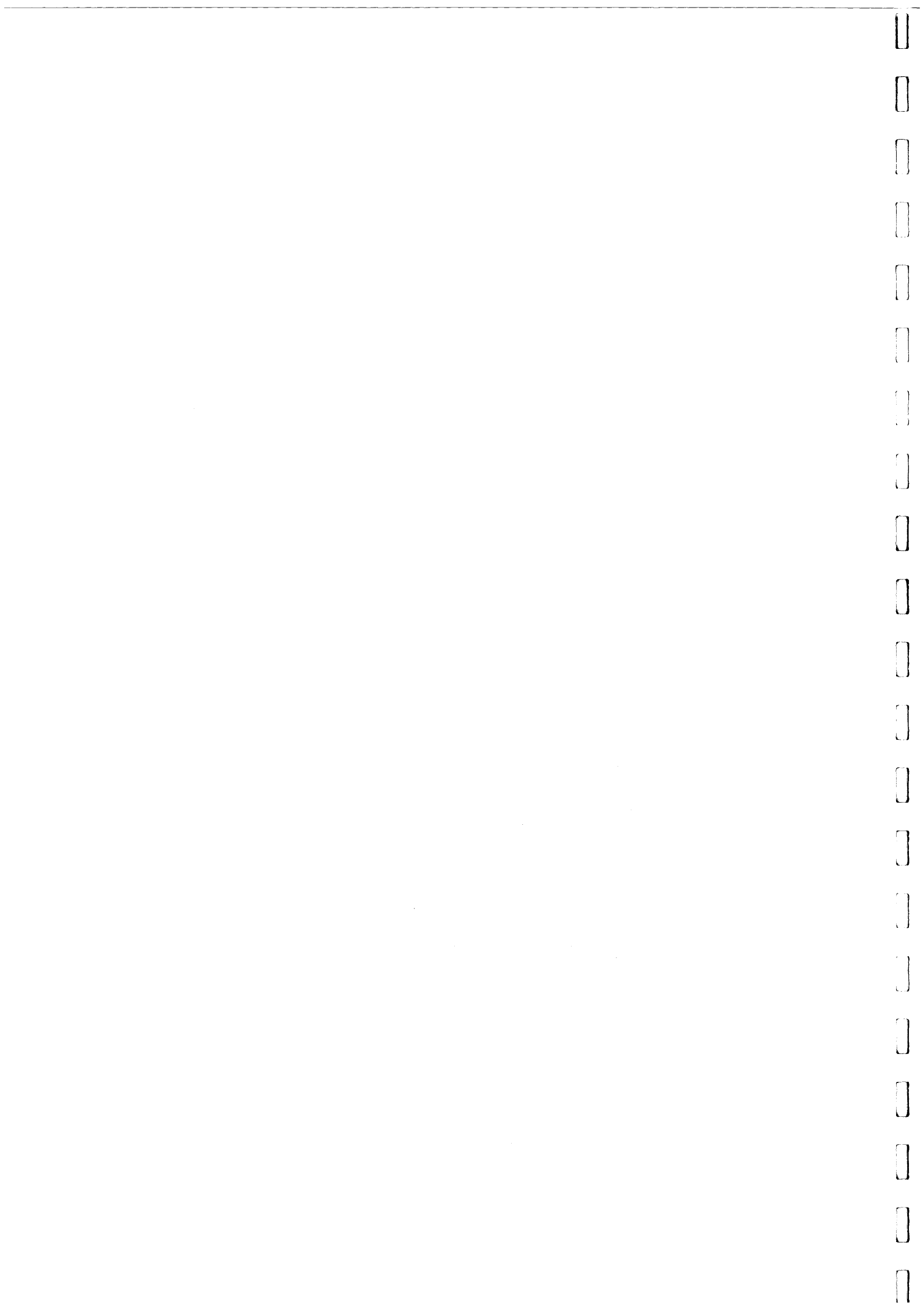
- PROPOSED TUNNEL RECLAMATION
- PROPOSED SLOPING SEAWALL
- PROPOSED BLOCKWORK SEAWALL

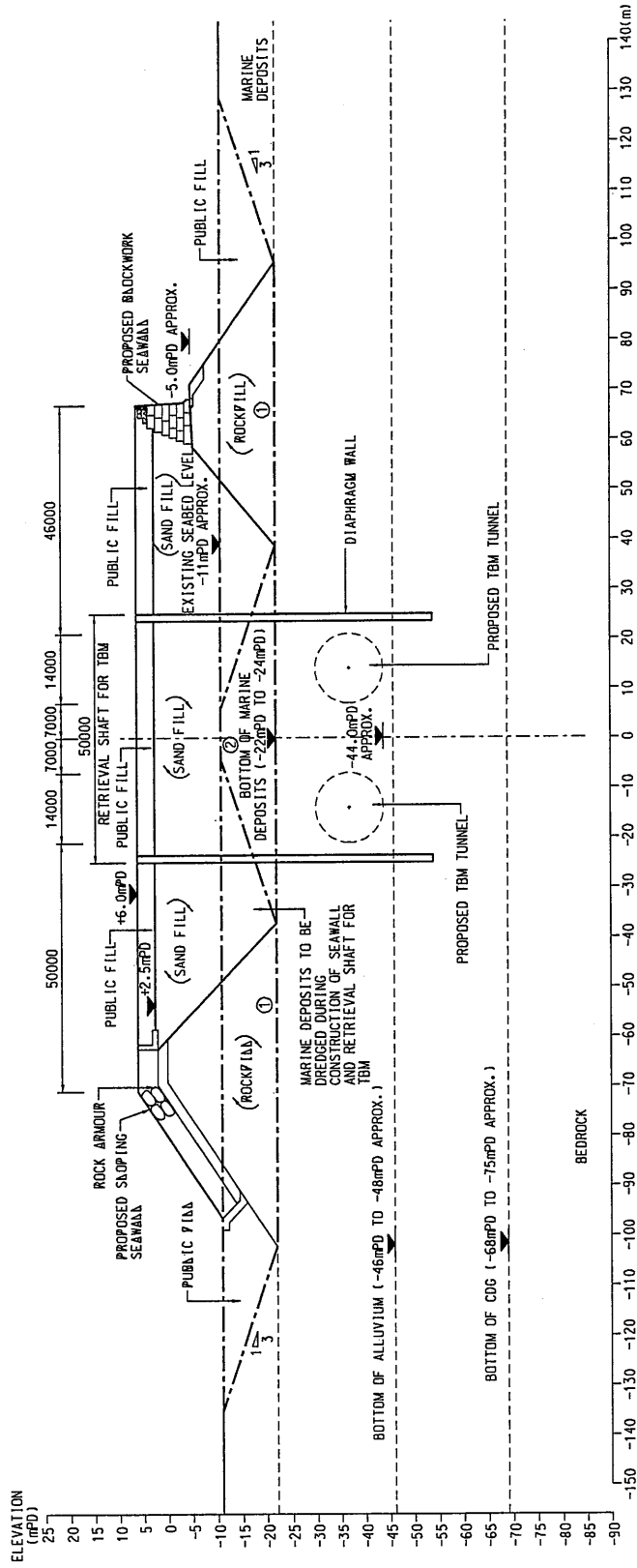
SCALE	A3 1:5000	DATE	JUL. 2009
CHECK	---	DRAWN	CL
JOB No.	60044963	DRAWING No.	Fig 2.6a
		REV	A

AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

SOUTHERN LANDFALL - GENERAL LAYOUT

AECOM





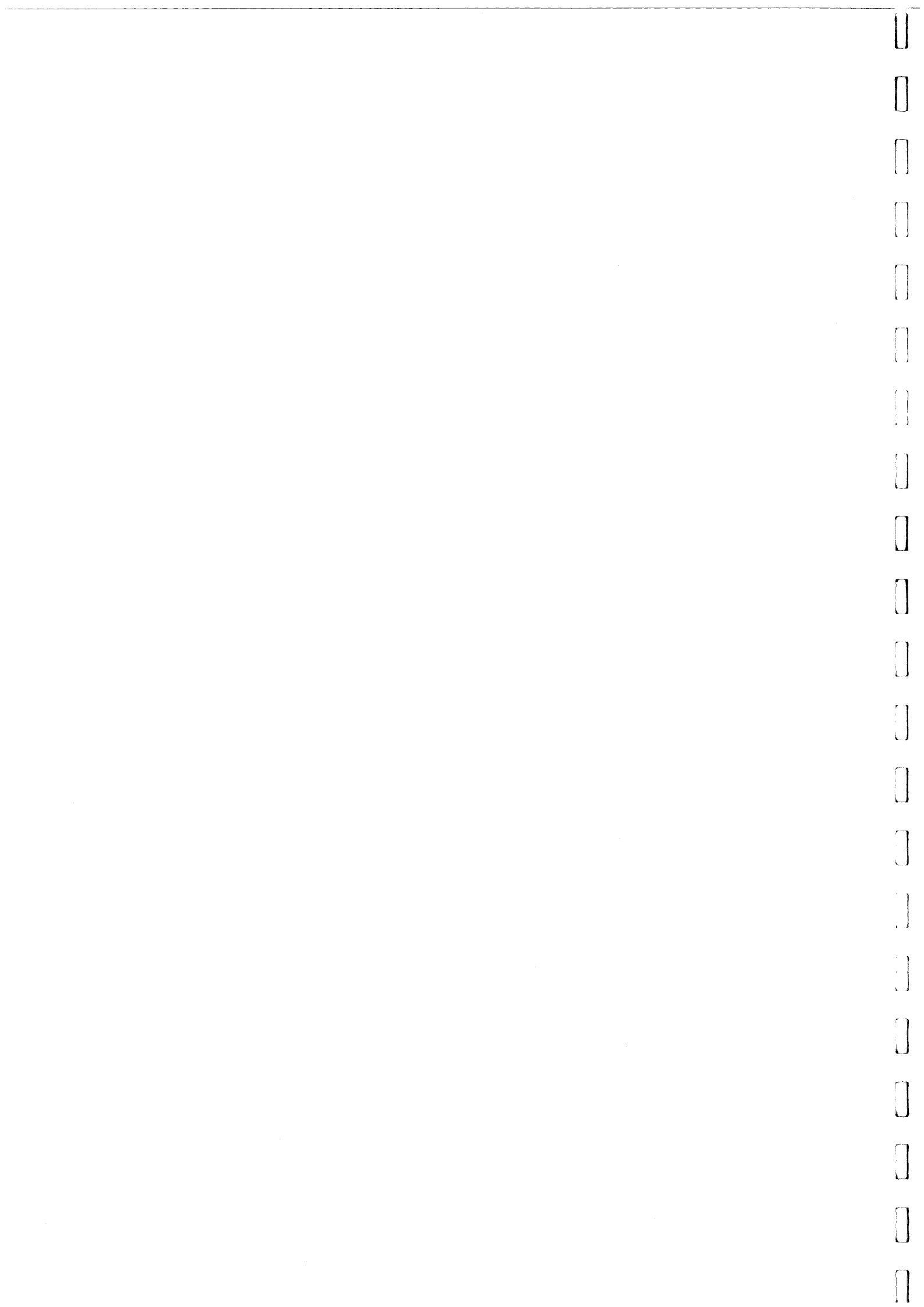
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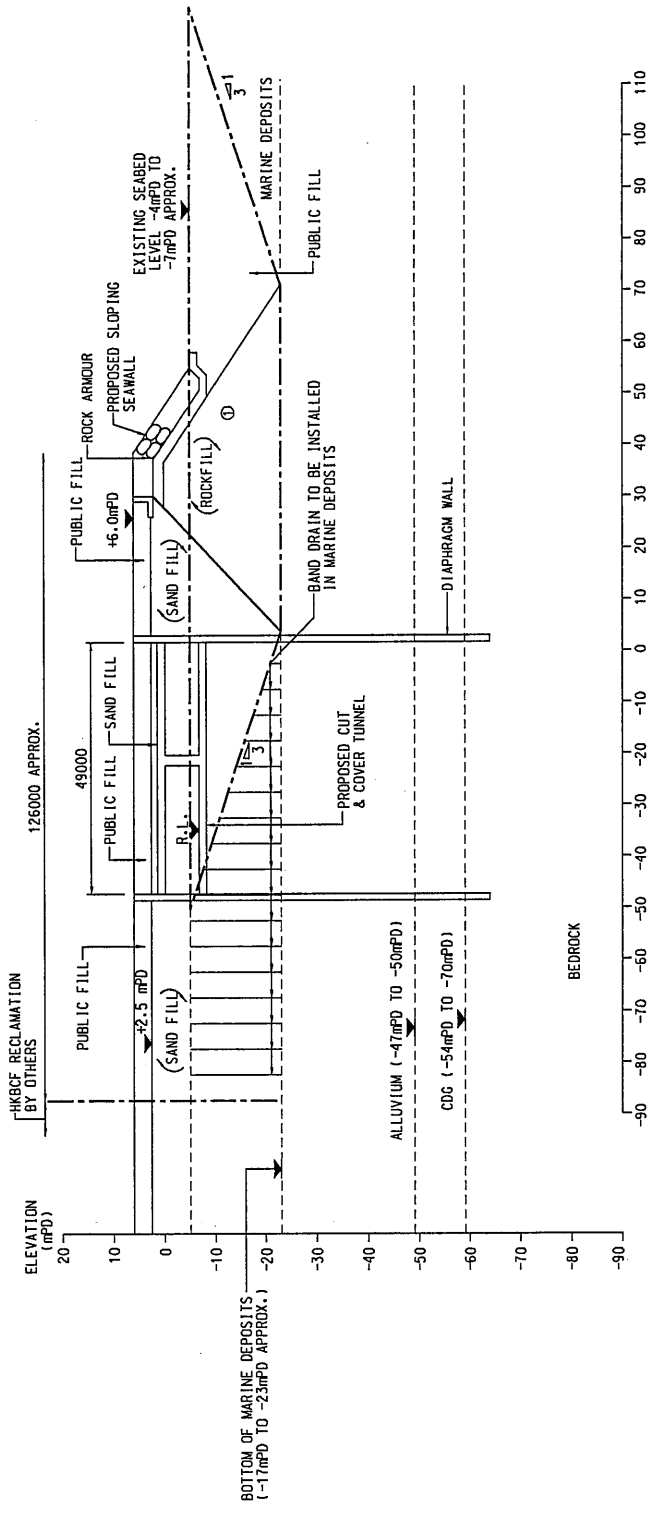
- ① EXTENT OF MARINE DEPOSITS TO BE DREDGED
- ② DREDGING DURING CONSTRUCTION OF SEAWALL
- ③ DREDGING FOR CONSTRUCTION OF TBM SHAFT

SCALE	A3 1:1000	DATE	JUNE 2009
CHECK	---	DRAWN	LCC
JOB No.	60044963	DRAWING No.	Fig 2.6b
REV	---	REV	---

AGREEMENT NO. CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
 SOUTHERN LANDFALL - SECTION A - A

AECOM





LEGEND

SCALE	A3 1:1000	DATE	JUN. 2009
CHECK	---	DRAWN	LCC
JOB No.	60044963	DRAWING No.	Fig 2.6c
REV	---	REV	---

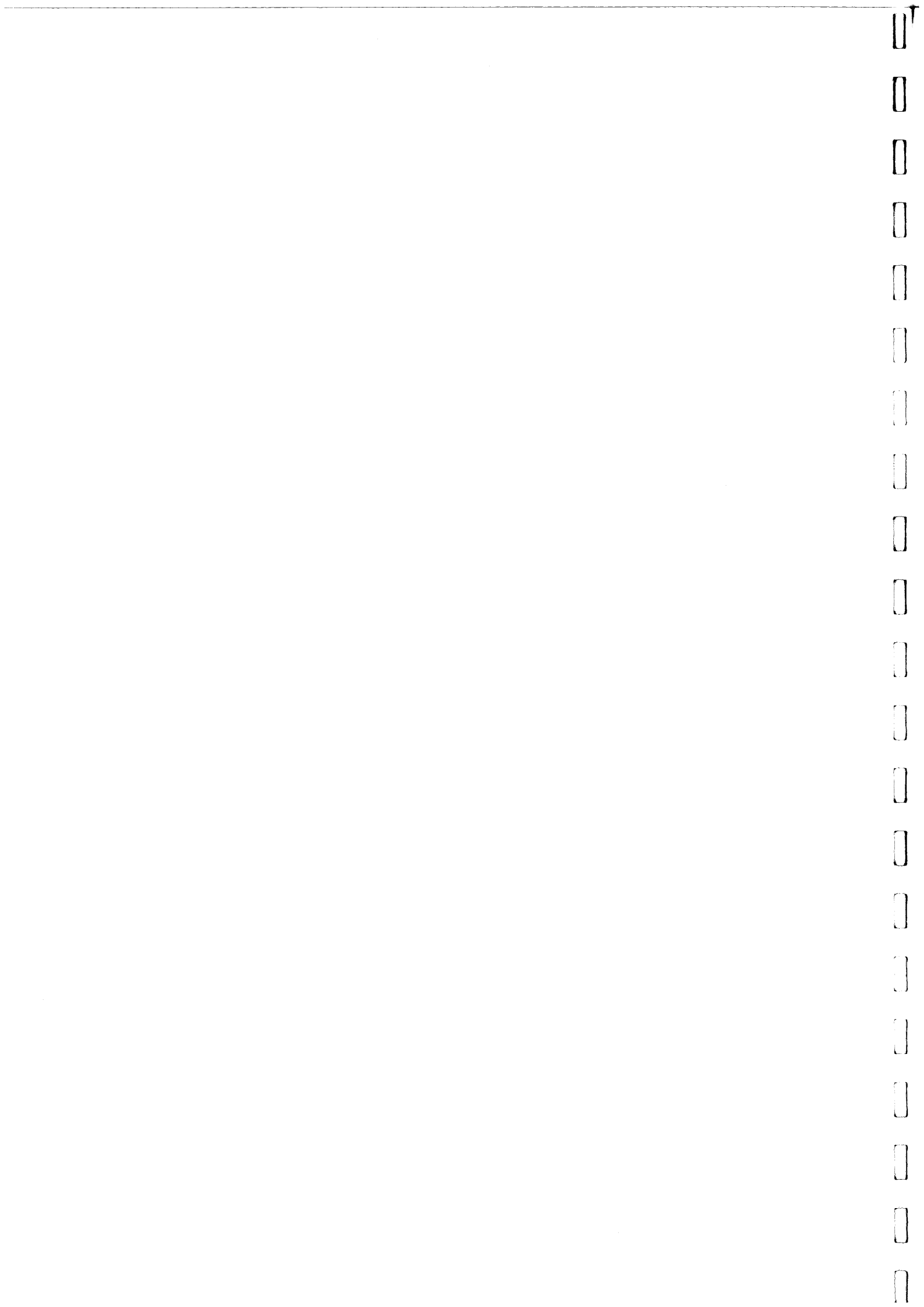
EXTENT OF MARINE DEPOSITS TO BE DREDGED

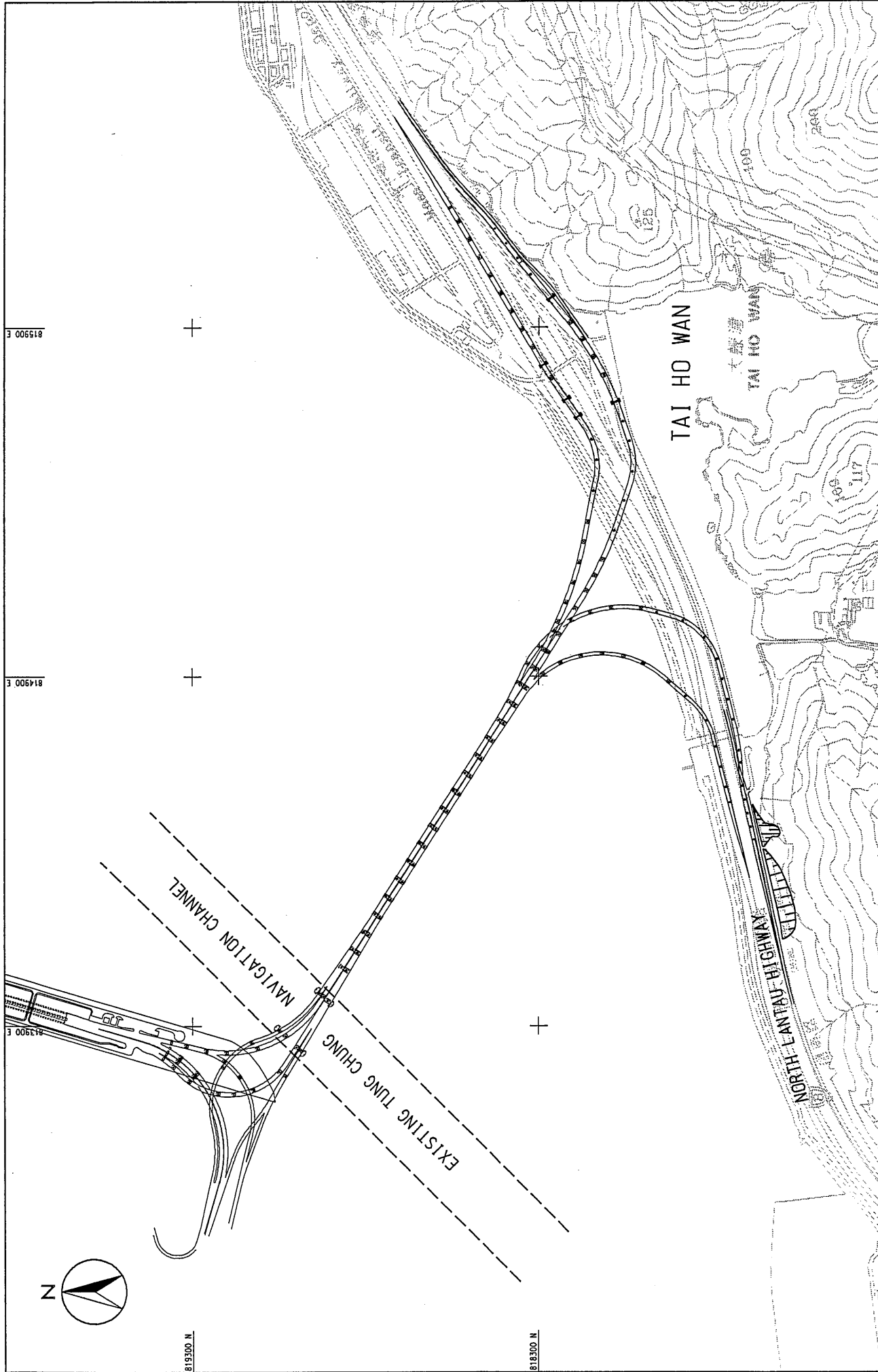
DREDGING DURING CONSTRUCTION OF SEAWALL

AGREEMENT NO. CE 52/2007(CHY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

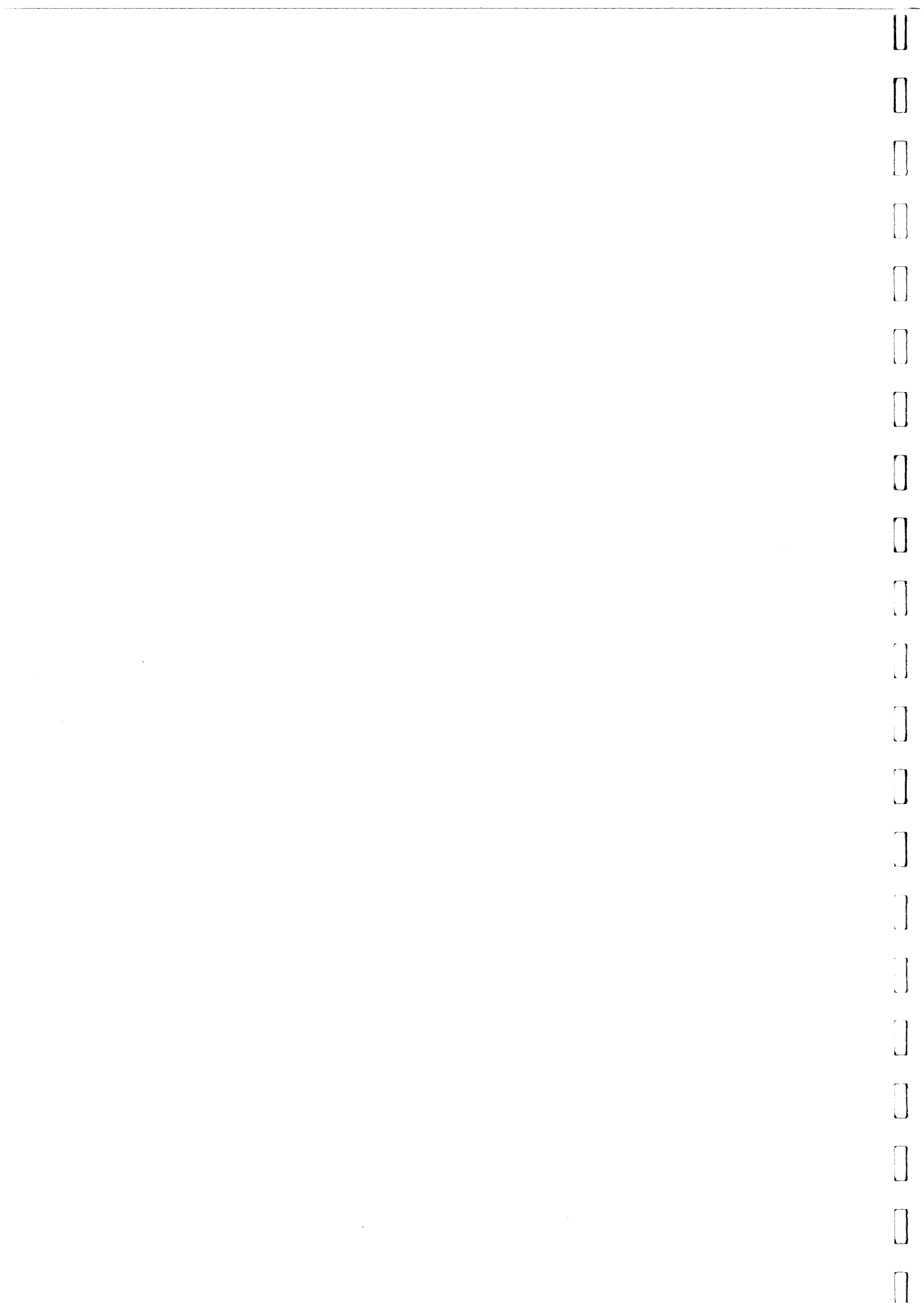
SOUTHERN LANDFALL - SECTION C-C

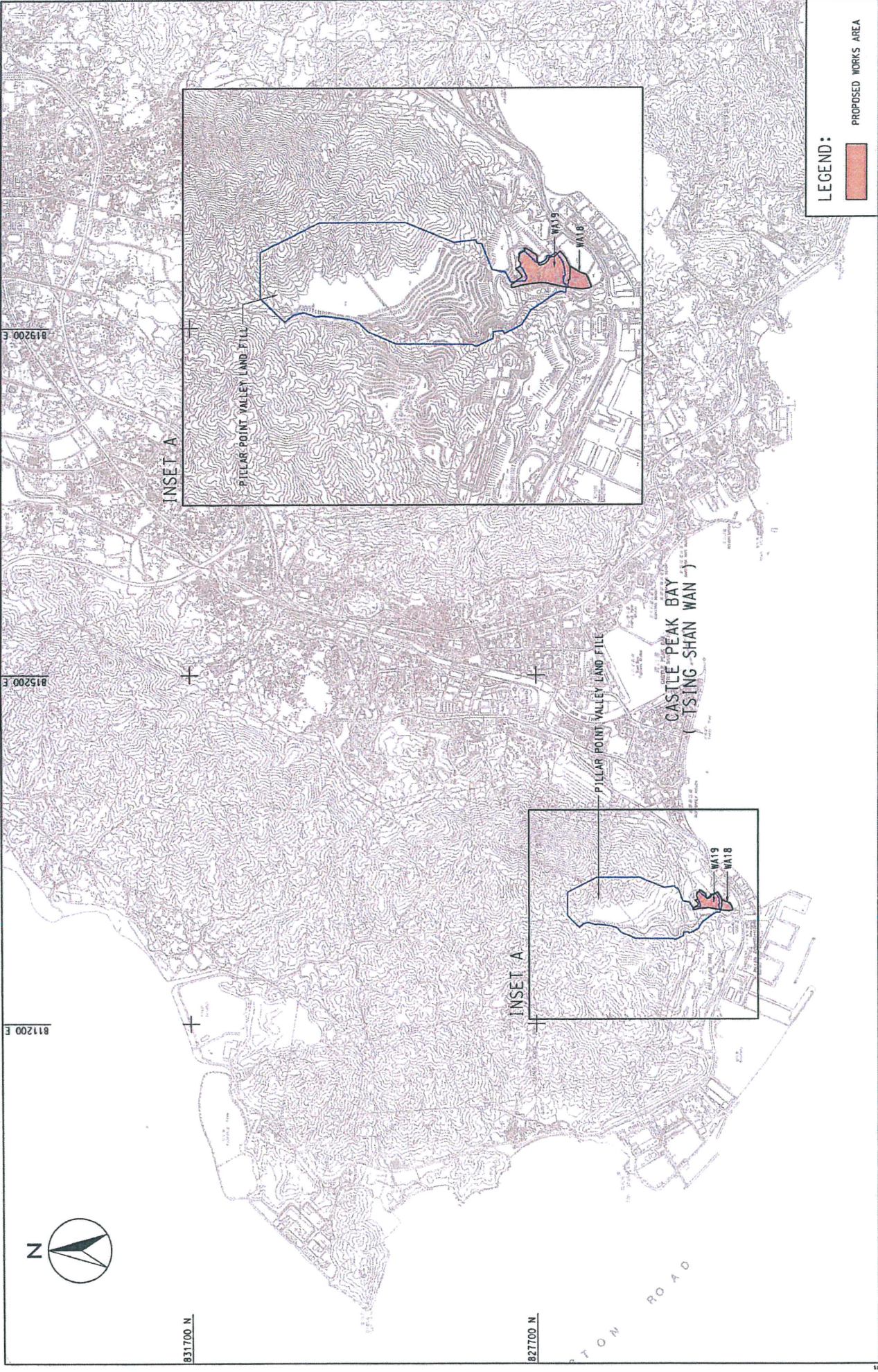
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AECOM	AGREEMENT NO. CE 52/2007(HY1) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION		
	SOUTHERN VIADUCT CONNECTION AND SLIP ROADS		
SCALE A3 1:10000	DATE JUL. 2009	DRAWING No. Fig 2.7	
CHECK ---	DRAWN HBF	DRAWING No. 60044963	REV A

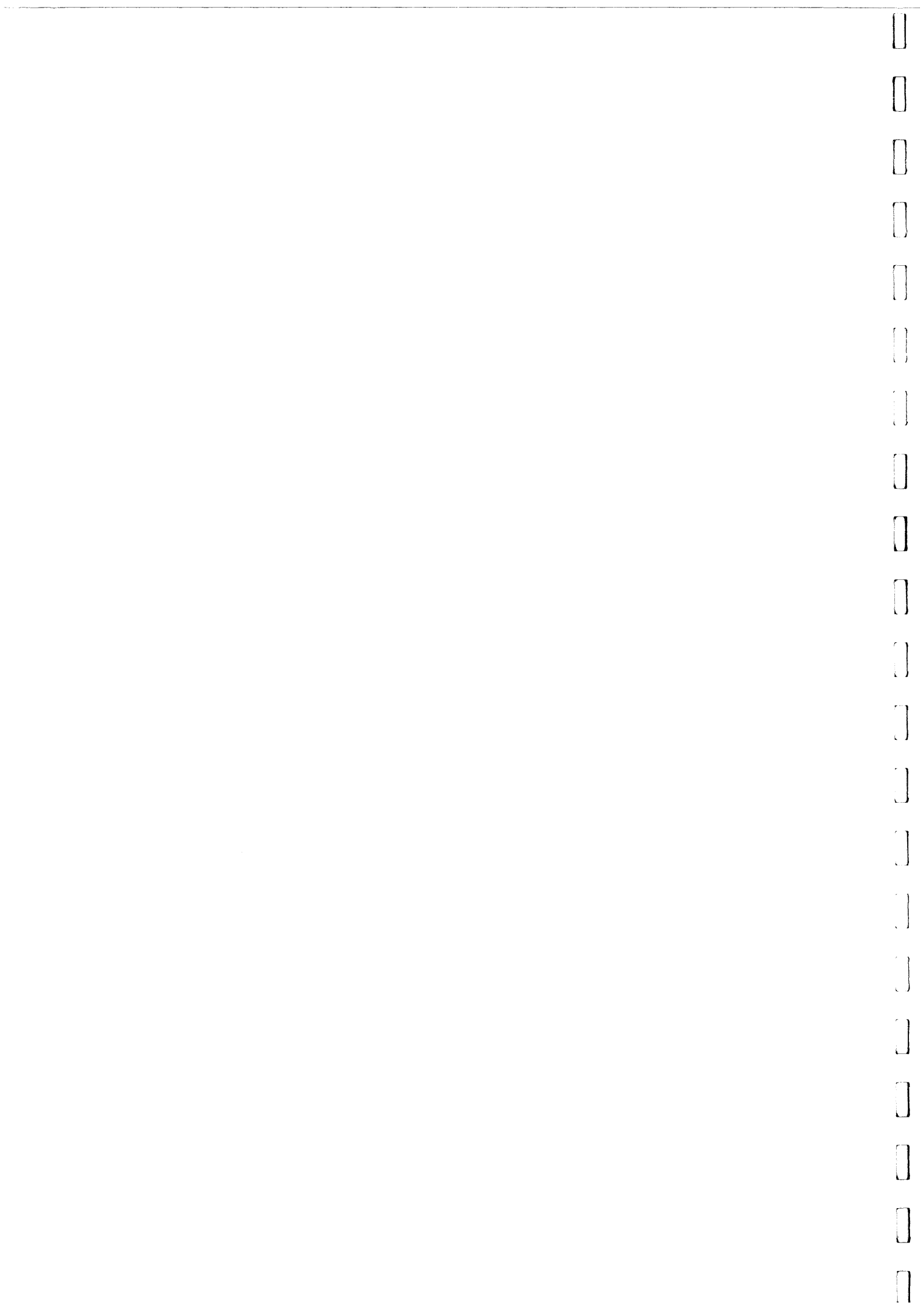


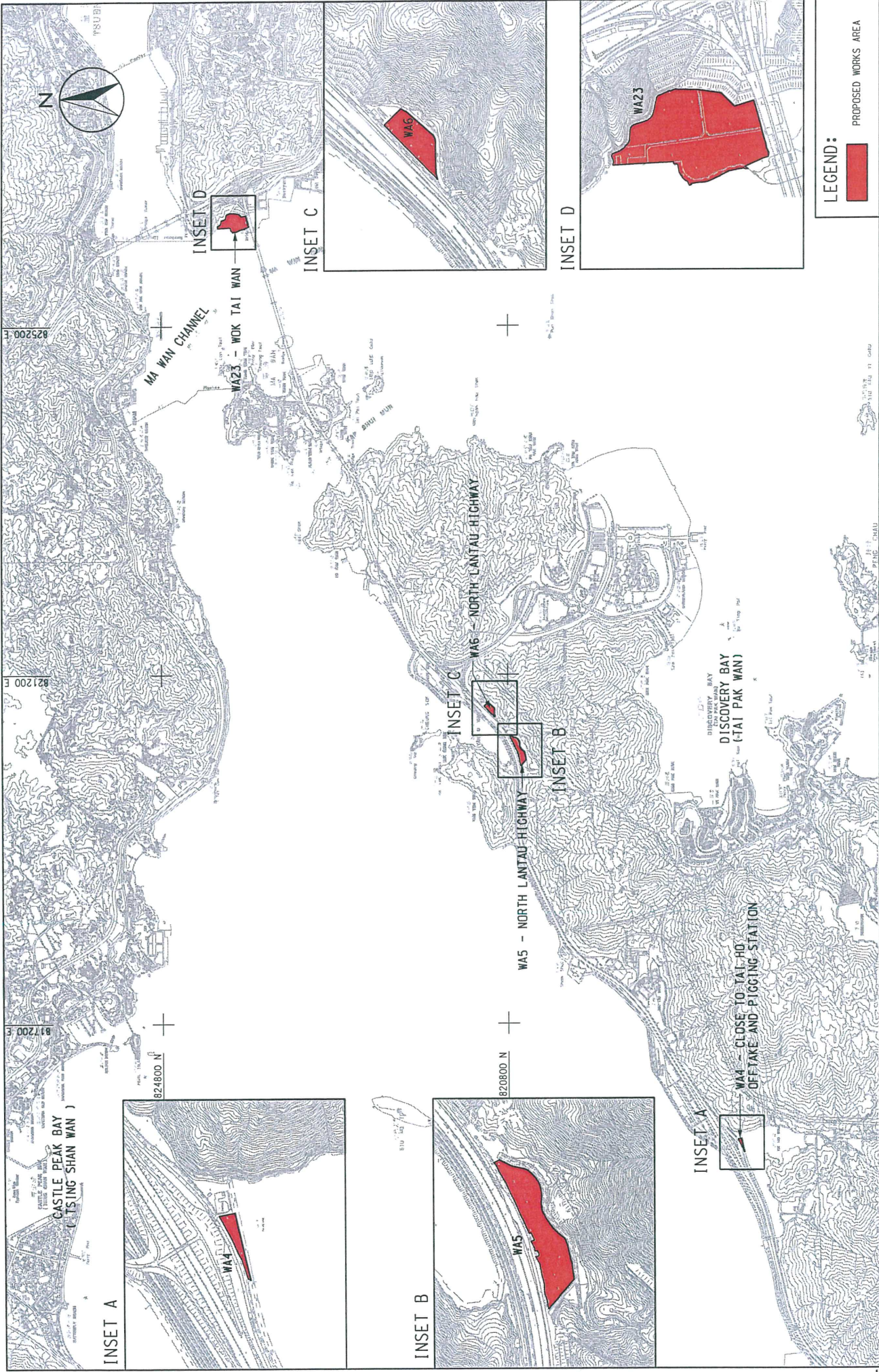


LEGEND:

PROPOSED WORKS AREA

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	PROPOSED WORKS AREAS FOR TMCLKL (TUEN MUN SIDE)			CHECK	---	BY	YHZ
				JOB No.	60044963	DRAWING No.	FIGURE 2.8a
				REV	---	REV	---





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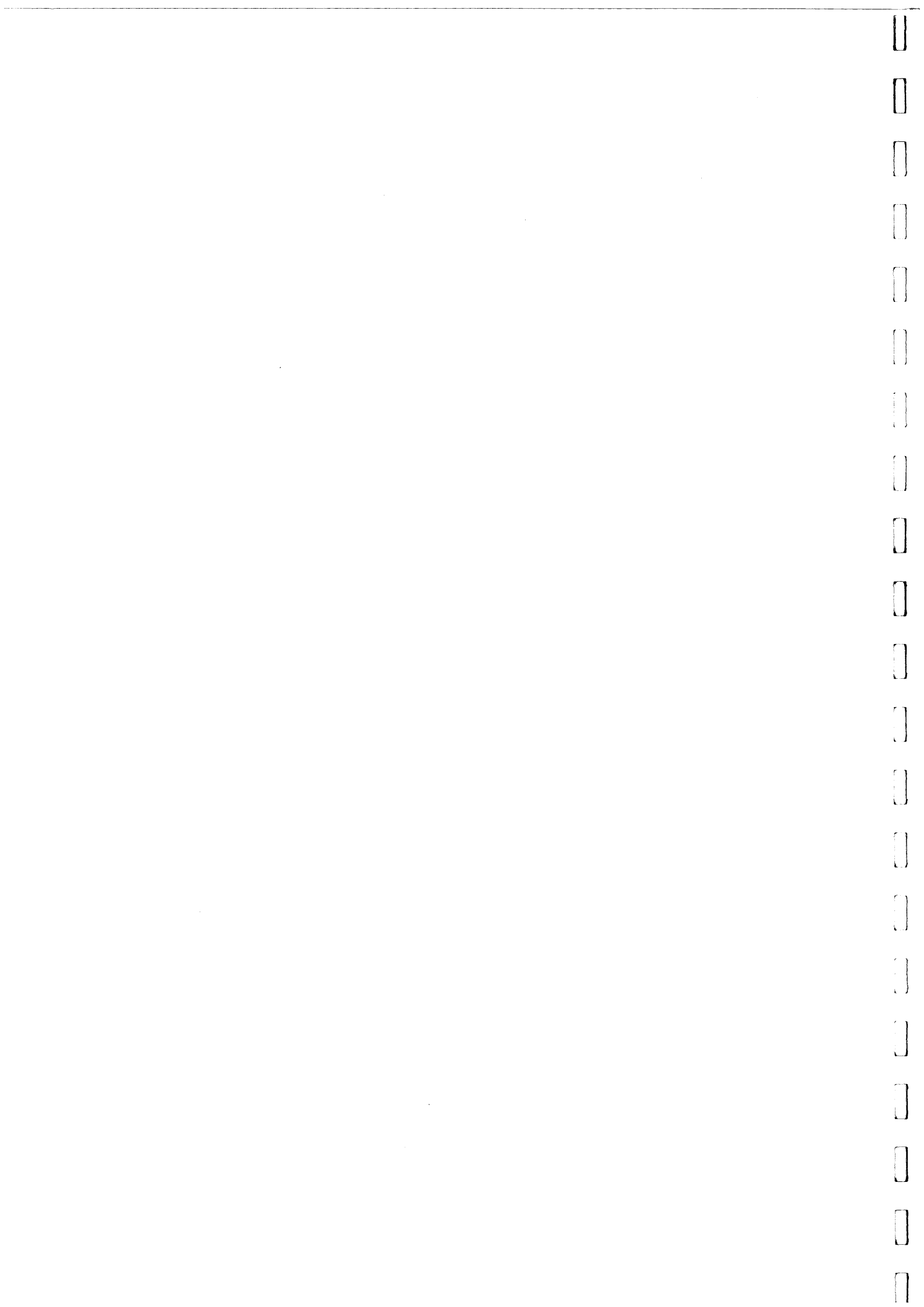
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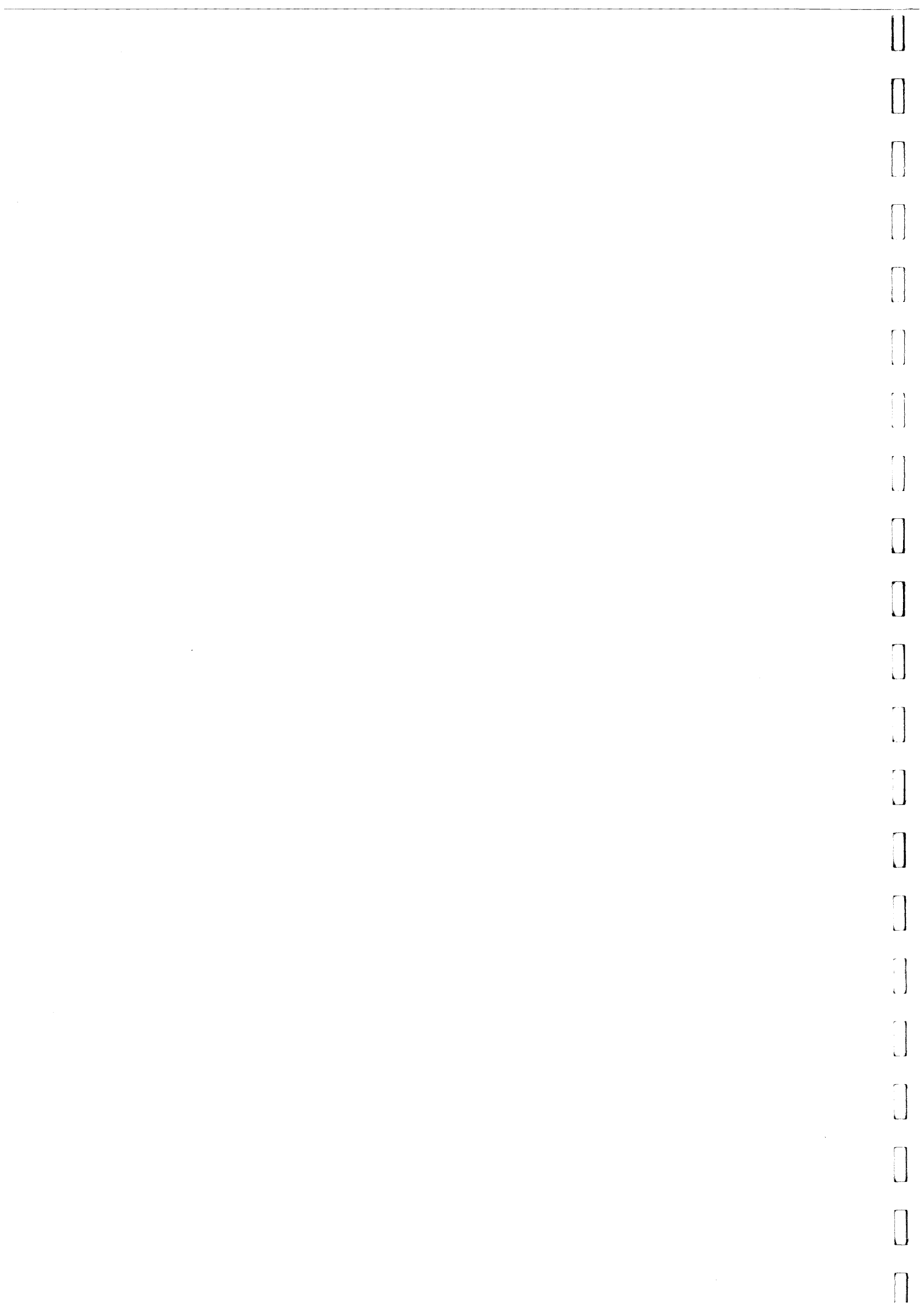
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CHECK	---	DRAWN	CXS
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REV	---	REV	---

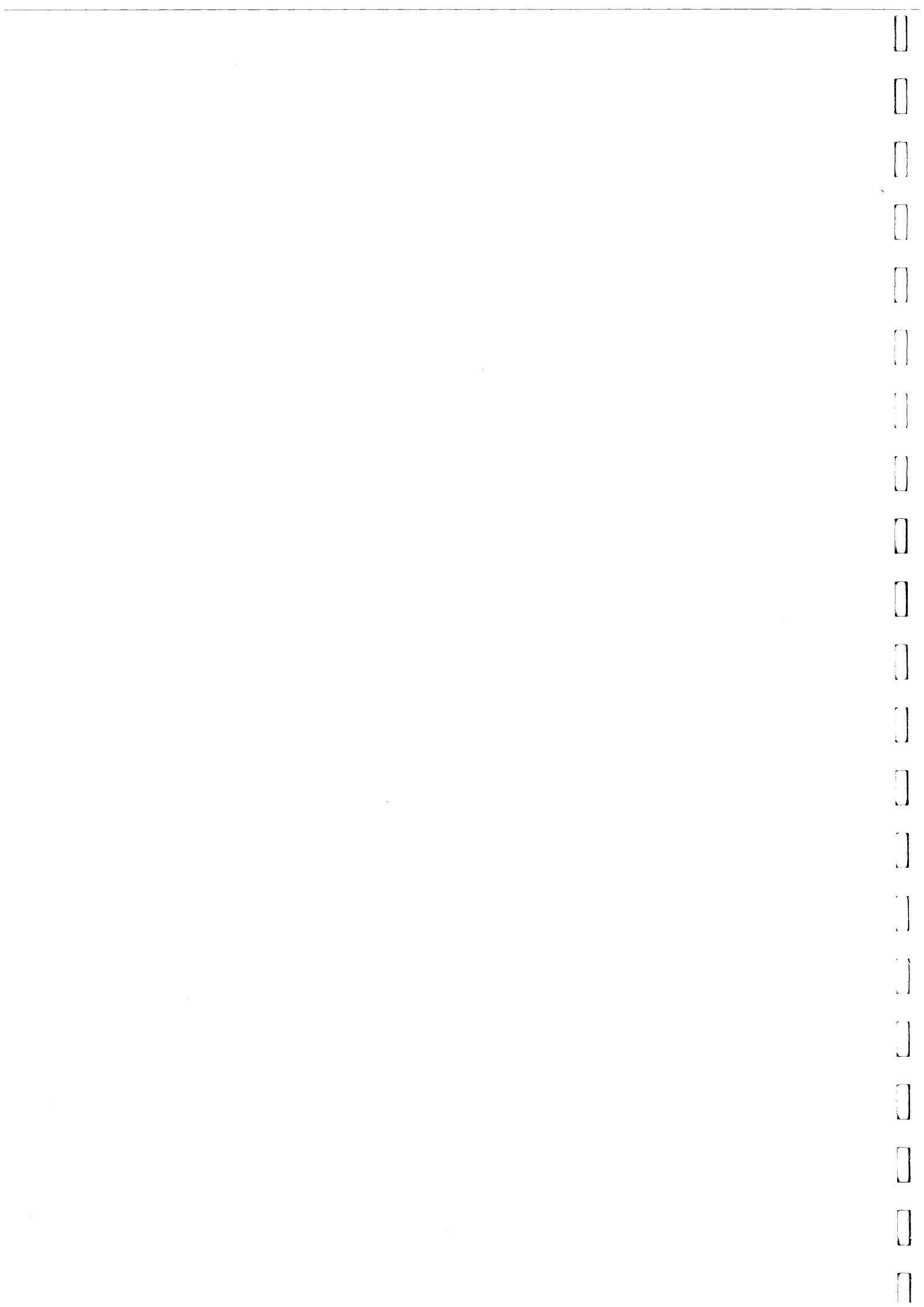
AGREEMENT NO. - CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

PROPOSED WORKS AREAS FOR TMCKL (LANTAU SIDE)

AECOM





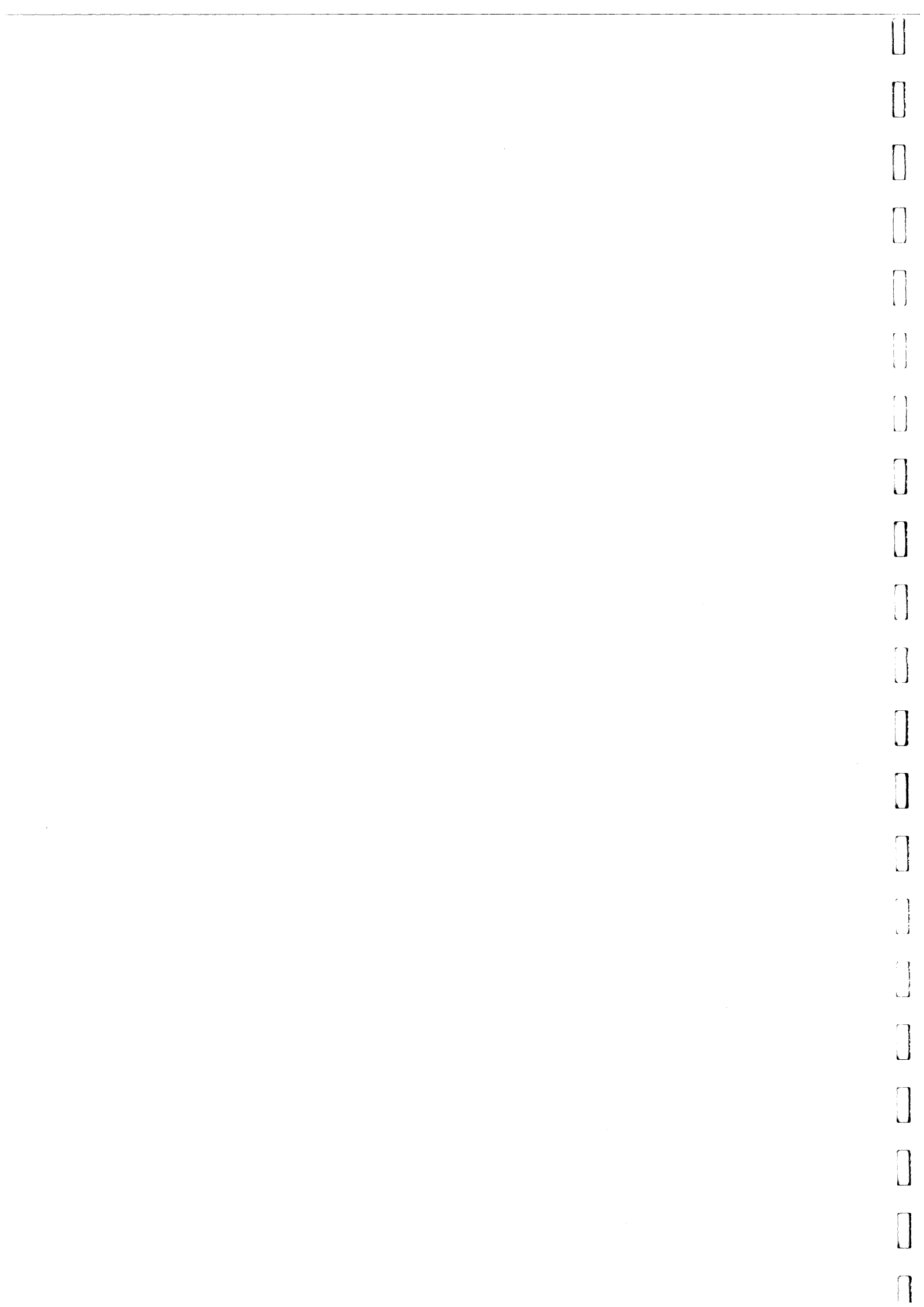


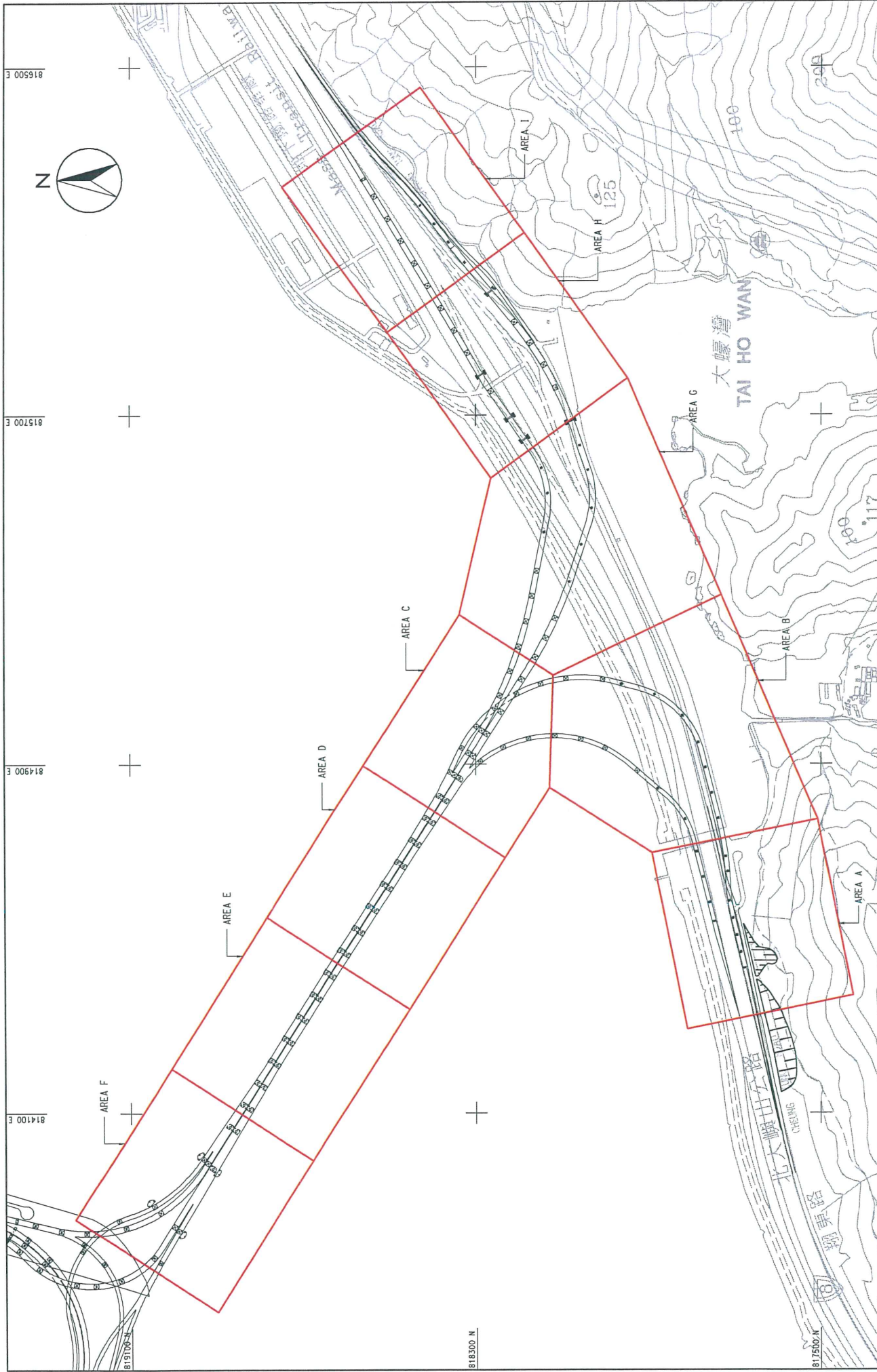


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SCALE		REV	A

AGREEMENT NO. CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
 PORTIONS OF WORKS IN TUEN MUN

AECOM

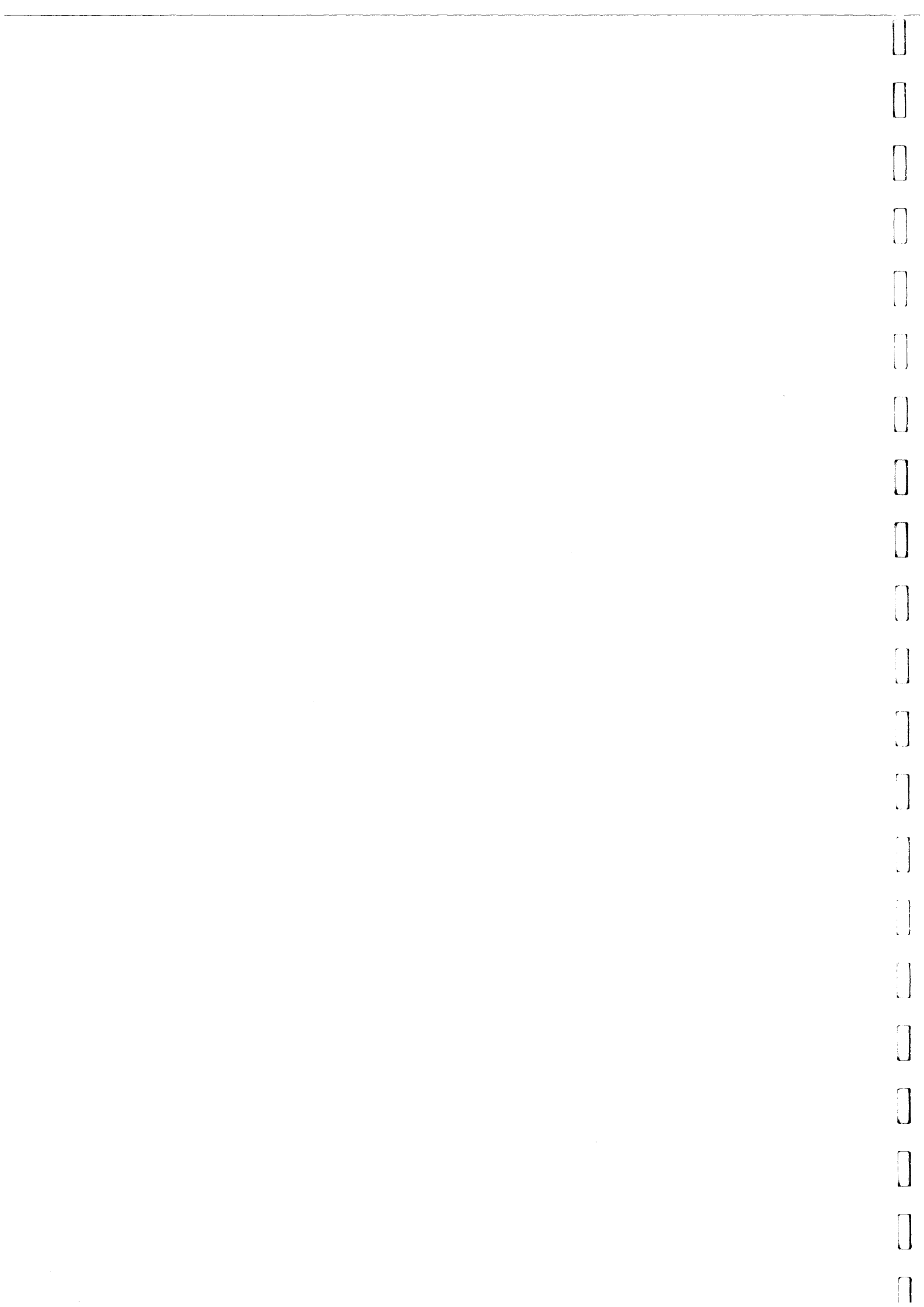


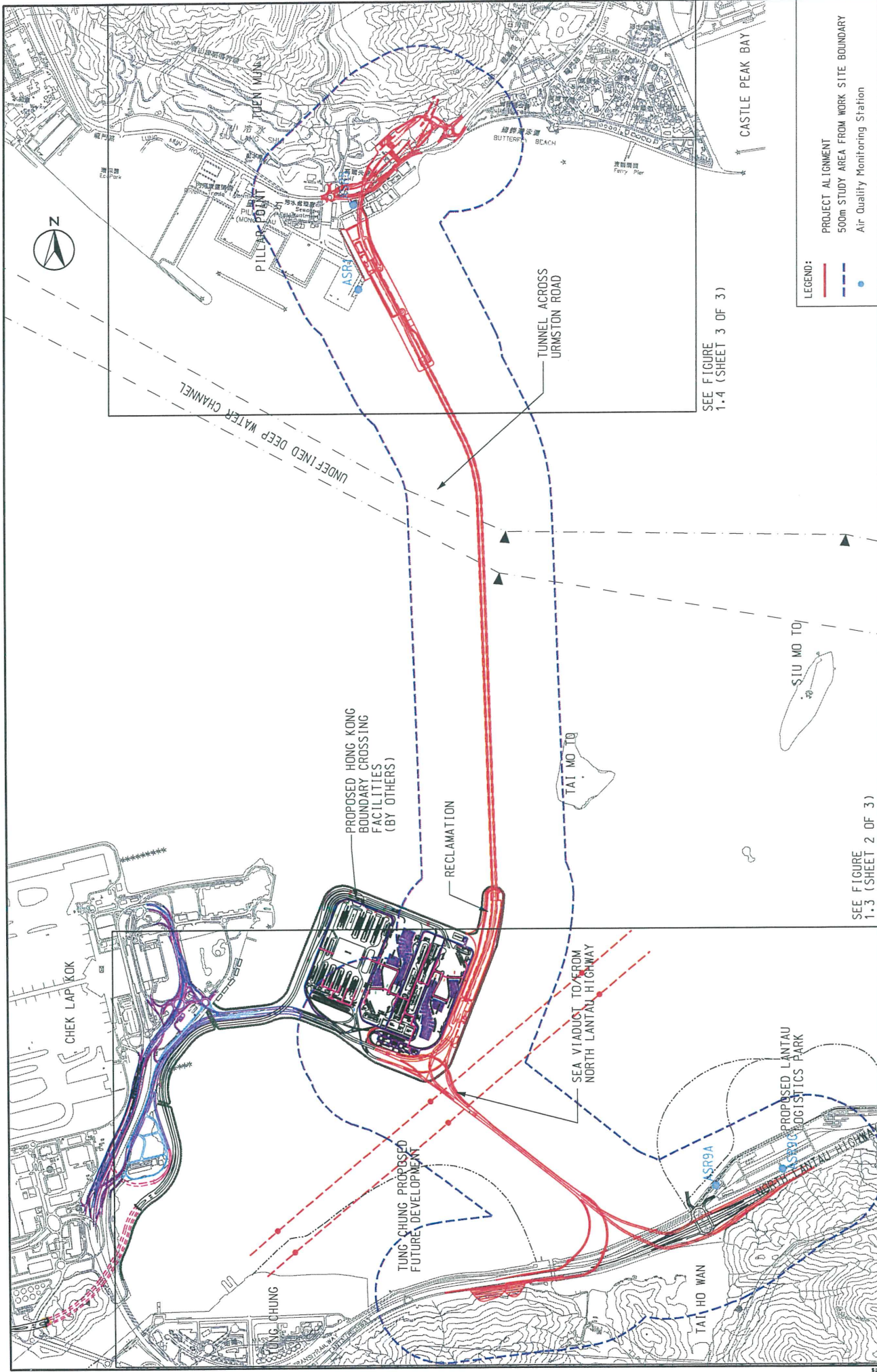


SCALE	A3 1:8000	DATE	JUL. 2009
CHECK	---	DRAWN	MZC
JOB No.	60044963	DRAWING No.	Fig 2.9d
		REV	A

AGREEMENT NO. CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
PORTIONS OF WORKS IN NORTH LANTAU

AECOM





SEE FIGURE 1.4 (SHEET 3 OF 3)

LEGEND:

- PROJECT ALIGNMENT
- - - 500m STUDY AREA FROM WORK SITE BOUNDARY
- Air Quality Monitoring Station

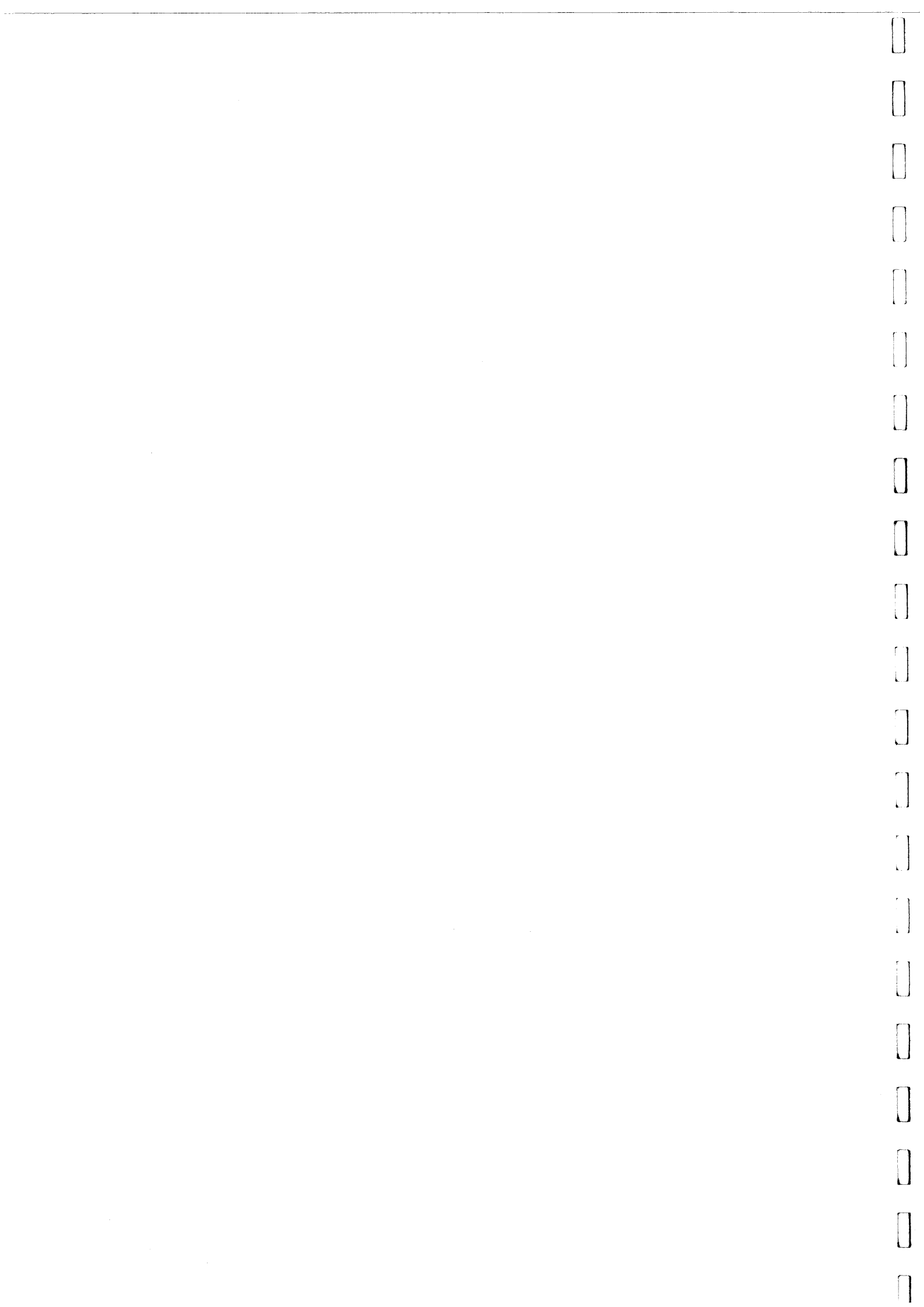
SCALE	1:25 000	DATE	MAY, 2009
CHECK		DRAWN	
JOB NO.	60044963	DRAWING NO.	FIGURE 3.2
		REV	-

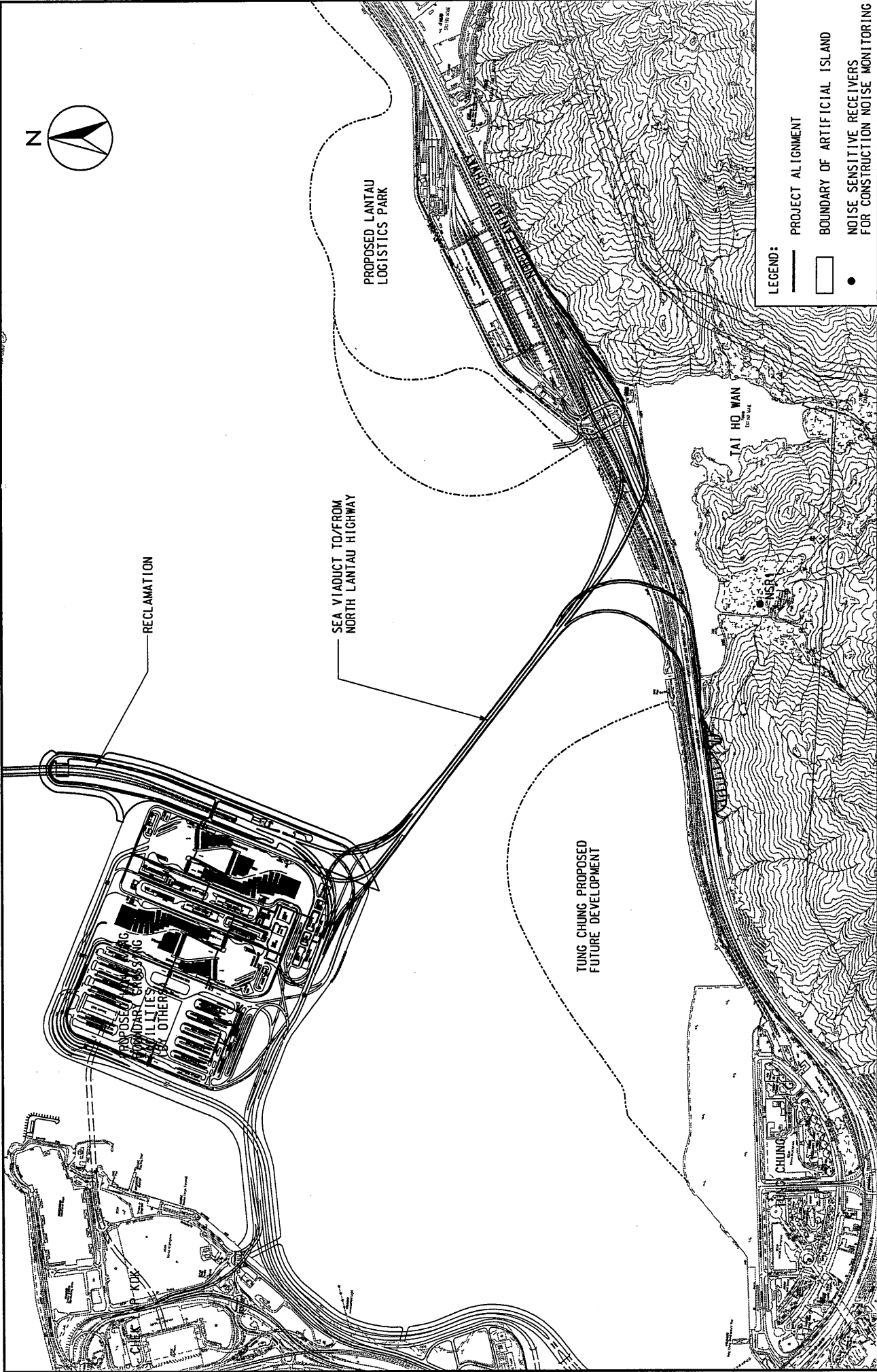
SEE FIGURE 1.3 (SHEET 2 OF 3)

AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

CONSTRUCTION AIR QUALITY MONITORING STATIONS

MAUNSELL AECOM
Mauritson Consultants Agent Ltd





RECLAMATION

SEA VIADUCT TO/FROM
NORTH LANTAU HIGHWAY

TUNG CHUNG PROPOSED
FUTURE DEVELOPMENT

PROPOSED LANTAU
LOGISTICS PARK

TAI HO WAN

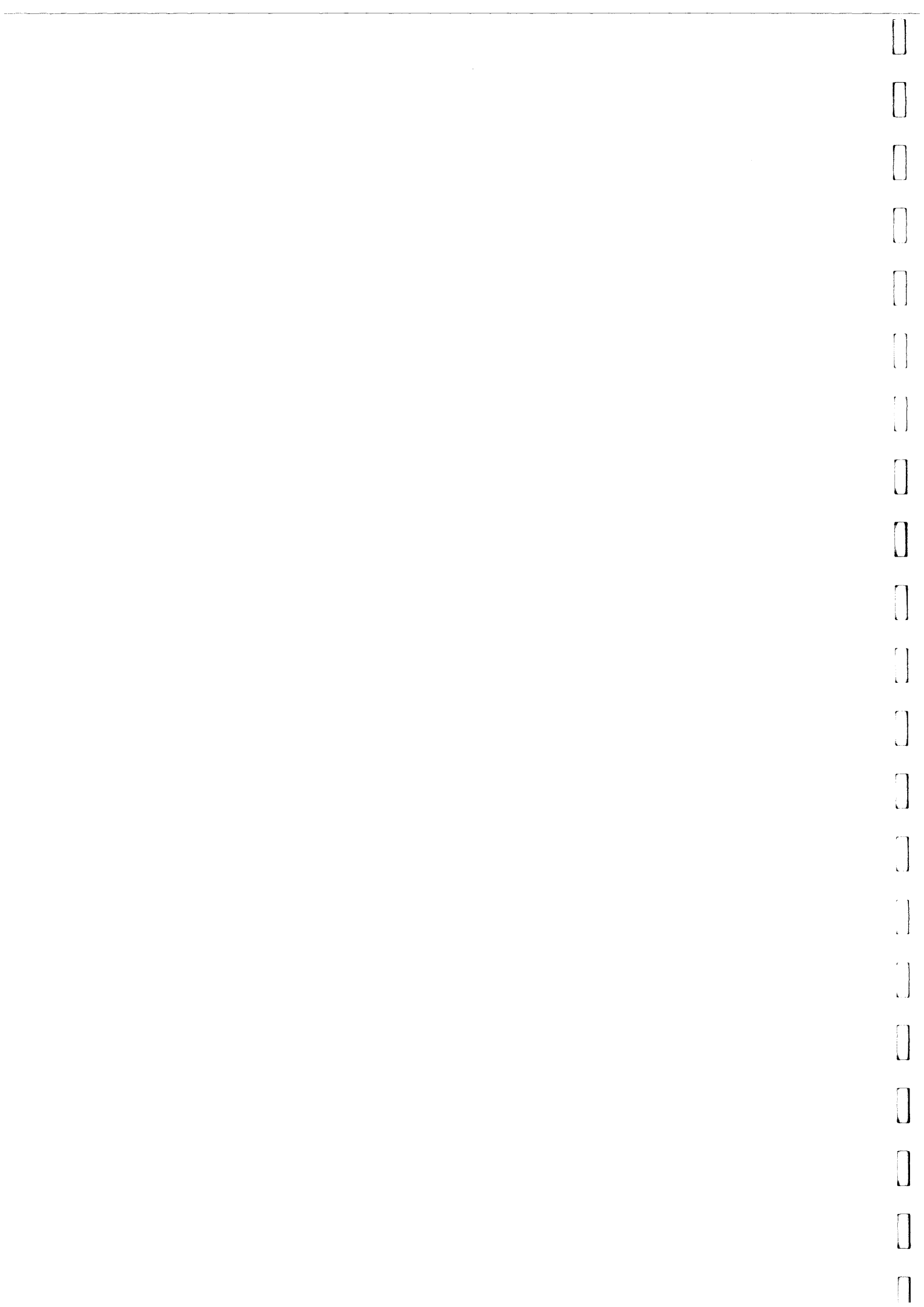
LEGEND:

- PROJECT ALIGNMENT
- BOUNDARY OF ARTIFICIAL ISLAND
- NOISE SENSITIVE RECEIVERS FOR CONSTRUCTION NOISE MONITORING

SCALE	1:15 000	DATE	JUL 9, 2009
CHECK		DRAWN	
JOB No.	60044963	DRAWING No.	FIGURE 4.2
		REV	-

AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

CONSTRUCTION NOISE MONITORING





813600 E

813100 E

812600 E

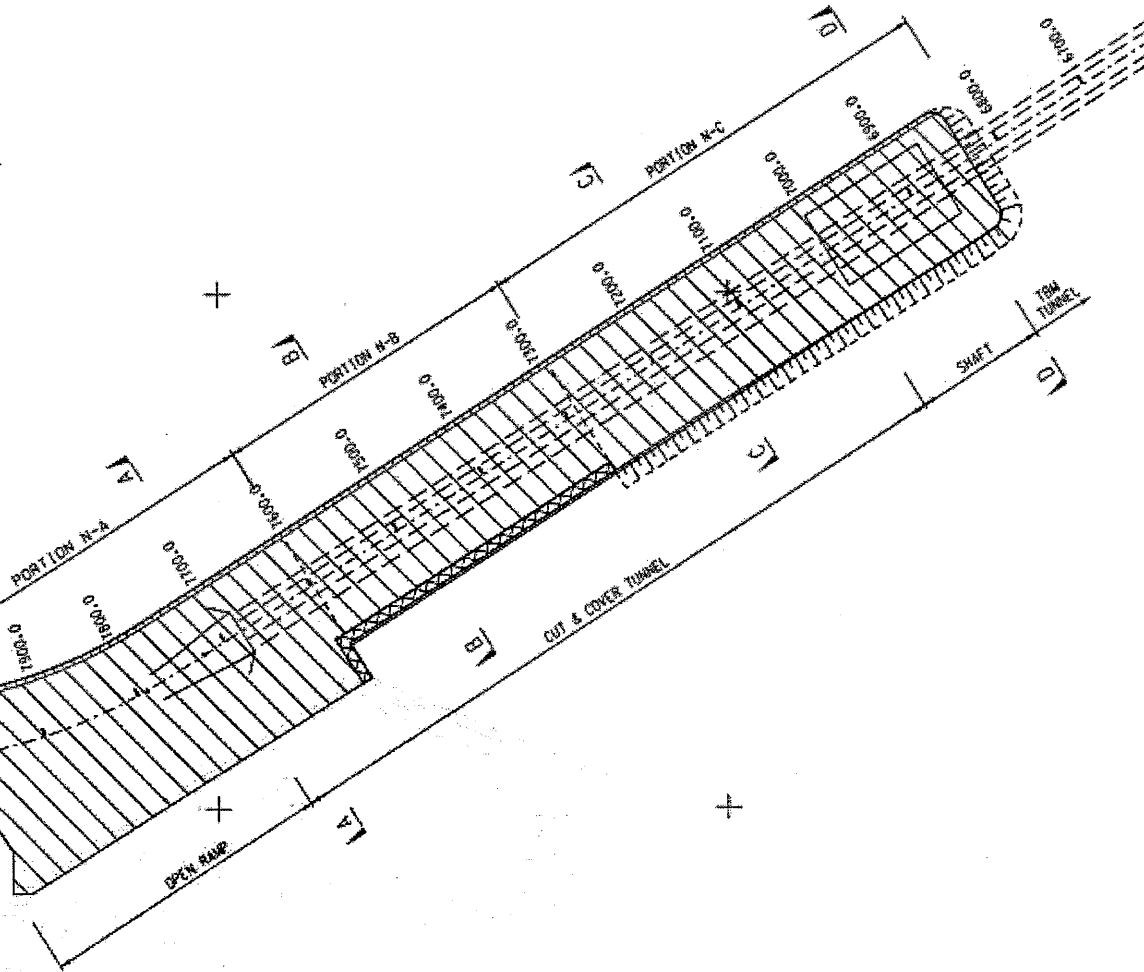
TUEN MAN

OPEN RAMP

CUT & COVER TUNNEL

SHAFT

TBM TUNNEL







824900 N

824400 N

REQUIREMENT OF SEAWALL/RECLAMATION

PORTION	SEAWALL	RECLAMATION
N-4	FULLY DREDGED	NON-DREDGED (WITH BAND BRAINS)
N-B	FULLY DREDGED	NON-DREDGED (WITH BAND BRAINS)
N-C	FULLY DREDGED	FULLY DREDGED

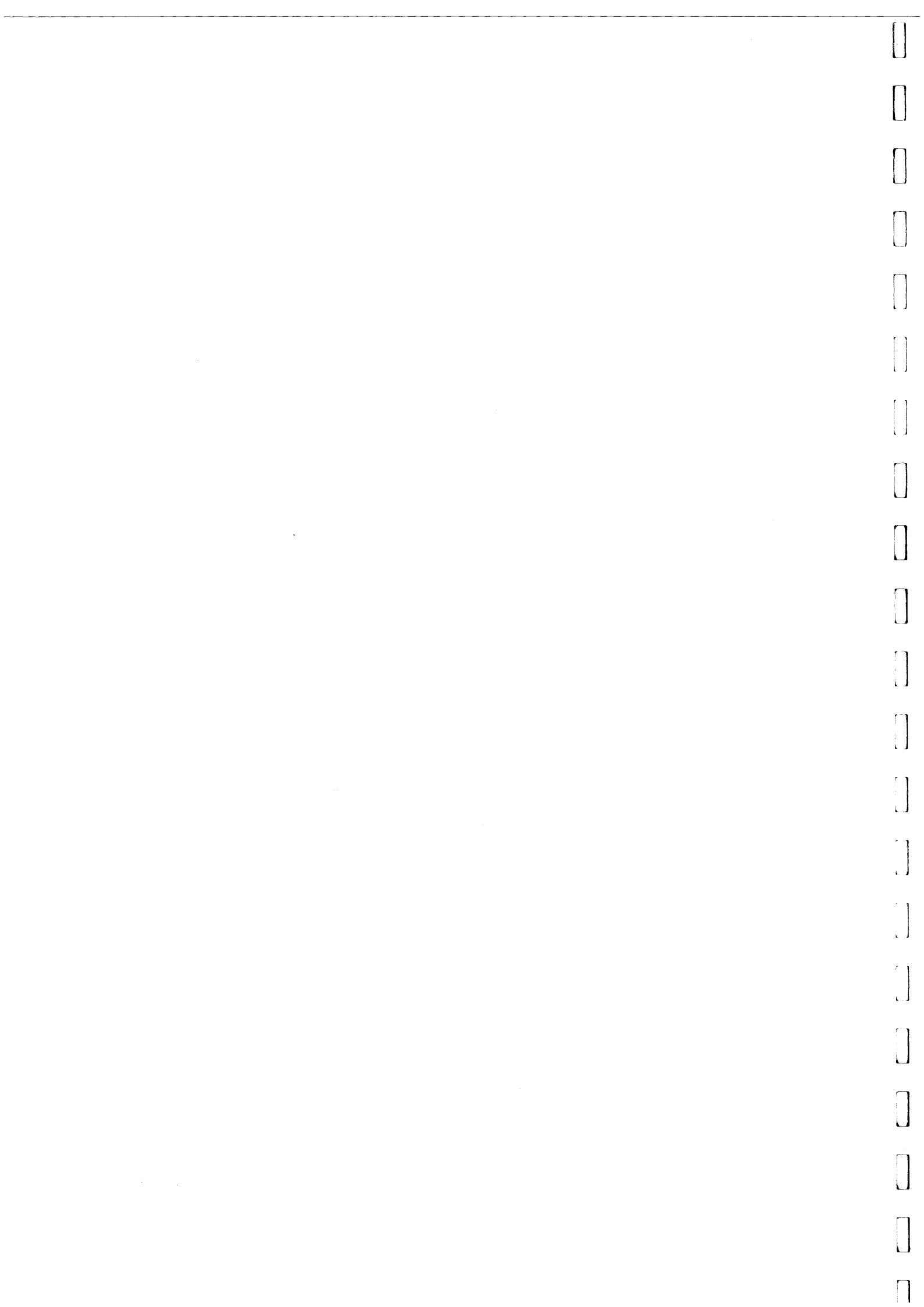
LEGEND:

-  PROPOSED TRENCH RECLAMATION
-  PROPOSED SLOPING SEAWALL
-  PROPOSED BLOCKWORK SEAWALL
-  PROPOSED WAVE ABSORPTION SEAWALL

SCALE	A3 1:5000	DATE	MAR. 2009
CHECK		DRAWN	LCC
JOB No.	60044963	DRAWING No.	5.1
		REV.	A

PROJECT'S: 60044963 DRAWING: FIGURE DRAWINGS FOR EA REPORT (CON) FIGURE 4-7.99a
 AGREEMENT NO. CE 82/2007(LINK)
 TUEN MAN - CHECK LAP FOR LINA - INVESTIGATION
 EXTENT OF DREDGED AREA AND TYPICAL SEAWALL SECTIONS IN NORTHERN LANDFALL OF TM - CLKL
 SHEET 1 OF 3

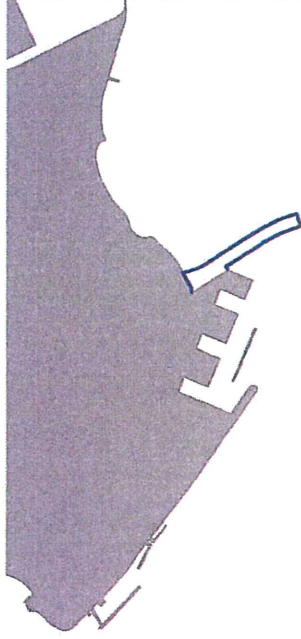
MAUNSELL



Mid-Ebb Tide

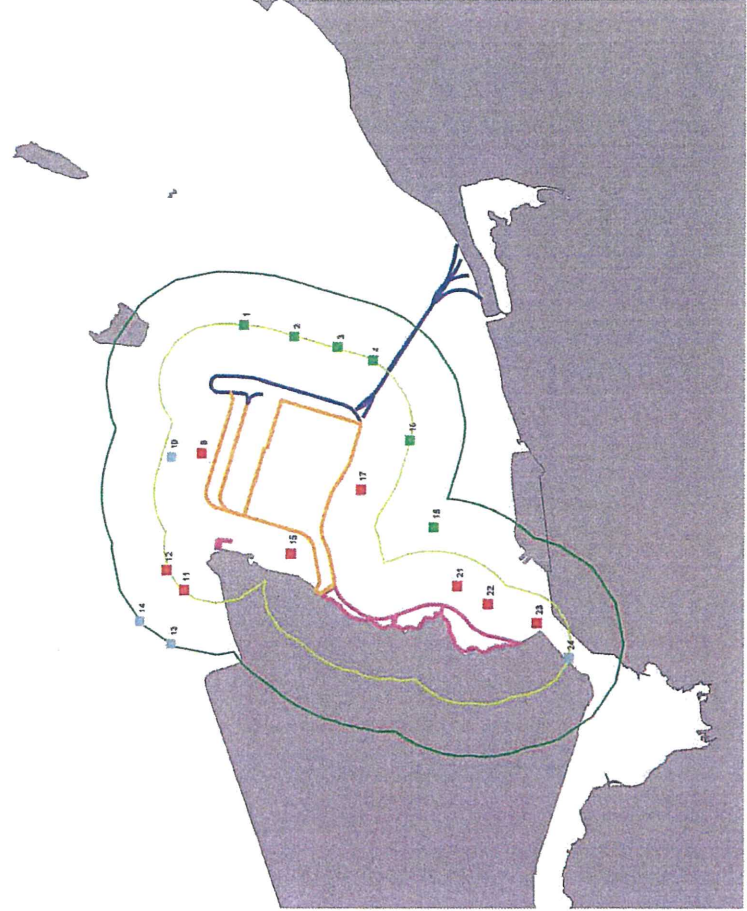


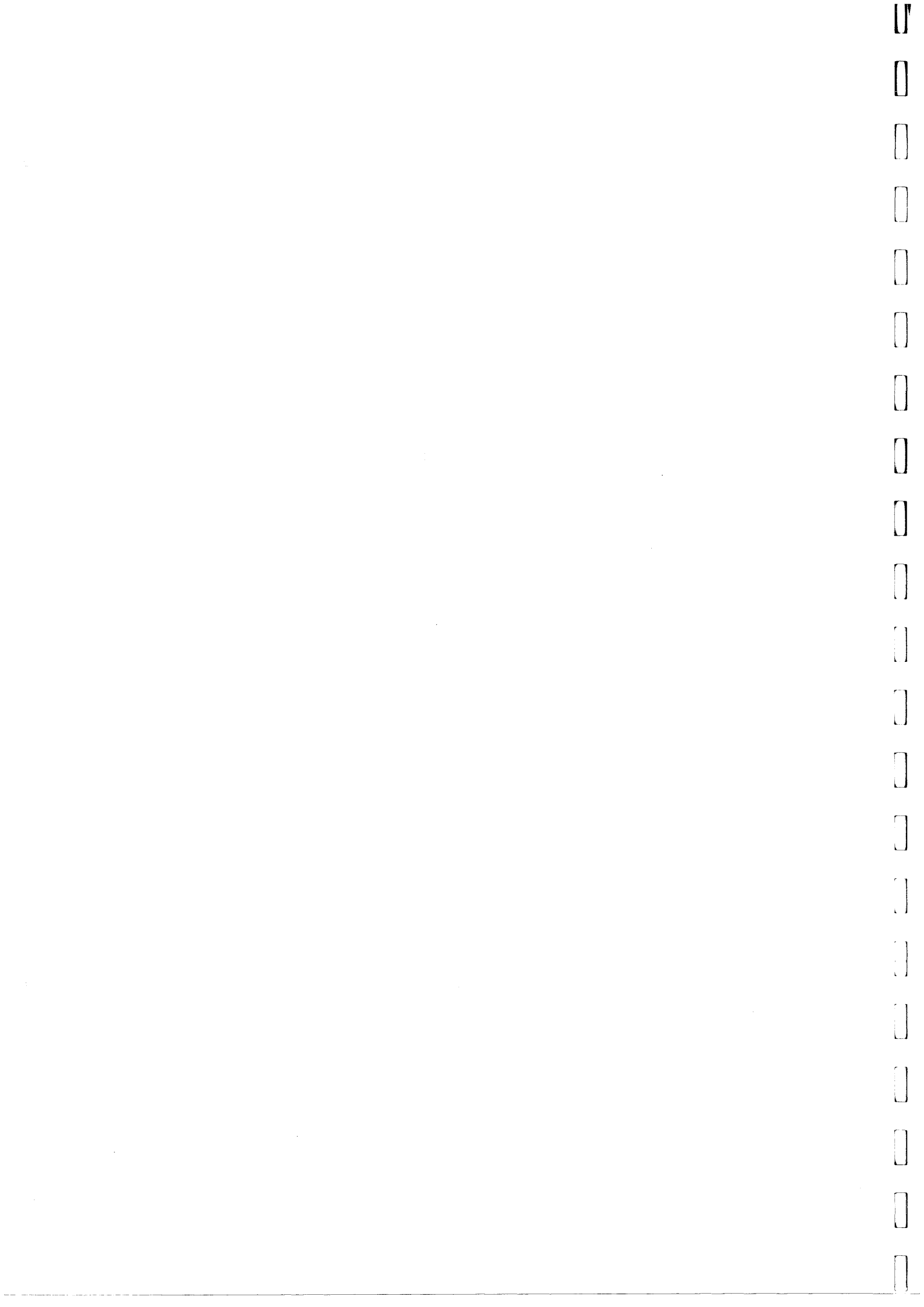
Mid-Flood Tide

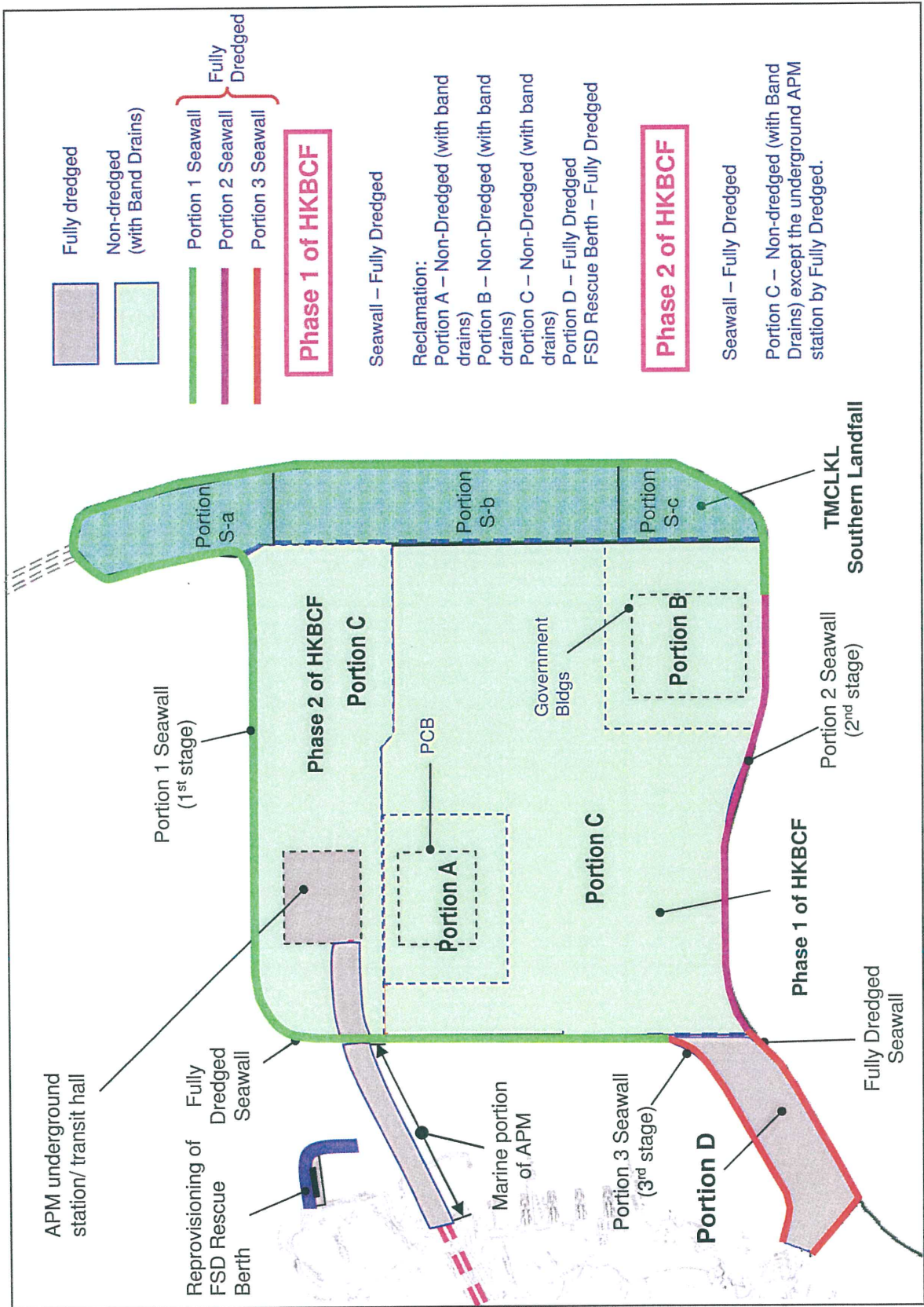


Legend:

- TM-CLKL Alignment
- Hong Kong Boundary Crossing Facilities
- Hong Kong Link Road
- 500m from Project Site
- 1000m from Project Site
- Water Quality Monitoring Station
- Control Station
- Mid Field
- Near Field







- Fully dredged
- Non-dredged (with Band Drains)
- Portion 1 Seawall
- Portion 2 Seawall
- Portion 3 Seawall

Phase 1 of HKBCF

Seawall – Fully Dredged

Reclamation:
 Portion A – Non-Dredged (with band drains)
 Portion B – Non-Dredged (with band drains)
 Portion C – Non-Dredged (with band drains)
 Portion D – Fully Dredged
 FSD Rescue Berth – Fully Dredged

Phase 2 of HKBCF

Seawall – Fully Dredged

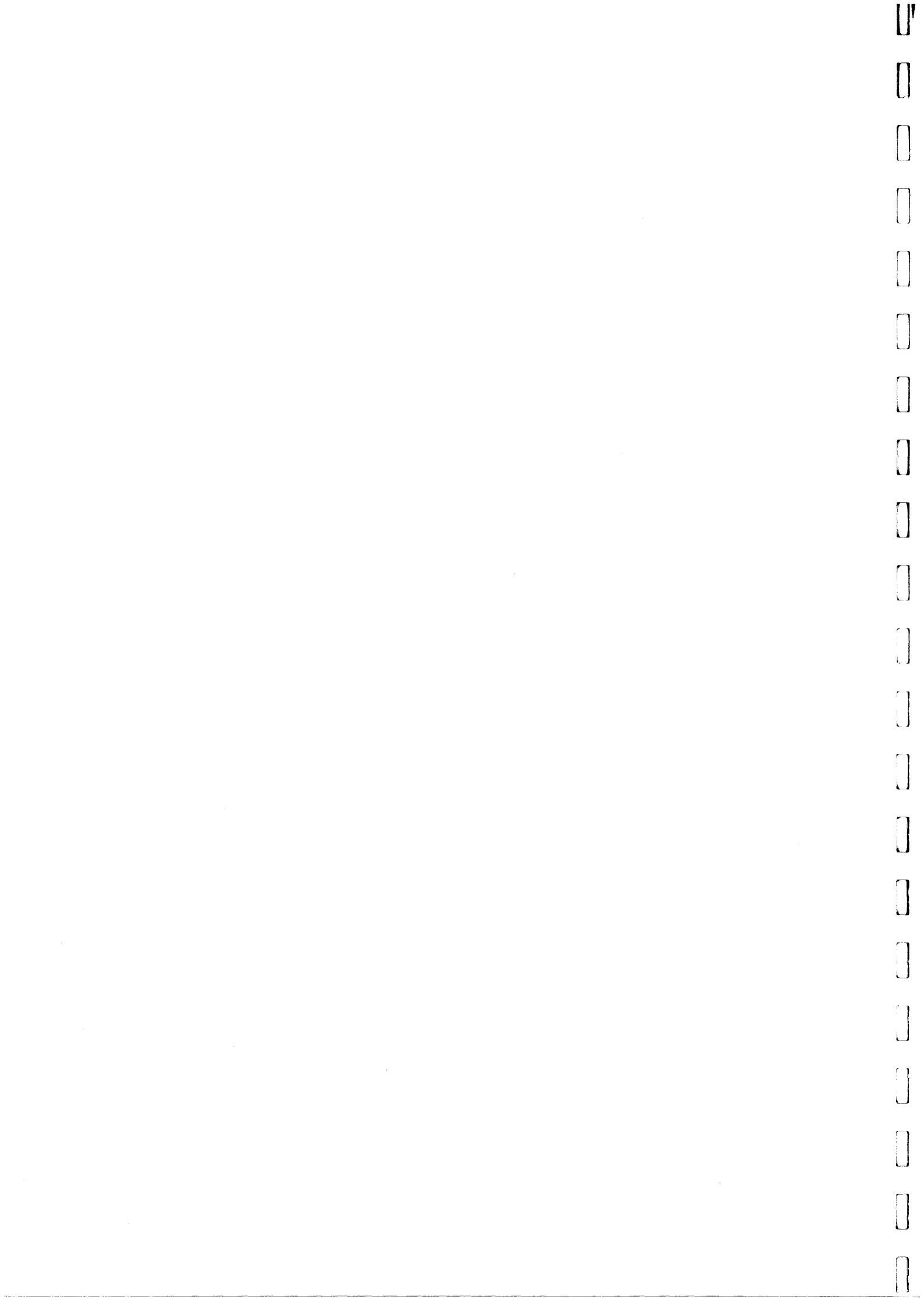
Portion C – Non-dredged (with Band Drains) except the underground APM station by Fully Dredged.

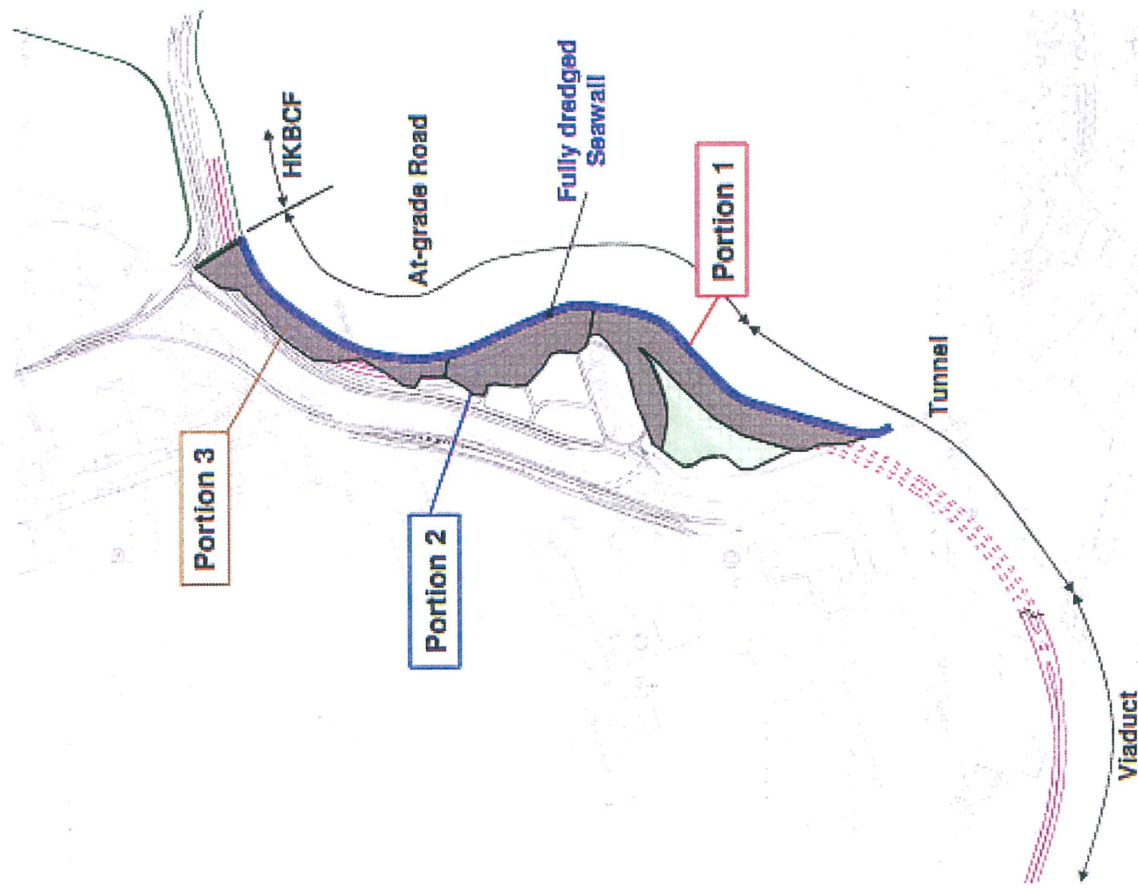
AGREEMENT No. CE 52/2007 (HY)
 TUEN MUN – CHECK LAP KOK LINK - INVESTIGATION

Extent of Dredged and Non-dredged Areas in HKBCF and Southern Landfall of TM-CLKL (Sequence B)

SCALE	NTS	DATE	JUL. 2009
CHECK		DRAWN	
JOB No.	60044963	DRAWING No.	5.3
		REV	

AECOM





Seawall – Fully Dredged

Reclamation:

Portion 1 { Full-dredged at seawall, tunnel area and mud pit to receive Mf sediment
Non-dredged at other area

Portion 2 - Fully Dredged

Portion 3 - Fully Dredged



Fully dredged



Reclamation area to received dredged Mf sediment within the site

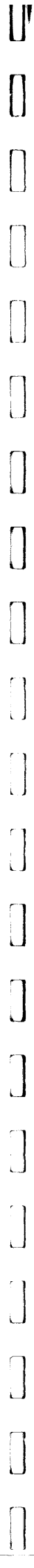
Priority 1a

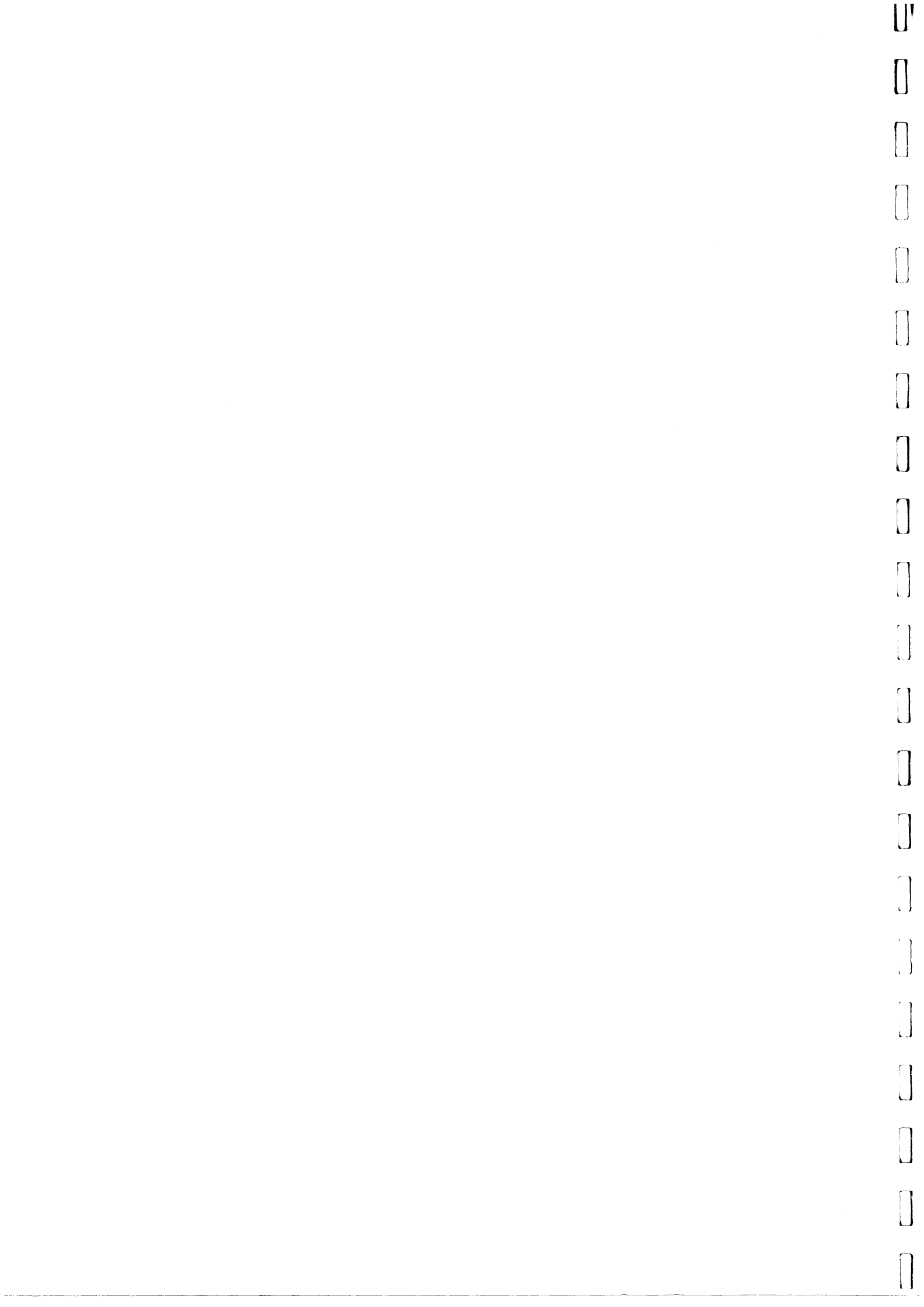
ARUP
 奧雅工程建築
 Ong Aun & Partners

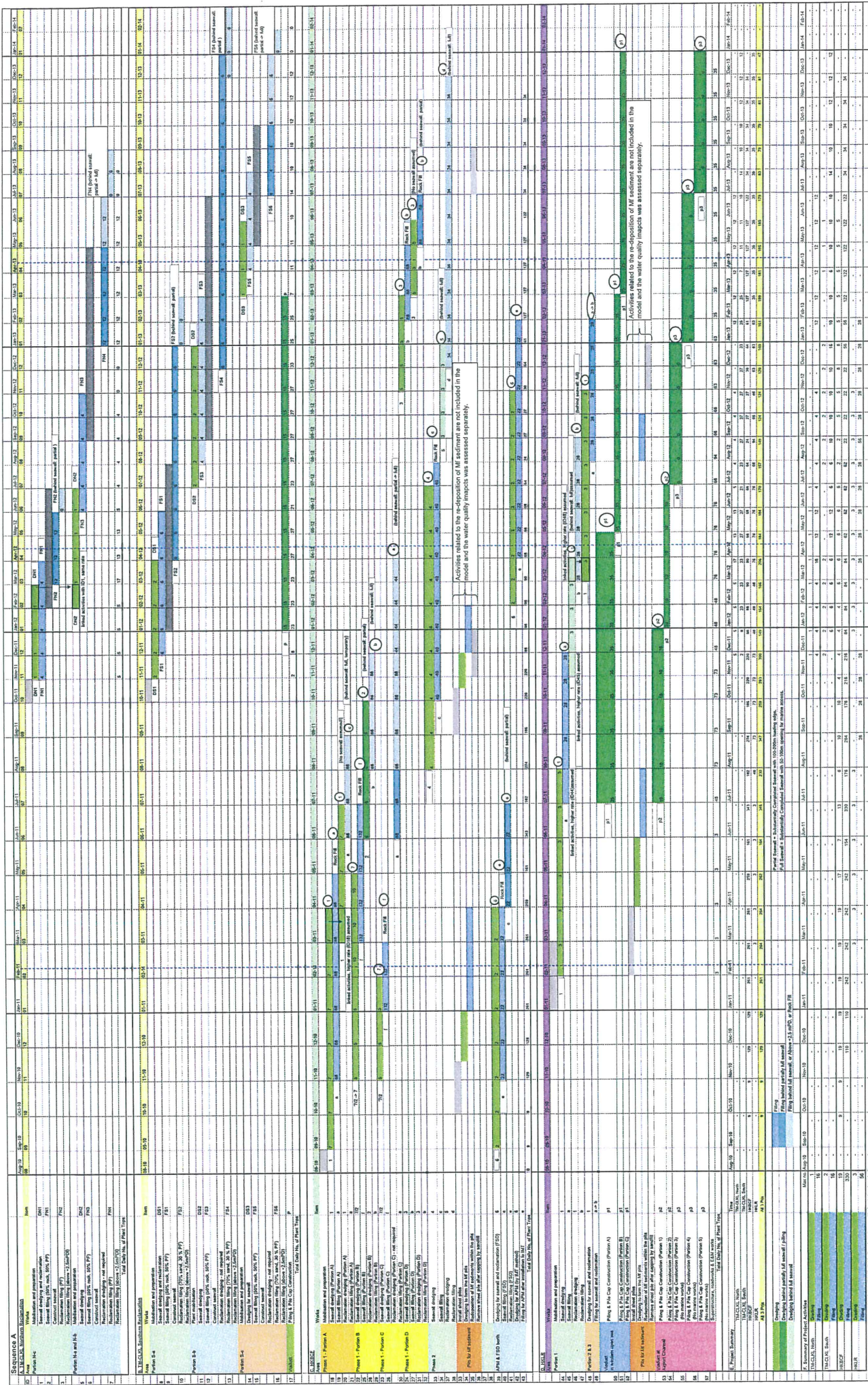
香港
 HIGHWAYS DEPARTMENT
 港務局 水務及渠務工程處
 Hong Kong Water and Sewerage
 Hong Kong Project Management Office

Reclamation layout of HKLR

Figure 5.4

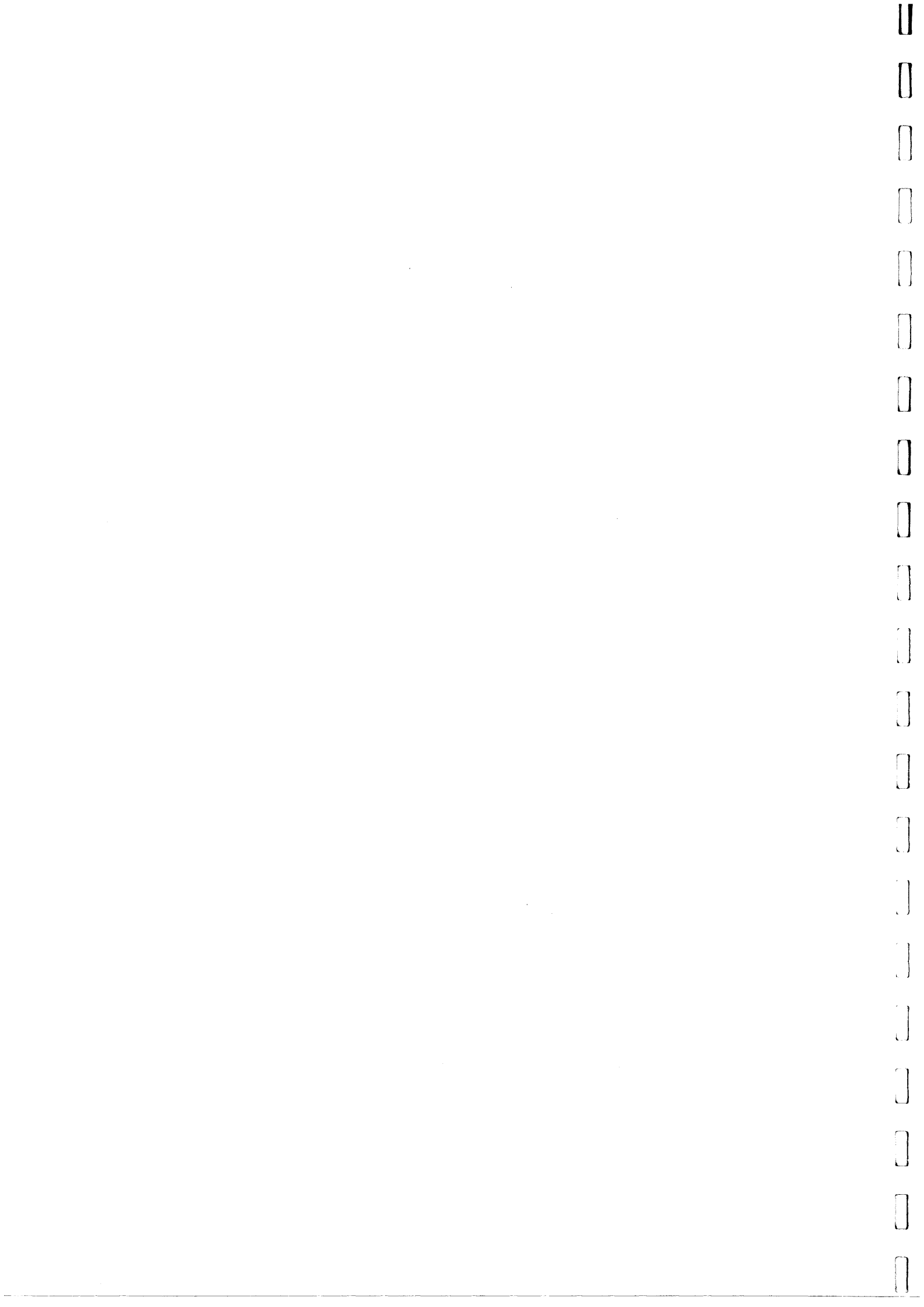


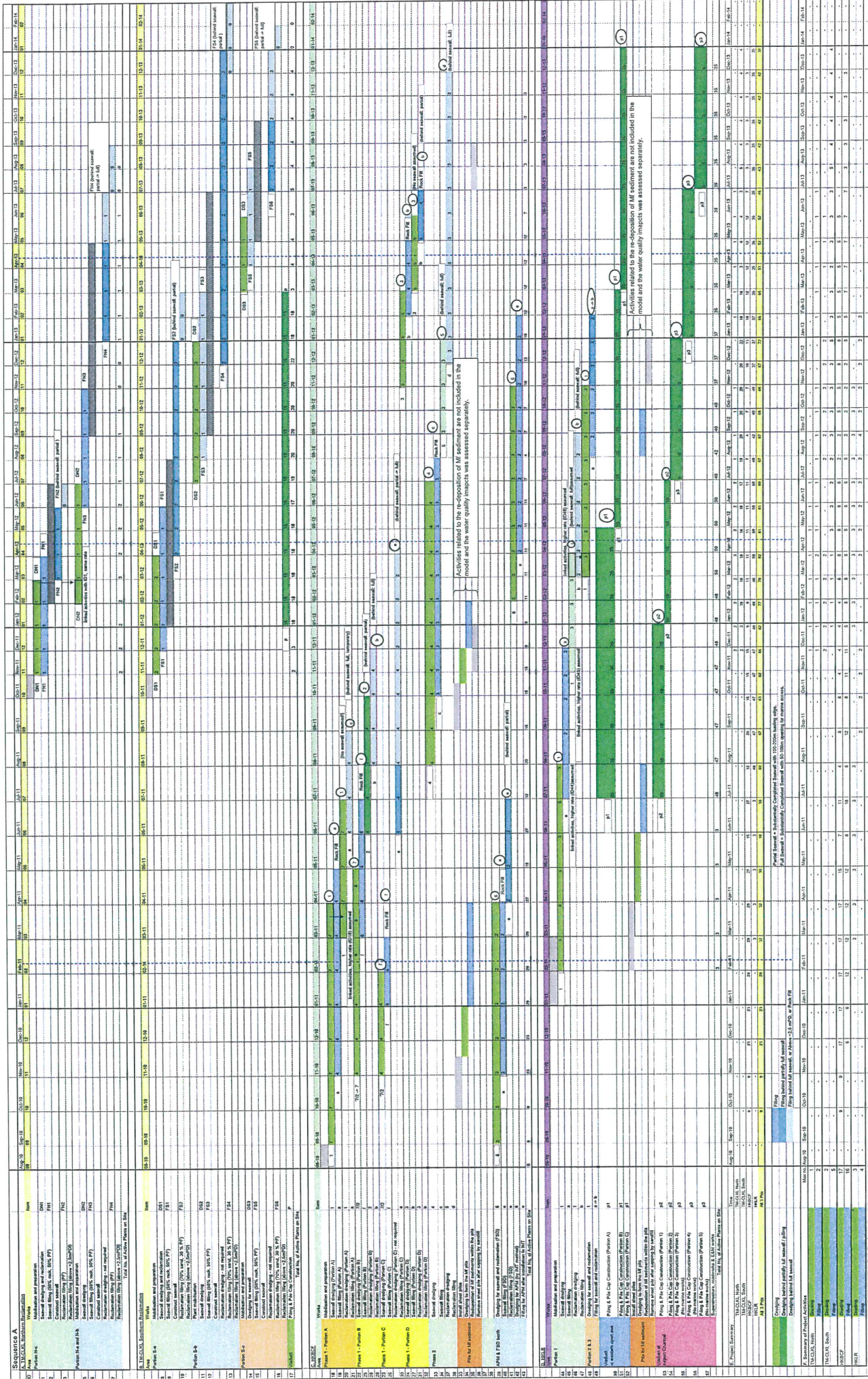




Overall Programme for TM-CLKL + HKBCF + HKLRF - Daily No. of Plant Trips (Sequence A)

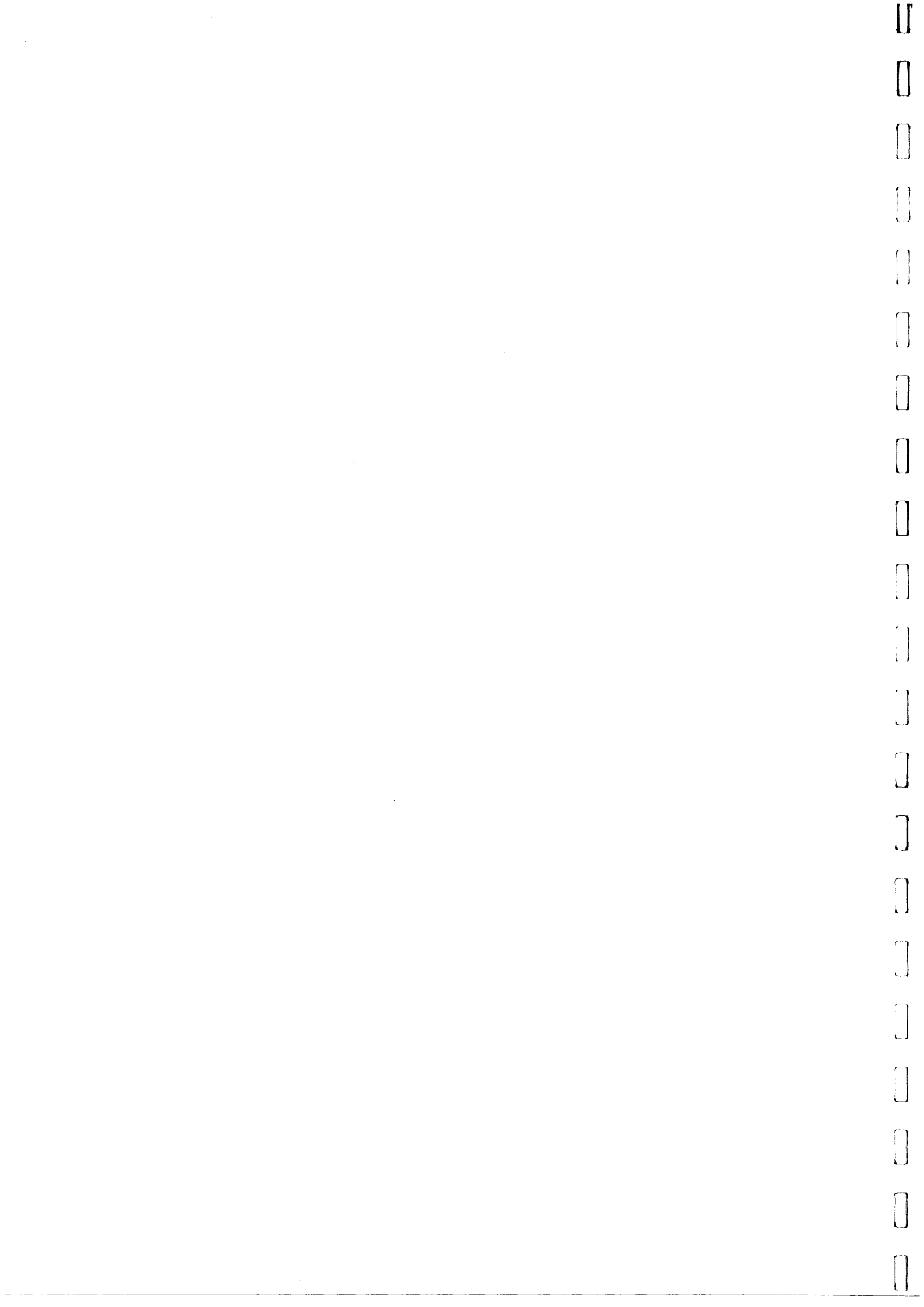
Figure 5.5b





Overall Programme for TM-CLKL + HKBCF + HKLR - No. of Active Dredging/Filling Plants on Site (Sequence A)

T:\M\AEC\Task Area - CCL\B\Report\5.5c - Summary Schedule (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100) (101) (102) (103) (104) (105) (106) (107) (108) (109) (110) (111) (112) (113) (114) (115) (116) (117) (118) (119) (120) (121) (122) (123) (124) (125) (126) (127) (128) (129) (130) (131) (132) (133) (134) (135) (136) (137) (138) (139) (140) (141) (142) (143) (144) (145) (146) (147) (148) (149) (150) (151) (152) (153) (154) (155) (156) (157) (158) (159) (160) (161) (162) (163) (164) (165) (166) (167) (168) (169) (170) (171) (172) (173) (174) (175) 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Overall Programme for TM-CLKL + HKBCF + HKLR - Maximum Daily Production Rate (bulked volume, m3/day) (Sequence B)

[Remarks] Table F includes the quantity for stacked board pile works.

Activity	May-19		Jun-19		Jul-19		Aug-19		Sep-19		Oct-19		Nov-19		Dec-19		Jan-20		Feb-20		Mar-20		Apr-20		May-20		Jun-20		Jul-20		Aug-20		Sep-20		Oct-20		Nov-20		Dec-20													
	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End	Start	End														
1. TM-CLKL, North	05-19	05-19	06-19	06-19	07-19	07-19	08-19	08-19	09-19	09-19	10-19	10-19	11-19	11-19	12-19	12-19	01-20	01-20	02-20	02-20	03-20	03-20	04-20	04-20	05-20	05-20	06-20	06-20	07-20	07-20	08-20	08-20	09-20	09-20	10-20	10-20	11-20	11-20	12-20	12-20	01-21	01-21	02-21	02-21	03-21	03-21	04-21	04-21	05-21	05-21	06-21	06-21
2. TM-CLKL, South	05-19	05-19	06-19	06-19	07-19	07-19	08-19	08-19	09-19	09-19	10-19	10-19	11-19	11-19	12-19	12-19	01-20	01-20	02-20	02-20	03-20	03-20	04-20	04-20	05-20	05-20	06-20	06-20	07-20	07-20	08-20	08-20	09-20	09-20	10-20	10-20	11-20	11-20	12-20	12-20	01-21	01-21	02-21	02-21	03-21	03-21	04-21	04-21	05-21	05-21	06-21	06-21
3. HKBCF, North	05-19	05-19	06-19	06-19	07-19	07-19	08-19	08-19	09-19	09-19	10-19	10-19	11-19	11-19	12-19	12-19	01-20	01-20	02-20	02-20	03-20	03-20	04-20	04-20	05-20	05-20	06-20	06-20	07-20	07-20	08-20	08-20	09-20	09-20	10-20	10-20	11-20	11-20	12-20	12-20	01-21	01-21	02-21	02-21	03-21	03-21	04-21	04-21	05-21	05-21	06-21	06-21
4. HKBCF, South	05-19	05-19	06-19	06-19	07-19	07-19	08-19	08-19	09-19	09-19	10-19	10-19	11-19	11-19	12-19	12-19	01-20	01-20	02-20	02-20	03-20	03-20	04-20	04-20	05-20	05-20	06-20	06-20	07-20	07-20	08-20	08-20	09-20	09-20	10-20	10-20	11-20	11-20	12-20	12-20	01-21	01-21	02-21	02-21	03-21	03-21	04-21	04-21	05-21	05-21	06-21	06-21
5. HKLR, North	05-19	05-19	06-19	06-19	07-19	07-19	08-19	08-19	09-19	09-19	10-19	10-19	11-19	11-19	12-19	12-19	01-20	01-20	02-20	02-20	03-20	03-20	04-20	04-20	05-20	05-20	06-20	06-20	07-20	07-20	08-20	08-20	09-20	09-20	10-20	10-20	11-20	11-20	12-20	12-20	01-21	01-21	02-21	02-21	03-21	03-21	04-21	04-21	05-21	05-21	06-21	06-21
6. HKLR, South	05-19	05-19	06-19	06-19	07-19	07-19	08-19	08-19	09-19	09-19	10-19	10-19	11-19	11-19	12-19	12-19	01-20	01-20	02-20	02-20	03-20	03-20	04-20	04-20	05-20	05-20	06-20	06-20	07-20	07-20	08-20	08-20	09-20	09-20	10-20	10-20	11-20	11-20	12-20	12-20	01-21	01-21	02-21	02-21	03-21	03-21	04-21	04-21	05-21	05-21	06-21	06-21

Activities related to the re-deposition of MF sediment are not included in the model and the water quality impacts was assessed separately.

p1

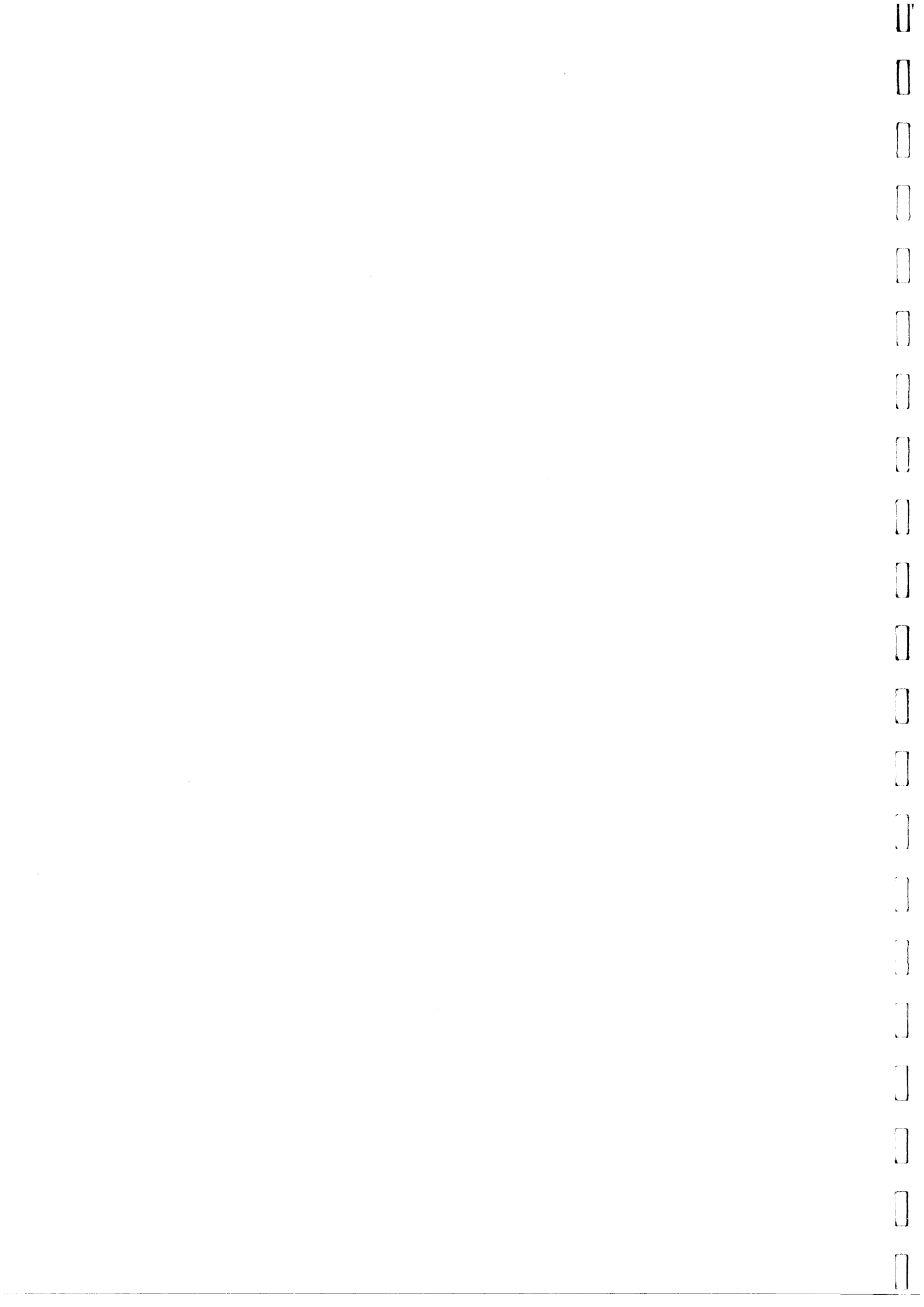
p2

p3

p4

p5

p6



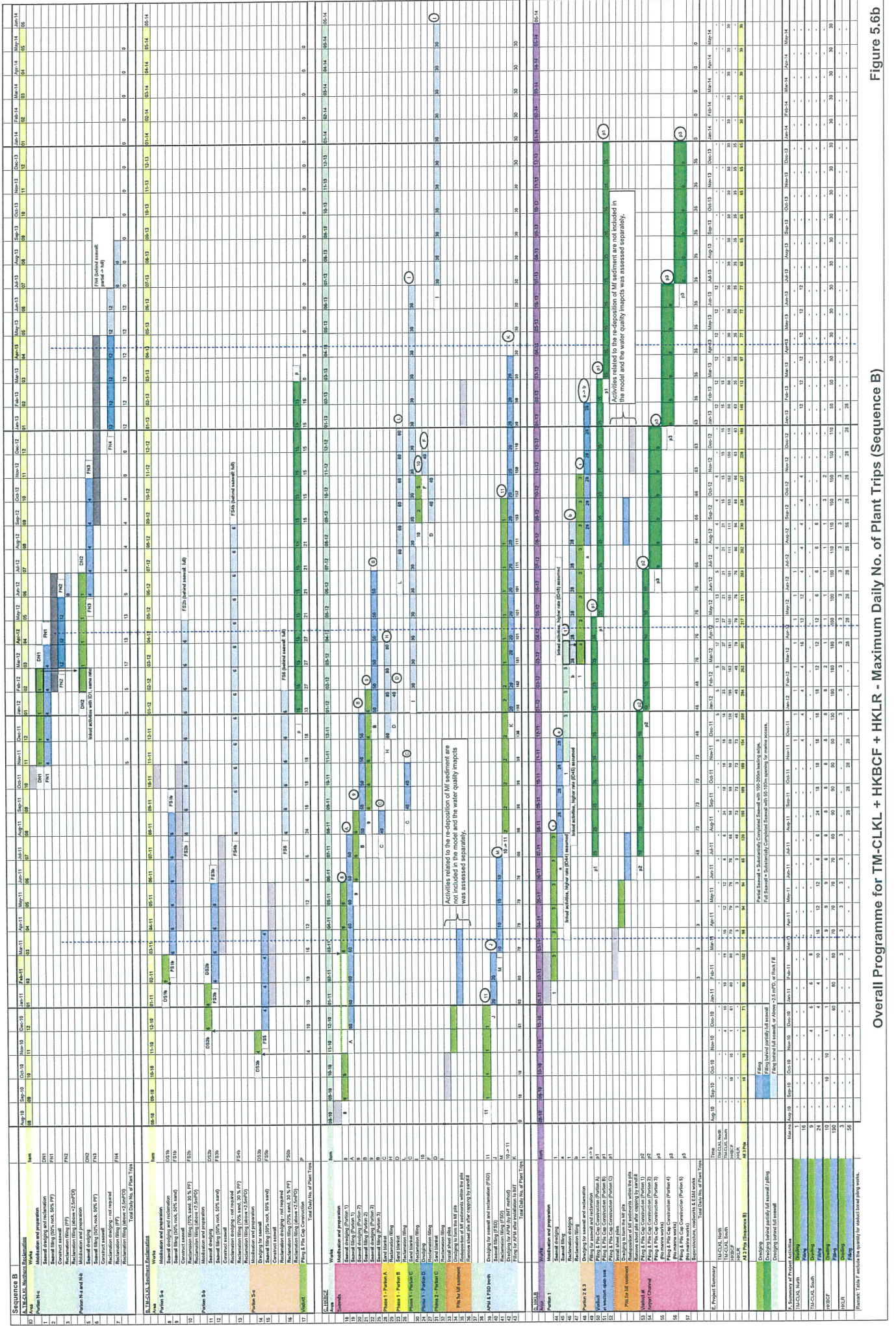
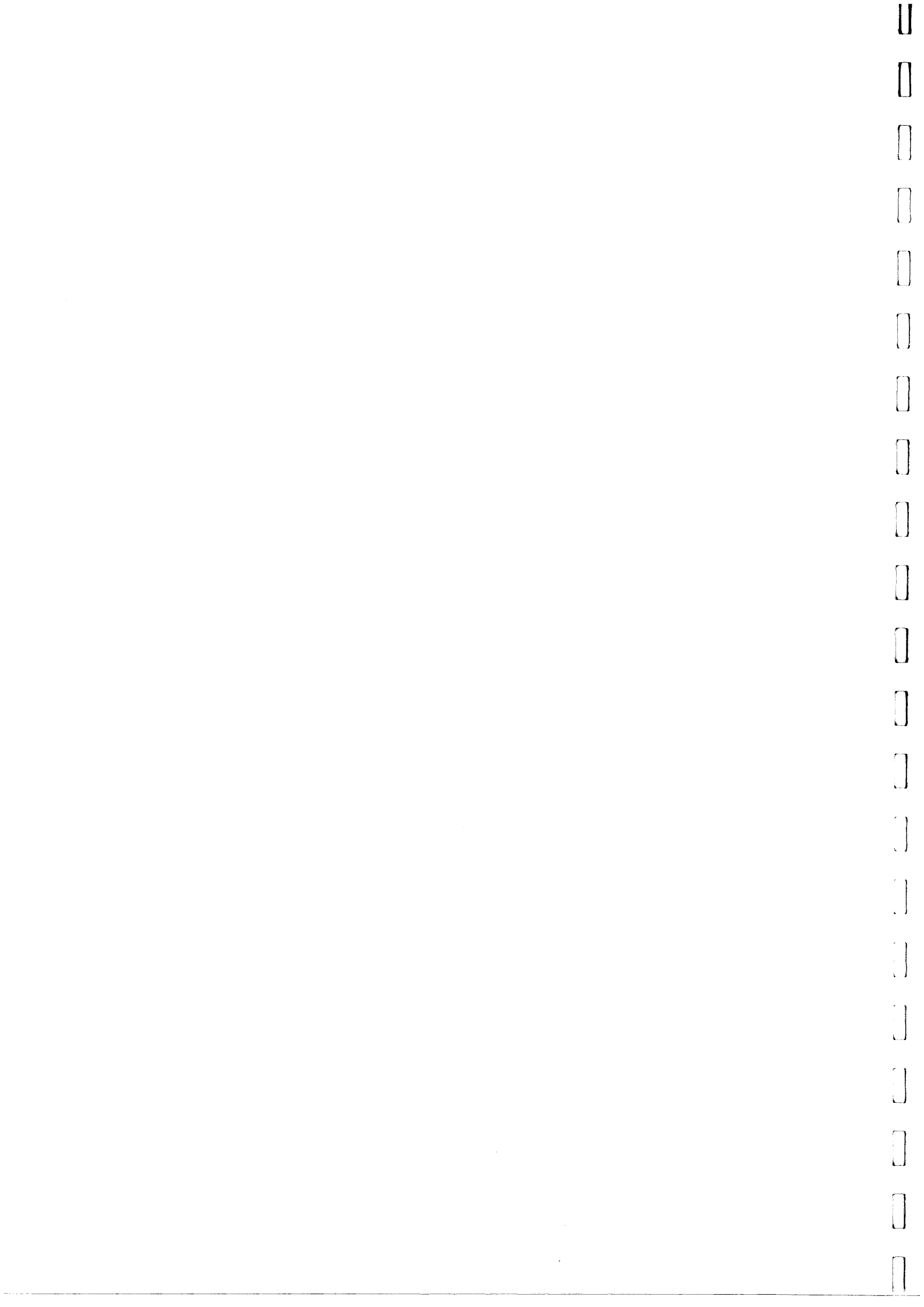
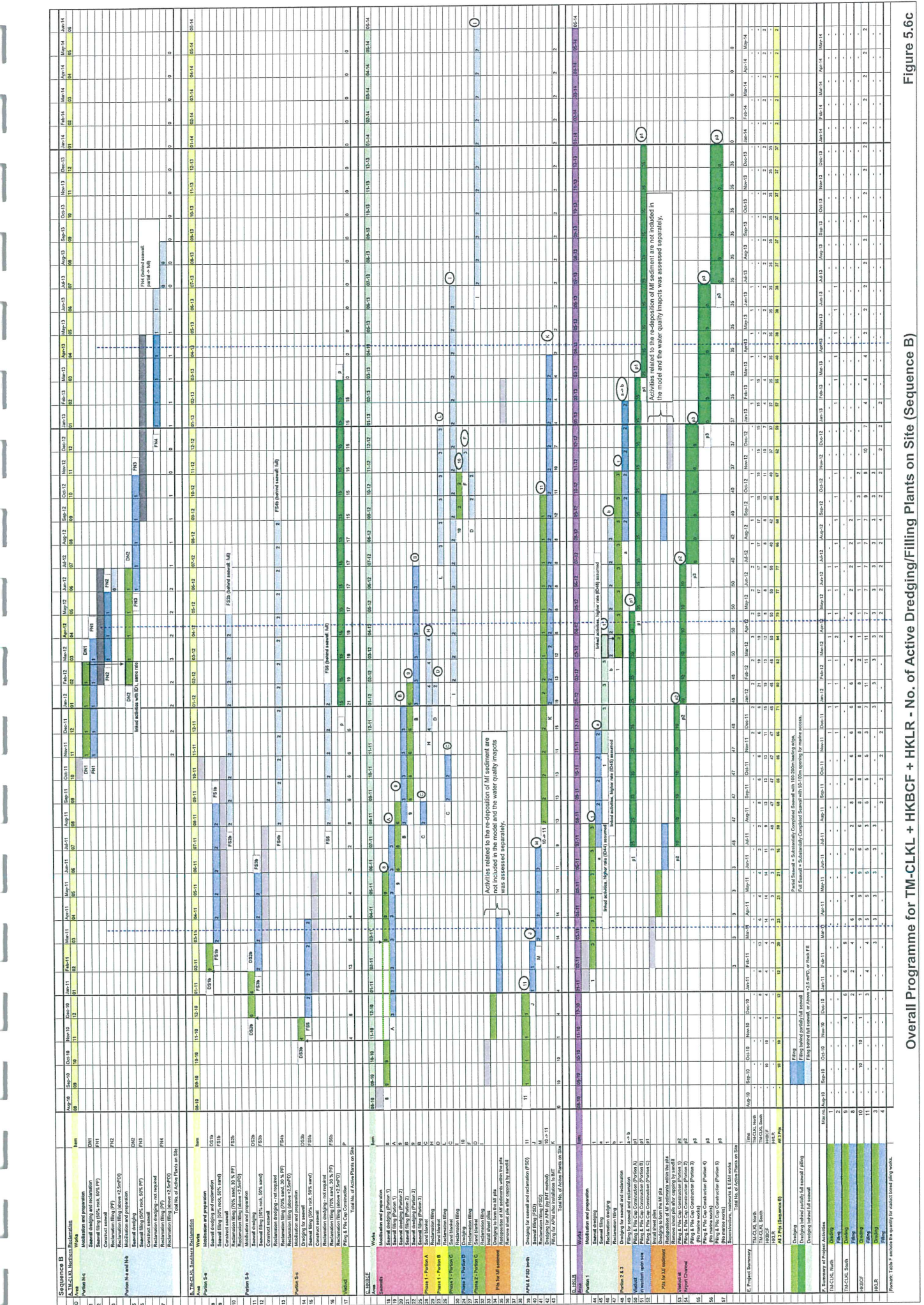


Figure 5.6b





Overall Programme for TM-CLKL + HKBCF + HKCLR - No. of Active Dredging/Filling Plants on Site (Sequence B)

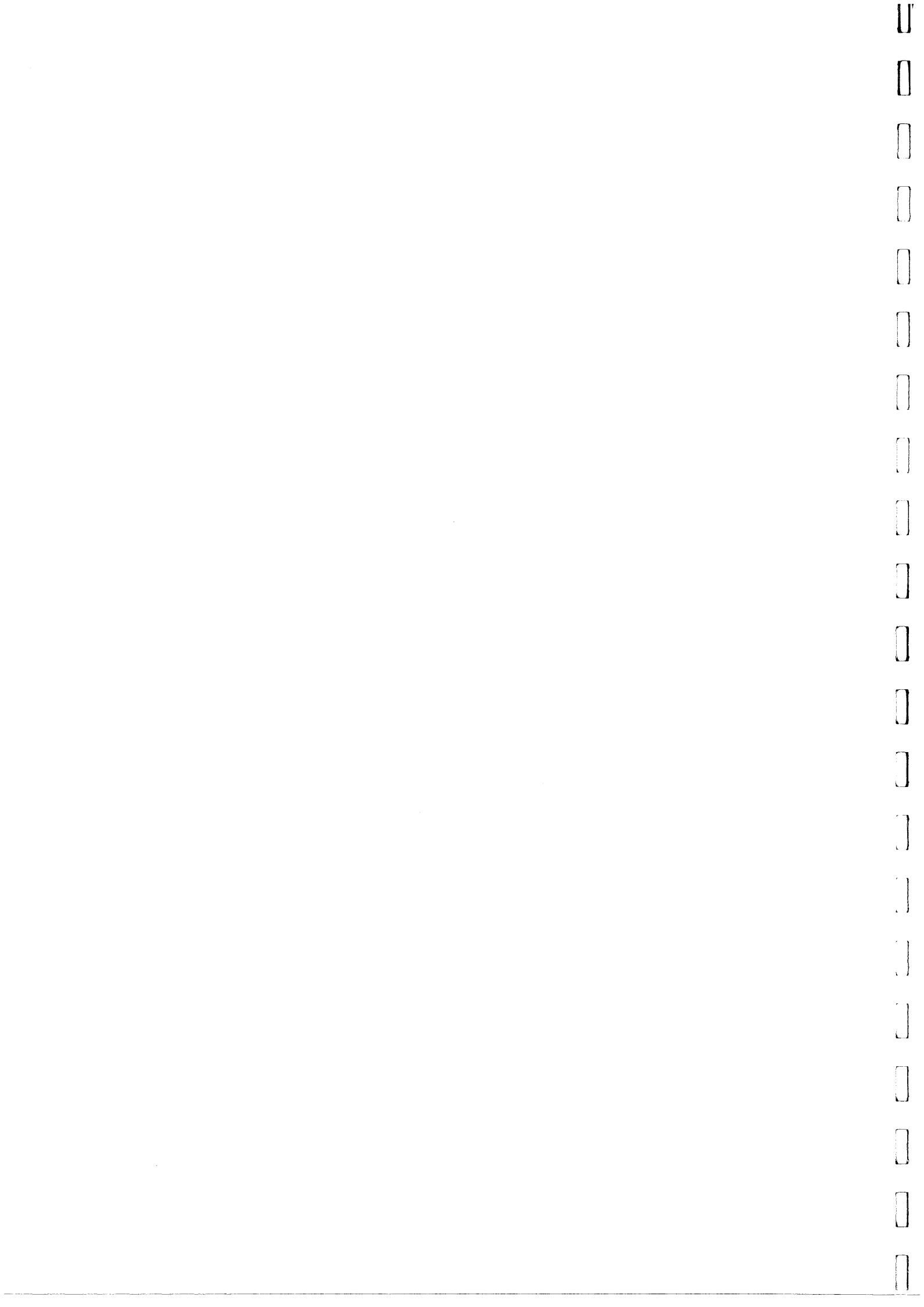


Figure 5.7 Water Quality Monitoring Data Record Sheet

Location				
Date				
Start Time (hh:mm)				
Weather				
Sea Conditions				
Tidal Mode				
Water Depth (m)				
Monitoring Depth		Surface	Middle	Bottom
Current Speed (predominant) (m/s)				
Current Direction (predominant)				
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

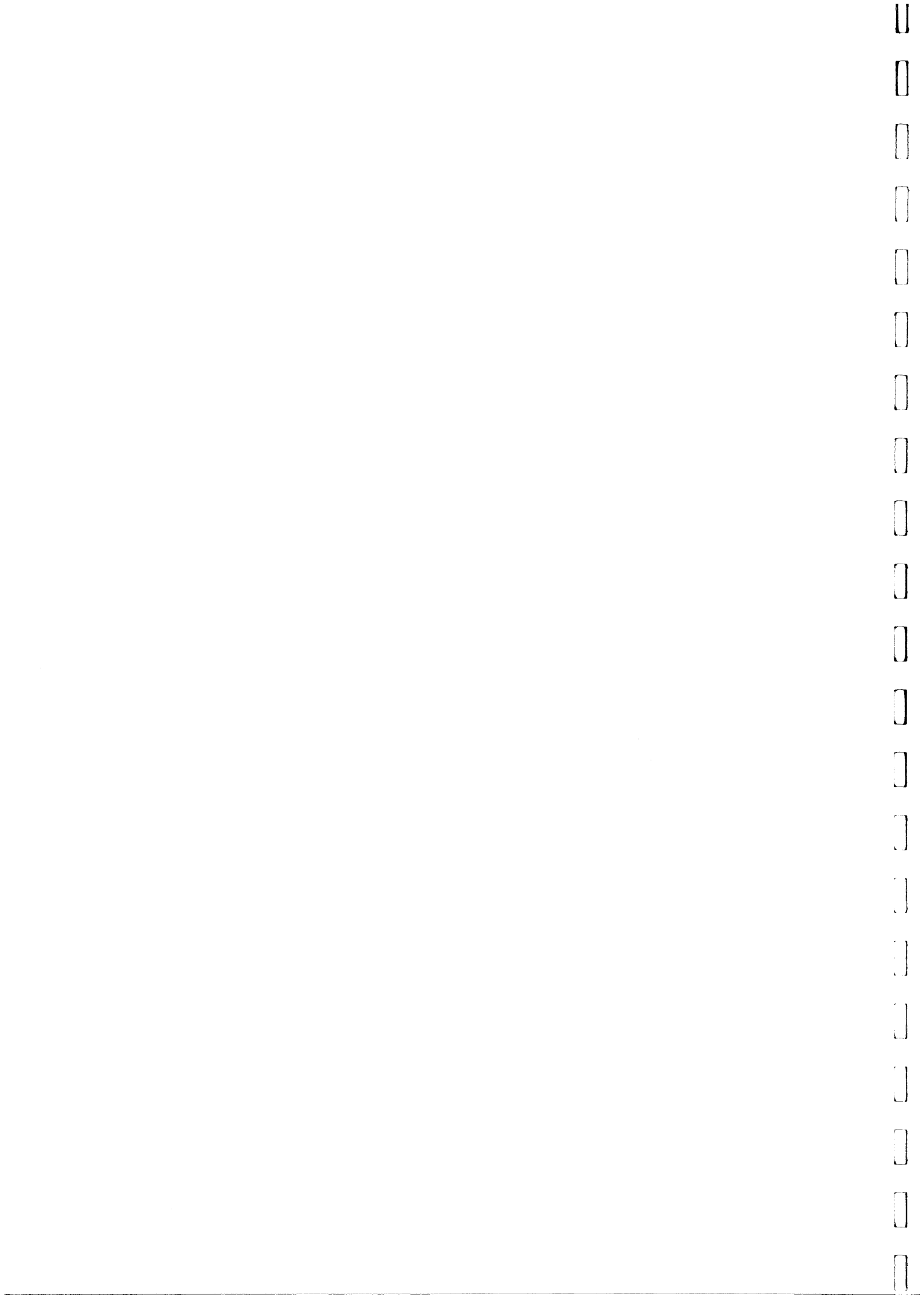
Signature

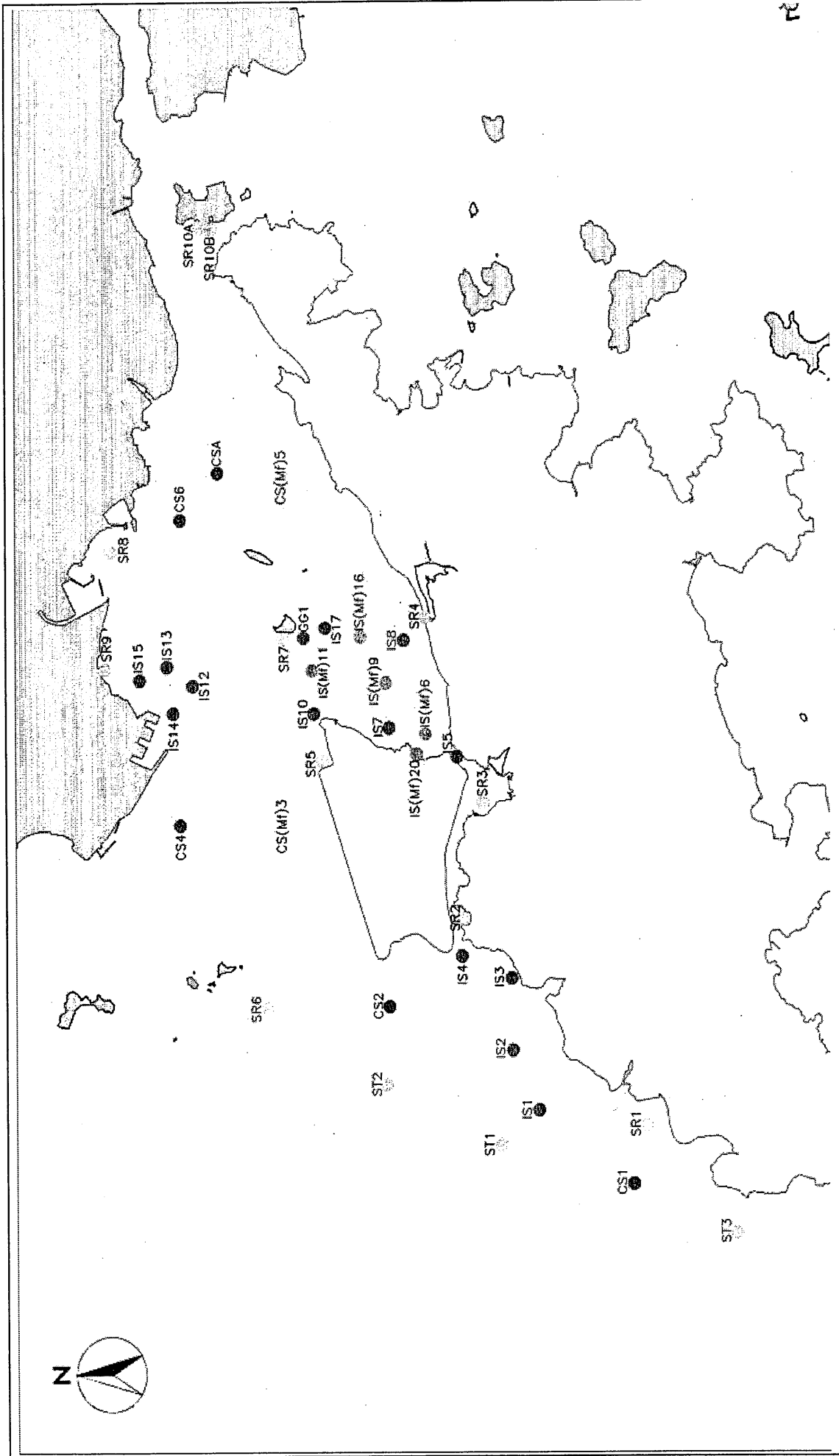
Date

Recorded By :

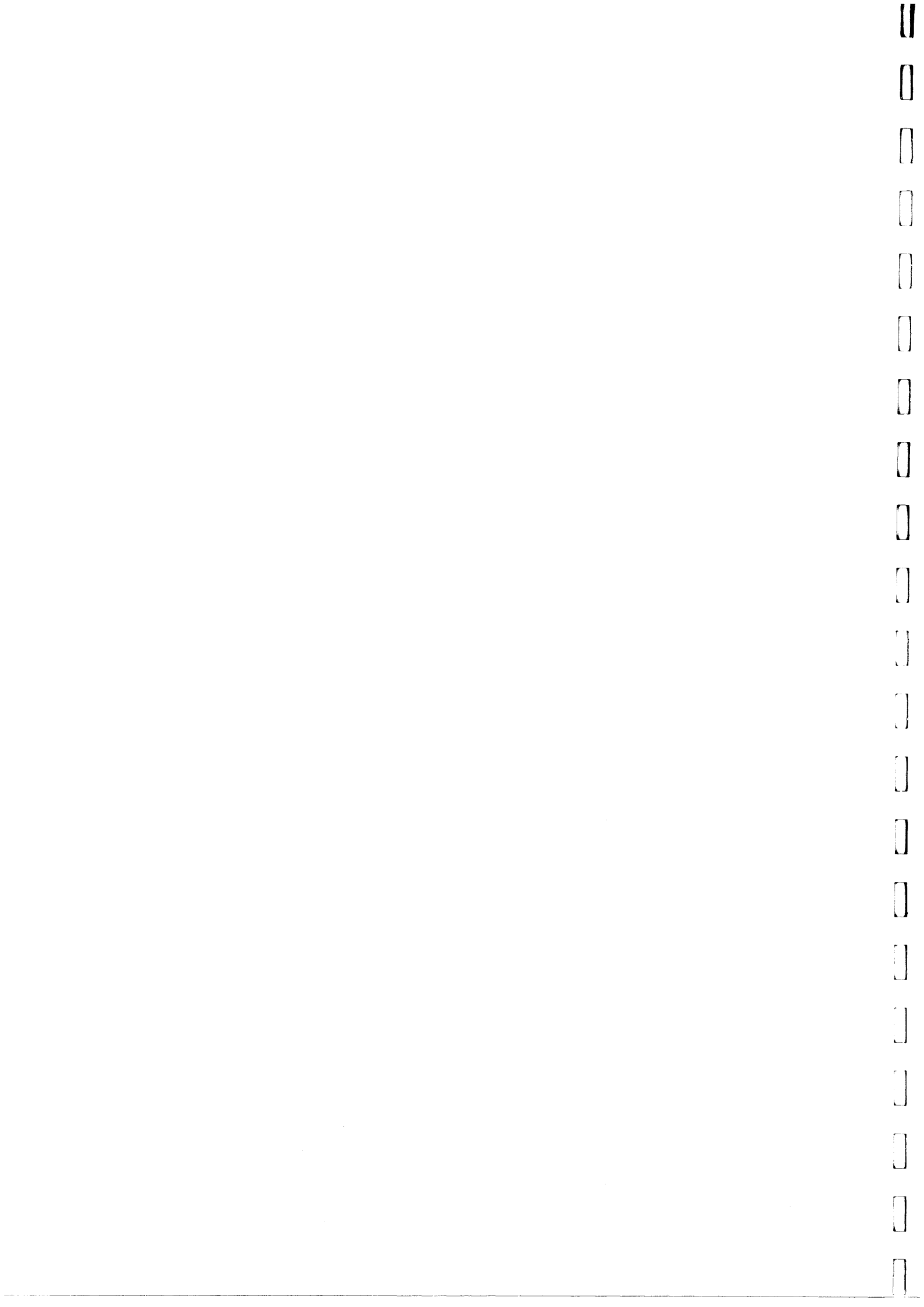
Checked By :

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





Title	Agreement No. CE 35/2011 (EP)		Scale	N.T.S	Project No.	MA11050
	Baseline Environmental Monitoring For Hong Kong-Zhuhai-Macao Bridge Hong Kong. Projects - Tuen Mun - Chek Lap Kok Link		Date	Nov-11	Figure	5.8
Location of Water Quality Monitoring Stations						
CINOTECH						



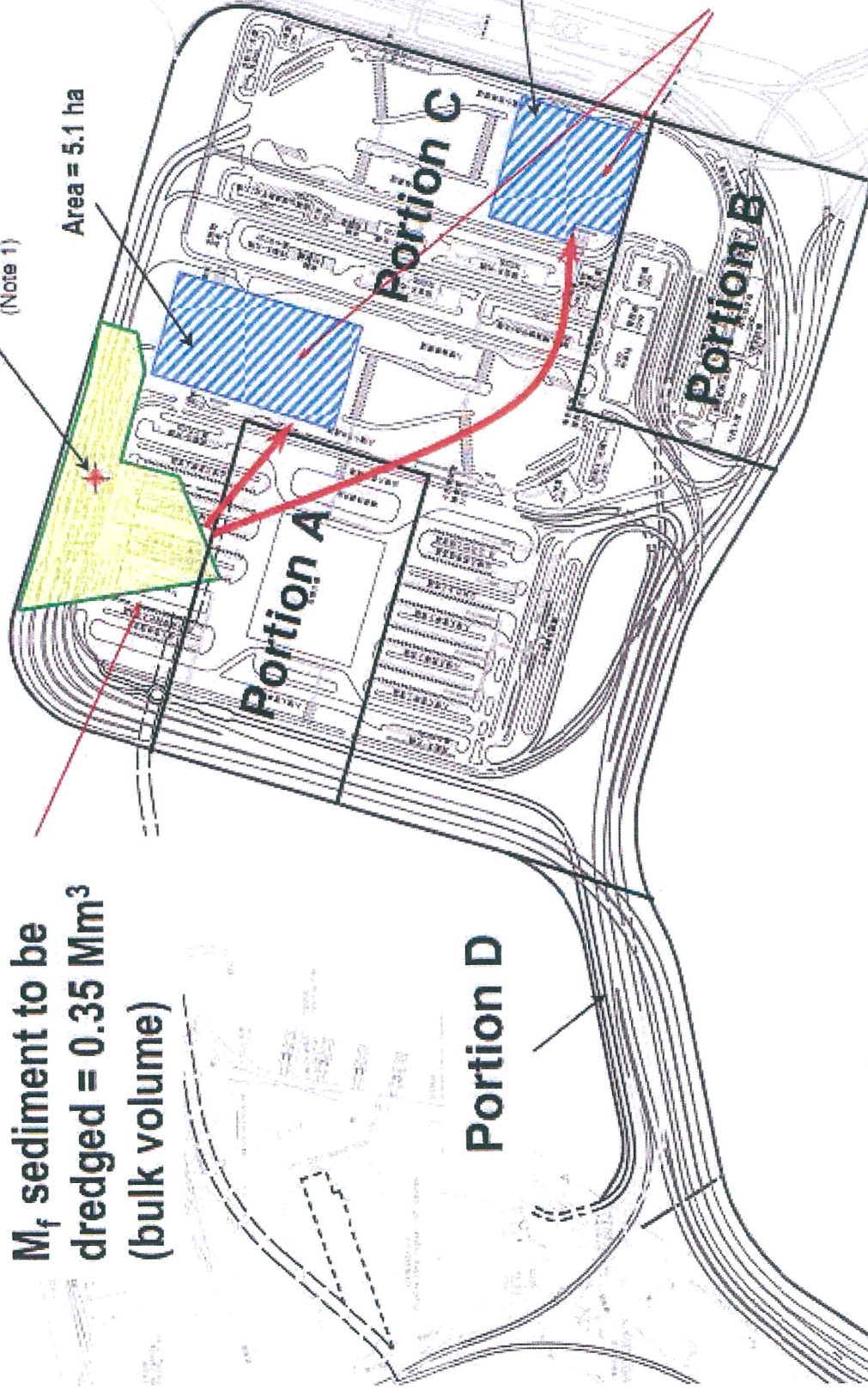
M_f sediment to be dredged = 0.35 Mm³ (bulk volume)

Vibrocore BCF/VC-A01 (Note 1)

Area = 5.1 ha

Area = 3.3 ha

Reclamation area to receive M_f sediment



Note 1:

Elutriate test result of sample obtained from Vibrocore BCF/VC-A01 at the depth of 9.9m to 10.8m is used for assessing the effect of depositing M_f Sediment to the water sensitive receivers



HIGHWAYS DEPARTMENT
 路政處
 地址：香港德輔道中 11 號
 Hong Kong
 Project Management Office



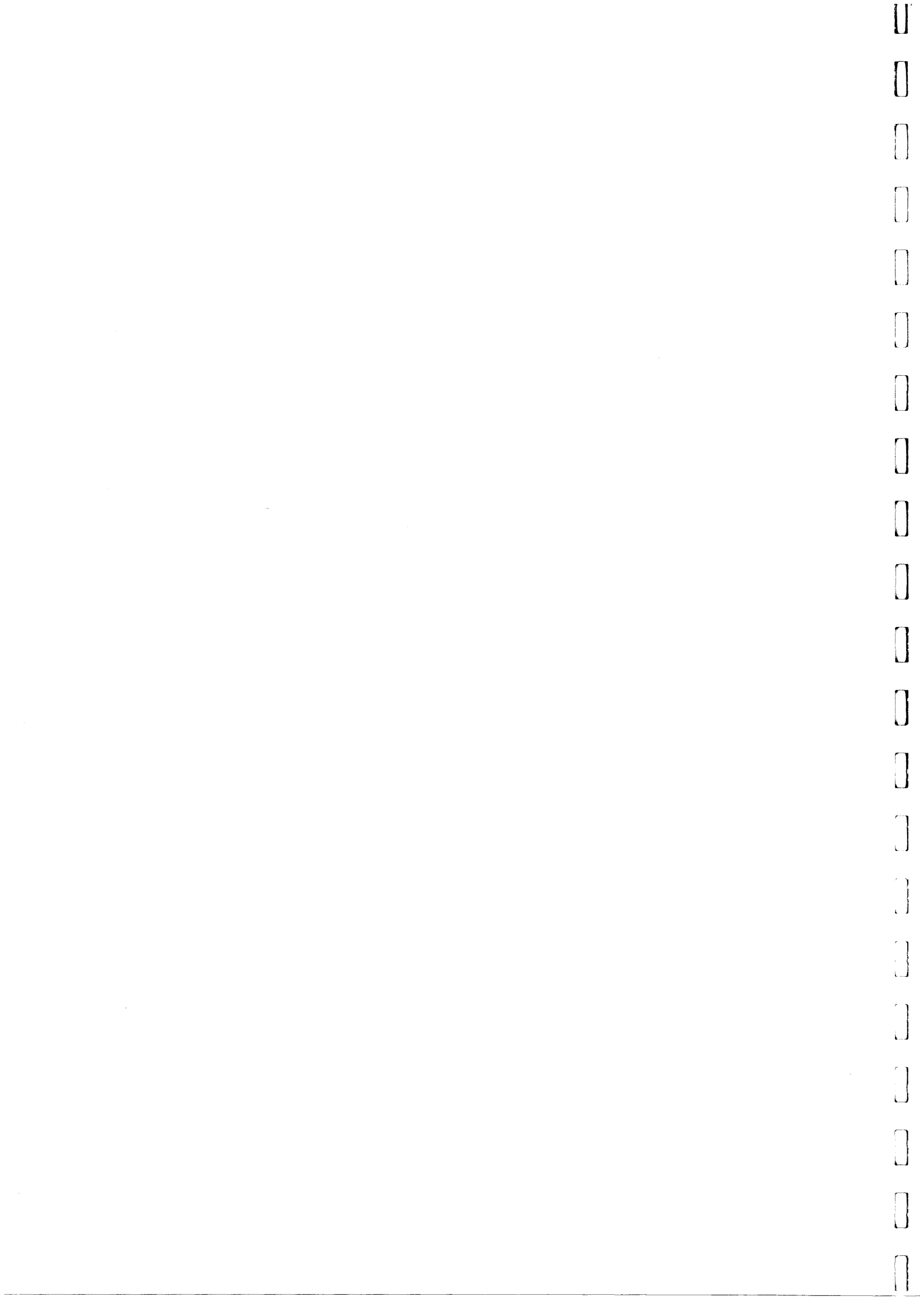
ARUP
 奧雅工程顧問
 香港中環皇后大道中 70 號 7 樓
 Hong Kong

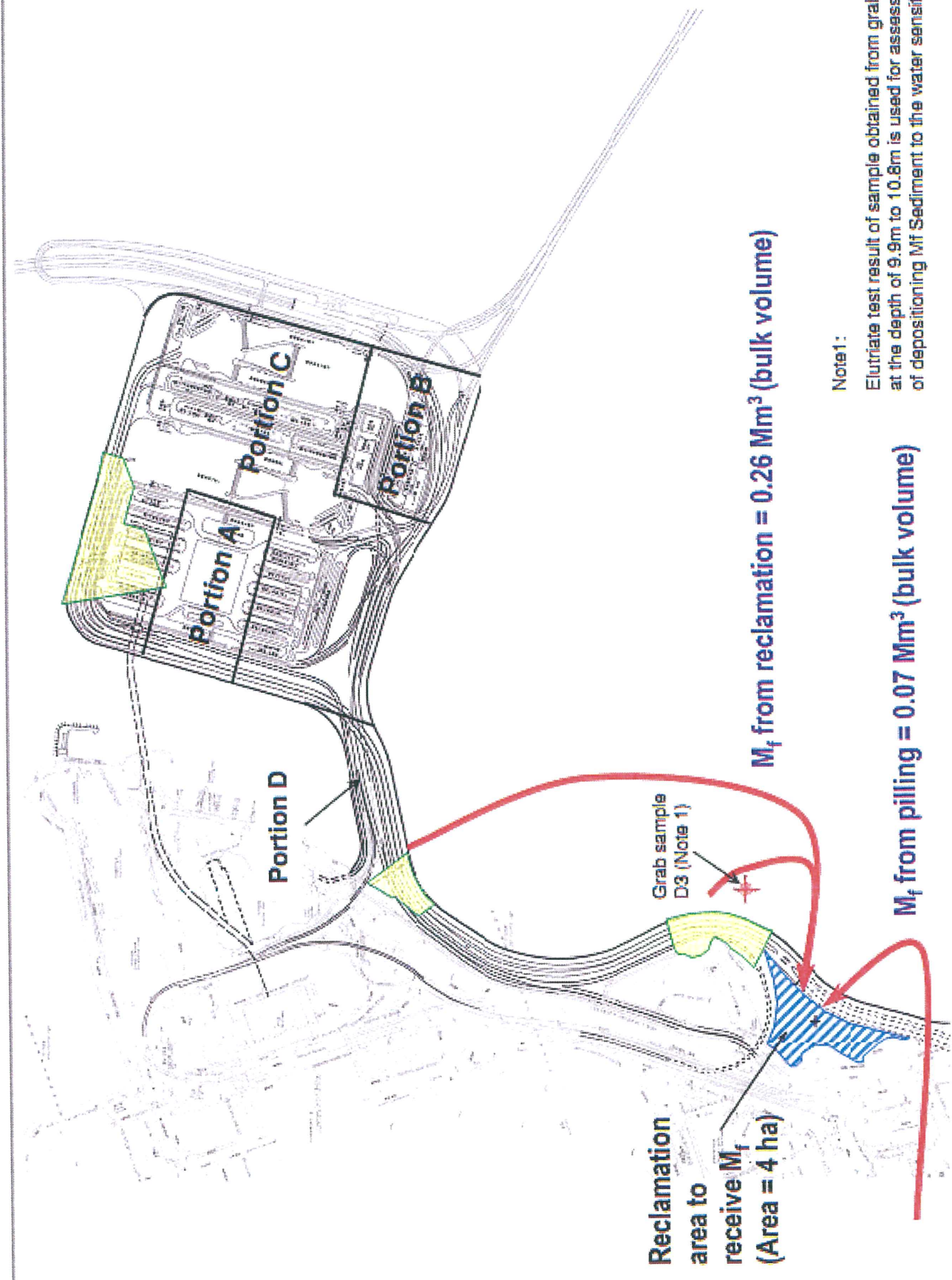
Figure 13a

Location Plan for the Proposed Pits to Receive M_f Sediment in HKBCF

Figure 13b

5.9





Reclamation area to receive M_f (Area = 4 ha)

M_f from reclamation = 0.26 Mm^3 (bulk volume)

M_f from pilling = 0.07 Mm^3 (bulk volume)

Note 1:

Elutriate test result of sample obtained from grab sample D3 at the depth of 9.9m to 10.8m is used for assessing the effect of depositing M_f Sediment to the water sensitive receivers



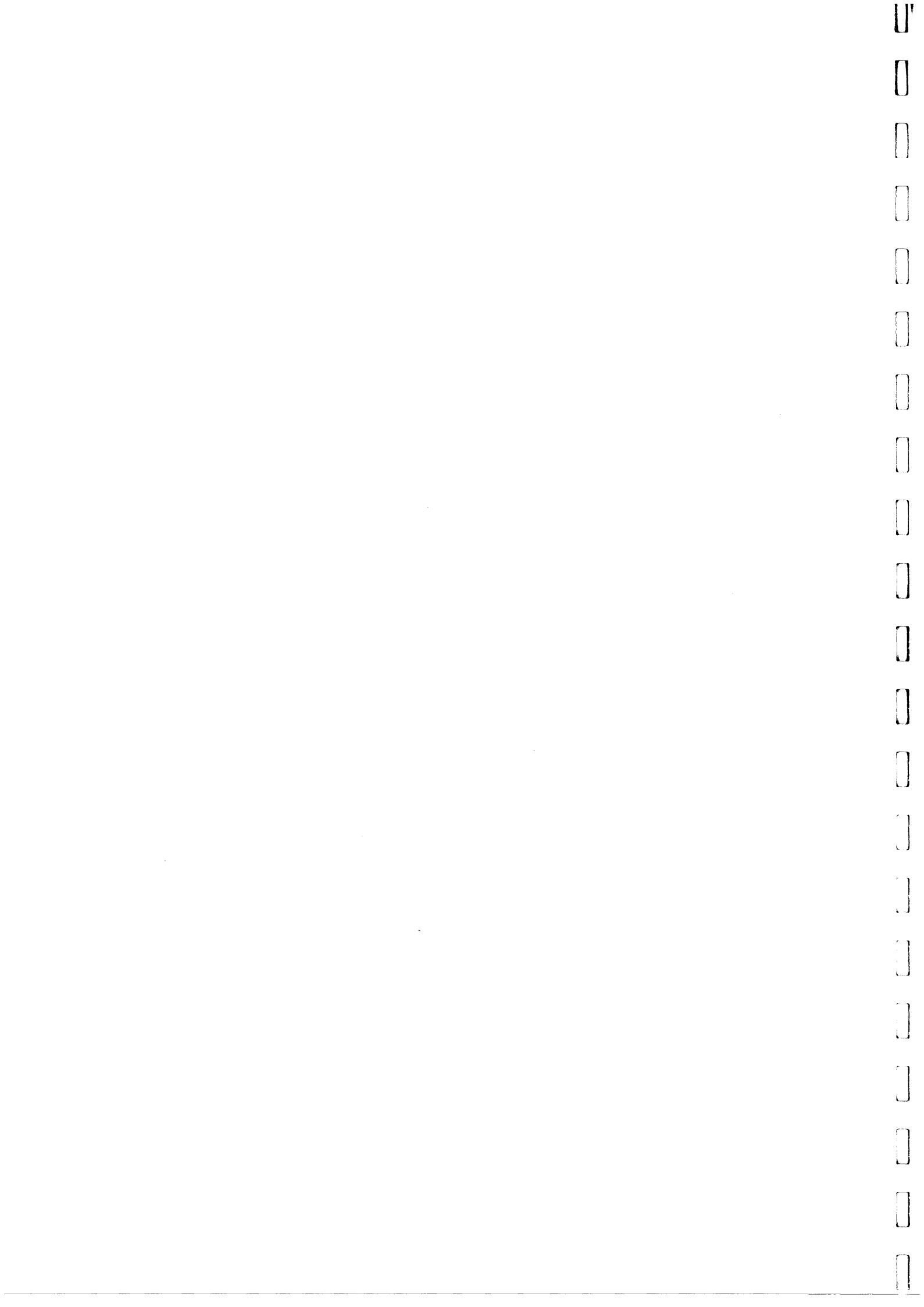
路政處
 HIGHWAYS DEPARTMENT
 道路工程處
 Hong Kong - Zhuhai - Macao Bridge
 Hong Kong Project Management Office

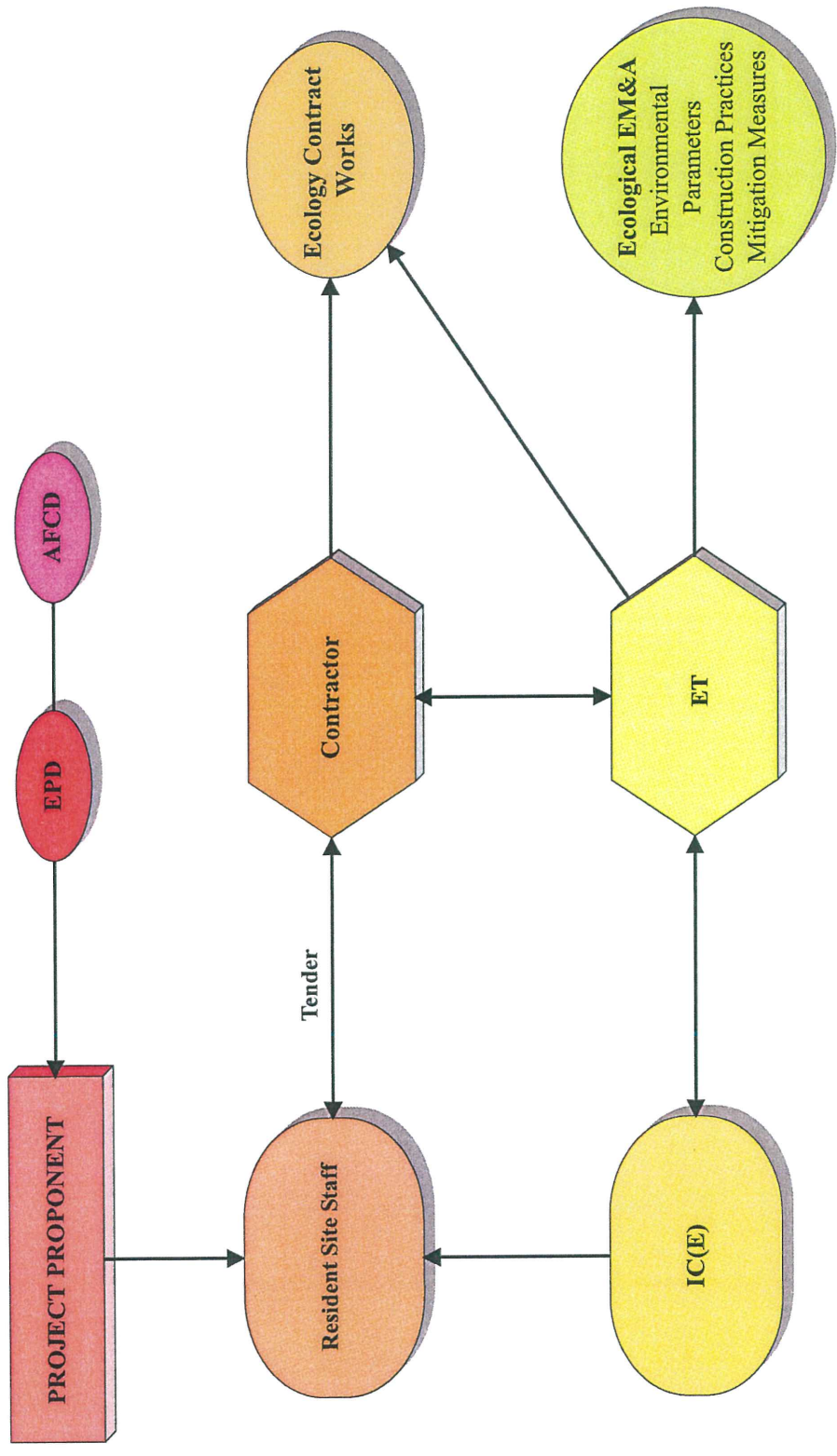


Location Plan for the Proposed Pits to Receive M_f Sediment in HKLR

Sheet No.

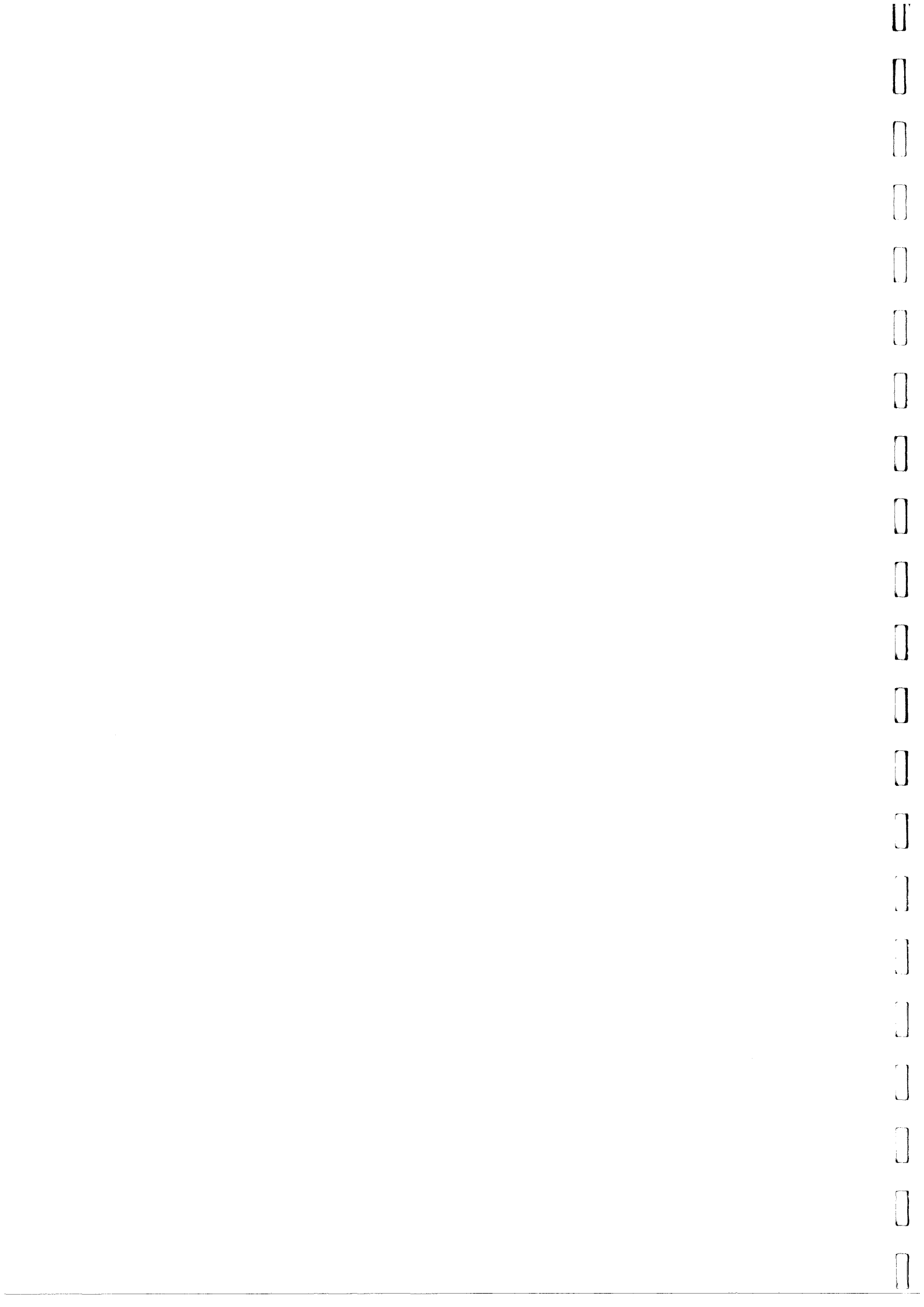
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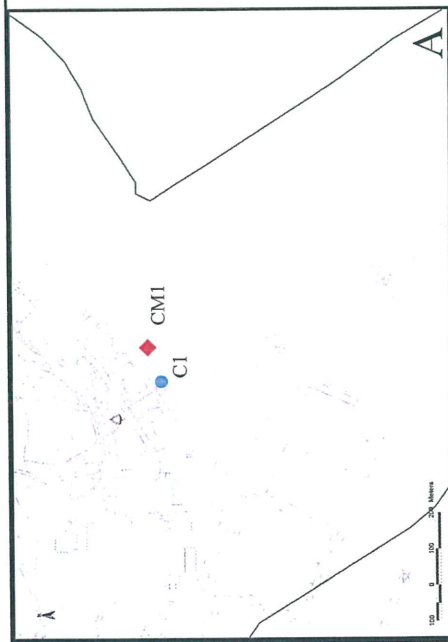
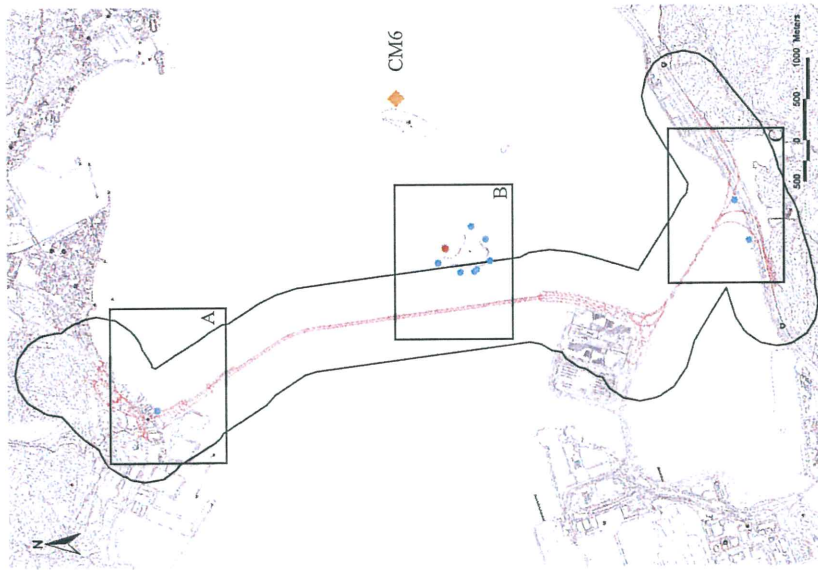
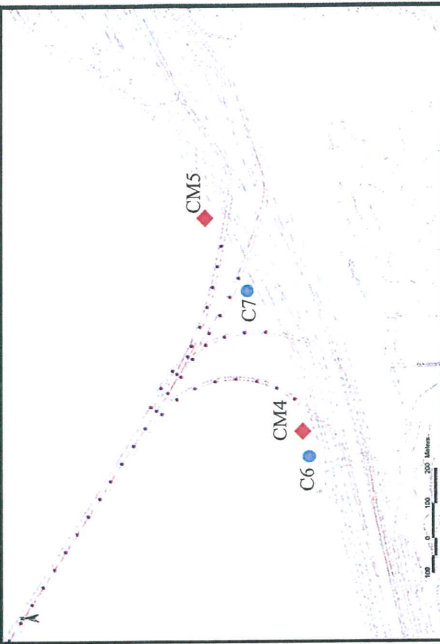




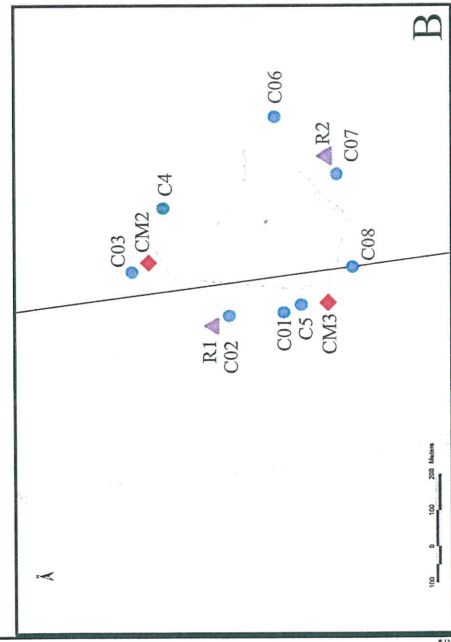
Construction Phase Ecological EM&A Procedure

Figure No. 6.1





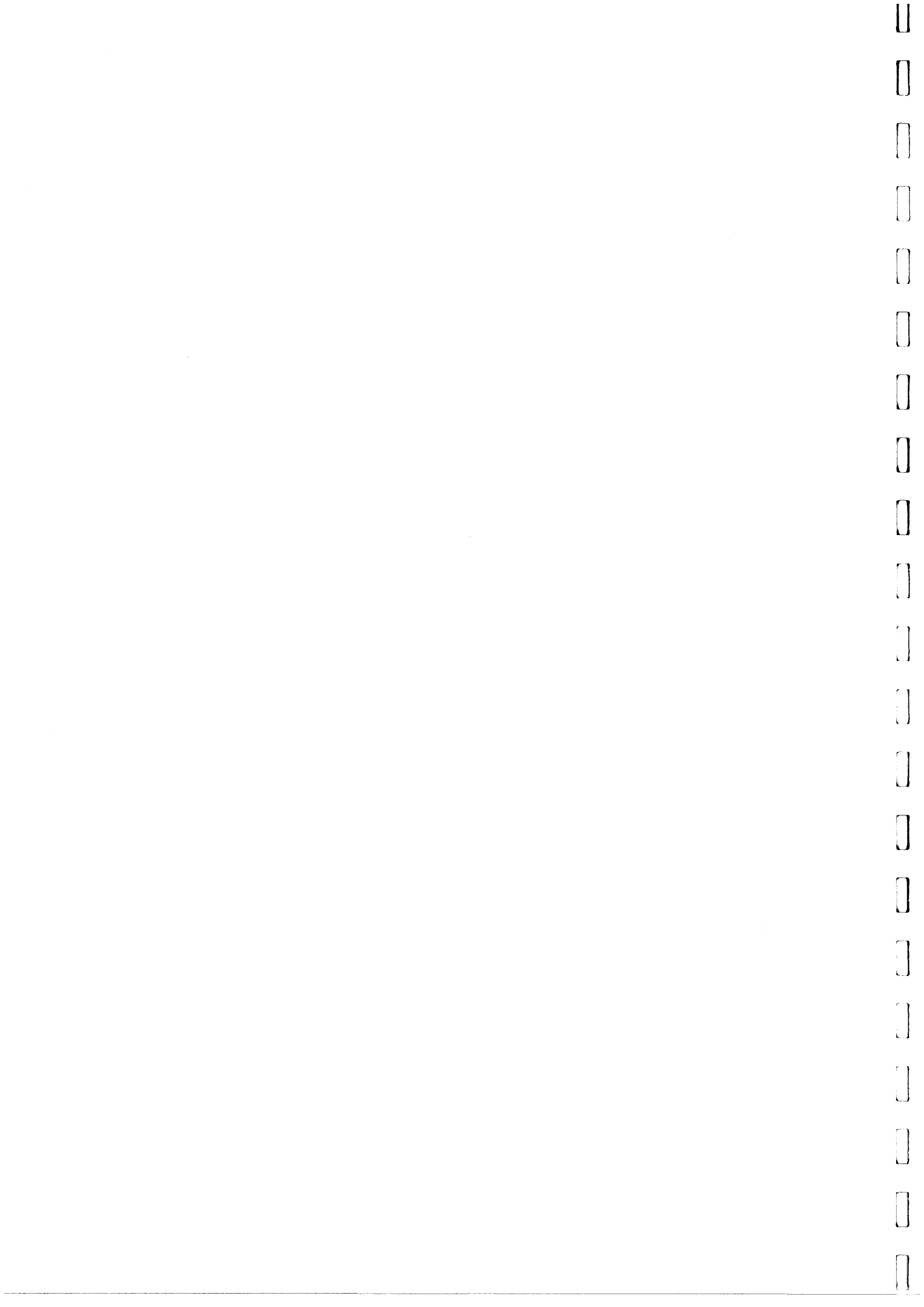
CM3



Legend

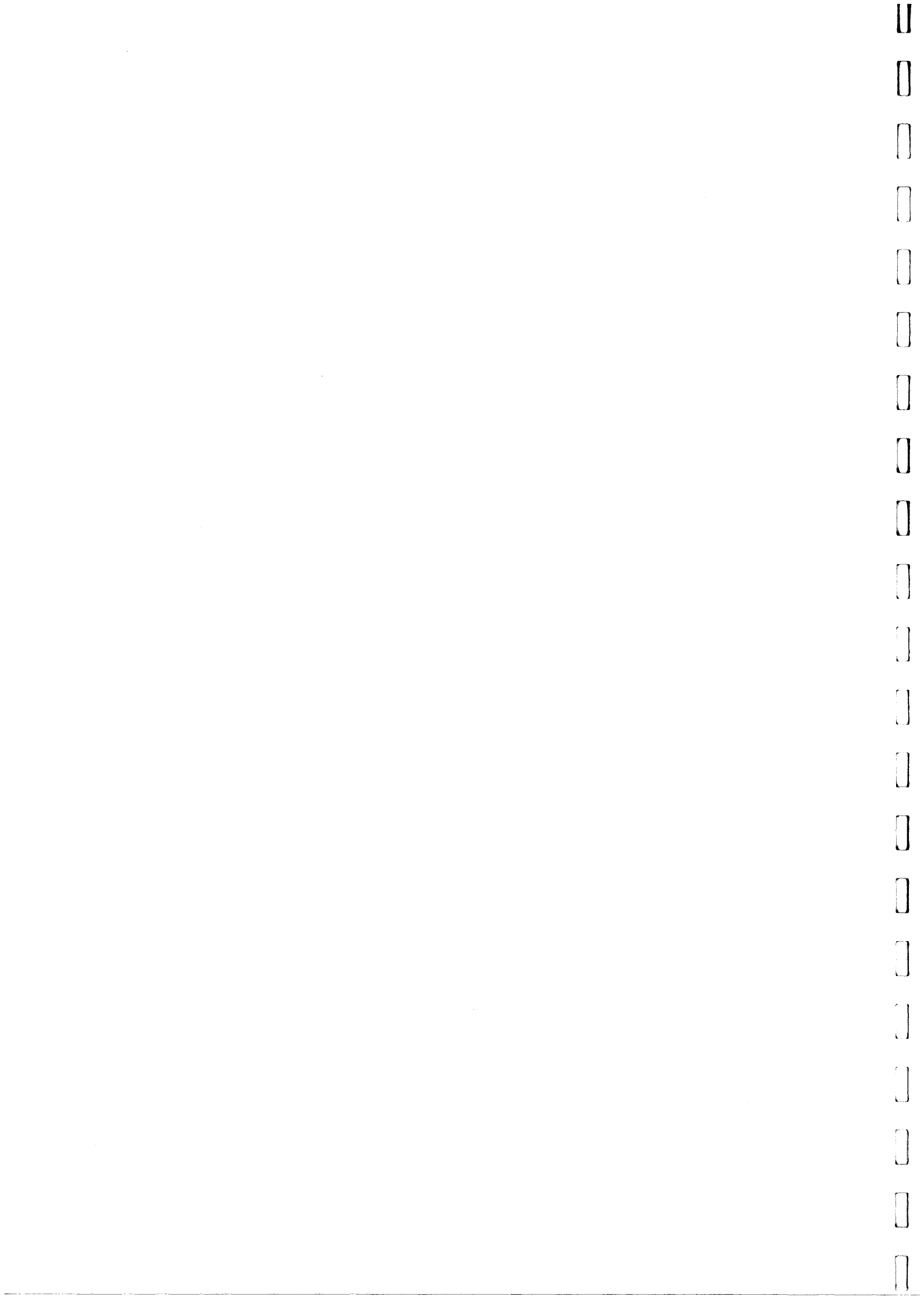
- Hard and Soft Corals Recorded
- Soft Coral Recorded
- Pier of TM-CLKL Viaduct
- ▲ Proposed Relocation Site
- ◆ Proposed Impact Monitoring Site
- ◆ Proposed Control Monitoring Site

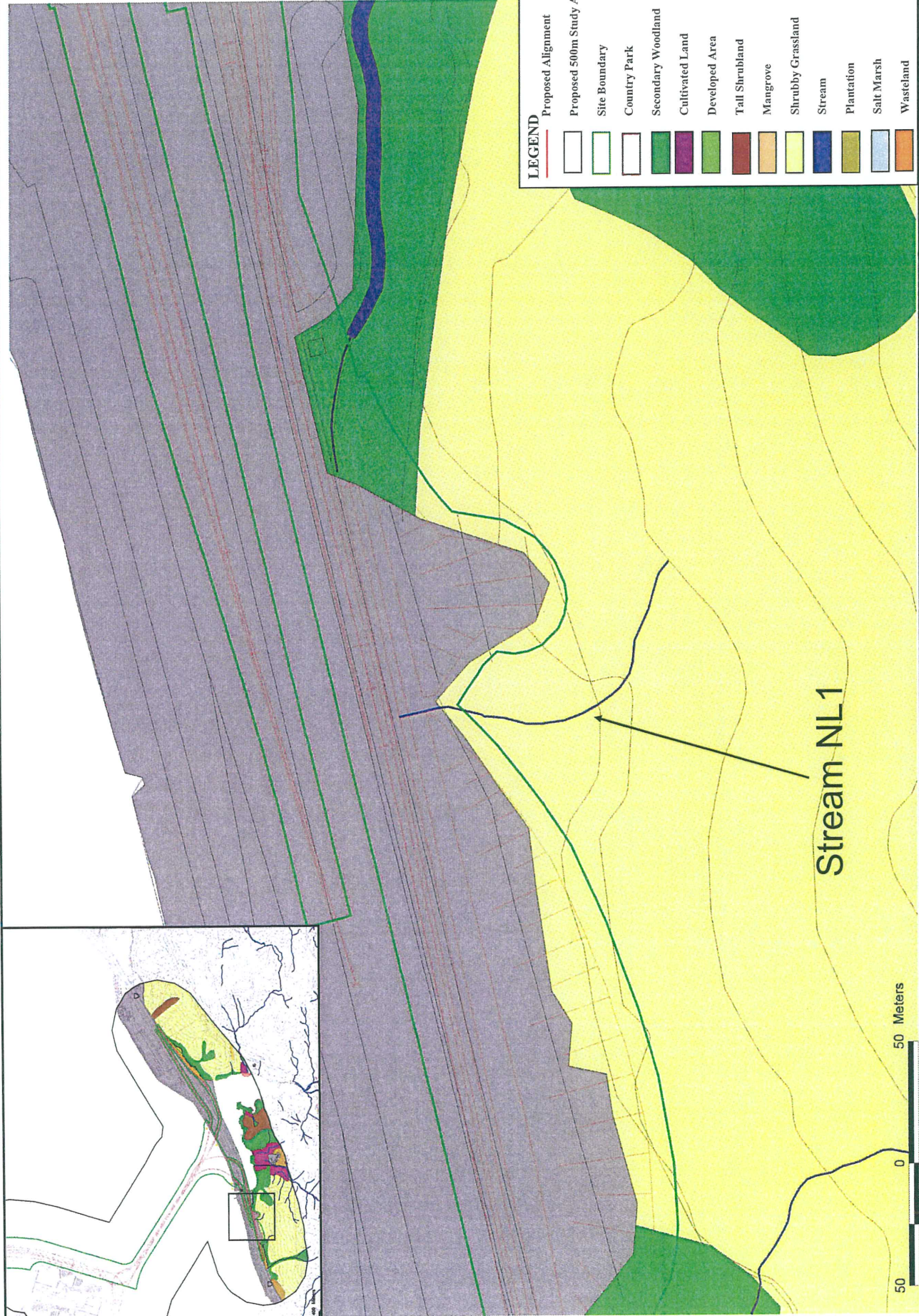
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CHECK	---	DRAWN	---
JOB NO.	08111511	DRAWING NO.	6.2
TUENGIKUMUN CIBIEK LAPHOKK LINK -- INKUSSEKADON		REV	---
AGREEMENT NO. CE 552/2007(HRY)		Locations of Hard and Soft Coral Surveyed Under TM-CLKL Coral Study (2008-2009) and Relocation Sites	
MAUNSELL		REV	





MAUNSELL CONSULTING ENGINEERS 1000 N. 10th St., Suite 100 Anchorage, Alaska 99503 Phone: 907.561.1111 Fax: 907.561.1112 Email: maunsell@maunsell.com	AGREEMENT NO. CE 52/2007(HR)Y TUEKJUNJUN - GIBEK LAPPKOK LINK -- JINWASEGKAGOMON		SCALE CHECK JOB NO.	NTS ---	DATE DRAWN DRAWING NO.	MAY. 2009 --- 08111511
	Layout of transect lines of Chinese White Dolphin survey in Northeast and Northwest Lantau survey area			JOB NO.	DRAWING NO.	REV --- 6.3 ---

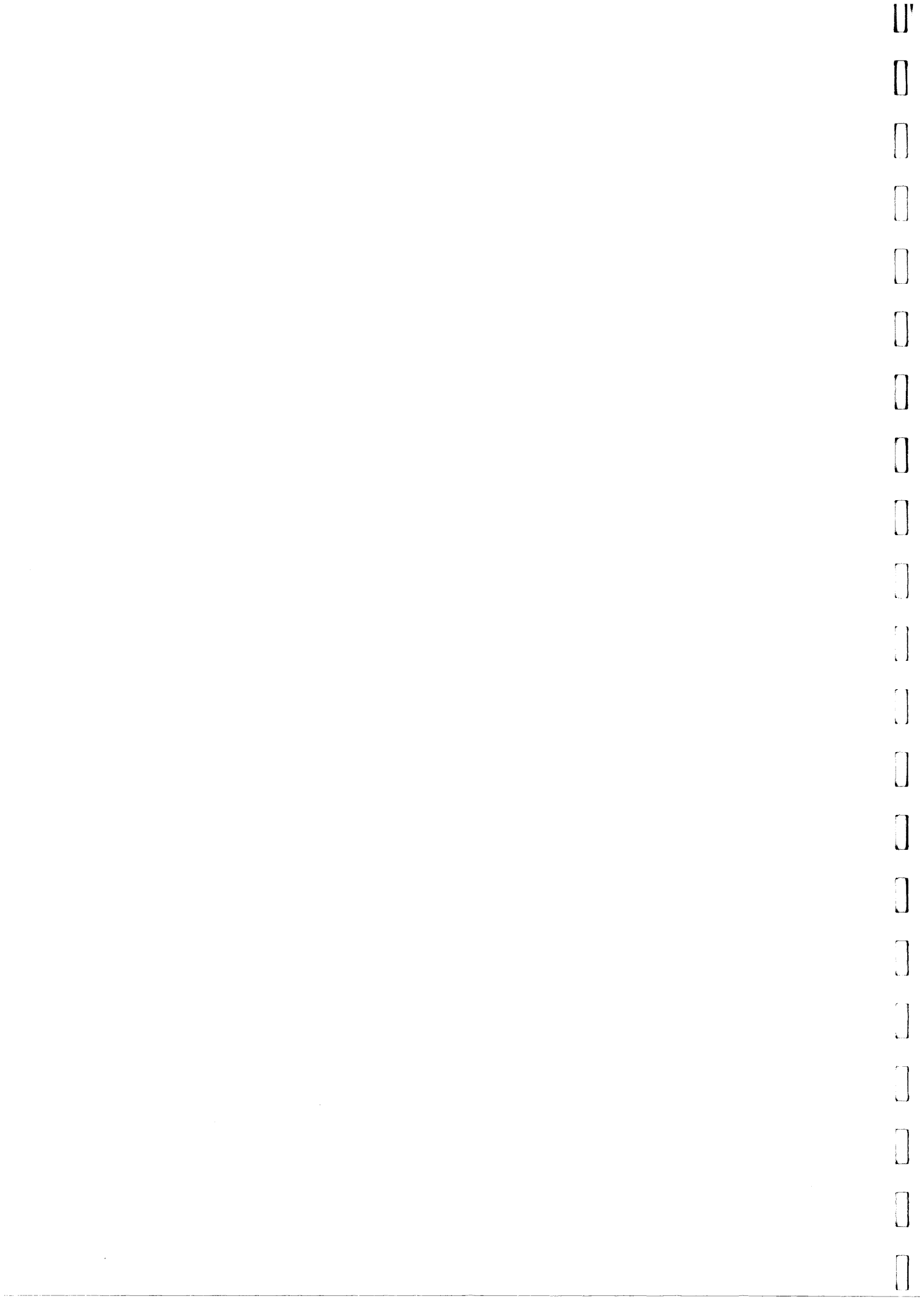




LEGEND

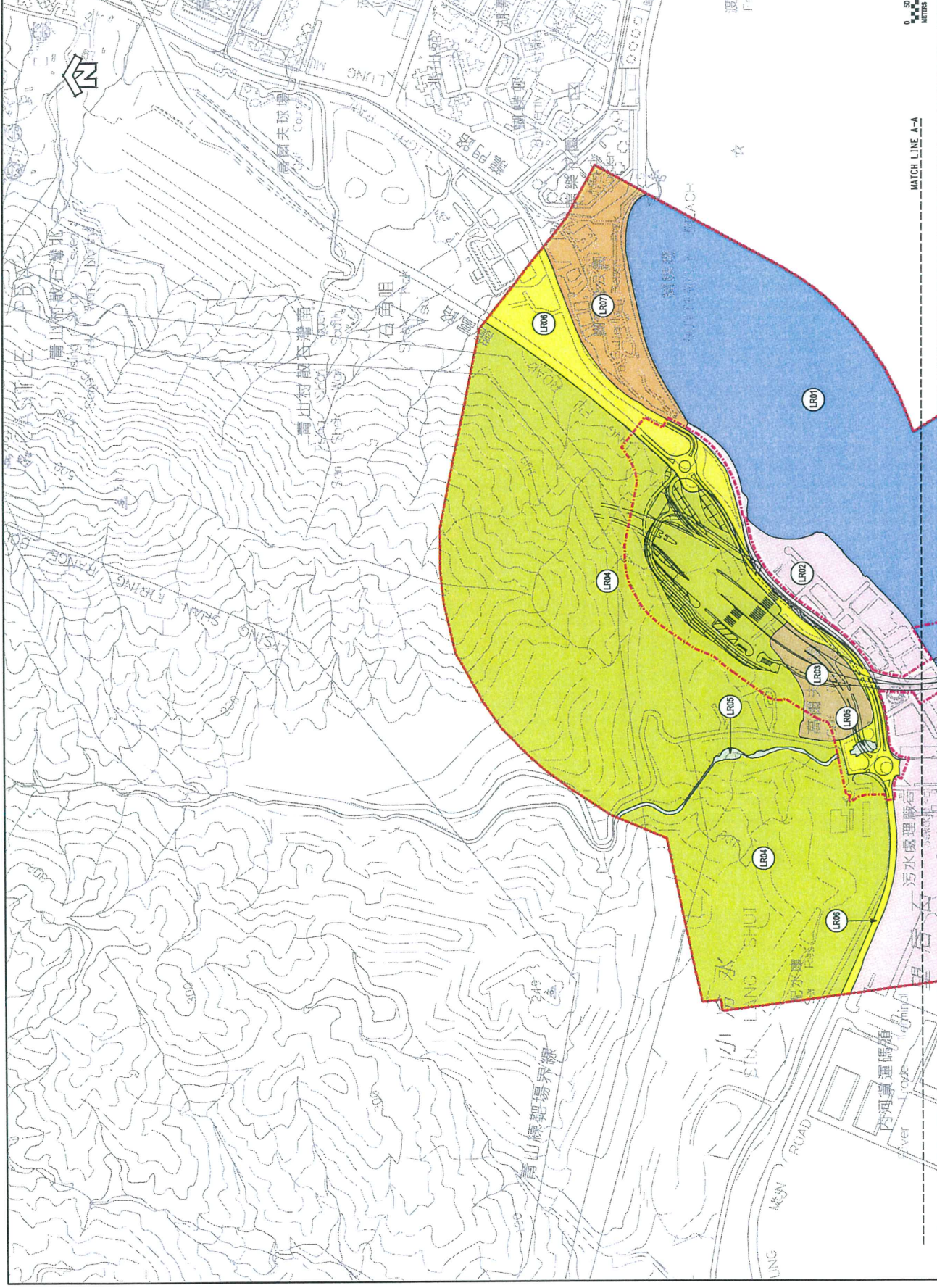
	Proposed Alignment
	Proposed 500m Study Area
	Site Boundary
	Country Park
	Secondary Woodland
	Cultivated Land
	Developed Area
	Tall Shrubland
	Mangrove
	Shrubby Grassland
	Stream
	Plantation
	Salt Marsh
	Wasteland

MAUNSELL CONSULTANTS 10/F, SCIENCE RESOURCE CENTRE 3 HONG KONG AVENUE, HONG KONG	SCALE: NTS CHECK: --- JOB No.: 08111511	DATE: MAY, 2009 DRAWN: --- DRAWING No.: 6.4	REV: ---
	AGREEMENT NO. CE 52/2007 (HY) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION Location of Stream NL1		



LEGEND:

	LANDSCAPE IMPACT STUDY BOUNDARY (200M)
	WORKS BOUNDARY
	BEACHES ROCKY AND SHORELINE BEACH AT PILLAR POINT
	PLAY AREA WITHIN THE RECREATIONAL AREA AND SEWAGE TREATMENT PLANT AT PILLAR POINT
	TEMPORARY RIVER TRADE GOLF WITHIN THE PLANNED CREMATORIUM, CENTRE AND OPEN SPACE
	TALL SHRUBLAND AND DISTURBED HILLSIDE PLANTATION AREA AT PILLAR POINT
	STREAM COURSE AT PILLAR POINT
	ROADSIDE PLANTING ALONG LUNG MAN ROAD
	BUTTERFLY BEACH PARK AND BUTTERFLY BEACH



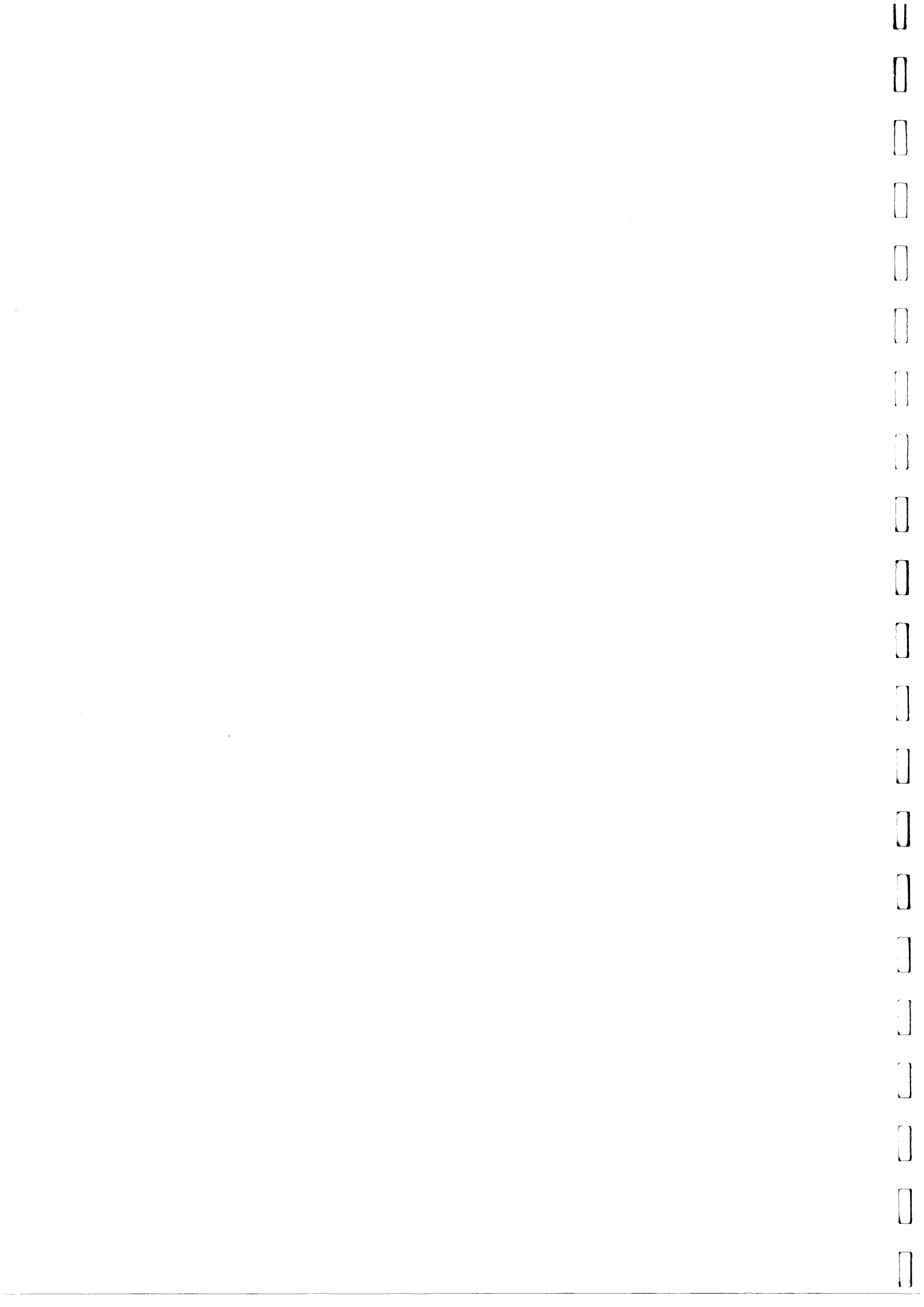
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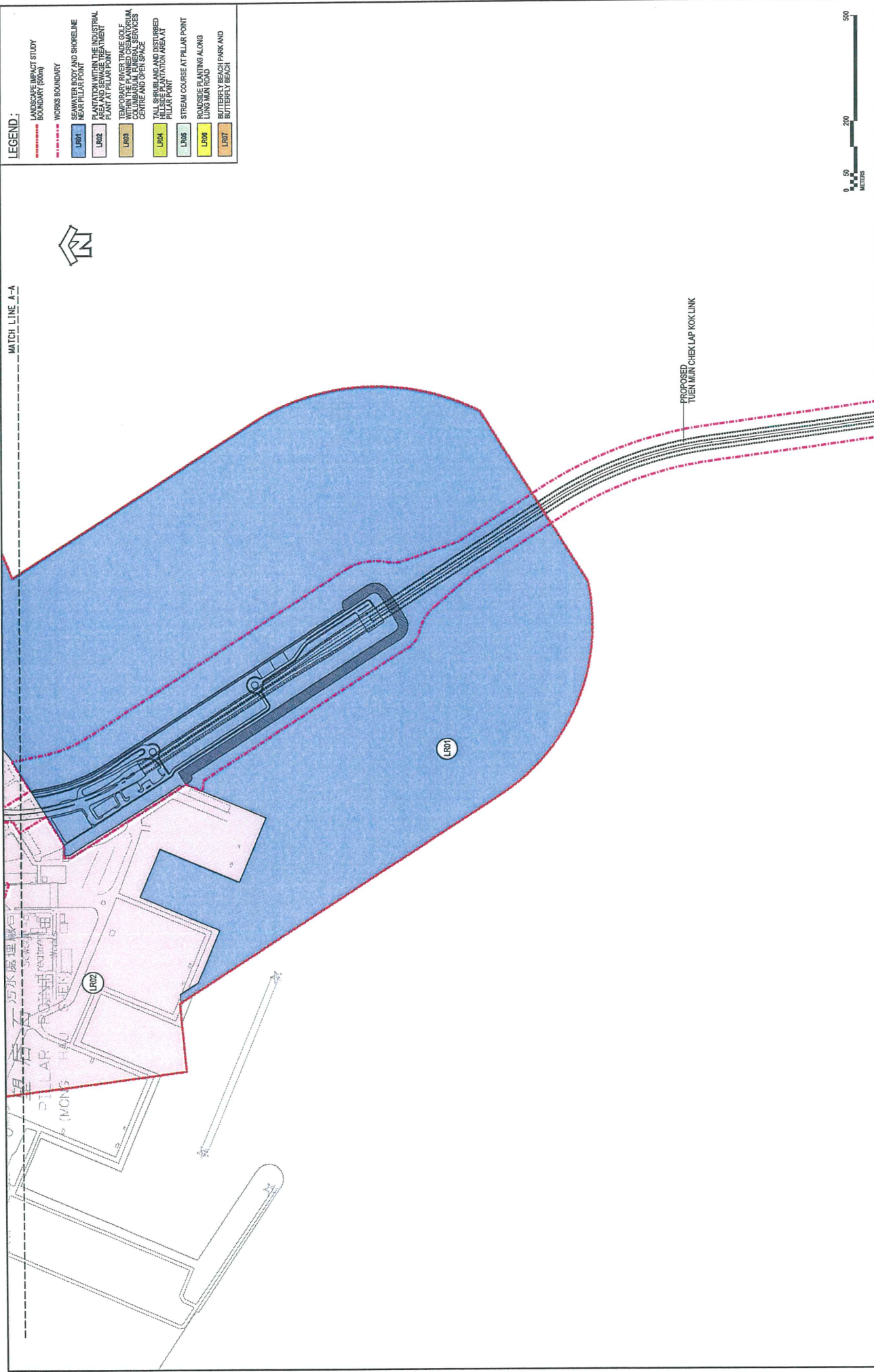
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	TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION	1:10000	MAY 2009	F.L.
D:\2008278 TM-CLK\03CAD\3.1\Sheets\L.VIA-EMAF\FIG-07-01-01-1.dgn	BASELINE LANDSCAPE RESOURCES WITH DEVELOPMENT PROPOSAL OVERLaid	CHECK	DRAWN	DRAWING NO.
		E.L.		60044963
		JOB No.		FIGURE 7.1.1.1

SHEET 1 OF 5

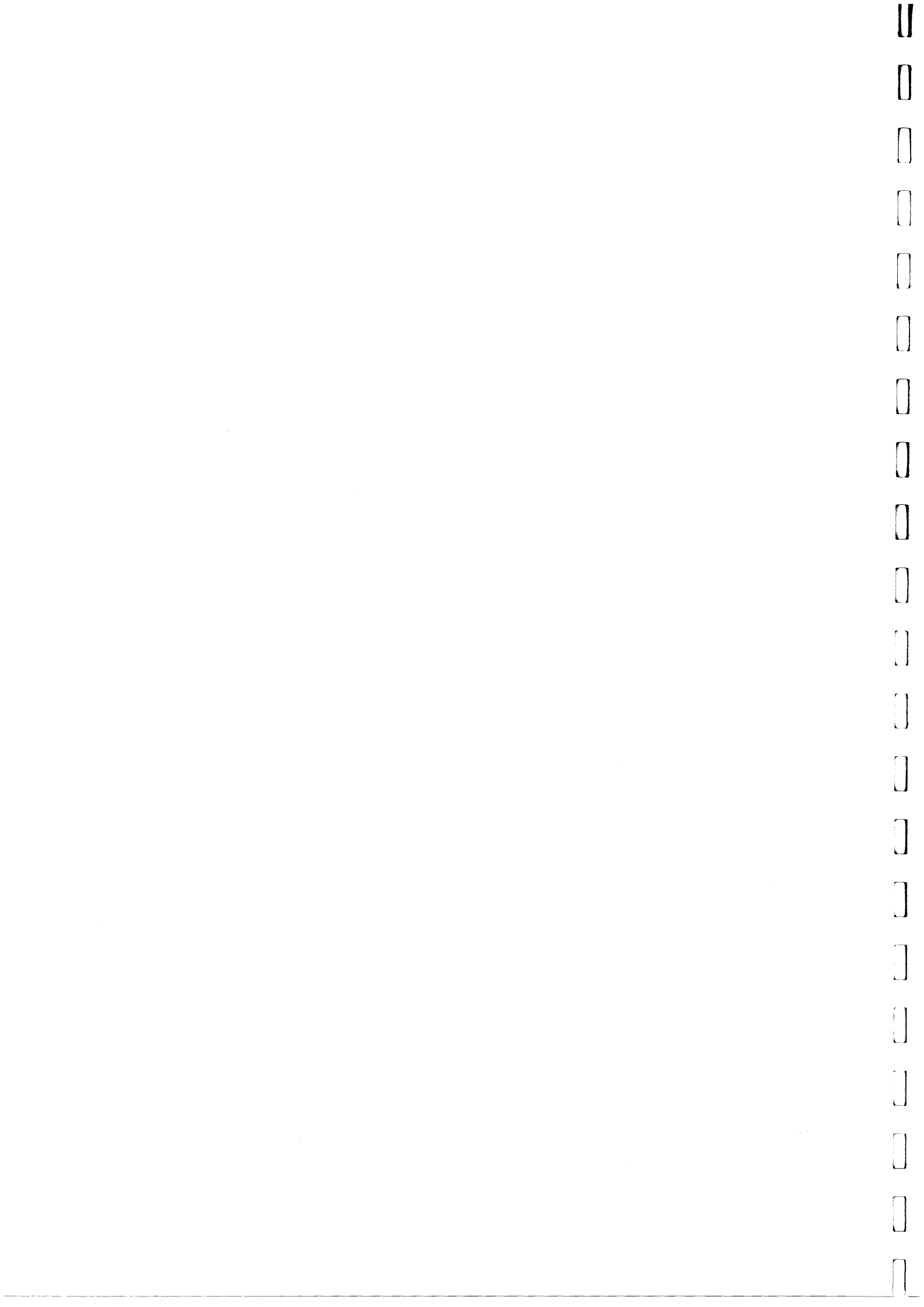
AECOM

FIG 07 SCALE: 1:10000





AECOM	AGREEMENT NO. - CE 52/2007(HY) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION		SCALE	DATE
	BASELINE LANDSCAPE RESOURCES WITH DEVELOPMENT PROPOSAL OVERLAIN		1:10000	MAY 2009
SHEET 2 OF 5		CHECK	DRAWN	REV
		JOB No.	E. L.	F. L.
			60044963	FIGURE 7.1.1.2

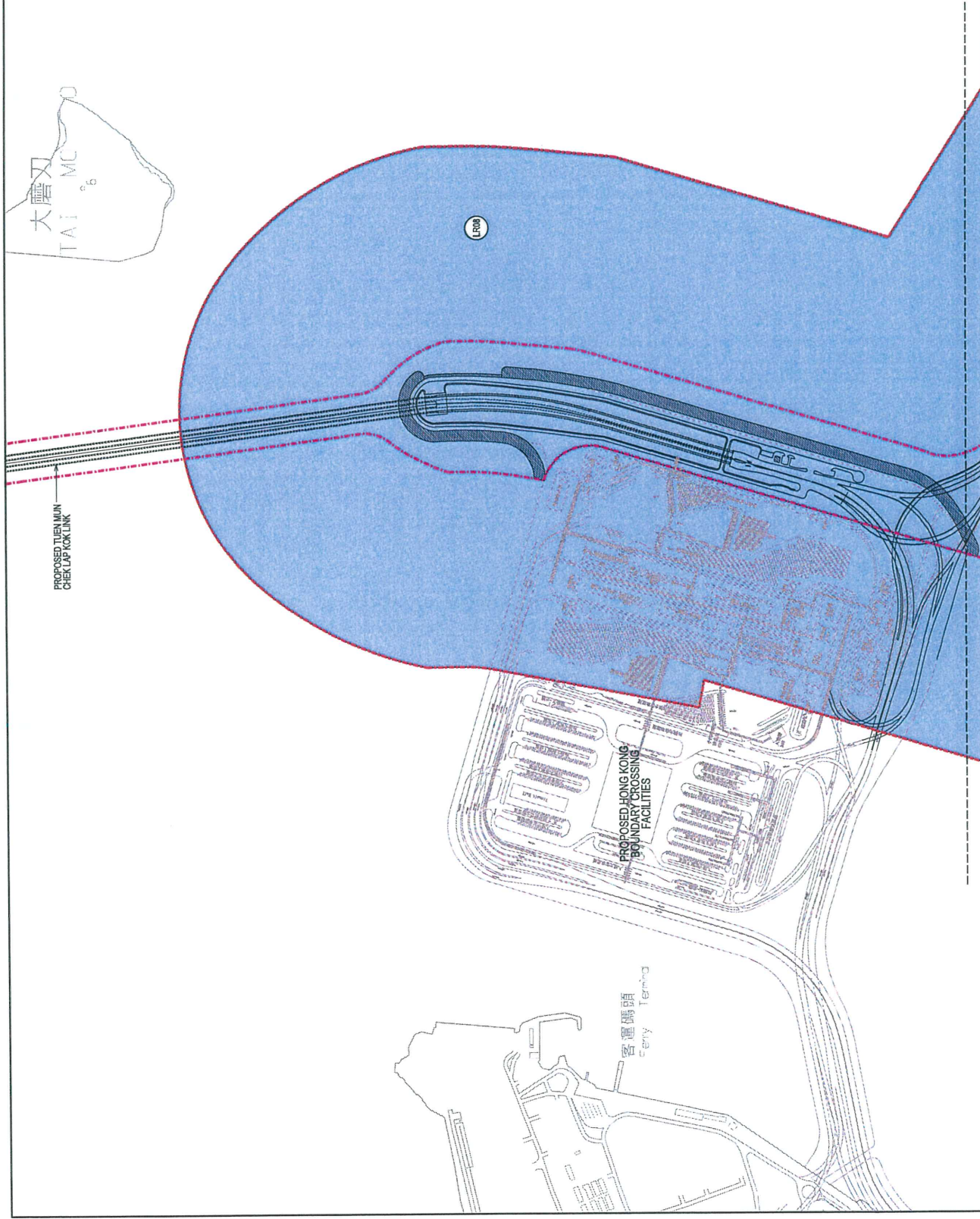


- LEGEND:**
- LANDSCAPE IMPACT STUDY BOUNDARY (600M)
 - WORKS BOUNDARY
 - COUNTRY PARK BOUNDARY
 - SSSI AREA
 - SEAWATER BODY AND SHORELINE NORTH OF TAI HO WAN
 - LR08 TAI HO WAN
 - LR09 TAI HO WAN
 - LR10 ROADSIDE PLANTING ALONG NORTH HANTAI HIGHWAY AND WITHIN MTR SU HO WAN DEPOT
 - LR11 VEGETATION AT TAI HO AND PAK MONG
 - LR12 STREAM COURSE AT PAK MONG

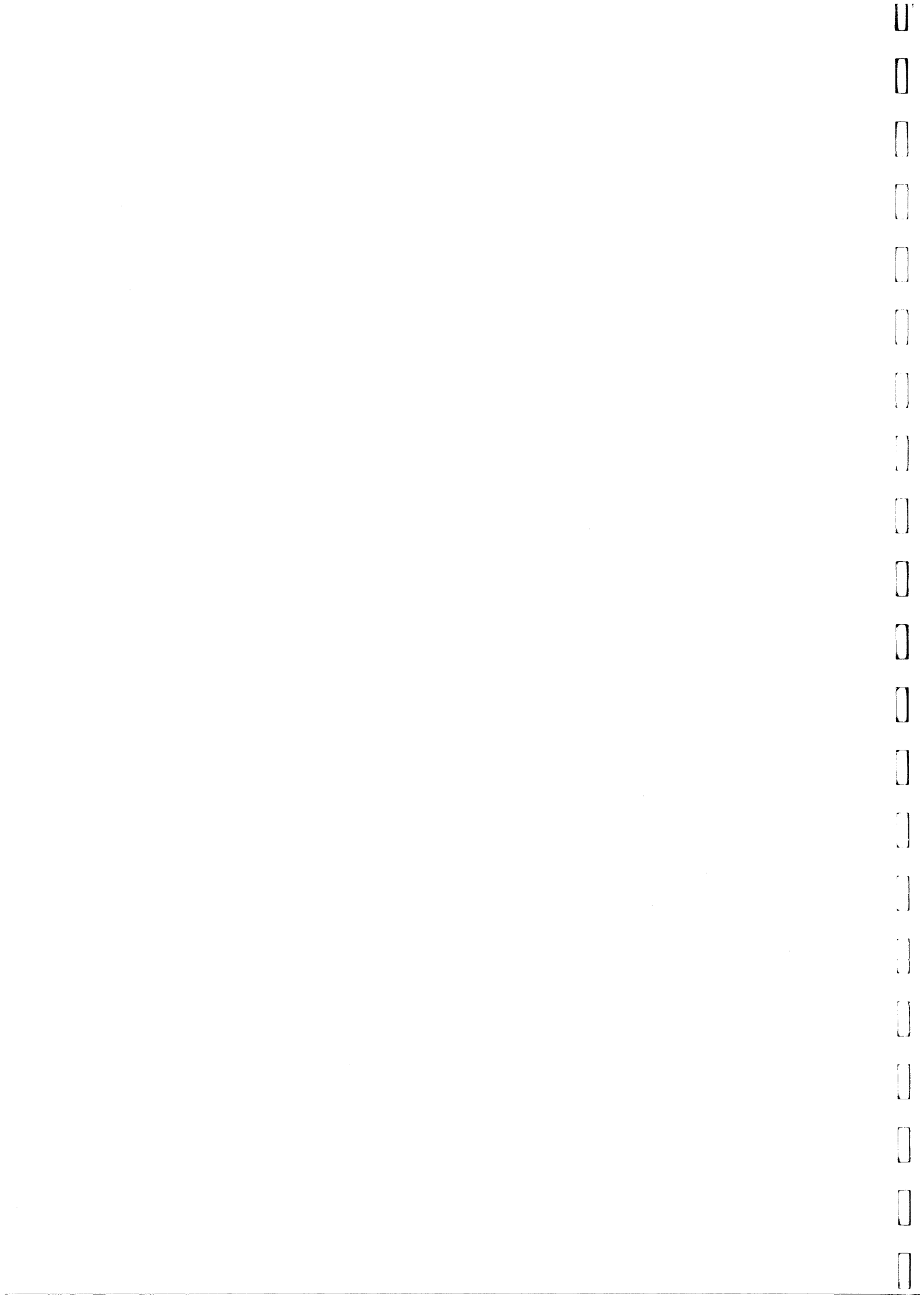
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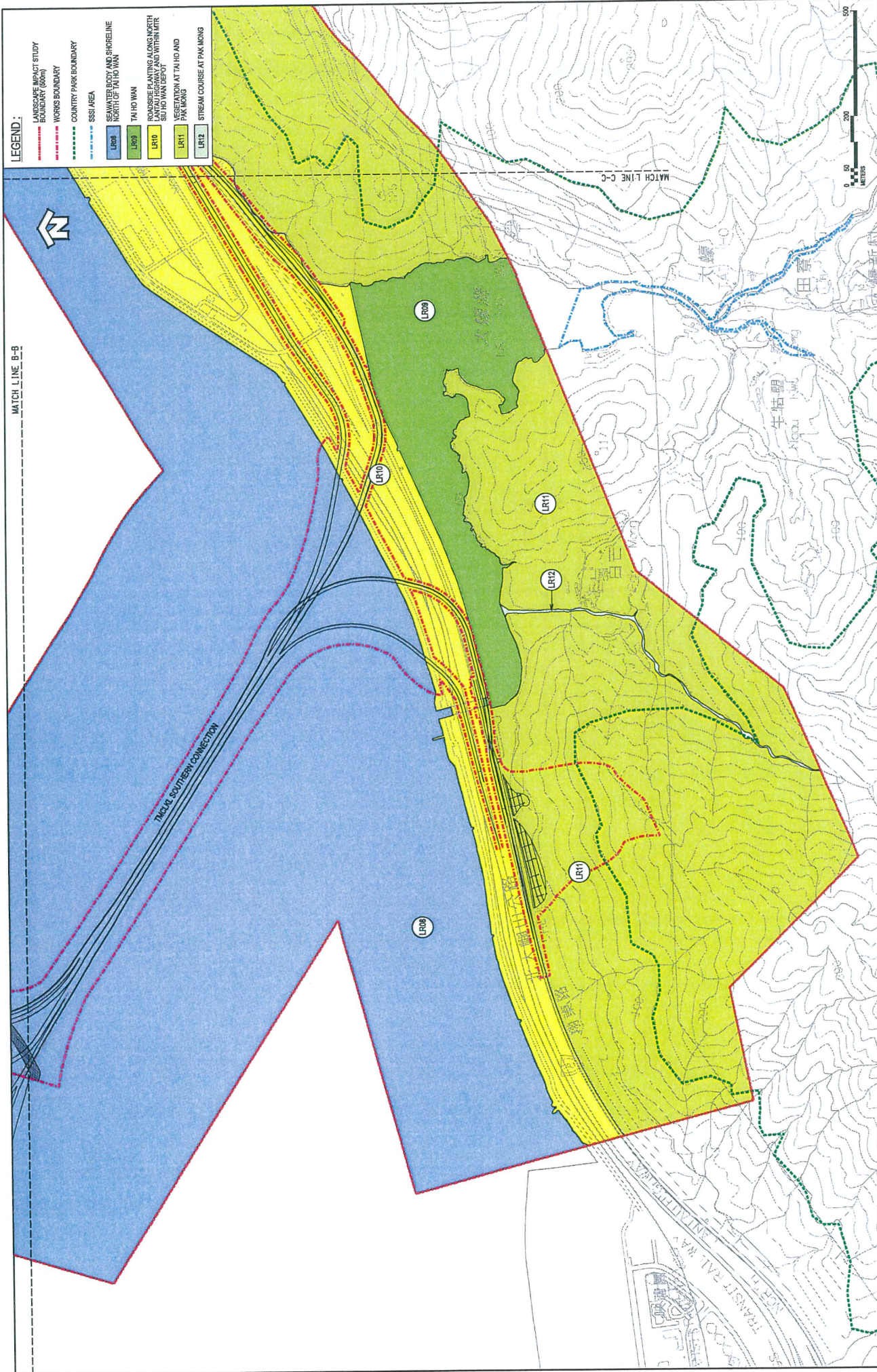
大磨叉 TAI MC 6

TSZ CAN CHAI



AECOM	AGREEMENT NO. CE 52/2007(HY)		DATE	MAY 2009
	TIEN MUN - CHEK LAP KOK LINK - INVESTIGATION		DRAWN	F.L.
BASELINE LANDSCAPE RESOURCES WITH DEVELOPMENT PROPOSAL OVERLaid		CHECK JOB No.	E.L.	DRAWING No.
SHEET 3 OF 5		60044963	FIGURE 7.1.1.3	
				REV ---





MATCH LINE B-B

MATCH LINE C-C

THICKET SOUTHERN CONNECTION

LRT10

LRT11

LRT12

LRT13

LRT14

LRT15

LRT16

LRT17

LRT18

LRT19

LRT20

LRT21

LRT22

LRT23

SEMI-WATERFRONT AND SHORELINE NORTH OF TAI HO WAN

TAI HO WAN

ROADSIDE PLANTING ALONG NORTH LANTAU HIGHWAY AND WITHIN MTR SU HO WAN DEPOT

VEGETATION AT TAI HO AND PAK KONG

STREAM COURSE AT PAK KONG

LANDSCAPE IMPACT STUDY BOUNDARY (50M)

WORKS BOUNDARY

COUNTRY PARK BOUNDARY

SSSI AREA

SEMI-WATERFRONT AND SHORELINE NORTH OF TAI HO WAN

TAI HO WAN

ROADSIDE PLANTING ALONG NORTH LANTAU HIGHWAY AND WITHIN MTR SU HO WAN DEPOT

VEGETATION AT TAI HO AND PAK KONG

STREAM COURSE AT PAK KONG

LANDSCAPE IMPACT STUDY BOUNDARY (50M)

WORKS BOUNDARY

COUNTRY PARK BOUNDARY

SSSI AREA

SEMI-WATERFRONT AND SHORELINE NORTH OF TAI HO WAN

TAI HO WAN

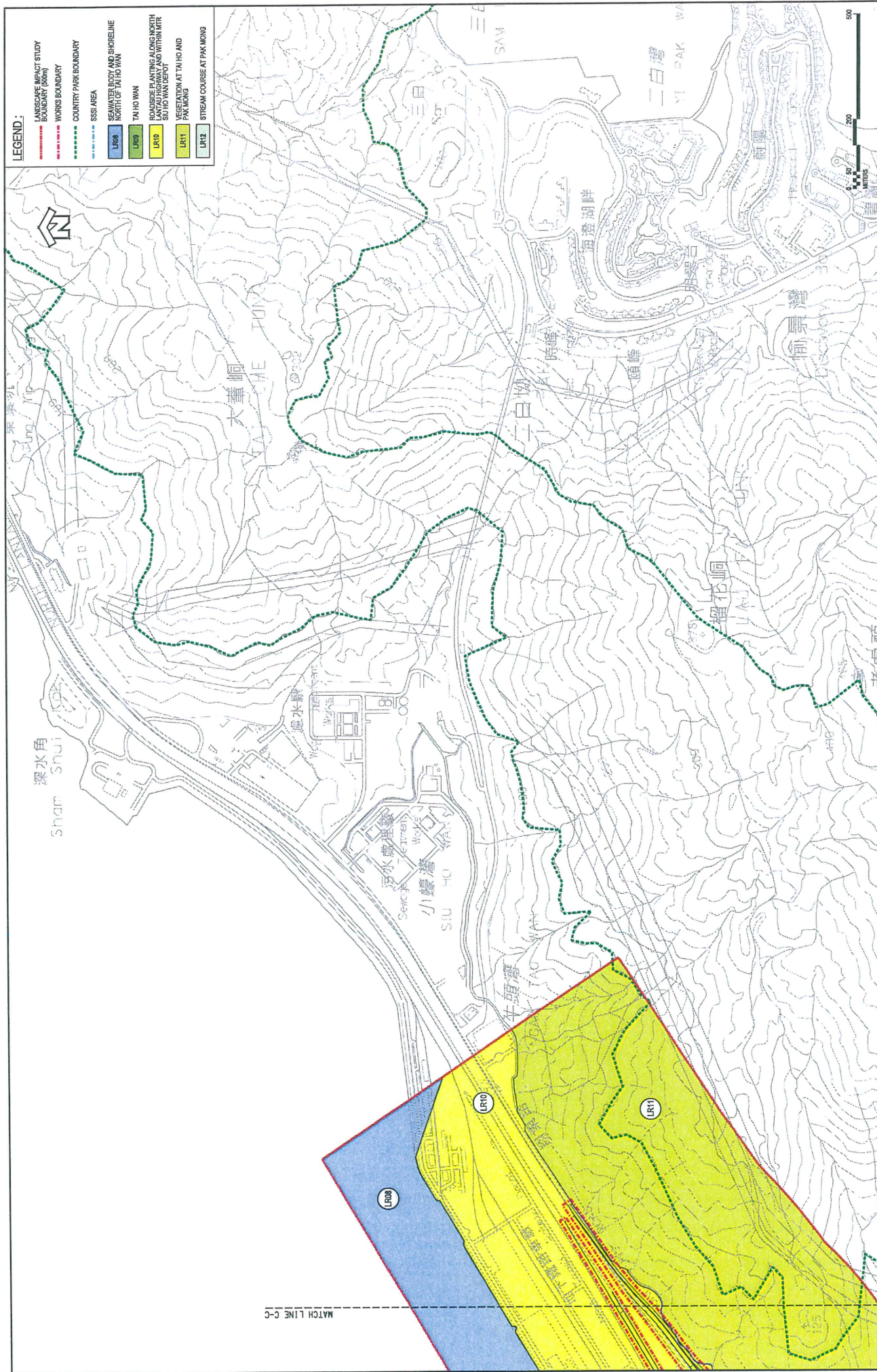
ROADSIDE PLANTING ALONG NORTH LANTAU HIGHWAY AND WITHIN MTR SU HO WAN DEPOT

VEGETATION AT TAI HO AND PAK KONG

STREAM COURSE AT PAK KONG

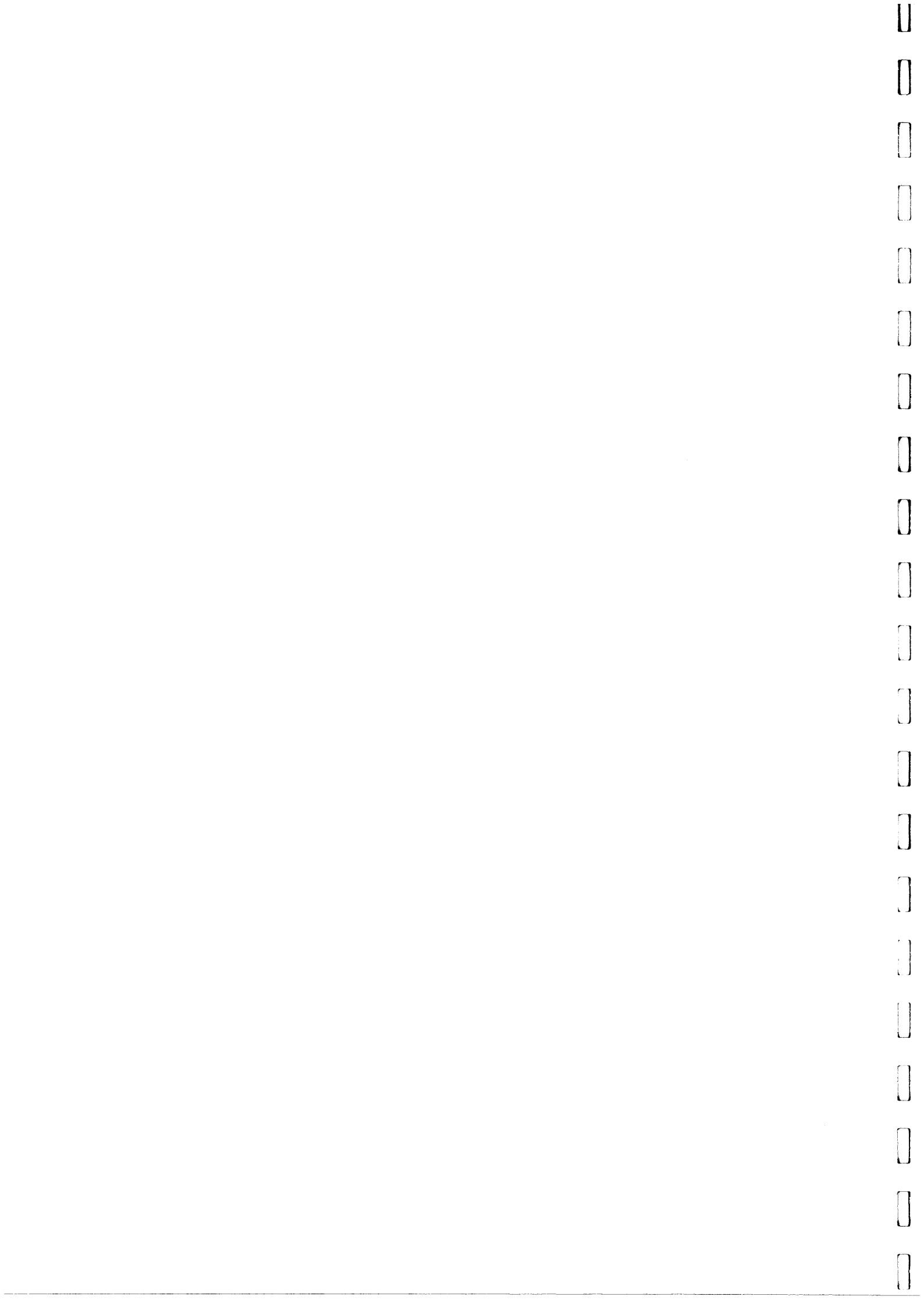
AECOM		AGREEMENT NO. CE 52/2007(HY1)	SCALE	DATE
TUEN MUN - CHEK LAP KOK L INK - INVESTIGATION		1:10000	E.L.	MAY 2009
BASELINE LANDSCAPE RESOURCES WITH DEVELOPMENT PROPOSAL OVERLaid		CHECK	DRAWN	F.L.
SHEET 4 OF 5		JOB No.	60044963	DRAWING NO.
		REV	FIGURE 7.1.1.4	REV

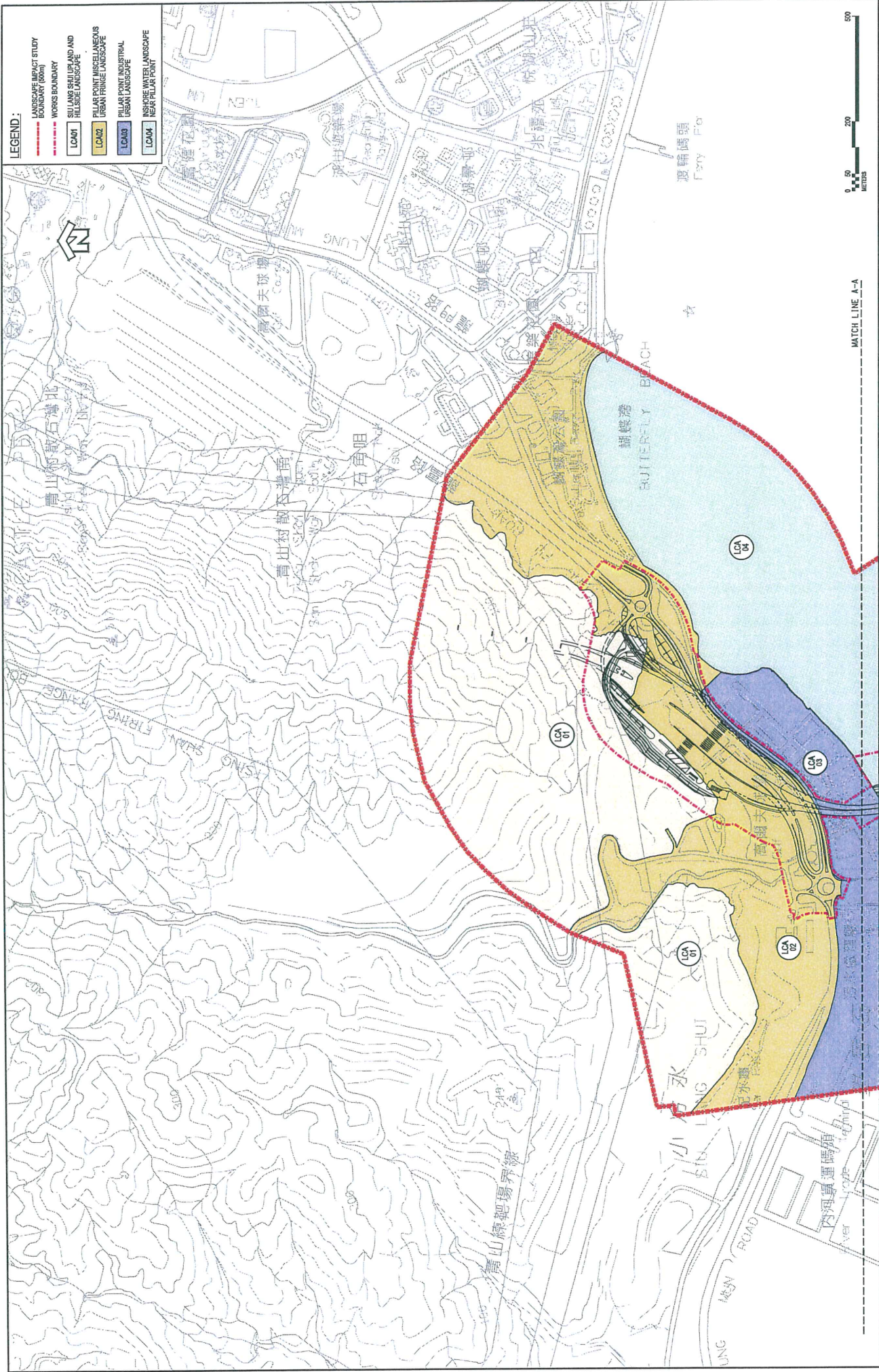




AGREEMENT NO. CE E2/2007(HY)		SCALE	1:10000	DATE	MAY 2009
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION		CHECK	E.L.	DRAWN	F.L.
BASELINE LANDSCAPE RESOURCES WITH DEVELOPMENT PROPOSAL OVERLaid		JOB No.	60044963	DRAWING No.	FIGURE 7.1.1.5
SHEET 5 OF 5		REV	--		

AECOM

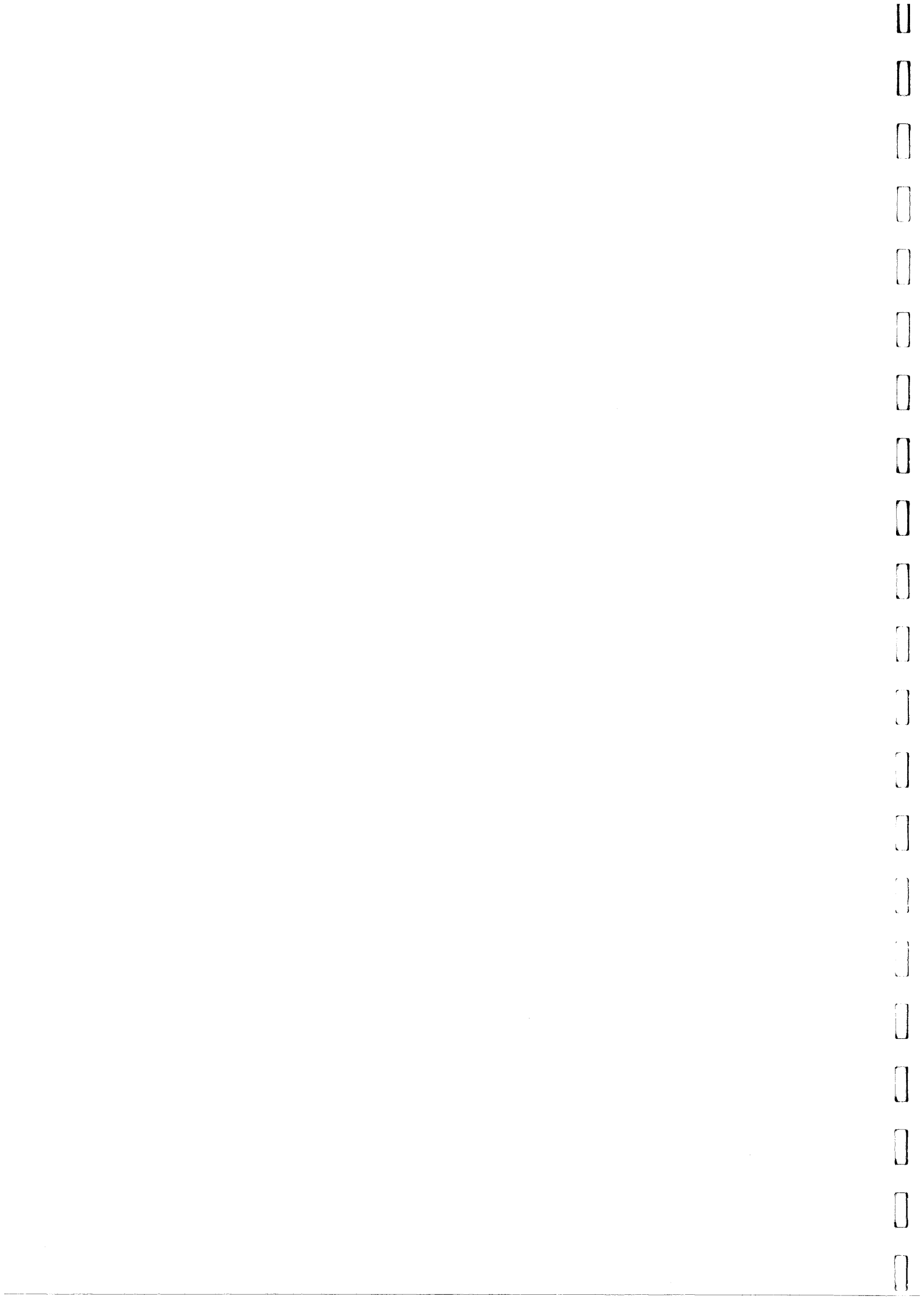




- LEGEND:**
- LANDSCAPE IMPACT STUDY BOUNDARY (600m)
 - WORKS BOUNDARY
 - LOA01 HILLSIDE URBAN AND HILLSIDE LANDSCAPE
 - LOA02 PILLAR POINT INDUSTRIAL URBAN LANDSCAPE
 - LOA03 PILLAR POINT INDUSTRIAL URBAN LANDSCAPE
 - LOA04 INSPIRE WATER LANDSCAPE NEAR PILLAR POINT

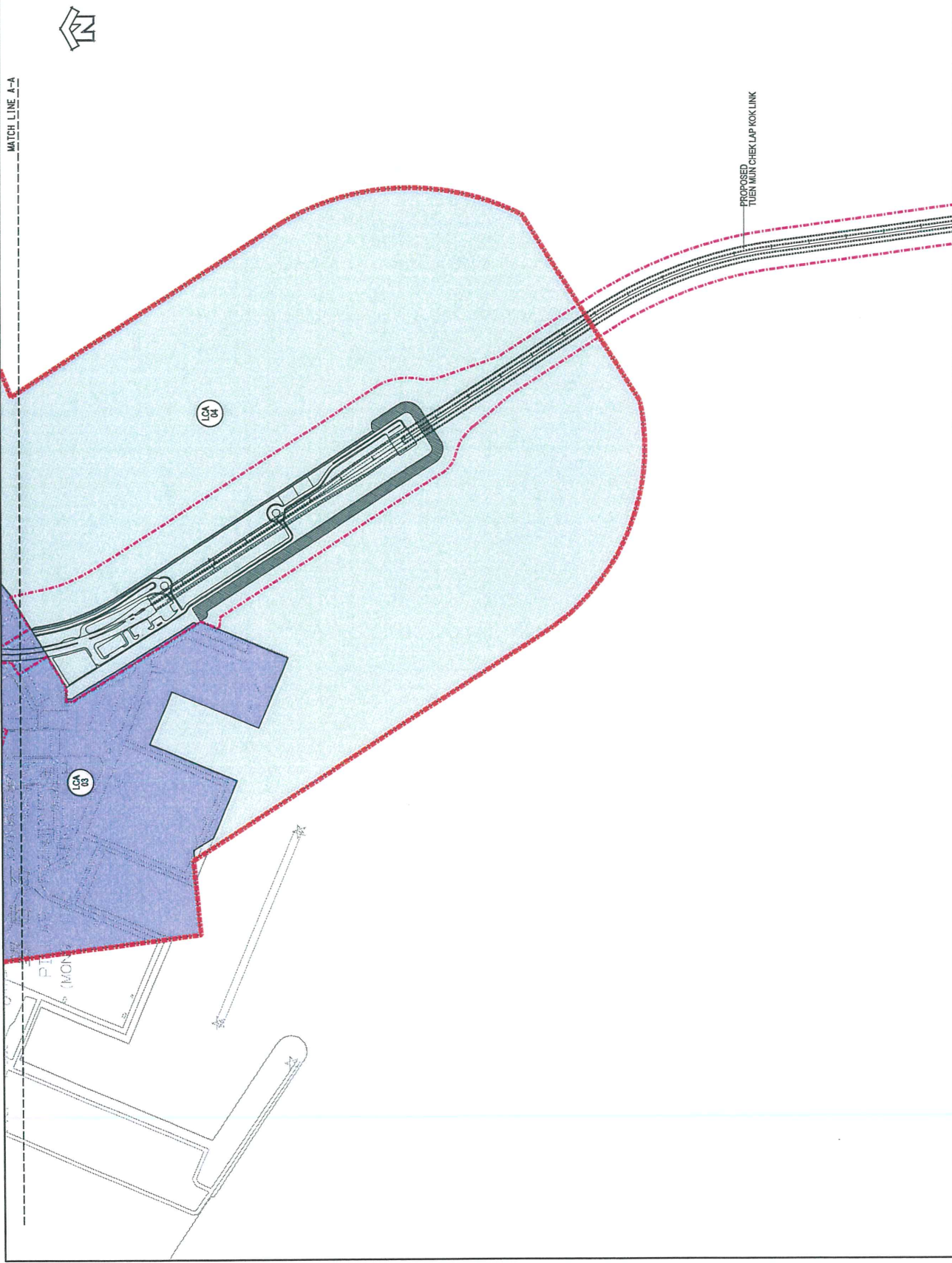
<p>AGREEMENT NO. CE 52/2007(LH1) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION BASELINE LANDSCAPE CHARACTER AREAS WITH DEVELOPMENT PROPOSAL OVERLaid</p>		SCALE	1:10000	DATE	MAY 2009
		CHECK	E.L.	DRAWN	F.L.
<p>AECOM</p>		JOB No.	60044963	DRAWING NO.	FIGURE 7.2.1.1
					REV

SHEET 1 OF 5

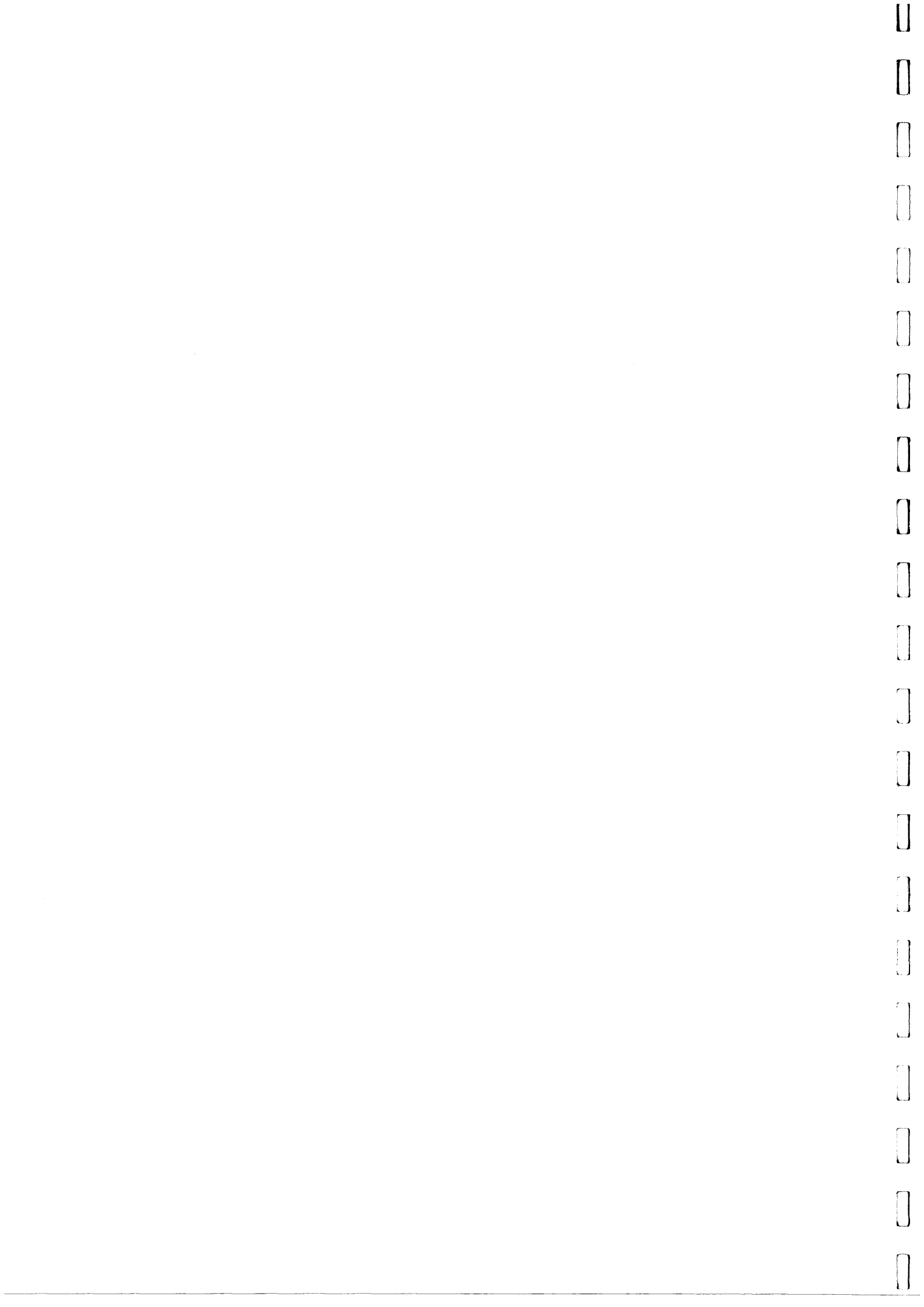


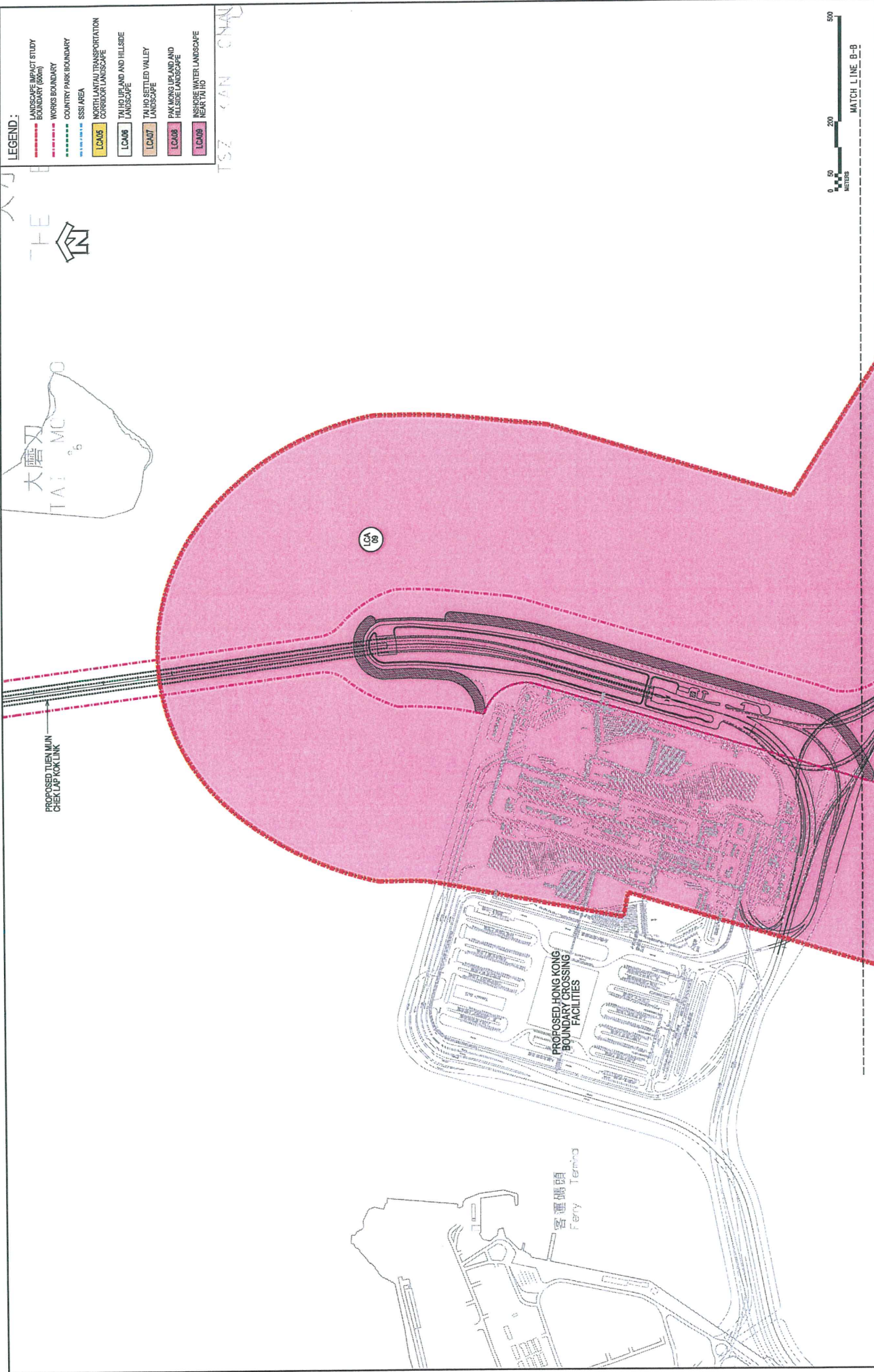
LEGEND :

	LANDSCAPE IMPACT STUDY BOUNDARY (BORN)
	WORKS BOUNDARY
	LCM01 SUI LUNG SHU UPLAND AND HILLSIDE LANDSCAPE
	LCM02 PILLAR POINT MISCELLANEOUS URBAN FRINGE LANDSCAPE
	LCM03 PILLAR POINT INDUSTRIAL URBAN LANDSCAPE
	LCM04 INSHORE WATER LANDSCAPE NEAR PILLAR POINT



AECOM	AGREEMENT NO. - CE 52/2007(HY) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION		SCALE	1:10000	DATE	MAY 2009
	BASELINE LANDSCAPE CHARACTER AREAS WITH DEVELOPMENT PROPOSAL OVERLaid		CHECK JOB No.	E.L.	DRAWN	F.L.
SHEET 2 OF 5		JOB No.	60044963	DRAWING NO. FIGURE 7.2.1.2		
		REV	---			

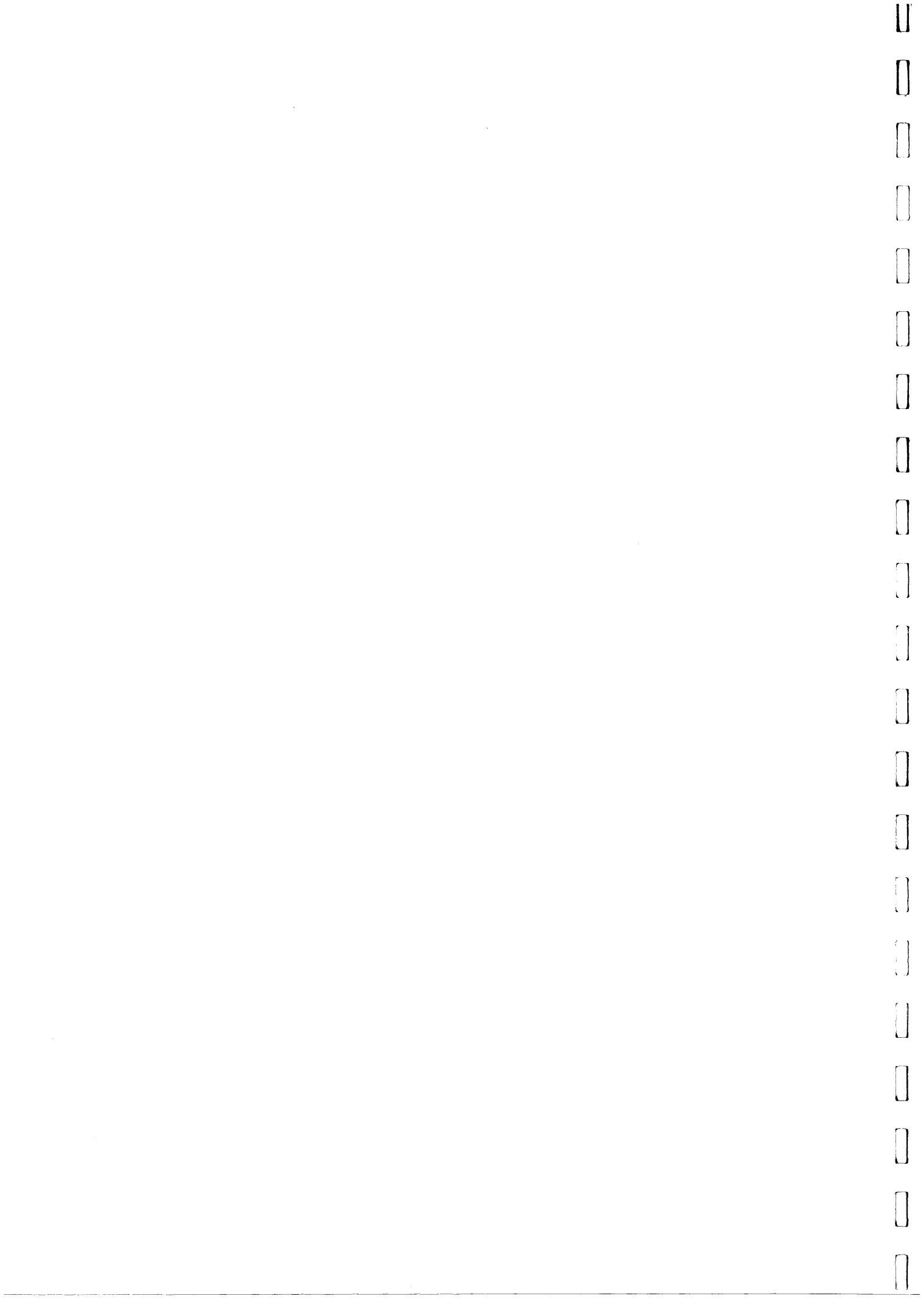


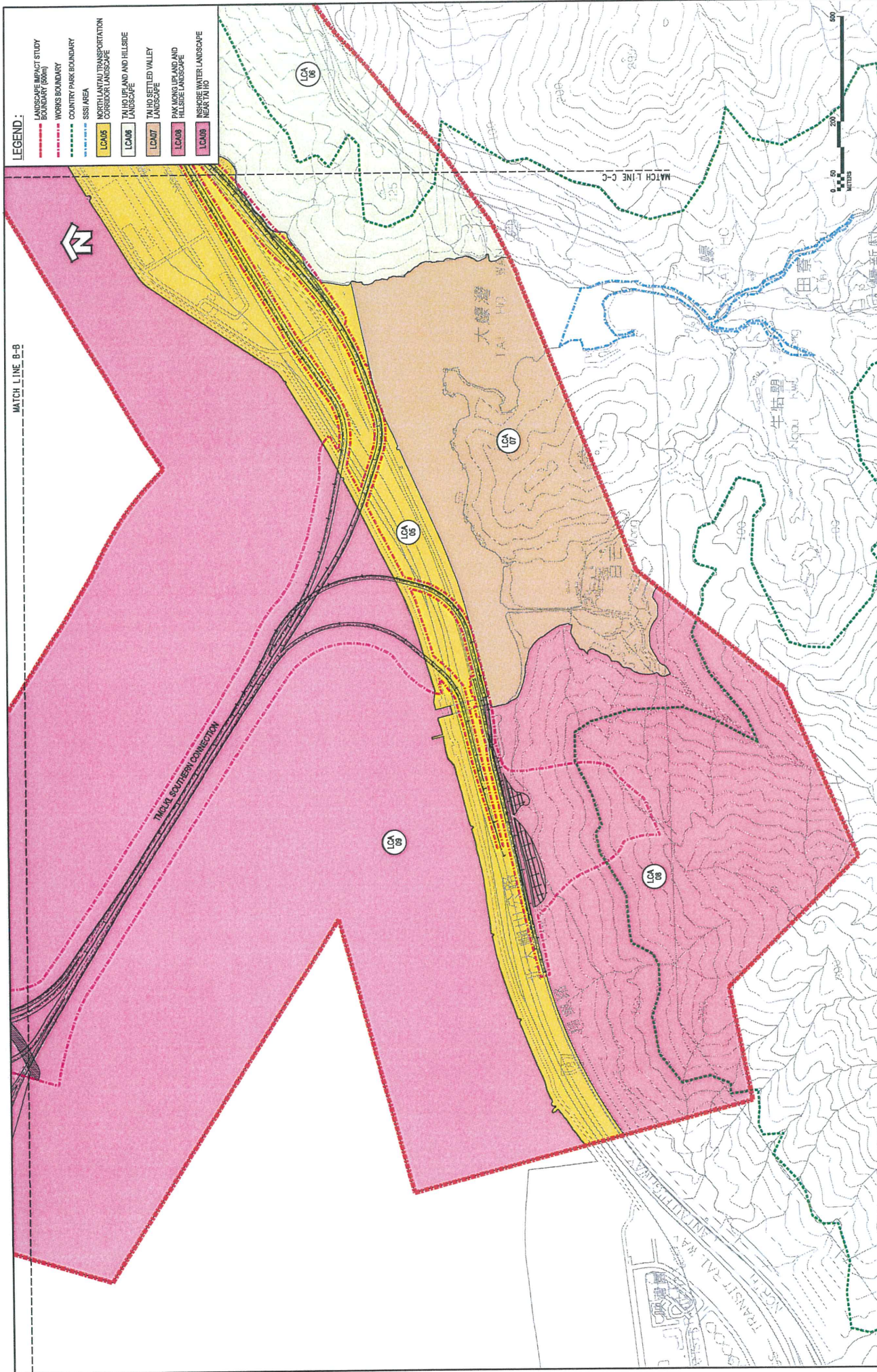


- LEGEND:**
- LANDSCAPE IMPACT STUDY BOUNDARY (6000)
 - WORKS BOUNDARY
 - COUNTRY PARK BOUNDARY
 - SSI AREA
 - NORTHLANTAU TRANSPORTATION CORRIDOR LANDSCAPE
 - LCA05 TAI HO UPLAND AND HILLSIDE LANDSCAPE
 - LCA06 TAI HO SETTLED VALLEY LANDSCAPE
 - LCA07 PAK WONG UPLAND AND HILLSIDE LANDSCAPE
 - LCA08 INSHORE WATERLANDSCAPE NEAR TAI HO



<p>AECOM</p>	<p>AGREEMENT NO. CE 52/2007(HY) TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION DEVELOPMENT PROPOSAL OVERLaid</p>		<p>SCALE CHECK JOB No.</p>	<p>1:10000 E.L. 60044963</p>	<p>DATE DRAWN DRAWING No.</p>	<p>MAY 2009 F.L. FIGURE 7.2.1.3</p>
	<p>SHEET 3 OF 5</p>			<p>REV ---</p>		





LEGEND:

- LANDSCAPE IMPACT STUDY BOUNDARY (800m)
- WORKS BOUNDARY
- COUNTRY PARK BOUNDARY
- SSSI AREA
- NORTH LANTAU TRANSPORTATION CORRIDOR LANDSCAPE
- LCA05 TAI HO UPLAND AND HILLSIDE LANDSCAPE
- LCA06 TAI HO SETTLED VALLEY LANDSCAPE
- LCA07 PAK WONG UPLAND AND HILLSIDE LANDSCAPE
- LCA08 INSHORE WATER LANDSCAPE NEAR TAI HO

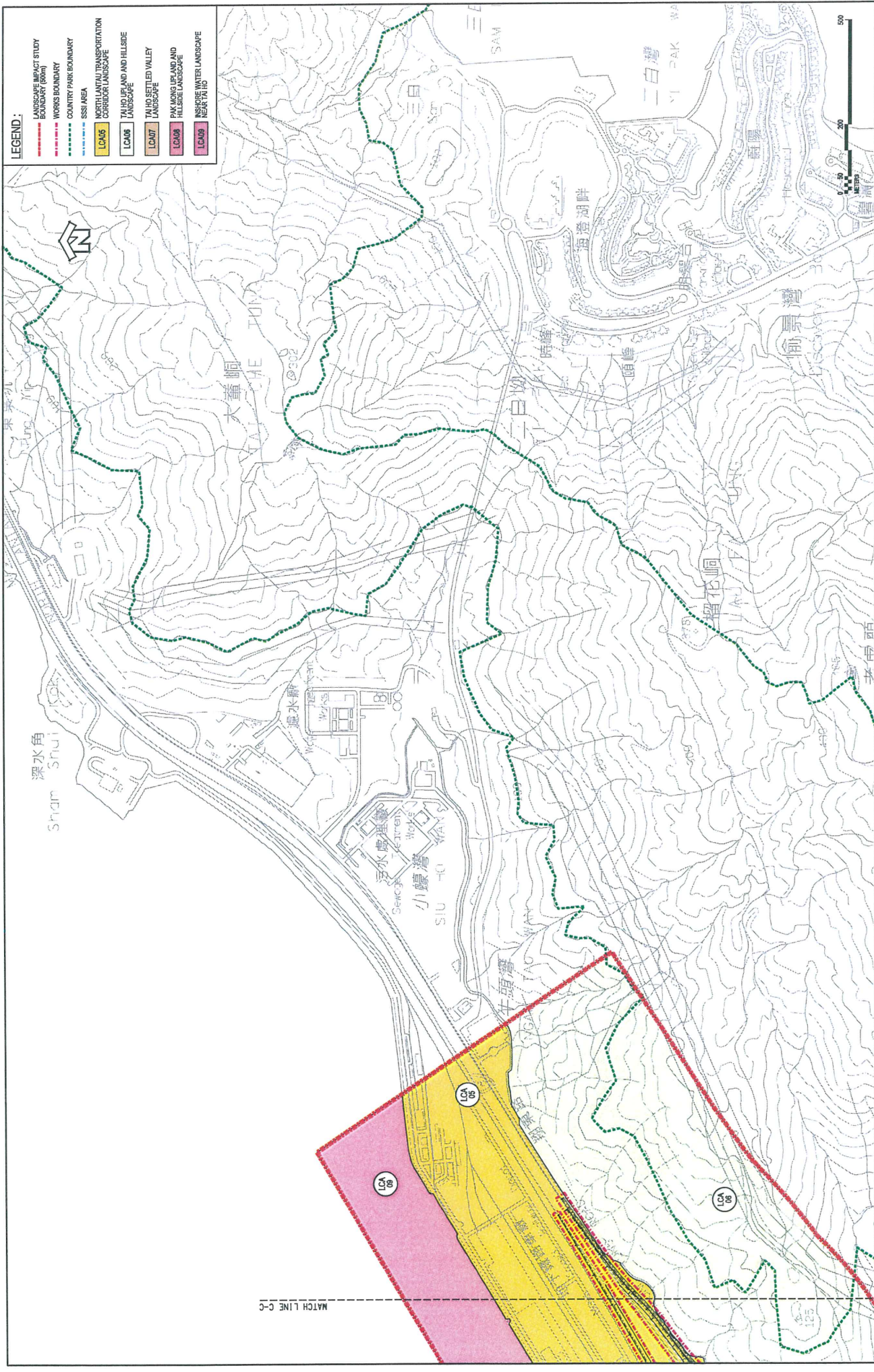
MATCH LINE B-B

MATCH LINE C-C

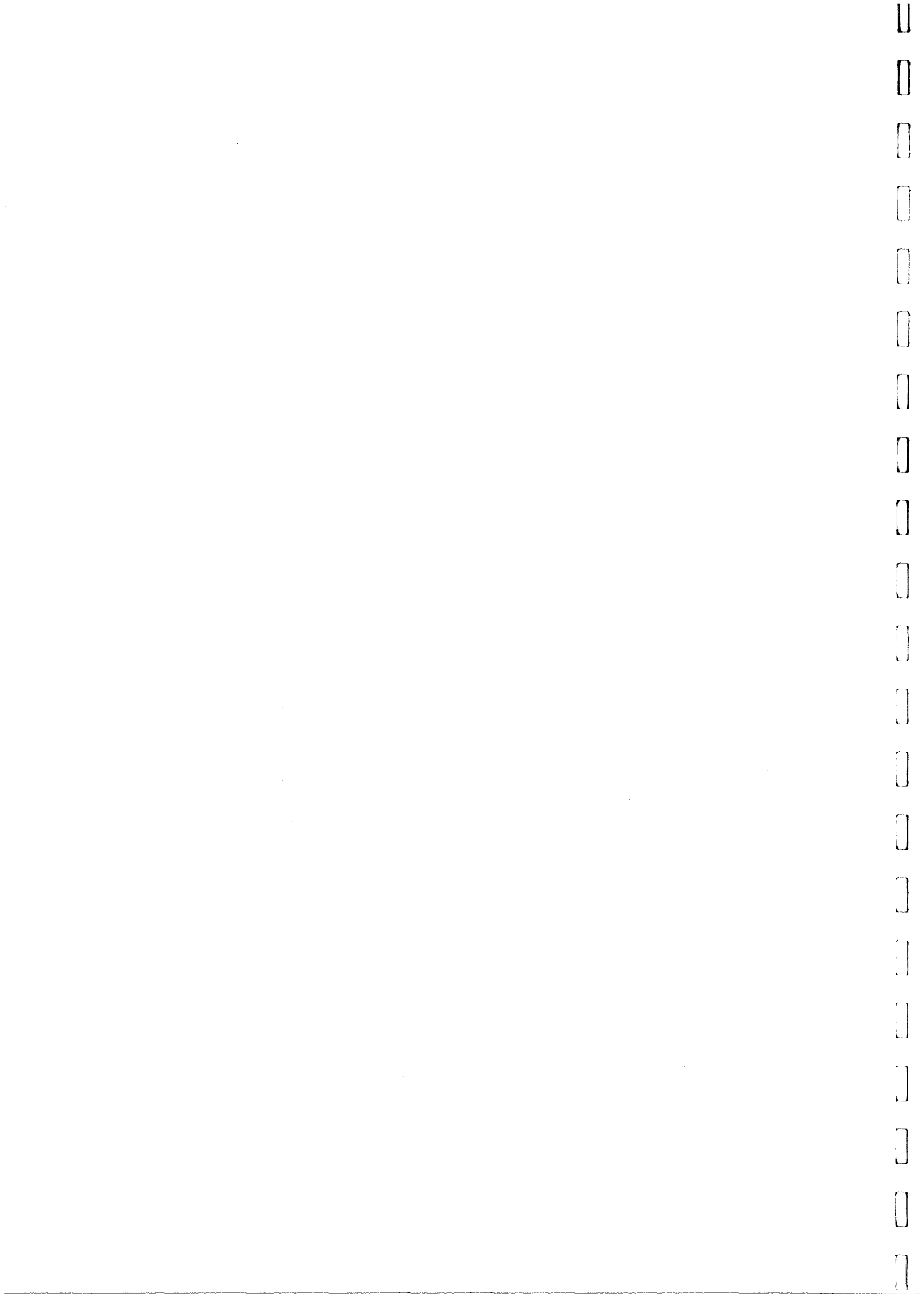
TUNICLAR SOUTHERN CONNECTION

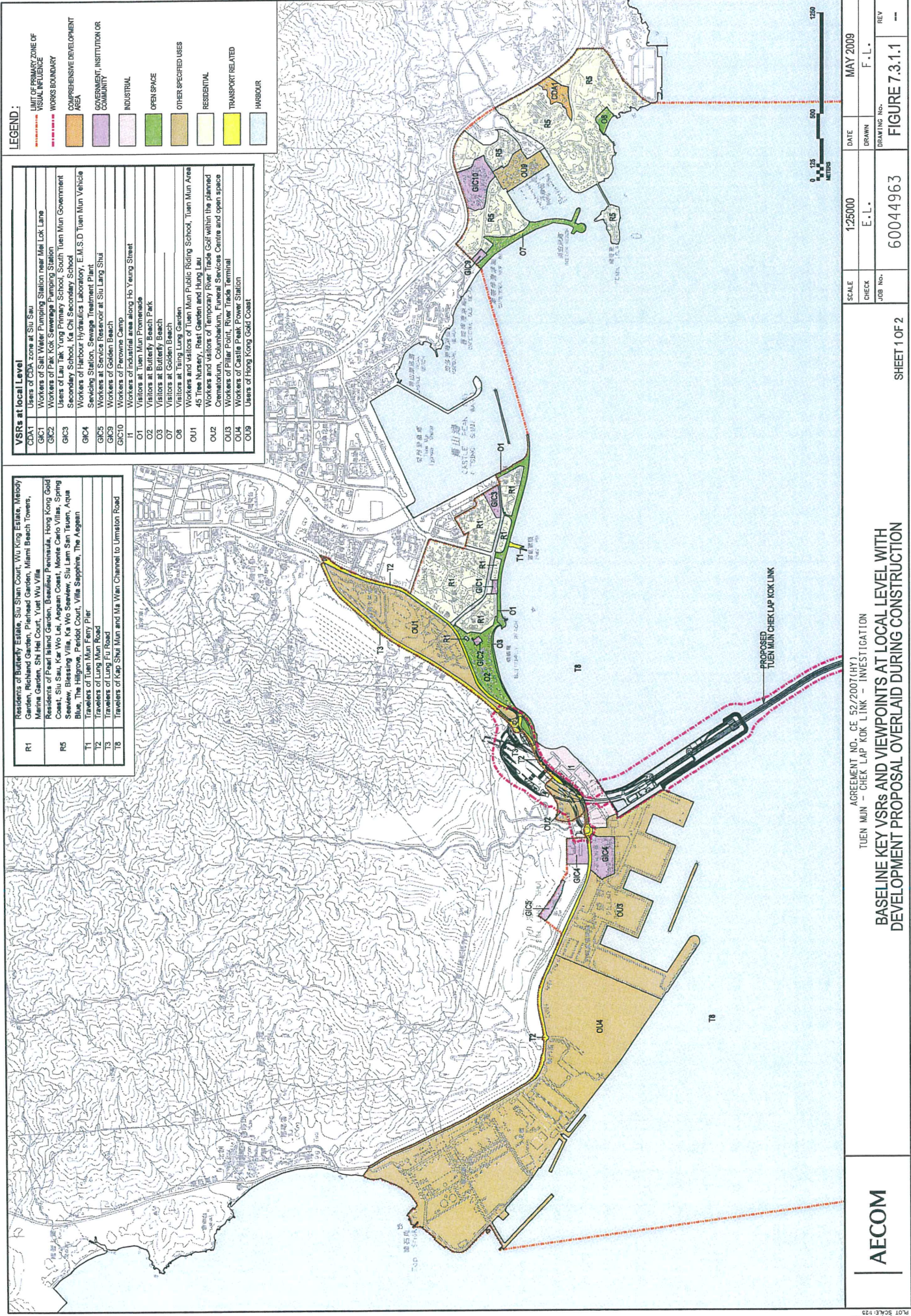
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		SCALE	1:10000	CHECK	E.L.
		JOB No.	60044963	DRAWING No.	FIGURE 7.2.14
		SHEET 4 OF 5		REV	--





AECOM	AGREEMENT NO.: CE 52/2007(HK)	DATE: MAY 2009
	TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION	DRAWN: F.L.L.
SHEET 5 OF 5	SCALE: 1:10000	JOB No.: 60044963
	CHECK: E.L.L.	DRAWING No.: FIGURE 7.2.1.5
		REV: --





R1	Residents of Butterley Estate, Siu Shan Court, Wu King Estate, Meiwoy Garden, Richland Garden, Pinehead Garden, Miami Beach Towers, Marina Garden, Shi Hei Court, Tui Yui Villa
R5	Residents of Pearl Island Garden, Islander Peninsula, Hong Kong Gold Coast, Siu Sai, Kwo Lo Lok, Kwo Lo Lok, Siu Lam San, Tsuen, Spring Blue, The Hillside, Paddy Court, Villa Sapphire, The Argosy
T1	Travelers of Tuén Mun Ferry Pier
T2	Travelers of Lung Mun Road
T3	Travelers of Kap Shui Mun and Ma Wan Channel to Umaton Road
T8	

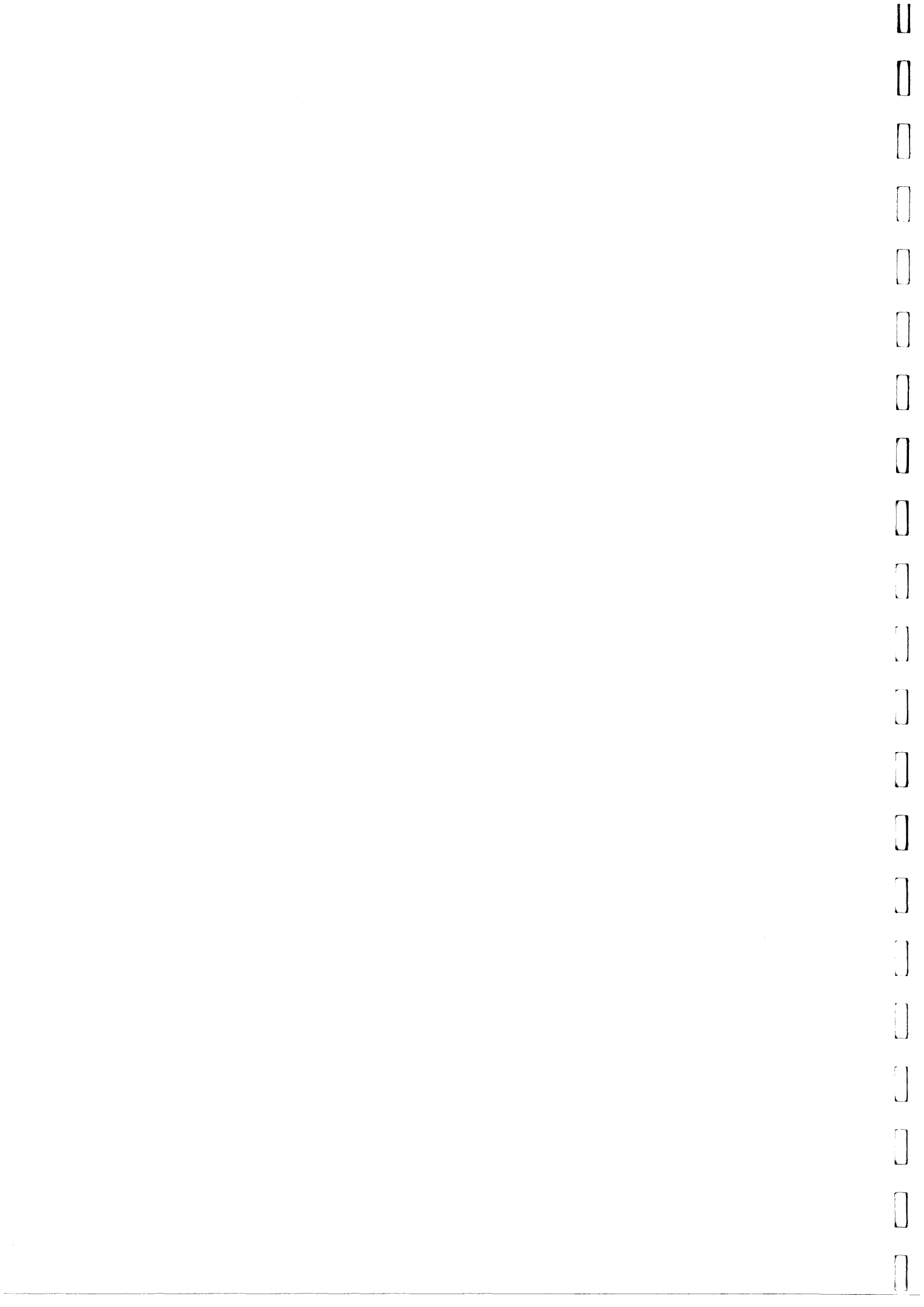
VSRs at local level	
GDA1	Users of CDA zone at Siu Siu
GK1	Workers of Salt Water Pumping Station near Mei Lok Lane
GK2	Workers of Pak Kok Sewage Pumping Station
GK3	Users of Lau Tak Young Primary School, South Tuén Mun Government Secondary School, Ka Chi Secondary School
GK4	Workers of Harbour Hydraulics Laboratory, E.M.S.D Tuén Mun Vehicle Servicing Station, Sewage Treatment Plant
GK5	Workers at Service Reservoir at Siu Lang Shui
GK6	Workers of Golden Beach
GK7	Workers of Parsons Camp
GK8	Workers of Ho Young Street
O1	Visitors at Tuén Mun Promenade
O2	Visitors at Butterley Beach Park
O3	Visitors at Golden Beach
O7	Visitors at Golden Beach
O8	Visitors at Tung Lung Garden
O11	Workers and visitors of Tuén Mun Public Riding School, Tuén Mun Area 45 Tree Nursery, Rest Garden and Hung Lau
O12	Workers and visitors of Temporary River Trade Golf within the planned Crematorium, Columbarium, Funeral Services Centre and open space
O13	Workers of Pillar Point, River Trade Terminal
O14	Workers of Castle Peak Power Station
O19	Users of Hong Kong Gold Coast

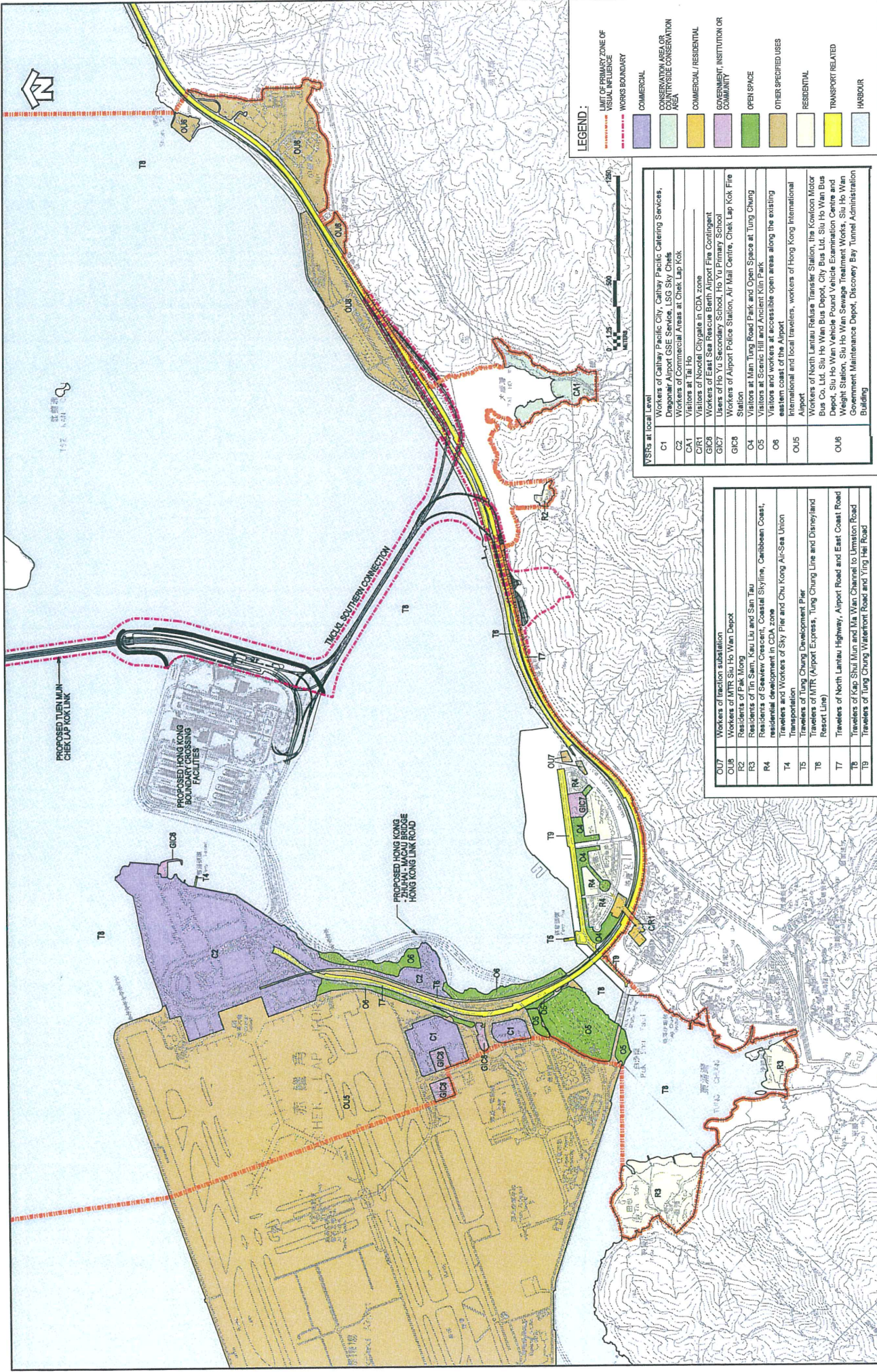
LEGEND:	
	LIMIT OF PRIMARY ZONE OF VISUAL INFLUENCE
	WORKS BOUNDARY
	COMPREHENSIVE DEVELOPMENT AREA
	GOVERNMENT INSTITUTION OR COMMUNITY
	INDUSTRIAL
	OPEN SPACE
	OTHER SPECIFIED USES
	RESIDENTIAL
	TRANSPORT RELATED
	HARBOUR

AGREEMENT NO. CE 52/2007(HY1)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
BASELINE KEY VSRs AND VIEWPOINTS AT LOCAL LEVEL WITH DEVELOPMENT PROPOSAL OVERLAID DURING CONSTRUCTION

SCALE	1:25000	DATE	MAY 2009
CHECK	E.L.	DRAWN	F.L.
JOB No.	6 0044963	DRAWING No.	FIGURE 7.3.1.1
SHEET 1 OF 2			

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 Plotting by: 4/18/2009 1:07 SCALE: 1:25





LEGEND:

- LIMIT OF PRIMARY ZONE OF VISUAL INFLUENCE
- WORKS BOUNDARY
- COMMERCIAL
- CONSERVATION AREA OR ENTIRE SITE CONSERVATION AREA
- COMMERCIAL/RESIDENTIAL
- GOVERNMENT, INSTITUTION OR COMMUNITY
- OPEN SPACE
- OTHER SPECIFIED USES
- RESIDENTIAL
- TRANSPORT RELATED
- HARBOUR

VSRs at local level

C1	Workers of Cathay Pacific City, Cathay Pacific Catering Services, Dragonair Airport GSE Service, LSG Sky Chefs
C2	Workers of Commercial Areas at Chek Lap Kok
C3	Visitors at Tin Hau
C3A	Visitors of City Square in CDA zone
G1C3	Workers of East Sea Rescue Bath Airport Fire Contingent
G1C7	Users of Ho Yu Secondary School, Ho Yu Primary School
G1C8	Workers of Airport Police Station, Air Mail Centre, Chek Lap Kok Fire Station
O4	Visitors at Mam Tung Road Park and Open Space at Tung Chung
O5	Visitors at Scenic Hill and Ancient Kin Park
O6	Visitors and workers at accessible open areas along the existing eastern coast of the Airport
O05	International and local travelers, workers of Hong Kong International Airport
O06	Workers of North Lantau Refuse Transfer Station, the Kowloon Motor Bus Co. Ltd, Siu Ho Wan Bus Depot, City Bus Ltd, Siu Ho Wan Bus Depot, Siu Ho Wan Vehicle Pound Vehicle Examination Centre and Weight Station, Siu Ho Wan Sewage Treatment Works, Siu Ho Wan Government Maintenance Depot, Discovery Bay Tunnel Administration Building

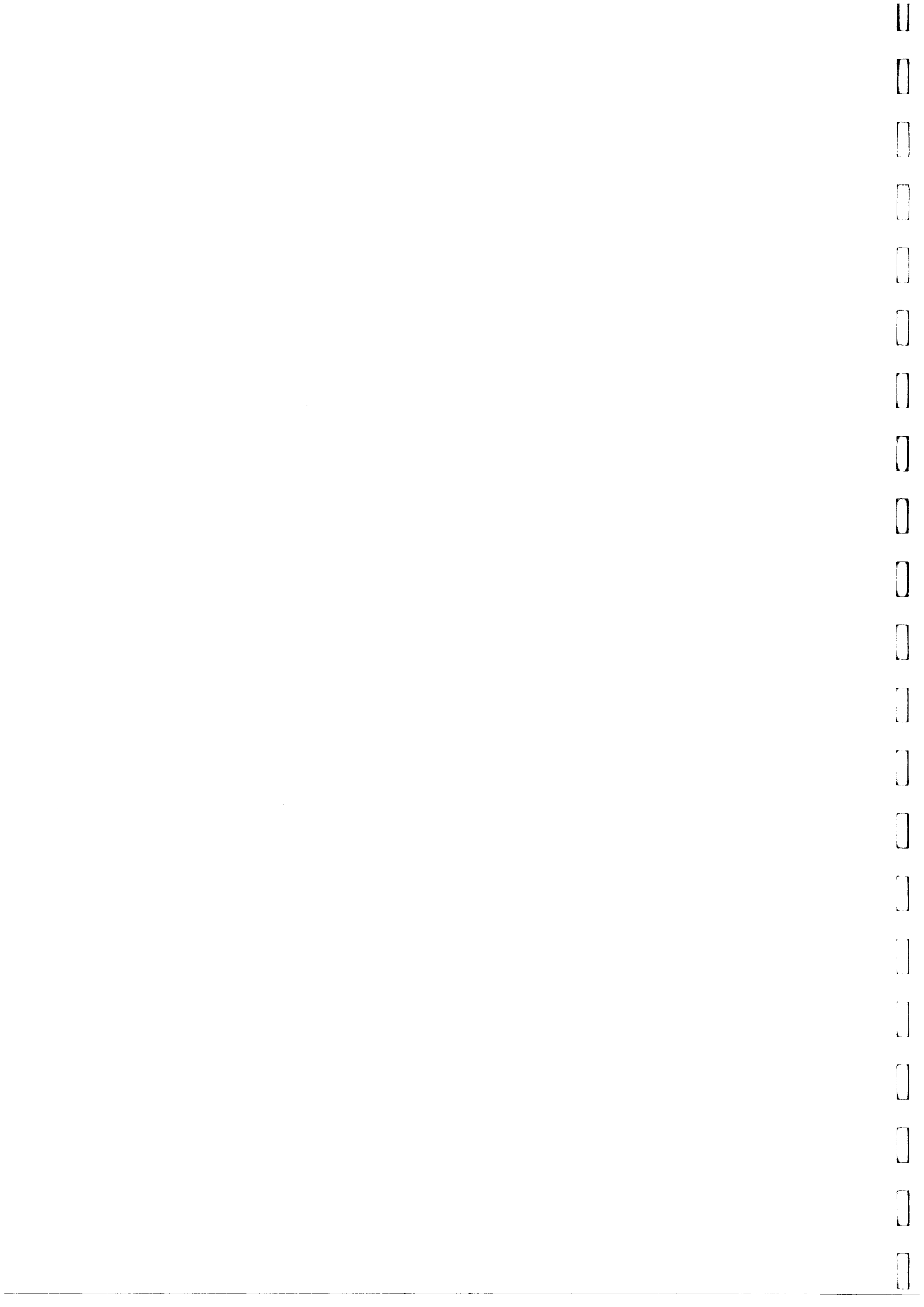
O07	Workers of traction substation
R2	Workers of MTR, Siu Ho Wan Depot
R3	Residents of Pak Mong
R4	Residents of Tin Sam, Kau Liu and San Tau
T4	Residents of Sawview Crescent, Coastal Skyline, Caribbean Coast, residential development in CDA zone
T5	Travelers and Workers of Sky Pier and Chu Kong Air-Sea Union Transportation
T6	Travelers of Tung Chung Development Pier
T7	Travelers of MTR (Airport Express, Tung Chung Line and Disney/land Resort Line)
T8	Travelers of North Lantau Highway, Airport Road and East Coast Road
T9	Travelers of Kap Shui Mun and Mia Wan Channel to Ummon Road
T9	Travelers of Tung Chung Waterfront Road and Ying Hai Road

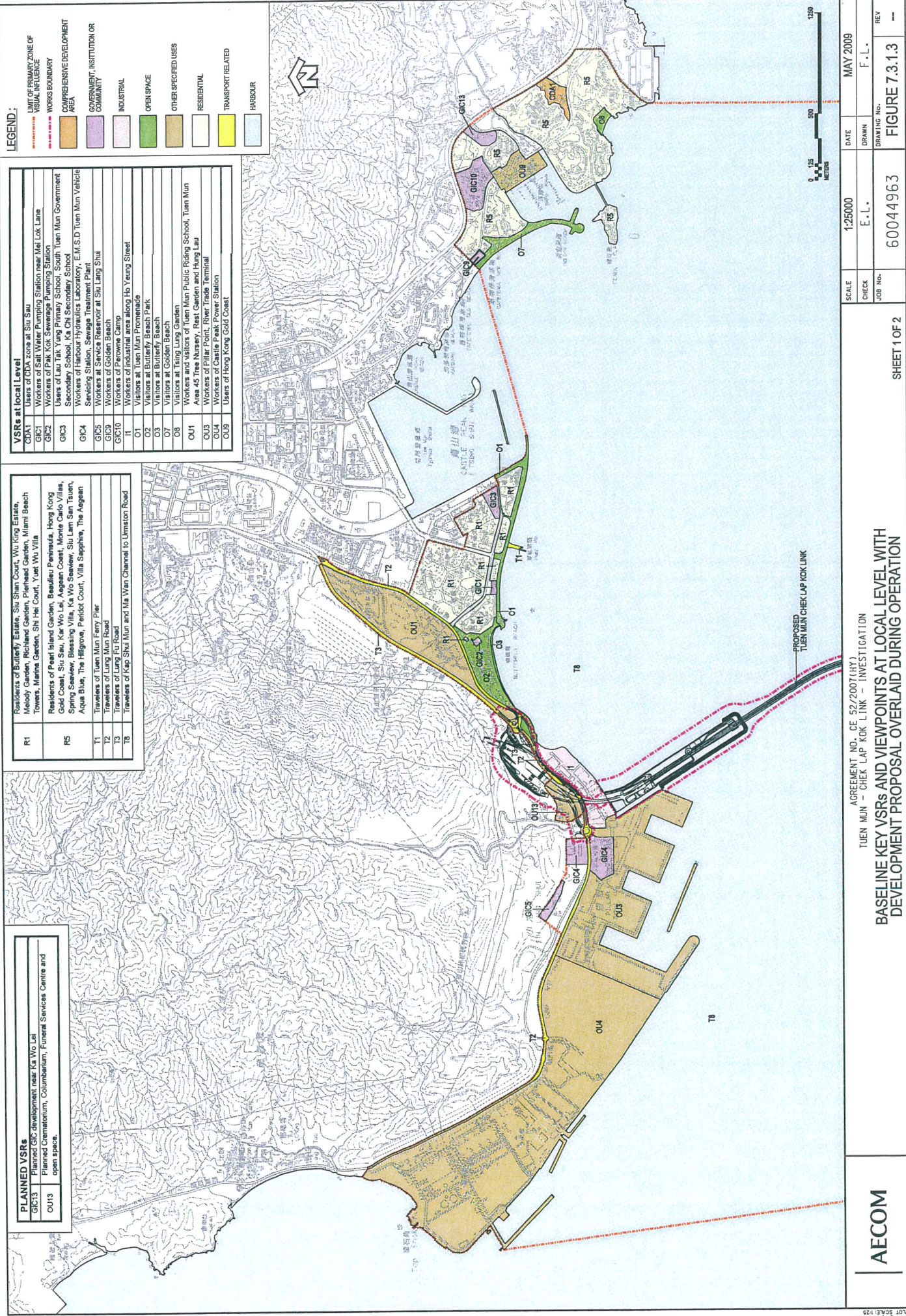
TUENN MUN - CHEK LAP KOK LINK - INVESTIGATION

BASELINE KEY VSRs AND VIEWPOINTS AT LOCAL LEVEL WITH DEVELOPMENT PROPOSAL OVERLAID DURING CONSTRUCTION

SHEET 2 OF 2

AECOM	SCALE	1:25000	DATE	MAY 2009
	CHECK	E.-L.	DRAWN	F.-L.
	JOB No.	60044963	DRAWING No.	FIGURE 7.3.1.2
			REV	--





PLANNED VSRs

GIC13	Planned GIC development near Ka Wo Lai
OU13	Planned Crematorium, Columbarium, Funeral Services Centre and open space.

R1	Residents of Butterfly Estate, Siu Shan Court, Wu King Estate, Heedey Garden, Richland Garden, Ploverhead Garden, Miami Beach Towers, Miami Garden, Shi Hei Court, Yuet Wu Villa
RS	Residents of Pearl Island Garden, Beauclieu Peninsula, Hong Kong Gold Coast, Siu Sau, Kar Wo Lei, Aagan Coast, Monte Carlo Villas, Spring Seaview, Blessing Villa, Ka Wo Seaview, Siu Lam San Tsuen, Aqua Blue, The Hillgrove, Peridot Court, Villa Sapphire, The Aegean.
T1	Travelers of Tuennan Ferry Pier
T2	Travelers of Lung Fu Road
T3	Travelers of Lung Fu Road
T8	Travelers of Kap Shui Mun and Ma Wan Channel to Umston Road

VSRs at local level

CDAT	Users of CDA zone at Siu Sau
GIC1	Workers of Salt Water Pumping Station near Mei Lok Lane
GIC2	Workers of Pak Kok Secondary School, Siu Mun Government School, Yuen Chi School
GIC3	Workers of Pak Kok Secondary School, Siu Mun Government School, Yuen Chi School
GIC4	Workers of Harbour Hydraulics Laboratory, E.M.S.D Tuennan Vehicle Service Station, Sewage Treatment Plant
GIC5	Workers at Service Reservoir at Siu Lang Shui
GIC9	Workers of Golden Beach
GIC10	Workers of Personnel Camp
I1	Workers of industrial area along Ho Young Street
O1	Visitors at Tuennan Promenade
O2	Visitors at Butterfly Beach Park
O3	Visitors at Butterfly Beach
O7	Visitors at Golden Beach
O8	Visitors at Tsing Lung Garden
OU1	Workers and visitors of Tuennan Public Riding School, Tuennan Area 45 Tree Nursery, Rest Garden and Hung Lau
OU3	Workers of Pillar Point, River Trade Terminal
OU4	Workers of Castle Peak Power Station
OU9	Users of Hong Kong Gold Coast

LEGEND :

(Red dashed line)	LIMIT OF PRIMARY ZONE OF VISUAL INTERFERENCE
(Red solid line)	WORKS BOUNDARY
(Orange)	COMPREHENSIVE DEVELOPMENT AREA
(Purple)	GOVERNMENT INSTITUTION OR COMMUNITY
(Light Blue)	INDUSTRIAL
(Green)	OPEN SPACE
(Yellow)	OTHER SPECIFIED USES
(Light Green)	RESIDENTIAL
(Light Yellow)	TRANSPORT RELATED
(Blue)	HARBOUR

AECOM

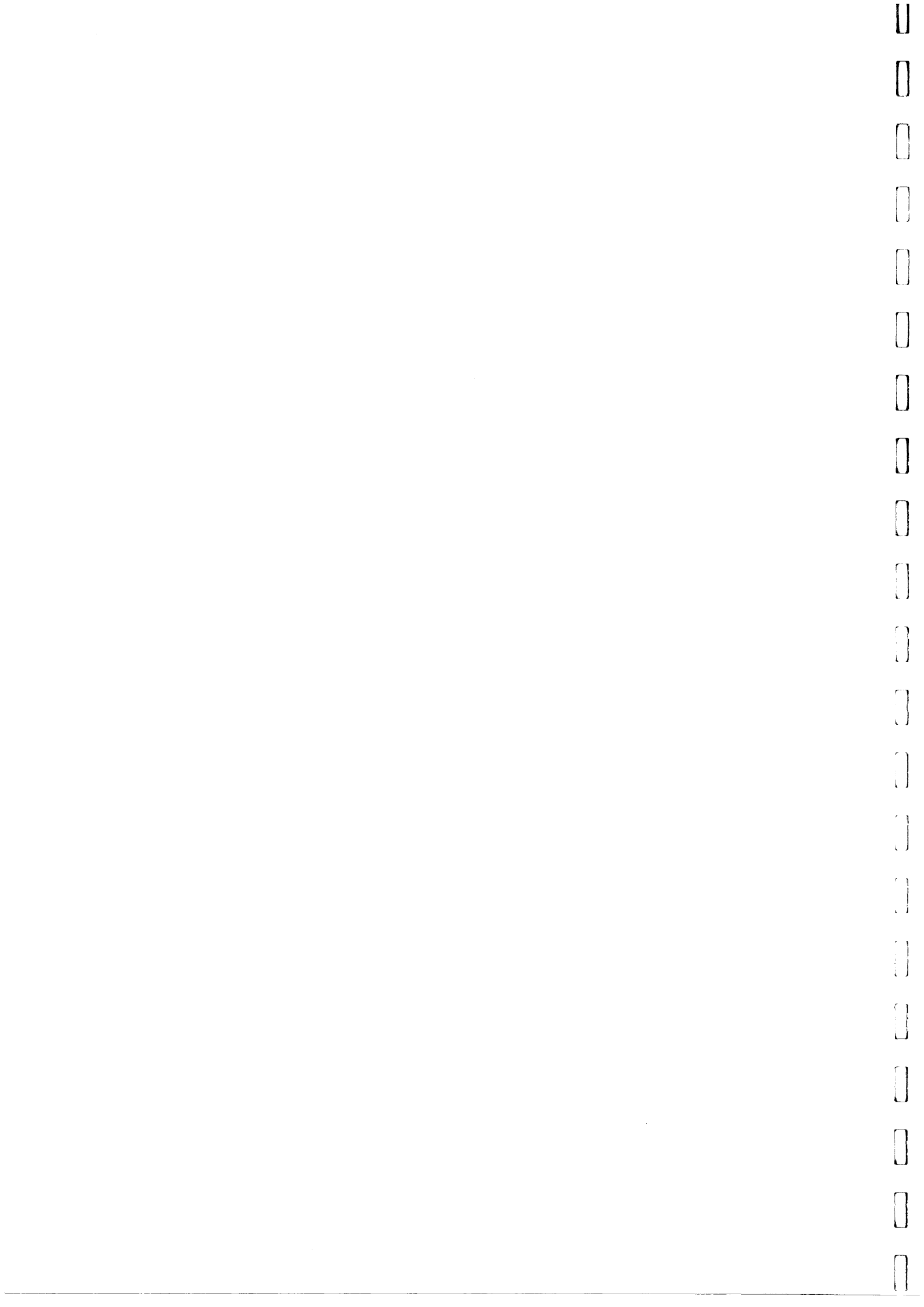
AGREEMENT NO. CE 52/2007(HY)
TUENNAN - CHEK LAP KOK LINK - INVESTIGATION

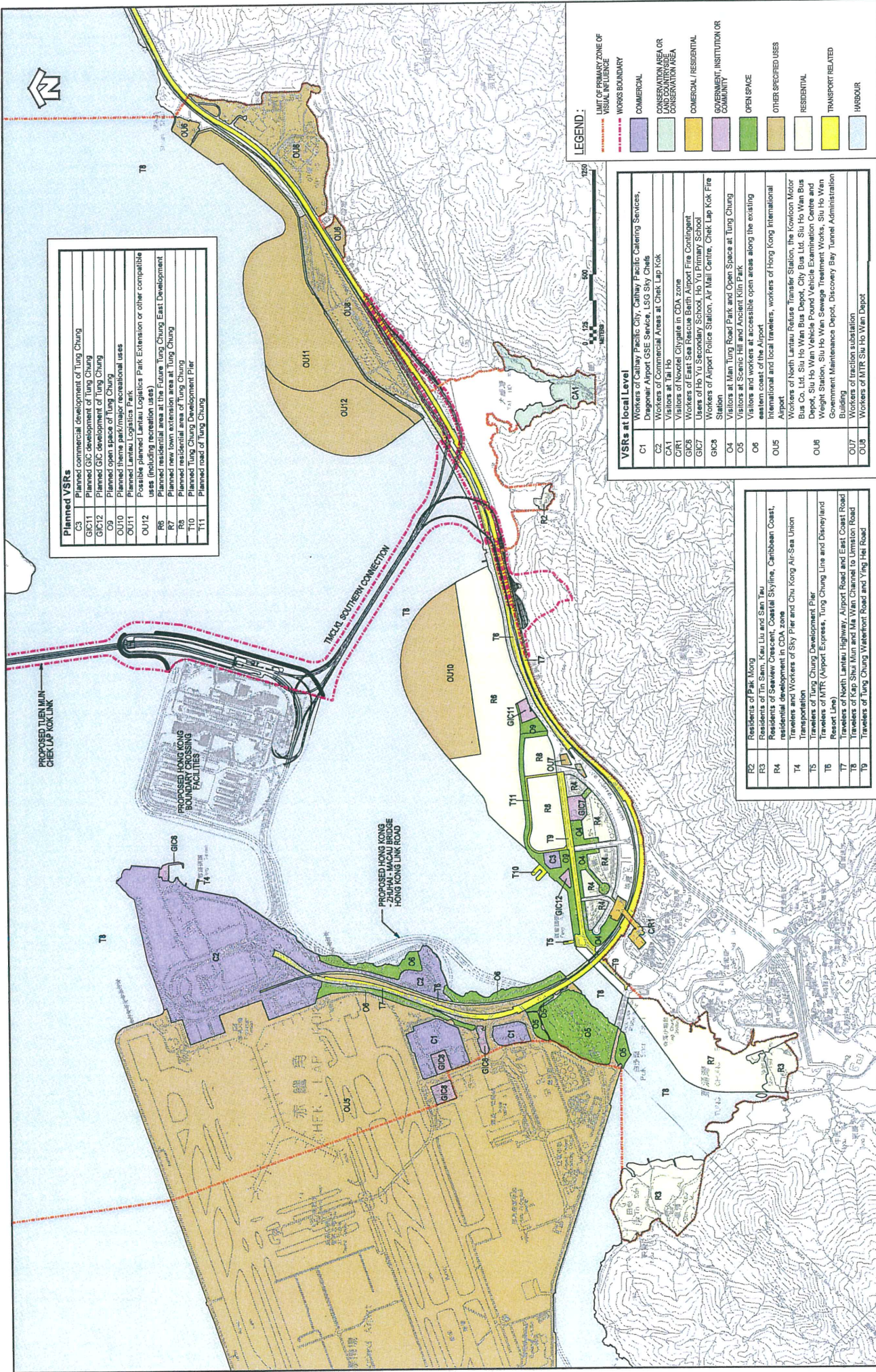
BASELINE KEY VSRs AND VIEWPOINTS AT LOCAL LEVEL WITH DEVELOPMENT PROPOSAL OVERLAID DURING OPERATION

SCALE: 1:25000
CHECK: E.L.L.
JOB NO.: 60044963

DATE: MAY 2009
DRAWN: F.L.L.
REV: --

SHEET 1 OF 2
FIGURE 7.3.1.3





Planned VSRs

C3	Planned commercial development of Tung Chung
GIC11	Planned GIC development of Tung Chung
GIC12	Planned GIC development of Tung Chung
O9	Planned open space of Tung Chung
OUI0	Planned theme park/major recreational uses
OUI1	Planned Lamtau Logistics Park
OUI2	Possible planned Lamtau Logistics Park Extension or other compatible uses (including recreation uses)
R8	Planned residential area at the Future Tung Chung East Development
R9	Planned residential area at Tung Chung
R10	Planned residential area of Tung Chung
T10	Planned Tung Chung Development Pier
T11	Planned road of Tung Chung

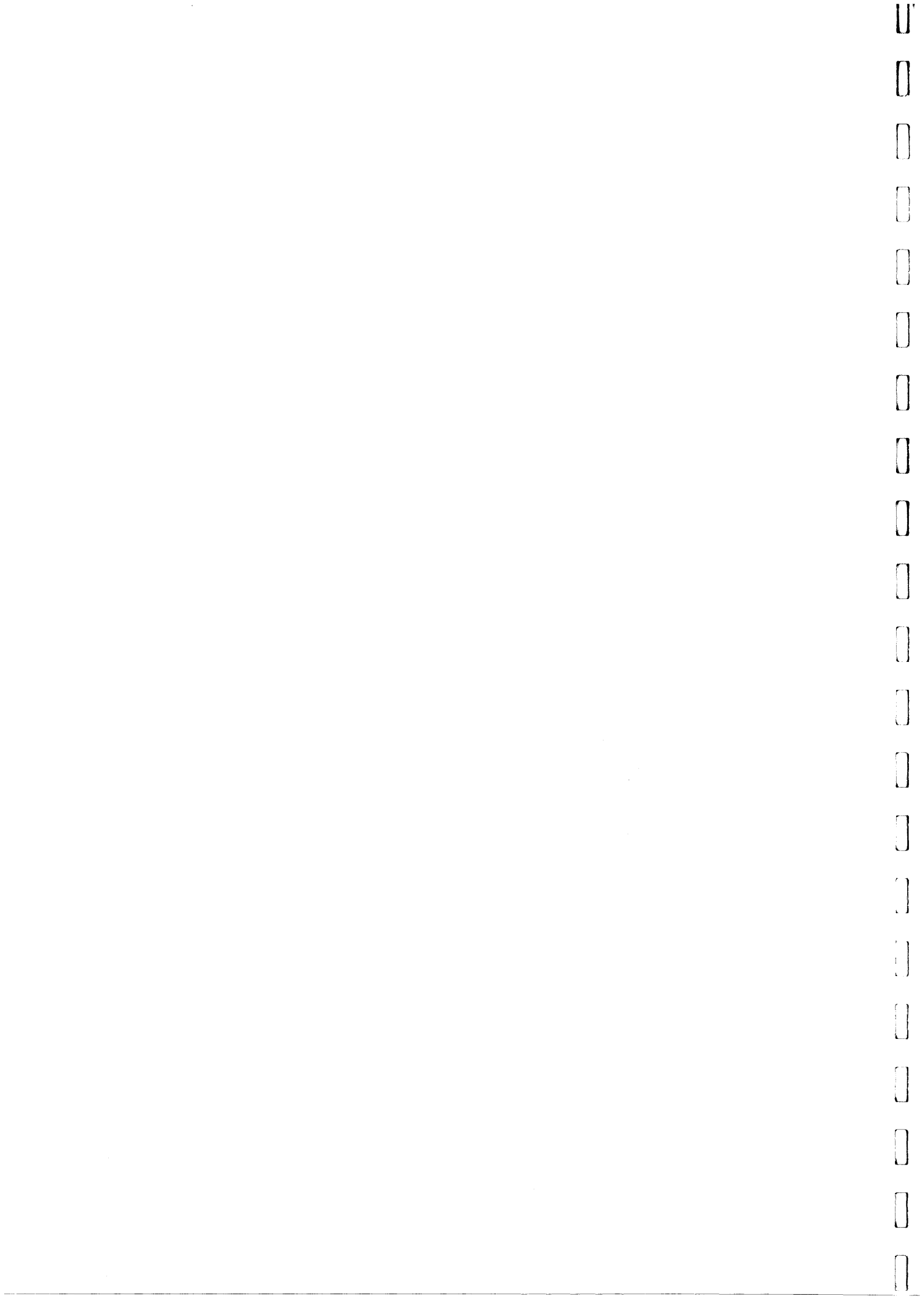
VSRs at local level

C1	Workers of Cathay Pacific City, Cathay Pacific Catering Services, Dragonair Airport GSE Service, LSG Sky Chefs
C2	Workers of Commercial Areas at Chek Lap Kok
C3	Visitors at Tai Ho
GIC1	Visitors of Novotel Citygate in CDA zone
GIC2	Workers of East Coast Reconciliation Basin (non-Fire Contingent)
GIC3	Workers of H10 to Secondary School Area Primary School
GIC4	Workers of Airport Police Station, Air Mail Centre, Chek Lap Kok Fire Station
O4	Visitors at Main Tung Road Park and Open Space at Tung Chung
O5	Visitors at Scenic Hill and Ancient Kiln Park
O6	Visitors and workers at accessible open areas along the existing eastern coast of the Airport
O15	International and local travellers, workers of Hong Kong International Airport
O16	Workers of North Lantau Refuse Transfer Station, the Kowloon Motor Bus Co. Ltd. Siu Ho Wan Bus Depot, City Bus Ltd. Siu Ho Wan Bus Depot, Siu Ho Wan Vehicle Found Vehicle Examination Centre and Weight Station, Siu Ho Wan Sewage Treatment Works, Siu Ho Wan Government Maintenance Depot, Discovery Bay Tunnel Administration Building
O17	Workers of traction substation
O18	Workers of MTR-Siu Ho Wan Depot

R2	Residents of Pak Mong
R3	Residents of Tin Sam, Kau Liu and San Tau
R4	Residents of Seaview Crescent, Coastal Skyline, Cambrian Coast, residential development in CDA zone
T4	Travellers and Workers of Sky Pier and Chu Kong Air-Sea Union
T5	Travellers of Tung Chung Development Pier
T6	Travellers of MTR (Airport Express, Tung Chung Line and Dancyland Resort Line)
T7	Travellers of North Lantau Highway, Airport Road and East Coast Road
T8	Travellers of Kap Shui Mun and Ma Wan Channel to Umiston Road
T9	Travellers of Tung Chung Waterfront Road and Ying Hei Road

AGREEMENT NO. CE 59/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION
BASELINE KEY VSRs AND VIEWPOINTS AT LOCAL LEVEL WITH DEVELOPMENT PROPOSAL OVERLAID DURING OPERATION

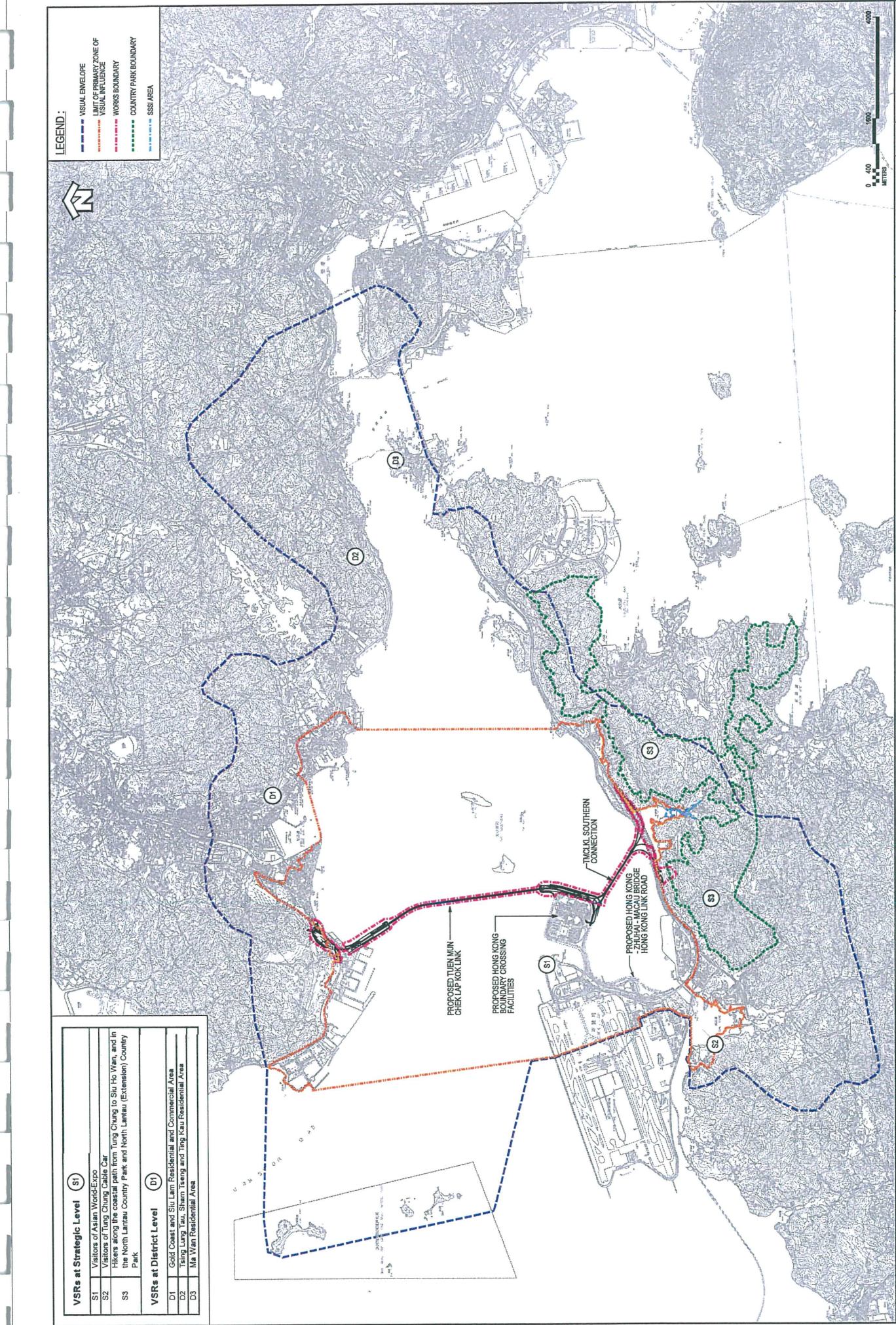
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	CHECK: E.L.	DRAWN: F.L.
JOB NO. 60044963	DRAWING NO. FIGURE 7.3.1.4	
SHEET 2 OF 2	REV: ---	



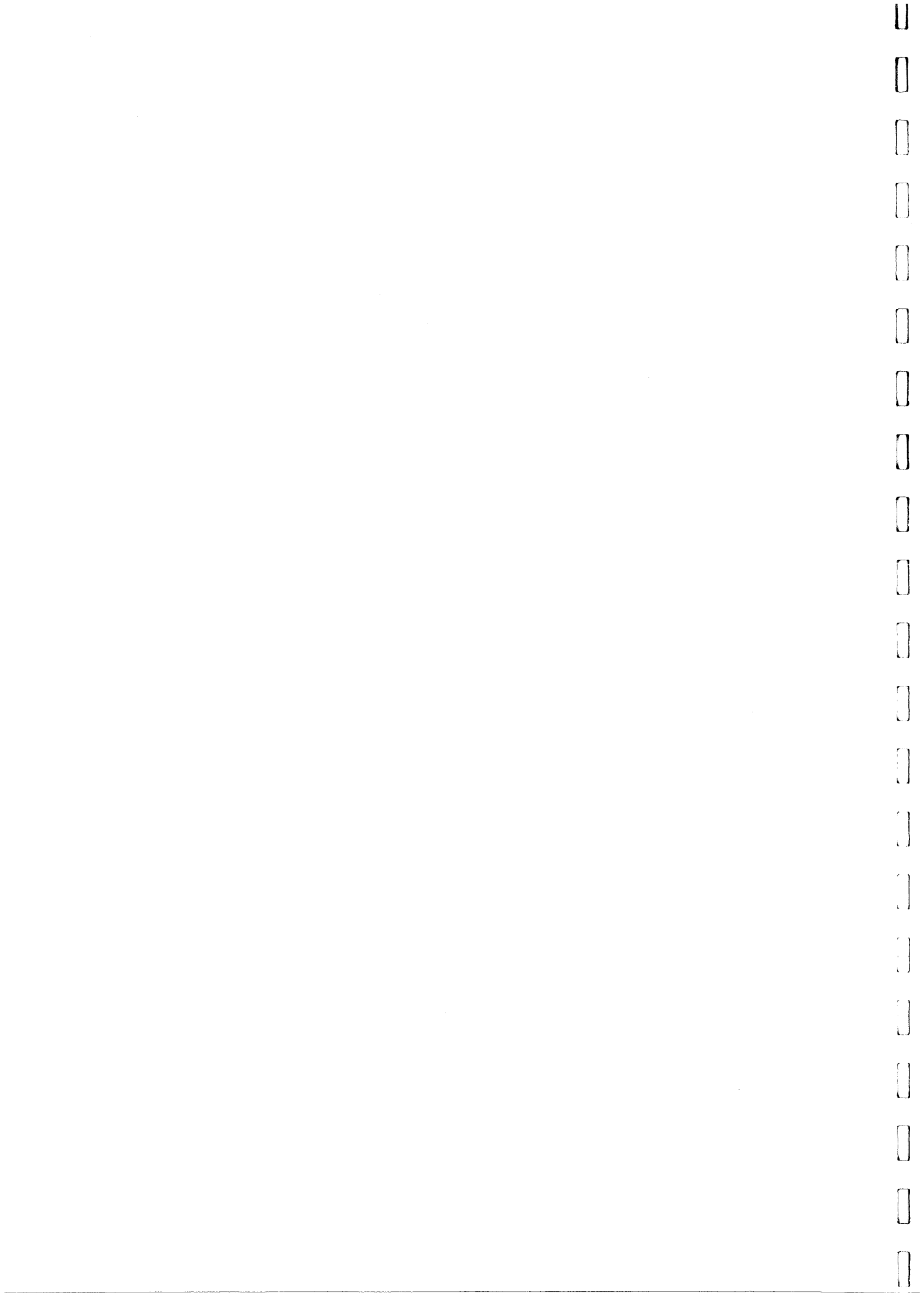
VSRs at Strategic Level (S1)	
S1	Visitors of Asian World Expo
S2	Visitors of Tung Chung Cable Car
S3	Hikers along the coastal path from Lung Chung to Siu Ho Wan, and in the North Lantau Country Park and North Lantau (Extension) Country Park
VSRs at District Level (D1)	
D1	Gold Coast and Siu Lam Residential and Commercial Area
D2	Tung Lung Tsau, Shern Tsang and Ting Kau Residential Area
D3	Ma Wan Residential Area

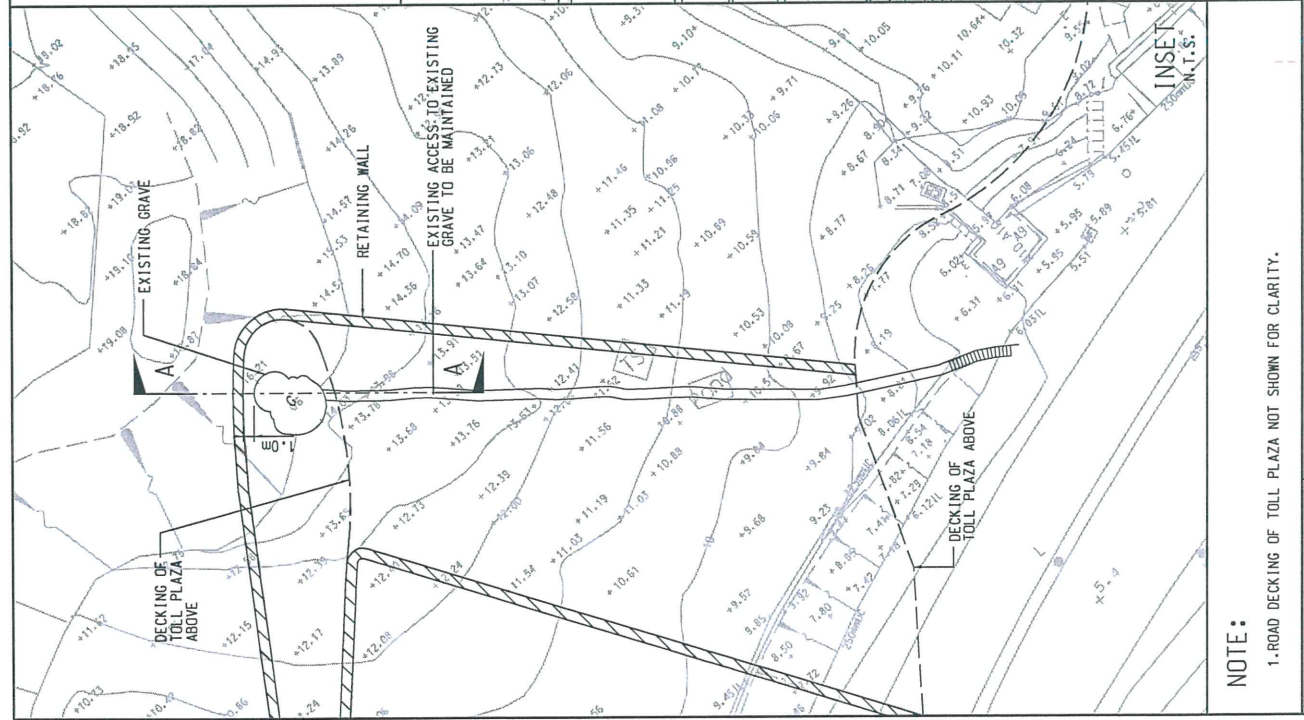
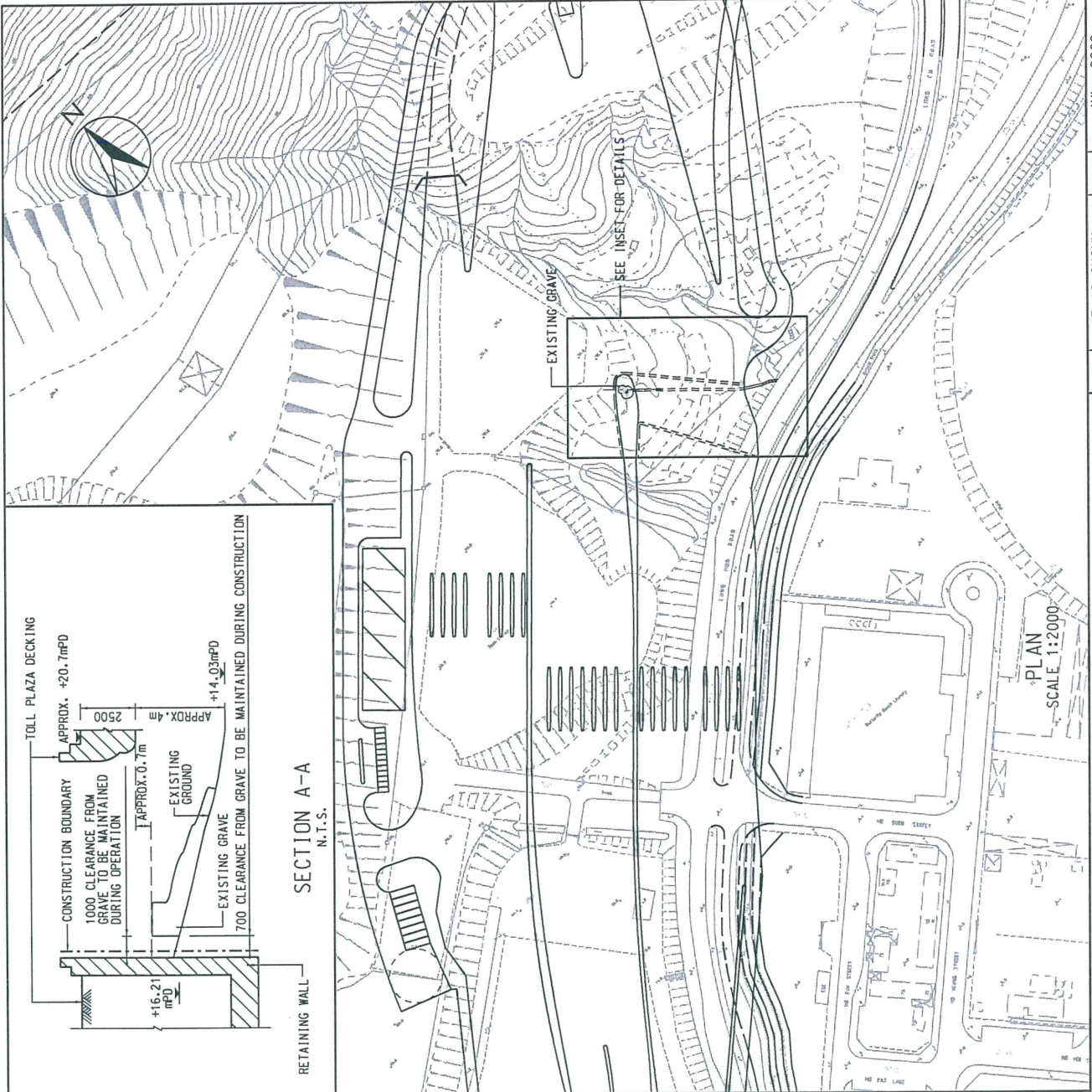
LEGEND:

- VISUAL ENVELOPE
- LIMIT OF PRIMARY ZONE OF VISUAL INFLUENCE
- WORKS BOUNDARY
- COUNTRY PARK BOUNDARY
- SSSI AREA



AECOM	AGREEMENT NO. CE 52/2007(HY)	SCALE	DATE
	TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION	1:80000	MAY 2009
BASELINE KEY VSRs AND VIEWPOINTS AT STRATEGIC AND DISTRICT LEVEL WITH DEVELOPMENT PROPOSAL OVERLAD	CHECK	DRAWN	DRAWING NO.
	JOB NO.	E.L.	F.L.
		60044963	FIGURE 7.3.2.1
			REV





NOTE:

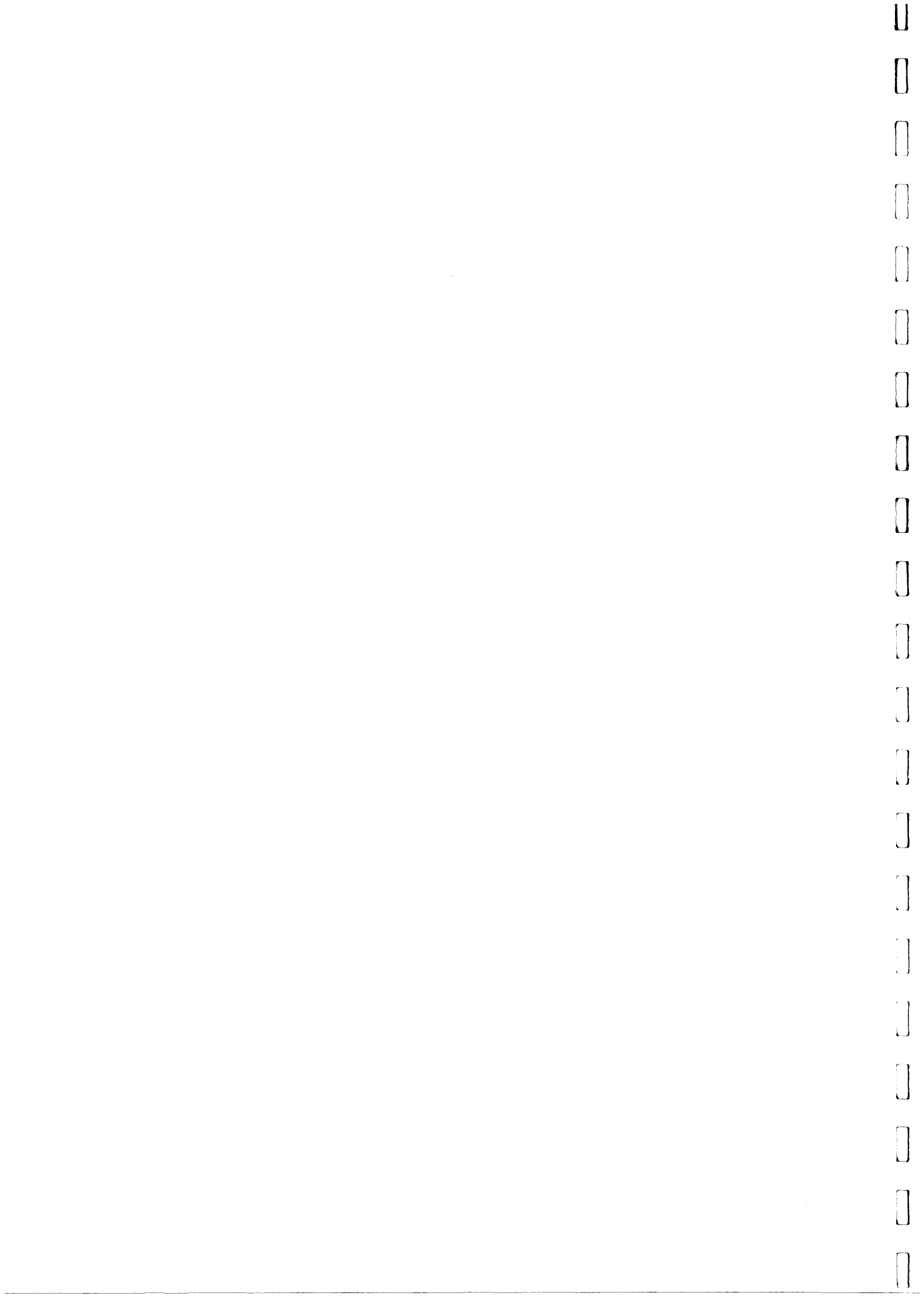
1.-ROAD DECKING OF TOLL PLAZA NOT SHOWN FOR CLARITY.

SCALE	A3 AS SHOWN	DATE	JUL. 2009
CHECK	---	DRAWN	HY
JOB NO.	60044963	DRAWING NO.	FIG 9.1
REV	---	REV	---

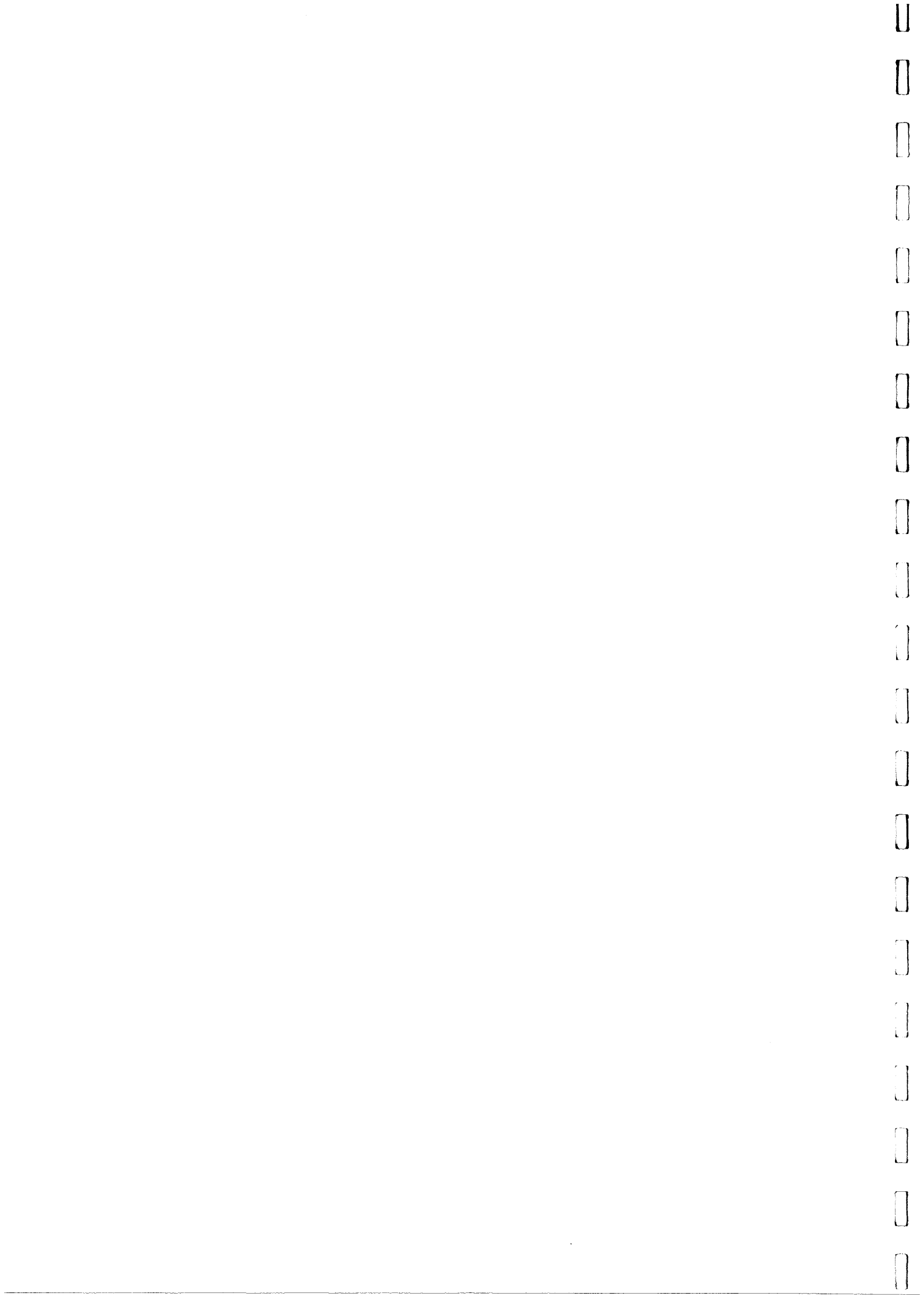
AGREEMENT NO. CE 52/2007(HY)
TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

RETAINING WALLS ARRANGEMENT AT EXISTING GRAVE

AECOM



Appendix A
Environmental Mitigation and Enhancement Measure
Implementation Schedules



**Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION**

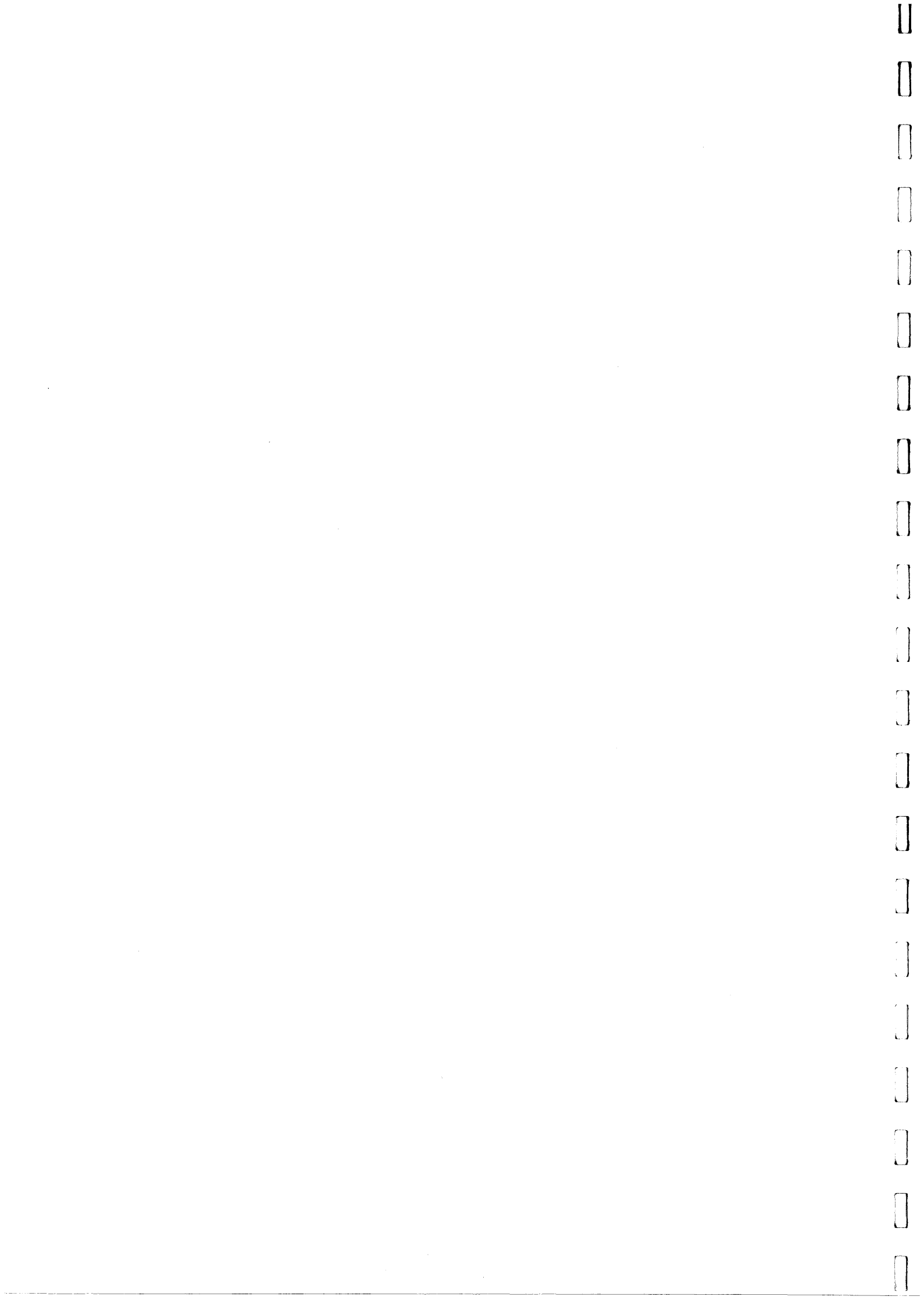
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Air Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
4.8.1	3.8	An effective watering programme of twice daily watering with complete coverage, is estimated to reduce by 50%. This is recommended for all areas in order to reduce dust levels to a minimum;	All areas / throughout construction period	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		n/a
4.8.1	3.8	Watering of the construction sites in Lantau for 8 times/day and in Tuen Mun for 12 times/day to reduce dust emissions by 87.5% and 91.7% respectively and shall be undertaken.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	The Contractor shall, to the satisfaction of the Engineer, install effective dust suppression measures and take such other measures as may be necessary to ensure that at the Site boundary and any nearby sensitive receiver, dust levels are kept to acceptable levels.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	The Contractor shall not burn debris or other materials on the works areas.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	In hot, dry or windy weather, the watering programme shall maintain all exposed road surfaces and dust sources wet.	All unpaved haul roads / throughout construction period in hot, dry or windy weather	Contractor	TMEIA Avoid smoke impacts and disturbance		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



**Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION**

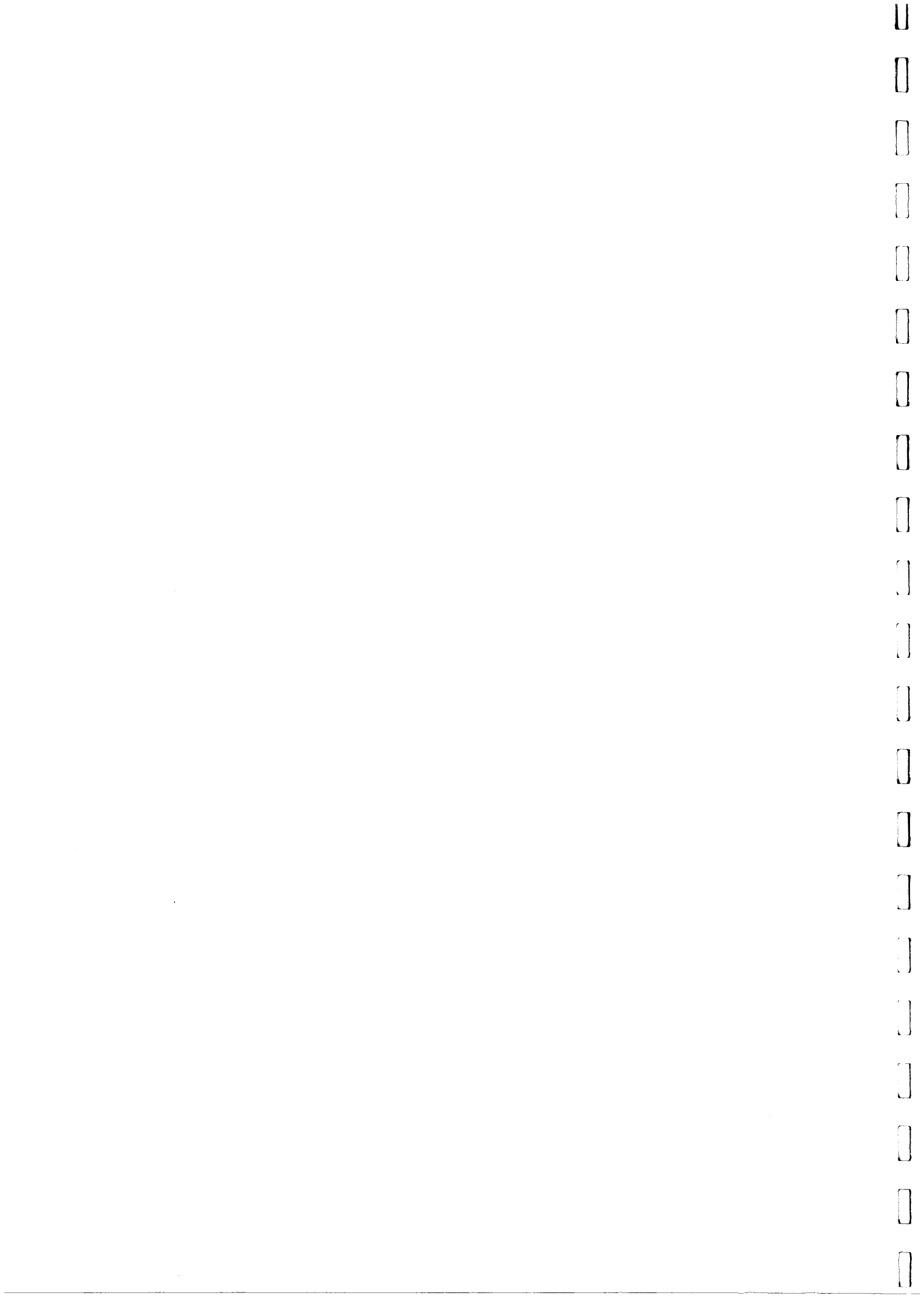
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Air Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
4.8.1	3.8	Where breaking of oversize rock/concrete is required, watering shall be implemented to control dust. Water spray shall be used during the handling of fill material at the site and at active cuts, excavation and fill sites where dust is likely to be created.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	Open dropping heights for excavated materials shall be controlled to a maximum height of 2m to minimise the fugitive dust arising from unloading.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	During transportation by truck, materials shall not be loaded to a level higher than the side and tail boards, and shall be dampened or covered before transport.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin. The tarpaulin shall be properly secured and shall extend at least 300mm over the edges of the side and tail boards.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	No earth, mud, debris, dust and the like shall be deposited on public roads. Wheel washing facility shall be usable prior to	All site exits / throughout construction period	Contractor	TMEIA Avoid dust		Y		n/a

Legend: D=Design, C=Construction, O=Operation

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**Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION**

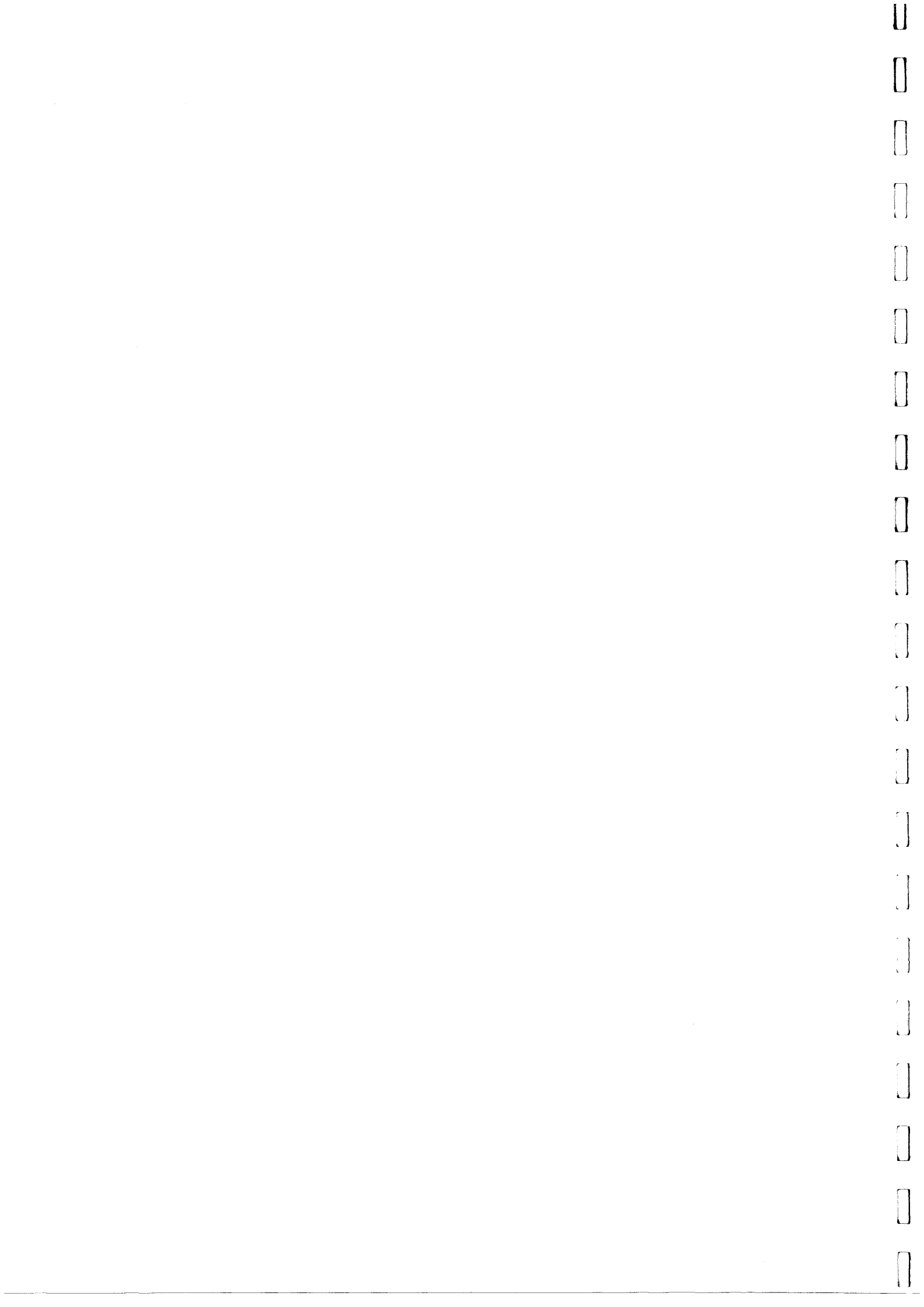
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Air Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
4.8.1	3.8	any earthworks excavation activity on the site. Areas of exposed soil shall be minimised to areas in which works have been completed shall be restored as soon as is practicable.	All exposed surfaces / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.8.1	3.8	All stockpiles of aggregate or spoil shall be enclosed or covered and water applied in dry or windy condition.	All areas / throughout construction period	Contractor	TMEIA Avoid dust generation		Y		n/a
4.11	Section 3	EM&A in the form of 1 hour and 24 hour dust monitoring and site audit	All representative existing ASRs / throughout construction period	Contractor	EM&A Manual		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



**Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION**

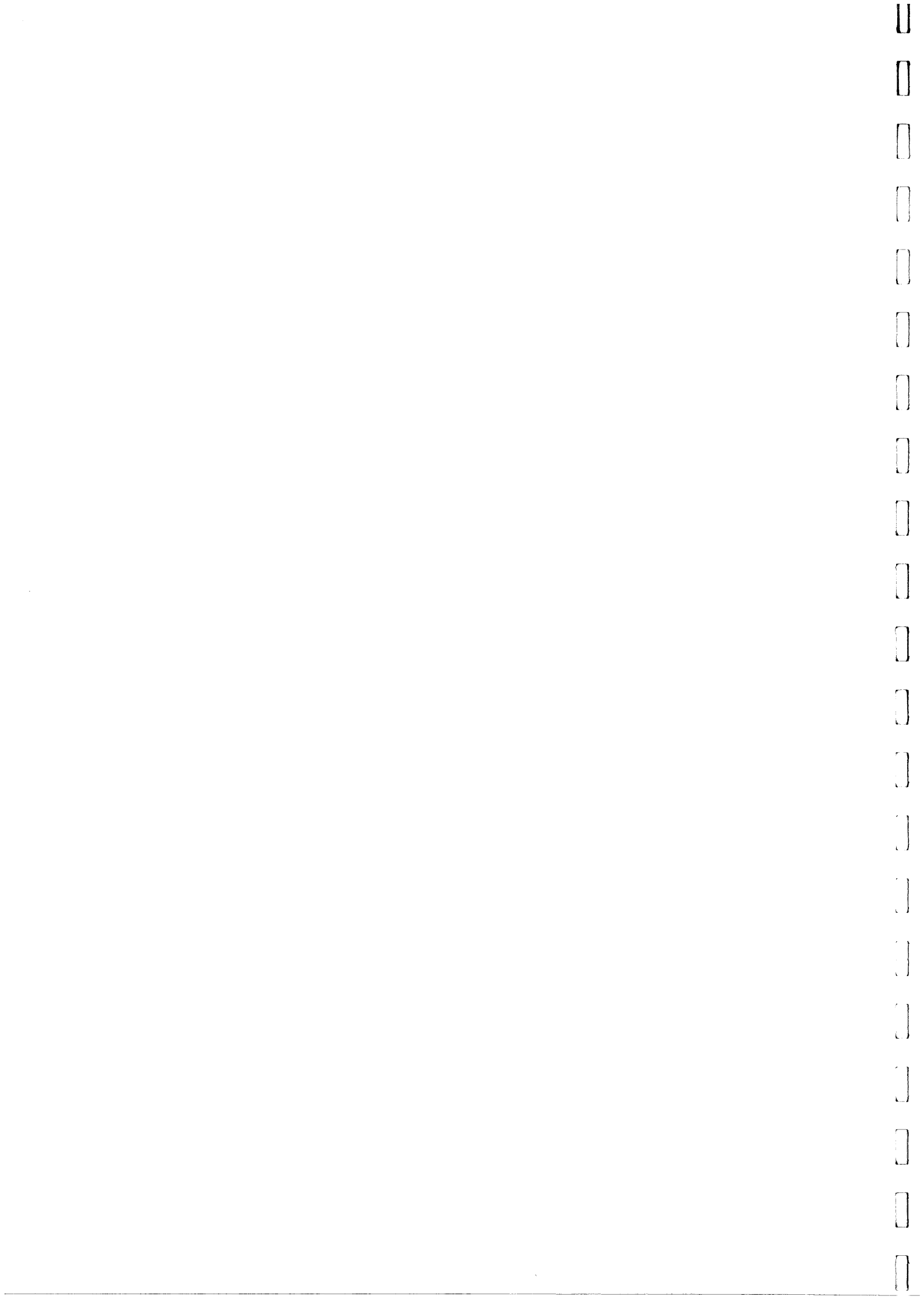
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Noise

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
5.11	Section 4	Noise monitoring	All existing representative sensitive receivers / during North Lantau Viaduct construction	Contractor	EM&A Manual		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



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TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION**

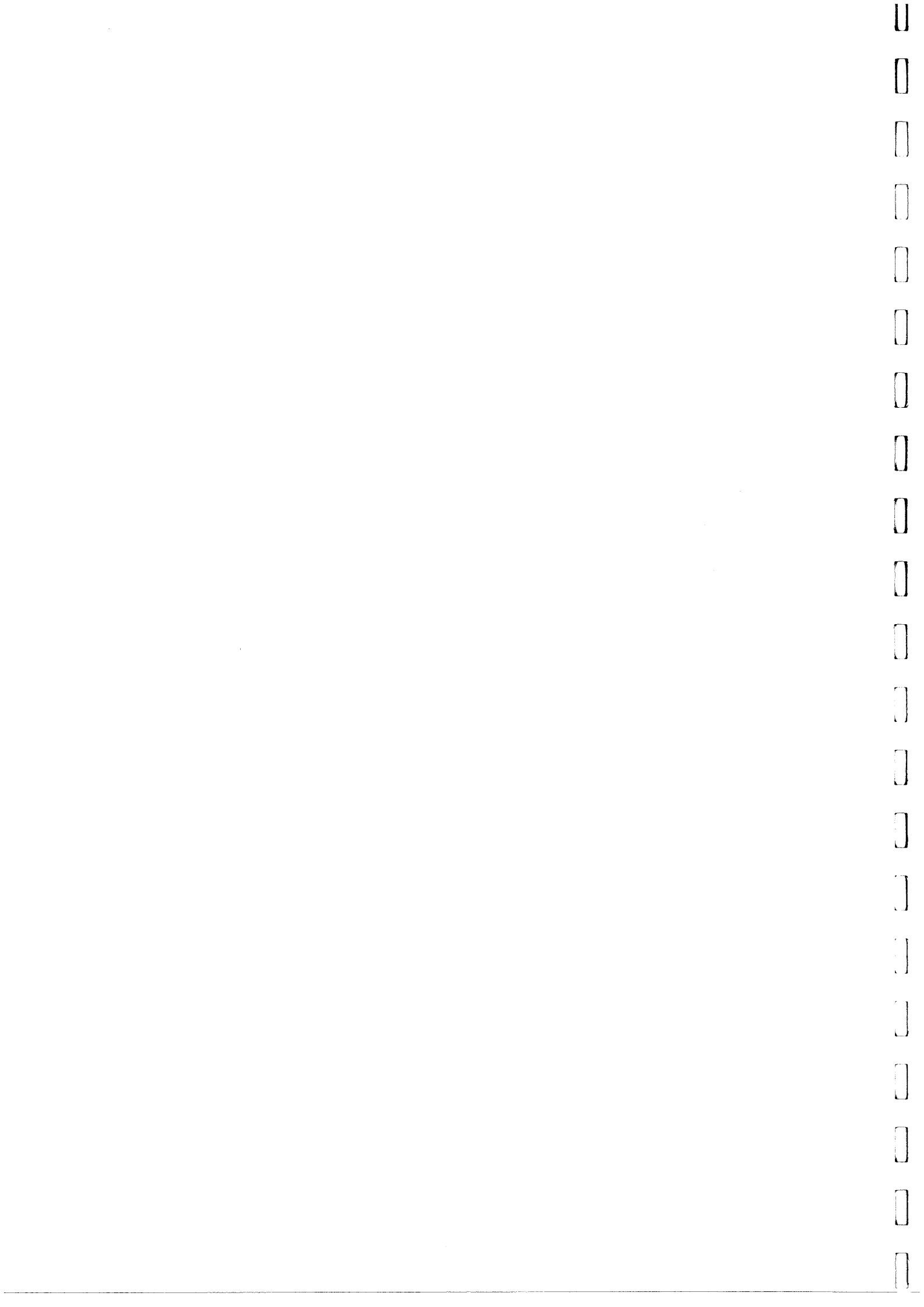
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
Marine Works (Sequence A)									
6.10	-	Formation of temporary seawall enclosing Portion A of HKBCF (except for 100m gaps for marine access) to be completed prior to the main phase of reclamation dredging and filling activities.	Portion A of HKBCF/ prior to dredging and backfilling works	Contractor	TM-EIAO	Y			n/a
6.10 Figure 6.2a Appendix D6a	Annex A	Construction of seawalls to be advanced by at least 200m before the main reclamation dredging and filling can commence. The protection by advanced seawall is a dynamic process depending on the progress of the construction activities and the stage when such protection could be realised is illustrated in Figure 6.2a and detailed in Appendix D6a. The part of the works where such measures can be undertaken for the majority of the time includes the following locations: - TM-CLKL northern reclamation; - TM-CLKL southern reclamation (after formation of the nips); - Reclamation dredging and filling for	All areas/ prior to dredging and backfilling works	Contractor	TM-EIAO	Y			n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



**Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION**

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		Portion B of HKBCF; - Reclamation filling for Portion C of HKBCF; - Reclamation filling for Portion D of HKBCF; Reclamation filling for FSD berth of HKBCF; and - Reclamation dredging and filling for Portion I of HKLR;							
6.10	-	a maximum of 30% public fill to be used for all seawall and reclamation filling below +2.5mPD for the HKBCF and HKLR projects.	HKBCF and HKLR seawall and reclamation filling	Contractor	TM-EIAO		Y		n/a
6.10	-	a maximum of 50% public fill to be used for all seawall filling below +2.5mPD for TM-CLKL southern and northern landfalls.	TM-CLKL seawall filling	Contractor	TM-EIAO		Y		n/a
6.10	-	a maximum of 30% public fill to be used for reclamation filling below +2.5mPD for TM-CLKL southern landfall	TM-CLKL southern landfall reclamation filling	Contractor	TM-EIAO		Y		n/a
6.10	-	a maximum of 100% public fill to be used for reclamation filling below +2.5mPD for TM-CLKL northern landfall	TM-CLKL northern landfall reclamation filling	Contractor	TM-EIAO		Y		n/a
6.10	-	Use of cage type silt curtains round all	All areas dredging works	Contractor	TM-EIAO		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



**Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION**

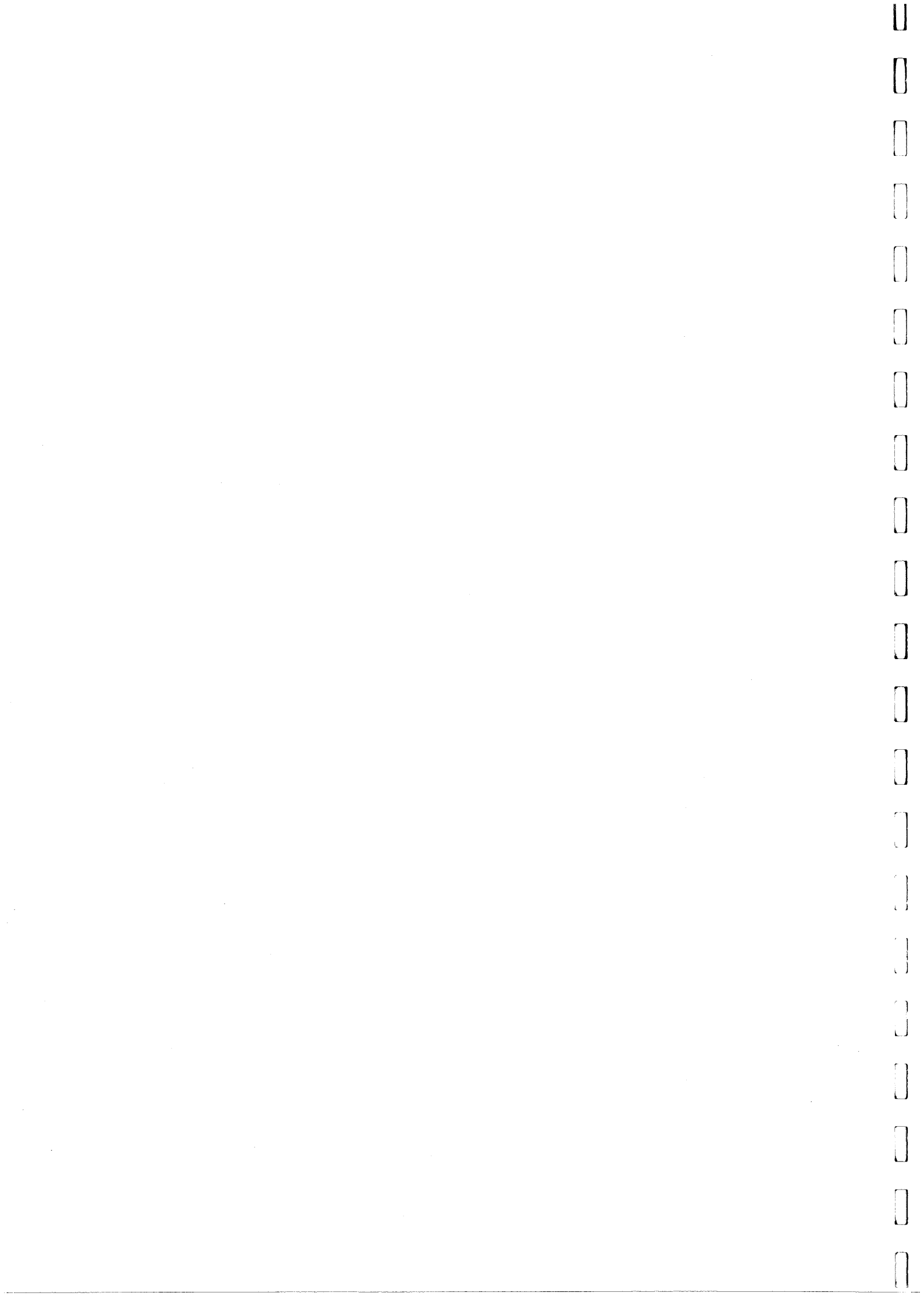
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		grab dredgers during the HKBCF, HKLR and TM-CLKL southern reclamation works.							
6.10 Appendix D6a	Annex A	A layer of floating type silt curtain will be applied around all works as defined in Appendix D6a.	All areas/ throughout marine works	Contractor	TM-EIAO		Y		n/a
6.10	-	Construct one side of Portion D of HKBCF seawalls crossing the channel prior to the other works.	Portion D of HKBCF / prior to other dredging and backfilling works	Contractor	TM-EIAO		Y		n/a
6.10 Appendix D6a	5.2 Annex A	Construct a sheet piled wall north of the HKBCF island (Appendix D6a), in order to allow the use of silt curtains during Phase 2 works.	North of HKBCF island/ prior to dredging and backfilling works	Contractor	TM-EIAO		Y		n/a
6.10	-	Trailer suction hopper dredgers shall not allow mud to overflow.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	The use of Lean Material Overboard (LMOB) systems shall be prohibited.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



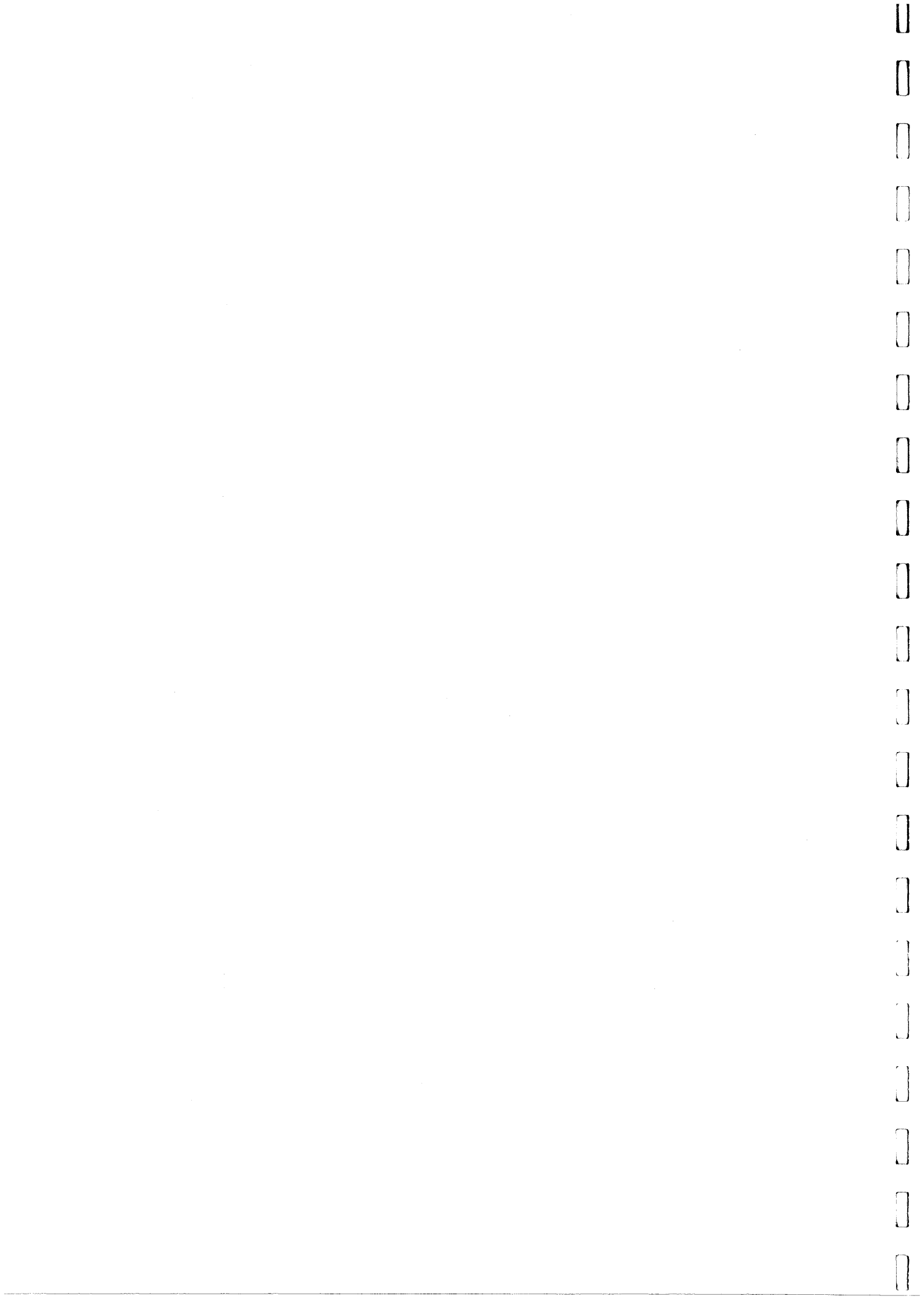
Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Water Quality

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
Marine Works (Sequence B)									
6.10	-	Formation of seawall enclosing the main reclamation site of TM-CLKL (southern landfall) and HKBCF (except for 100m gaps for marine access) to be completed prior to reclamation dredging and filling activities	HKBCF and TM-CLKL southern landfall prior to reclamation dredging and reclamation backfilling works	Contractor	TM-EIAO		Y		n/a
6.10	Annex A	Installation of sheet pile wall next to the northern boundary of the HKBCF+TM-CLKL (southern landfall) to ensure floating type silt curtains can be applied effectively (See Figure 3 of Appendix D5b). The sheet piled wall is a recommended mitigation measure under Sequence A and further developed as an integrated protection measure under Sequence B: - before the completion of the sheet pile wall next to the northern boundary of the HKBCF+TM-CLKL (southern landfall), seawall dredging at the area north of the demarcation line of the	HKBCF and TM-CLKL southern landfall	Contractor	TM-EIAO		Y		n/a

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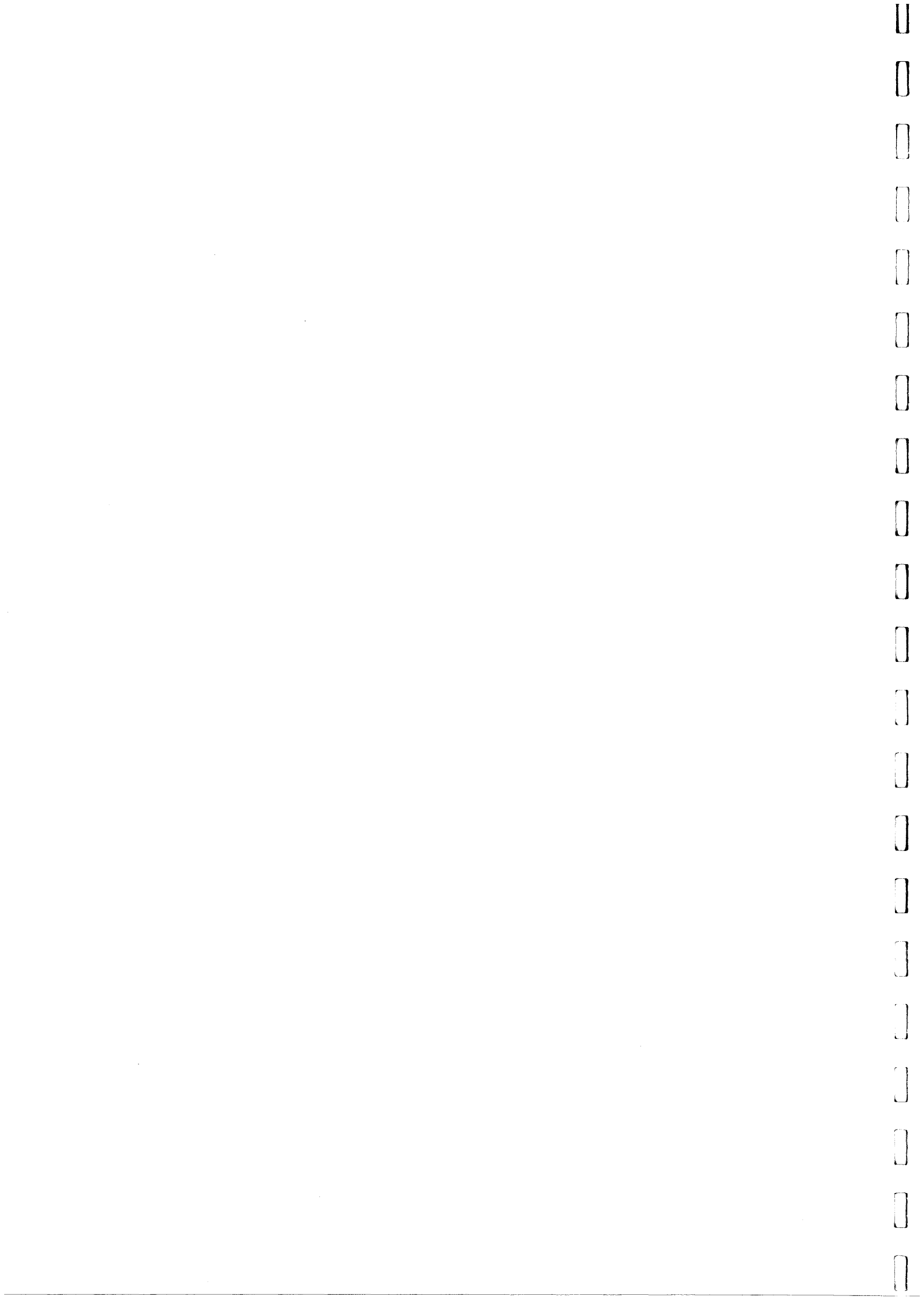
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						D	C	O	
		<p>Phase 1 and 2 of HKBCF will not be carried out;</p> <ul style="list-style-type: none"> - before the seawall within the area of Phase 2 of HKBCF is formed above +2.5mPD, except for 100m gaps for marine access, the sheet pile wall at the northern boundary of the HKBCF+TM-CLKL (southern landfall) will not be removed; and - before the whole perimeter of seawall for HKBCF+TM-CLKL (southern landfall) is formed above +2.5mPD, except for 100m gaps for marine access and portion D of HKBCF, no dredging and reclamation filling will be carried out within the seawall boundary. Dredging for the formation of the pits for the subsequent Mf sediment backfilling within the HKBCF boundary is an exception 							
6.10	Annex A	For other parts of the reclamation works construction of seawalls to be advanced by	TM-CLKL northern landfall,	Contractor	TM-EIAO		Y		n/a

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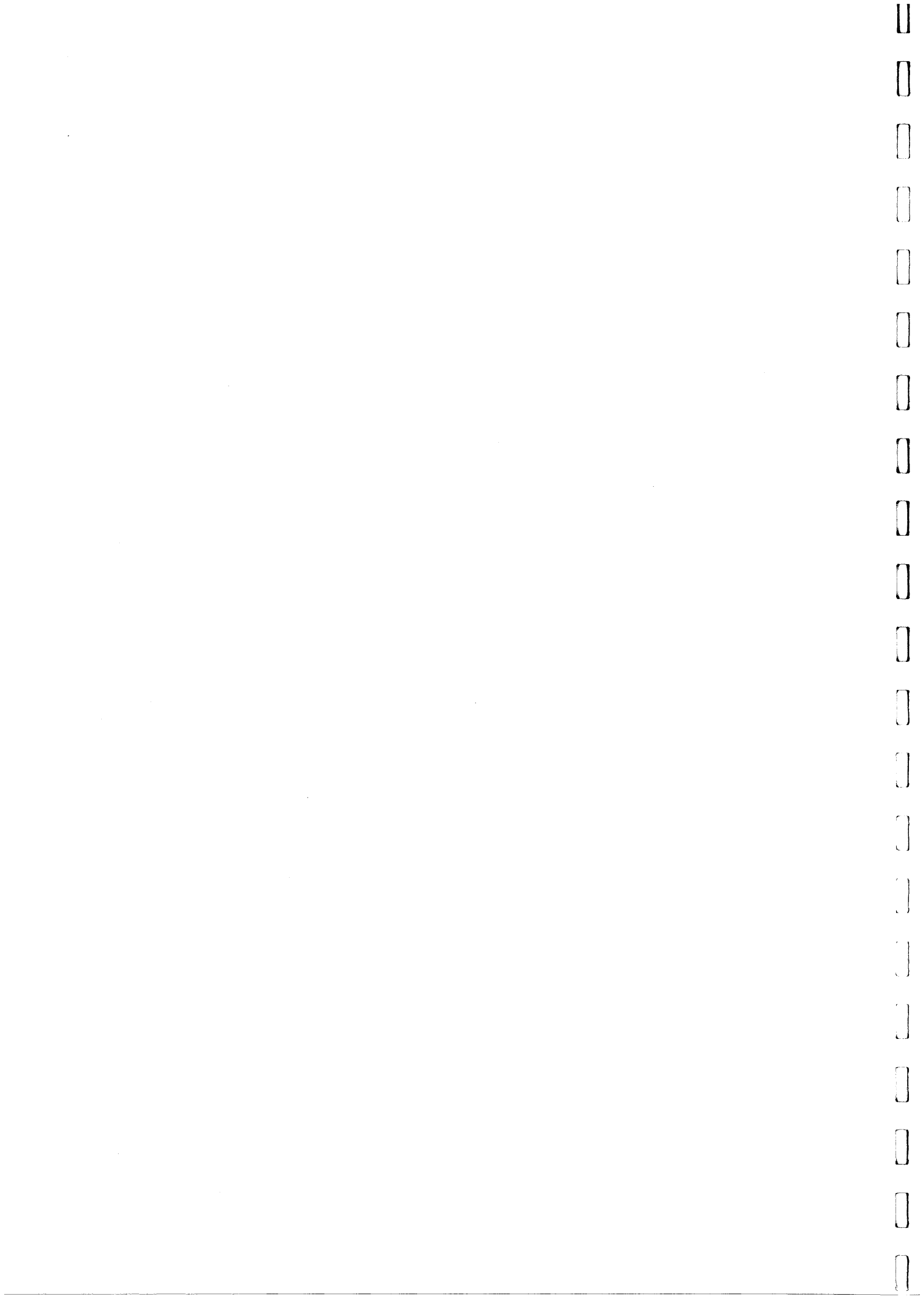
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Figure 6.2b Appendix D6b		<p>at least 200m before the main reclamation dredging and filling can commence. It should be noted that the protection by advanced seawall is a dynamic process depending on the progress of the construction activities and the stage when such protection could be realised is illustrated in Figure 6.2b and detailed in Appendices D6b. The part of the works where such measures can be undertaken for the majority of the time includes the following locations:</p> <ul style="list-style-type: none"> - TM-CLKL northern reclamation; - Reclamation filling for Portion D of HKBCF; Reclamation filling for FSD berth of HKBCF; and - Reclamation dredging and filling for Portion 1 of HKLR; 	Portion D of HKBCF and HKLR						
6.10	-	For HKBCF seawall filling, no soft public fill will be used for filling below +2.5mPD;	HKBCF seawall filling works	Contractor	TM-EIAO		Y		n/a

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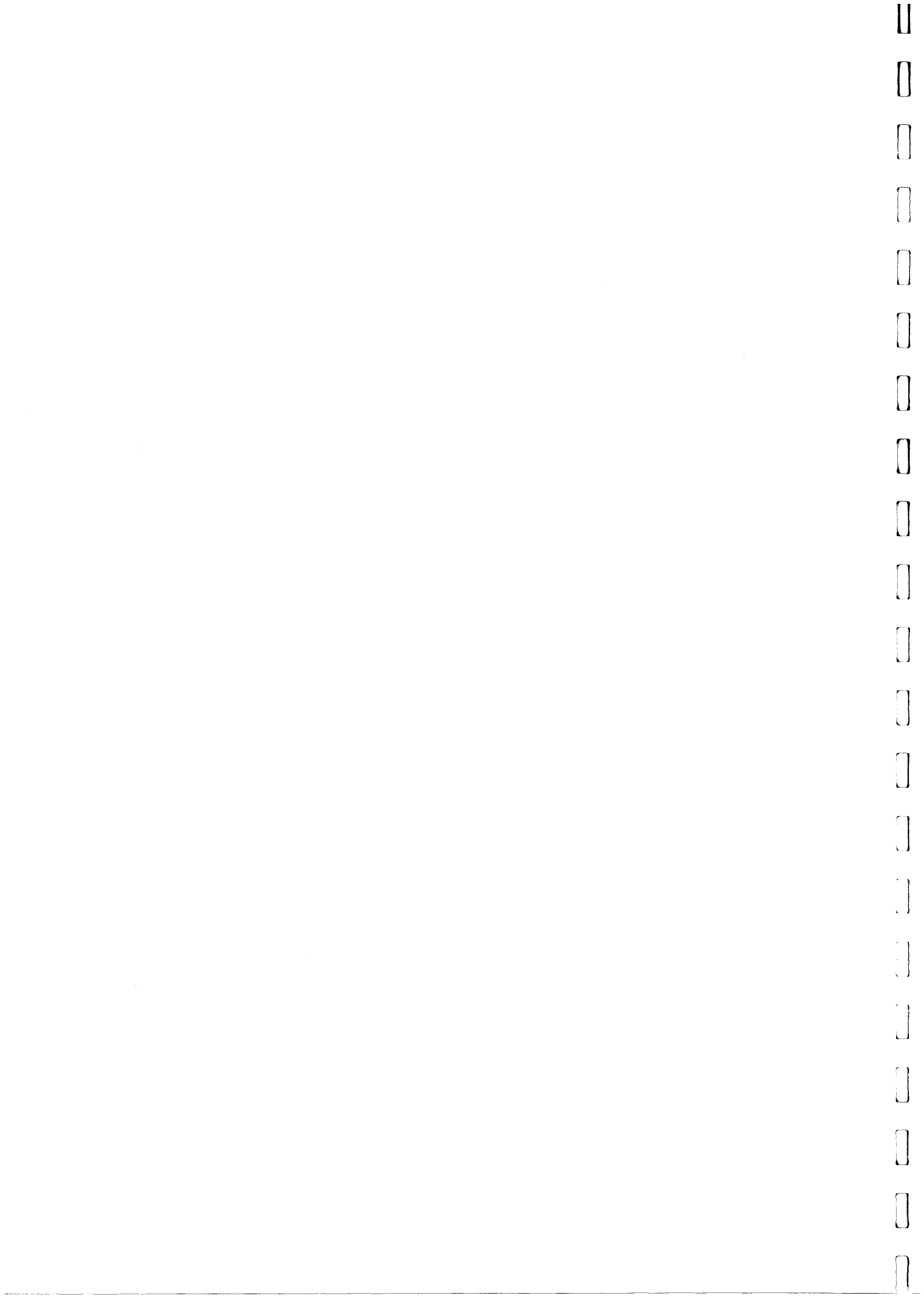
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						D	C	O	
6.10	-	For TM-CLKL southern landfall seawall filling, no soft public fill will be used for filling below +2.5mPD and the fill material below that level will consist of 50% sand and 50% rock;	TM-CLKL southern landfall seawall filling works	Contractor	TM-EIAO	Y			n/a
6.10	-	The filling material for the other parts of the works are the same as Sequence A;	All other areas/backfilling works	Contractor	TM-EIAO	Y			n/a
6.10	5.7	Cage type silt curtain (with steel enclosure) shall be used for grab dredgers working in the site of HKBCF and TM-CLKL southern reclamation. Cage type silt curtains will be applied round all grab dredgers at other works area	HKBCF, HKLR and TM-CLKL grab dredging	Contractor	TM-EIAO	Y			n/a
6.10	Annex A	A layer of floating type silt curtain will be applied around all works as defined in Appendix D6b	All areas/ through out marine works	Contractor	TM-EIAO	Y			n/a
6.10	-	HKBCF+TM-CLKL southern landfall: - The construction sequence of the seawall shall commence at the southern part of Portion 1 seawall in HKBCF,	All areas/ through out marine works	Contractor	TM-EIAO	Y			n/a

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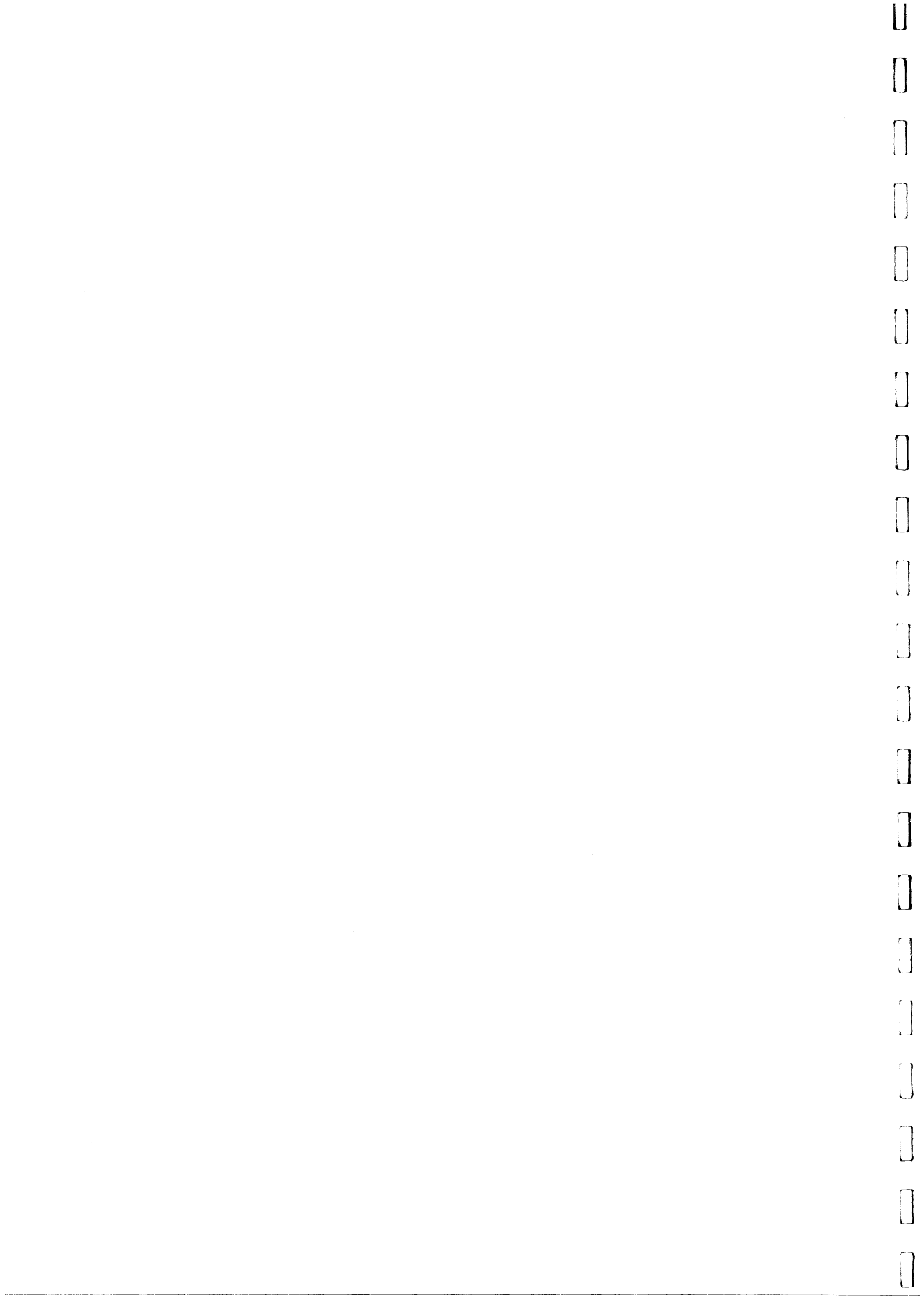
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						D	C	O	
6.10	-	<p>and then TM-CLKL southern landfall seawall, northern part of Portion 1 seawall, Portion 2 and finally Portion 3 seawall in HKBCF;</p> <ul style="list-style-type: none"> - The seawall dredging and filling works for TM-CLKL southern landfall shall start from the south-most Portion N-c towards Portion N-a unless the northern sheet piled wall has been completed; and - The main dredging and filling works at the reclamation areas of HKBCF+TM-CLKL southern landfall within the seawall boundary shall only be carried out when the whole Portion 1 seawall (except for 100m gaps for marine access) is completed above +2.5mPD. <p>TM-CLKL northern landfall:</p> <ul style="list-style-type: none"> - Reclamation filling shall not proceed until at least 200m section of leading seawall at both the east and west sides 	All areas/ through out marine works	Contractor	TM-EIAO	Y			n/a

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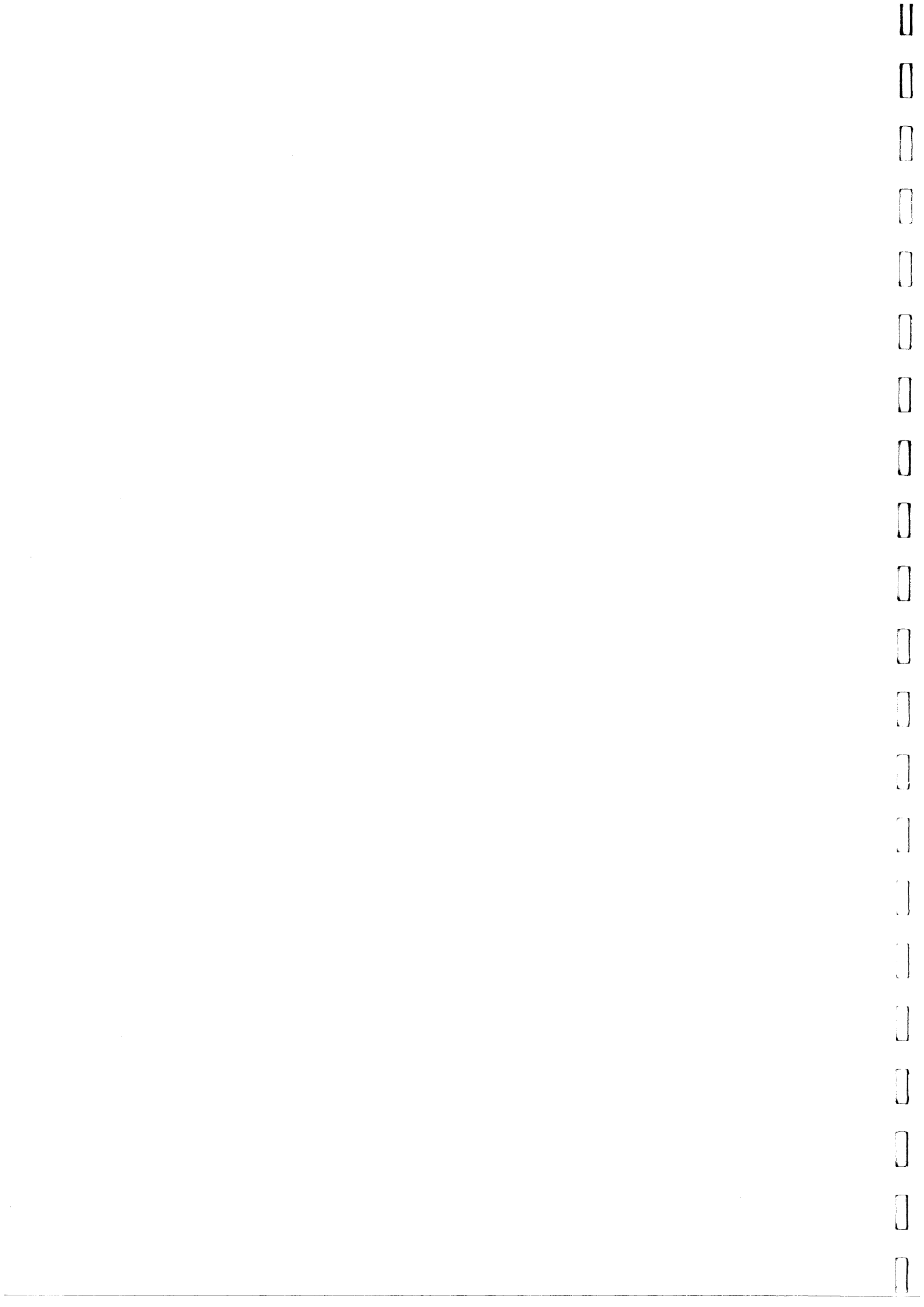
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						D	C	O	
6.10	-	of the reclamation are formed above +2.5 mPD, except for 100m gaps for marine access; HKLR coastal reclamation: - Reclamation filling shall not proceed until at least 200m section of leading seawall are formed above +2.5 mPD, except for 100m gaps for marine access;	All areas/through out marine works	Contractor	TM-EIAO	Y			n/a
General Marine Works									
6.10	-	Use of TMB for the construction of the submarine tunnel.	Tunnel works / Construction phase	Contractor	TM-EIAO	Y			n/a
6.10	-	Export dredged spoils from NWWCZ.	All areas as much as possible / dredging activities	Contractor	DASO Permit conditions	Y			n/a
6.10	-	Bored piling to be undertaken within a metal casing.	Marine viaducts of TM-CLKL and HKLR/ bored piling	Contractor	TM-EIAO	Y			n/a
6.10	-	Where public fill is proposed for filling below +2.5mPD, the fine content in the public fill will be controlled to 25%	All areas/ backfilling works	Contractor	TM-EIAO	Y			n/a
6.10	-	Where sand fill is proposed for filling	All areas/ backfilling works	Contractor	TM-EIAO	Y			n/a

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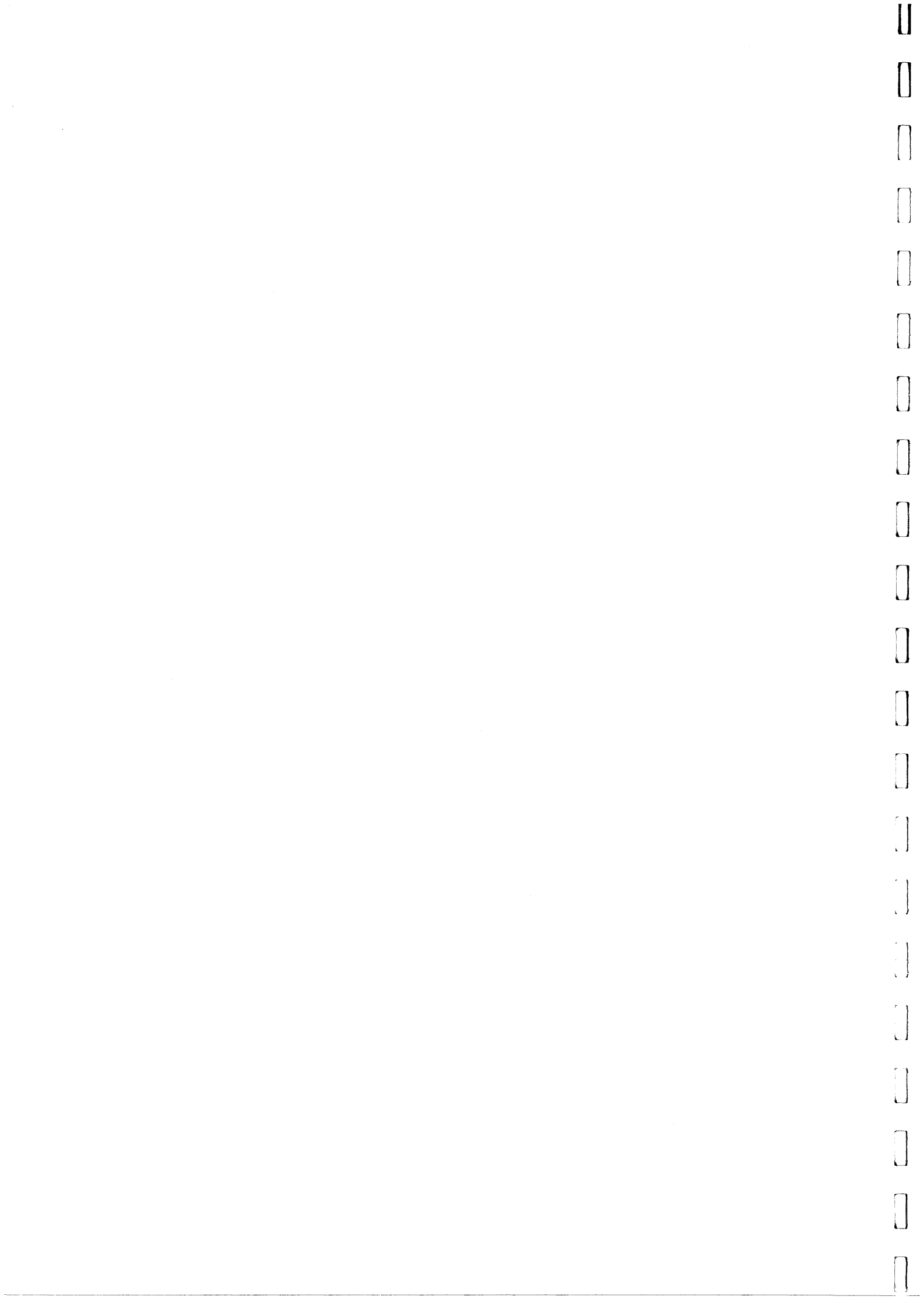
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						D	C	O	
6.10	-	below +2.5mPD, the fine content in the sand fill will be controlled to 5%. Mechanical grabs shall be designed and maintained to avoid spillage and should seal tightly while being lifted.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	Barges and hopper dredgers shall have tight fitting seals to their bottom openings to prevent leakage of material.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	Any pipe leakages shall be repaired quickly. Plant should not be operated with leaking pipes.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	Loading of barges and hoppers shall be controlled to prevent splashing of dredged material to the surrounding water. Barges or hoppers shall not be filled to a level which will cause overflow of materials or pollution of water during loading or transportation.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a

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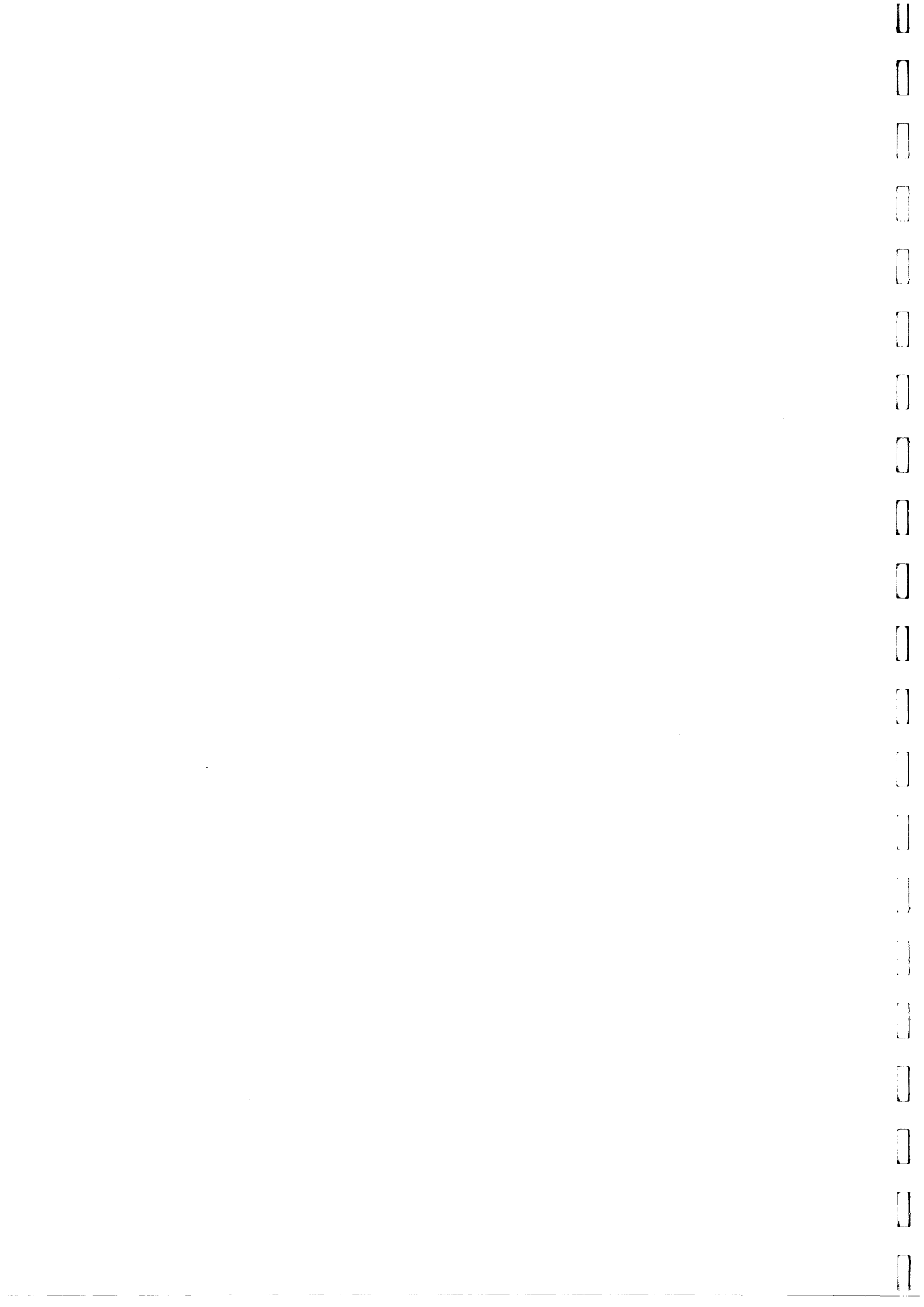
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						D	C	O	
6.10	-	Excess material shall be cleaned from the decks and exposed fittings of barges and hopper dredgers before the vessel is moved	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	Adequate freeboard shall be maintained on barges to reduce the likelihood of decks being washed by wave action;	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	All vessels shall be sized such that adequate clearance is maintained between vessels and the sea bed at all states of the tide to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	-	The works shall not cause foam, oil, grease, litter or other objectionable matter to be present in the water within and adjacent to the works site.	All areas/ throughout construction period	Contractor	Marine Fill Committee Guidelines. DASO permit conditions.		Y		n/a
6.10	5.2	Silt curtain shall have proved effectiveness from the producer and shall be fully maintained throughout the works by the	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a

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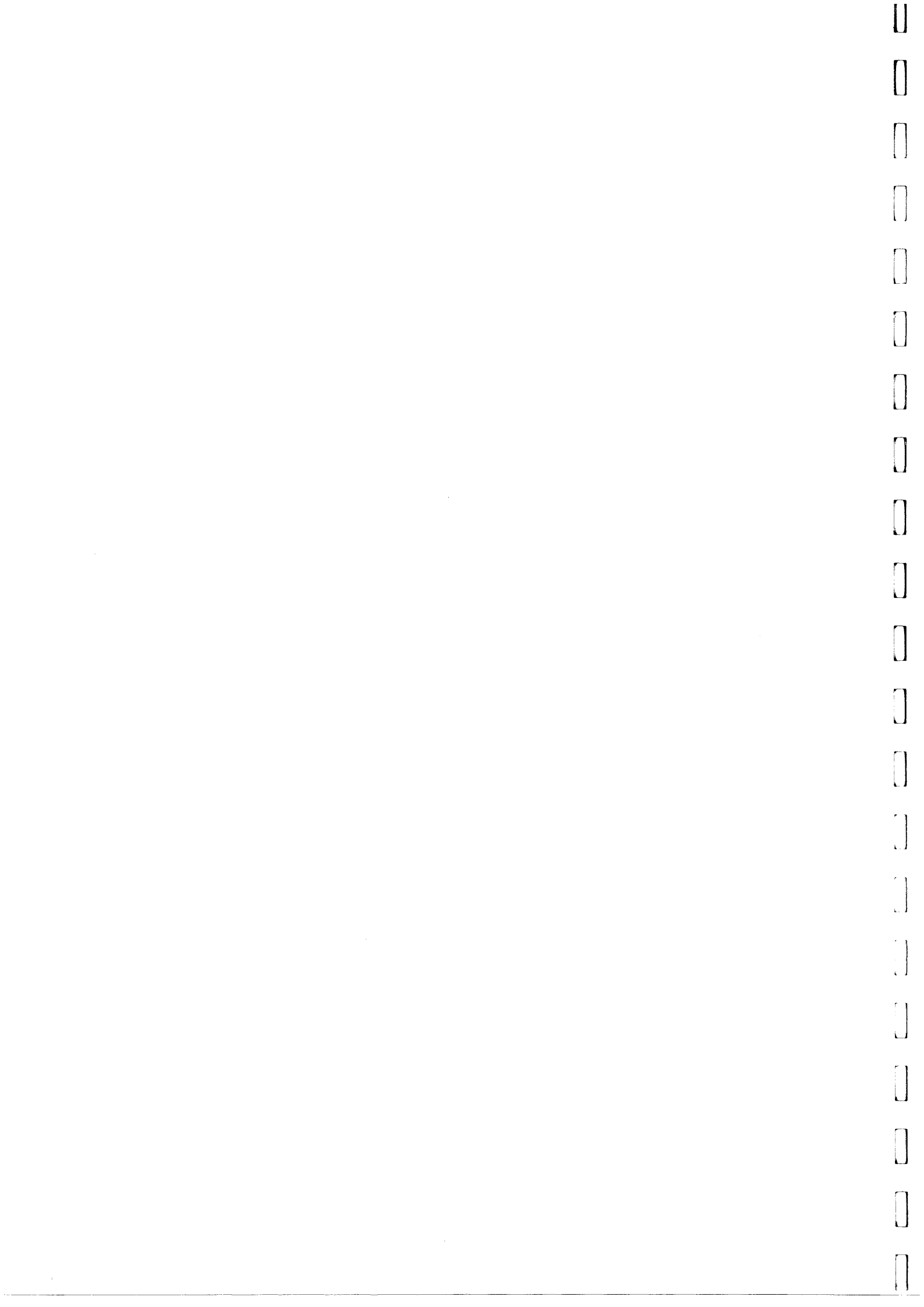
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						D	C	O	
6.10	-	contractor. Single layer silt curtain to be applied around the North-east airport water intake (WSR 25)	Areas around the North-east airport water intake	Contractor	TM-EIAO		Y		n/a
6.10	-	The daily maximum production rates shall not exceed those assumed in the water quality assessment.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	The dredging and filling works shall be scheduled to spread the works evenly over a working day.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
Land Works									
6.10	-	Wastewater from temporary site facilities should be controlled to prevent direct discharge to surface or marine waters.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Sewage effluent and discharges from on-site kitchen facilities shall be directed to Government sewer in accordance with the requirements of the WPCO or collected for disposal offsite. The use of soakaways shall be avoided.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Storm drainage shall be directed to storm	All areas/ throughout	Contractor	TM-EIAO		Y		n/a

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Water Quality

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						D	C	O	
		drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. Channels, earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.	construction period						
6.10	-	Silt removal facilities, channels and manholes shall be maintained and any deposited silt and grit shall be removed regularly, including specifically at the onset of and after each rainstorm.	All areas/ throughout construction period	Contractor	TM-EIAO	Y			n/a
6.10	-	Temporary access roads should be surfaced with crushed stone or gravel.	All areas/ throughout construction period	Contractor	TM-EIAO	Y			n/a
6.10	-	Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.	All areas/ throughout construction period	Contractor	TM-EIAO	Y			n/a
6.10	-	Measures should be taken to prevent the washout of construction materials, soil, silt	All areas/ throughout construction period	Contractor	TM-EIAO	Y			n/a

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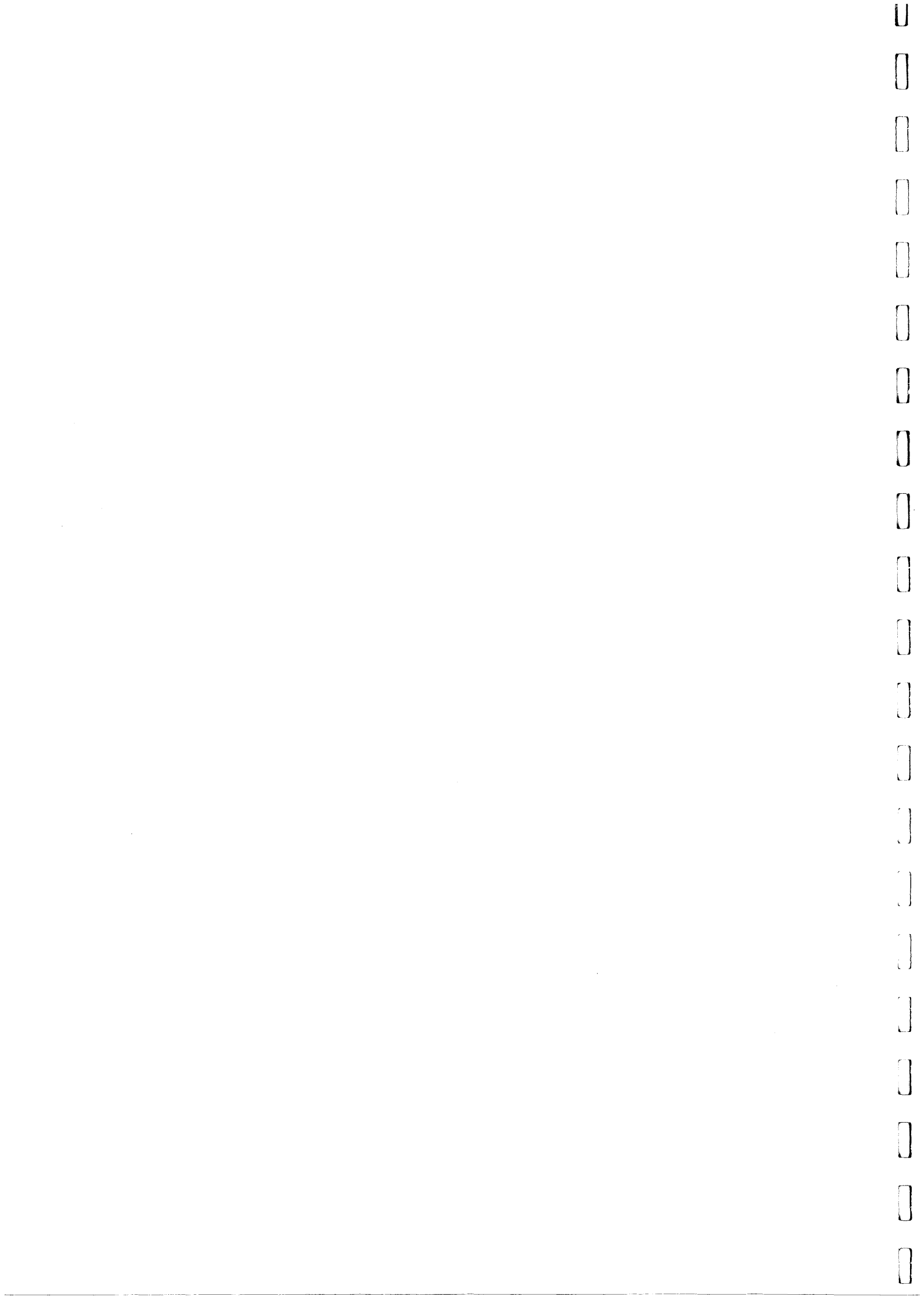
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Water Quality

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						D	C	O	
6.10	-	or debris into any drainage system. Open stockpiles of construction materials (e.g. aggregates and sand) on site should be covered with tarpaulin or similar fabric during rainstorms.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	5.8	Manholes (including any newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Discharges of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	All vehicles and plant should be cleaned before they leave the construction site to ensure that no earth, mud or debris is deposited by them on roads. A wheel washing bay should be provided at every site exit.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a

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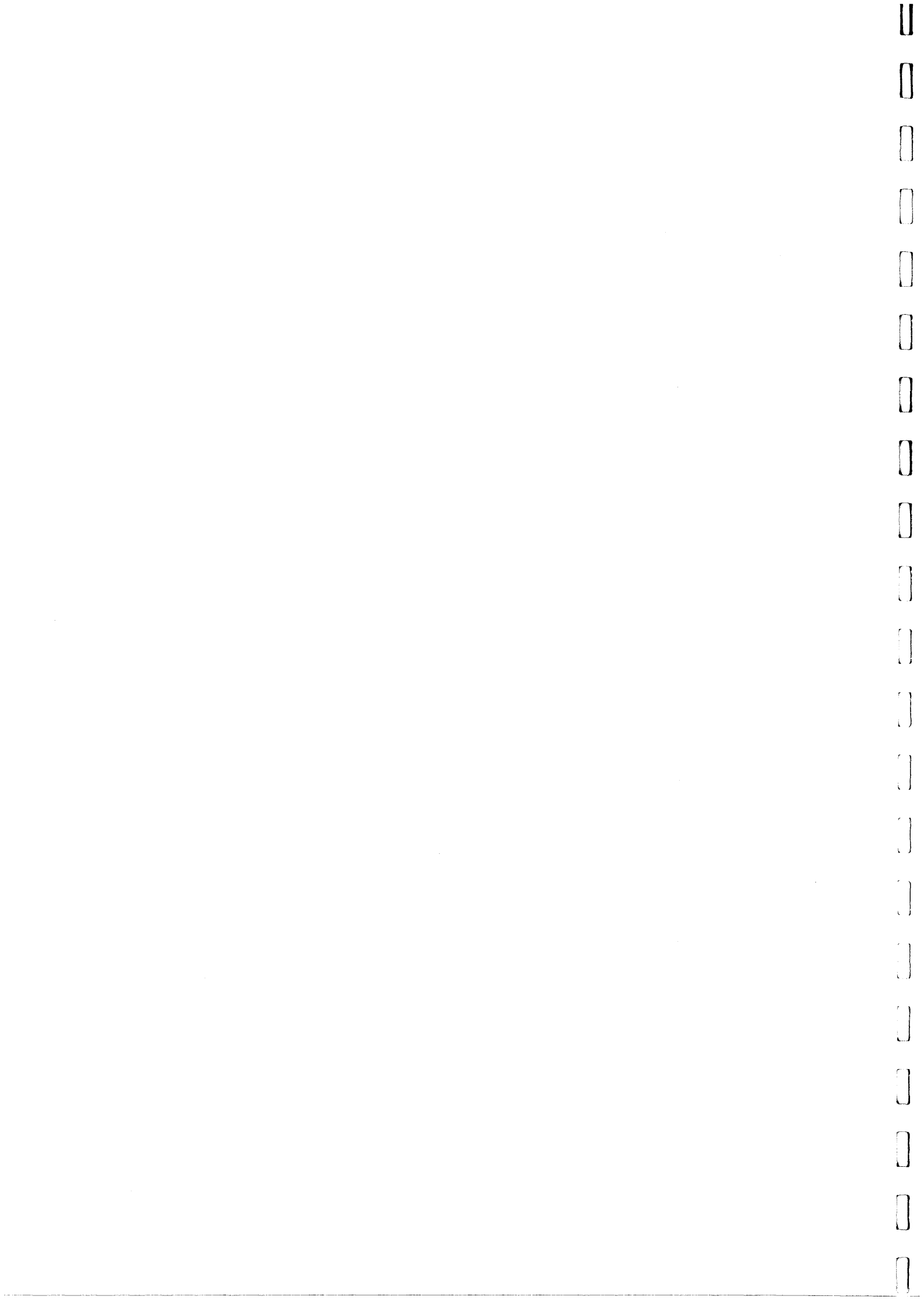
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						D	C	O	
6.10	-	Wheel wash overflow shall be directed to silt removal facilities before being discharged to the storm drain.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Section of construction road between the wheel washing bay and the public road should be surfaced with crushed stone or coarse gravel.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Wastewater generated from concreting, plastering, internal decoration, cleaning work and other similar activities, shall be screened to remove large objects.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	Vehicle and plant servicing areas, vehicle wash bays and lubrication facilities shall be located under roofed areas. The drainage in these covered areas shall be connected to foul sewers via a petrol interceptor in accordance with the requirements of the WPCO or collected for off site disposal.	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a
6.10	-	The Contractor shall prepare an oil / chemical cleanup plan and ensure that leakages or spillages are contained and	All areas/ throughout construction period	Contractor	TM-EIAO		Y		n/a

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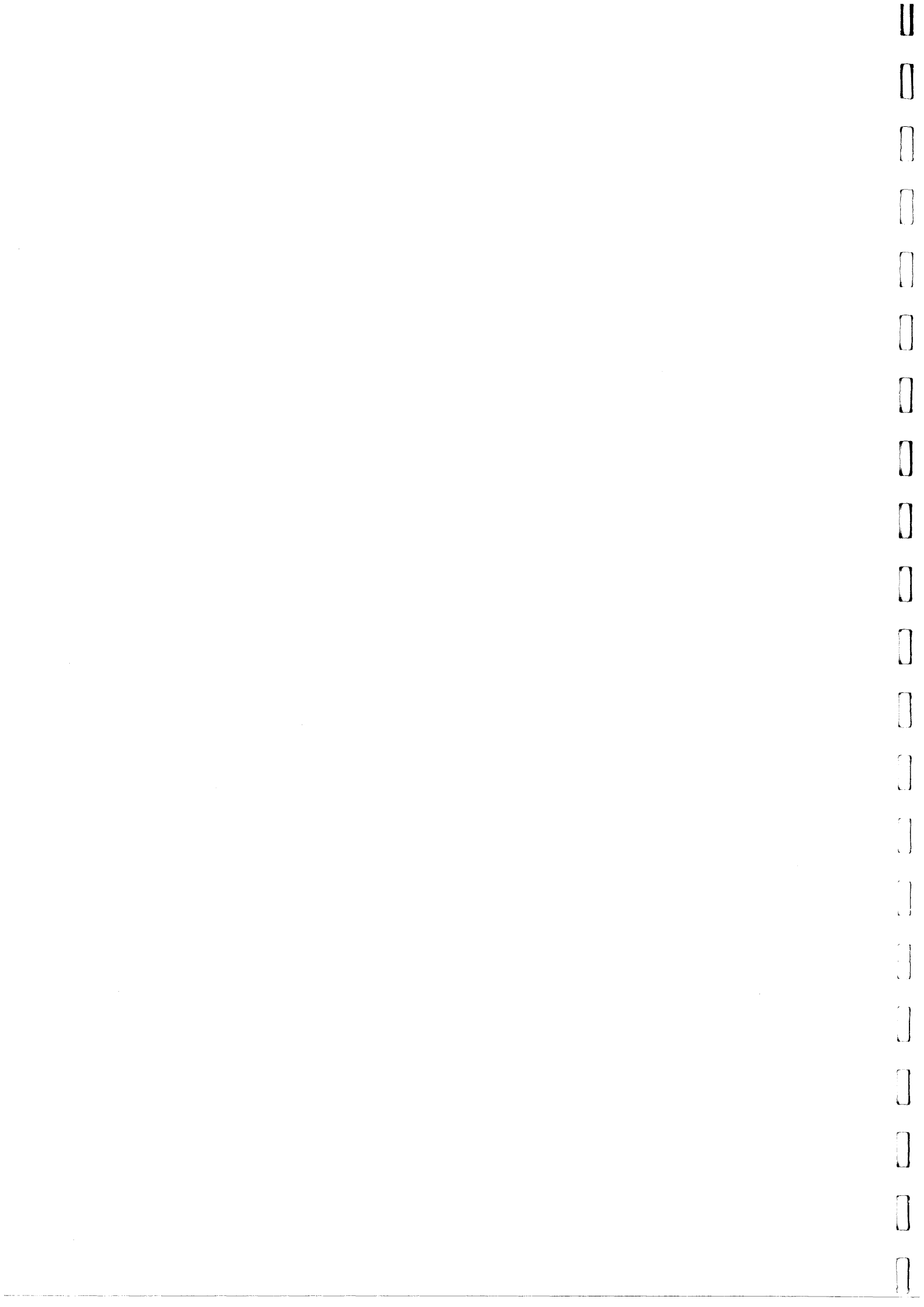
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						D	C	O	
6.10	-	cleaned up immediately. Waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance.	All areas/ throughout construction period	Contractor	TM-EIAO Waste Disposal Ordinance	Y			n/a
6.10	-	All fuel tanks and chemical storage areas should be provided with locks and be sited on sealed areas. The storage areas should be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank.	All areas/ throughout construction period	Contractor	TM-EIAO	Y			n/a
6.10	-	Surface run-off from bunded areas should pass through oil/grease traps prior to discharge to the stormwater system.	All areas/ throughout construction period	Contractor	TM-EIAO	Y			n/a
6.10	-	Roadside gullies to trap silt and grit shall be provided prior to discharging the stormwater into the marine environment. The sumps will be maintained and cleaned at regular intervals.	Roadside/design and operation	Design Consultant/ Contractor	TM-EIAO	Y		Y	n/a
6.10	Section 5	All construction works shall be subject to routine audit to ensure implementation of all EIA recommendations and good	All areas/ throughout construction period	Contractor	EM&A Manual	Y		Y	N/A

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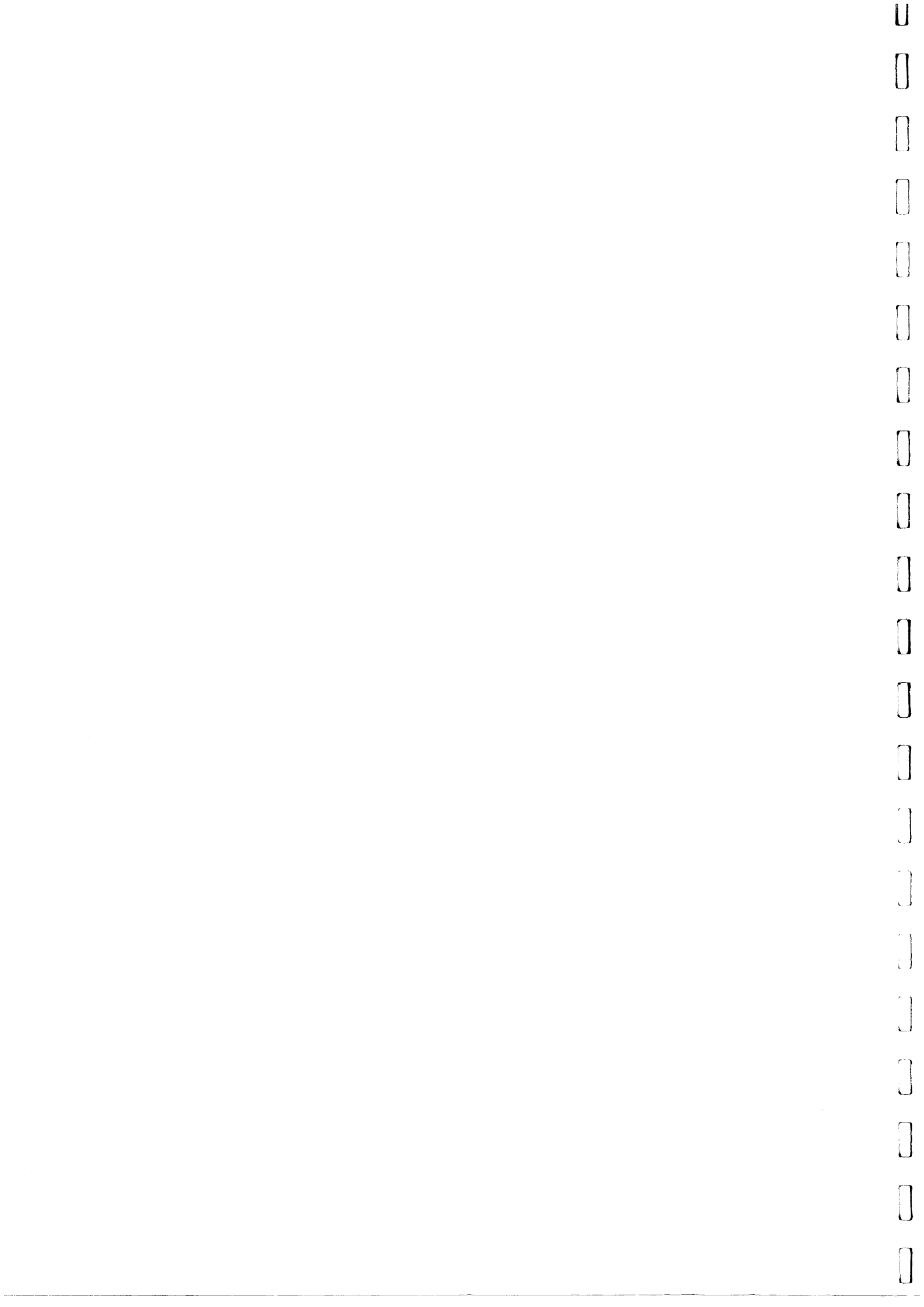
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Water Quality

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						D	C	O	
Water Quality Monitoring									
6.10	Section 5	Water quality monitoring shall be undertaken for suspended solids, turbidity, and dissolved oxygen. Nutrients and metal parameters shall also be measured for Mf sediment operations (only HKBCF and HKLR required handling of Mf sediment) during baseline, backfilling and post construction period. One year operation phase water quality monitoring at designated stations	Designated monitoring stations as defined in EM&A Manual, Section 5/ Before, through-out marine construction period, post construction and monthly operational phase water quality monitoring for a year.	Contractor	EM&A Manual	Y	Y		N/A

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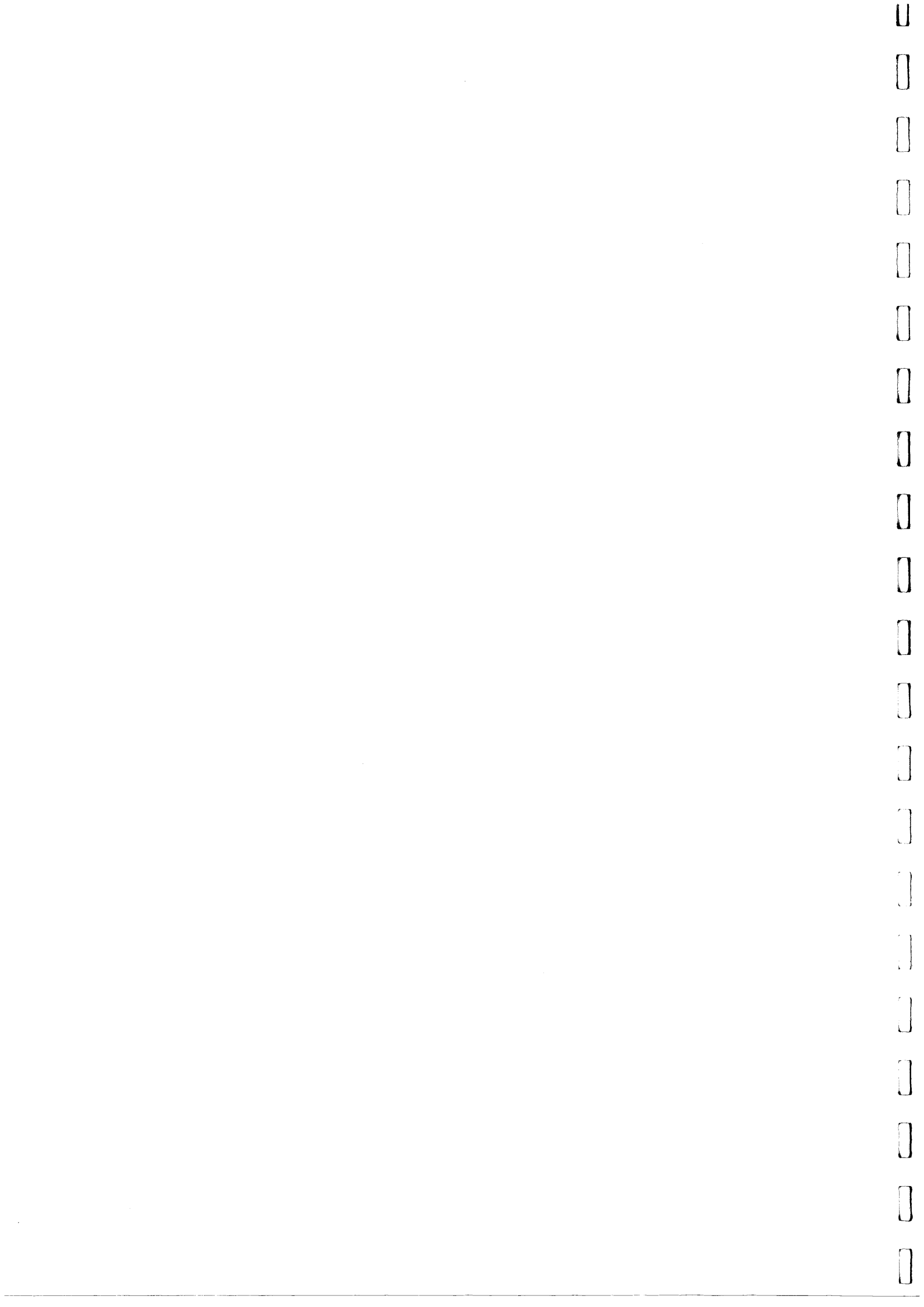
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Ecology

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
8.14	6.3	Specification for and implement pre, during and post construction dolphin abundance monitoring.	All Areas/Detailed Design/ during construction works/post construction	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a
8.14	6.3	Specification for bored piling monitoring	Detailed Design	Design Consultant	TMEIA	Y			n/a
8.14	6.3	Implement any recommendations of the bored piling monitoring	Southern marine viaduct/Throughout construction during bored piling	Contractor	TMEIA		Y		n/a
8.14	6.3,6.5	Avoidance of peak CWD calving season in May and June for driving of metal caissons during bored piling works	Southern marine viaduct/ May and June during bored piling	Contractor	TMEIA		Y		n/a
8.14	6.3,6.5	Specification and implementation of 250m dolphin exclusion zone.	All dredging and reclamation areas/Detailed Design/during all reclamation and dredging works	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
8.14	6.3, 6.5	Specification and implementation of 250m dolphin exclusion zone.	Sheet piling wall north of TMCLKL southern landfill and HKBCF island/Detailed Design/during sheet and bored piling works	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
8.15	6.3, 6.5	Specification and deployment of an artificial reef of an area of 3,600m ² in an area where fishing activities are prohibited.	Area of prohibited fishing activities/Detailed Design/towards end of construction period	TM-CLKL/ HKBCF Design Consultant/ TM-CLKL/ HKBCF Contractor	TMEIA	Y		Y	A/CD

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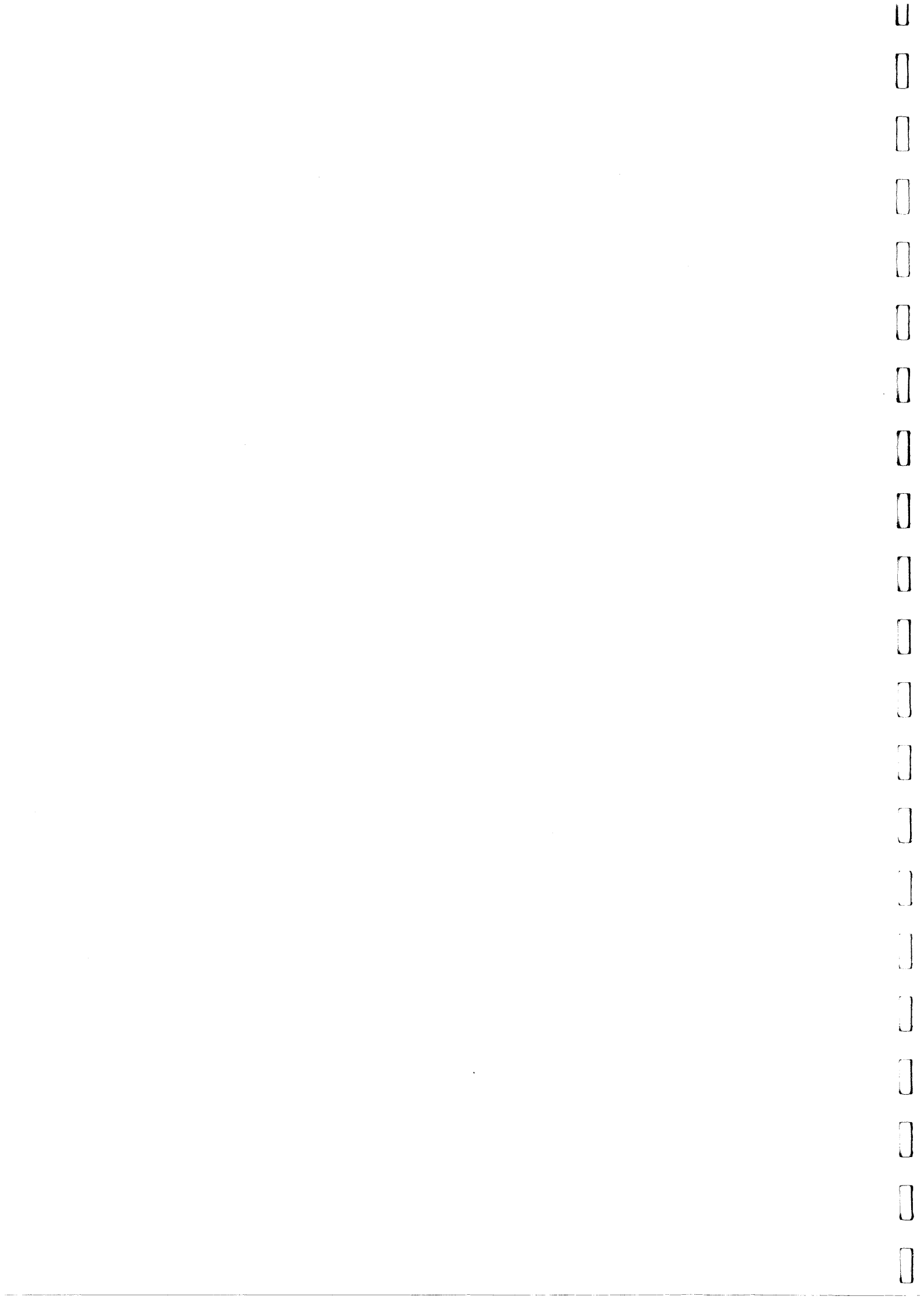
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EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
8.14	6.3, 6.5	Specification and implementation of marine vessel control specifications	All areas/Detailed Design/during construction works	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
8.14	6.3, 6.5	Design and implementation of acoustic decoupling methods for dredging and reclamation works	All areas/ Detailed Design/during dredging and reclamation works	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
8.17	6.3	Commitment to seek to designate the Brothers Islands as a marine park.	The Brothers Islands/after completion of the construction works	Government Administration	Marine and Country Parks Ordinance			Y	AFCD
7.13	6.3, 6.5	Hoarding for Protection of Pitcher Plant	Tuen Mun Area 46 shrubland/ Detailed Design/Prior to construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
7.13	6.5	Audit Pitcher Plant protection measures	Tuen Mun Area 46	Contractor	TMEIA		Y		n/a
8.15	6.3, 6.4	Pre-construction phase survey and coral translocation	Detailed Design/Prior to construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
8.15	6.5	Audit coral translocation success	Post translocation	Contractor	TMEIA		Y		n/a
7.13	6.5	Undertaken gabion wall works in Stream NL1 in the dry season	North Lantau slope works/dry season/construction phase	Contractor	TMEIA		Y		n/a

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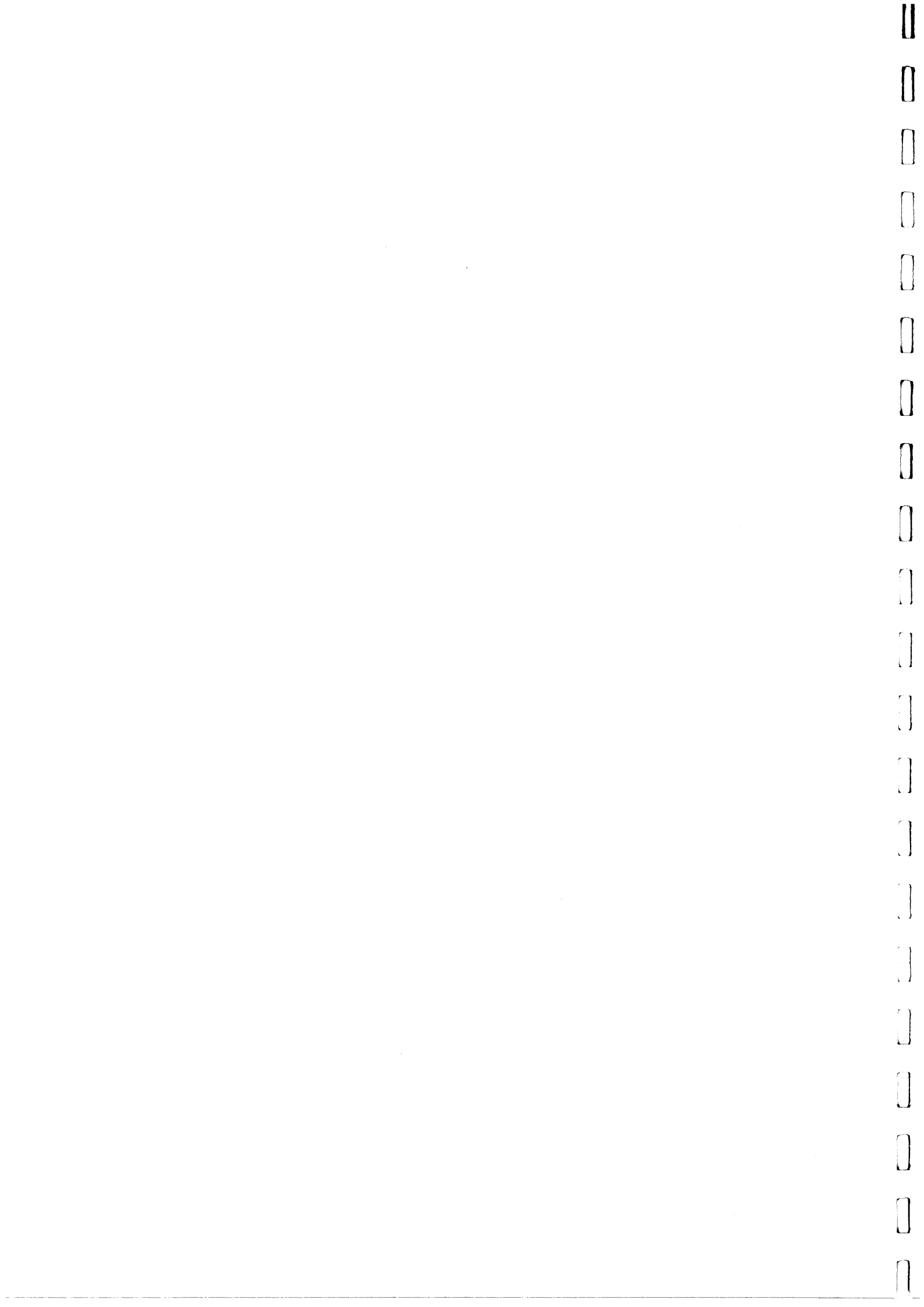
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Ecology

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
7.13	6.5	The loss of habitat shall be supplemented by enhancement planting in accordance with the landscape mitigation schedule.	All areas / As soon as accessible	Contractor	TMEIA		Y		AFCD/LCSD
7.13	6.5	Spoil heaps shall be covered at all times.	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a
7.13	6.5	Avoid damage and disturbance to the remaining and surrounding natural habitat	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a
7.13	6.5	Placement of equipment in designated areas within the existing disturbed land	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a
7.13	6.5	Disturbed areas to be reinstated immediately after completion of the works.	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a
7.13	6.5	Construction activities should be restricted to the proposed works boundary	All areas / Throughout construction period	Contractor	TMEIA		Y		n/a

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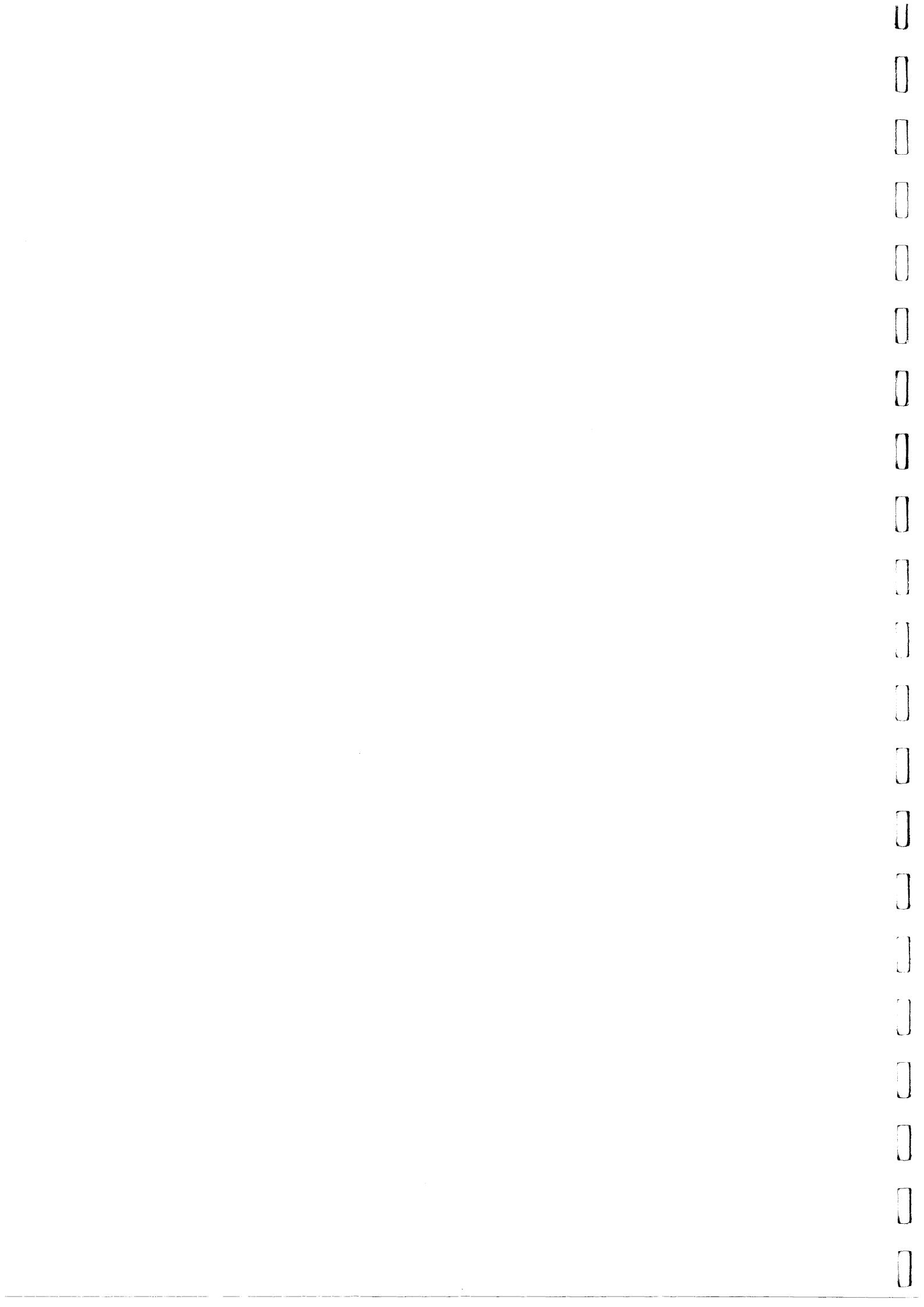
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landscape and Visual

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
10.9	7.6	The large surface of the retaining wall along the toll plaza area shall adopt a patterned/ smoother finishes and texture design to break the large surface. Climber treatment is proposed to soften the structures (DM1)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	The colour and shape of the toll control buildings, ventilation building and administration building shall adopt a design which could blend it into the vicinity elements, and the details will be developed in detailed design stage (DM2)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Round angle, patterned finishes, and oval shaped pier were considered in the viaduct design, and further details will be developed under ACABAS submission (DM3)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Details of the street furniture will be developed in the detailed design stage (DM4)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Aesthetic design of the viaduct, retaining wall and other structures will be developed under ACABAS submission (DM5)	All areas/detailed design	Design Consultant	TMEIA	Y			n/a
10.9	7.6	Existing trees on boundary of the Project	All areas/detailed design/ during	Design	TMEIA	Y	Y		n/a

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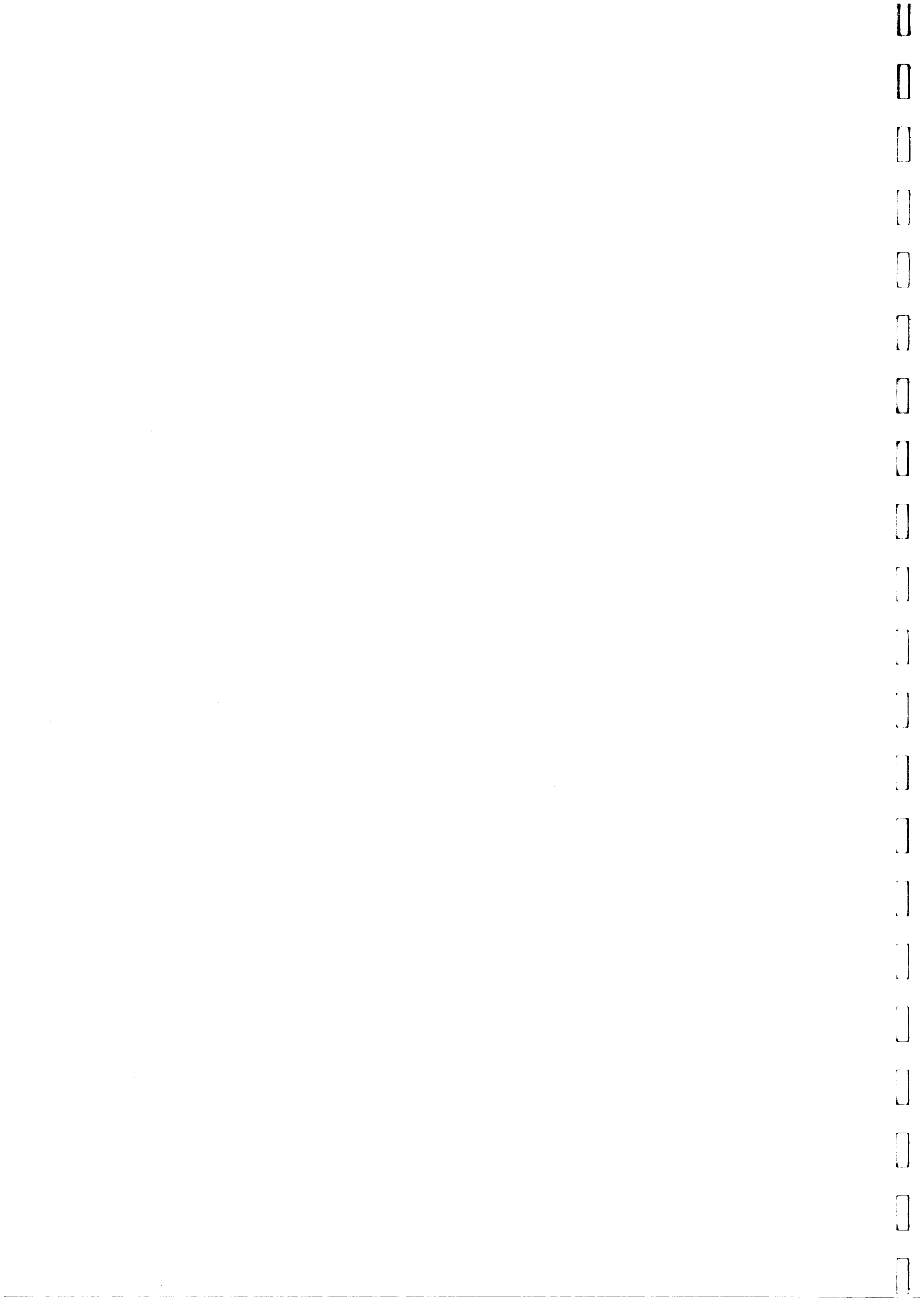
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landscape and Visual

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
10.9	7.6	Area shall be carefully protected during construction. Detailed Tree Protection Specification shall be provided in the Contract Specification. Under this specification, the Contractor shall be required to submit, for approval, a detailed working method statement for the protection of trees prior to undertaking any works adjacent to all retained trees, including trees in contractor's works areas. (Tree protection measures will be detailed at Tree Removal Application stage) (CM1) Trees unavoidably affected by the works shall be transplanted where practical. Trees will be transplanted straight to their final receptor site and not held in a temporary nursery. A detailed Tree Transplanting Specification shall be provided in the Contract Specification. Sufficient time for necessary tree root and crown preparation periods shall be allowed in the project programme (CM2)	construction All areas/detailed design/ during construction	Consultant/ Contractor Design Consultant/ Contractor	TMEIA	Y	Y	n/a	
10.9	7.6	Hillside and roadside screen planting to proposed roads, associated structures	All areas/detailed design/ during construction/post construction	Design Consultant/	TMEIA	Y	Y	n/a	

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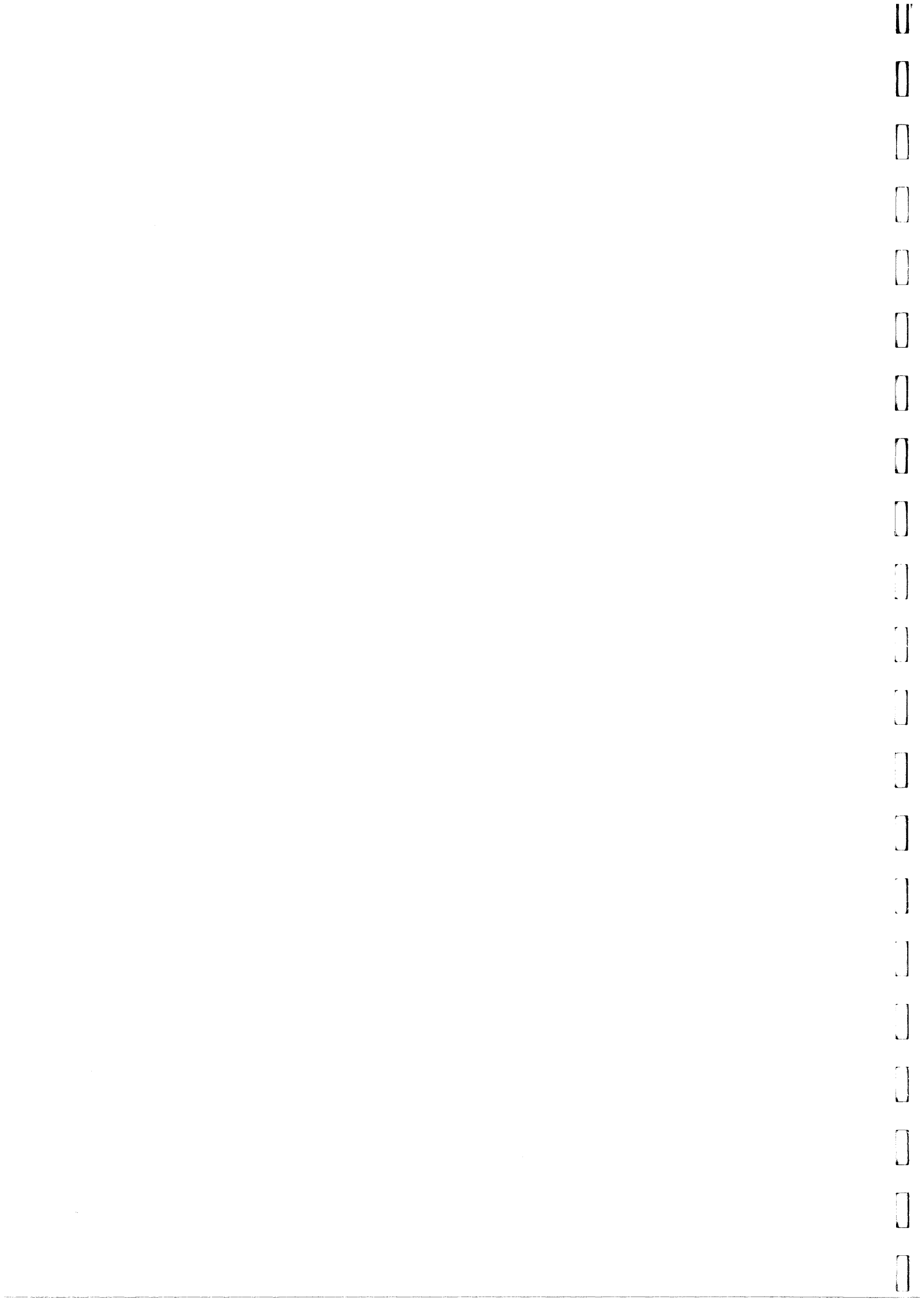
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landscape and Visual

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
10.9	7.6	and slope works (CM3) Hydroseeding or sheeting of soil stockpiles with visually unobtrusive material (in earth tone) (CM4)	All areas/detailed design/ during construction/post construction	Contractor Design Consultant/ Contractor	TMEIA	Y	Y		n/a
10.9	7.6	Screening of construction works by hoardings around works area in visually unobtrusive colours, to screen works (CM5)	All areas/detailed design/ during construction/post construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
10.9	7.6	Control night-time lighting and glare by hooding all lights (CM6)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
10.9	7.6	Ensure no run-off into water body adjacent to the Project Area (CM7)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
10.9	7.6	Avoidance of excessive height and bulk of buildings and structures (CM8)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
10.9	7.6	Recycle/Reuse all felled trees and vegetation, e.g. mulching (CM9)	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a
10.9	7.6	Compensatory tree planting shall be provided to the satisfaction of relevant Government departments. Required numbers and locations of compensatory trees shall be determined and agreed separately with Government during the	All areas/detailed design/ during construction	Design Consultant/ Contractor	TMEIA	Y	Y		n/a

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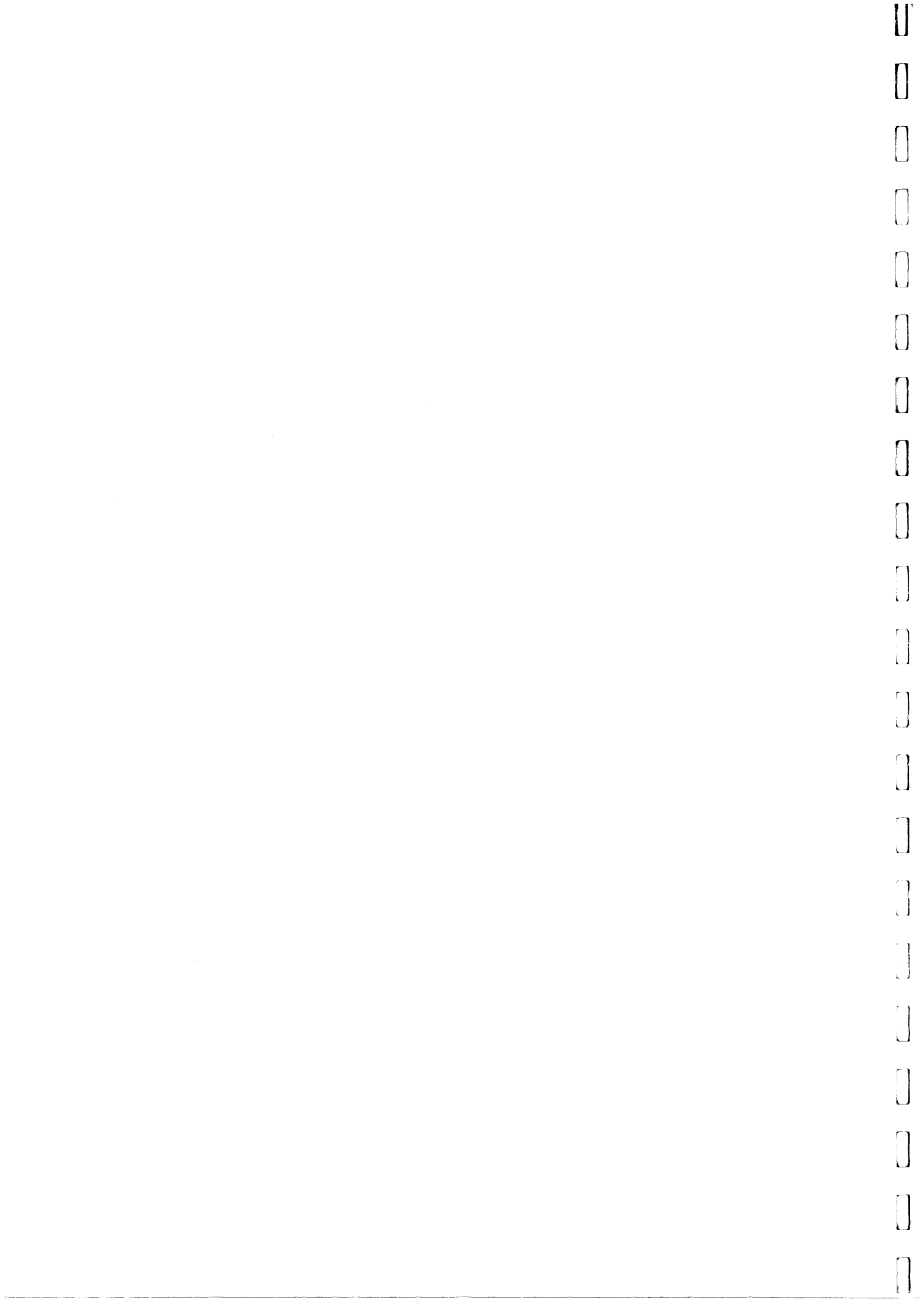
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Landscape and Visual

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		Tree Felling Application process under ETWBTC 3/2006 (CM10)							
10.9	7.6	Re-vegetation of affected woodland/shrubland with native species (OM1)	All areas/detailed design/ during construction/ during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	AFCD/HyD/LCSD
10.9	7.6	Tall buffer screen tree / shrub / climber planting should be incorporated to soften hard engineering structures and facilities (OM2)	All areas/detailed design/ during construction/ during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	HyD/LCSD
10.9	7.6	Streetscape elements (e.g. paving, signage, street furniture, lighting etc.) shall be sensitively designed in a manner that responds to the local context, and minimises potential negative landscape and visual impacts. Lighting units should be directional and minimise unnecessary light spill (OM3)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	HyD/LCSD
10.9	7.6	Structure, ornamental tree / shrub / climber planting should be provided along roadside amenity strips, central dividers and newly formed slopes to enhance the townscape quality and further greenery enhancement (OM4)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	HyD/LCSD
10.9	7.6	Aesthetically pleasing design (visually unobtrusive and non-reflective) as regard to the form, material and finishes	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	HyD

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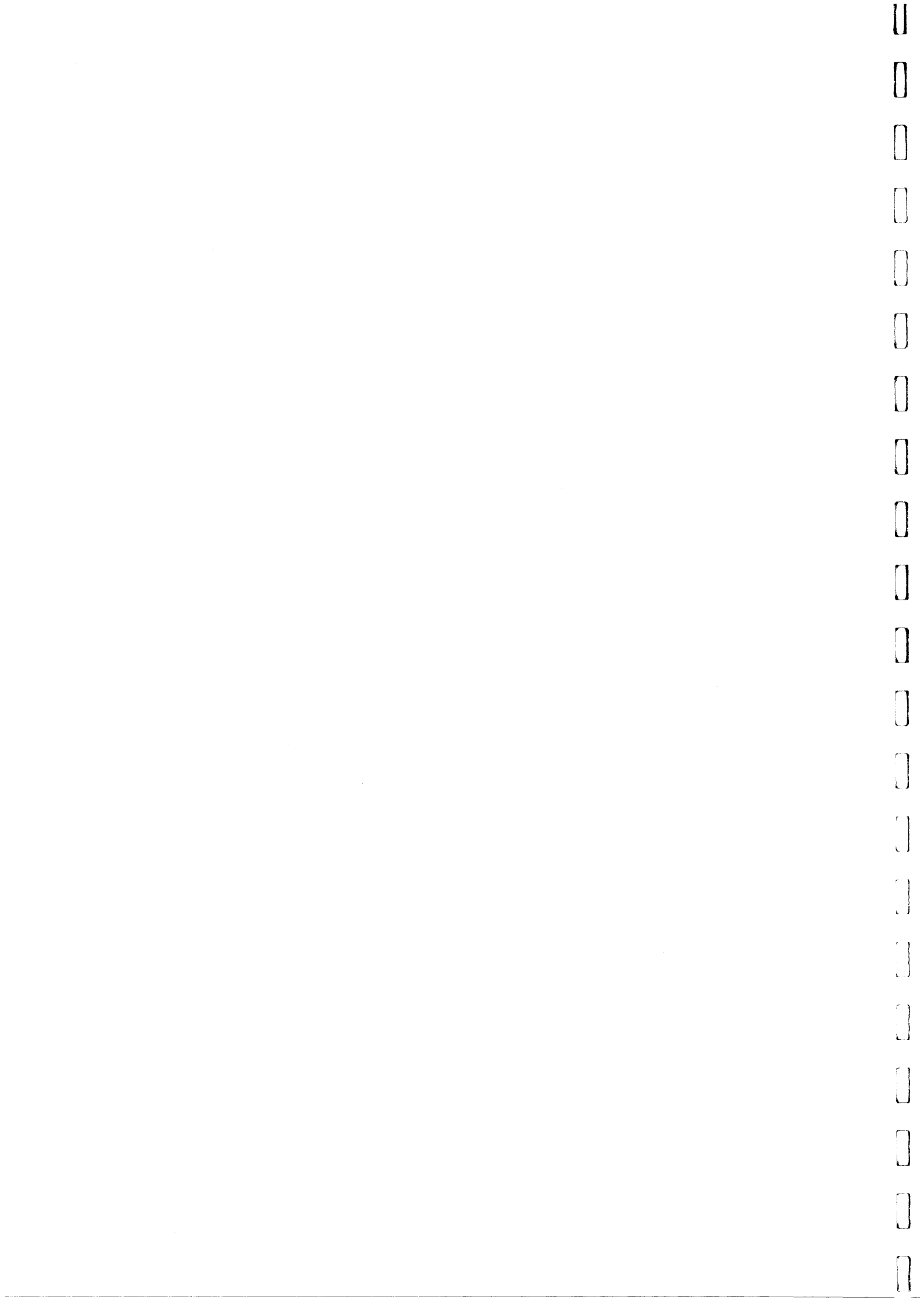
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landscapes and Visual

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
10.9	7.6	shall be incorporated to all buildings, engineering structures and associated infrastructure facilities (OM5) Avoidance of excessive height and bulk of buildings and structures (OM6)	All areas/detailed design/ during construction / during operation	Design Consultant/ Contractor	TMEIA	Y	Y	Y	n/a

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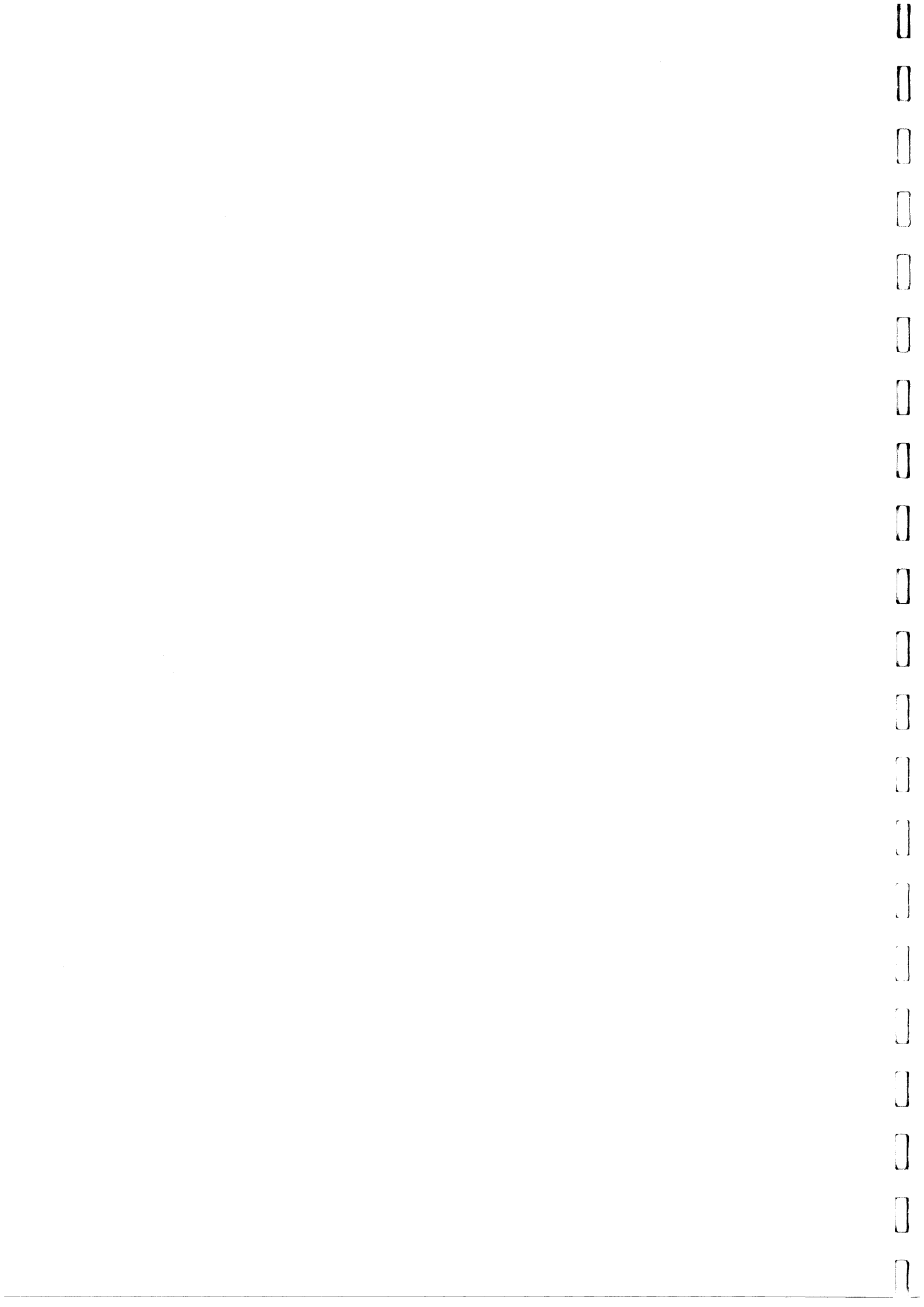
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
12.6		The Contractor shall identify a coordinator for the management of waste.	Contract mobilisation	Contractor	TMEIA	Y			n/a
12.6		The Contractor shall prepare and implement a Waste Management Plan which specifies procedures such as a ticketing system, to facilitate tracking of loads and to ensure that illegal disposal of wastes does not occur, and protocols for the maintenance of records of the quantities of wastes generated, recycled and disposed. A recording system for the amount of waste generated, recycled and disposed (locations) should be established.	Contract mobilisation	Contractor	TMEIA, Works Branch Technical Circular No. 5/99 for the Trip-ticket System for Disposal of Construction and Demolition Material	Y			n/a
12.6		The Contractor shall apply for and obtain the appropriate licenses for the disposal of public fill, chemical waste and effluent discharges.	Contract mobilisation	Contractor	TMEIA, Land (Miscellaneous Provisions) Ordinance (Cap 28); Waste Disposal Ordinance (Cap 354); Dumping at Sea Ordinance (Cap 466); Water Pollution Control Ordinance.	Y			n/a
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedures	Contract Mobilisation	Contractor	TMEIA	Y			n/a

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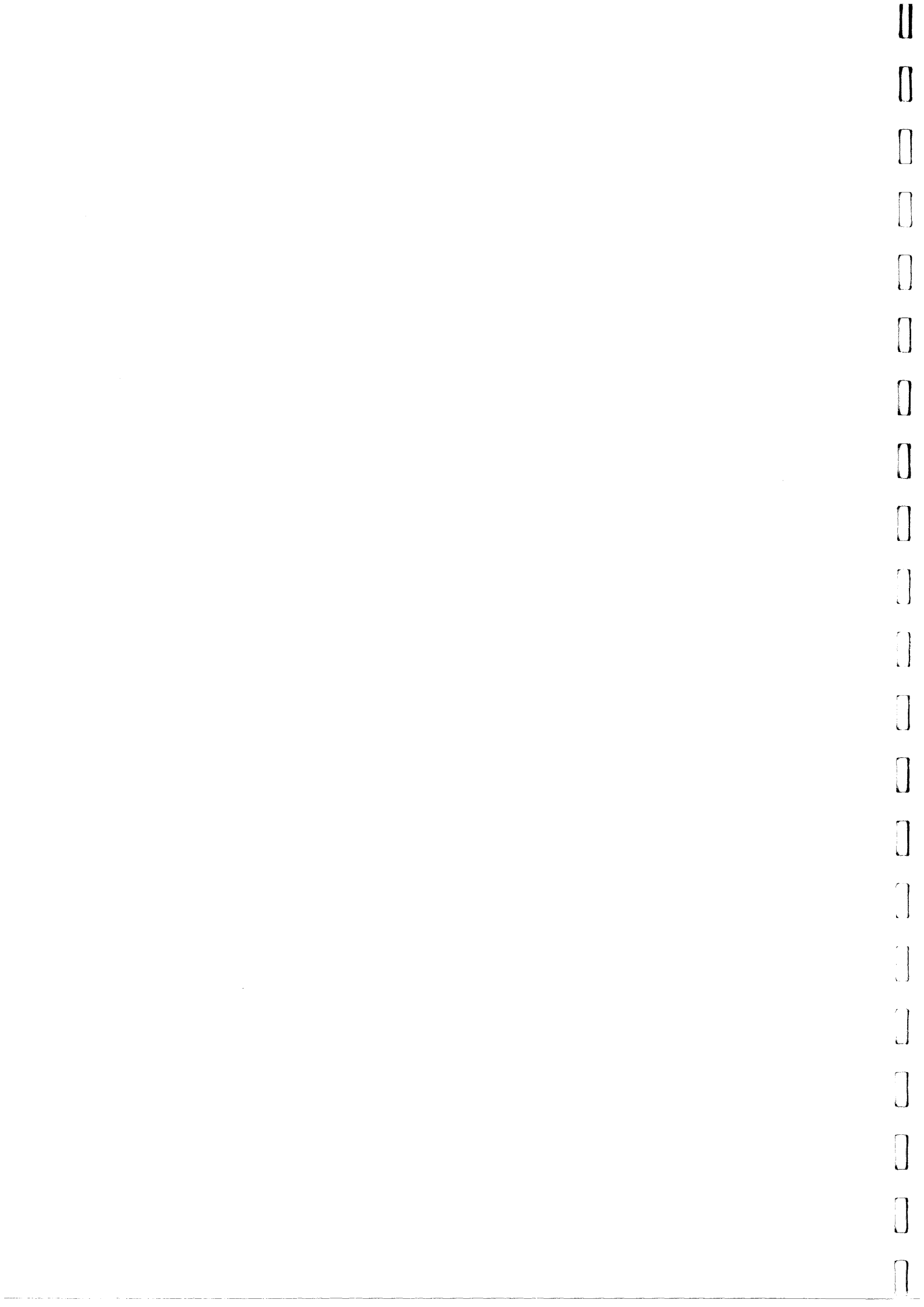
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Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		including waste reduction, reuse and recycling							
12.6	8.1	The extent of cutting operation should be optimised where possible. Earth retaining structures and bored pile walls should be proposed to minimise the extent of cutting.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Inert C&D materials from the toll plaza cut slopes shall be reused for construction of the raised platform for the toll plaza where possible.	Tol Plaza / toll plaza construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	C&D materials generated by construction of cut slopes along NLH at North Lantau shall be reused in reclamation works where possible.	NLH slope works / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	The surplus surcharge should be transferred to a fill bank	Reclamation areas / after surcharge works	Contractor	TMEIA		Y		n/a
12.6	8.1	Rock armour from the existing seawall should be reused on the new sloping seawall as far as possible	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	TMB generated alluvium and CDG material should be treated at a slurry treatment plant prior to transfer to a fill bank.	TMB works area / during TBM works	Contractor	TMEIA		Y		n/a

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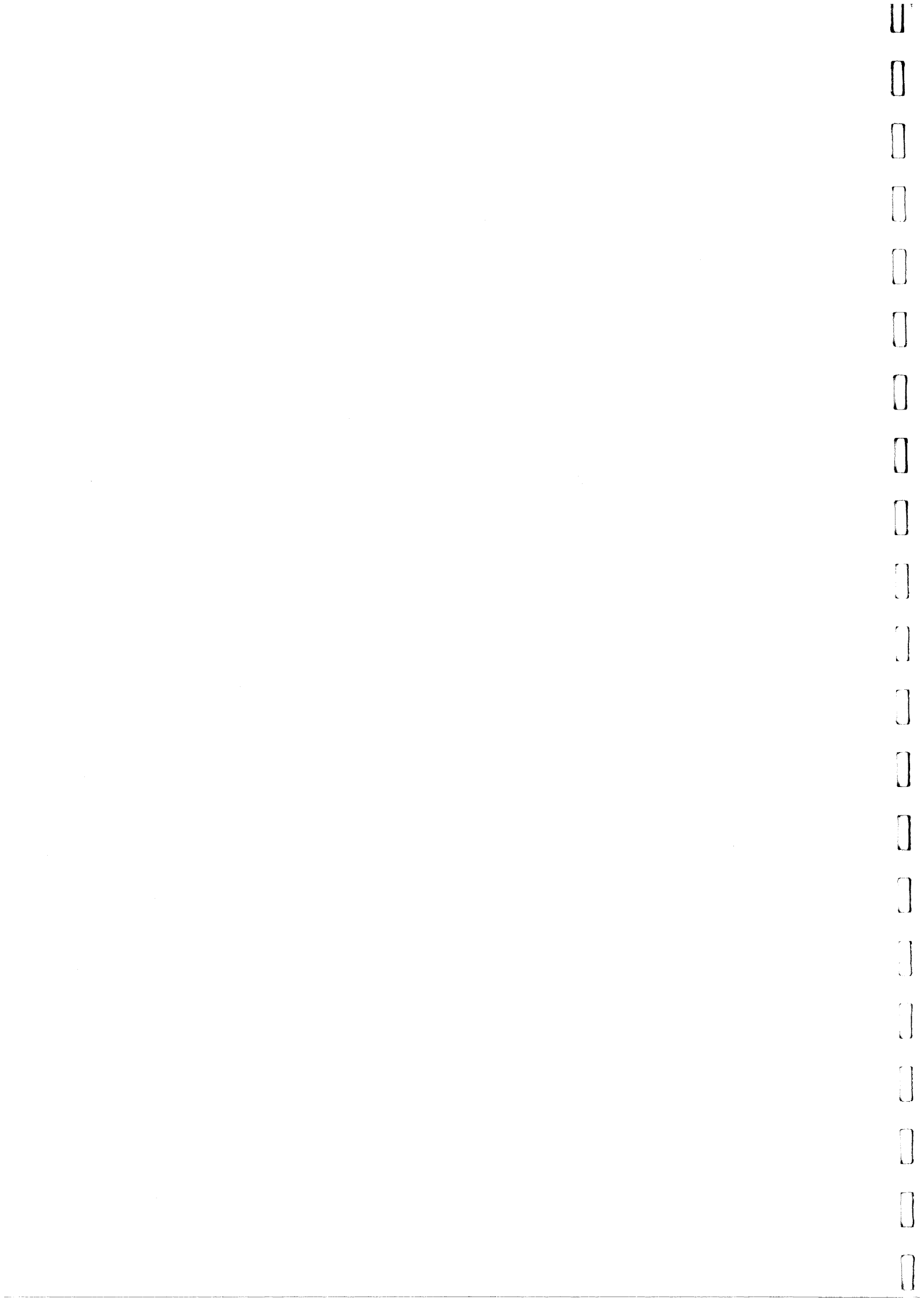
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Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
12.6	8.1	The site and surroundings shall be kept tidy and litter free.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	No waste shall be burnt on site.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Provisions to be made in contract documents to allow and promote the use of recycled aggregates where appropriate.	Detailed Design	Design Consultant	TMEIA	Y			n/a
12.6	8.1	The Contractor shall be prohibited from disposing of C&D materials at any sensitive locations. The Contractor should propose the final disposal sites in the EMP and WMP for approval before implementation.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Stockpiled material shall be covered by tarpaulin and /or watered as appropriate to prevent windblown dust/ surface run off.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Excavated material in trucks shall be covered by tarpaulins to reduce the potential for spillage and dust generation.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Wheel washing facilities shall be used by all trucks leaving the site to prevent transfer of mud onto public roads.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a

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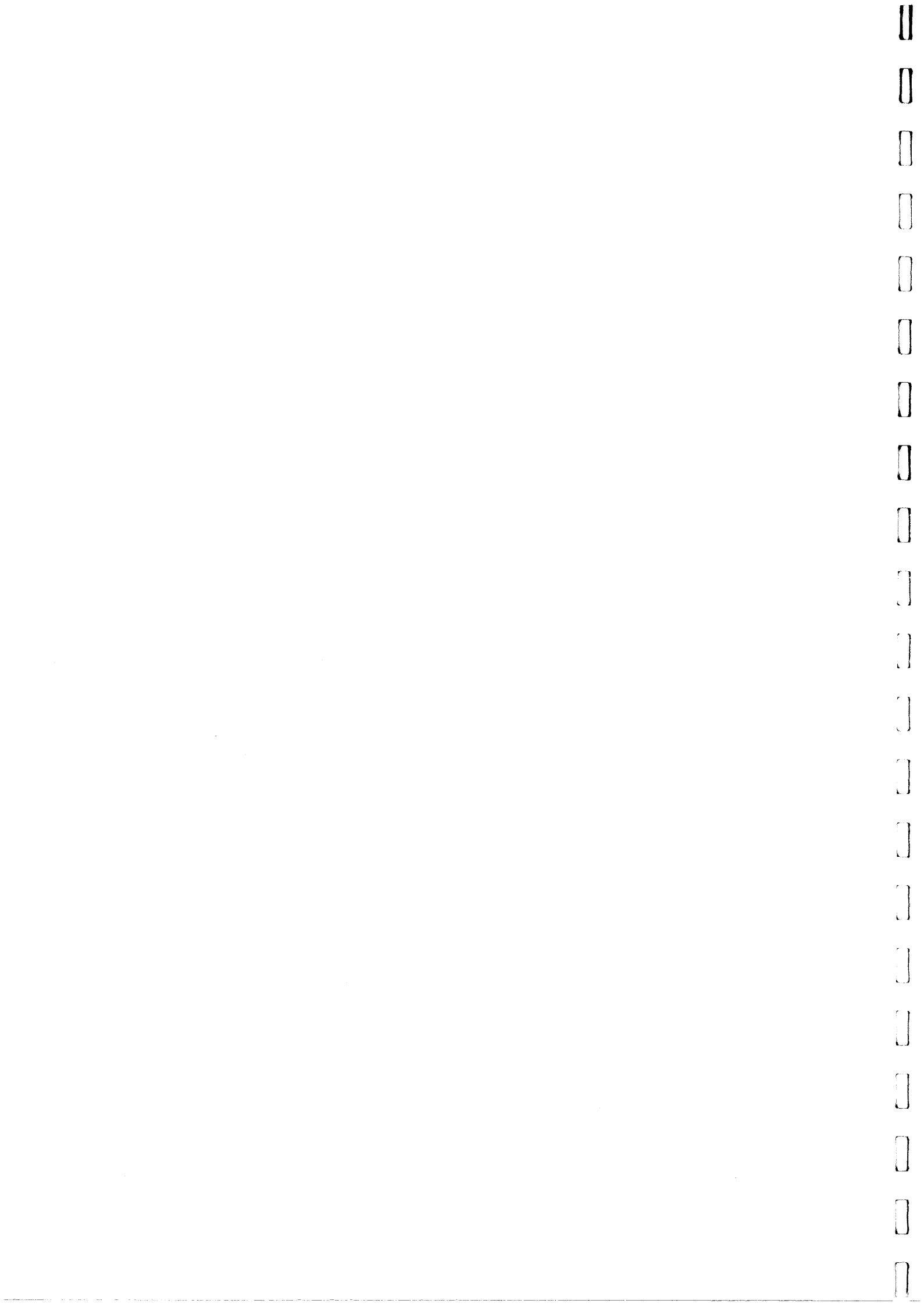
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Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
12.6	8.1	Dredged marine mud shall be disposed of in a gazetted marine disposal ground under the requirements of the Dumping at Seas Ordinance.	Reclamation areas / throughout dredging works	Contractor	TMEIA		Y		n/a
12.6	8.1	Standard formwork or pre-fabrication should be used as far as practicable so as to minimise the C&D materials arising. The use of more durable formwork/plastic facing for construction works should be considered. The use of wooden hoardings should be avoided and metal hoarding should be used to facilitate recycling. Purchasing of construction materials should avoid over-ordering and wastage.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	The Contractor should recycle as many C&D materials (this is a waste section) as possible on-site. The public fill and C&D waste should be segregated and stored in separate containers or skips to facilitate the reuse or recycling of materials and proper disposal. Where practicable, the concrete and masonry should be crushed and used as fill materials. Steel reinforcement bar should be collected for use by scrap steel mills. Different areas of the sites should	All areas / throughout construction period	Contractor	TMEIA		Y		n/a

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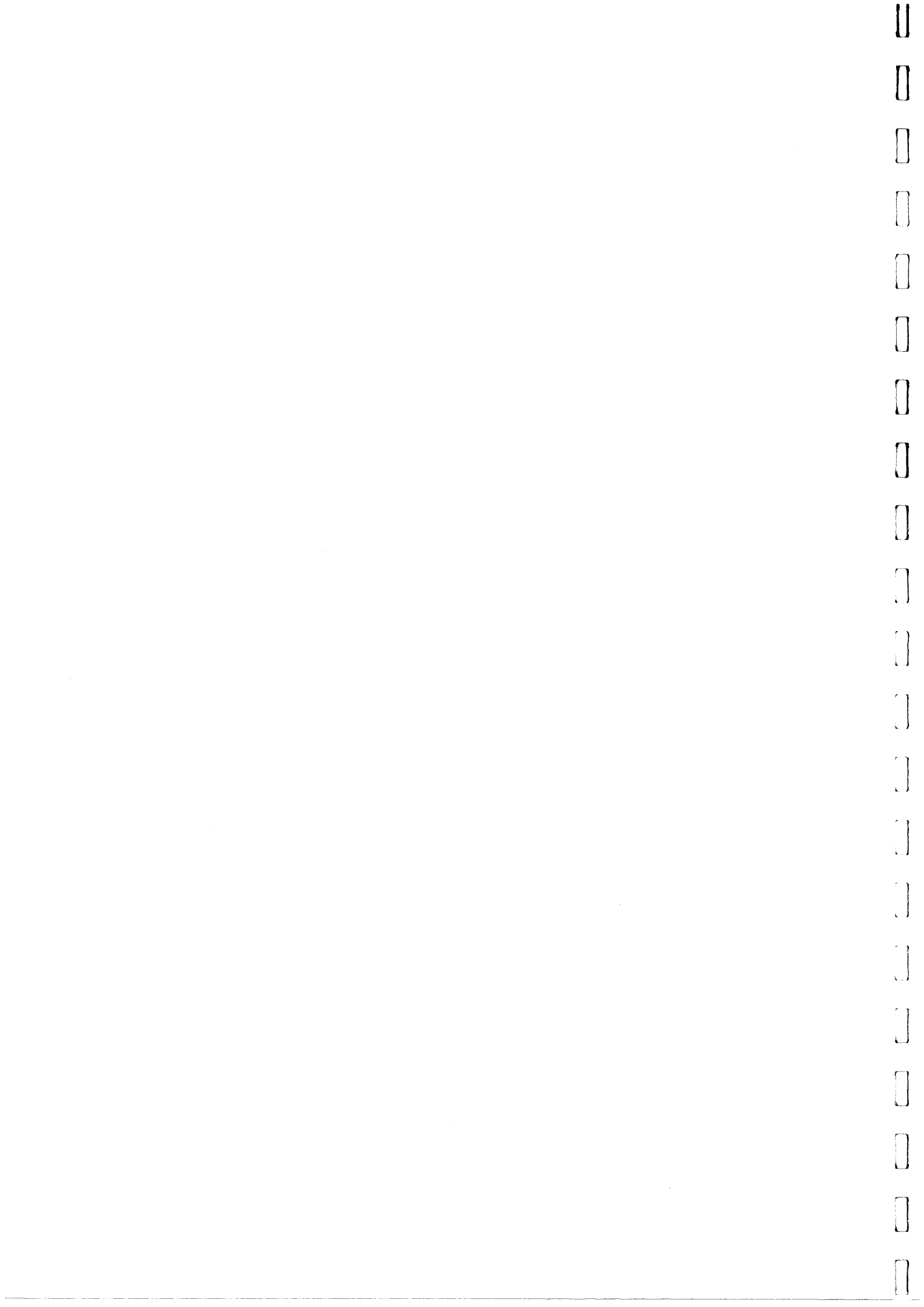
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Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		be considered for segregation and storage activities.							
12.6	8.1	All falsework will be steel instead of wood.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Chemical waste producers should register with the EPD. Chemical waste should be handled in accordance with the Code of Practice on the Packaging, Handling and Storage of Chemical Wastes as follows: <ul style="list-style-type: none"> ▪ suitable for the substance to be held, resistant to corrosion, maintained in good conditions and securely closed; ▪ Having a capacity of <450L unless the specifications have been approved by the EPD; and ▪ Displaying a label in English and Chinese according to the instructions prescribed in Schedule 2 of the Regulations. ▪ Clearly labelled and used solely for the storage of chemical wastes; ▪ Enclosed with at least 3 sides; ▪ Impermeable floor and bund with capacity to accommodate 110% of the volume of the largest container or 20% 	All areas / throughout construction period	Contractor	TMEIA		Y		n/a

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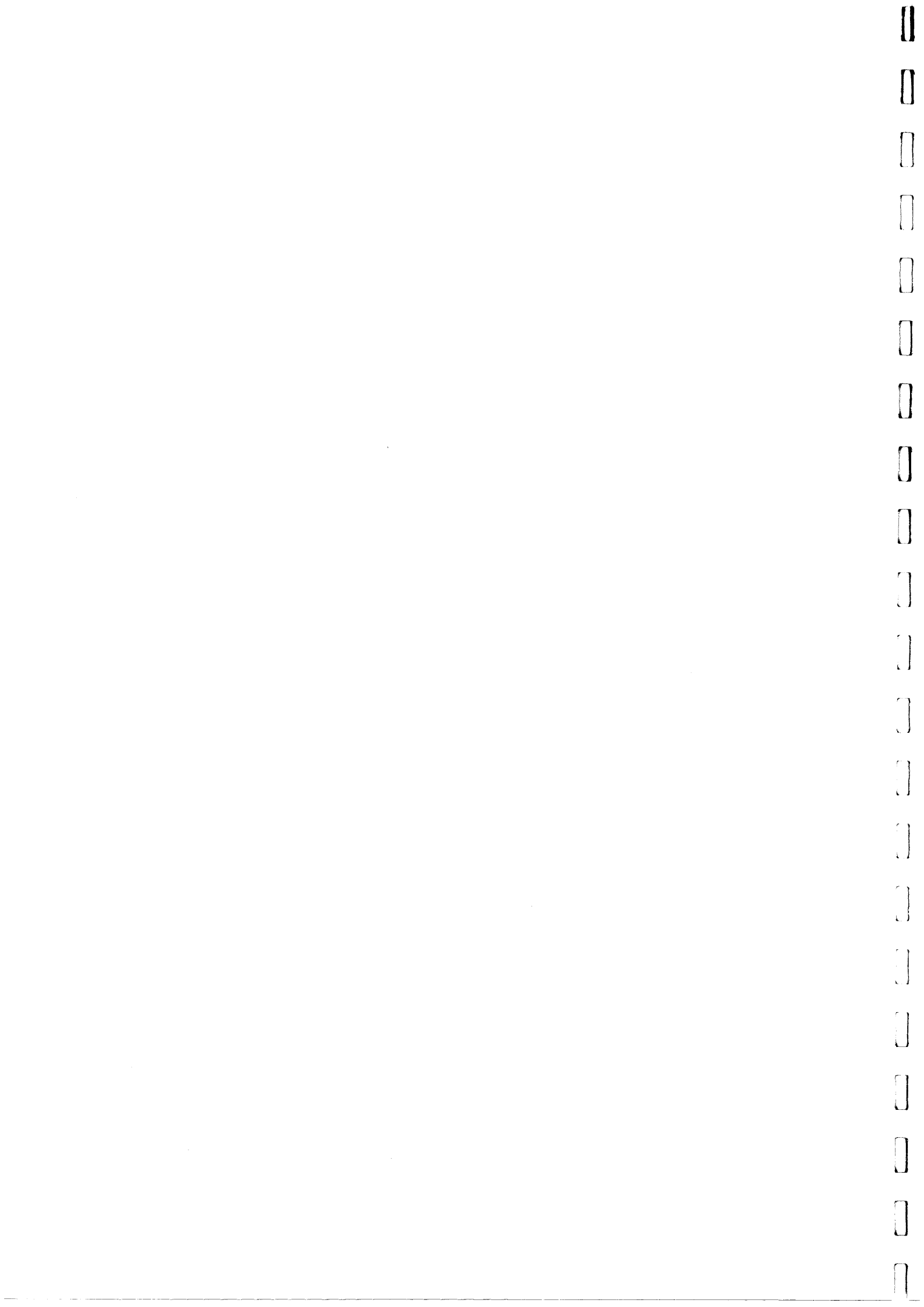
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Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		<p>by volume of the chemical waste stored in the area, whichever is greatest;</p> <ul style="list-style-type: none"> ▪ Adequate ventilation; ▪ Sufficiently covered to prevent rainfall entering (water collected within the bund must be tested and disposed of as chemical waste, if necessary); and ▪ Incompatible materials are adequately separated. 							
12.6	8.1	Waste oils, chemicals or solvents shall not be disposed of to drain,	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Adequate numbers of portable toilets should be provided for on-site workers. Portable toilets should be maintained in reasonable states, which will not deter the workers from utilising them.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	Night soil should be regularly collected by licensed collectors.	All areas / throughout construction period	Contractor	TMEIA		Y		n/a
12.6	8.1	General refuse arising on-site should be stored in enclosed bins or compaction units separately from C&D and chemical wastes. Sufficient dustbins shall be provided for storage of waste as required under the Public Cleansing and Prevention	All areas / throughout construction period	Contractor	TMEIA		Y		n/a

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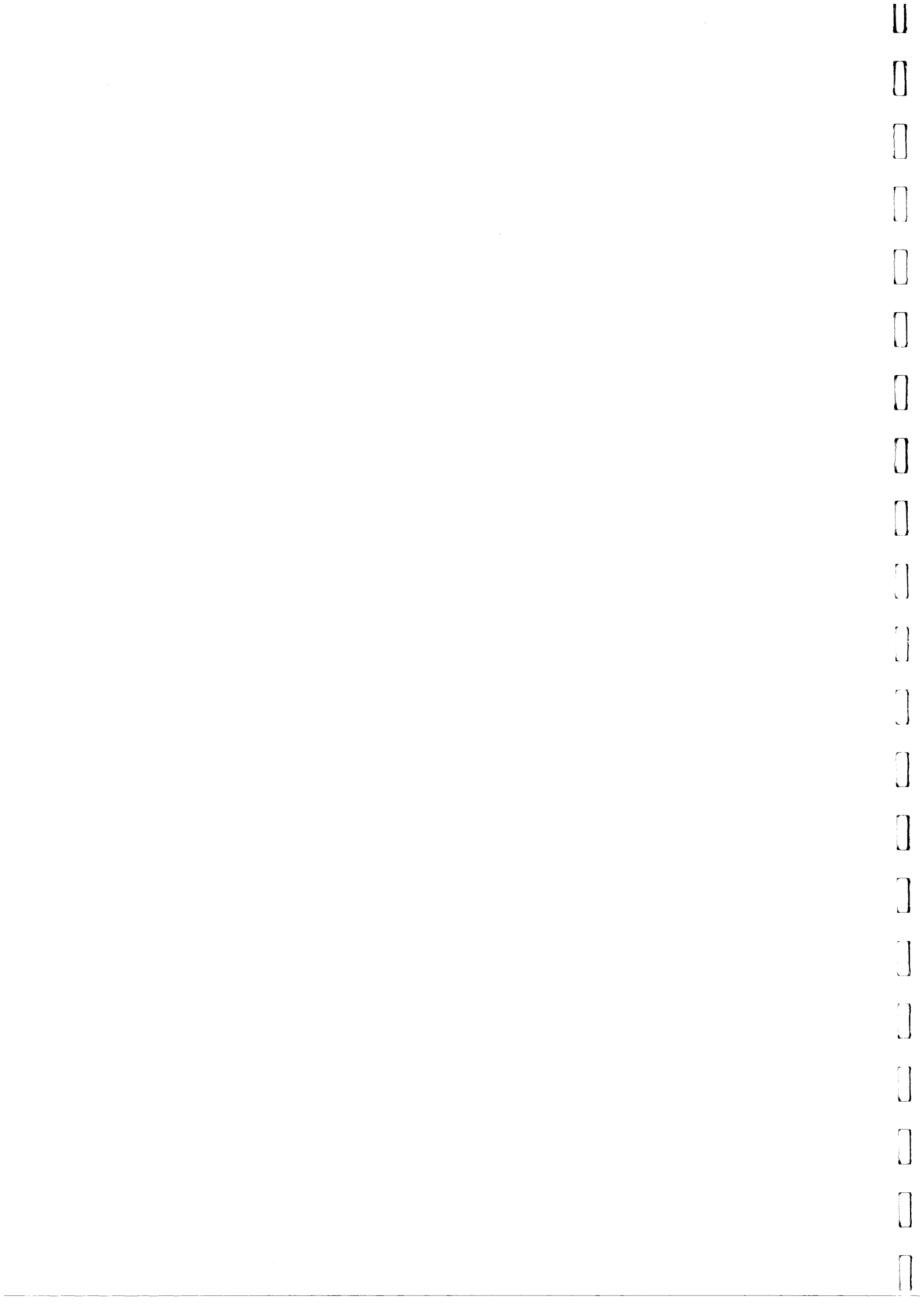
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Waste

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		of Nuisances By-laws. In addition, general refuse shall be cleared daily and shall be disposed of to the nearest licensed landfill or refuse transfer station. Burning of refuse on construction sites is prohibited.							
12.6	8.1	All waste containers shall be in a secure area on hardstanding;	All areas / throughout construction period	Contractor	TMEIA	Y			n/a
12.6	8.1	Training shall be provided to workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling.	All areas / throughout construction period	Contractor	TMEIA	Y			n/a
12.6	8.1	Office wastes can be reduced by recycling of paper if such volume is sufficiently large to warrant collection. Participation in a local collection scheme by the Contractor should be advocated. Waste separation facilities for paper, aluminium cans, plastic bottles, etc should be provided on-site.	Site Offices/ throughout construction period	Contractor	TMEIA	Y			n/a
12.6	Section 8	EM&A of waste handling, storage, transportation, disposal procedures and documentation through the site audit programme shall be undertaken.	All areas / throughout construction period	Contractor	EM&A Manual	Y			n/a

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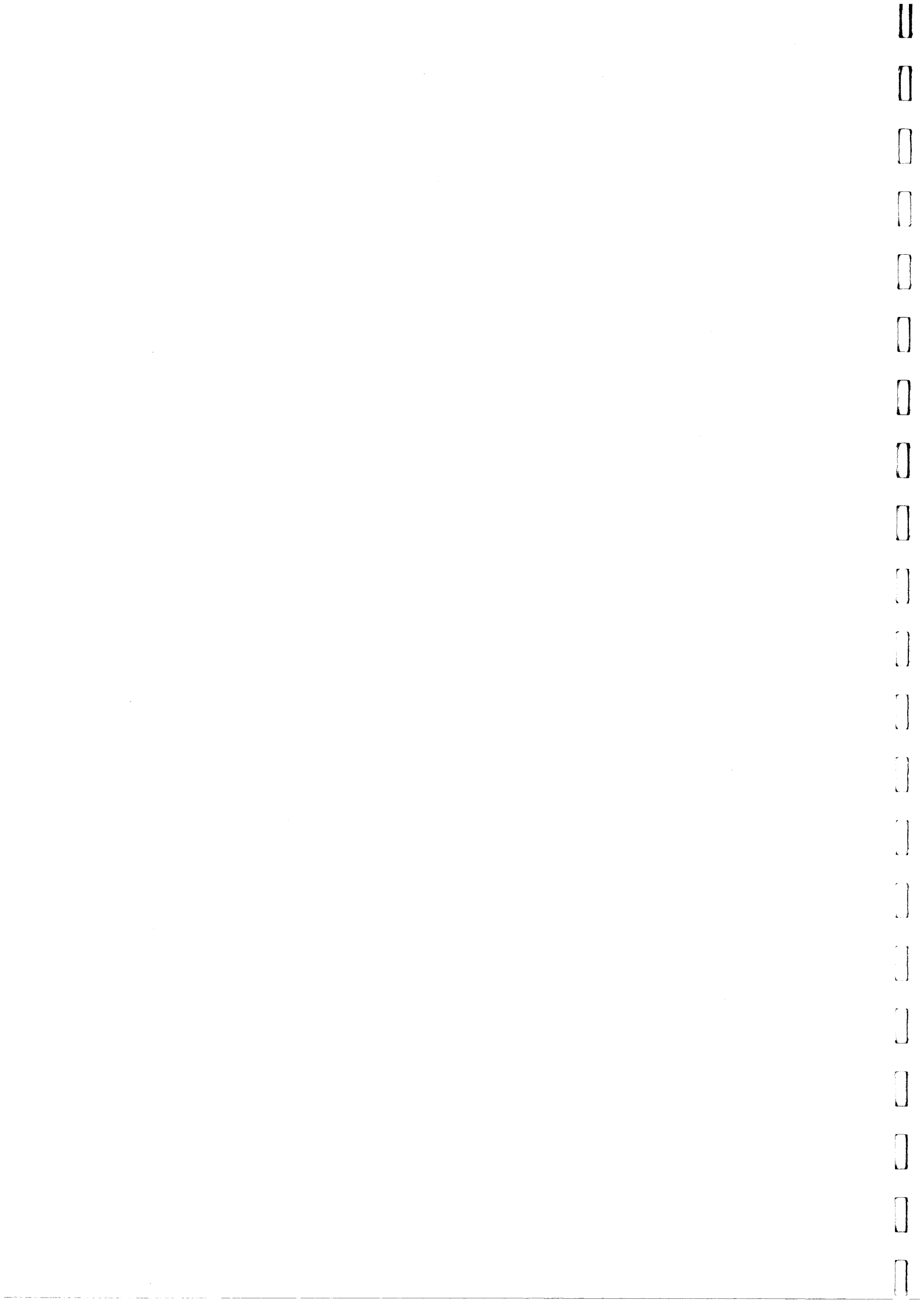
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ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Cultural Heritage

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
11.8	9.3	Audit detailed design to ensure 1.0m buffer around Grave G1 and the foot path reprovisioning included	Detailed Design	Highways Department	EIAO-TM	Y			n/a
11.8	Section 9	EM&A in the form of audit of the mitigation measures	All areas / throughout construction period	Highways Department	EIAO-TM		Y		n/a

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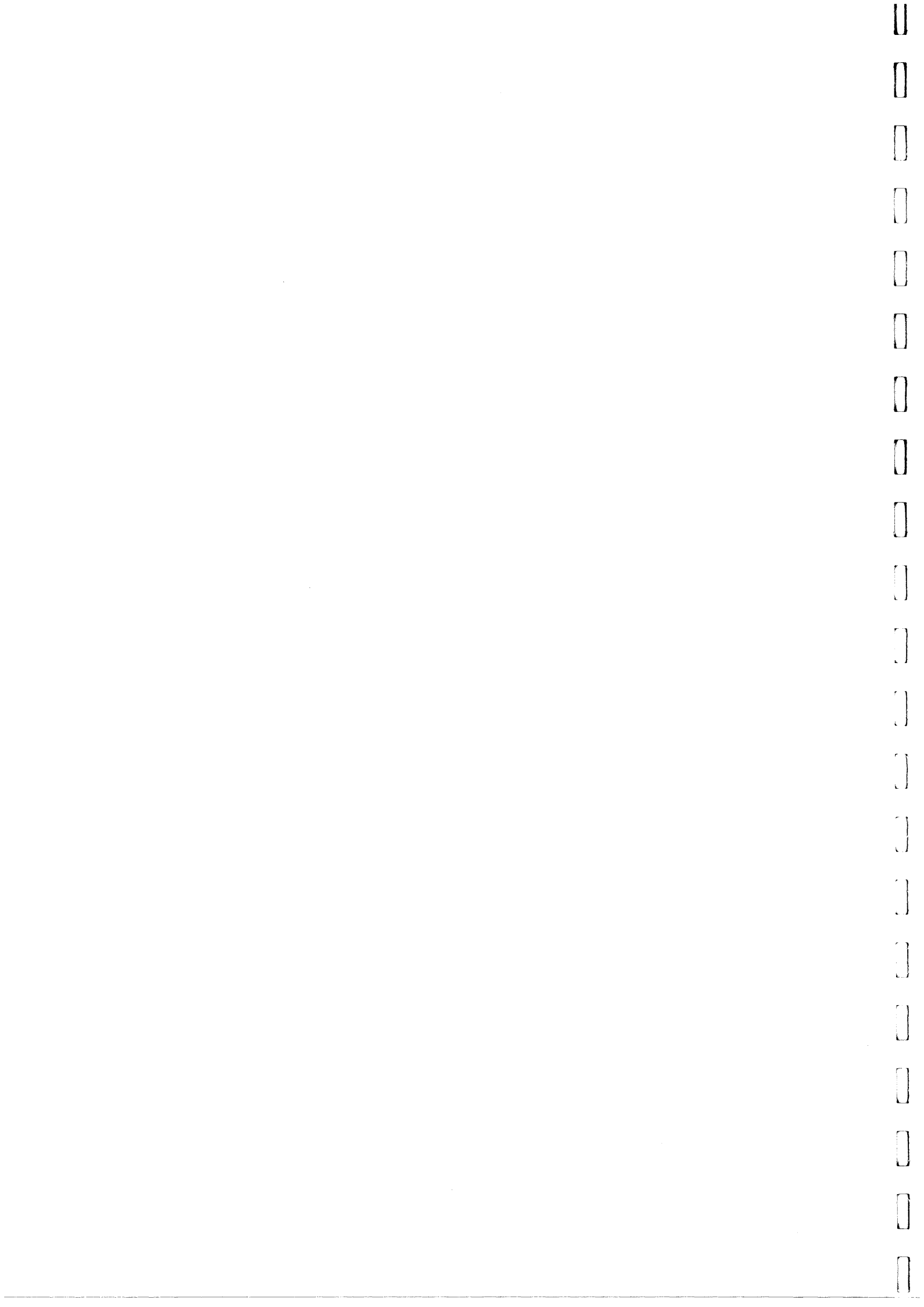
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ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landfill Gas Hazard Assessment

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
14.12.2	10.2	<u>Appointment of Safety Officer</u> Appoint a properly trained safety officer and provide with appropriate equipment to measure and monitor LFG hazard. The monitoring frequency and areas to be monitored should be set down prior to commencement of ground-works either by the Safety Officer or an approved and appropriately qualified person.	Construction Stage	Contractor	EPD/TR8/97 - Landfill Gas Hazard Assessment Guidance Note ProPECC PN 3/96 – LFG HA for Development Adjacent to Landfill		Y		N/A
14.12.2	-	<u>Safety Measures - Excavation</u> Staff should receive appropriate training on working in areas susceptible to landfill gas, fire and explosion hazards. Excavation procedures and code of practice should be implemented.	Construction Stage	Contractor	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill		Y		N/A

Legend: D=Design, C=Construction, O=Operation
Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landfill Gas Hazard Assessment

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
14.12.2	-	<u>Safety Measures – Welding, Flame-Cutting and Hot works</u> Hot works should be confined to open areas away from any trench or excavation. Should hot works must be carried out in trenches or confined space, “permit to work” procedures should be followed.	Construction Stage	Contractor	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill	Y			N/A
14.12.2	-	<u>Safety Measures – Enclosed Spaces</u> Site offices or buildings located within PPV Landfill Consultation Zone which have the capacity to accumulate landfill gas, then they should either be located in an area which has been proven to be free of landfill gas; or be raised clear of the ground by a minimum of 500mm.	Site office, building, tunnel, subway, confined area / Construction Stage	Contractor	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill	Y			N/A
14.12.2	-	<u>Safety Measures – Electrical Equipment</u> Any electrical equipment, such as motors and extension cords, should be intrinsically safe.	Construction Stage	Contractor	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill	Y			N/A

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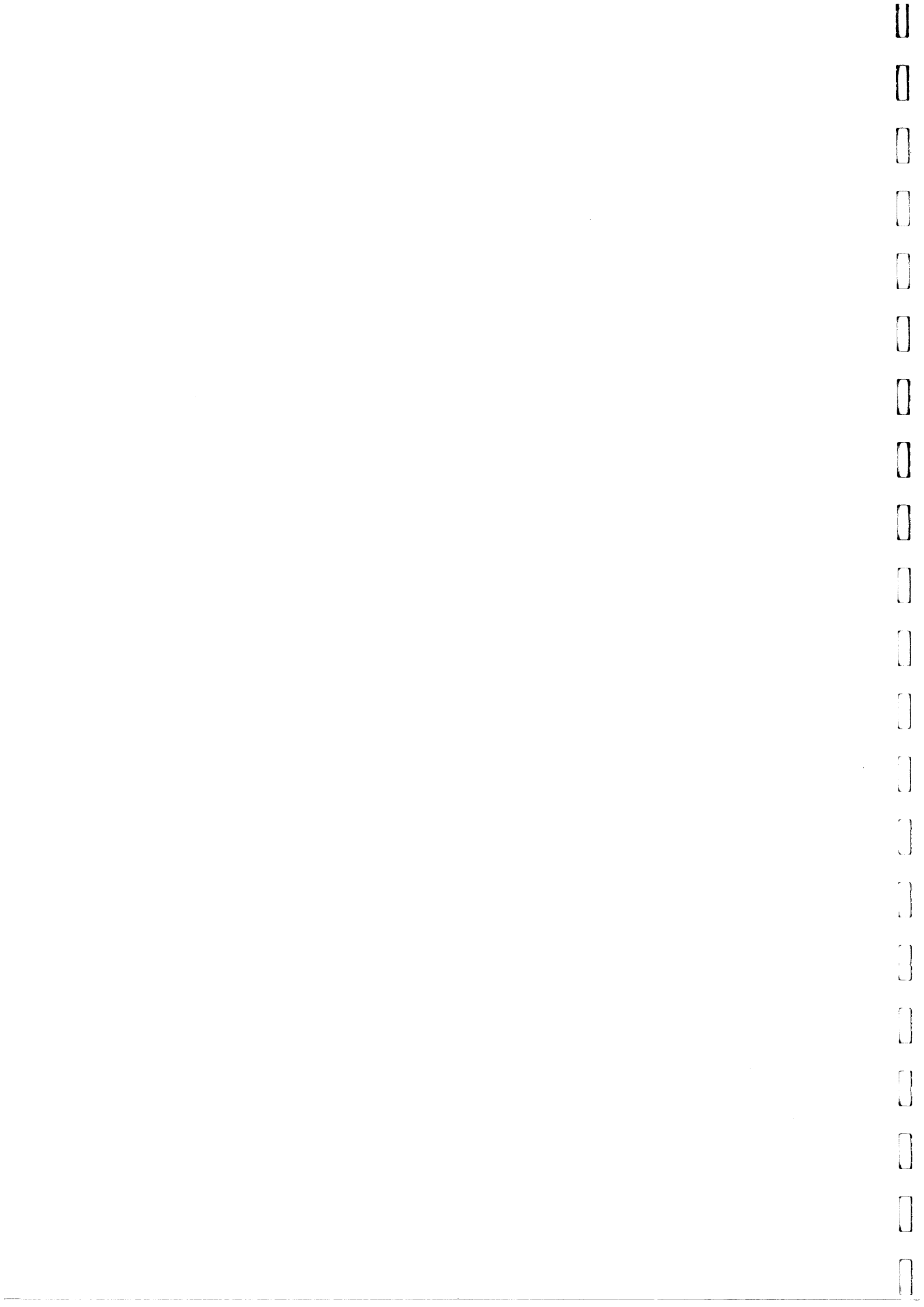
Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landfill Gas Hazard Assessment

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
14.12.2	-	<u>Safety Measures – Piping</u> During piping assembly or conduiting construction, all valves/seals should be closed immediately after installation. As construction progresses, all valves/seals should be closed as installed to prevent the migration of gases through the pipeline/conduit. All piping/conduiting should be capped at the end of each working day.	Services & utilities / Construction Stage	Contractor	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill	Y			N/A
14.12.2	-	<u>Safety Measures – Fire Safety</u> Adequate fire safety equipments should be provided on site. Workers and visitors should be notified of the potential fire hazards. Safety notices should be posted around the site warning the anger and potential hazards.	Construction Stage	Contractor	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill	Y			N/A

Legend: D=Design, C=Construction, O=Operation
Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



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TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION

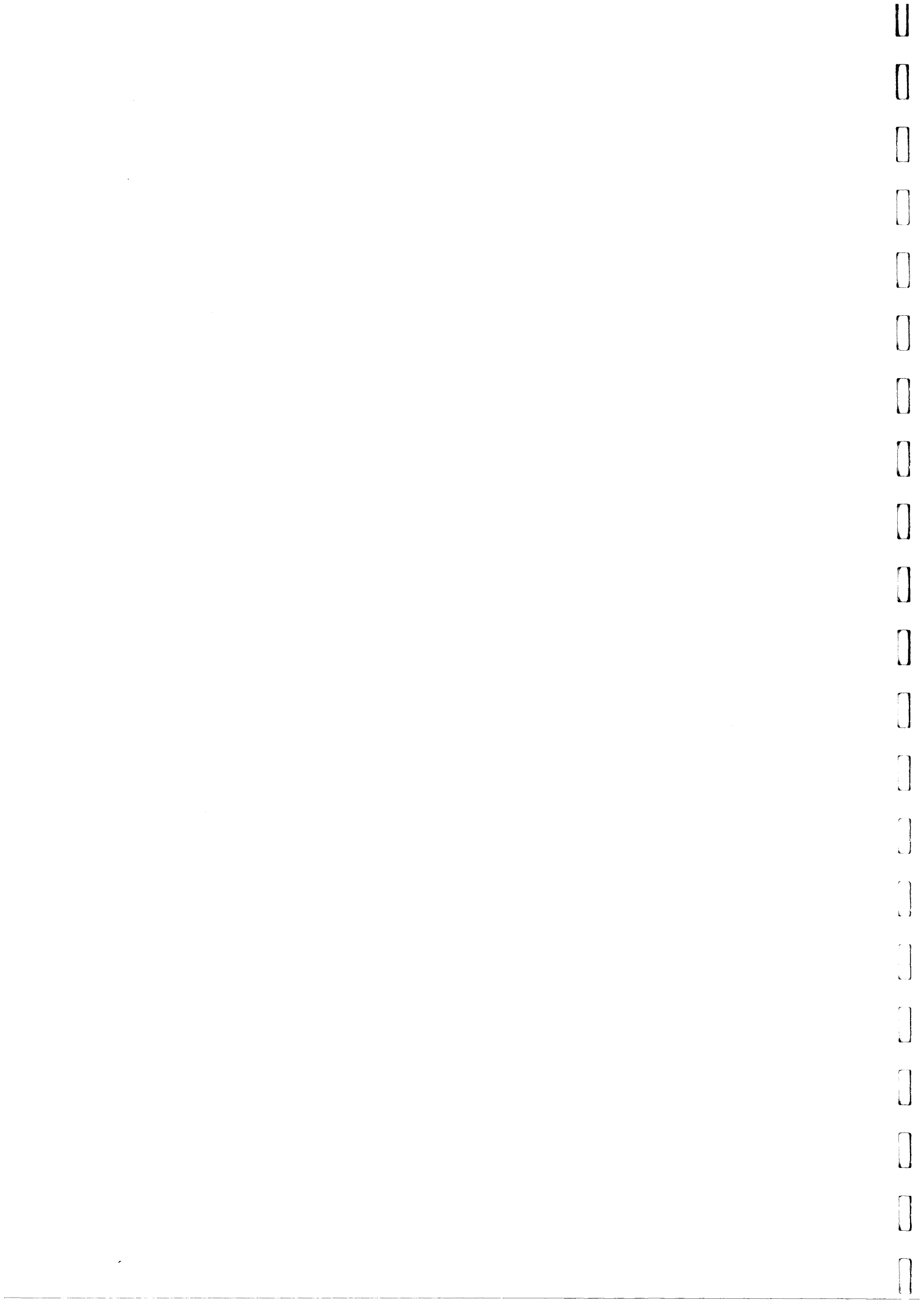
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landfill Gas Hazard Assessment

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
14.12.2	-	<u>Safety Measures – Confined Spaces</u> Precautionary measures should include ensuring that staff members are aware of the potential hazards of working in confined spaces, and that appropriate monitoring procedures are in place to prevent hazards in confined spaces.	Confined space / Construction Stage	Contractor	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill		Y		N/A
14.12.2	10.2	<u>Monitoring</u> Periodically during ground-works within the Consultation Zone, the works area should be monitored for methane, carbon dioxide and oxygen using appropriately calibrated portable gas detection equipment. Depending on the results of the measurements, actions required will vary. As a minimum these should encompass those actions specified in Table 14.8 of the EIA Report or Table 14.1 of the EM&A Manual.	Construction Stage	Contractor	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill		Y		N/A

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION

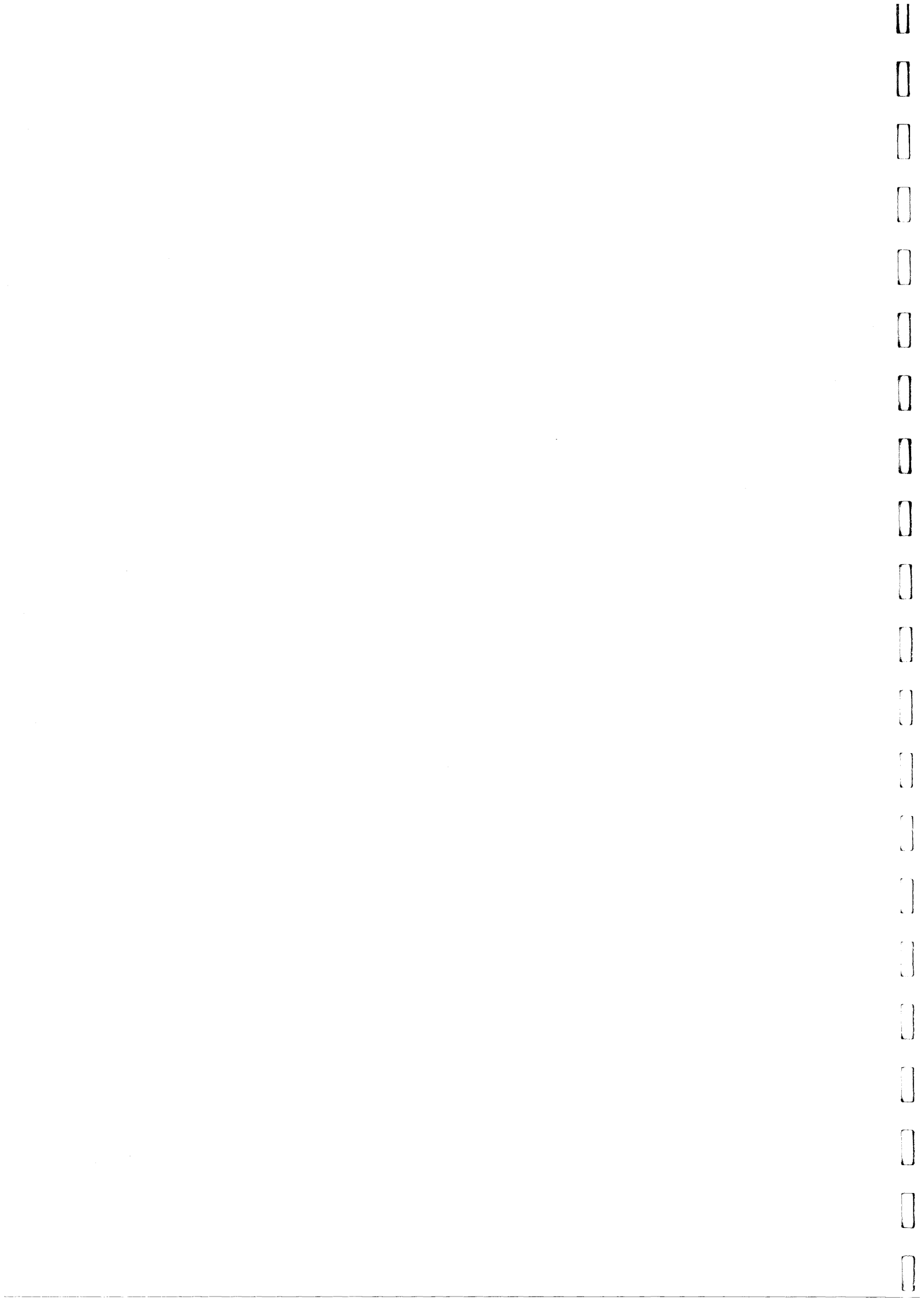
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landfill Gas Hazard Assessment

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
14.12.3	-	<u>Building Protection Design Measure</u> Engineering measures (such as gas-resistant polymeric membranes, synthetic composite geotextile, clear void under the structure, etc) for buildings structures with ground level or below ground rooms / voids. Provision of mechanical ventilation if necessary and detection systems.	Design Stage	Design Consultant	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill	Y			N/A
14.12.3	-	<u>Design Measures for Sub-surface Building Services</u> Generic protection measures (such as barriers made of HDPE, vent pipes, etc) for the design measures for sub-surface building services.	Design Stage	Design Consultant	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill	Y			N/A
14.12.3	-	<u>Design Measures for Tunnel / Subway</u> Enhanced passive control (membrane with conservative lapping, passive venting, etc)	Design Stage	Design Consultant	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill	Y			N/A

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



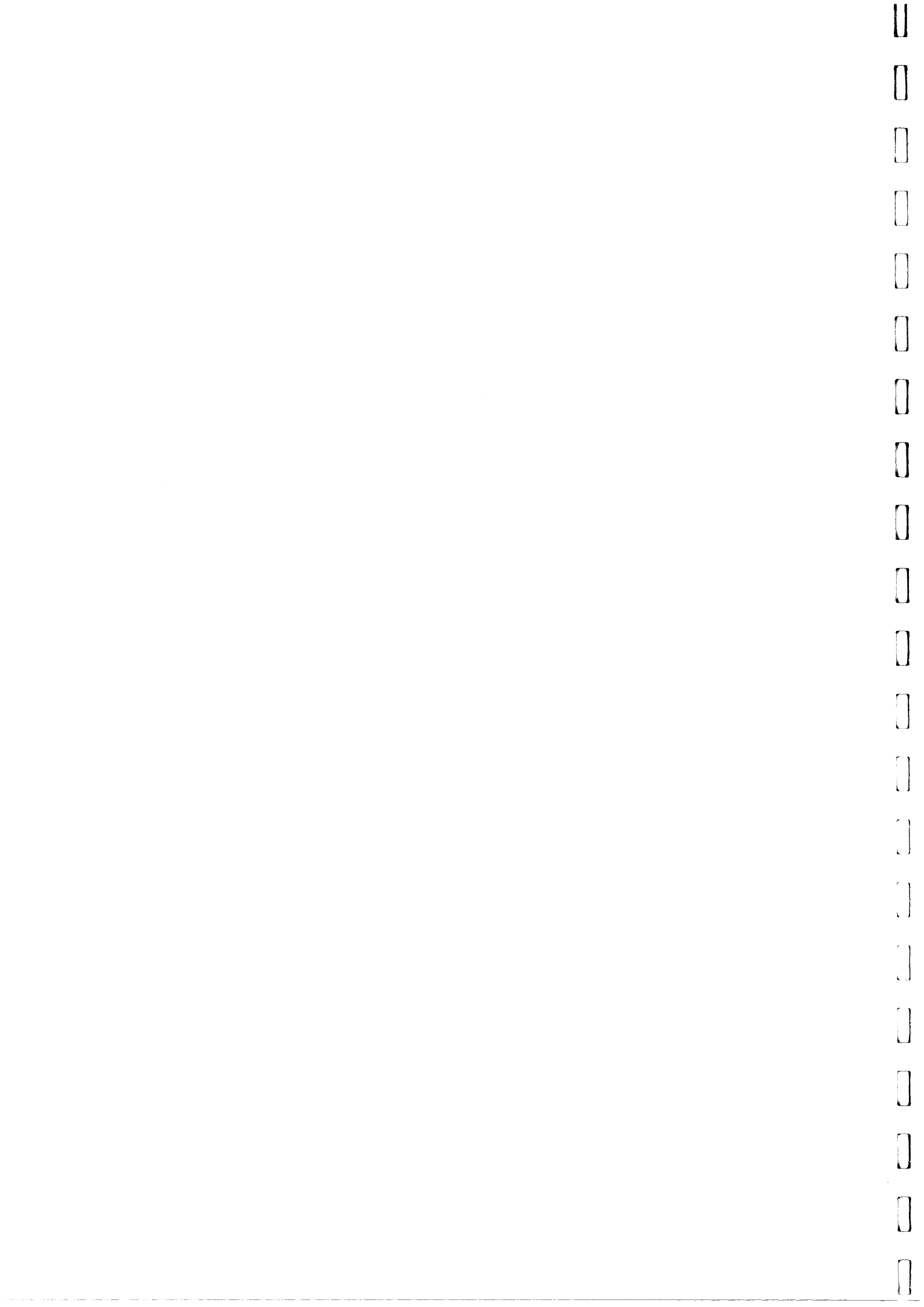
Agreement No. CE 52/2007 (HY)
 TUEN MUN – CHEK LAP KOK LINK
 INVESTIGATION

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landfill Gas Hazard Assessment

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
14.12.3	-	<p><u>Guidance for Entry into Service Rooms / Voids, Manholes and Chamber</u></p> <p>Safety Guide to Working in Confined Spaces should be followed to ensure compliance with the Factories and Industrial Undertakings (Confined Spaces) Regulation.</p> <p>In general, appropriate safety equipments should be available for works in confined spaces. Workers and Supervisors should be trained. A permit-to-work system for entry should be developed and consistently employed. The safety measures recommended in Chapter 8 of the Landfill Gas Hazard Assessment Guidance Note should also be strictly followed.</p>	Confined space / Operation Stage	Operator	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill			Y	N/A

Legend: D=Design, C=Construction, O=Operation
 Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



**Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION**

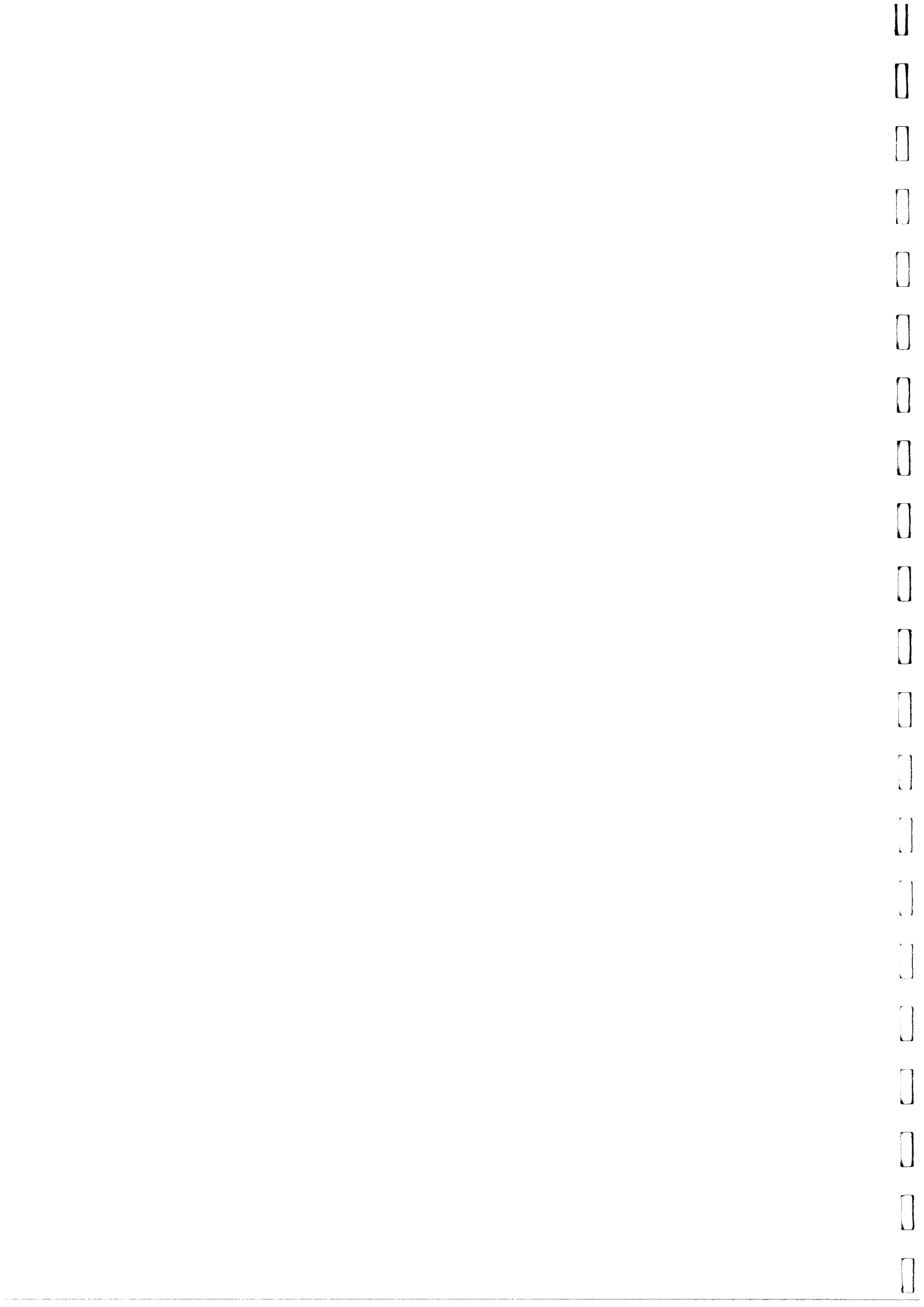
ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landfill Gas Hazard Assessment

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
14.12.3	10.2	<u>Other Safety Measures</u> Operators and maintenance workers should be informed of the potential LFG hazards, and appropriate safety procedures (ie entering confined area as above) should be followed. Communication channels with EPD and Landfill operators should be established. In case of abnormal situation (eg detection of gas emission, smell) at the site, the operators should report the case to EPD / Landfill operators for advice. Regular monitoring of landfill gas should be conducted. Monitoring is required to verify the effectiveness and to ensure the continued performance of the implemented protection measures.	Operation	Operator	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA for Dev. Adj. to Landfill			Y	N/A
14.12.3	10.2	The design of the landfill gas protection measures to be adopted on-site associated to the Project will be conducted by a competent professional person appointed by the Project	Detailed Design Stage	Detailed Design Consultant (competent professional person)	EPD/TR8/97 - LFG HA GN ProPECC PN 3/96 - LFG HA	Y			N/A

Legend: D=Design, C=Construction, O=Operation

Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



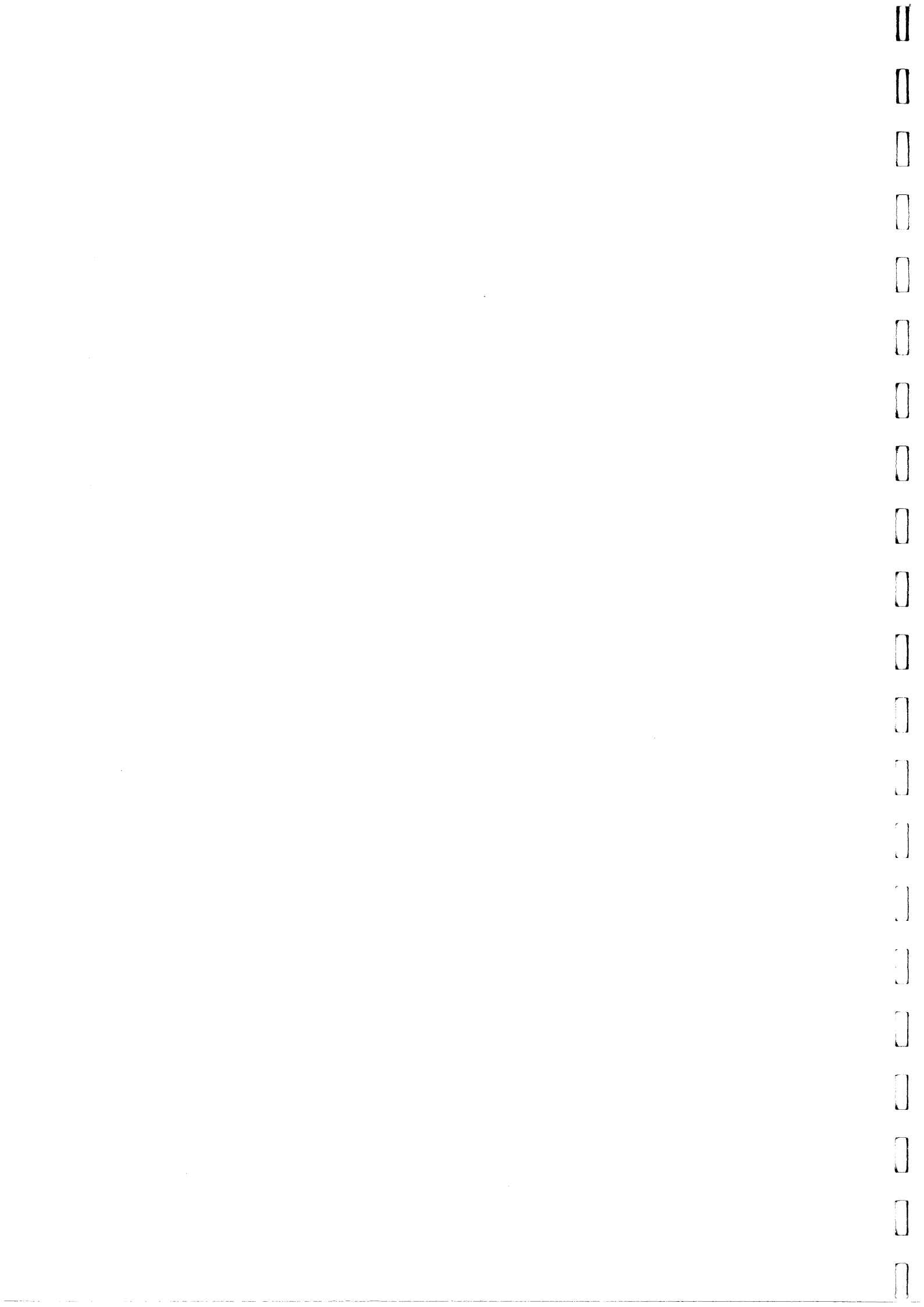
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 TUEN MUN – CHEK LAP KOK LINK
 INVESTIGATION

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

Landfill Gas Hazard Assessment

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		<p>Proponent. The Project Proponent shall ensure that the required protective measures are implemented and constructed in accordance to the design and shall establish a maintenance & monitoring programme for ensuring the continual performance of the implemented protection measures.</p> <p>At the detailed design stage, a review on this preliminary LFG hazard assessment should be conducted in consideration of the updated information from the detailed design.</p> <p>When the detailed designs of the protection measures are available, the project proponent is required to undertake a detailed LFG hazard assessment to take the updated information into account (particularly the finalized LFG protective measures).</p> <p>The design of the finalized LFG</p>			for Dev. Adj. to Landfill				

Legend: D=Design, C=Construction, O=Operation
 Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



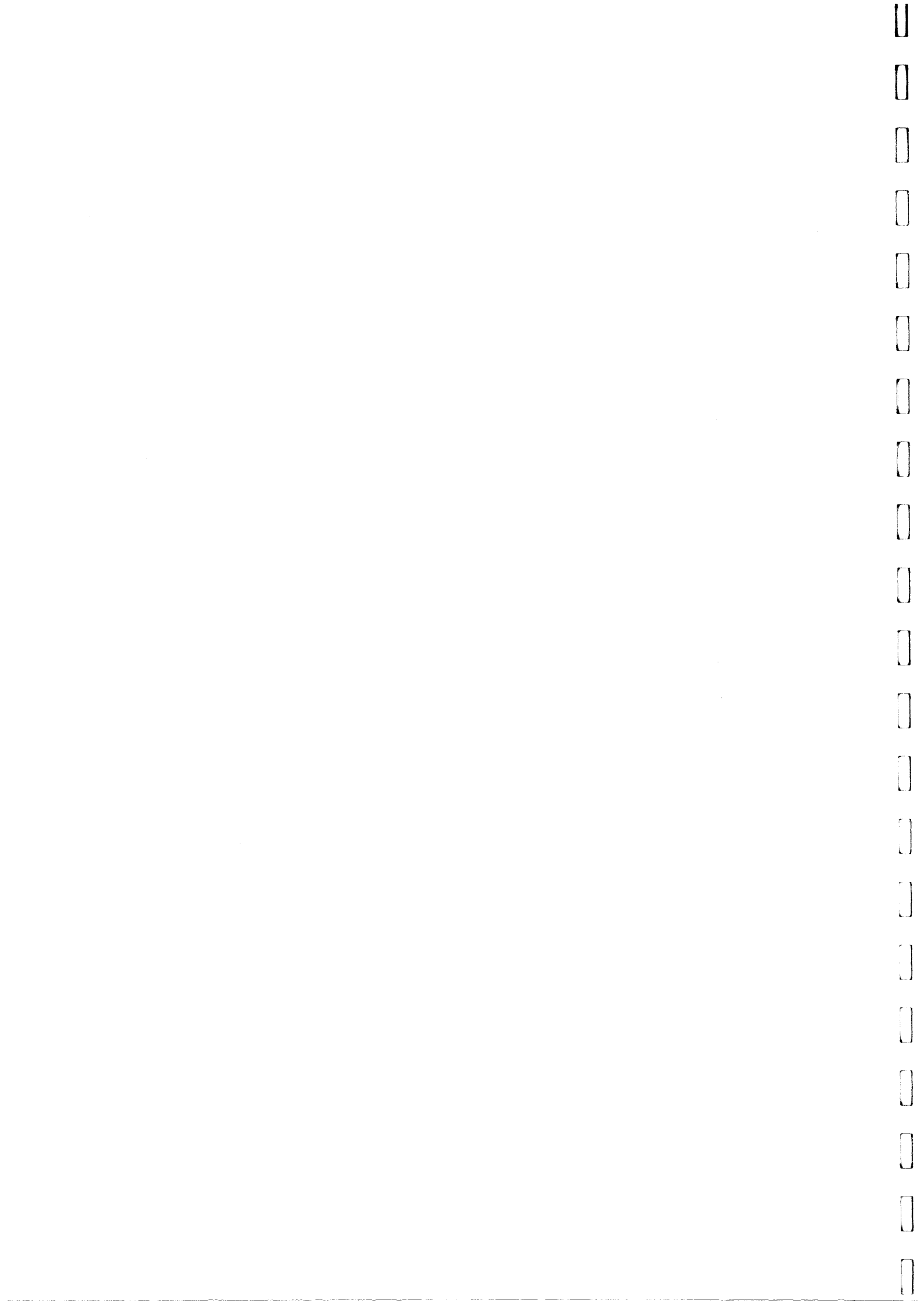
**Agreement No. CE 52/2007 (HY)
TUEN MUN – CHEK LAP KOK LINK
INVESTIGATION**

ENVIRONMENTAL MITIGATION AND ENHANCEMENT MEASURE IMPLEMENTATION SCHEDULE

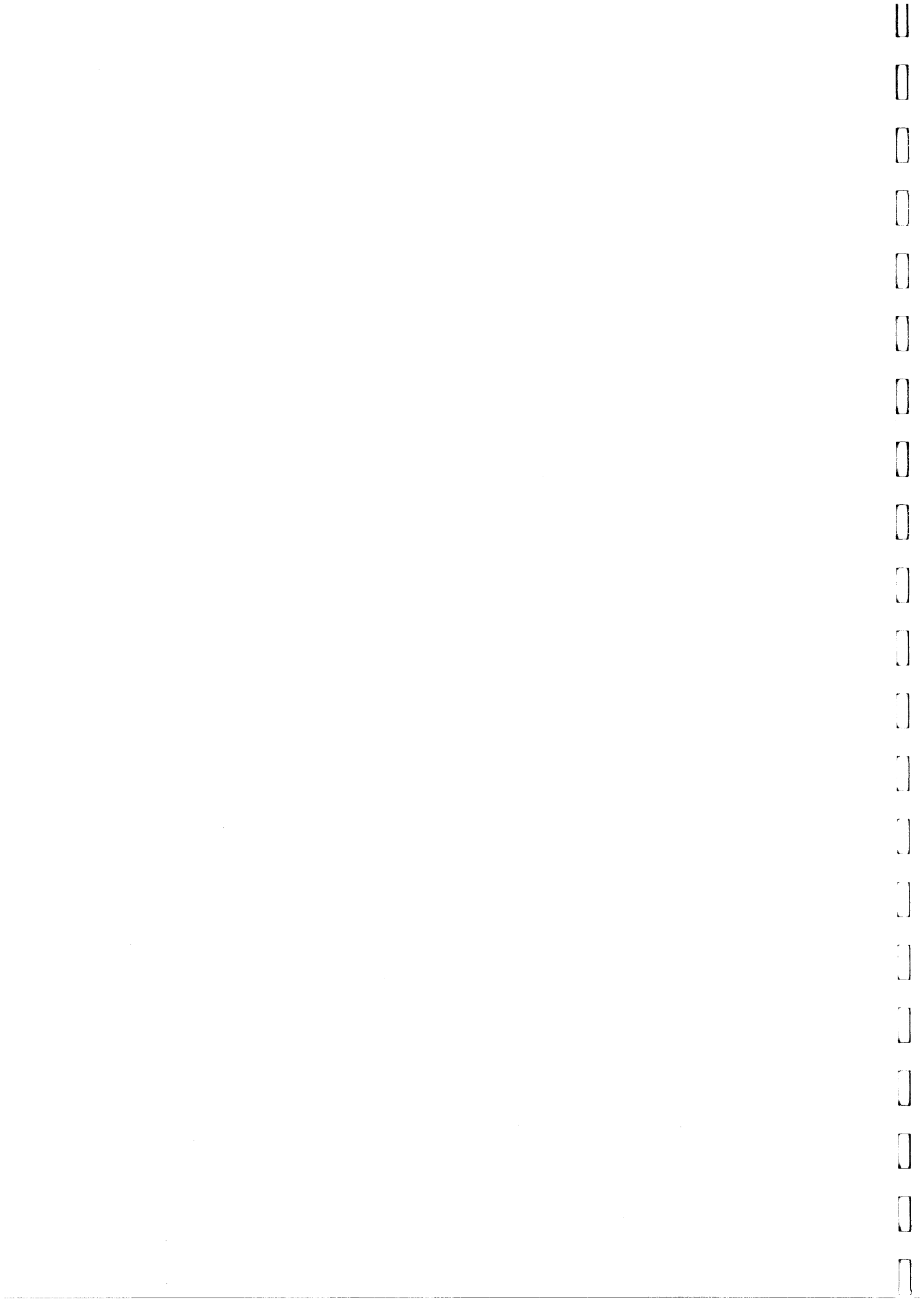
Landfill Gas Hazard Assessment

EIA Reference	EM&A Manual Reference	Environmental Protection Measures	Location/ Timing	Implementation Agent	Relevant Standard or Requirement	Implementation Stages			Maintenance Agency
						D	C	O	
		protective measures, detailed LFG hazard assessment and the LFG monitoring programme should be submitted to EPD for vetting.							

Legend: D=Design, C=Construction, O=Operation
Note: Funding Agent for all mitigation measures will be the Highways Department of the Hong Kong SAR Government



Proforma for Construction Phase EM&A Programme



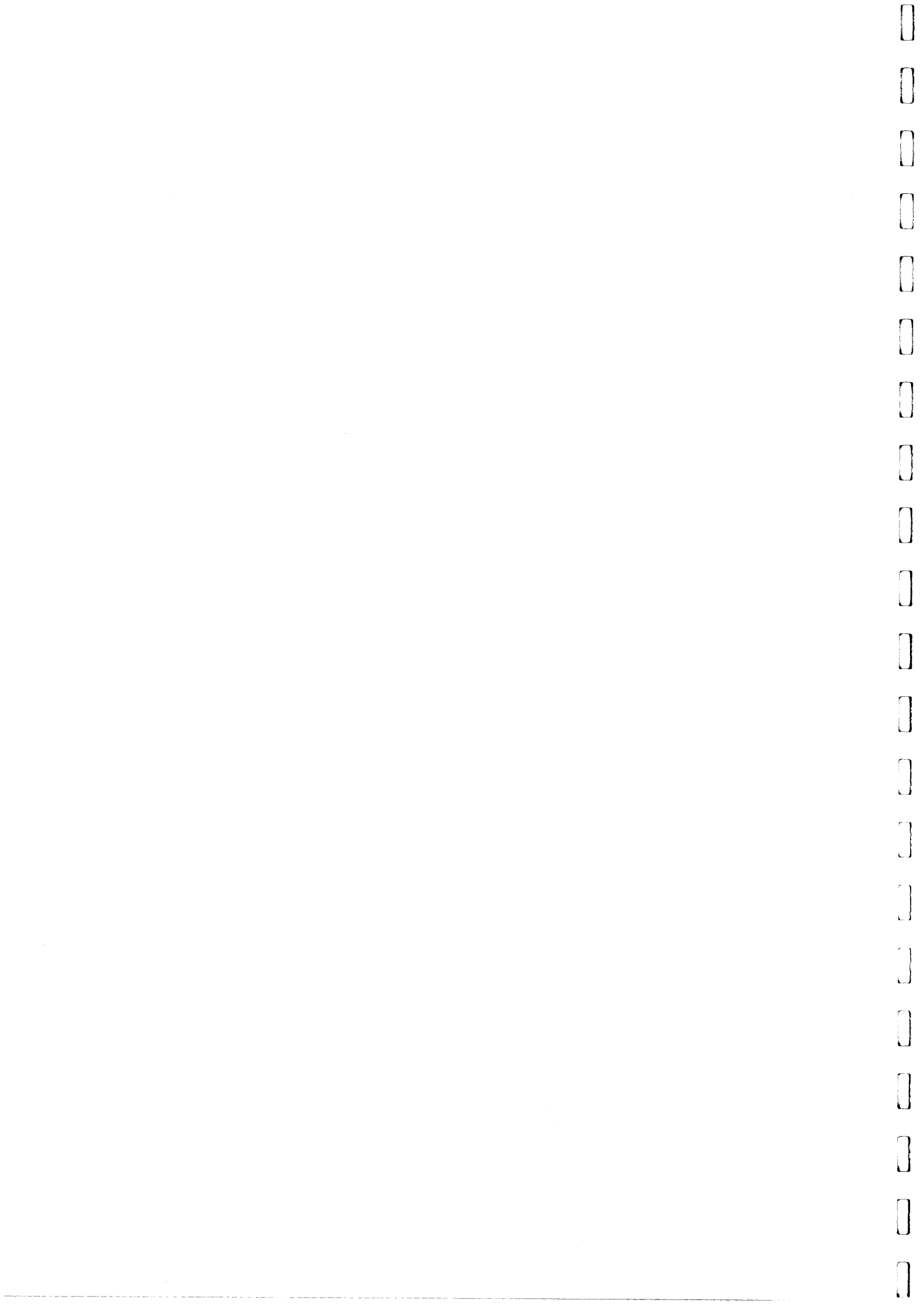
COMPLAINT LOG

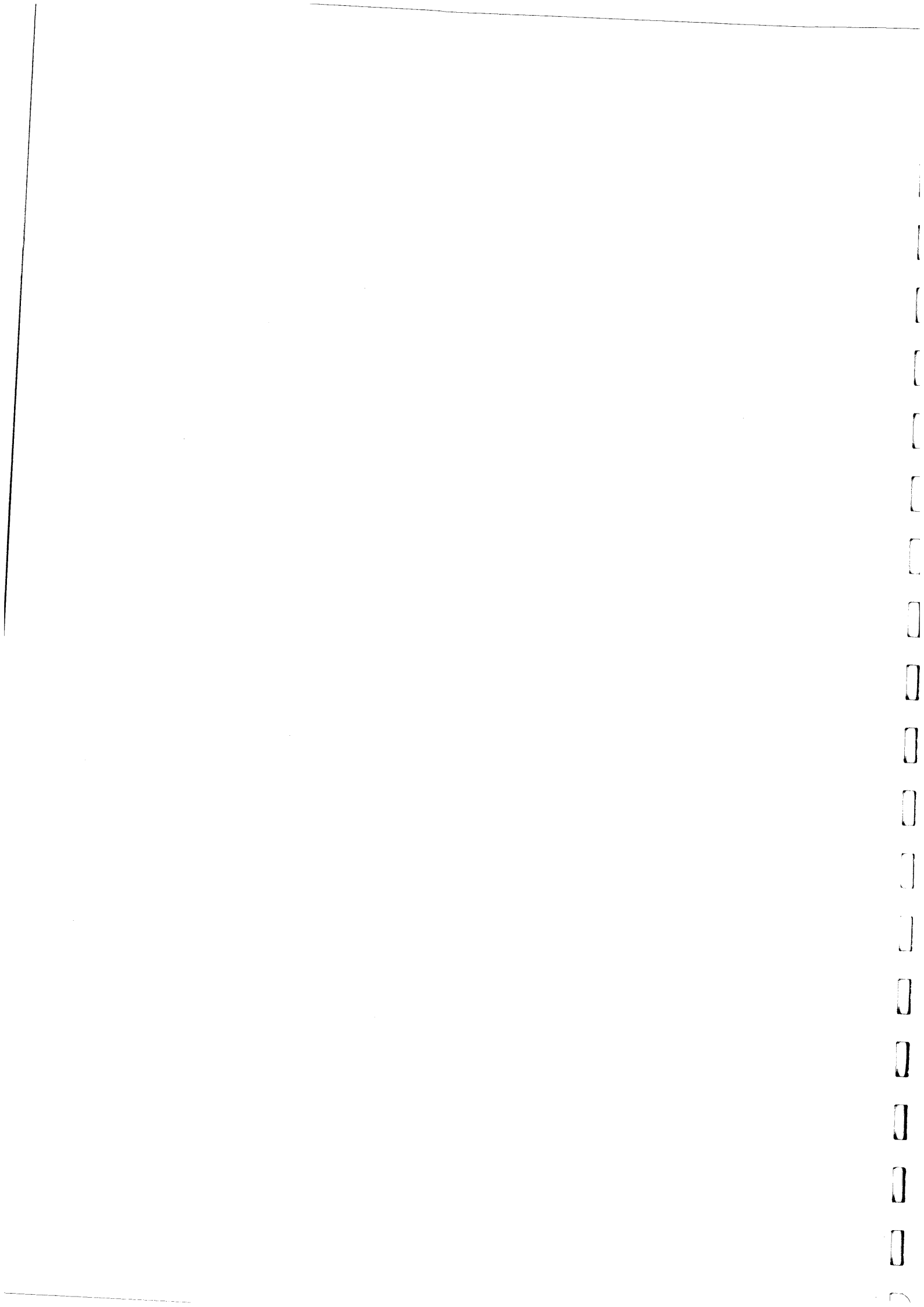
Ref: _____

Log Ref.	Date / Location	Complainant/ Date of Contract	Details of Complaint	Investigation / Mitigation Action	File Closed

Filed by Environmental Team Leader

Date: _____







Ref: _____

DATA RECOVERY SCHEDULE

Date	Air Quality Monitoring										Noise Monitoring							
	Monitoring Station*										Monitoring Station*							
	A02	A06	A07	A21	A24	A34	A36	A40	A42		R2	R5	R7	R14	R16	R21	R24	
1																		
2																		
3																		
4																		
5																		
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26																		
27																		
28																		
29																		
30																		
31																		
% of R																		

* Research type of parameters
 % of R The percentage of Data Recovery is the natural monitoring over the scheduled monitoring

Date: _____

Signed by Environmental Team Leader _____



SITE INSPECTION PROFORMA

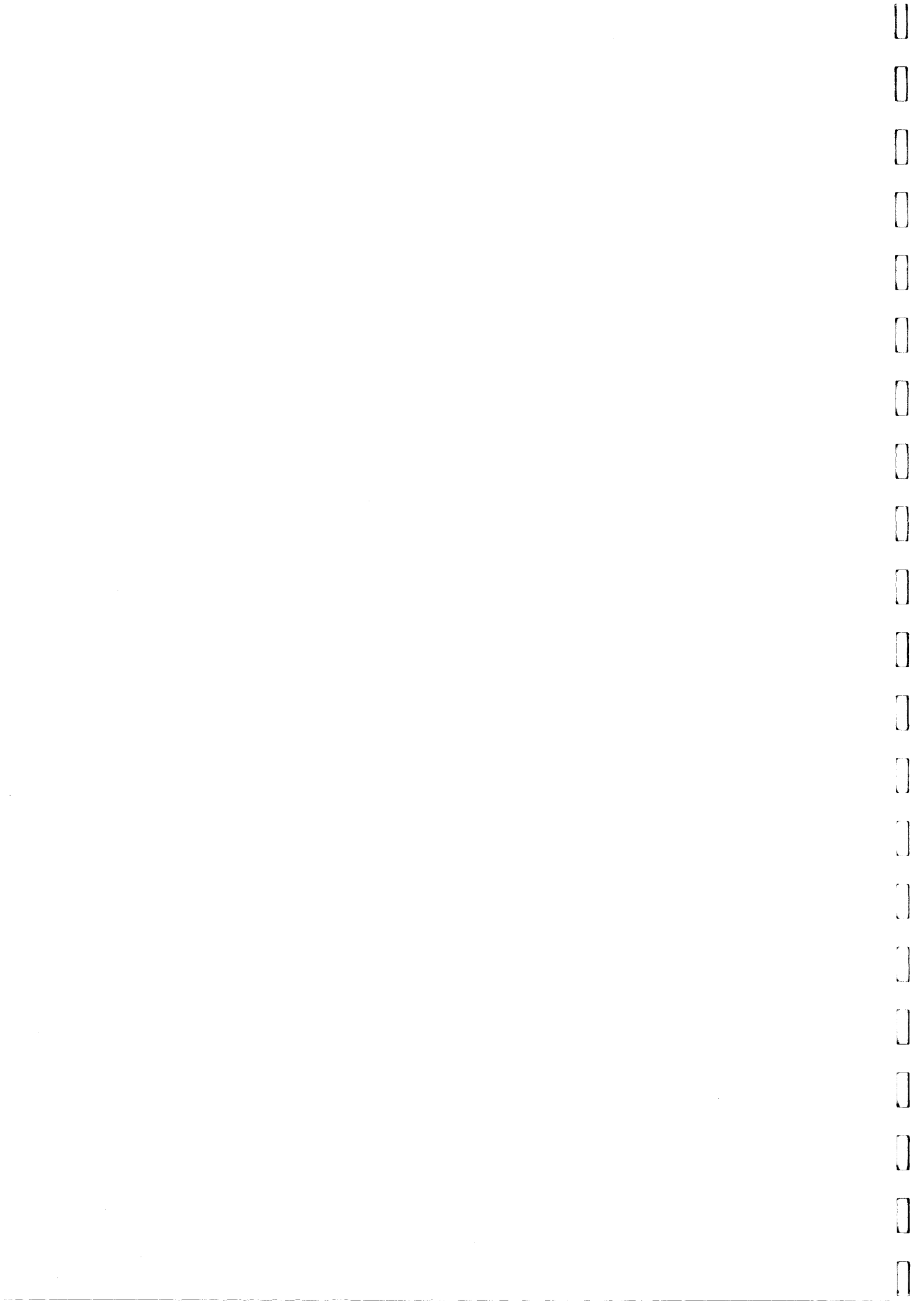
Ref: _____

Date	Location	Req=t Ref.*	Observation / Deficiency	Mitigation Action** (Responsible Agency)	Date*** of Confirmation

* EIA Ref/ EM&A Log Ref/ Design Document Ref/ Environmental Protection Contract Clause
 ** Specific Environmental Mitigation Measures should be stated, such as, equipment, processes, systems, practices or technologies
 *** The required completion date to confirm the specified Environmental Protection Action

This Proforma is an:
 Environmental Protection Instruction for _____ Date: _____

Signed by Environmental Team Leader _____ Date: _____



PROACTIVE ENVIRONMENTAL PROTECTION PROFORMA

Ref: _____

Ref*	Proposed Construction Method*	Location/ Working Period	Anticipated Impacts	Recommended Mitigation Measures

* *ELA Ref / EM&A Log Ref / Design Ref*

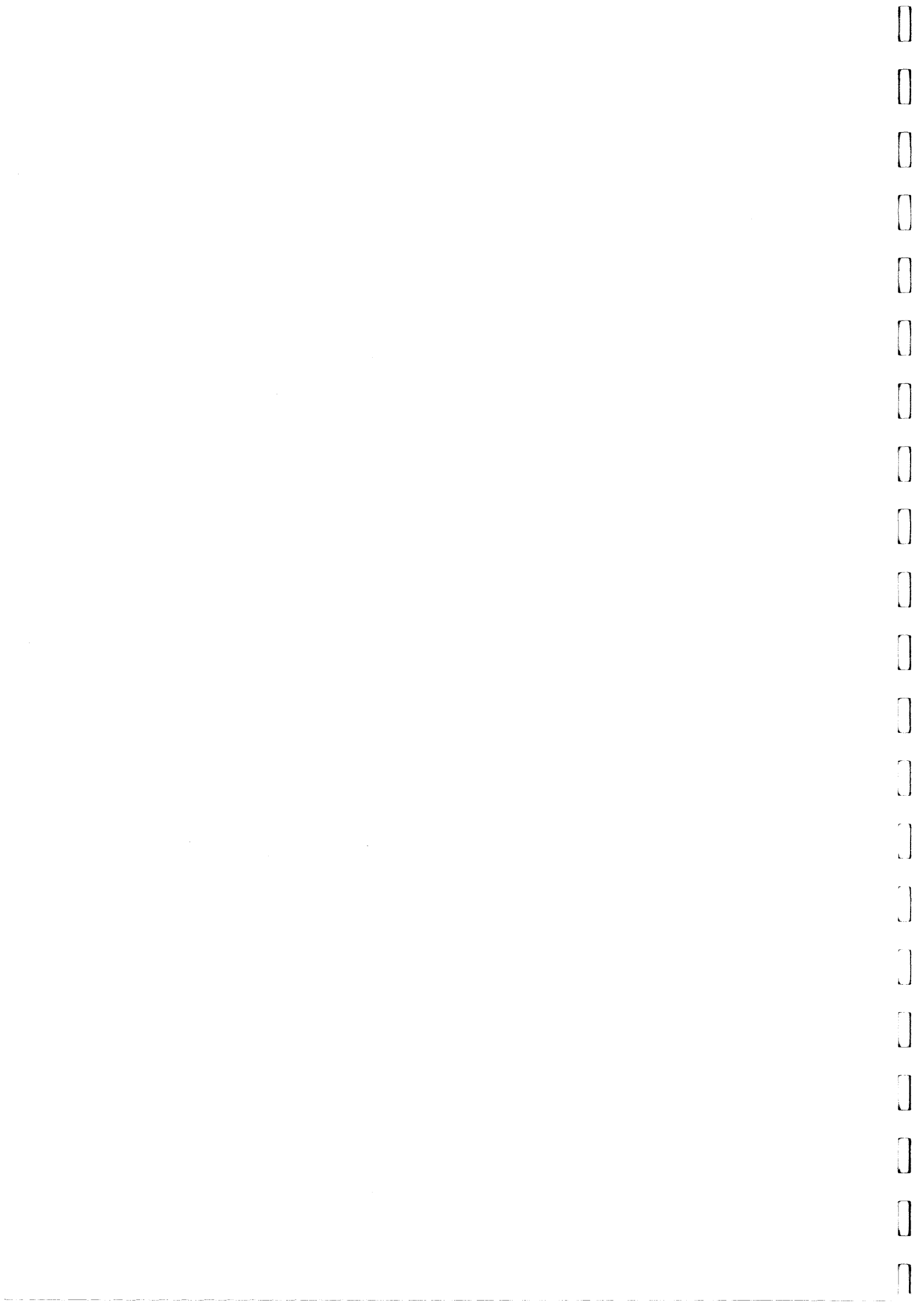
** *Details of equipment, vehicles, plants, processes, technologies for the option of construction method*

Signed by Environmental Team Leader

Date: _____

Audited by Independent Environment Checker

Date: _____



REGULATORY COMPLIANCE PROFORMA

Ref: _____

Ref*	Environmental License / Permit*	Control Area / Facility / Location	Effective Date

* *Name of Applicant, Business Corporation, relevant regulation and remark of license / permit conditions*

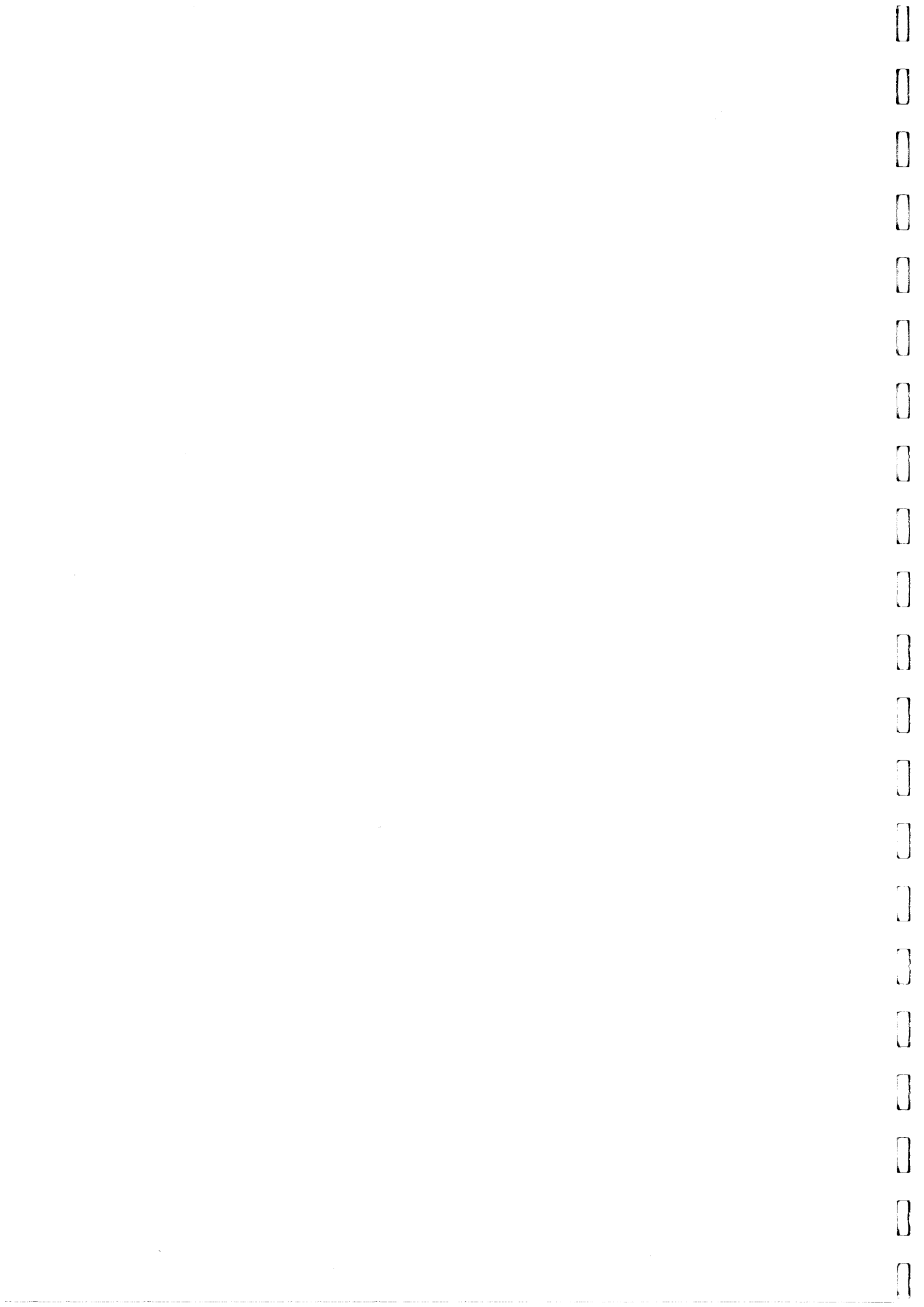
** *File reference of the licensee / permittee*

Signed by Environmental Team Leader _____ Date: _____

Audited by Independent Environment Checker _____ Date: _____

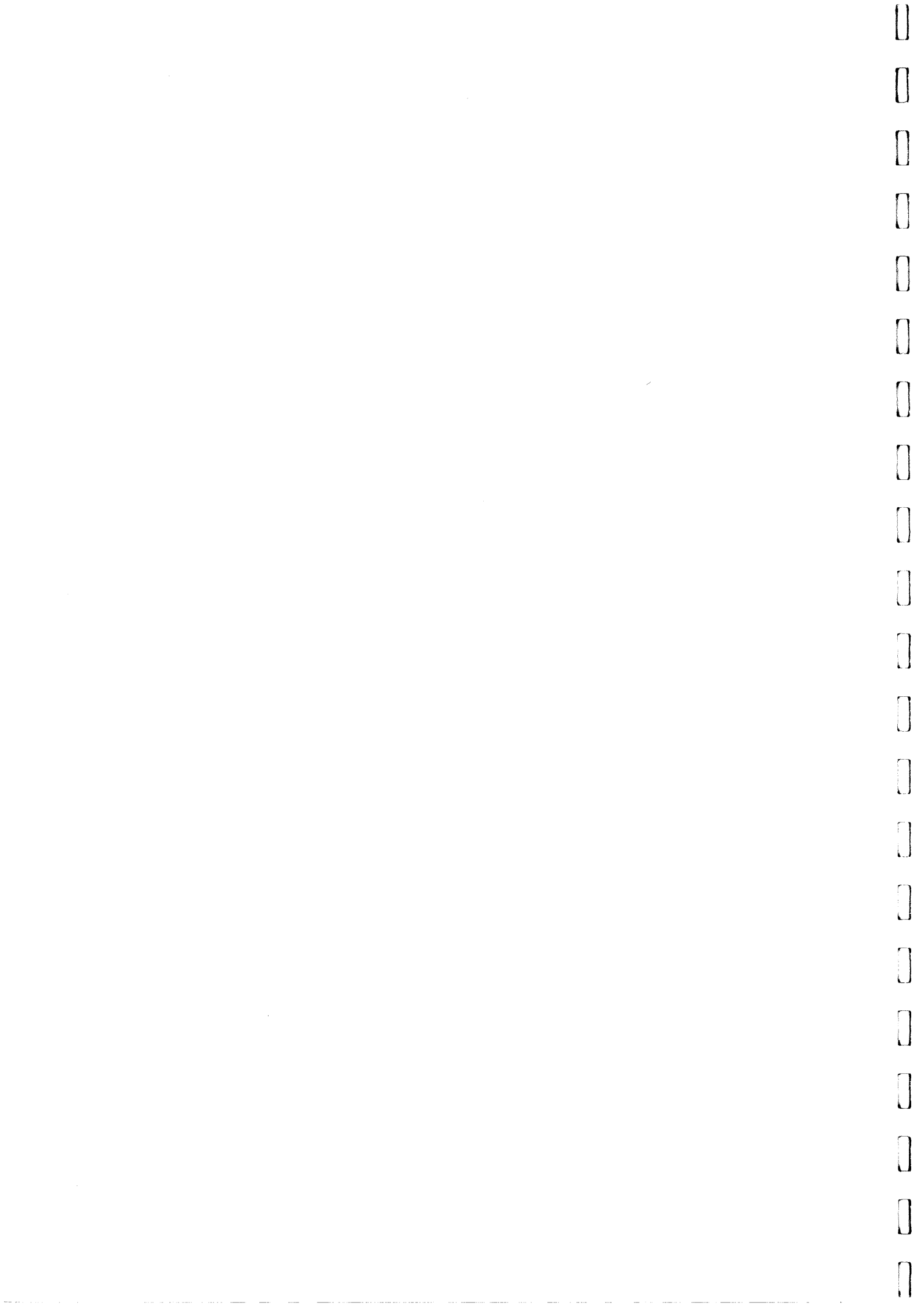


Appendix B
Environmental Proformas



Proforma for Operational Phase EM&A Programme





REGULATORY COMPLIANCE PROFORMA

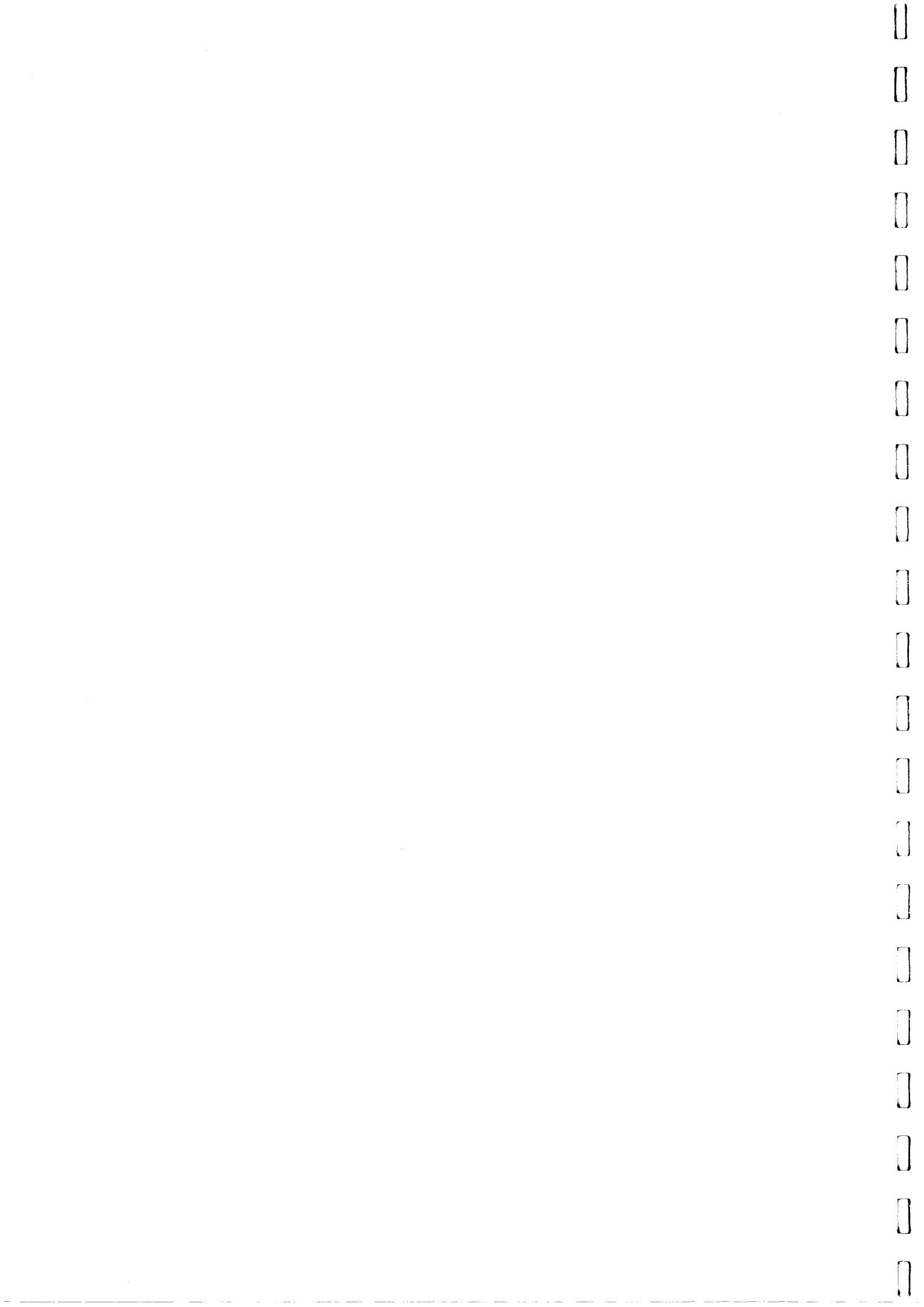
Ref: _____

Ref*	Environmental License / Permit*	Control Area / Facility / Location	Effective Date

* *Name of Applicant, Business Corporation, relevant regulation and remark of license / permit conditions*
 ** *File reference of the licensee / permittee*

Signed by Environmental Team Leader _____ Date: _____

Audited by Independent Environment Checker _____ Date: _____



IMPLEMENTATION STATUS PROFORMA

Ref: _____

Ref**	Environmental Protection Measures*	Implementation Status

* All recommendations and requirements resulted during the Course of EIA/EA Process, including ACE and / or accepted public comment to the proposed project
** EIA Ref/EM&A Log Ref/ Design Document Ref

Signed by Environmental Team Leader _____ Date: _____

Audited by Independent Environment Checker _____ Date: _____



**Sample Template for Interim Notifications of Environmental Quality Limits
Exceedances**

Incident Report on Action Level or Limit Level Non-compliance

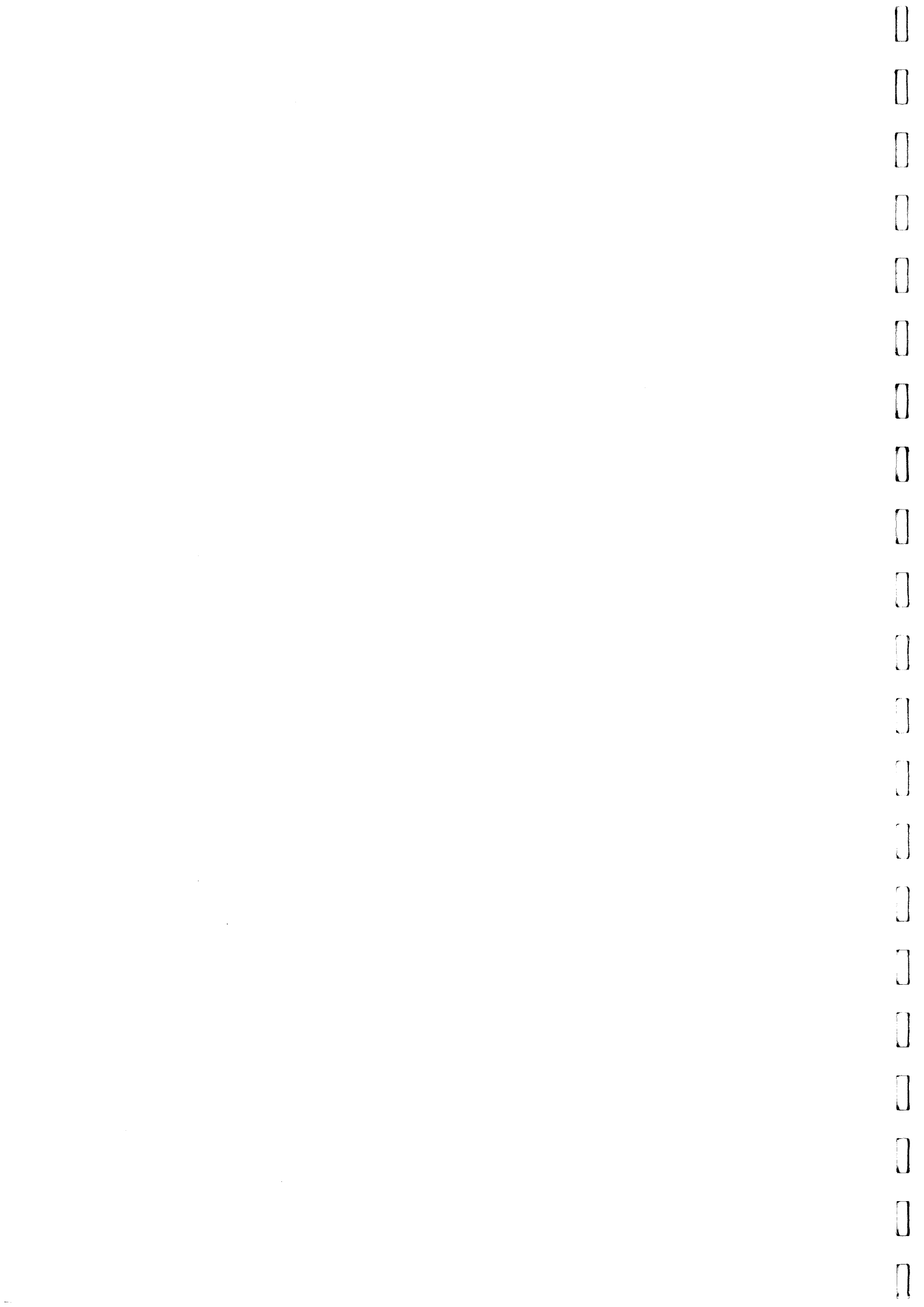
Project	
Date	
Time	
Monitoring Location	
Parameter	
Action & Limit Levels	
Measured Level	
Possible reason for Action or Limit Level Non-compliance	
Actions taken / to be taken	
Remarks	

Prepared by: _____

Designation: _____

Signature: _____

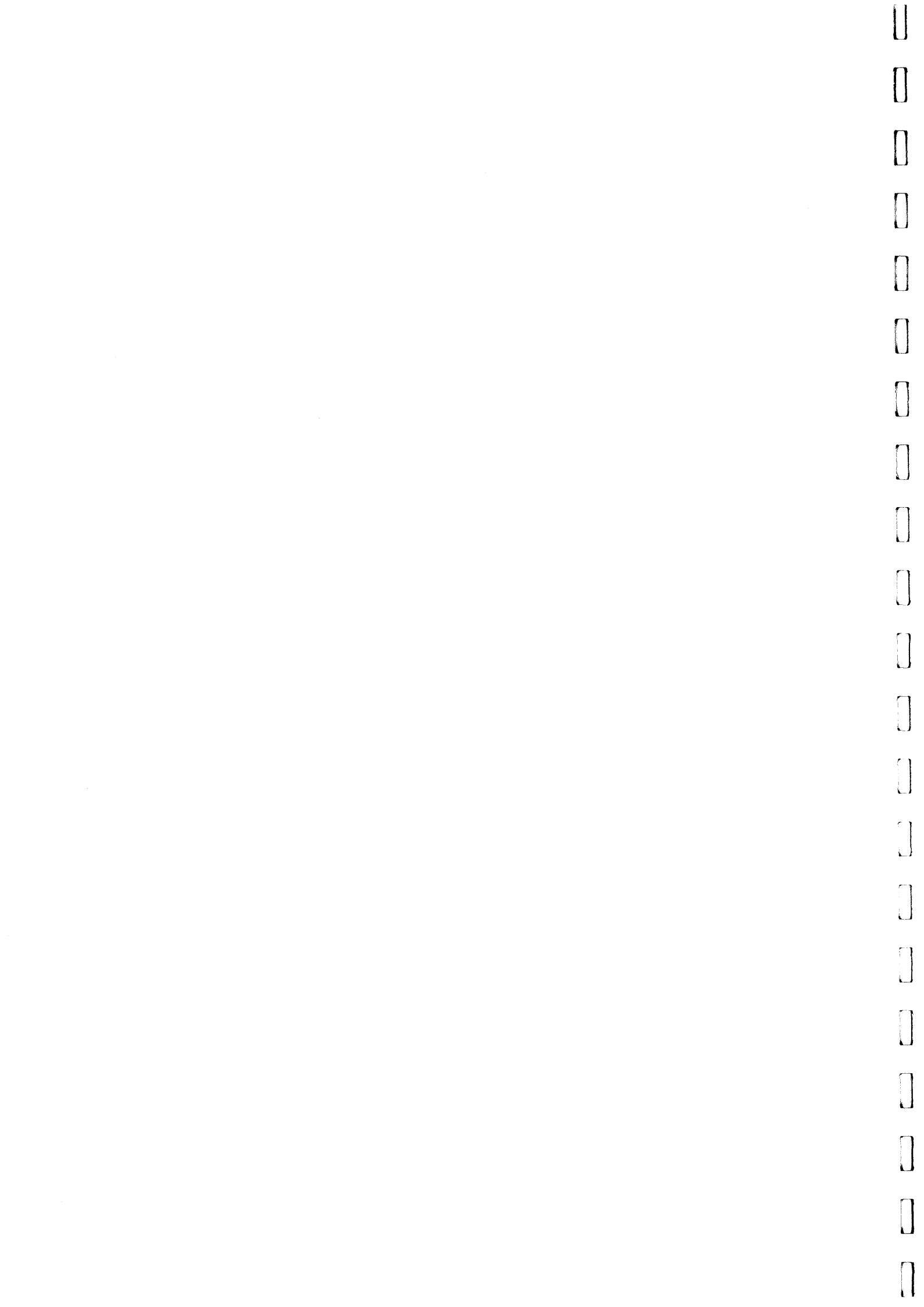
Date: _____

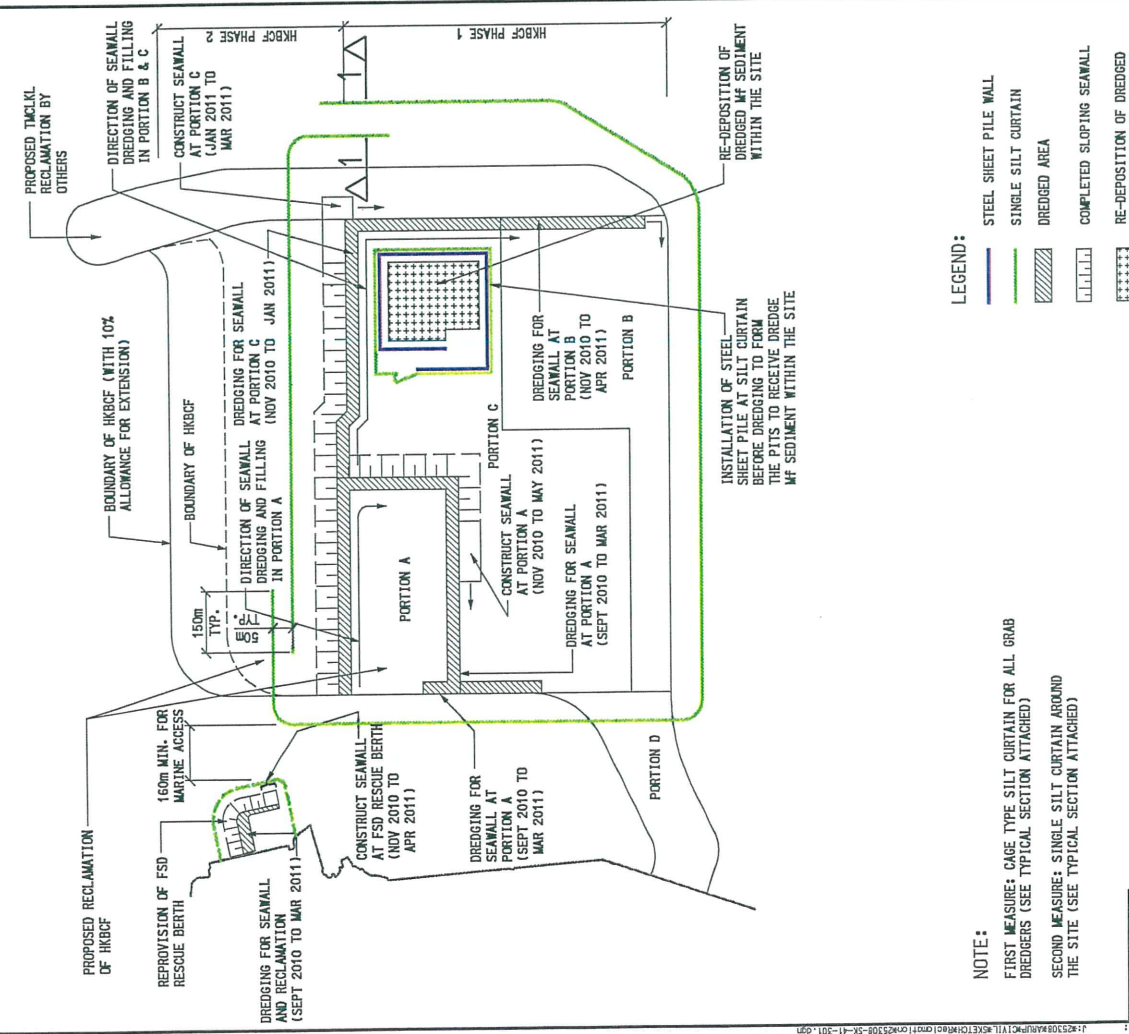
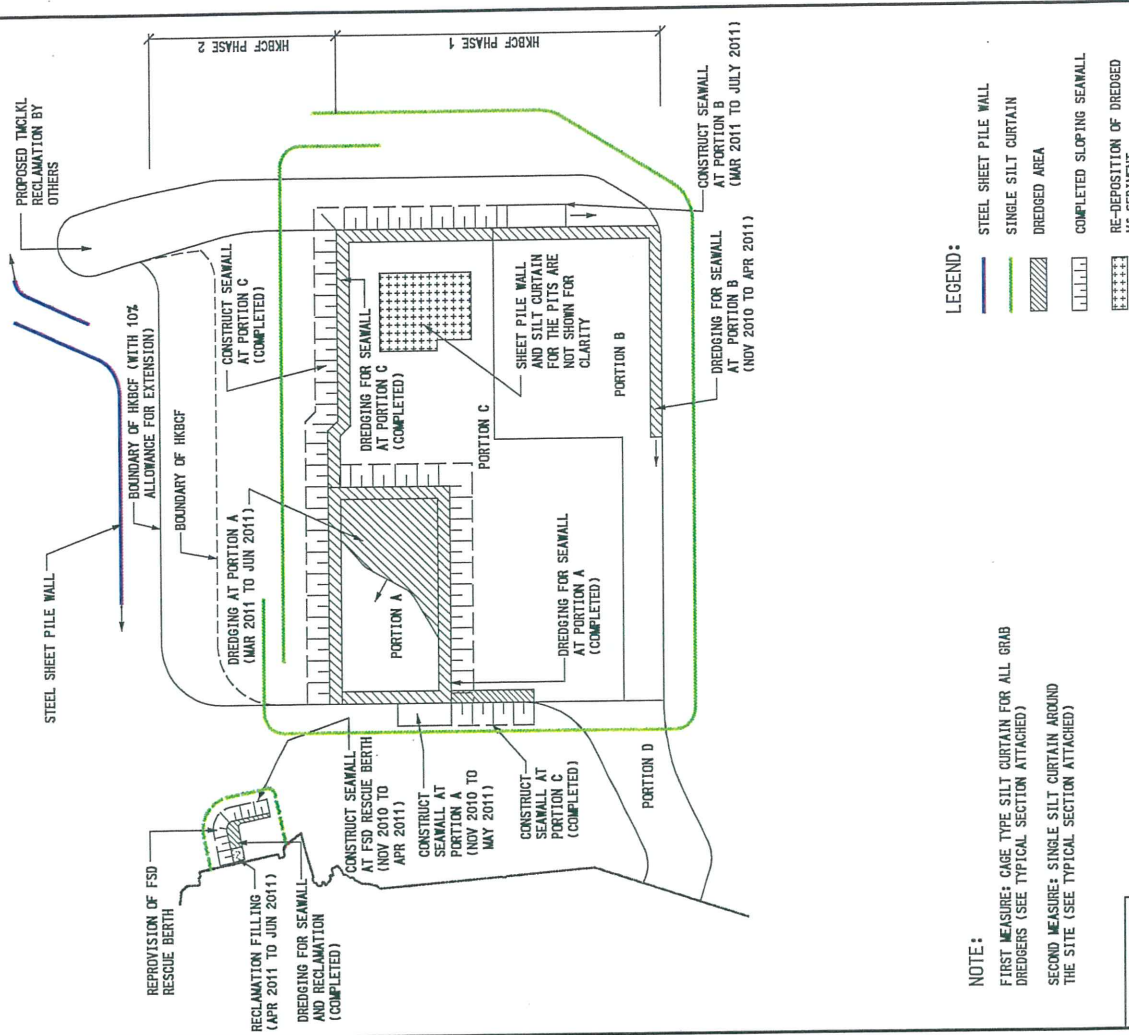


Annex A



**Arrangement of Silt Curtain Systems
under Construction Sequence A**





LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- ▨ DREDGED AREA
- COMPLETED SLOPING SEAWALL
- ***** RE-DEPOSITION OF DREDGED MF SEDIMENT

NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

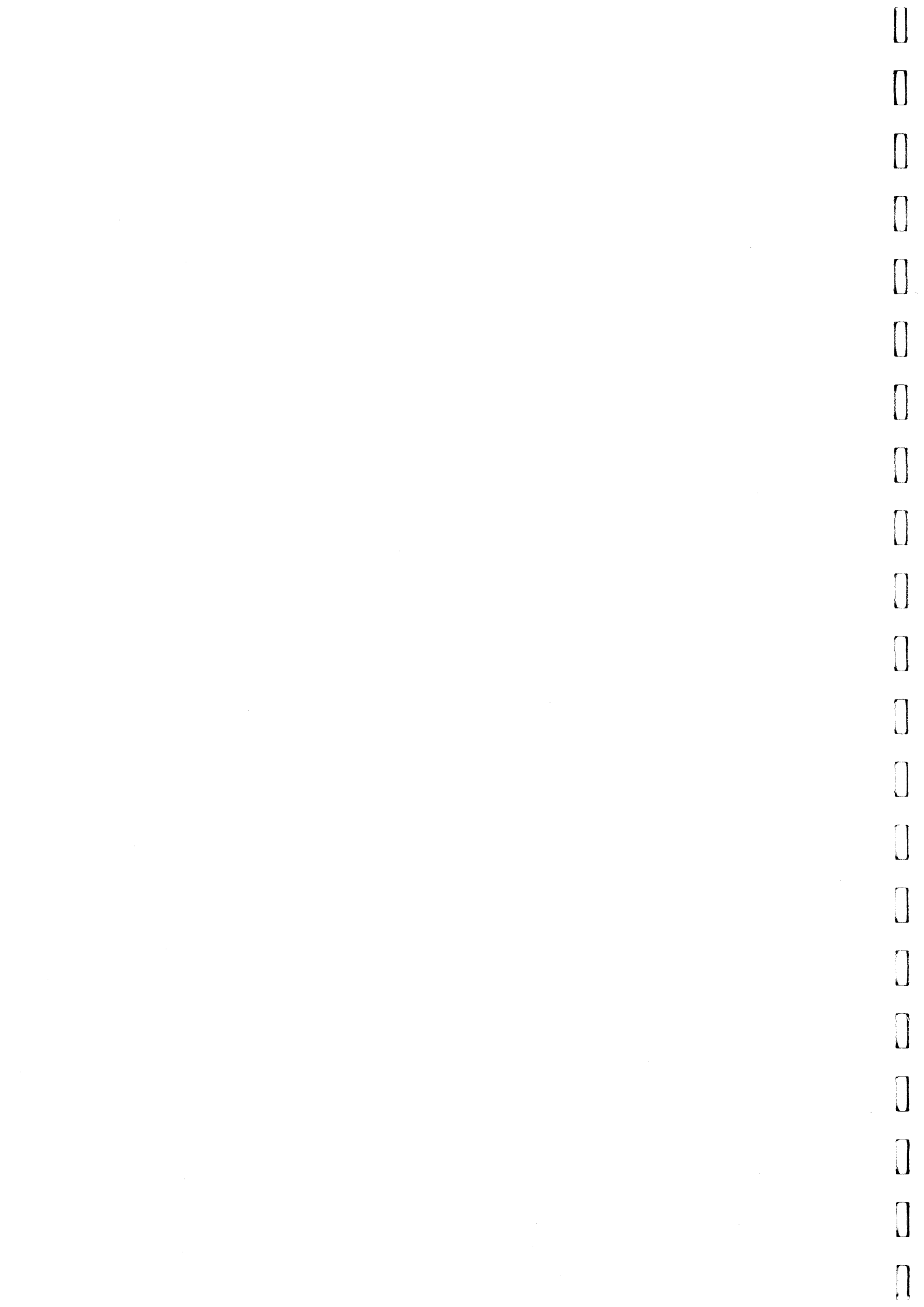
- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- ▨ DREDGED AREA
- COMPLETED SLOPING SEAWALL
- ***** RE-DEPOSITION OF DREDGED MF SEDIMENT

NOTE:

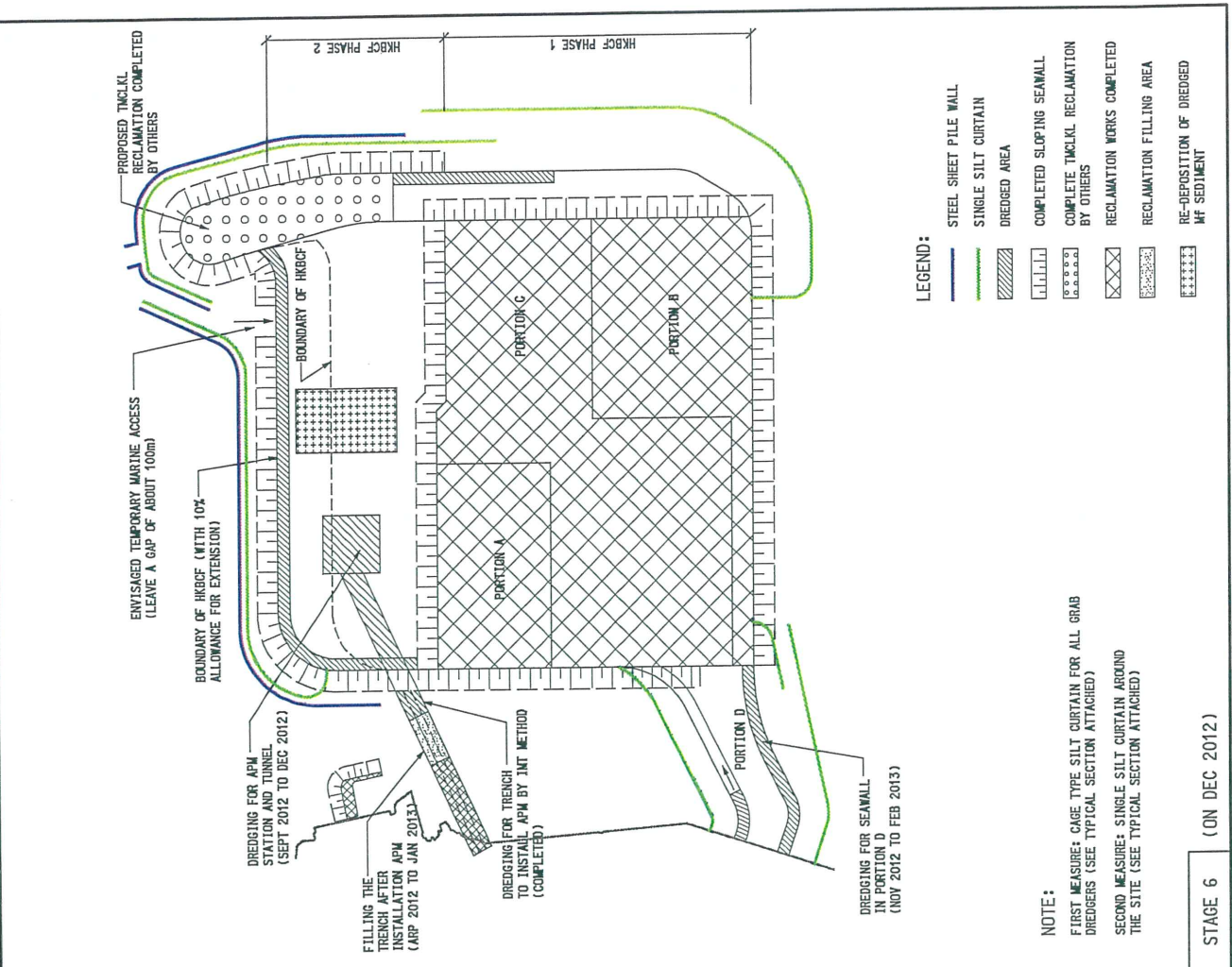
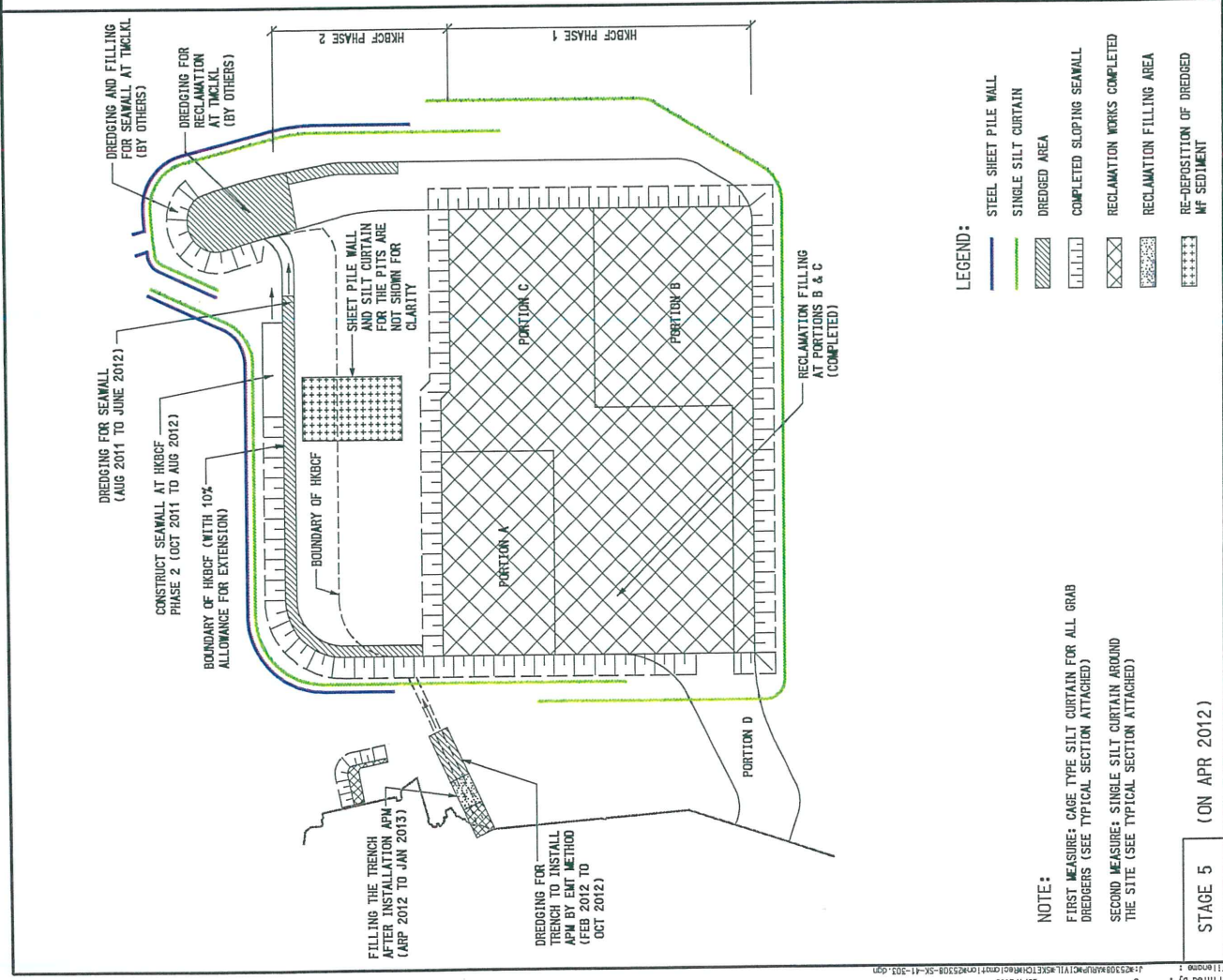
FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 1 (ON FEB 2011)		STAGE 2 (ON APRIL 2011)	
ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE A)			
Drawn	Checked	Date	Scale
ON	SK	02/09	1:12500 on A3
Drawn No.	Checked	Date	Scale
25308/041/301	AK	02/09	1:12500 on A3
Job Title	Description		
Agreement No. CE 14/2008 (CE)	FIRST ISSUE		
Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Investigation	A		
ARUP Ove Arup & Partners Hong Kong Limited	PRELIMINARY		
HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理局 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office	Rev. A		







LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- ▨ DREDGED AREA
- ▤ COMPLETED SLOPING SEAWALL
- ▥ RECLAMATION WORKS COMPLETED
- ▧ RECLAMATION FILLING AREA
- ▩ RE-DEPOSITION OF DREDGED MF SEDIMENT

NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- ▨ DREDGED AREA
- ▤ COMPLETED SLOPING SEAWALL
- ▥ COMPLETE TWCLKL RECLAMATION BY OTHERS
- ▧ RECLAMATION WORKS COMPLETED
- ▩ RE-DEPOSITION OF DREDGED MF SEDIMENT

NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

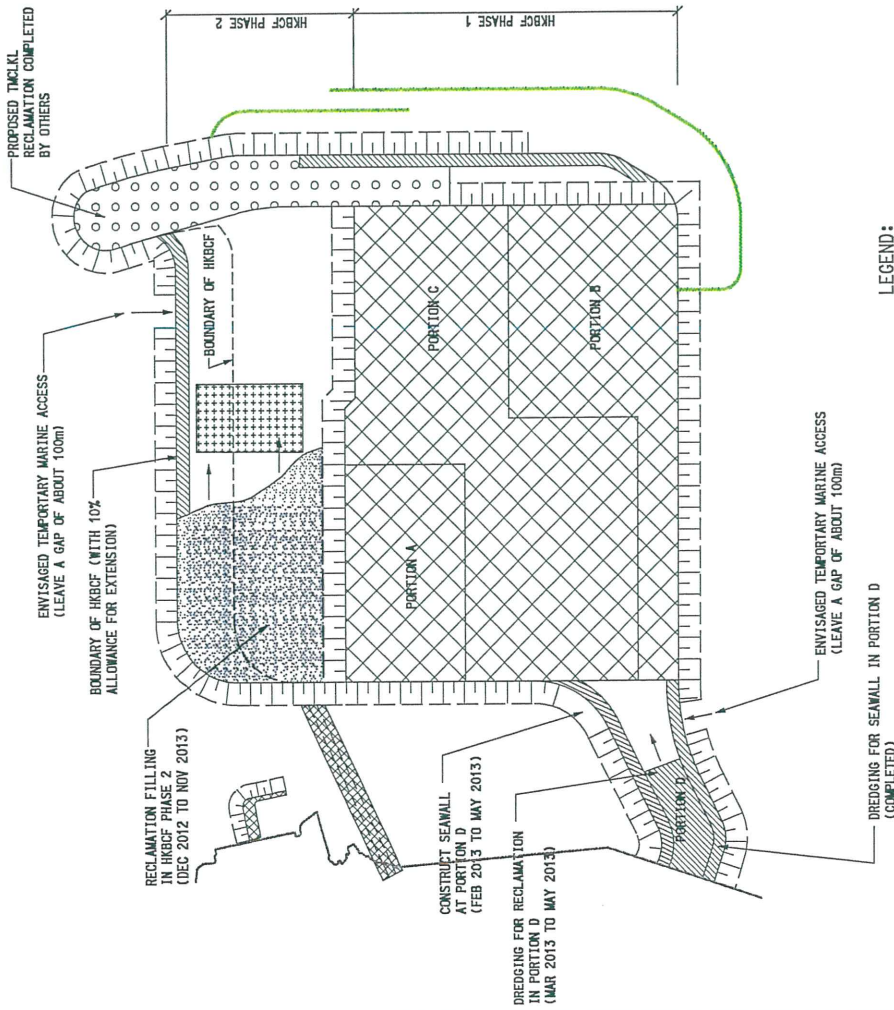
SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 5 (ON APR 2012)

STAGE 6 (ON DEC 2012)

 ARUP CONSULTANTS HONG KONG LIMITED	Agreement No. CB 14/2008 (CE) Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Investigation	Job Title ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE A)	Drawing No. 25308/041/303
	Job Title ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE A)	Drawing No. 25308/041/303	Status PRELIMINARY
29/7/2009 Printed by :	25308/MH/MC11/SK/ET/041/01/02/08/SC-11-303-093	Date 02/09	Date 02/09
29/7/2009 Printed by :	25308/MH/MC11/SK/ET/041/01/02/08/SC-11-303-093	Drawn CN	Approved AK
29/7/2009 Printed by :	25308/MH/MC11/SK/ET/041/01/02/08/SC-11-303-093	Checked SK	Scale 1:12500 on A3
29/7/2009 Printed by :	25308/MH/MC11/SK/ET/041/01/02/08/SC-11-303-093	Description A FIRST ISSUE	Rev. A





LEGEND:

- SINGLE SILT CURTAIN
- DREGED AREA
- COMPLETED SLOPING SEAWALL
- COMPLETE TMLKLL RECLAMATION BY OTHERS
- RECLAMATION WORKS COMPLETED
- RECLAMATION FILLING AREA
- RE-DEPOSITION OF DREGED MF SEDIMENT

NOTE:

- FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREGERS (SEE TYPICAL SECTION ATTACHED)
- SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 7 (ON APR 2013)

路政署
HIGHWAYS DEPARTMENT
 港務大橋香港工程署
 Hong Kong - Zhuhai - Macao Bridge
 Hong Kong Project Management Office

ARUP
 One Arup & Partners
 Hong Kong Limited

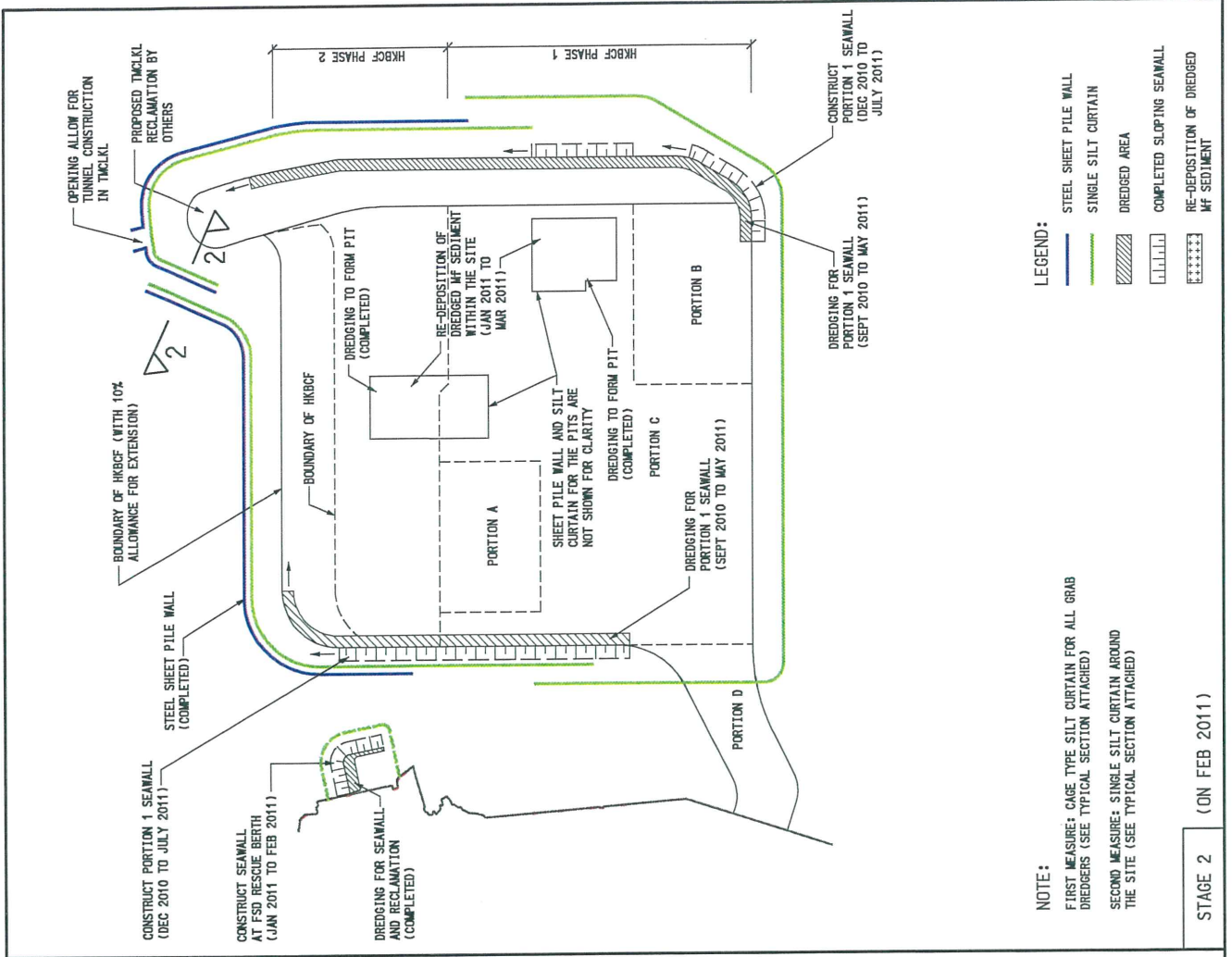
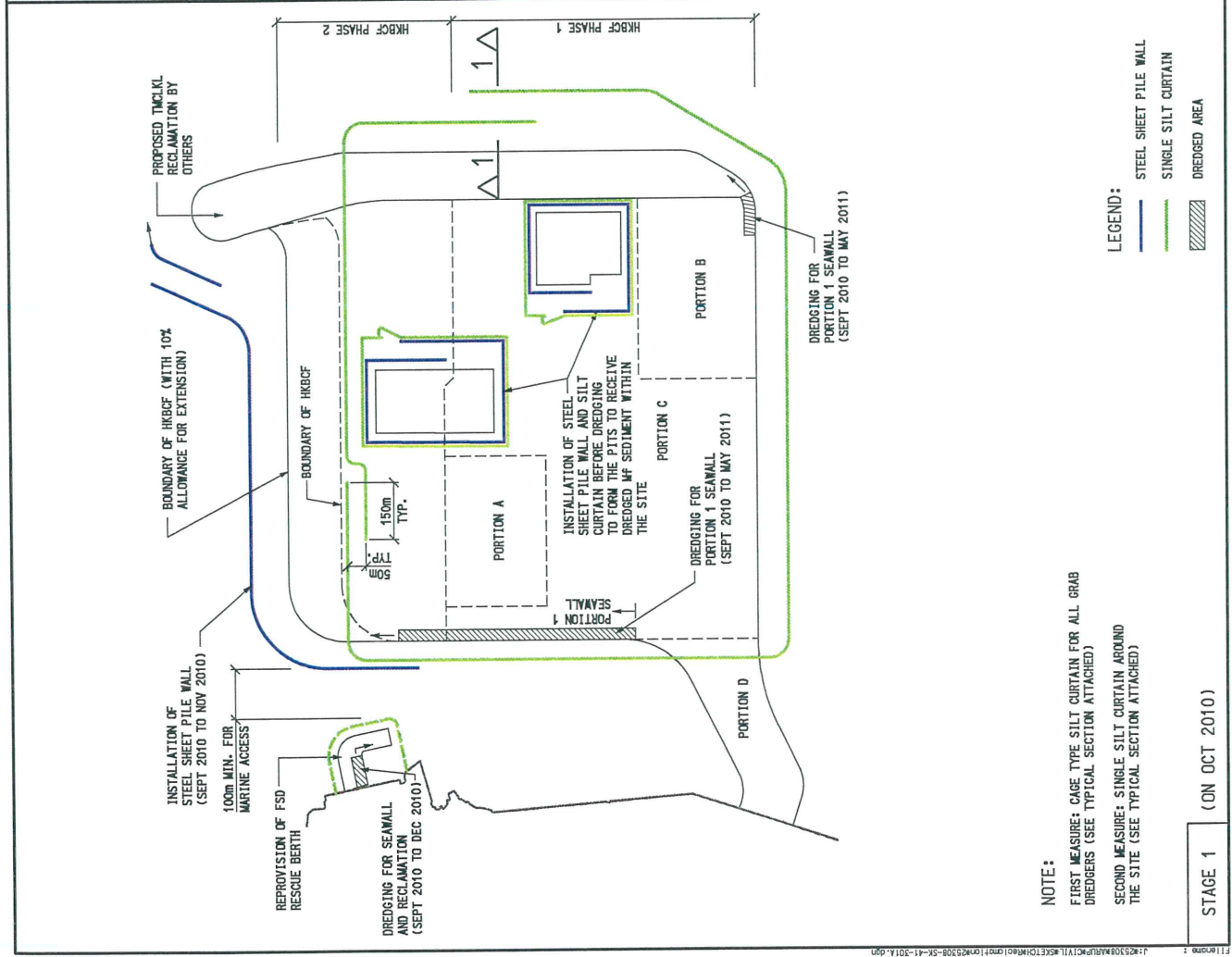
Job Title
Agreement No. CB 14/2008 (CB)
Hong Kong-Zhuhai-Macao Bridge Hong Kong
Boundary Crossing Facilities - Investigation

ANTICIPATED CONSTRUCTION
SEQUENCE OF HKBCF (SEQUENCE A)

Drawn	Checked	Scale	Date	Drawn	Checked	Scale	Date
			02/09	CN	SK	1:12500 on A3	02/09
			Approved		AK		02/09

Drawing No. 25308/041/304
 Status PRELIMINARY
 Rev. A





Rev.	Date	Description
A	02/03	FIRST ISSUE

Scale	1:12500 on A3
Checked	SK
Approved	AK
Date	02/09
Drawn	CH

Drawing No.	25308/041/301A
Status	PRELIMINARY
Rev.	A

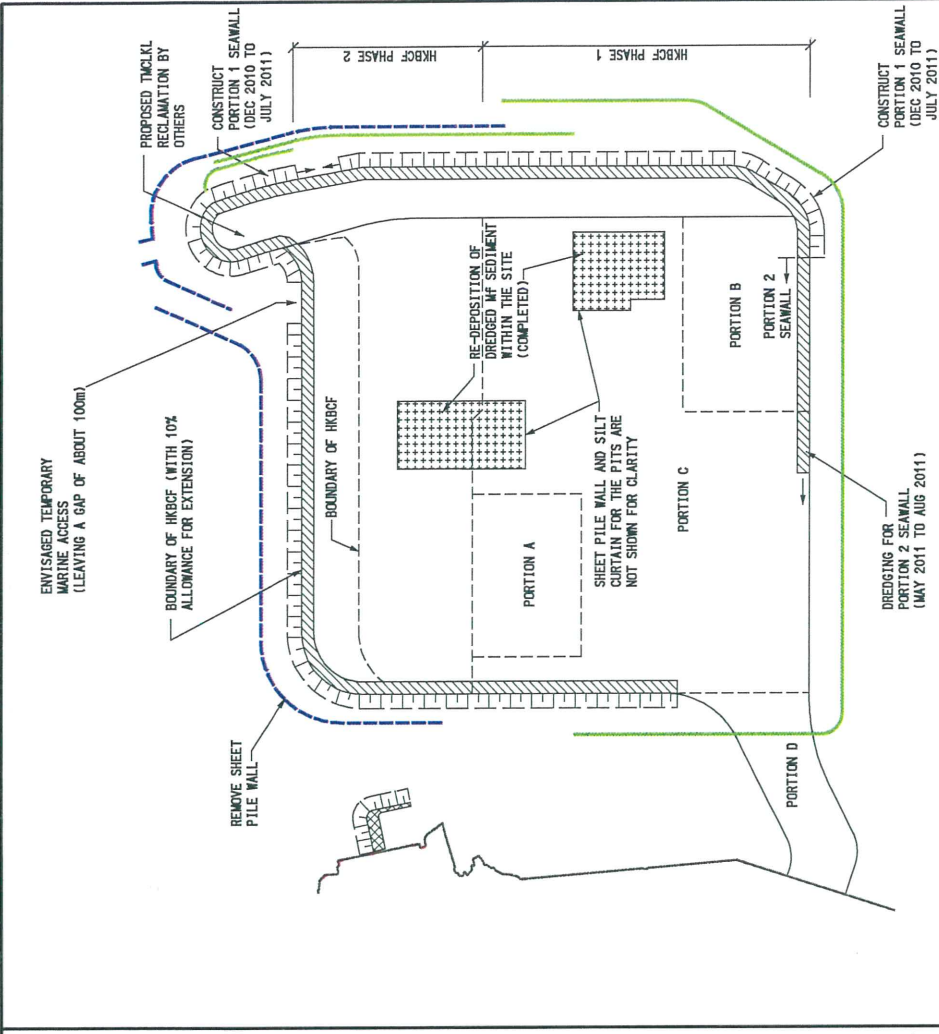
Job Title
 ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE B)

Job Title
 Agreement No. CE 14/2008 (CE)
 Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Investigation

ARUP
 The Asia & Pacific
 Hong Kong Limited

Highways Department
 港務局
 Hong Kong - Zhuhai - Macao Bridge
 Hong Kong Project Management Office





LEGEND:

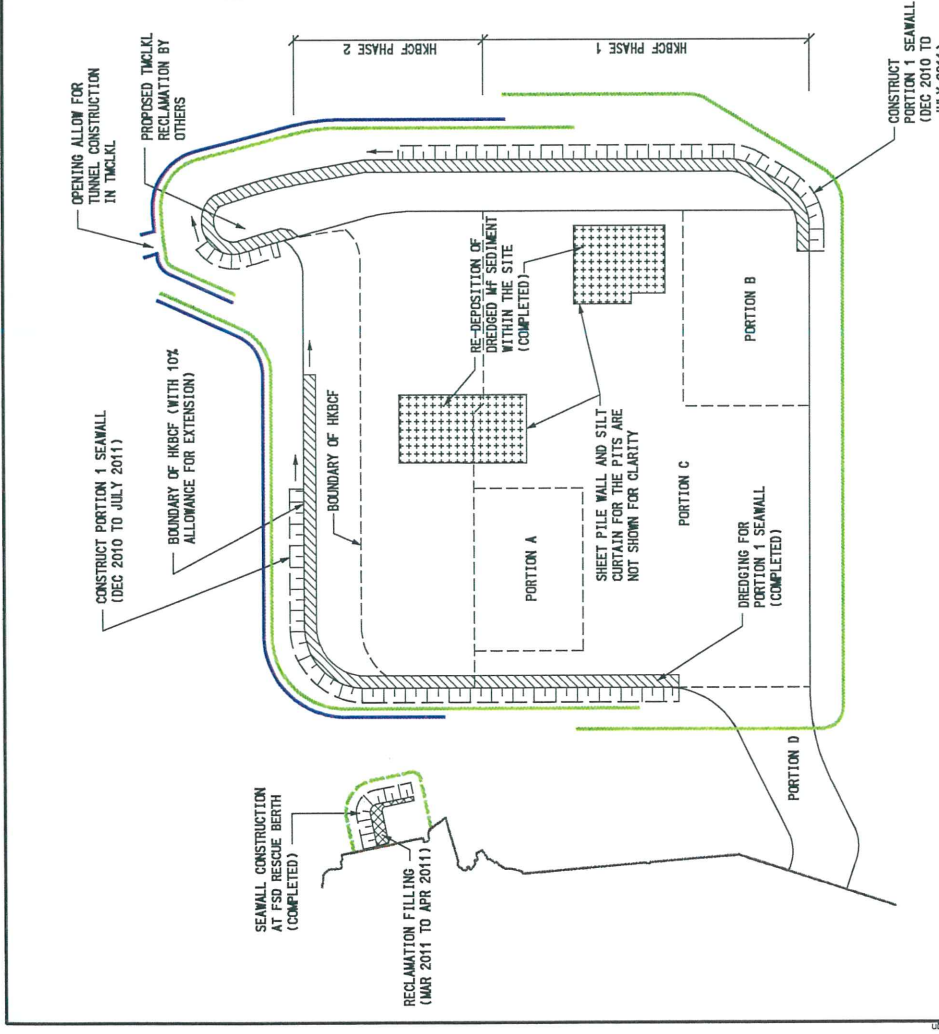
- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RE-DEPOSITION OF DREDGED MUD SEDIMENT
- RECLAMATION WORKS COMPLETED

NOTE:

FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 3 (ON APR 2011)



LEGEND:

- STEEL SHEET PILE WALL
- SINGLE SILT CURTAIN
- DREDGED AREA
- COMPLETED SLOPING SEAWALL
- RE-DEPOSITION OF DREDGED MUD SEDIMENT
- RECLAMATION WORKS COMPLETED

NOTE:

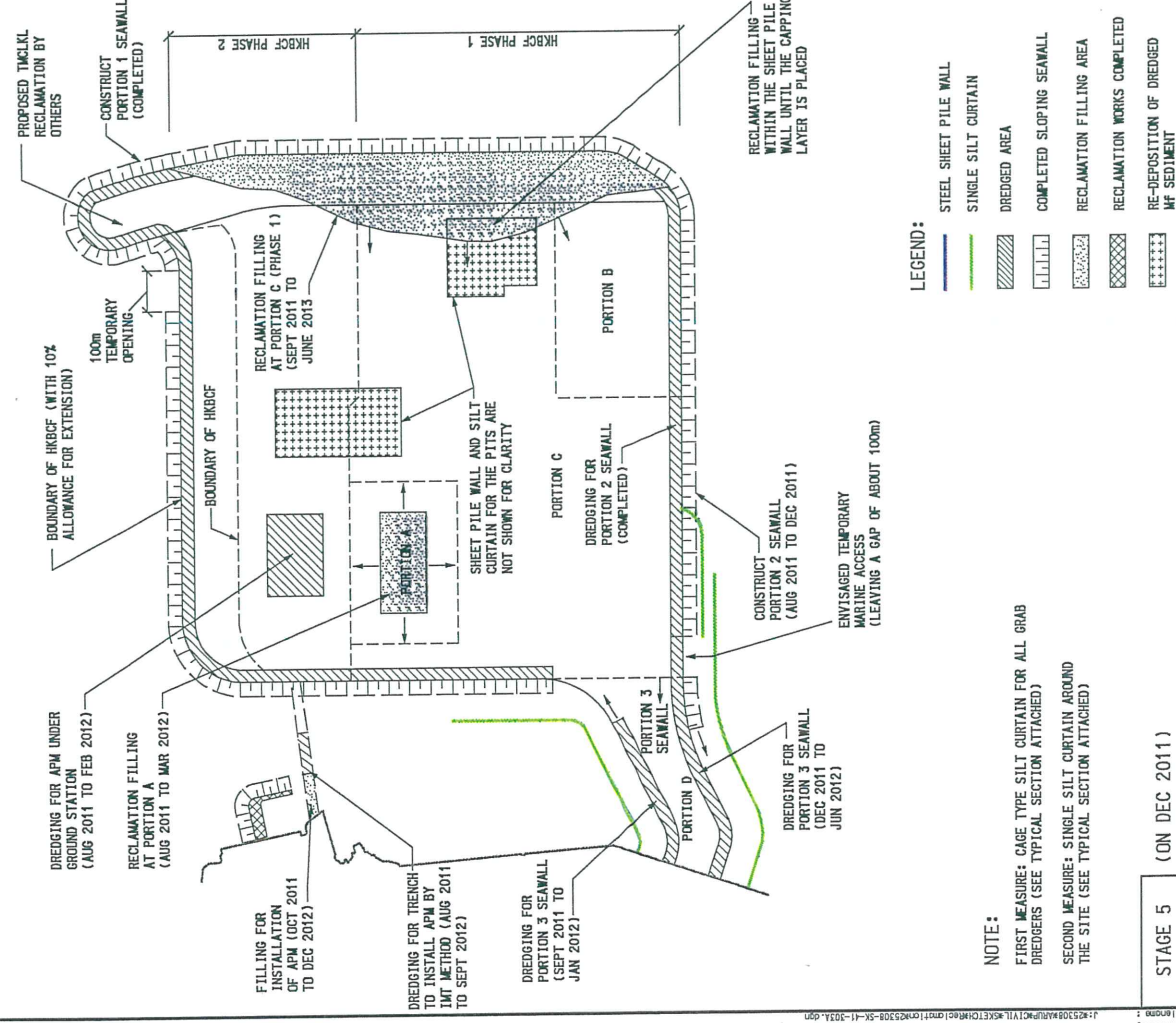
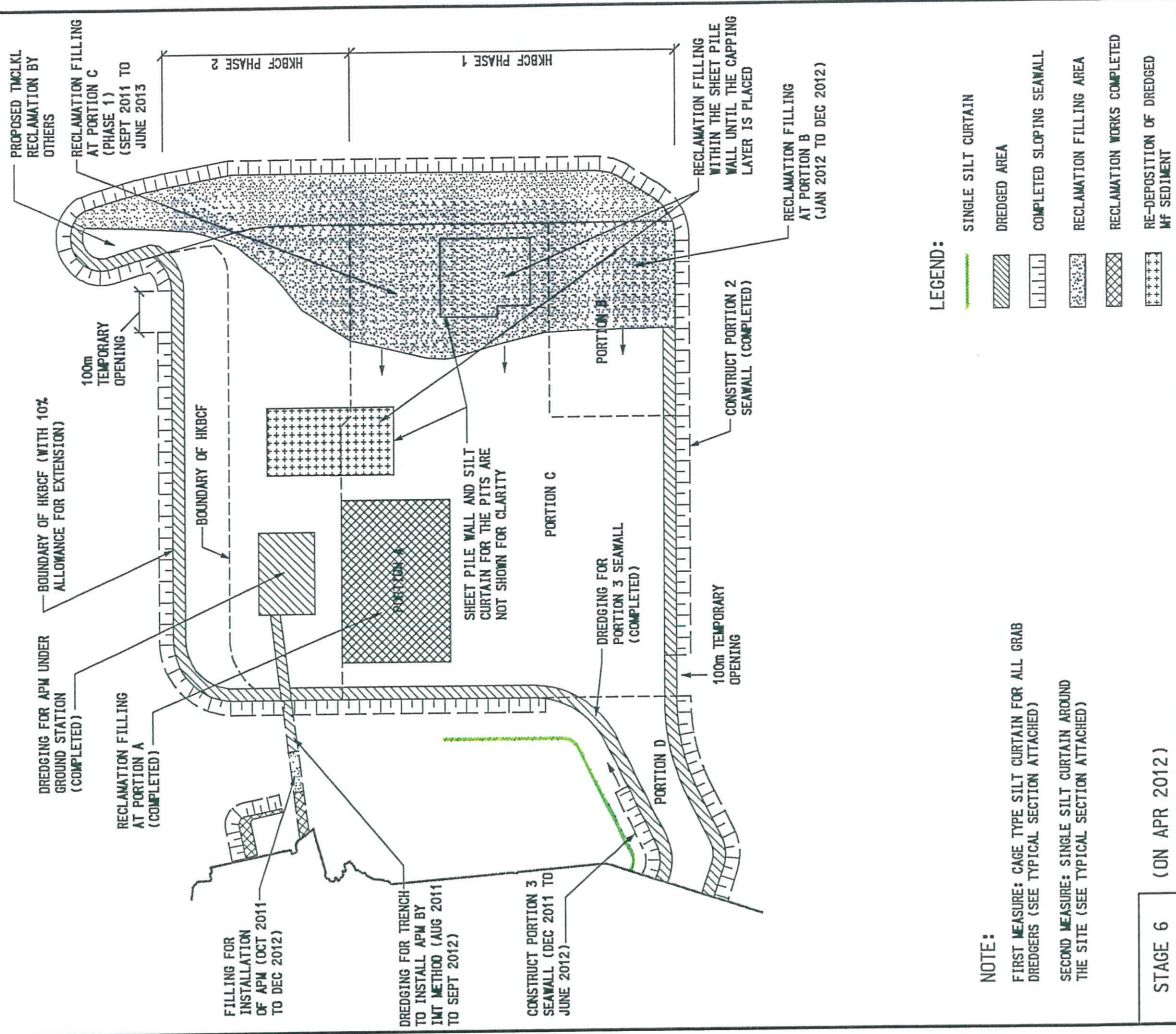
FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)

SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 4 (ON JUNE 2011)

 ARUP One Asia & Pacific Hong Kong Limited	Job Title Agreement No. CE 14/2008 (CE) Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Investigation	Drawing Title ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE B)	Drawn CN	Date 02/09	Drawing No. 25308/041/302A
			Checked SK	Approved AK	Scale 1:12500 on A3
Revisions A FIRST ISSUE 02/09	Description Description	Date 02/09	Scale 1:12500 on A3	Status PRELIMINARY	Rev. A





- LEGEND:**
- STEEL SHEET PILE WALL
 - SINGLE SILT CURTAIN
 - DREDGED AREA
 - COMPLETED SLOPING SEAWALL
 - RECLAMATION FILLING AREA
 - RECLAMATION WORKS COMPLETED
 - RE-DEPOSITION OF DREDGED MF SEDIMENT

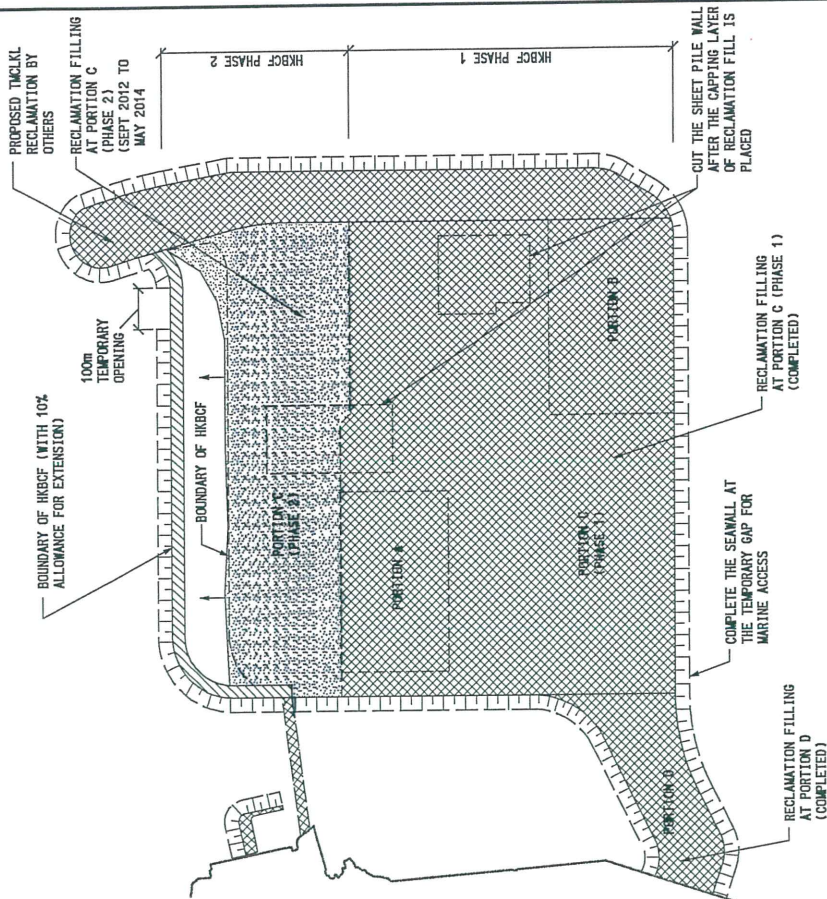
- NOTE:**
- FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)
 - SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

STAGE 5 (ON DEC 2011)

STAGE 6 (ON APR 2012)

	Agreement No. CE 14/2008 (CE) Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Investigation	Drawing Title ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE B)	Drawing No. 25308/041/303A
	Job Title Agreement No. CE 14/2008 (CE) Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Investigation	Description ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE B)	Date 02/09
ARUP 路政署 HIGHWAYS DEPARTMENT 港珠澳大橋香港工程管理處 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office	ARUP 奧雅工程 Hong Kong Limited Hong Kong Project Management Office	Checked SK	Scale 1:12500 on A3
25/7/2009	1:2500 on A3	Approved AK	Status PRELIMINARY

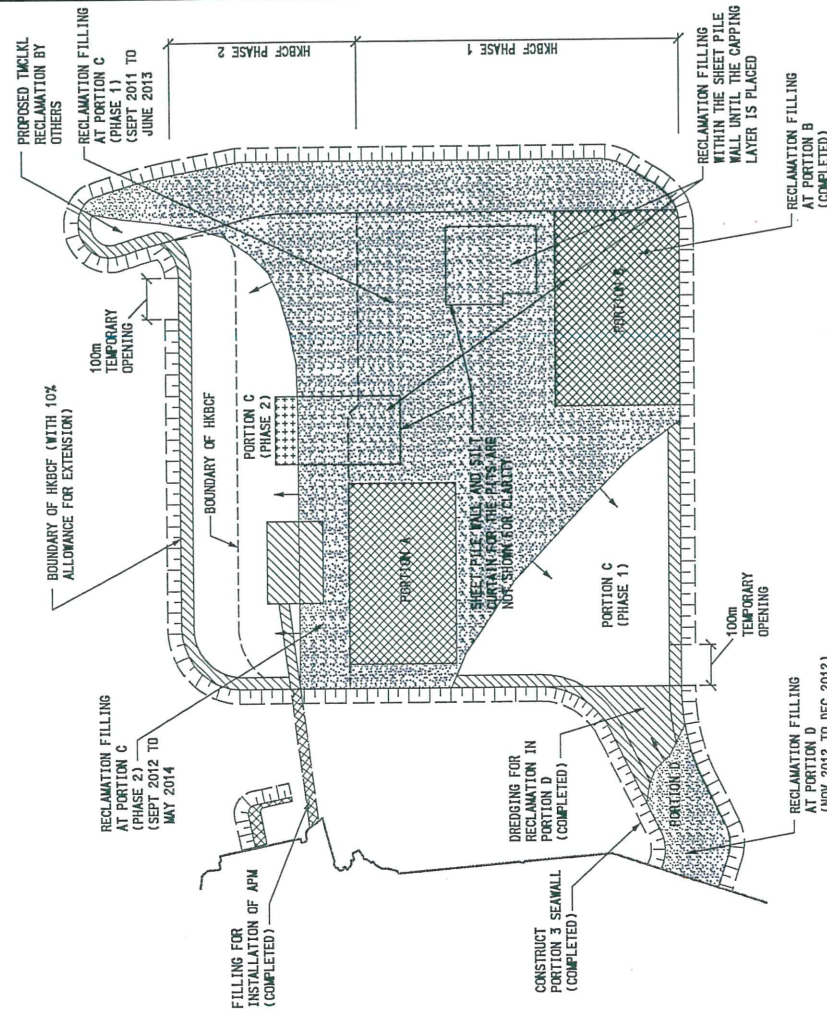




NOTE:
 FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)
 SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:
 [Hatched Box] DREDGED AREA
 [Vertical Lines Box] COMPLETED SLOPING SEAWALL
 [Cross-hatched Box] RECLAMATION FILLING AREA
 [Diagonal Lines Box] RECLAMATION WORKS COMPLETED
 [Dotted Box] RE-DEPOSITION OF DREDGED MF SEDIMENT

STAGE 7 (ON DEC 2012)



NOTE:
 FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS (SEE TYPICAL SECTION ATTACHED)
 SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (SEE TYPICAL SECTION ATTACHED)

LEGEND:
 [Hatched Box] DREDGED AREA
 [Vertical Lines Box] COMPLETED SLOPING SEAWALL
 [Cross-hatched Box] RECLAMATION FILLING AREA
 [Diagonal Lines Box] RECLAMATION WORKS COMPLETED
 [Dotted Box] RE-DEPOSITION OF DREDGED MF SEDIMENT

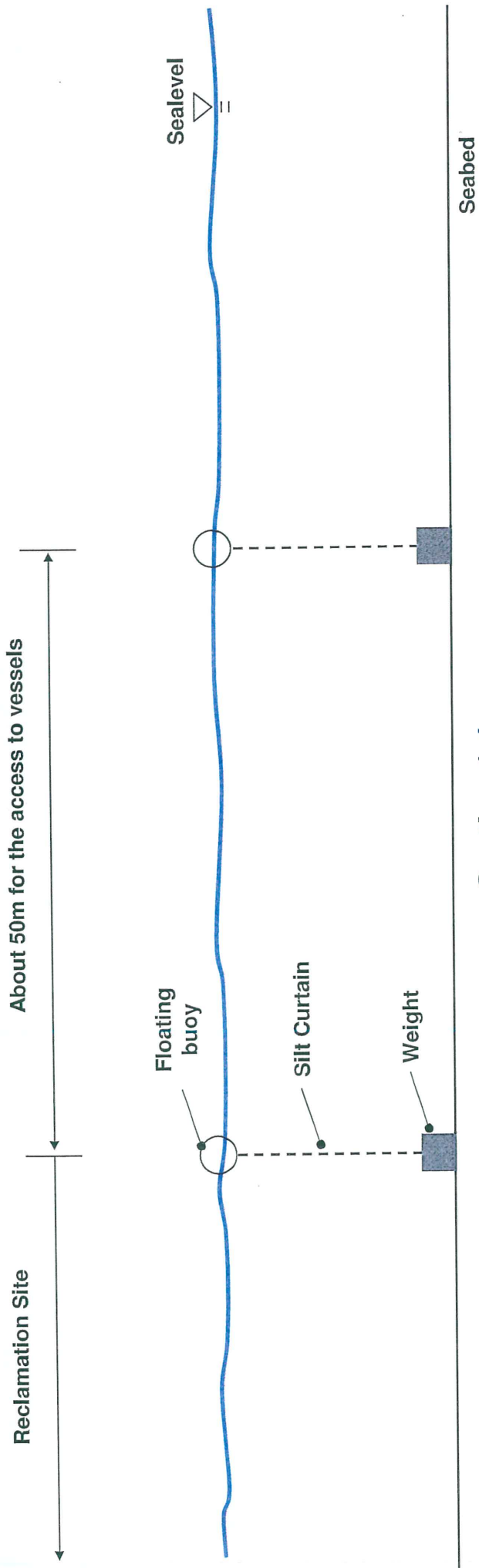
STAGE 8 (ON DEC 2013)

 ARUP One Arup & Partners Hong Kong Limited	HIGHWAYS DEPARTMENT 港務局 港務局工程管理部 Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office	Job Title Agreement No. CB 14/2008 (CE) Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Investigation	Drawing Title ANTICIPATED CONSTRUCTION SEQUENCE OF HKBCF (SEQUENCE B)	Drawing No. 25308/041/304A
		Date 02/09	Status PRELIMINARY	Rev. A
Checked SK	Approved AK	Date 02/09	Description A. FIRST ISSUE	Scale 1:12500 on A3
Drawn CN	Date 02/09	Status 1:12500 on A3	Description A. FIRST ISSUE	Scale 1:12500 on A3

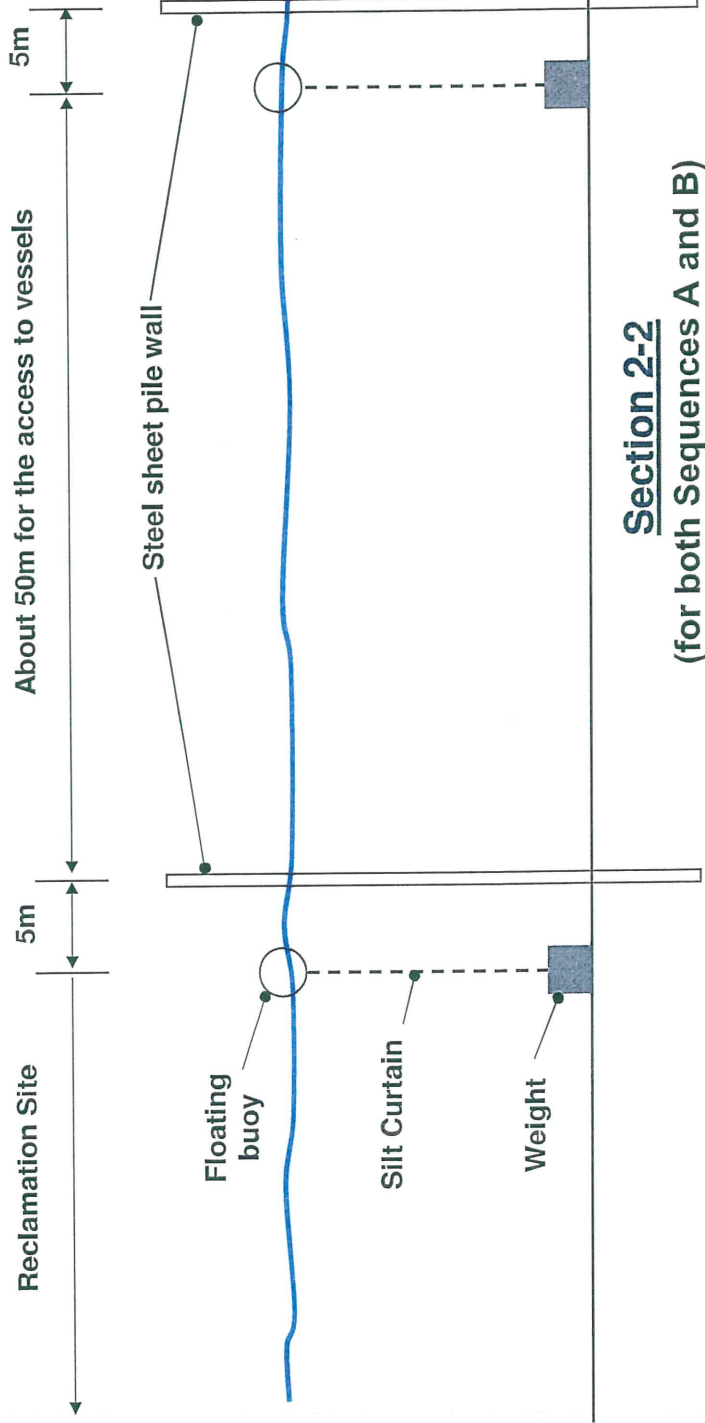


**Arrangement of Silt Curtain Systems
under Construction Sequence B**



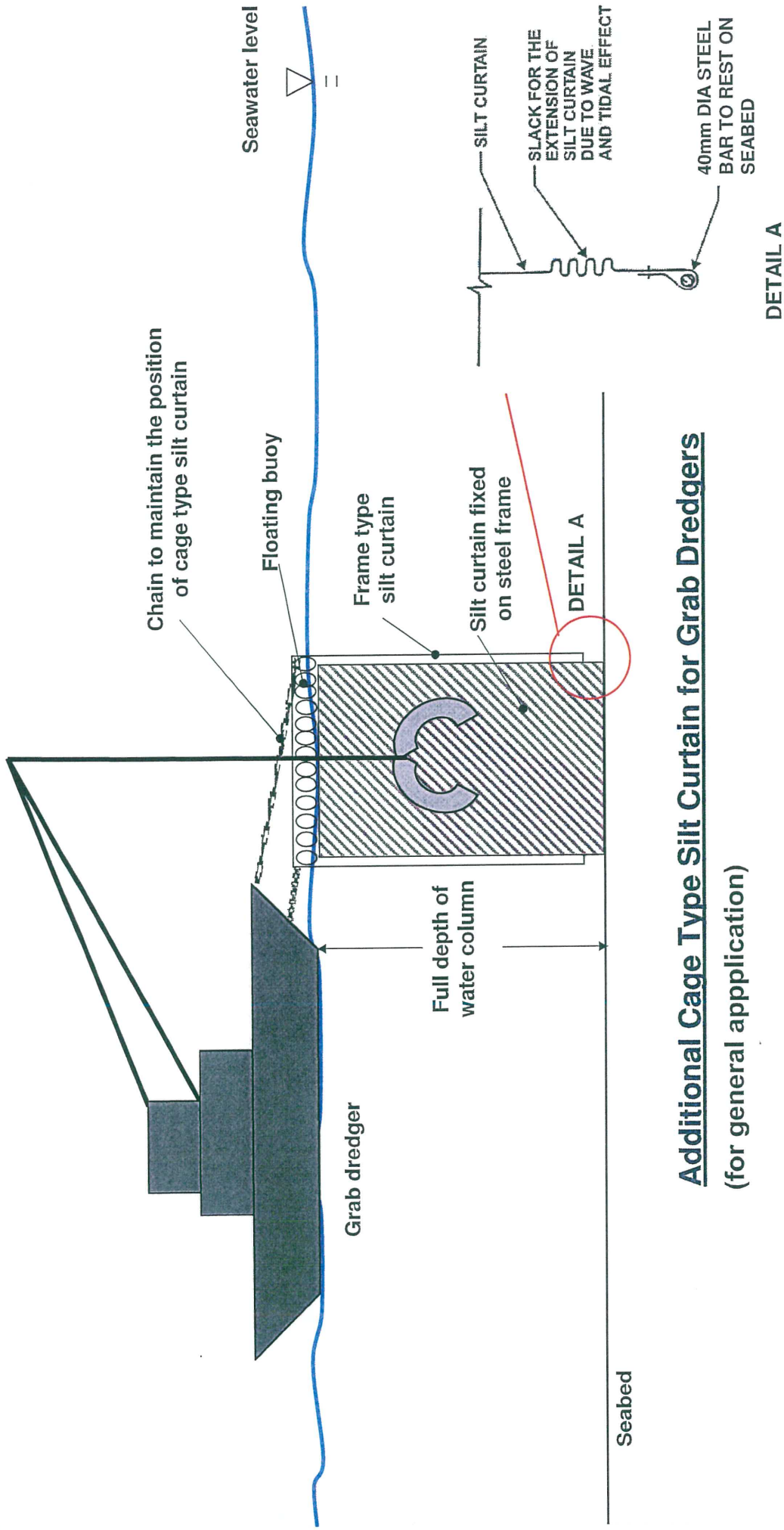


Section 1-1
(for both Sequences A and B)



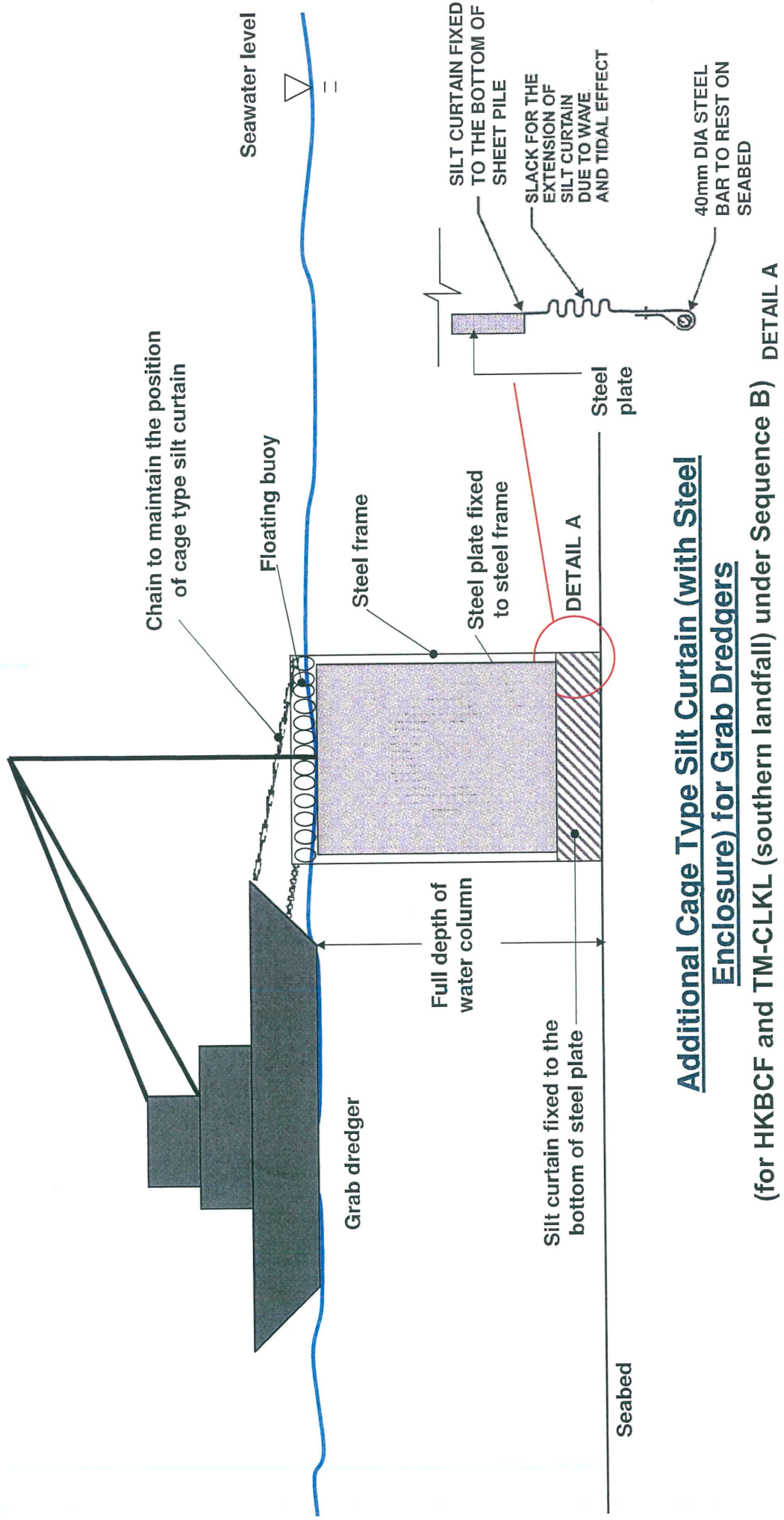
Section 2-2
(for both Sequences A and B)





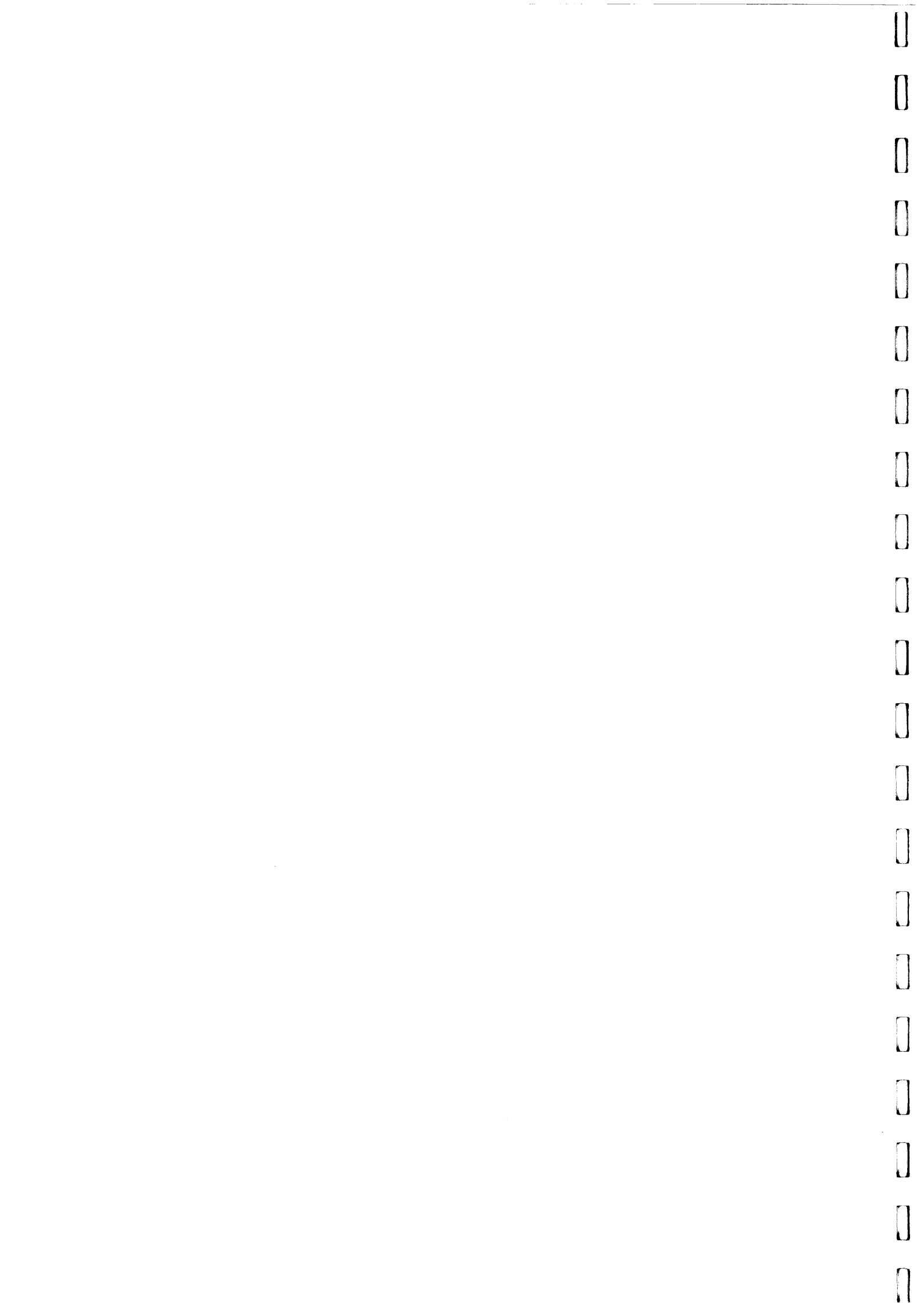
Additional Cage Type Silt Curtain for Grab Dredgers
 (for general application)





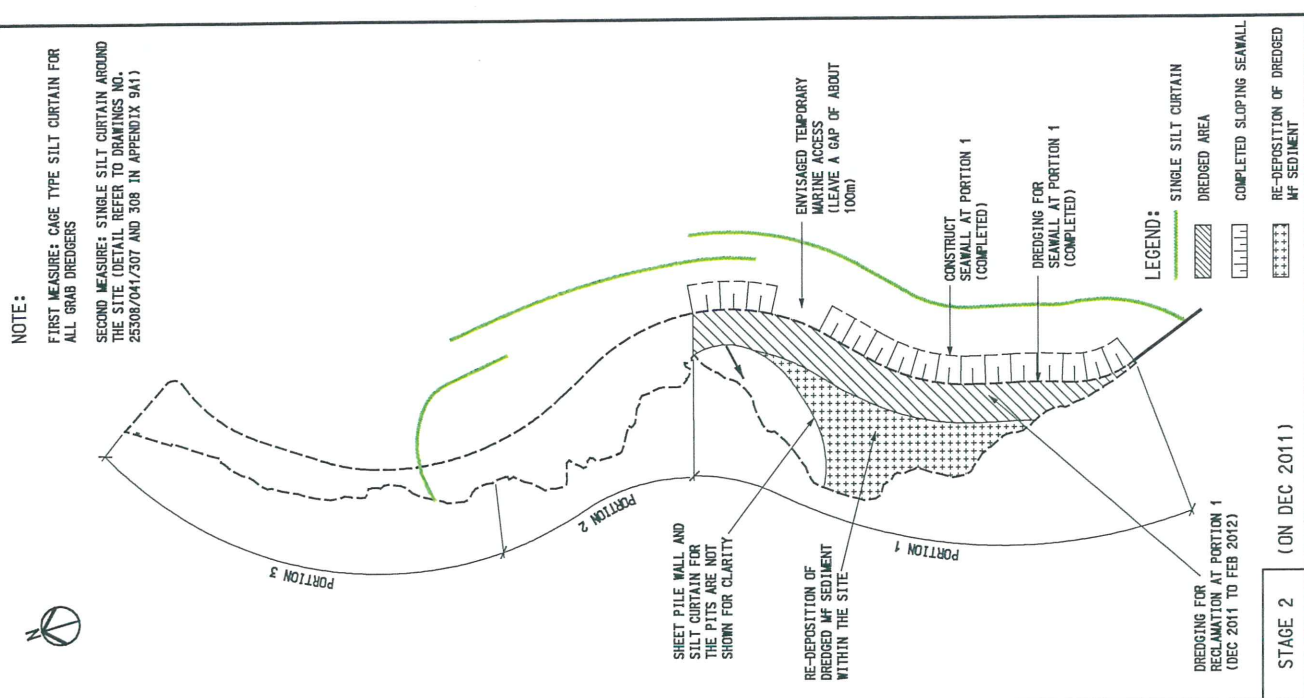
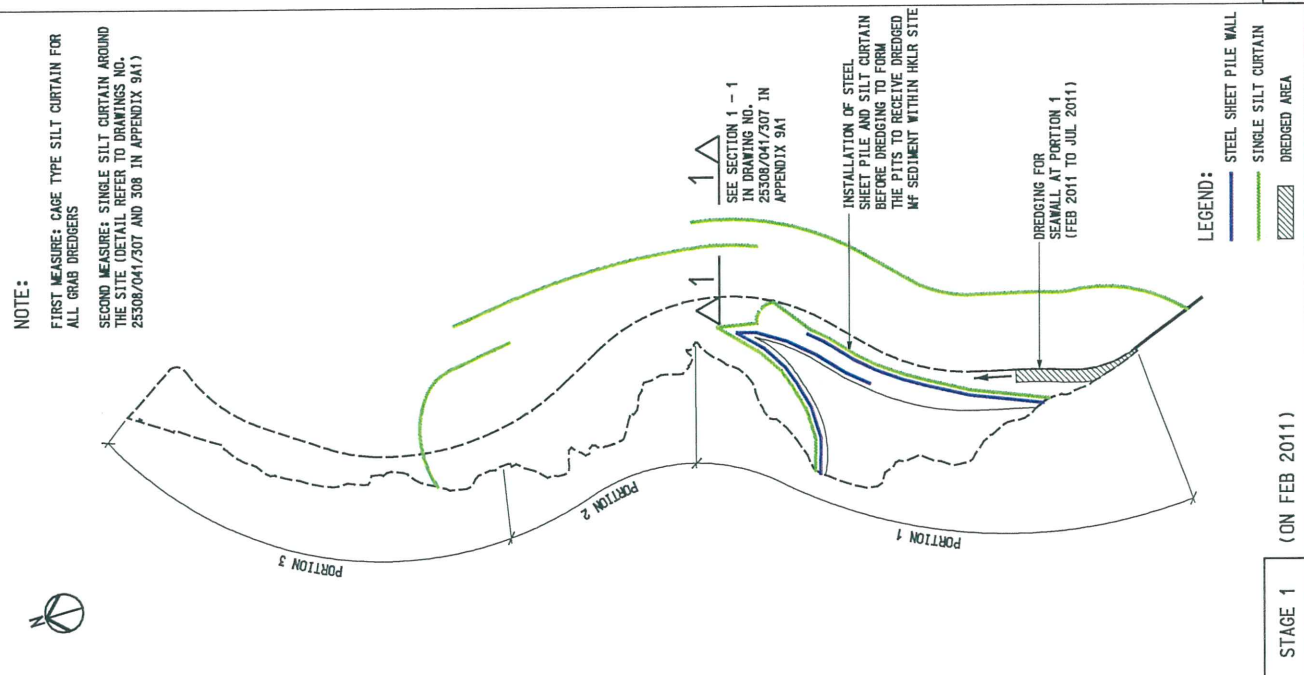
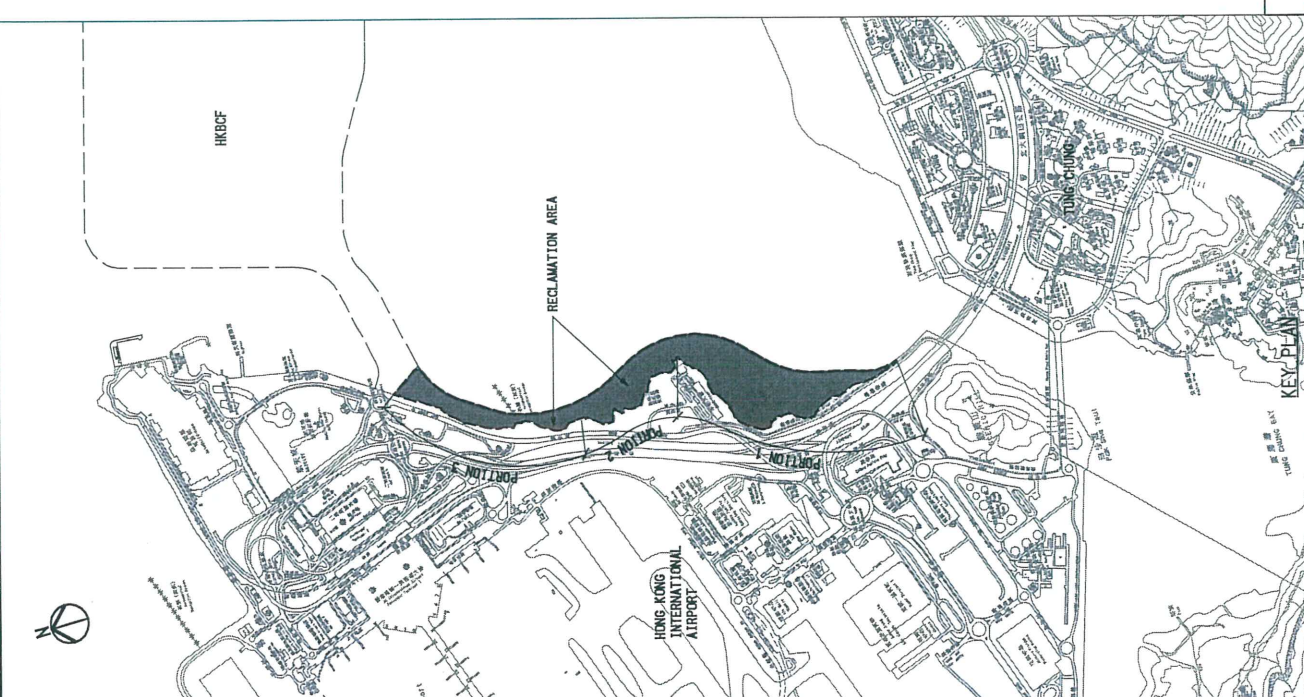
Additional Cage Type Silt Curtain (with Steel Enclosure) for Grab Dredgers

(for HKBCF and TM-CLKL (southern landfall) under Sequence B) DETAIL A



**Arrangement of Silt Curtain Systems
of
TM-CLKL Northern Landfall
And
HKLR Coastal Reclamation**





NOTE:
 FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS
 SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (DETAIL REFER TO DRAWINGS NO. 25308/041/307 AND 308 IN APPENDIX 9A1)

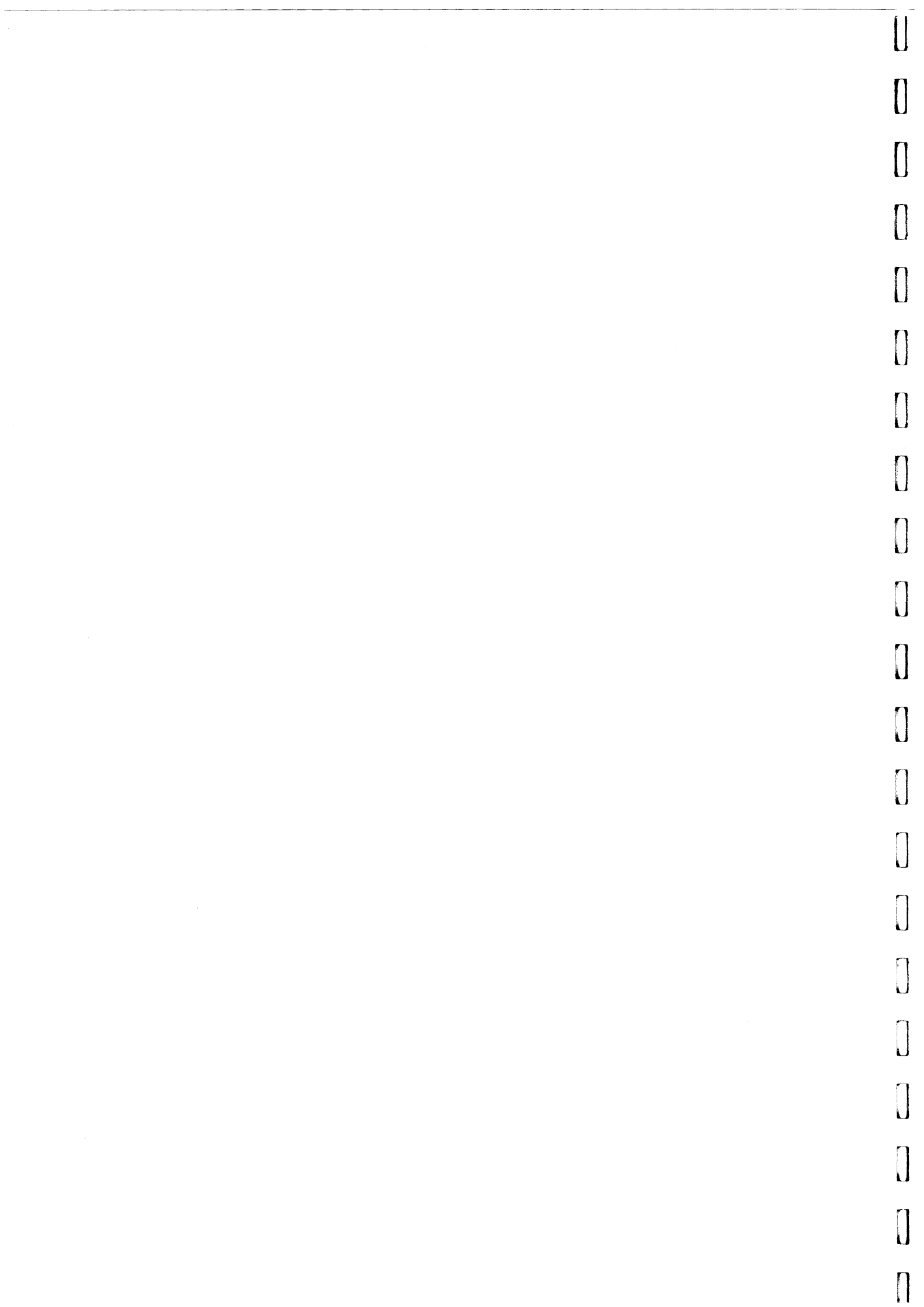
NOTE:
 FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS
 SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (DETAIL REFER TO DRAWINGS NO. 25308/041/307 AND 308 IN APPENDIX 9A1)

NOTE:
 FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS
 SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (DETAIL REFER TO DRAWINGS NO. 25308/041/307 AND 308 IN APPENDIX 9A1)

STAGE 1 (ON FEB 2011)

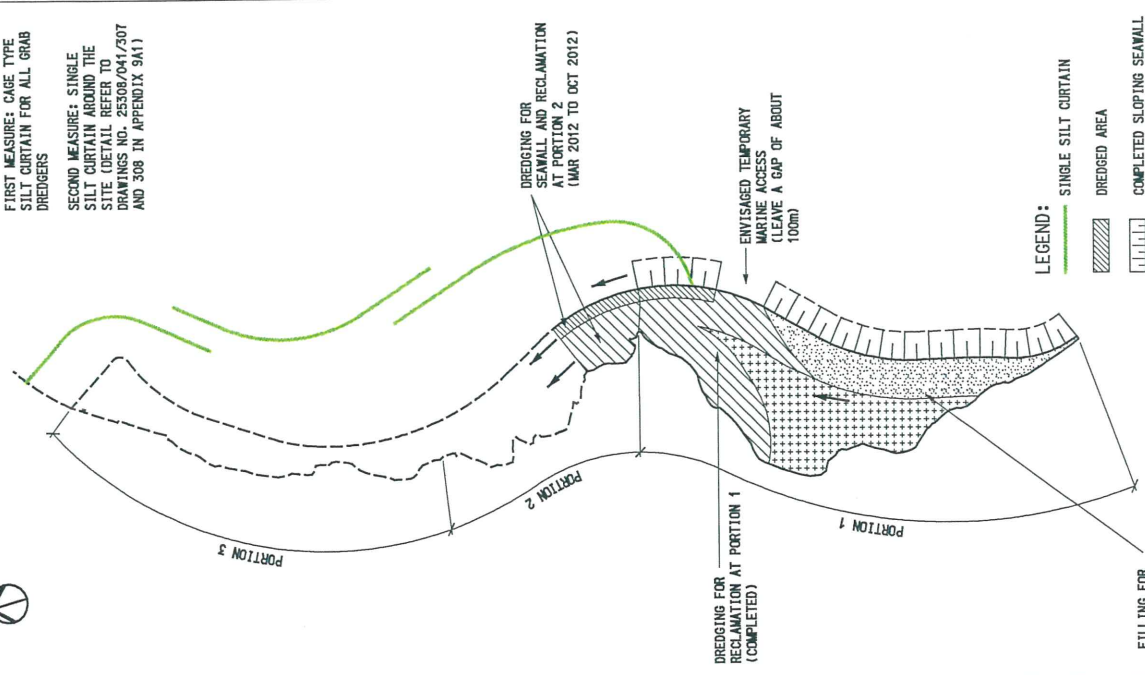
STAGE 2 (ON DEC 2011)

<p>ARUP One Arup & Partners Hong Kong Limited</p>	<p>Job Title Agreement No. CE 14/2008 (CE) Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Investigation</p>	<p>Drawing Title ANTICIPATED CONSTRUCTION SEQUENCE OF HKLR</p>	<p>Drawn: AL</p>	<p>Date: 02/09</p>	<p>Drawing No.: 25308/041/305</p>
			<p>Checked: SK</p>	<p>Approved: AK</p>	<p>Status: PRELIMINARY</p>
<p>Project Information</p>		<p>Scale: 1:10000 on A3</p>	<p>Date: 02/09</p>	<p>Description:</p>	<p>Sheet: A</p>





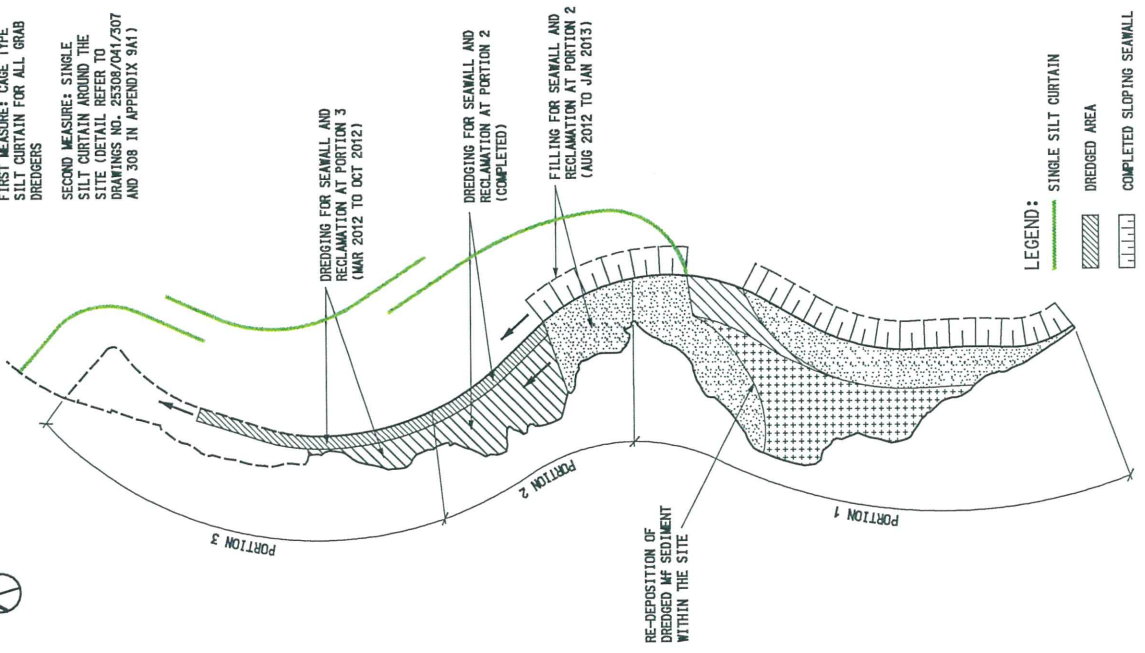
NOTE:
FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS
SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (DETAIL REFER TO DRAWINGS NO. 25308/041/307 AND 308 IN APPENDIX 9A1)



STAGE 3 (ON APR 2012)



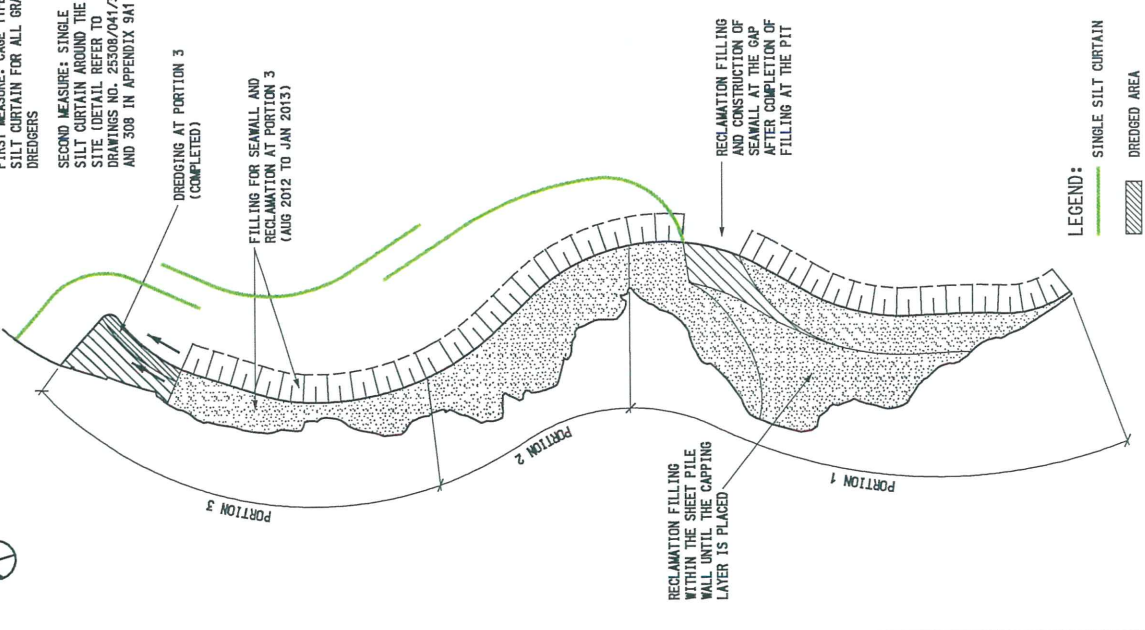
NOTE:
FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS
SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (DETAIL REFER TO DRAWINGS NO. 25308/041/307 AND 308 IN APPENDIX 9A1)



STAGE 4 (ON AUG 2012)



NOTE:
FIRST MEASURE: CAGE TYPE SILT CURTAIN FOR ALL GRAB DREDGERS
SECOND MEASURE: SINGLE SILT CURTAIN AROUND THE SITE (DETAIL REFER TO DRAWINGS NO. 25308/041/307 AND 308 IN APPENDIX 9A1)



STAGE 5 (ON DEC 2012)

 ARUP One Arup & Partners Hong Kong Limited	Job Title Agreement No. CE 14/2008 (CE) Hong Kong-Zhuhai-Macao Bridge Hong Kong Boundary Crossing Facilities - Investigation	Drawing Title ANTICIPATED CONSTRUCTION SEQUENCE OF HKLR	Drawing No. 25308/041/306
	Status PRELIMINARY	Rev. A	Date 02/09
Design AL	Checked SK	Approved AK	Scale 1:10000 on A3
Date 02/08	Description A. FIRST ISSUE	Issue 1	Date 02/08





AGREEMENT NO.: CE 52/2007(HY)
 TUEN MUN - CHEK LAP KOK LINK - INVESTIGATION

Anticipated Construction Sequence of TM-CLKL

DATE	APR. 2009
DRAWN	LCC
CHECK	
JOB NO.	25308/041/309
SCALE	A3 1:5000
CHECK	
JOB NO.	60044963
DATE	APR. 2009
DRAWN	LCC
CHECK	
JOB NO.	25308/041/309
SCALE	A3 1:5000
CHECK	
JOB NO.	60044963

SHEET 1 OF 1

MAUNSELL AECOM
 Maunsell Ombudsman Area Ltd

