KOWLOON SOUTHERN LINK
Contractor's Submission Form

Contract: KDB200 - West Kowloon Station and Tunnels, Jordan Road to East Tsim Sha Tsui Station

To: Engineer's Representative-Mr. Tom Keenan

For KCRC Internal Use Only
EDMS No. :

Title of Submission: Environmental Monitoring and Audit Manual

Submission Ref. No. KDB200/CSF/ENV/000742/A

Description of Contents: (for material submissions, include information of suppliers, brand, type, and location of application)

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From: Contractor's Representative
Name: Mr. Greg Jacques Signature:
Title: Project Director
Date: 18-Oct-2007

Link 200 Joint Venture
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EP Condition 2.6, General Specification G8.4 and G8.10

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RECEIPT DATE:

SUBJECT CODE:

NAME	ACTION	COMMENT	INFO

CON04-T1(KSL)
Prepared by: Chow, Kenneth
CSF Type:Construction/General
Outgoing Ref:17137

[ ] MMJV review :_____

Link 200 Joint Venture

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Link 200 Joint Venture

Environmental Monitoring & Audit Manual

Contract KDB200
West Kowloon Station and Tunnels, Jordan Road to East Tsim Sha Tsui Station

for

KCR Corporation

Prepared by: Environmental Engineer

Certified by: Environmental Team Leader

Approved by: Project Director

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1. Introduction

1.1 Project Background

The proposed Kowloon Southern Link project is classified as a designated project under Schedule 2 of the Environmental Impact Assessment Ordinance. In accordance with the requirements of Section 5(1) of the Environmental Impact Assessment Ordinance, a project profile (PP-160/2002) was submitted to Environmental Protection Department for the application of an Environmental Impact Assessment Study Brief on 21 January 2002. Pursuant to Section 5(7)(a) of the Environmental Impact Assessment Ordinance, the Environmental Protection Department issued to the Kowloon Canton Railway Corporation a study brief (reference: Environmental Impact Assessment Study Brief ESB-097/2002 dated March 2002) to carry out an Environmental Impact Assessment Study.

The proposed 3.8 kilometres underground railway will connect the new KCR Corporation East Tsim Sha Tsui Station to the current West Rail Nam Cheong Station, with its alignment running under Salisbury Road, Canton Road and West Kowloon Reclamation area (Figure 1-1). West Kowloon Station will be located at West Kowloon on the west side of Canton Road between Austin Road and Jordan Road. Neither reclamation nor dredging is anticipated for KSL.

There are two ventilation/plant building for the Kowloon Southern Link:

- Yau Ma Tei ventilation building located at Hoi Ting Road, and between Yau Ma Tei Interchange and Cherry Street, and

- Canton Road Plant Building at the junction of Kowloon Park Drive and Canton Road.

This manual is for Contract KDB200. The scope of the project will involve 1.9 kilometres underground railway connecting, the West Kowloon Station, the Canton Road Plant Building and an Emergency Egress Point (Figure 1-2).

1.2 Construction Programme

The construction work will commence in October 2005 and is scheduled to be completed by late 2009. Testing and commissioning of the railway system will then be conducted for target completion for operation in late 2009. All construction work will be undertaken during normal working hours from 07h00 to 19h00, except for the tunnel-boring-machine launching shaft and associated activities to the south of West Kowloon Station, which will operate for 24 hours subject to the approval of construction noise permit. The commencement of construction of the Tunnel Boring Machine (TBM) launching shaft is scheduled for October 2005. The commencement of dewatering of groundwater is scheduled in Mar 2006. The commencement of excavation of contaminated material/soil as part of the site clearance/preparation work is scheduled in October 2005. A master construction programme is given in Appendix 1-1.

1.3 Environmental Mitigation Implementation Schedule

Detailed environmental impact assessments have been discussed and presented in the Environmental Impact Assessment Report. All necessary mitigation measures have also been identified and recommended. The Environmental Mitigation Implementation Schedule is given in Appendix 1-2. It specifies the extent, locations, time frame and responsibilities for the implementation of the environmental mitigation measures identified.

2. Purpose of Manual

This manual outlines the monitoring and audit programme to be undertaken during the construction of Contract KDB200. It aims to provide systematic procedures for monitoring, auditing and minimizing environmental impacts associated with construction activities. The purpose of this manual is to:

– guide the set-up of an environmental monitoring and audit programme;

– ensure compliance with the recommendations stated in Environmental Impact Assessment and the associated Environmental Permits, and

– identify any need for additional mitigation measures or remedial action.

Relevant environmental regulations, Guidelines for Development Projects in Hong Kong, Environmental Monitoring and Audit, and recommendations in the KSL EIA report have been used to set up this Manual. This Manual contains the following:

– responsibilities of the Link 200 Joint Venture, the environmental manager, Engineer's Representative, independent environmental checker and environmental team with respect to the environmental monitoring and audit requirements during construction;

– information on project organization and programming of construction activities for the project;

– requirements with respect to the construction schedule and the necessary environmental monitoring and audit programme to track the varying environmental impacts;

– details of the monitoring methodologies, including all field works, laboratory analytical procedures, quality assurance and quality control;

– definition of action and limit levels;

– establishment of event and action plans;

– requirements for reviewing pollution sources and working procedures in the event of non-compliance of the environmental criteria and complaints;

– requirements for reviewing the effectiveness of the recommended mitigation measures;

– requirements of the Environmental Management Plan and other deliverables for the contractors, and

– requirements of presentation of environmental monitoring and audit data and appropriate reporting procedures.

For the purpose of this manual, the Engineer's Representative shall refer to the Engineer as defined in the Contract, in cases where the Engineer's powers have been delegated to

the Engineer's Representative, in accordance with the Contract. The environmental-team leader, who shall be responsible for and in charge of the environmental team, shall refer to the person proposed by the Link 200 Joint Venture for the role of executing the environmental monitoring and audit requirements.

3. Project Organization

An organization consisting of the environmental manager, independent environmental checker, Link 200 Joint Venture's environmental team, Engineer's Representative and the Link 200 Joint Venture shall be formed to take the responsibilities of the environmental protection matters. The project organization and lines of communication with respect to environmental protection works are shown in Appendix 3-1. The responsibilities of respective parties are detailed below.

3.1 Environmental Manager

The environmental manager shall be employed by the KCR Corporation and shall:

- supervise the environmental monitoring and audit programme, its members and the timely production and quality of outputs;
- provide guidance to the KCR Corporation personnel in their dealings with the Link 200 Joint Venture's environmental team;
- achieve the agreed objectives and deadlines, as set out in this manual,
- ensure the quality of deliverables, and
- provide and establish the Electronic Environmental Management System (EEMS) to handle environmental data and information.

3.2 Independent Environmental Checker

An independent environmental checker shall be appointed by the KCR Corporation to audit and verify the overall environmental performance of Contract KDB200 and to assess the effectiveness of the environmental team in its duties. The main duties of the independent environmental checker are to:

- review and comment on the Link 200 Joint Venture's environmental submissions as per the Environmental Permit;
- arrange and conduct monthly site inspections at the different works area along the KDB200 alignment;
- review the programme of work to anticipate any potential environmental impacts that may arise;
- ensure the impact monitoring is conducted at the correct locations at the correct frequency, as identified in this manual;
- check the mitigation measures that have been recommended in the Environmental Impact Assessment and this manual, and ensure they are properly implemented in a timely manner, when necessary,
- report the findings of site inspections and other environmental performance

reviews to the environmental manager and the Environmental Protection Department,

– Verify EM&A report that has been certified by the ET leader,

– Feedback audit results to ET/Permit Holder according to Event/Action Plan in the EM&A manual, and

– provide input into the Electronic Environmental Management System (EEMS) established by KCRC.

3.3 Contractor's Project Environmental Manager

The roles of the Link 200 Joint Venture's project environmental manager are to:

– Authority:
  - the project environmental manager has the specific authority to implement and maintaining the approved Environmental Management Plan and other documents submitted under the EP with the assistance from the quality manager.

– Accountability:
  - the project environmental manager is directly accountable to the quality manager and project director for the implementation and maintenance of the Environmental Management Plan and for overseeing the monitoring of environmental performance.

– Responsibilities:
  - initiating and coordinating the initial planning, documentation and maintenance of the Environmental Management Plan and maintaining and updating that plan during the project;
  - making sure that all environmental requirements are communicated to Link 200 Joint Venture staff, subcontractors and the workforce;
  - liaising with the environmental team to make sure that the environmental monitoring and audit programme is implemented;
  - liaising with the KCR Corporation's site supervision staff, environmental staff and representatives of the Environmental Protection Department on environment-related issues;
  - making sure that procedures set out in the Environmental Management Plan are fully implemented;
  - providing or arranging technical support and assistance to Link 200 Joint Venture project staff relating to environmental issues;
  - monitoring licence and permit applications and their issue to make sure that they are prepared and received in a timely manner to prevent delays to the works;
  - monitoring of the environmental system on a day-to-day basis to make sure that the requirements of the Environment Management Plan are operational and effective;
  - monitoring environmental performance in accordance with the Environmental Management Plan;

- collating environmental performance data and assessing performance against environmental objectives and targets;
- preparing periodic environmental performance reports, and
- making sure that training programmes are implemented.

3.4 Environmental Team Leader

The project environmental manager shall act as the environmental team leader for the project. The duties of the Link 200 Joint Venture's environmental team leader are:

– carrying out duties as stipulated in the Further Environmental Permit;

– set up all the required environmental monitoring stations;

– monitor various environmental parameters for baseline and impact monitoring, as required by this manual;

– investigate and audit the Link 200 Joint Venture's equipment and work methodologies with respect to pollution control and environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises;

– audit and prepare audit reports on the environmental monitoring data and the site environmental conditions;

– report the environmental monitoring and audit results to the Link 200 Joint Venture and the Engineer's Representative;

– formulate and undertake regular on-site audits/inspections and report to the Link 200 Joint Venture and the Engineer's Representative any potential non-compliance,

– follow up and close out non-compliance actions,

– investigating results of complaint cases and the effectiveness of corrective measures, and

– provide input into the Electronic Environmental Management System (EEMS) established by KCRC.

3.5 Environmental Engineer / Assistant Engineer (Environmental)

The duties of the environmental engineer / assistant engineer (environmental) are:

- co-ordinate and oversee the environmental monitoring and audit programme for various environmental parameters, such as baseline and impact monitoring, as required;

- co-ordinate and oversee the setting up and maintenance of all the required

environmental monitoring stations;

- investigate and audit the Link 200 Joint Venture's equipment and work methodologies with respect to pollution control and environmental mitigation, and to anticipate environmental issues that may require mitigation before the problem arises;

- audit and review reports on the environmental monitoring data and the site environmental conditions;

- report the environmental monitoring and audit results to the ETL and project environmental manager;

- assists the ETL and project environmental manager in the implementation of the Environmental Management Plan, EM&A Manual and Waste Management Plan;

- monitors and controls the works, including those of subcontractors, to ensure compliance with contractual and statutory requirements;

- reports any non-compliance to the ETL and project environmental manager and recommends remedial action;

- assists the ETL and project environmental manager in his preparation of weekly environmental inspection checklist, and monthly environmental reports;

- assist ETL to investigate and report complaints;

- make sure that remedial actions or mitigation measures are carried out as planned; and

- provide input into the Electronic Environmental Management System (EEMS) established by KCRC.

3.6 Environmental Monitoring Technicians

The duties of environmental monitoring technicians are to:

- set up and maintain all the required environmental monitoring stations;

- monitor various environmental parameters for baseline and impact monitoring, as required;

- prepare reports on the environmental monitoring and audit results;

- report the environmental monitoring and audit results to the EPE, the ETL and project environmental manager;

- investigates and verifies exceedances from impact monitoring and reports

to the EPE, the ETL and project environmental manager; and

- provide input into the Electronic Environmental Management System (EEMS) established by KCRC.

3.7 Engineer's Representative

The Engineer's Representative shall:

– monitor the Link 200 Joint Venture's compliance with the Contract Specifications, including the effective implementation and operation of the environmental mitigation measures;

– instruct the Link 200 Joint Venture to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints,

– comply with the agreed Event Contingency Plan in the event of any Exceedance, and

– provide input into the Electronic Environmental Management System (EEMS) established by KCRC.

3.8 Contractor

The Link 200 Joint Venture shall:

– employ an environmental team to undertake monitoring, auditing, laboratory analysis and reporting of the environmental monitoring and audit;

– work within the scope of the construction Contract and other tender conditions with respect to environmental requirements;

– cooperate with the environmental performance review undertaken by the KCR Corporation and the Engineer's Representative and undertake any corrective actions as instructed by the Engineer's Representative;

– operate and strictly adhere to the guidelines of the Environmental Management Plan developed by its project staff,

– procure, implement and maintain a Continuous Noise Monitoring System throughout the construction period, and

– investigating results of complaint cases and the effectiveness of corrective measures, and

– provide input into the Electronic Environmental Management System (EEMS) established by KCRC.

3.9 Geotechnical Engineer/Decontamination Specialist

The Geotechnical Engineer/Decontamination Specialist shall supervise the

land/soil remediation programme for the excavation and removal of the contaminated material/soil. All relevant method statements prepared by the remediation contractor shall be reviewed and approved by the Geotechnical Engineer/Decontamination Specialist before proceeding with the works.

4. Environmental Submission

The Link 200 Joint Venture shall prepare the Environmental Management Plan, Construction Method Statement, Waste Management Plan and obtain approval from the Engineer's Representative and the Environmental Protection Department to encompass the recommended environmental protection/mitigation measures with respect to the latest construction methodology and programme.

4.1 Environmental Management Plan

A systematic Environmental Management Plan shall be set up by the Link 200 Joint Venture to ensure effective implementation of the mitigation measures, monitoring and remedial requirements presented in the Environmental Impact Assessment, Environmental Monitoring & Audit, and Environmental Mitigation Implementation Schedule. The KCR Corporation and the independent environmental checker will audit the implementation status against the Environmental Management Plan and advise the necessary remedial actions required. Those remedial actions shall be enforced by the Engineer's Representative through the Contract.

The Environmental Management Plan will require the Link 200 Joint Venture (together with its subcontractors) to define in details how to implement the recommended mitigation measures in order to achieve the environmental performance defined in the Hong Kong environmental legislation and the Environmental Impact Assessment documentation.

The review of on-site environmental performance shall be undertaken by the KCR Corporation and independent environmental checker through a systematic checklist and audit once construction starts. The environmental performance review programme comprises a regular assessment on the effectiveness of the Environmental Management Plan.

4.2 Construction Method Statement

In case the Link 200 Joint Venture would like to adopt a different construction method or implementation schedule, it is required to submit details of methodology and equipment to the Engineer's Representative for approval before starting the work. Any changes in construction method shall be reflected in a revised Environmental Management Plan or the Link 200 Joint Venture will be required to demonstrate the manner in which the existing Environmental Management Plan should accommodate the proposed changes. The Link 200 Joint Venture shall apply for a Further Environmental Permit from the Environmental Protection Department in accordance with the Contract.

4.3 Waste Management Plan

The Link 200 Joint Venture shall prepare a Waste Management Plan, in accordance with the EP 215/2005/B condition 2.7, for the construction of the project and submit it to the Engineer's Representative and the Environmental Protection Department for approval. When waste generation is unavoidable, the opportunities for recycling or re-using should be maximized. If waste cannot be

recycled, recommendations for appropriate disposal routes should be provided in the Waste Management Plan. A method statement for stockpiling and transporting excavated material and other construction waste shall be prepared and approved before starting construction. All mitigation measures arising from the approved Waste Management Plan shall be fully implemented.

For the purpose of enhancing the management of construction and demolition material, including rock, and minimizing its generation at source, construction shall be undertaken in accordance with the Environment, Transport and Works Bureau's Technical Circular (Works) 33/2002 - Management of Construction and Demolition Material Including Rock, or its latest versions. The management measures stipulated in that Technical Circular should be incorporated in the Waste Management Plan.

4.4 Detailed Drawing(s) and Explanatory Statements of All Noise, Dust and Visual Impact Mitigation Measures for the TBM Launching Shaft and Spoil Conveyor System

The Joint Venture shall prepare five sets of detailed drawings and explanatory statements of all noise, dust and visual impact mitigation measures for the Tunnel Boring Machine (TBM) launching shaft and spoil conveyor system for approval one month prior to the commencement of construction of the TBM launching shaft and related spoil conveyor system.

The mitigation measures shall include noise enclosures, fabric filter systems for the conveyor system, conveyor transfer points, hopper discharge areas and fixed transfer point. The detailed drawings shall be certified by the ET Leader and verified by the IEC as conforming to the information and recommendations contained in the approved EIA report.

4.5 Web Camera System

The Joint Venture shall propose a plan and a system of web cameras for the KCR Corporation to obtain the Director's agreement within one month of the commencement of construction of the Project. The web camera(s) shall be designed to provide sufficient locations/views covering the whole alignment of the LINK 200 Project.

4.6 Groundwater Monitoring Plan

A working plan of groundwater monitoring shall be prepared and submitted by the Joint Venture for ensuring the groundwater quality will not be adversely affected if there will be any recharging operation. The working plan shall include the number of recharge wells and their specific locations, the baseline parameters of the recharge and monitoring locations, number of treatment facilities and their treatment capacities shall be submitted one month prior to the dewatering process.

4.7 Detailed Landscape Drawing(s)

The LINK 200 Joint Venture shall, within six months after the commencement of construction of the Project, prepare five sets of detailed landscape drawing(s)/design drawing(s) for the KCR Corporation to submit to the Director for approval. The drawing(s) shall conform with the recommendations in the EIA report.

4.8 As-built Drawing(s) for Tunnelling Works underneath the Former Marine Police Headquarters

Five sets of as-built drawing(s) shall be submitted within 1 month after the completion of the tunnelling works underneath the Former Marine Police Headquarters (FMPHQ) to confirm the vertical separation of 6-16m between the tunnels and the heritage elements in the FMPHQ compound is maintained.

There shall be no physical contact with the Old Fire Station Buildings (OFSB) during construction. For the tunnel section underneath FMPHQ, a clear separation of about 6m between the tunnels and the OFSB, and 16m from the FMPHQ Main Building shall be maintained. The as-built drawing(s) shall be certified by the ET Leader and verified by the IEC.

5. Environmental Monitoring

5.1 Air Quality

5.1.1 Monitoring Parameters

Monitoring and audit of the total suspended particulate levels shall be carried out by the environmental team to ensure that any deteriorating air quality could be readily detected and timely actions taken to rectify the situation.

1-hour and 24-hour total suspended particulates levels shall be measured to indicate the impacts of construction dust. The total suspended particulates levels shall be measured using the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, USA, Chapter 1 (Part 50), Appendix B. On approval by the Engineer's Representative, 1-hour total suspended particulates levels can be measured by direct reading methods that are capable of producing comparable results as that by the high-volume sampling method to indicate short-event impacts.

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, and other special phenomena and work progress of the concerned site, shall be recorded in detail. A sample data sheet is shown in Appendix 5-3.

5.1.2 Monitoring Equipment

A high-volume sampler complying with the following specification shall be used for carrying out 24-hour total suspended particulates monitoring:

- 0.6-1.7 cubic metres per minute adjustable flow range;
- equipped with a timing/control device with ±5 minutes accuracy for 24 hours operation;
- installed with elapsed-time meter with ±2 minutes accuracy for 24 hours operation;
- capable of providing a minimum exposed area of 406 cubic centimetres;
- flow control accuracy of ±2.5% deviation over 24-hour sampling period;
- equipped with a shelter to protect the filter and sampler;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with a peaked roof inlet;

– incorporated with a manometer;

– able to hold and seal the filter paper to the sampler housing at horizontal position;

– easy to change the filter, and

– capable of operating continuously for a 24-hour period.

The environmental-team leader shall be responsible for provision, installation and maintenance of the monitoring equipment. He shall ensure that sufficient number of high-volume samplers with an appropriate calibration, are available for carrying out the baseline monitoring, regular 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. The equipment installation location shall be proposed by the environmental-team leader and agreed with the Engineer's Representative and the Environmental Protection Department in consultation with the independent environmental checker.

Initial calibration of dust monitoring equipment shall be conducted on installation and thereafter at two-monthly intervals. The transfer standard shall be traceable to the internationally recognized primary standard and be calibrated annually. The calibration data shall be properly documented for future reference. All the data shall be converted into standard temperature and pressure condition.

The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and be recorded down in the data sheet, as mentioned in 5.1.1.

A direct-reading dust meter to measure 1-hour total suspended particulates levels, shall be used for the 1-hour TSP sampling. The instrument should also be calibrated regularly, and the 1-hour sampling shall be determined periodically by a high-volume sampler to check the validity and accuracy of the results measured by the direct-reading method.

Wind data monitoring equipment shall also be provided and set up at conspicuous locations for logging wind speed and wind direction near to the dust monitoring locations. The equipment installation location is proposed to be on the roof top of the Studio Theatre in Hong Kong Cultural Centre and to be agreed with the Engineer's Representative. For installation and operation of wind data monitoring equipment, the following points shall be observed:

– the wind sensors shall be installed on masts at an elevated level 10 metres above ground so that they are clear of obstructions or turbulence caused by buildings;

– the wind data shall be captured by a data logger and downloaded for processing at least once a month;

– the wind data monitoring equipment shall be re-calibrated at least once every six months, and

– wind direction shall be divided into 16 sectors of 22.5 degrees each.

It is also suggested to obtain the wind data from Hong Kong Observatory which is only about 700m away from the construction site and monitoring stations. The use of these representative wind data will be subject to the approval from the Engineer's Representative, the Environmental Protection Department and the independent environmental checker.

5.1.3 Laboratory Measurement/Analysis

A clean laboratory with constant temperature and humidity control, and equipped with necessary measuring and conditioning instruments, to handle the dust samples, shall be employed for sample analysis, and equipment calibration and maintenance. The laboratory should be Hong Kong Laboratory Accreditation Scheme accredited.

If a site laboratory is set up or a non-Hong Kong Laboratory Accreditation Scheme accredited laboratory is hired for carrying out the laboratory analysis, the laboratory equipment shall be approved by the Engineer's Representative and the measurement procedures shall be witnessed by the Engineer's Representative. The environmental-team leader shall provide the Engineer's Representative with one copy of the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B for his reference.

Filter paper of size 8 inches x l0 inches shall be labelled before sampling. It shall be clean with no pin holes, and shall be conditioned in a humidity-controlled chamber for over 24 hours and be pre-weighed before use for the sampling.

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 an accurate weighing by an electronic balance with a readout down to 0.1 milligrams. The balance shall be regularly calibrated against a traceable standard.

All the collected samples shall be kept in a good condition for six months before disposal.

5.1.4 Monitoring Locations

The proposed dust monitoring locations are shown in Table 5-1 and are illustrated in Figures 5-1-1 and 5-1-2. The status and locations of dust-sensitive receivers may change after issuing this manual. In such cases, the environmental team leader shall propose updated monitoring locations and seek approval from the Engineer's Representative, independent environmental checker and the Environmental Protection Department.

Table 5-1 Proposed Dust-monitoring Locations

ID	Description#
AM1	Hong Kong Cultural Centre, on podium level outside Administration Building
AM2	4-8 Canton Road, on roof top
AM3	Lai Chack Middle School, on roof top
AM4	Man Cheong Street Refuse Collection Point, on roof top *

The exact monitoring locations are subject to the confirmation with IEC and EPD.
* The formal location at Man King Building was changed.

When alternative monitoring locations are proposed, the following criteria, as far as practicable, shall be followed:
– at the site boundary or such locations close to the major dust emission source;
– close to the sensitive receptors;
– proper position/sitting and orientation of the monitoring equipment; and
– take into account the prevailing meteorological conditions.

1-hour and 24-hour TSP monitoring at Man King Building was changed to the Man Cheong Street Refuse Collection Point. After thorough appraisal of the original intended location of Man King Building, the location was considered not viable. There was no parapet wall constructed at the roof of Man King Building, inducing serious safety concern during installation and operation of monitoring equipment and its associating power supply. After sourcing alternative locations, Man Cheong Street Refuse Collection point was considered the most viable monitoring location to represent that considered in the EIA Report. The proposal for relocating AM4 has been justified by the ET Leader and verified by the IEC.

When positioning the samplers, the following points shall be noted:

– a horizontal platform with appropriate support to secure the samplers against gusty win should be provided;

– no two samplers should be placed less than 2 metres apart;

– the distance between the sampler and an obstacle, such as buildings, must be at least twice the height that the obstacle protrudes above the sampler;

– a minimum of 2 metres separation from walls, parapets and penthouses is required for rooftop samplers;

– a minimum of 2 metres separation from any supporting structure measured horizontally is required;

– no furnace or incinerator flue is nearby;

– airflow around the sampler is unrestricted;

– the sampler is more than 20 metres from the drip-line;

– any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;

– permission must be obtained to set up the samplers and to obtain access to the monitoring stations, and

– a secured supply of electricity is needed to operate the samplers.

5.1.5 Baseline Monitoring

The environmental team shall carry out baseline monitoring at all designated monitoring locations for at least 14 consecutive days prior to starting the construction works to obtain daily 24-hour total suspended particulates samples. 1-hour sampling shall also be done at least three times per day while the highest dust impact is expected. During the baseline monitoring, there should not be any construction or dust generating activities in the vicinity of the monitoring stations. A schedule on the baseline monitoring shall be submitted to the Engineer's Representative and the independent environmental checker for approval before the monitoring starts.

In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the environmental team shall carry out the monitoring at alternative locations that can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations shall have prior approval by the Engineer's Representative and agreed with the independent environmental checker.

In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the environmental-team leader shall liaise with the independent environmental checker and the Environmental Protection Department to agree on an appropriate set of data to be used as a baseline reference and submit to the Engineer's Representative for approval.

Ambient conditions may vary seasonally and shall be reviewed every three months. If the environmental-team leader considers that the ambient conditions have been changed and a repeat of the baseline monitoring is required for obtaining the updated baseline levels, the monitoring shall be conducted at times when the Link 200 Joint Venture'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, should be revised. The revised baseline levels and air-quality criteria should be agreed with the Environmental Protection Department and the independent environmental checker.

5.1.6 Impact Monitoring

The environmental team shall carry out impact monitoring during the course of the construction. For regular impact monitoring, the sampling frequency of at least once in every six days, shall be strictly complied with at all monitoring stations for 24-hour total suspended particulate monitoring. For 1-hour total suspended

particulate monitoring, the sampling frequency of at least three times in every six days shall be undertaken when the highest dust impact occurs. The specific time to start and stop the 24-hour total suspended particulate monitoring shall be clearly defined for each location and be strictly followed by the operator.

In case of non-compliance with the air-quality criteria, a more-frequent monitoring exercise, as specified in the Action Plan in 5.1.7, shall be conducted within 24 hours after the result is obtained. That additional monitoring shall be continued until the excessive dust emission or the deterioration in air quality is rectified.

5.1.7 Event and Action Plan for Air Quality

The baseline monitoring results form the basis for determining the air-quality criteria, namely action and limit levels, for the impact monitoring. The environmental-team leader shall compare the impact monitoring results with air-quality criteria set up for 24-hour and 1-hour total suspended particulate levels. Table 5-2 shows the action and limit levels.

Table 5-2 Action and Limit Levels for Air Quality

Parameters	Action	Limit
24-hour total suspended particulates level in pg/m^3	For baseline level ≤200 mg/m^3, Action level = (130% of baseline level + Limit Level)/2 For baseline level >200 mg/m^3, Action level = Limit level	260 #
1-hour total suspended particulates level in pg/m^3	For baseline level ≤384 mg/m^3, Action level = (130% of baseline level + Limit Level)/2 For baseline level >384 mg/m^3, Action level = Limit level	500 #

The Action Level value would be included when available

Should non-compliance of the air-quality criteria occur, the environmental team, the Engineer's Representative and the Link 200 Joint Venture shall undertake the relevant actions in accordance with the Event and Action Plan in Table 5-3.

Table 5-3 Event/Action Plan for Air Quality

Event	Action			
	Environmental-team Leader	Independent Environmental Checker	Engineer's Representative	Link 200 Joint Venture
Action Level				
1. Exceedance for one sample	1. Identify source, investigate causes of exceedance and propose remedial measures 2. Inform independent environmental checker and Engineer's Representative 3. Repeat	1. Check monitoring data submitted by environmental team 2. Check Link 200 Joint Venture's working method	1. Notify Link 200 Joint Venture	1. Rectify any unacceptable practice 2. Amend working methods if appropriate

Event	Action			
	Environmental-team Leader	Independent Environmental Checker	Engineer's Representative	Link 200 Joint Venture
	measurement to confirm finding 4. Increase monitoring frequency to daily			
2. Exceedance for two or more consecutive samples	1. Identify source 2. Inform independent environmental checker and Engineer's Representative 3. Advise Engineer's Representative on effectiveness of proposed remedial measures 4. Repeat measurements to confirm findings 5. Increase monitoring frequency to daily 6. Discuss with independent environmental checker and Link 200 Joint Venture on remedial actions required 7. If exceedance continues, arrange meeting with independent environmental checker, and arrange meeting with independent environmental checker and Engineer's Representative 8. If exceedance stops, cease additional monitoring	1. Check monitoring data submitted by environmental team 2. Check Link 200 Joint Venture's working method 3. Discuss with environmental-team leader and Link 200 Joint Venture on possible remedial measures 4. Advise Engineer's Representative on effectiveness of proposed remedial measures 5. Supervise implementation of remedial measures	1. Confirm receipt of notification of exceedance in writing 2. Notify Link 200 Joint Venture 3. Ensure remedial measures properly implemented	1. Submit proposals for remedial actions to independent environmental checker within 3 working days of notification 2. Implement agreed proposals 3. Amend proposal if appropriate
Limit Level				
1. Exceedance for one sample	1. Identify source, investigate causes of exceedance and propose remedial measures 2. Inform Engineer's Representative and Environmental	1. Check monitoring data submitted by environmental team 2. Check Link 200 Joint Venture's working method 3. Discuss with environmental-	1. Confirm receipt of notification of exceedance in writing 2. Notify Link 200 Joint Venture 3. Ensure remedial measures properly implemented	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to independent environmental checker within 3 working days of

Event	Action			
	Environmental-team Leader	Independent Environmental Checker	Engineer's Representative	Link 200 Joint Venture
	Protection Department 3. Repeat measurement to confirm finding 4. Increase monitoring frequency to daily 5. Assess effectiveness of Link 200 Joint Venture's remedial actions and keep independent environmental checker, Environmental Protection Department and Engineer's Representative informed of results	team leader and Link 200 Joint Venture on possible remedial measures 4. Advise Engineer's Representative on effectiveness of proposed remedial measures 5. Supervise implementation of remedial measures		notification 3. Implement agreed proposals 4. Amend proposal if appropriate
2. Exceedance for two or more consecutive samples	1. Notify independent environmental checker, Engineer's Representative, Environmental Protection Department and Link 200 Joint Venture 2. Identify source 3. Repeat measurements to confirm findings 4. Increase monitoring frequency to daily 5. Carry out analysis of Link 200 Joint Venture's working procedures to determine possible mitigation to be implemented 6. Arrange meeting independent environmental checker and Engineer's Representative to discuss remedial actions to be taken 7. Assess effectiveness of Link 200 Joint Venture's remedial	1. Discuss among Engineer's Representative, environmental-team leader and Link 200 Joint Venture on potential remedial actions 2. Review Link 200 Joint Venture's remedial actions whenever necessary and advise Engineer's Representative accordingly 3. Supervise implementation of remedial measures	1. Confirm receipt of notification of exceedance in writing 2. Notify Link 200 Joint Venture 3. In consultation with independent environmental checker, agree remedial measures to be implemented 4. Ensure remedial measures are properly implemented 5. If exceedance continues, consider what activity of work is responsible and instruct Link 200 Joint Venture to stop that activity of work until exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to independent environmental checker within 3 working days of notification 3. Implement agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop relevant activity of works as determined by Engineer's Representative until exceedance is abated

Event	Action			
	Environmental-team Leader	Independent Environmental Checker	Engineer's Representative	Link 200 Joint Venture
	actions and keep independent environmental checker, Environmental Protection Department and Engineer's Representative informed of results 8. If exceedance stops, cease additional monitoring			

5.2 Airborne Construction Noise

5.2.1 Monitoring Parameters

The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{Aeq}). $L_{Aeq,\ 30\ min}$ shall be used as the monitoring parameter for the time period between 07h00 and 19h00 on normal weekdays. For all other time periods (including restricted hours), $L_{Aeq,\ 5\ min}$ shall be employed for comparison with the Noise Control Ordinance criteria.

As supplementary information for data auditing, statistical results such as L_{10} and L_{90} shall also be obtained for reference. A sample data record sheet is shown in Appendix 5-3 for reference.

5.2.2 Monitoring Equipment

In accordance with the Technical Memorandum issued under the Noise Control Ordinance, sound level meters in compliance with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1) specifications shall be used for carrying out noise monitoring. 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 1.0 decibel.

The environmental-team leader shall be responsible for the provision, installation and maintenance of the monitoring equipment. He shall ensure that sufficient noise-monitoring equipment and associated instrumentation are available for carrying out the baseline monitoring, regular impact monitoring and *ad-hoc* monitoring. All the equipment and associated instrumentation shall be clearly labelled. The location of equipment installation should be proposed by the environmental-team leader and agreed with the Engineer's Representative and the Environmental Protection Department in consultation with the independent environmental checker.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5 metres per second or wind with gusts exceeding 10 metres per second. The wind speed shall be checked with a portable wind-speed meter capable of measuring the wind speed in metres per second.

5.2.3 Monitoring Locations

The noise-monitoring locations are shown in Figures 5-2-1 and 5-2-2 and are summarized in Table 5-4. The status and locations of noise-sensitive receivers may change after issuing this manual. In such cases, the environmental-team leader should propose updated monitoring locations and seek approval from the Engineer's Representative, the independent environmental checker and the Environmental Protection Department.

Table 5-4 Proposed Airborne Construction Noise Monitoring Locations

ID	Description#
NMI	Hong Kong Cultural Centre, on the roof top of the studio theatre (façade)
NM2	4-8 Canton Road, on roof top (façade)
NM3	Lai Chack Middle School, on roof top (façade)
NM4	Man King Building, ground level (façade) *

The exact monitoring location are subject to the confirmation with IEC and EPD.
* Baseline monitoring was previously carried out at Man Cheong Street Refuse Collection Point (NM4a). No further baseline monitoring was carried out at NM4. These two locations (NM4 and NM4a) are similar in terms of horizontal and vertical distances from construction site.

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

– at locations close to the major site activities that are likely to have noise impacts;

– close to the noise-sensitive receivers, and

– for monitoring locations in the vicinity of the sensitive receivers, care should be taken to avoid disturbance to the occupants during monitoring.

The monitoring station shall normally be at a point 1 metre from the exterior of the sensitive receivers building façade and be at a position 1.2 metres 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. For reference, a correction of +3 decibels (acoustic) shall be made to the free field measurements. The environmental-team leader shall agree with the independent environmental checker on the monitoring positions and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

5.2.4 Baseline Monitoring

The environmental team shall carry out baseline noise monitoring prior to the

commencement of the construction works. There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. Continuous baseline noise monitoring for the A-weighted levels L_{Aeq}, L_{A10} and L_{A90} shall be carried out daily for a period of at least two weeks in a sample period of 5 minutes or 30 minutes between 07h00 and 19h00, and 5 minutes between 19h00 and 07h00. A schedule on the baseline monitoring shall be submitted to the Engineer's Representative and the independent environmental checker for approval before the monitoring starts.

In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the environmental-team leader shall liaise with the independent environmental checker and the Environmental Protection Department to agree on an appropriate set of data to be used as a baseline reference and submit to the Engineer's Representative for approval.

5.2.5 Impact Monitoring

During normal construction working hours (07h00–19h00 Monday to Saturday), monitoring of $L_{Aeq,\ 30\ min}$ noise levels (as six consecutive $L_{Aeq,\ 5\ min}$ readings) shall be carried out at the agreed monitoring locations once every week in accordance with the methodology in the Technical Memorandum.

Other noise sources such as road traffic may make a significant contribution to the overall noise environment. Therefore, the results of noise monitoring activities will take into account such influencing factors, which may not be presented during the baseline monitoring period.

In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event and Action Plan in 5.2.7 shall be carried out. That additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

5.2.6 Continuous Noise Monitoring

The Link 200 Joint Venture shall also procure, implement and maintain a continuous noise monitoring system throughout the construction period, as recommended in the Environmental Impact Assessment Report. Continuous noise monitoring locations are shown in Figure 5-3 and are summarized in Table 5-5. The status and locations of noise-sensitive receivers may change after issuing this manual. In such cases, the environmental-team leader should propose updated monitoring locations and seek approval from the Engineer's Representative, the independent environmental checker and the Environmental Protection Department.

Table 5-5 Proposed Locations of Continuous Noise Monitoring

ID	Description#
CM1	Lai Chack Middle School, on roof top (façade)
CM2	Man Cheong Street Refuse Collection Point, on roof top (façade) *

The exact monitoring locations are subject to the confirmation with IEC and EPD.
* The formal location at Man King Building was changed

Continuous noise monitoring at Man King Building was changed to the Man Cheong Street Refuse Collection Point. After thorough appraisal of the original intended location of Man King Building, the location was considered not viable. There was no parapet wall constructed at the roof of Man King Building, inducing serious safety concern during installation and operation of monitoring equipment and its associating power supply. After sourcing alternative locations, Man Cheong Street Refuse Collection point was considered the most viable monitoring location to represent that considered in the EIA Report. The proposal for relocating CM2 has been justified by the ET Leader and verified by the IEC.

a) System Requirements

In summary, the objectives of implementing the continuous noise monitoring system are:

– measure various noise data (different measurement parameters) at designated locations continuously during specified period(s);

– transmit the measured noise data electronically to a central computer system within the required time frame;

– upload the measurement data to the KCR Corporation's web site in an agreed format for public inspection, and

– maintain and keep all the measurement data in an agreed format during the entire construction period for subsequent analysis, where necessary.

The general configuration of the continuous noise monitoring system is described below. Subject to comments/approval from the KCR Corporation, the Environmental Protection Department and the independent environmental checker:

– sound-level meters;
– wireless data transmitters and receivers;
– modems;
– computer system (completed with necessary software and connection to the internet);
– power supply, and
– security measures.

The general requirements of the above components of the continuous noise monitoring system are summarized in Table 5-6.

Table 5-6 General Requirements of Continuous Noise Monitoring System

Equipment/Components	General Requirements
Sound-level meters (with data logger)	Be suitable for outdoor use Comply with IEC 651:1979 (Type 1), 804:1985 (Type 1) and 1672/EN61672 Class 1 requirements
Wireless data transmitters and	Be suitable for outdoor use Transfer noise measurement data from sound-level meters to

Equipment/Components	General Requirements
receivers	receiver wirelessly Transmission power/frequency should be suitable and adequate for local conditions
Modems	Transfers measurement data to computer system
Computer system	Complete with necessary software (eg, spreadsheet, word processor and internet access) for data processing Process measurement data into agreed format Upload processed data (including tables, charts, trends) to KCR Corporation's website via the Electronic Environmental Management System (EEMS), which should allow the user (including public) to search previous measurement data Provided with sufficient memory to keep measurement data for further use
Power supply	Complete with all cabling and connection to power supply Complete with appropriate back-up power supply for sound-level meters, transmitters/receivers and computer system
Security measures	Complete with security measures to prevent unnecessary human interference and damage

All sound-level meters shall be calibrated against a portable acoustic calibrator once every two weeks. The portable acoustic calibrator shall be traceable to international reference source. Calibration records shall be stored for further reference. Full annual calibration is required every year and the full set of noise monitoring system will be sent back to the manufacturer (or other approved agency). Temporary replacement would be required to maintain uninterrupted noise measurements.

b) Noise Parameters

A summary of the noise parameters to be measured by the continuous noise monitoring system is given in Table 5-7.

Table 5-7 Summary of Noise Parameters for Continuous Noise Monitoring System

Period	Parameters
Weekdays 07h00–19h00	$L_{eq\ (30\ min)}$ in six consecutive $L_{eq\ (5\ min)}$ measurements Other parameters in L_{10}, L_{90} and L_{max} should also be measured
Restricted hours 19h00–07h00 Monday to Saturday and at any time on Sundays or public holidays)	$L_{eq\ (15\ min)}$ in three consecutive $L_{eq\ (5\ mm)}$ measurements Other parameters in L_{10}, L_{90} and L_{max} should also be measured

c) Implementation Responsibility

The Link 200 Joint Venture shall submit detailed method statement before procurement of continuous noise monitoring system to state proposed equipment, configuration and other operational/ maintenance details to independent

environmental checker, KCR Corporation and Environmental Protection Department for approval. A summary of the implementation responsibilities for the continuous noise monitoring system is given in Table 5-8.

Table 5-8 Summary of Implementation Responsibilities for Continuous Noise Monitoring System

Party	Implementation Responsibilities
KCR Corporation	Review, comment and approve method statement to be submitted by Link 200 Joint Venture Maintain a website to display measured noise data for public inspection throughout entire construction period
Engineer's Representative	Ensure all Environmental Permit requirements are incorporated into Particular Specification for procurement of continuous noise monitoring system Ensure continuous noise monitoring system is installed and operated in safe manner and satisfy other legislative requirement (eg, power supply)
Independent environmental checker	Comments on and verify method statement to be submitted by Link 200 Joint Venture Verify and upload verified data (including plots) and actions/limit levels onto KCR Corporation's website before midnight of next day Verify calibration records to be provided by environmental team
Link 200 Joint Venture	Submit detailed method statement before procurement of continuous noise monitoring system to state proposed equipment, configuration and other operational/ maintenance details to independent environmental checker, KCR Corporation and Environmental Protection Department for approval Procure, install and maintain continuous noise monitoring system throughout construction period for impact monitoring Arrange site access for installation of continuous noise monitoring system Maintain necessary spare parts to maintain uninterrupted operation of continuous noise monitoring system Provide all necessary power supply/connection and security measures
Environmental team	Submit measurement data in agreed format to independent environmental checker, KCR Corporation and Link 200 Joint Venture within one working day Conduct regular calibration of sound-level meters and continuous noise monitoring system as specified Maintain field data sheet to record meteorological data and site observations for further reference

5.2.7 Event and Action Plan for Construction Noise

The action and limit levels for construction noise are defined in Table 5-9. Should

non-compliance of the criteria occur, actions in accordance with the Action Plan in Table 5-10 shall be carried out.

Table 5-9 Action and Limit Levels for Construction Noise

Time Period	Action	Limit
07h00–19h00 on normal weekdays	When one documented complaint is received	75[1] dB(A)
07h00–23h00 on holidays; and 1900–2300 on all other days		65/70[2] dB(A)
23h00–07h00 of next day		50/55[2] dB(A)

Notes: [1] For school, 70 decibels (acoustic) for schools and 65 decibels (acoustic) during school examination periods. And for school with noise insulation, 80 decibels (acoustic) for schools and 75 decibels (acoustic) during school examination periods.

[2] Limit depends on area-sensitivity rating. For monitoring locations located at Canton Road (from Salisbury Road to Kowloon Park Drive) and Haiphong Road, the area-sensitivity rating should be "B" and hence the limit should be 65 decibels (acoustic) and 50 decibels (acoustic) for the period 07h00–23h00 on holidays & 19h00-23h00 on all other days and 23h00–07h00 of the next day, respectively. For monitoring locations located at other sections, the area-sensitivity rating "should be C" and hence the limit should be 70 decibels (acoustic) and 55 decibels (acoustic) for the period 07h00–23h00 on holidays & 19h00-23h00 on all other days and 23h00–07h00 of the next day, respectively.

Table 5-10 Event/Action Plan for Airborne Construction Noise

Event	Action			
	Environmental-team Leader	Independent Environmental Checker	Engineer's Representative	Link 200 Joint Venture
Action Level	1. Notify independent environmental checker and Link 200 Joint Venture 2. Carry out investigation 3. Report results of investigation to independent environmental checker and Link 200 Joint Venture 4. Discuss with Link 200 Joint Venture and formulate remedial measures 5. Increase monitoring frequency to check mitigation	1. Review with analyzed results submitted by environmental team 2. Review proposed remedial measures by Link 200 Joint Venture and advise Engineer's Representative accordingly 3. Supervise implement of remedial measures	1. Confirm receipt of notification of exceedance in writing 2. Notify Link 200 Joint Venture 3. Require Link 200 Joint Venture to propose remedial measures for analyzed noise problem 4. Ensure remedial measures are properly implemented	1. Submit noise mitigation proposals to independent environmental checker 2. Implement noise mitigation proposals

Event	Action			
	Environmental-team Leader	Independent Environmental Checker	Engineer's Representative	Link 200 Joint Venture
	measures			
Limit Level	1. Identify source 2. Notify independent environmental checker, Engineer's Representative, Environmental Protection Department and Link 200 Joint Venture 3. Repeat measurement to confirm findings 4. Increase monitoring frequency 5. Carry out analysis of Link 200 Joint Venture's working procedures to determine possible mitigation to be implemented 6. Inform independent environmental checker, Engineer's Representative and Environmental Protection Department causes and actions taken for exceedances 7. Assess effectiveness of Link 200 Joint Venture's remedial actions and keep independent environmental checker, Environmental Protection Department and Engineer's Representative informed of results 8. If exceedance stops, cease additional monitoring	1. Discuss among Engineer's Representative, environmental-team leader and Link 200 Joint Venture on potential remedial actions 2. Review Link 200 Joint Venture's remedial actions whenever necessary to ensure effectiveness and advise Engineer's Representative accordingly 3. Supervise implementation of remedial measures	1. Confirm receipt of notification of exceedance in writing 2. Notify Link 200 Joint Venture 3. Require Link 200 Joint Venture to propose remedial measures for analyzed noise problem 4. Ensure remedial measures are properly implemented 5. If exceedance continues, consider what activity of work is responsible and instruct Link 200 Joint Venture to stop that activity of work until exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to independent environmental checker within 3 working days of notification 3. Implement agreed proposals 4. Resubmit proposals if problem still not under control 5. Stop relevant activity of works as determined by Engineer's Representative until exceedance is abated

To account for cases where ambient noise levels as identified by baseline monitoring approach or exceed the stipulated limit levels prior to starting construction, a maximum acceptable impact level may be defined and agreed with the Environmental Protection Department, which incorporates the baseline noise

levels and the identified construction noise limit level. The amended level will therefore be greater than 75 decibels (acoustic) and will represent the maximum acceptable noise level at a specific monitoring station. Correction factors for the effects of acoustic screening and/or architectural features of noise-sensitive receivers may also be applied for as specified in the Technical Memorandum.

For the purposes of compliance checking, after taking into account any adjustments agreed with the Environmental Protection Department, comparison with either the limit or the maximum acceptable impact level shall represent the governing criteria for noise impact assessment.

For continuous noise monitoring, in cases where the levels exceeds the action/limit levels (see 5.2.7), the hourly site log shall be examined to check whether the exceedance is caused by extraneous activities. The environmental team is required to investigate whether the exceedance is caused by KCR Corporation's site activities or other extraneous noise sources. The site log should contain brief description of prevailing wind speeds and weather, once for morning and once for afternoon each day. A short explanation of the causes of any exceedance of action/limit levels shall accompany the plots.

5.3 Construction Groundborne Noise

Prediction of construction groundborne noise within the Environmental Impact Assessment indicates the criteria will be achieved and mitigation measures are not required. In order to ensure proper control of groundborne noise is executed by the Link 200 Joint Venture, rock breaking activities such as TBM excavation will be subject to an assurance groundborne noise measurement at one selected location each inside Hong Kong Cultural Centre, Hong Kong Space Museum and the Former Marine Police Headquarter to be agreed with their respective operators. If groundborne noise criterion is exceeded, the monitoring shall continue daily until acceptance has been restored against the criterion. Otherwise the monitoring can be discontinued.

The groundborne noise monitoring plan is attached in Appendix 5-1. The proposed groundborne noise monitoring locations are shown in Figure 5-4 and summarised in Table 5-11.

5.3.1 Monitoring Parameters

The construction noise level shall be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{Aeq}). $L_{Aeq,\ 30\ min}$ shall be used as the monitoring parameter for the time period between 07h00 and 19h00 on normal weekdays. For all other time periods (including restricted hours), $L_{Aeq,\ 5\ min}$ shall be employed for comparison with the Noise Control Ordinance criteria. A sample data record sheet (same as airborne noise monitoring) is shown in Appendix 5-3 for reference.

5.3.2 Monitoring Equipment

In accordance with the Technical Memorandum issued under the Noise Control Ordinance, sound level meters in compliance with International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1)

specifications shall be used for carrying out noise monitoring. 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 1.0 decibel.

The environmental-team leader shall be responsible for the provision, installation and maintenance of the monitoring equipment. He shall ensure that sufficient noise-monitoring equipment and associated instrumentation are available for carrying out impact monitoring. All the equipment and associated instrumentation shall be clearly labelled. The location of equipment installation should be proposed by the environmental-team leader and agreed with the Engineer's Representative and the Environmental Protection Department in consultation with the independent environmental checker.

5.3.3 Monitoring Locations

The proposed groundborne noise monitoring locations are shown in Figure 5-4 and summarised in Table 5-11. The status and locations of noise-sensitive receivers may change after issuing this manual. In such cases, the environmental-team leader should propose updated monitoring locations and seek approval from the Engineer's Representative, the independent environmental checker and the Environmental Protection Department.

Table 5-11 Proposed Groundborne Noise Monitoring Locations

ID	Description
G1	Hong Kong Space Museum – Planetarium, Recording Room
G2	Hong Kong Cultural Centre – Grand Theatre, Studio Theatre, Concert Hall
G3	Former Marine Police Headquarter

5.3.4 Event and Action Plan for Construction Groundborne Noise

The action and limit levels for construction groundborne noise are defined in Table 5-12. Should non-compliance of the criteria occur, actions in accordance with the Action Plan in Table 5-10 shall be carried out.

Table 5-12 Action and Limit Levels for Groundborne Noise

ID No.		Description	Noise Limits Leq(30mins) (3), dB(A)		
			Daytime (except General Holidays & Sunday)	Daytime during general holidays and Sundays and all days during Evening (1900 to 2300 hrs)	Night-time (2300 to 0700 hrs)
G1(1)	a	Hong Kong Space Museum – Planetarium	60	55	-
	b	Hong Kong	60	55	-

		Space Museum – Recording Room			
G2(1)	a	Hong Kong Cultural Centre – Studio Theatre	60	55	-
	b	Hong Kong Cultural Centre – Grand Theatre	60	55	-
	c	Hong Kong Cultural Centre – Concert Hall	60	55	-
G3 (2)		Former Marine Police Headquarters building	65	55	40

Notes: (1) Noise limits for HKCC (G1) and HKSM (G2) are with A/C switched on. Also, there will not be any operation during night-time and hence the HKCC and HKSM are only NSR during daytime and evening periods.

(2) Monitoring at the FMPHQ shall commence when it is occupied.
(3) The noise limits were set forth in the endorsed EIA report (AEIAR-083/2005).

5.4 Water Quality

From the EIA study, no contaminated groundwater that required remediation was encountered. If contaminated ground water is encountered, during the dewatering processes it should be recharged back into the ground at the recharging wells. The recharge wells shall be located at places where the groundwater quality will not be affected by the recharge operation. The Link 200 Joint Venture shall perform ambient measurements on the groundwater quality with reference to ProPECC PN3/94, Contaminated Land Assessment and Remediation, prior to the selection of the recharge wells; and submit a working plan to the Environmental Protection Department for agreement. The measurement data of the ground water will serve as the baseline and the pollutant levels of the groundwater to be recharged shall be measured and not be higher than the baseline at the recharge well.

Monitoring and auditing works will based on the groundwater monitoring working plan submitted by Link 200 JV on 31 July 2006 (approved by EPD on 7 August 2006). The approved working plan is attached in Appendix 5-2.

Groundwater monitoring wells will be installed to monitor the effectiveness of the recharge wells. The locations of the monitoring wells will be near to the recharge points and at site boundaries. During the recharge period, the groundwater and pollution level at the monitoring wells shall be monitored to ensure that there is no likelihood of locally risen groundwater level and transfer of pollutants beyond the site boundary. A control well shall also be selected to monitor the natural variation of the pollution level.

5.4.1 Monitoring Locations

As required in the Environmental Mitigation Implementation Schedule (Appendix to the EIA and the EM&A Manual) and in EIA Reference S.8.4.2.4, the groundwater samples should be taken at the West Kowloon Station, and to the north of the station in the cut and cover section. Furthermore, the groundwater quality will be defined along the alignment, along with a control station. The groundwater monitoring locations are summarised in Table 5-13.

Table 5-13 Groundwater Monitoring Locations

ID	Coordinates	Description
C	835201, 818009	Control point near the site boundary to determine the current site conditions and to act as a control if and when any recharging commences.
S1	835317, 818134	Within the launching shaft area, adjacent to the previous locations of DHE52 and DHE53 in the EIA Report.
S2	835273, 818236	In WKN (inside station), on either side of the previous location DHE063 in the EIA Report.
S3	835243, 818296	
S4	835140, 818513	In the cut and cover section North of WKN (inside station).
R	835240, 818240	Location of recharge well.
M1	835194, 818192	Monitoring wells to monitor potential disperse of contaminants from the recharge well.
M2	835118, 818282	

5.4.2 Monitoring Parameters

The chemical testing of ground water should include the parameters and reporting limits shown in Table 5-14 to be undertaken by a Hong Kong Laboratory Accreditation Scheme accredited laboratory and with individual Hong Kong Laboratory Accreditation Scheme accredited methods. The reference methods are shown in Appendix 5-4. The groundwater level should also be recorded.

Table 5-14 Groundwater Testing Parameters and Reporting Limits

Parameters	Reporting Limit (µg/ℓ)
Total petroleum hydrocarbons C10–C14	25
Total petroleum hydrocarbons C15–C28	25
Total petroleum hydrocarbons C29–C36	25
Cadmium	1
Copper	1
Mercury	0.5

Note:
[1]: The effluent limits for inshore waters apply to the discharge of uncontaminated groundwater to storm drain only.

5.4.3 Groundwater Collection

Groundwater samples at each monitoring well should be collected using either a telfon bailer or a poly-vinyl-chloride bailer which will be decontaminated using non-phosphate detergents. The bailer should be decontaminated prior to use and in

between sampling. Immediately after collection, the groundwater samples should be transferred to clearly-labelled and pre-cleaned sample containers with necessary preservatives. Sufficient quantity of samples should be collected for all laboratory analyses. After collection, the groundwater samples should be stored at 0–4 degrees Celsius and delivered to the laboratory within 24 hours under a proper chain-of-custody system. There should be zero headspace when sampling for volatile chemicals.

5.4.4 Baseline Monitoring

Prior to construction, ambient groundwater quality measurements will be conducted at the designated monitoring locations specified in Table 5-13. The parameters and the associated reporting limits/TM-Water limits as shown in Table 5-14 should be adopted. Groundwater sampling should be conducted daily for 7 days. Where the concentrations of parameters exceed the relevant limits, the ground water should be recharged within the site. Groundwater level should also be monitored at each monitoring well.

5.4.5 Impact Monitoring

During the re-charging of underground water, the water level at the wells C, R, M1 and M2 should be monitored on a daily basis to ensure that the water levels at the site boundary do not increase significantly.

Water quality at the wells C, R, M1 and M2 shall be measured on a weekly basis to ensure that the pollution levels will not increase significantly. Measurement parameters include TPH, cadmium, copper and mercury.

The Limit Levels for impact monitoring is specified in Table 5-15.

Table 5-15 Limit Levels for Recharging

Parameters	Limit Level (µg/ℓ)
Total petroleum hydrocarbons C10–C14	56*
Total petroleum hydrocarbons C15–C28	224*
Total petroleum hydrocarbons C29–C36	110*
Cadmium#	1
Copper#	500
Mercury#	1

* The limit levels for recharging groundwater would be the 95th percentile of the recorded baseline levels at recharge well.

\# The baseline levels of Cd, Cu & Hg at recharge well are below the TM-Water Effluent Limits, so the TM-Water Effluent limits are taken as limit levels.

5.4.6 Event and Action Plan

The event and action plan is summarized as follows:

Table 5-16 Event and Action Plan for Groundwater Recharging

Event	Action			
	Environmental-team Leader	Independent Environmental Checker	Engineer's Representative	Link 200 Joint Venture

Event	Action			
	Environmental-team Leader	Independent Environmental Checker	Engineer's Representative	Link 200 Joint Venture
Ground water level at recharge point exceeds 1m from baseline	1. Notify IEC and the Contractor. 2. Carry out investigation and repeat monitoring of the well to clarify the result. 3. Report the results of investigation to IEC and the Contractor. 4. Discuss with the Contractor and formulate remedial measures. 5. Increase monitoring frequency to check mitigation measures.	1. Review with analysed results submitted by ET. 2. Review the proposed remedial measures by the Contractor and advise ER accordingly. 3. Supervise the implement of remedial measures.	1. Confirm receipt of notification of exceedance in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed groundwater problem. 4. Ensure remedial measures are properly implemented.	1. Reduce the recharge rate AND / OR 2. Suspend the recharge until the groundwater level at recharge points falls back to less than 1m difference with the baseline.
Pollution level of recharging groundwater exceed the baseline levels[1] / the pollution levels at the monitoring well	1. Notify IEC and the Contractor. 2. Carry out investigation and repeat monitoring for 3 consecutive days to clarify the result. 3. Review results of 3 consecutive days. 4. Report the results of investigation to IEC and the Contractor. 5. Discuss with the Contractor and formulate remedial measures. 6. Increase monitoring frequency to check mitigation measures.	1. Review with analysed results submitted by ET. 2. Review the proposed remedial measures by the Contractor and advise ER accordingly. 3. Supervise the implement of remedial measures.	1. Confirm receipt of notification of exceedance in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed groundwater problem. 4. Ensure remedial measures are properly implemented.	If samples for 3 consecutive days indicate exceedance of baseline levels, then: 1. Suspend the recharge OR 2. Carry out maintenance on sedimentation tank and carbon filter.

5.5 Cultural heritage

The Link 200 Joint Venture shall liaise with the Former Marine Police Headquarters developer to conduct structural monitoring during the construction of the bored tunnel underneath the Former Marine Police Headquarters to ensure compliance with Buildings Ordinance. The monitoring shall be conducted for the Former Marine Police Headquarters compound including the various built heritage within the site, the disused air-raid tunnel and the Portal A to be preserved. The Link 200 Joint Venture shall prepare a methodology of conducting structural monitoring for submission to the Antiquities and Monuments Office and the Buildings Department.

In addition, before starting construction work, the Link 200 Joint Venture shall also consult the Antiquities and Monuments Office on any other mitigation measures that would be required administratively or under the Antiquities and Monuments Ordinance. The Link 200 Joint Venture shall implement those

requirements from the Antiquities and Monuments Office during the construction period.

6. Environmental Site Audit

6.1 Site Inspection

Site inspections provide direct means to trigger and enforce the specified environmental protection and pollution control measures. They shall be undertaken routinely to inspect the construction activities to ensure appropriate environmental protection and pollution control mitigation measures are properly implemented. With well-defined pollution control, mitigation specifications and a well-established site inspection, deficiency and action reporting system, site inspection is one of the most effective tools to enforce the environmental protection requirements on the construction site.

The environmental-team leader shall be responsible for formulating the environmental site inspection, deficiency and action reporting system, and carrying out the site-inspection works. The proposal for deficiency and action reporting system is shown in Appendix 6-1 for approval from the Engineer's Representative and the independent environmental checker.

Regular site inspections shall be carried out at least once per week. The areas of inspection shall not be limited to the environmental situation, pollution control and mitigation measures within the site. It should also review the environmental situation outside the site area that is likely to be affected, directly or indirectly, by the site activities. The environmental-team leader shall make reference to the following information when conducting the inspection:

- the Environmental Impact Assessment recommendations on environmental protection and pollution control mitigation measures;
- works progress and programme;
- individual works methodology (which shall include proposal on associated pollution control measures);
- Contract Specifications on environmental protection;
- relevant environmental protection and pollution control laws, and
- previous site-inspection results.

The Link 200 Joint Venture shall update the environmental-team leader with all relevant information of the construction Contract for him to carry out the site inspections. The inspection results and its associated recommendations on improvements to the environmental protection and pollution control works shall be submitted to the Engineer's Representative, the independent environmental checker and the Link 200 Joint Venture within one working day for reference and for taking immediate actions. The Link 200 Joint Venture shall follow the procedures and time-frame as stipulated in the environmental site inspection,

deficiency and action reporting system formulated by the environmental-team leader to report on any remedial measures subsequent to the site inspections.

Ad-hoc site inspections shall also be carried out if significant environmental problems are identified. Inspections may also be required subsequent to receipt of an environmental complaint, or as part of the investigation work, as specified in the Action Plan for environmental monitoring and audit.

6.2 Compliance with Legal and Contractual Requirement

There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution control laws in the Hong Kong SAR, which the construction activities shall comply with. In order to comply with the Contractual requirements, all works method statements submitted by the Link 200 Joint Venture to the Engineer's Representative and the independent environmental checker for approval shall be sent to the environmental-team leader for vetting, to see whether sufficient environmental protection and pollution control measures have been included.

The environmental-team leader 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. The Link 200 Joint Venture shall regularly copy relevant documents to the environmental-team leader so that the checking work can be carried out. The document shall at least include the updated Work Progress Reports, the updated Works Programme, the application letters for different licence/permits under the environmental protection laws, and all the valid licences/permits. The site diary shall also be available for the environmental-team leader's inspection on his request.

After reviewing the document, the environmental-team leader shall advise the Engineer's Representative, the independent environmental checker and the Link 200 Joint Venture of any non-compliance with the contractual and legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the environmental-team leader's review concludes that the current status on licence/permit application and any environmental protection and pollution control preparation works may not cope with the works programme, or may result in potential violation of environmental protection and pollution control requirements by the works in due course, he shall also advise the Link 200 Joint Venture, the Engineer's Representative, and the independent environmental checker accordingly.
On receipt of the advice, the Link 200 Joint Venture shall undertake immediate actions to rectify the situation. The Engineer's Representative shall follow up to ensure that appropriate action has been taken by the Link 200 Joint Venture such that the environmental protection and pollution control requirements are fulfilled.

6.3 Environmental Complaints

Complaints shall be referred to the environmental-team leader for carrying out complaint investigation. The environmental-team leader shall undertake the following procedures on receipt of a complaint:

1) Log the complaint and date of receipt in the complaint database.

2) Investigate the complaint to determine its validity, and to assess whether the source of the problem is due to works activities.

3) Identify mitigation measures if the complaint is valid and due to works.

4) Advise the Link 200 Joint Venture accordingly if mitigation measures are required.

5) Review the Link 200 Joint Venture's response on the identified mitigation measures and the updated situation.

6) Submit an interim report to the Engineer's Representative on the status of the complaint investigation and follow-up action within the time frame assigned by the Engineer's Representative.

7) Undertake additional monitoring and audit to verify the situation if necessary, and review that any valid reason for complaint does not recur.

8) Report the investigation results and the subsequent actions to the source of complaint for responding to complainant (if the source of complaint is the Environmental Protection Department, the results should be reported within the time frame assigned by the Environmental Protection Department).

9) Record the complaint, investigation, the subsequent actions and the results in the monthly Environmental Monitoring & Audit Report.

The Link 200 Joint Venture and the Engineer's Representative shall also be notified of the nature of a complaint. An investigation shall be initiated to determine the validity of the complaint and to identify the source of the problem. As necessary, the Engineer's Representative shall undertake the following steps:

1) Investigate and identify the source of the problem (KCR Corporation/IEC or the Engineer's Representative may request additional dust or noise monitoring).

2) Liaise with the environmental manager to identify remedial measures.

3) Require the Link 200 Joint Venture to take action to mitigate the situation.

4) Repeat monitoring to check compliance with the action and limit levels.

5) Repeat review procedures to identify further possible areas of improvement if monitoring results show exceedances.

The outcome of the investigation and the action taken shall be documented on the complaints proforma. When practicable, a formal response to each complaint

received shall be prepared within a maximum of seven days so as to notify the concerned person(s) that action has been taken.

All enquires that trigger this process shall be reported in the monthly Environmental Monitoring & Audit Report, which shall include the results of inspections undertaken by site staff, and details of the measures taken, and additional monitoring results. It should be noted that the receipt of a complaint or enquiry will not, in itself, be sufficient reason to introduce additional mitigation measures. They will, however, initiate the Event/Action Plan and those procedures may lead to the introduction of mitigation measures if they are considered necessary. In all cases the complainant shall be notified of the findings of the Event/Action Plan and audit procedures put in place to ensure that the problem does not recur.

During the complaint investigation work, the Link 200 Joint Venture and the Engineer's Representative shall cooperate with the environmental-team leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Link 200 Joint Venture shall promptly carry out the mitigation. The Engineer's Representative shall ensure that the measures have been carried out by the Link 200 Joint Venture.

A flowchart of the complaint response procedures is shown in Appendix 6-2 and an example of complaint proforma is provided in Appendix 6-3.

6.4 Environmental Mitigation Measures

Environmental mitigation measures have been recommended in the Environmental Impact Assessment Report, which shall be implemented to control adverse effects on air quality, noise, water quality, wastes, land contamination, landscape and visual, and cultural heritage. The Environmental Mitigation Implementation Schedule is given in Appendix 1-2.

All mitigation measures shall be implemented properly during the entire construction period. The Link 200 Joint Venture shall review the recommended mitigation measures with respect to the latest construction methods and programme. The Link 200 Joint Venture shall also liaise with the environmental-team leader on some other mitigation measures.

6.4.1 Dust Mitigation Measures

The Link 200 Joint Venture is obliged to follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation and shall be responsible for the design and implementation of the recommended dust control and mitigation measures, which shall include:

- proper watering on all exposed spoil undertaken throughout the construction phase;

- any excavated or stockpile of dusty material covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then

removed or back-filled or reinstated within 24 hours of the excavation or unloading;

– any dusty material remaining after a stockpile is removed wetted with water and cleared from the surface of roads or streets;

– a stockpile of dusty material not extending beyond the pedestrian barriers, fencing or traffic cones;

– the load of dusty material on a vehicle leaving a construction site covered entirely by clean impervious sheeting to ensure that the dusty material does not leak from the vehicle;

– when practicable, vehicle washing facilities with high-pressure water jet provided at every discernible or designated vehicle exit point; the area where vehicle washing takes place and the road section between the washing facilities and the exit point paved with concrete, bituminous material or hardcore;

– when there are open excavation and reinstatement works, hoarding of not less than 2.4 metres high provided as far as practicable along the site boundary with provision for public crossing;

– all main haul roads paved with concrete, bituminous materials, hardcore or metal plates, and kept clear of dusty material; or sprayed with water or a dust suppression chemical so as to maintain the entire road surface wet;

– the portion of any road leading only to construction site that is within 30 metres of a vehicle entrance or exit kept clear of dusty material;

– surfaces where any pneumatic or power-driven drilling, cutting, polishing or other mechanical breaking operation takes place sprayed continuously with water or a dust suppression chemical;

– any area that involves demolition activities sprayed with water or a dust suppression chemical immediately prior to, during and immediately after the activities so as to maintain the entire surface wet;

– where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting provided to enclose the scaffolding from the ground-floor level of the building, or a canopy provided from the first-floor level up to the highest level of the scaffolding;

– any skip hoist for material transport should be totally enclosed by impervious sheeting;

– every stock of more than 20 bags of cement or dry pulverized fuel ash covered entirely by impervious sheeting or placed in an area sheltered on the top and three sides;

– cement or dry pulverized fly ash delivered in bulk stored in a closed silo fitted with an audible high-level alarm that is interlocked with the material filling line and no overfilling is allowed, and

– loading, unloading, transfer, handling or storage of bulk cement or dry pulverized fly ash carried out in a totally-enclosed system or facility, and any vent or exhaust fitted with an effective fabric filter or equivalent air-pollution control system.

By implementing those control measures and with good construction site practice, it is anticipated that dust impacts will be insignificant. The Link 200 Joint Venture will undertake proper watering on all exposed spoil (with at least four times per day for the West Kowloon Station and two times per day for the remaining sections) throughout the construction phase. The barging facility should be designed with dust enclosures along the loading ramps to avoid dust dispersion. All road surfaces within the barging facility should be paved. Watering should be undertaken twice a day over the work area and all vehicles are required to pass through designated wheel-washing facilities before leaving the barging facility.

6.4.2 Construction Noise Mitigation Measures

The Link 200 Joint Venture shall be responsible for the design and implementation of the construction noise control and mitigation measures, which shall include but not be limited to the following:

– use of site hoarding as a noise barrier to screen noise;

– quiet equipment and construction method should be employed;

– only well-maintained plant shall be operated on site and plant shall be serviced regularly during the construction work;

– machines and plant that may be in intermittent use (such as breakers) shall be shut down between work periods or should be throttled down to a minimum;

– mobile plant shall be sited as far away from noise-sensitive receivers as practicable;

– material stockpiles and other structures shall be effectively utilized, when practicable, to screen noise from on-site construction activities;

– silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works;

– the Link 200 Joint Venture shall proactively liaise with the School Representative on a regular basis to collate the latest information on the examination periods, and carefully arrange noisy construction activities to avoid those periods;

– use of temporary noise barrier/acoustic mat at for mobile plants;

– temporary enclosures should be provided for static plant, including compressors and generators, and

– the tunnel-boring-machine launching shaft should be provided with a noise insulating cover that will be closed during restricted hours to shelter the plant items; a typical configuration of acoustic panel that can achieve that insulation requirement is 1.5-millimetre galvanized-steel outer skin, 100-millimetre acoustic infill of 80 kilograms per cubic metre, and an inner perforated sheet.

The predicted construction groundborne noise impacts at noise-sensitive receivers are within the statutory requirements and, hence, mitigation measures are not required.

6.4.3 Water quality

No waste water will be discharged directly into the Victoria Harbour Water Control Zone. The requirements on good site practices as stipulated in ProPECC Note 5/93, Drainage Plan subject to Comment by the Environmental Protection Department, ProPECC Note 1/94, Construction Site Drainage, and Recommended Pollution Control Clauses for Construction Contracts shall be adopted to handle the construction site discharges.

When dewatering is needed during excavation, the ground water should be recharged below the water table outside the diaphragm wall (or temporary walls). The groundwater level should be monitored at the recharge point.

6.4.4 Waste Management

The Link 200 Joint Venture shall be responsible for controlling waste within the construction site, removing waste material, and implementing mitigation measures to minimize waste or redressing problems arising by waste. The waste material may include any sewage, waste water or effluent containing sand, cement, silt or any other suspended or dissolved material flowing from the site onto any adjoining land, storm sewer, sanitary sewer, or any waste matter or refuse to be deposited anywhere within the site or onto any adjoining land, as well as public fill generated as part of site formation activities.

The Link 200 Joint Venture shall also pay attention to the Waste Disposal Ordinance, the Dumping at Sea Ordinance, the Public Health and Municipal Services Ordinance and the Water Pollution Control Ordinance, and carry out the appropriate waste-management work. The relevant licence/permit, such as the effluent discharge licence and the chemical waste producer registration, shall be obtained. The Link 200 Joint Venture shall refer to the relevant booklets issued by the Environmental Protection Department and its Environmental Management Plan and Waste Management Plan when applying for the licence/permit.

During site inspections and document review procedures, the environmental-team leader shall pay special attention to the issues relating to waste management, and check whether the Link 200 Joint Venture has followed the relevant Contract Specifications and the procedures specified under the laws of the Hong Kong SAR.

Mitigation measures have been proposed in the Environmental Impact Assessment to minimize the generation of various waste and associated environmental impacts. In summary, the key measures are:

- ensure proper implementation of a trip-ticket system;
- re-use excavated fill material for back-filling and reinstatement;
- for the tunnel section to the north of the West Kowloon Station, stockpile excavated construction and demolition material adjacent to its source for immediate back-fill once the tunnel section is completed;
- carry out on-site sorting;
- surplus artificial hard material should be delivered to Tuen Mun Area 38 recycling plant for recycling into subsequent useful products;
- use the existing bituminous pavement for paving of construction access and temporary holding/parking areas;
- use standard formwork as far as practicable to minimize the arising of construction and demolition material;
- use metal hoarding to enhance the possibility of being recycled;
- consider alternatives that generate reduced quantities or even no chemical waste, or less dangerous types of chemical waste;
- handle chemical waste in accordance with the Code of Practice on the Packaging - Handling and Storage of Chemical Wastes;
- provide adequate numbers of portable toilets for the workers and maintain those toilet in a clean state, and
- ensure all general refuse is stored in enclosed bins or compaction units and provide waste-separation facilities for paper, aluminium cans, plastic bottles, etc.

6.4.5 Land Contamination

A land-contamination assessment has been conducted and historical information such as site geological information, ground condition, aerial photos have been reviewed. It has been concluded that approximately 39 cubic metres of soil near the ex-government dockyard at Canton Road Government was contaminated and, hence, need to be properly disposed. Figure 6-1 shows the location of drillhole of contamination.

The soil excavation and disposal methodology and the requirements for compliance testing for contaminated soil are given below. The necessary licence

requirements for the disposal of the contaminated materials are described in the Waste Management Plan.

a) Excavation and Disposal Methodology

The Remediation Assessment Plan has been prepared and submitted to the Environmental Protection Department for approval. During excavation of the contaminated soil, the procedure provided in the Remediation Assessment Plan shall strictly be followed.

The remediation area for contaminated soil shall be clearly marked out on site and excavated to an extent of 3.5-metre radius from the sample location. Excavation shall be undertaken by dedicated earth-moving plant.

The overlaying uncontaminated material shall be removed and stockpiled adjacent to the excavation until the specified depth is reached. The excavated contaminated soil should not be stockpiled on site, but should immediately be loaded onto trucks and taken to the chosen landfill site. All trucks carrying contaminated material should be adequately covered by sheets to prevent dispersion of contamination.

The remediation contractor shall have a valid discharge licence from the Environmental Protection Department when applicable and should carry out the remediation works in accordance with all relevant legislative requirements and the Environmental Protection Department's Guidance Note.

The remediation programme shall be supervised by the on-site geotechnical engineer (to be appointed by the Link 200 Joint Venture) with at least seven-years' experience in contamination assessment or decontamination. All relevant method statements prepared by the remediation contractor should be reviewed and approved by the decontamination specialist before proceeding with the works.

b) Compliance Testing

Following completion of excavation to the specified depth, the confirmatory testing shall consist of five samples in each contaminated site, situating immediately to the north, south, east and west of each contaminated site and at the base of the contaminated excavation. The compliance testing requirements are shown in Table 6-1.

Table 6-1 Requirements for Compliance Testing

Location	Testing Requirement	Acceptance Criteria
KSD100/DH063	Lead	Dutch B Level

If the analysis indicates continued presence of contamination, the excavation shall be extended a further l-metre depth or width, with material disposed of as described above, and a further sample taken for compliance testing. The process of excavation, sampling and compliance testing should continue until all contaminated material is removed. The excavated hole shall then be back-filled by using suitable clean fill material.

c) Protective and Safety Measures

The contaminants present on the site are at relatively low levels, and are not expected to pose serious acute health risk to the site workforce. However, it is good practice to ensure that remediation workers are adequately protected to ensure that there are no significant residual risks. The health and safety precautions shall include:

- personal protective equipment, such as safety hat, chemical protective gloves, masks, eye goggles, protective clothing (upgraded if contact with contaminated material cannot be avoided) and protective footwear shall be provided to staff involved in the remediation work (work must *not* be allowed without suitable personal protective equipment);

- workers shall inspect and check their personal protective equipment before, during and after use; in cases where any of the personal protective equipment is broken, the worker shall stop work immediately and inform the on-site registered safety officer; that worker shall *not* be allowed to re-start his work until the damaged personal protective equipment is replaced;

- hand-washing basins or other washing facilities shall be provided in areas easily accessible to all workers;

- workers shall always maintain basic hygiene standards (eg, hand wash before leaving the contaminated work zone); workers shall also be responsible for cleaning and storing their own personal protective equipment in a secure place before leaving the site, and

- eating, drinking and smoking shall be strictly prohibited within the site areas, and

It should be noted that those precautions are additional to any other health and safety requirements that will apply on the site, such as those requiring protective footwear and headgear.

6.4.6 Landscape and Visual

A number of mitigation measures have been identified in the Environmental Impact Assessment to minimize the landscape and visual impacts during the construction phase and operational phase as detailed in the Environmental Mitigation Implementation Schedule. The effectiveness of the Link 200 Joint Venture's implementation and maintenance of those mitigation measures shall be monitored as part of the ongoing site audit programme.

a) Landscape

Landscape mitigation measures include action to:

– retain and protect existing trees within the Link 200 Joint Venture's temporary works areas and in the site of the Former Marine Police Headquarters (FMPHO);

- make sure that trees to be maintained are not damaged during the construction work;

- make sure that tree transplanting is conducted efficiently without reducing the survival potential of the transplanted tree;

- incorporate all compensatory trees as in the Environmental Impact Assessment Report;

- protect Champion trees along HaiPhong Road at all times;

- make sure that landscape restoration works start at the earliest opportunity to-minimize the visual impact of the works;

- monitor planting, if applicable, to ensure correct species and correct spacing, etc, to ensure maximum possible survival rates are achieved;

- monitor the number of planted trees to ensure that tree loss is adequately compensated for in terms of their numbers;

- take photographical records of all retained trees before construction;

- provide a Tree Protection Specification and a Tree Transplanting Specification in the Contract Specification;

- submit a detailed construction method statement, under the detailed Tree Protection Specification, for trees protection by the Link 200 Joint Venture, and

- ensure the provision of an attractive public streetscape area in front of the West Kowloon Station (at least 400 square metres), with shade trees in paving and adequate seating facilities, as partial mitigation for the permanent alienation of the public open space at the corner of Canton Road and Kowloon Park Drive.

b) Visual

Visual mitigation measures include action to:

- make sure that site hoardings are positioned correctly to provide visual screening of the works from key sensitive receivers, and

- make sure that the recommendations of the Environmental Impact Assessment for hoarding arrangement, colours, design and heights are implemented efficiently on-site and are maintained in a clean and tidy state during construction.

6.4.7 Cultural heritage

The Link 200 Joint Venture shall conduct structural monitoring during the construction of the bored tunnel underneath the Former Marine Police Headquarters to ensure compliance with the Buildings Ordinance. He shall

prepare and submit a monitoring methodology for submission to the relevant government departments (eg, the Buildings Department and the Antiquities and Monuments Office) for agreement/approval.

In addition, before starting construction work, the Link 200 Joint Venture shall also consult the Antiquities and Monuments Office on any other mitigation measures that would be required administratively or under the Antiquities and Monuments Ordinance. The Link 200 Joint Venture shall implement those requirements from the Antiquities and Monuments Office during the construction period.

7. Reporting

7.1 General

The following reporting requirements are based on a paper documented approach. However, the same information can be provided in an electronic medium on agreeing the format with the Engineer's Representative and the Environmental Protection Department. That would enable a transition from a paper/historic and reactive approach to an electronic/real-time proactive approach.

7.2 Baseline Monitoring Report

The environmental-team leader shall prepare and submit a Baseline Environmental Monitoring Report, endorsed by the independent environmental checker, within ten working days of the completion of baseline monitoring. Copies of the Baseline Environmental Monitoring Report shall be submitted to each of the four parties:

– Link 200 Joint Venture;
– independent environmental checker;
– Engineer's Representative, and
– Environmental Protection Department.

The environmental-team leader shall liaise with the relevant parties on the exact number of copies required. The format of the report and the format of the baseline monitoring data in magnetic media to be submitted to the Environmental Protection Department shall be agreed with the Environmental Protection Department.

The baseline monitoring report shall include:

– up to a half-page executive summary;

– brief project-background information;

– drawings showing locations of the baseline monitoring stations;

– monitoring results (in both hard and diskette copies) together with the following information:
  - monitoring methodology;
  - equipment used and calibration details;
  - parameters monitored;
  - monitoring locations (and depth), and
  - monitoring date, time, frequency and duration;

– 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;

– determination of the action and limit levels for each monitoring parameter and

statistical analysis of the baseline data;

– revisions for inclusion in the Environmental Monitoring & Audit Manual, and

– comments and conclusions.

7.3 Monthly Environmental Monitoring & Audit Report

The results and findings of all environmental monitoring and audit works required in this manual shall be recorded in the Monthly Environmental Monitoring & Audit Report prepared by the environmental-team leader and endorsed by the independent environmental checker. The Environmental Monitoring & Audit Report shall be prepared and submitted within ten working days of the end of each reporting month, with the first report due in the month after construction starts. Copies of each monthly Environmental Monitoring & Audit Report shall be submitted to each of the four parties:

– Link 200 Joint Venture;
– Engineer's Representative;
– independent environmental checker, and
– Environmental Protection Department.

Before submission of the first Environmental Monitoring & Audit Report, the environmental-team leader shall liaise with the parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement.

The environmental-team leader shall review the number and location of monitoring stations and monitoring parameters every six months or on an as-needed basis in order to cater for the changes in surrounding environment and nature of works in progress.

7.3.1 First Monthly Environmental Monitoring & Audit Report

The first monthly Environmental Monitoring & Audit Report shall include at least:

– Executive Summary (one-page);

– Basic Project Information, including a synopsis of the project organization, programme and management structure, and the work undertaken during the month;

– Brief Summary of Environmental Monitoring and Audit Requirements, including:
  - all monitoring parameters;
  - environmental quality performance limits (action and limit levels);
  - Event-Action Plans;
  - environmental mitigation measures, as recommended in the Environmental Impact Assessment Report, and
  - environmental requirements in Contract documents;

– Advice on Implementation Status of Environmental Protection and Pollution Control/Mitigation Measures, as recommended in the Environmental Impact Assessment Report and Implementation Schedule;

– Drawings, showing the project area, any environmental-sensitive receivers and the locations of the monitoring and control stations;

– Monitoring Results (in hard and diskette copies) together with:
  - monitoring methodology;
  - equipment used and calibration details;
  - parameters monitored;
  - monitoring locations (and depth), and
  - monitoring date, time, frequency, and duration;

– Graphical Plots of Trends of monitored parameters over the past four scheduled audits for representative monitoring stations annotated against:
  - major activities being carried out on site during the period;
  - weather conditions during the period, and
  - any other factors that might affect the monitoring results;

– Advice on Solid and Liquid Waste Management Status;

– Summary of Non-compliance (Exceedances), of the environmental quality performance limits (action and limit levels);

– Review of Reasons for and Implications of Non-compliance, including review of pollution sources and working procedures;

– Description of Actions Taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance;

– Summary Record of Complaints Received (written or oral) for each media, including locations and nature of complaints, liaison and consultation undertaken, actions and follow-up procedures taken and summary of complaints, and

– Account of Future Key Issues, as reviewed from the works programme and work method statements.

7.3.2 Subsequent Environmental Monitoring & Audit Reports

The subsequent monthly Environmental Monitoring & Audit Reports shall include:

– Title Page;

– Executive Summary (one page):
  - Breaches of Action-limit Levels;
  - Complaints Log;
  - Reporting Changes, and
  - Future Key Issues;

– Contents Page;

– Environmental Status:
  - 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;

– Environmental Issues and Actions:
  - Review Issues Carried Forward, and any follow-up procedures related to earlier non-compliance (complaints and deficiencies);
  - Description of Actions Taken, in the event of non-compliance and deficiency reporting;
  - Recommendations, should be specific and target the appropriate party for action, and
  - Implementation Status, of the mitigation measures and the corresponding effectiveness of the measures;

– Future Key Issues, and

– Appendices:
  - action-limit levels;
  - graphical plots of trends of monitored parameters at key stations over the past four scheduled audits for representative monitoring stations annotated against:
    - 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.

7.3.3 Final Environmental Monitoring & Audit Review Report

The Final Environmental Monitoring & Audit Report shall contain at least:

– Executive Summary (one page);

– EM&A termination proposal, including determination criteria based on completion of construction activities, trends analysis of the EM&A programme, no environmental complaint and prosecution and IEC's endorsement.

– Drawings, showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;

– Basic Project Information, including a synopsis of the project organization contacts of key management, and a synopsis of work undertaken during the course of the project or past 12 months;

– Brief Summary, of Environmental Monitoring and Audit Requirements,

including:
- environmental mitigation measures, as recommended in the Environmental Impact Assessment Report;
- environmental impact hypotheses tested;
- action-limit levels;
- all monitoring parameters, and
- Event-Action Plans;

– Summary of Implementation Status, of environmental protection and pollution control/mitigation measures, as recommended in the Environmental Impact Assessment Report summarized in the updated implementation schedule;

– Graphical Plots and Statistical Analysis, of the trends of monitored parameters over the course of the project, including post-project monitoring (for the past 12 months for annual report) for all monitoring stations 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;

– Summary of Non-compliance (Exceedances), of the environmental quality performance limits (action-limit levels);

– Review, of reasons for and the implications of non-compliance, including review of pollution sources and working procedures as appropriate;

– Description of Actions Taken, in the event of non-compliance;

– Summary Record of Complaints Received (written or verbal), for each media liaison and consultation undertaken, action and follow-up procedures taken;

– Summary Record of Notifications of Summons and Prosecutions, for breaches of the current environmental protection/pollution control legislation, including locations and nature of the breaches, investigation, follow-up actions taken and results;

– Review of Validity of Environmental Impact Assessment Report predictions and identification of shortcomings in Environmental Impact Assessment Report recommendations;

– Review of Effectiveness and Efficiency of Mitigation Measures; and

– Review of Success of Environmental Monitoring and Audit Programme to cost effectively identify deterioration and to initiate prompt effective mitigation action when necessary.

7.4 Data Keeping

Site documents, such as the monitoring field records, laboratory analysis records and site inspection forms, are not required to be included in the monthly Environmental Monitoring & Audit Reports. However, the documents shall be

retained by the environmental-team leader and be ready for inspection on request. All relevant information shall be clearly and systematically recorded in the documents. The monitoring data shall also be recorded in magnetic media form. All the documents and data shall be kept for at least one year after completion of the construction Contract.

7.5 Interim Notification of Environmental Quality Limit Exceedances

With reference to Event/Action Plans, when the environmental quality limits are exceeded, the environmental-team leader shall immediately notify the Engineer's Representative, the independent environmental checker and the Environmental Protection Department, as appropriate. The notification shall be followed up to advise the Environmental Protection Department and the independent environmental checker of the results of the investigation, proposed action and, if necessary, follow-up proposals in case of exceedance. A sample template for the interim notifications is shown in Appendix 6-1.

Figures

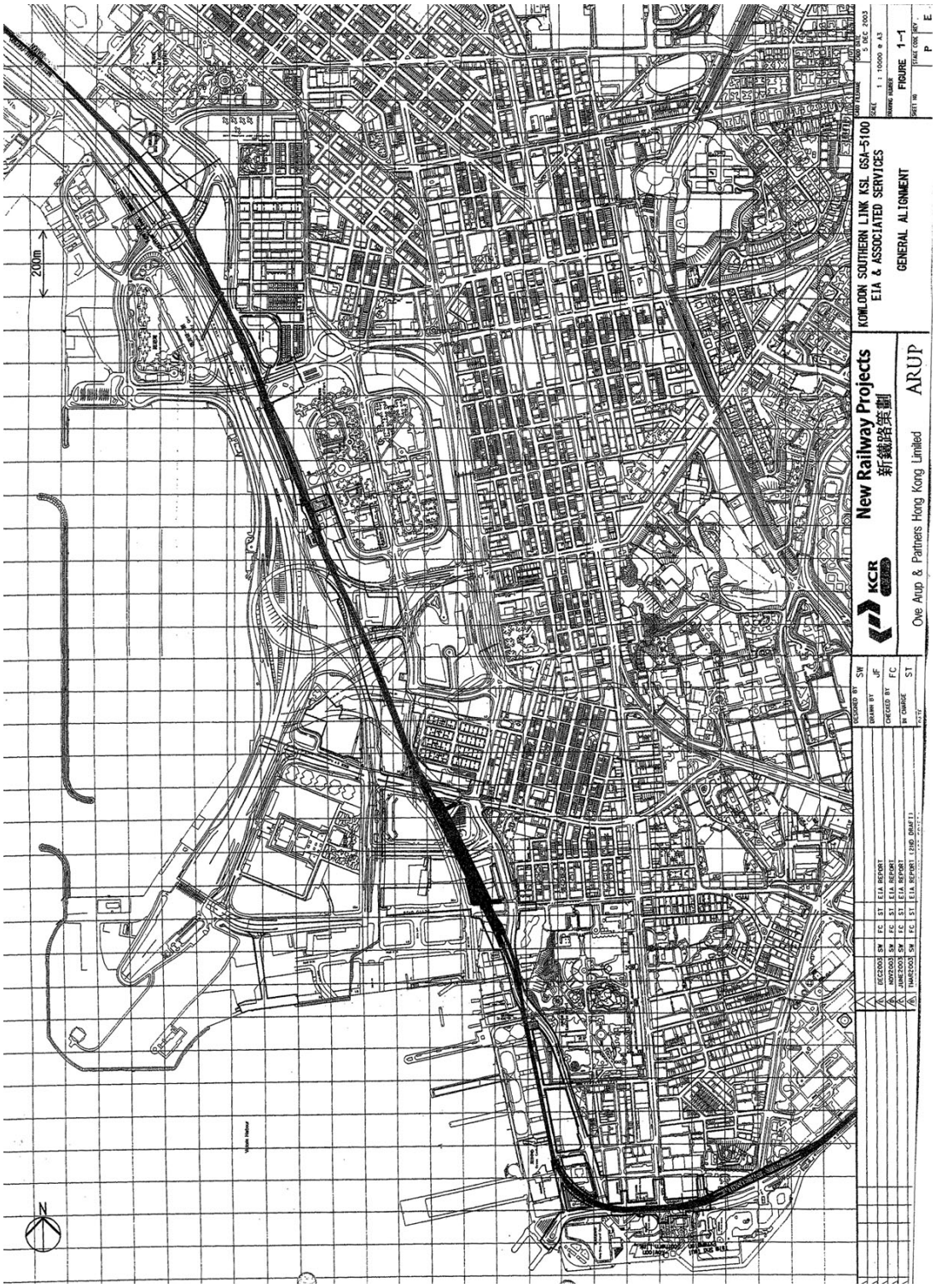


Figure 1.1 General Alignment

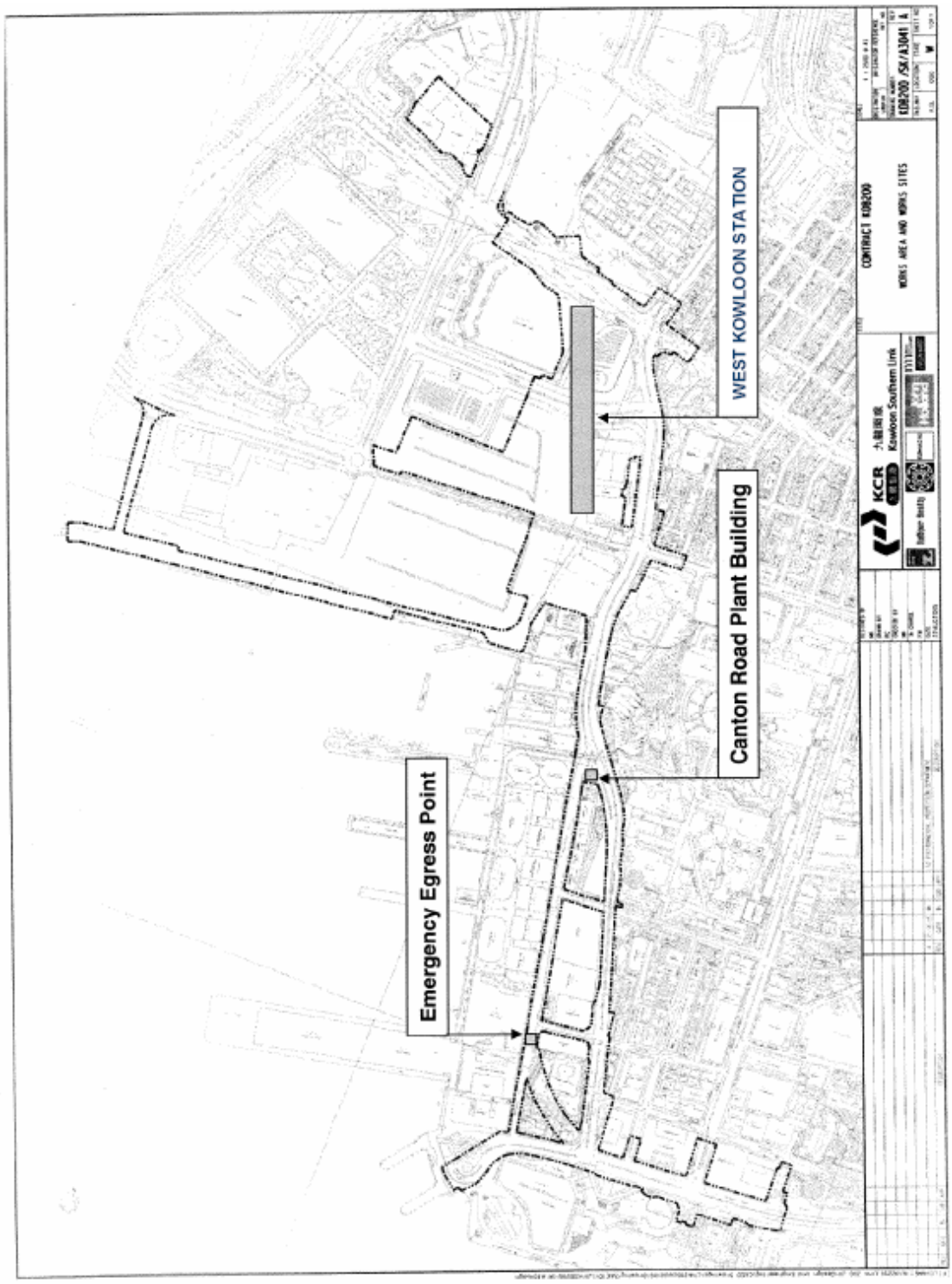


Figure B1 Boundary

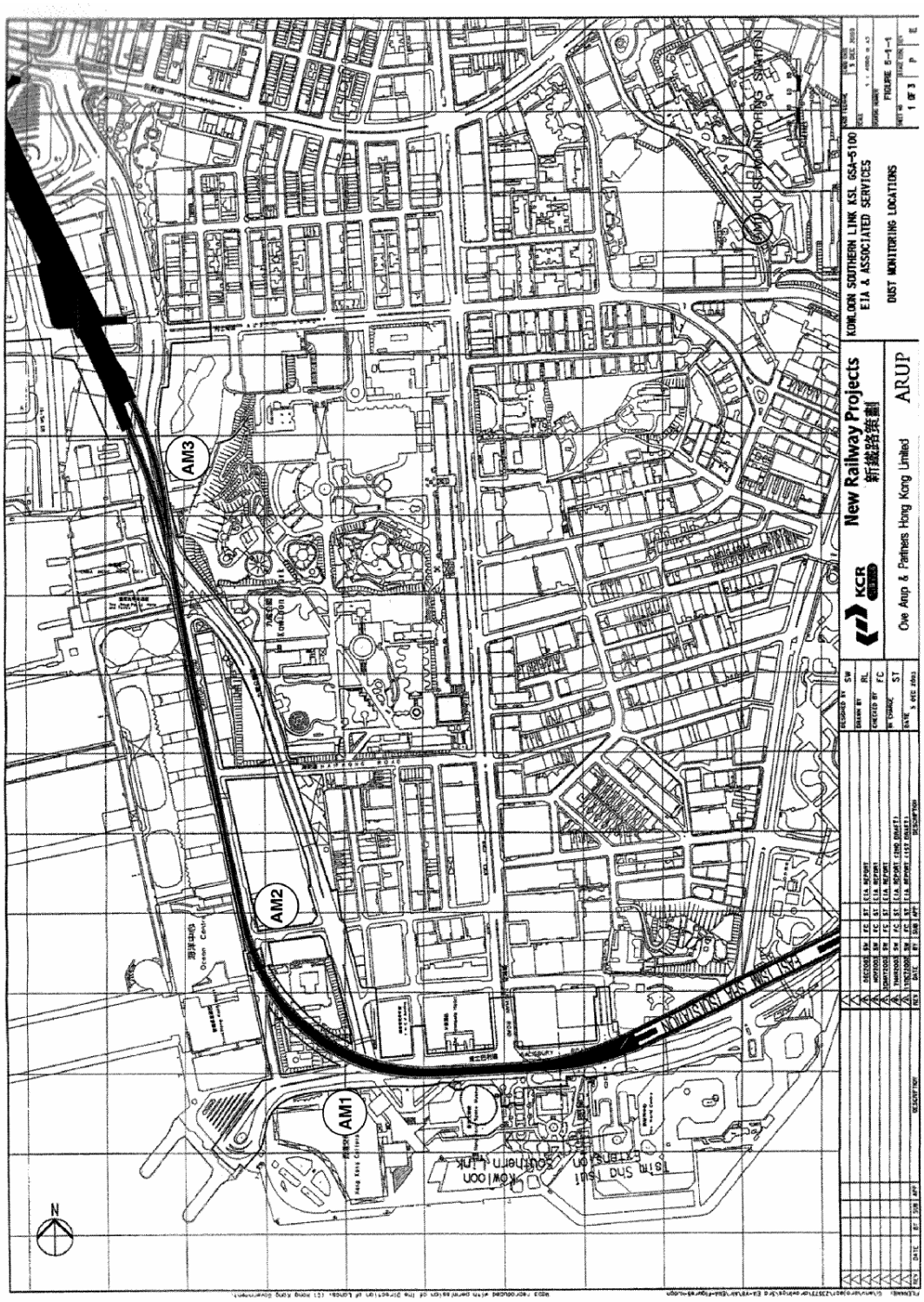


Figure E1 Monitoring Location (1)

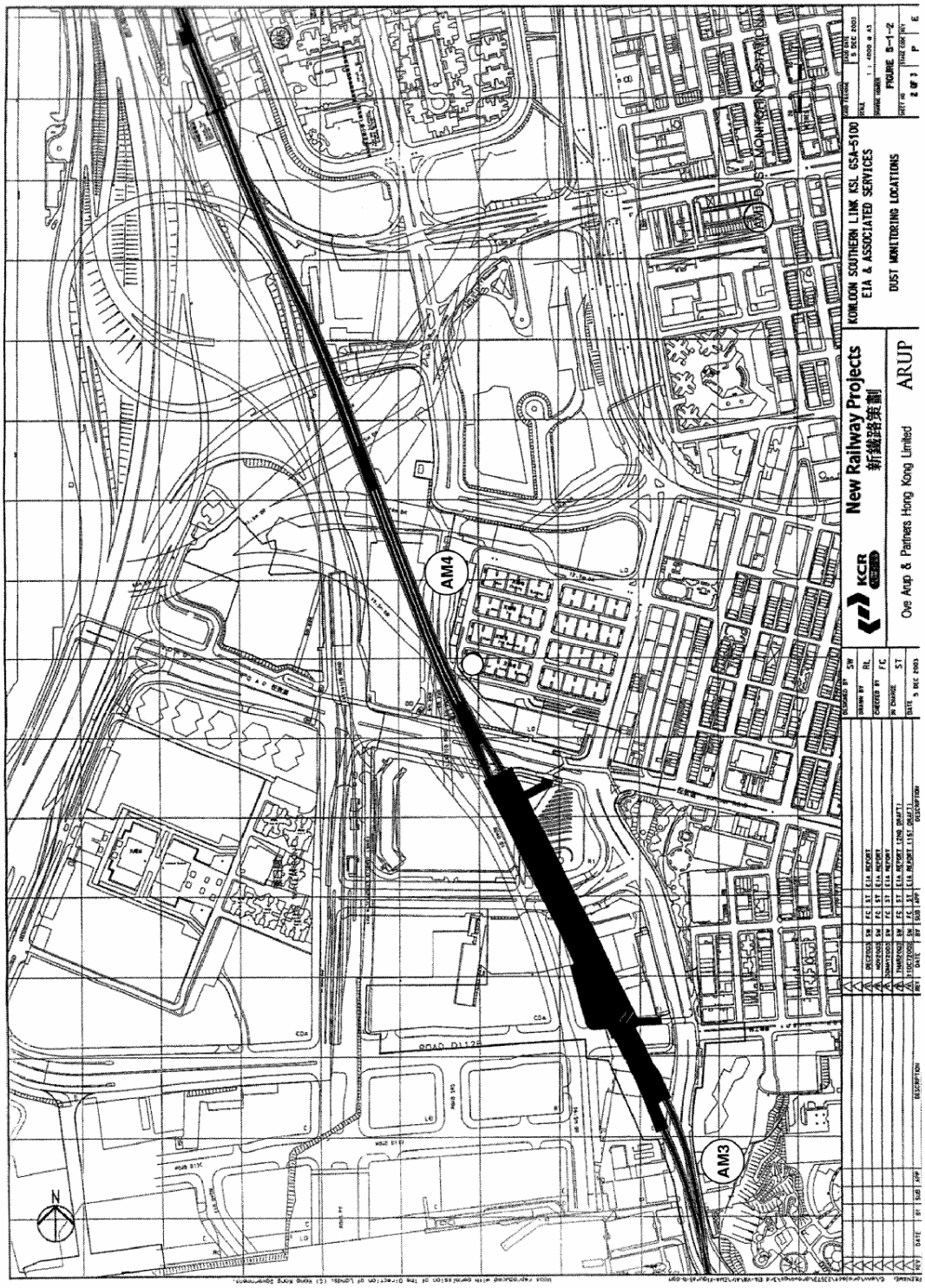


Figure 8.1.2 Air Monitoring Locations (2)

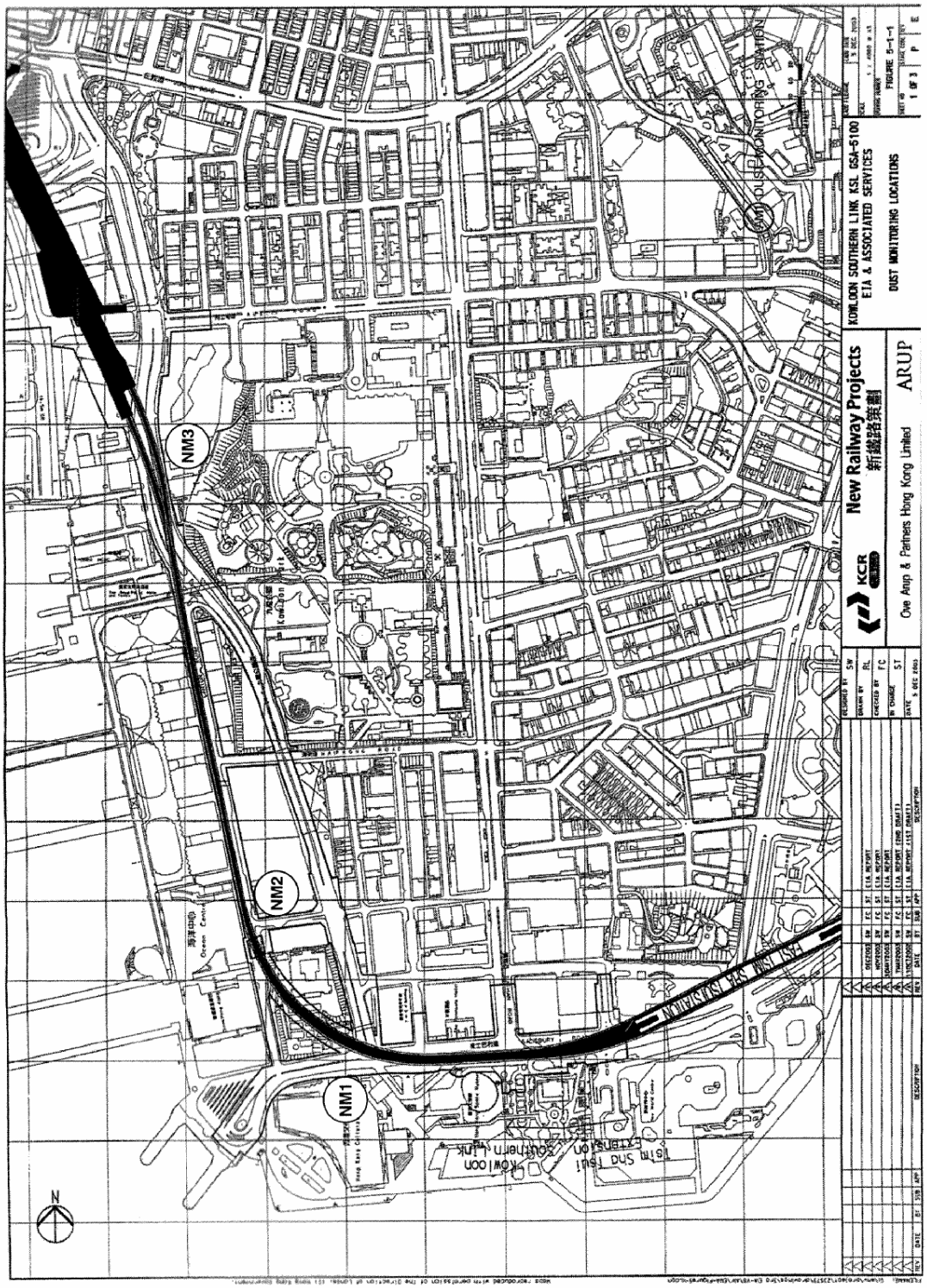


Figure 5-1-1 Dust Monitoring Locations

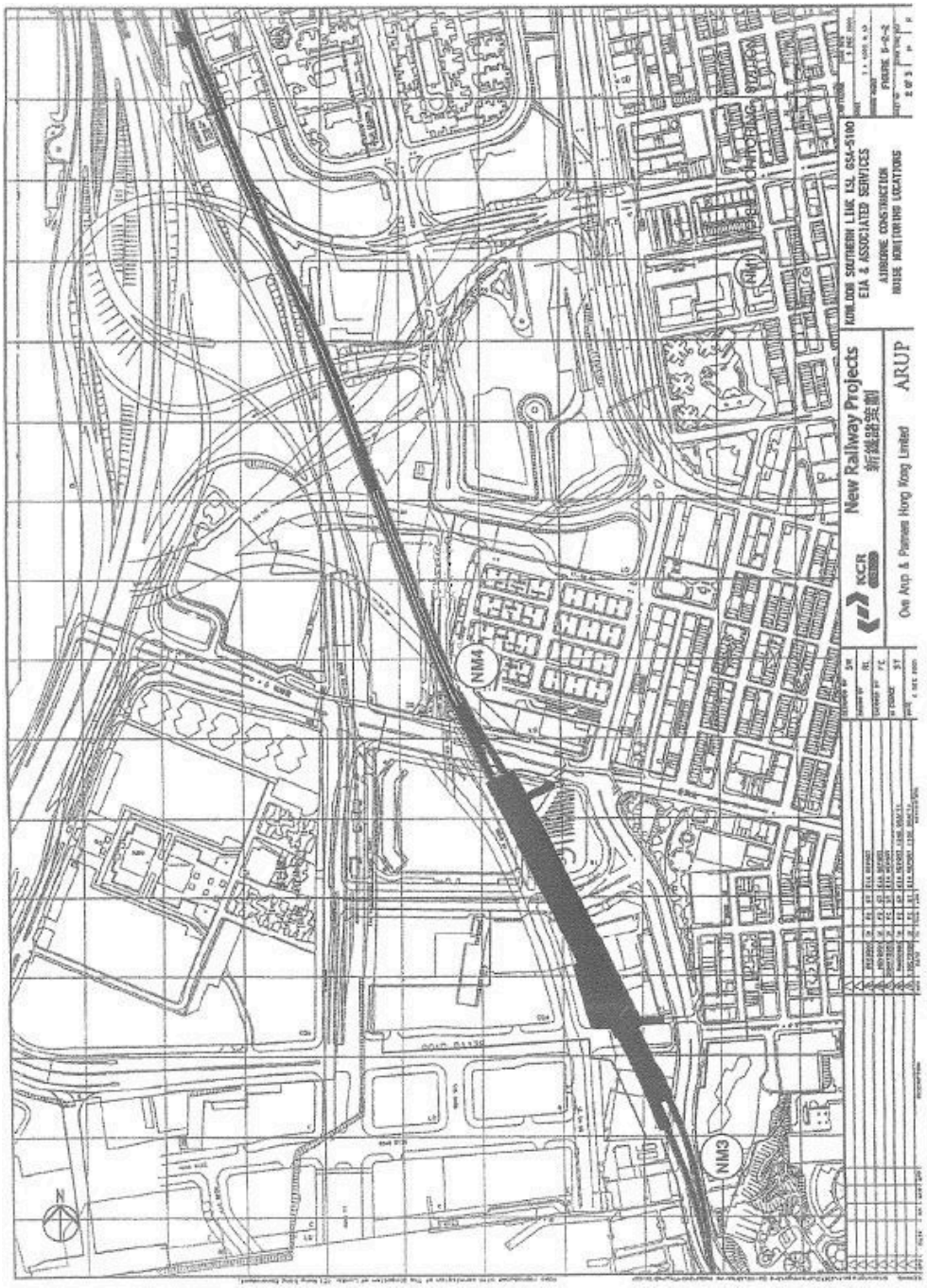


Figure 2.1 Construction Noise Monitoring Location (2)

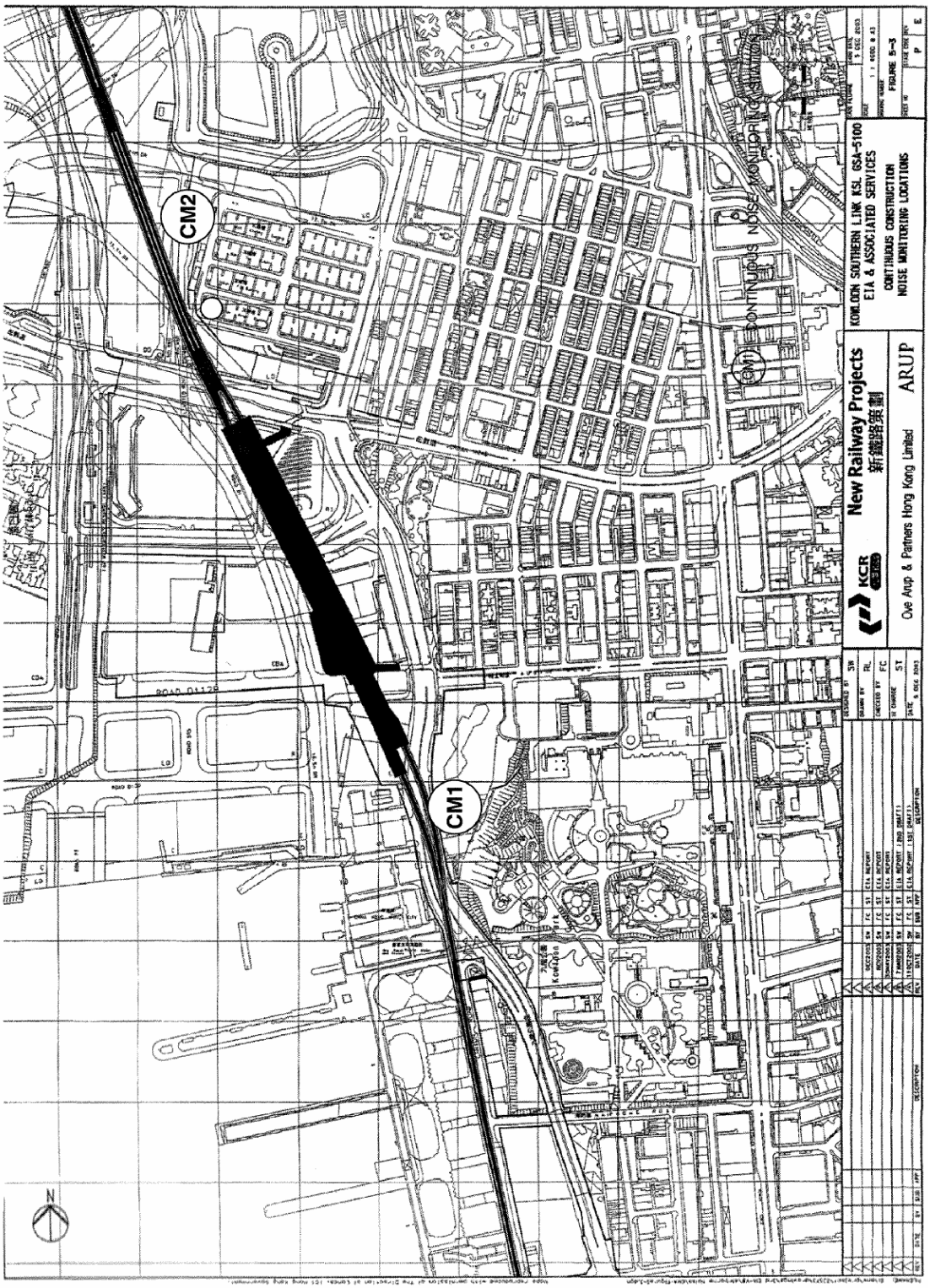


Figure 5-5 Continuous Construction Noise Monitoring Locations

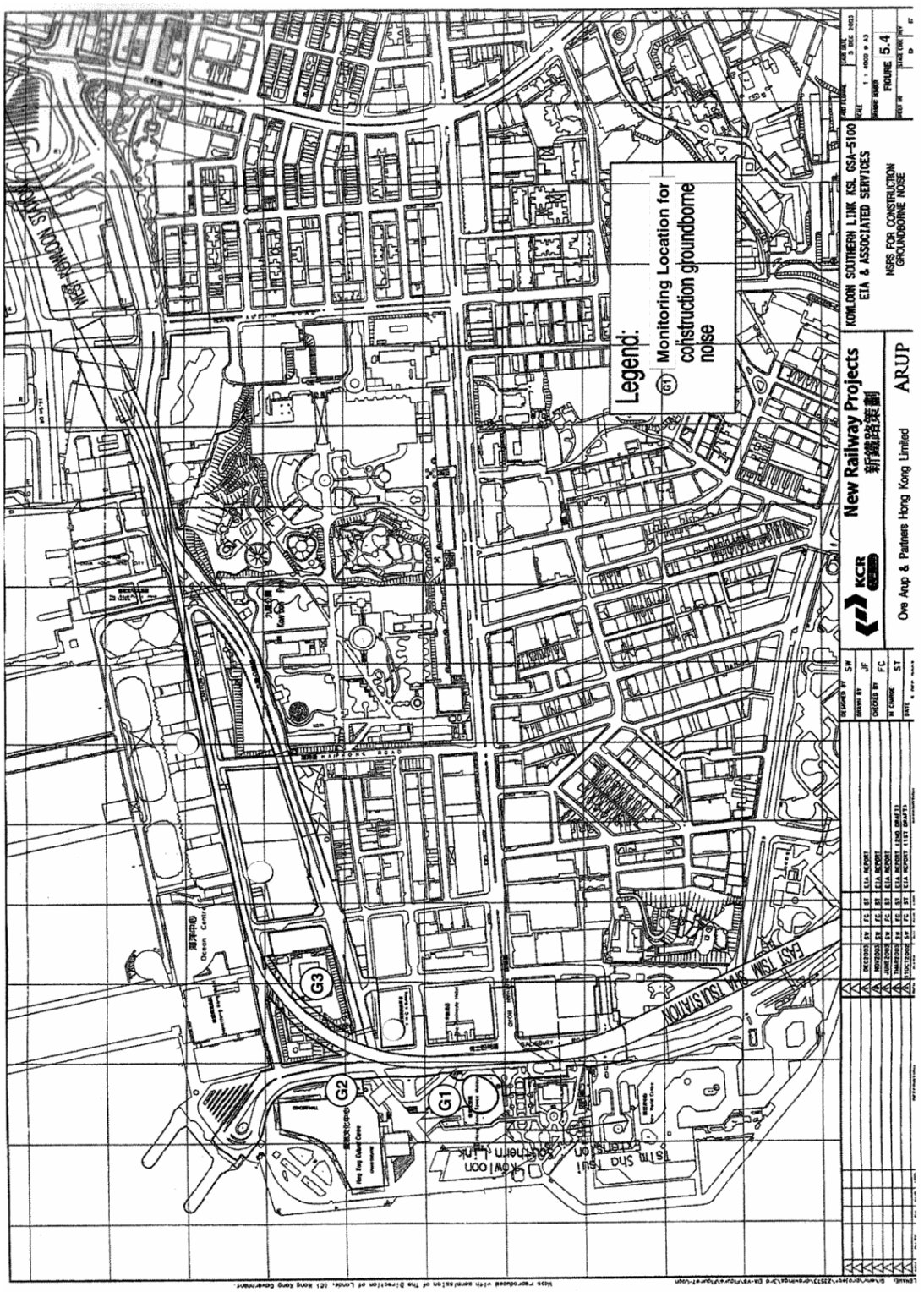


Figure 5.4 Location of Monitoring Stations for Construction Groundborne Noise

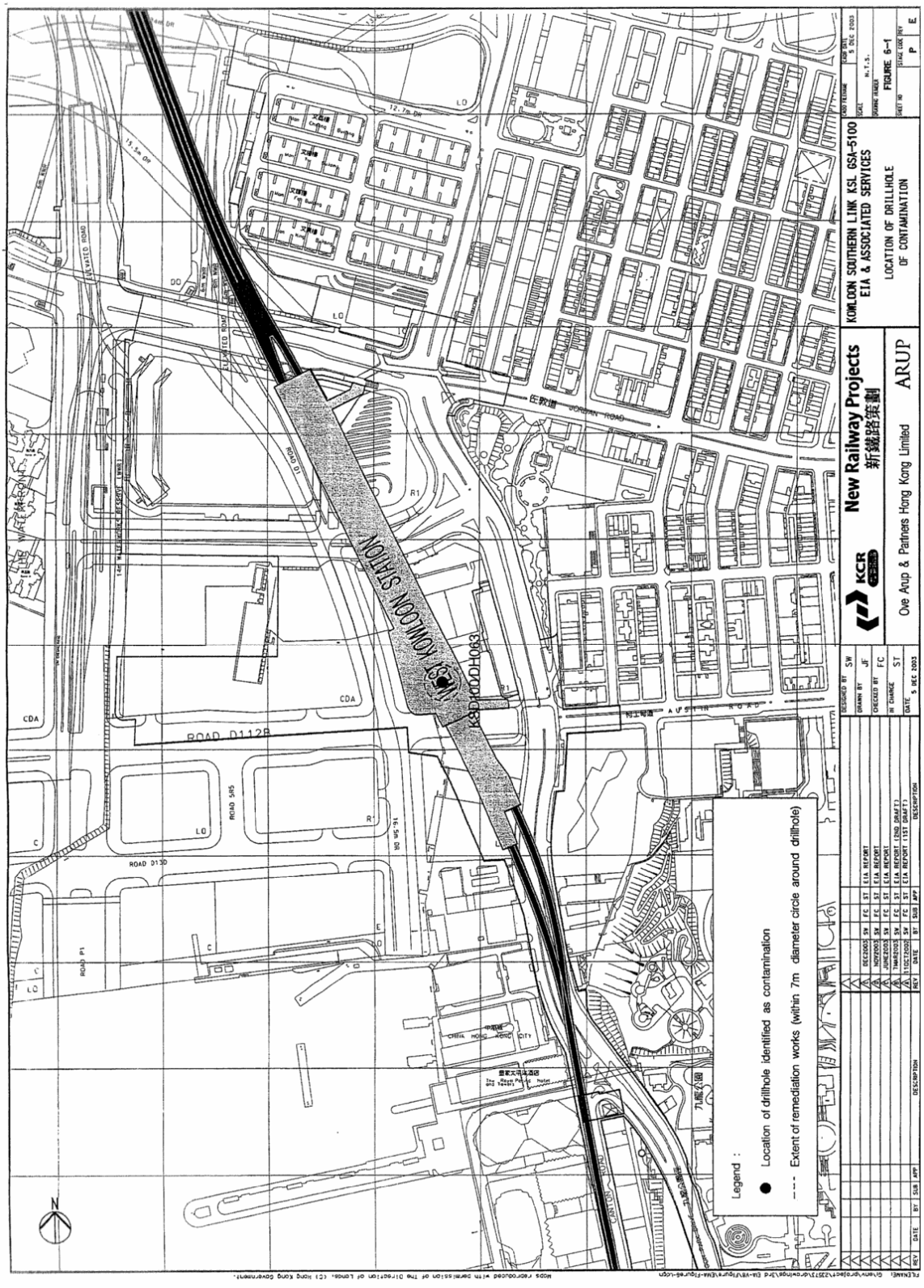


Figure 6-1 Location of Drillhole of Contamination

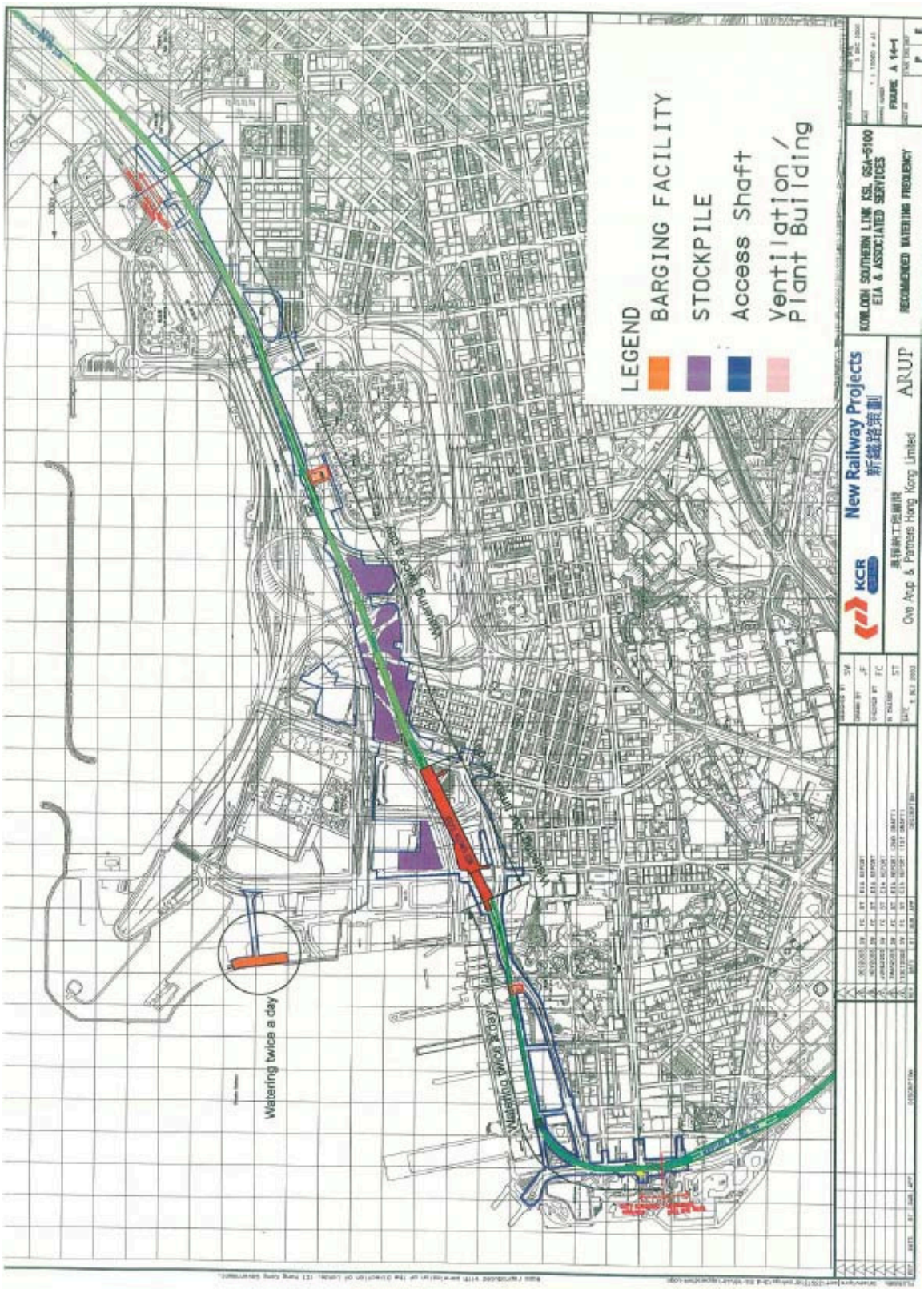


Figure 4.1 Recommended Watering Frequency

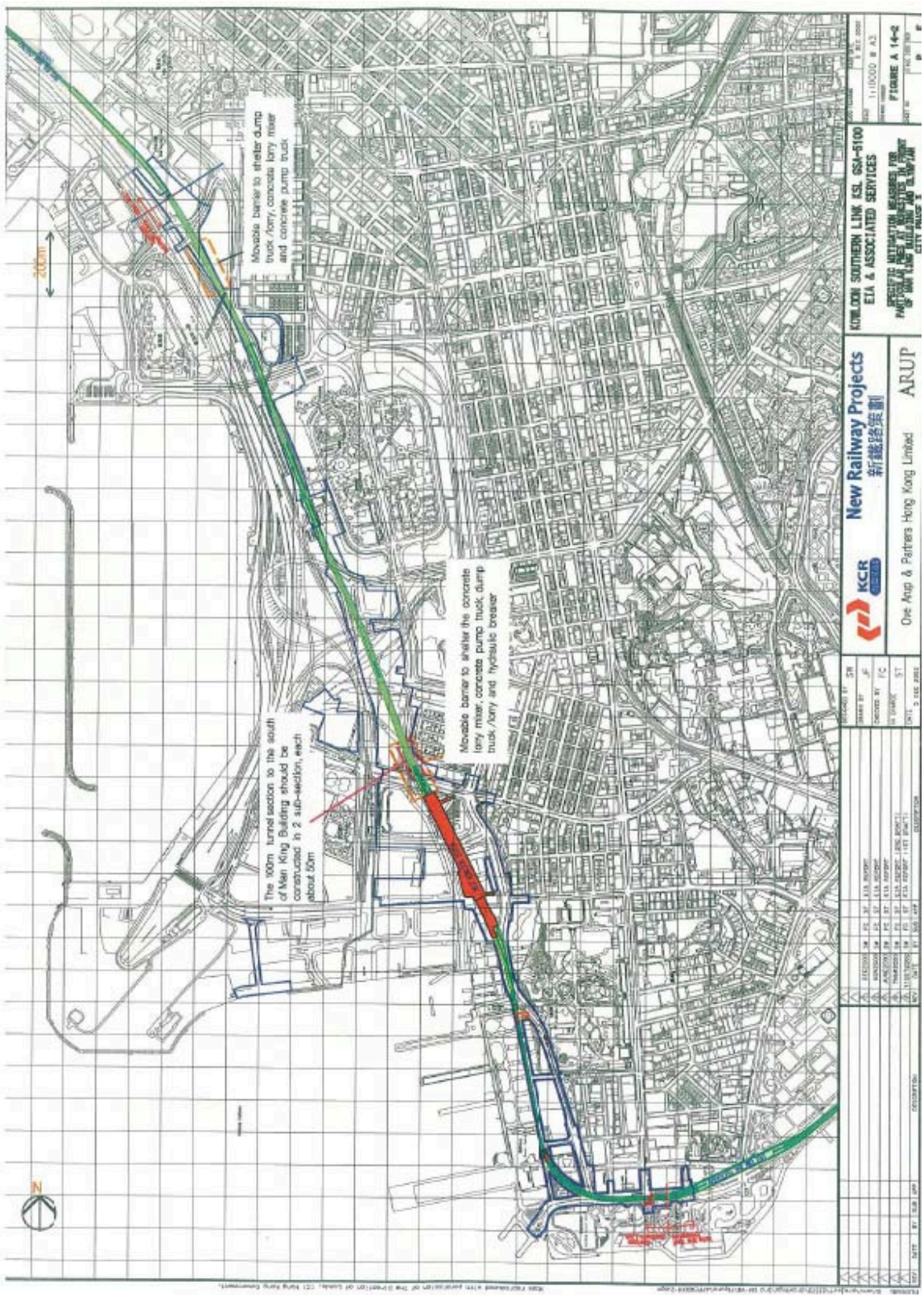


Figure A14.2 Location of Movable Barrier

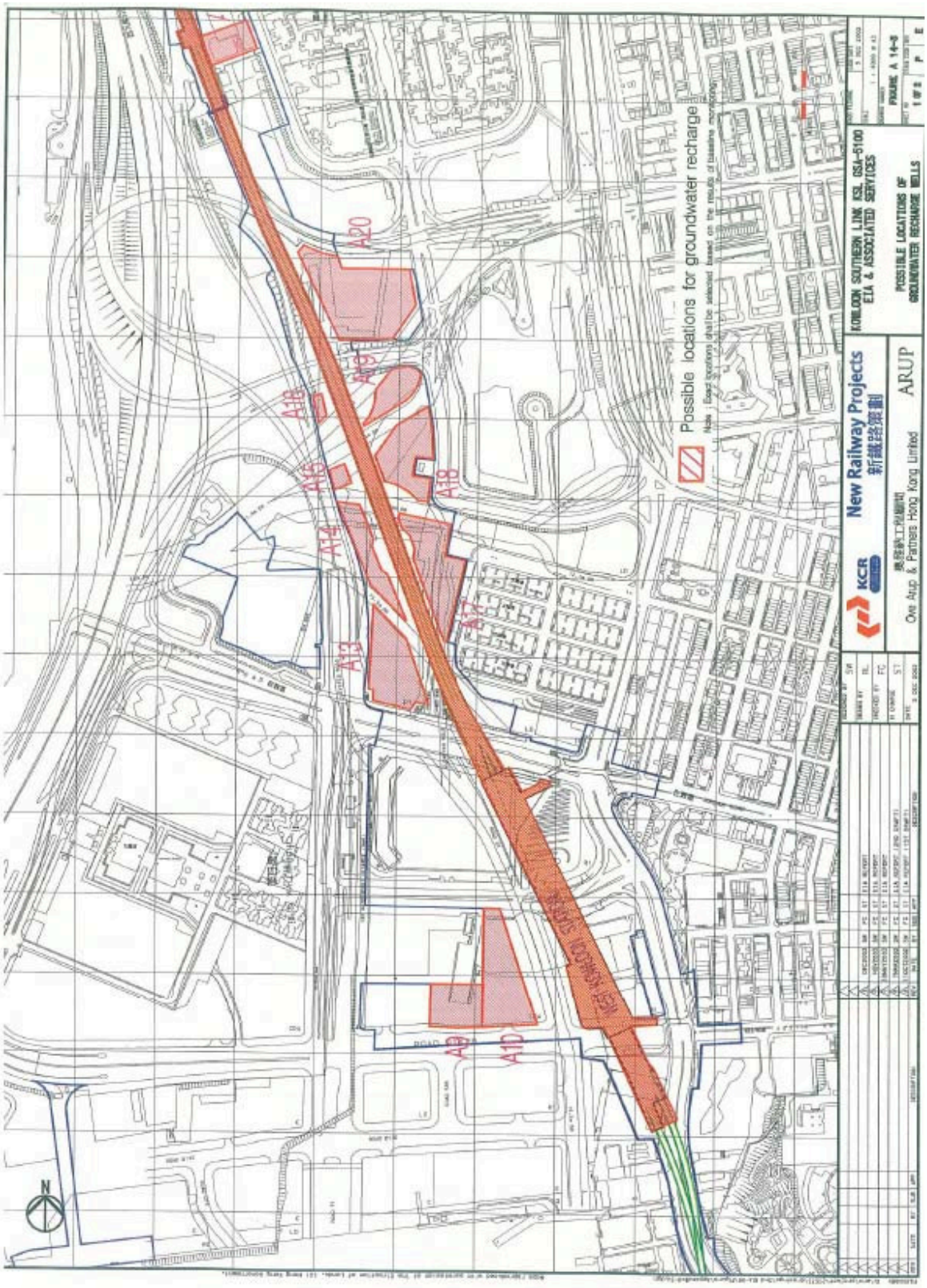
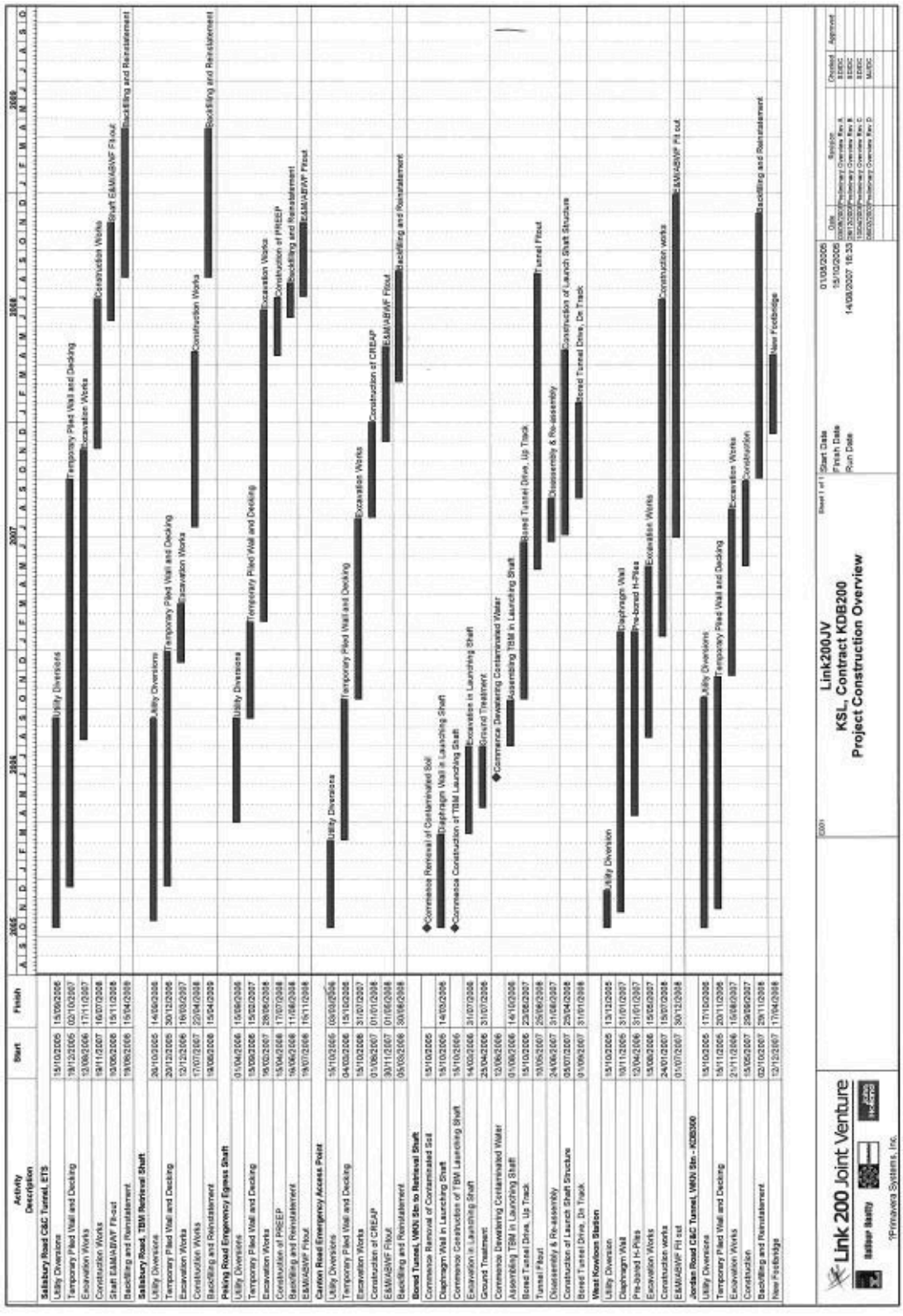


Figure A14.2 Locations of Groundwater Recharge Wells

Appendix 1-1
Master Construction Programme


Link 200 Joint Venture
Link200JV
KSL, Contract KDB200
Project Construction Overview
Start Date
Finish Date
Run Date
01/03/2006
15/10/2009
14/03/2007 16:33

Appendix 1-2
Environmental Mitigation Implementation Schedule

Environmental Mitigation Implementation Schedule

Note: Chapters 1 to 3 of the Environmental Impact Assessment Report present the background information of the project, identified concurrent projects, objectives and scope for various environmental aspects, and selection of the preferred alignment. Chapters 15, 16 and 17 describe the environmental outcomes, conclusion and reference of the Environmental Impact Assessment Study. There are no mitigation measures recommended in those chapters.

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
Construction Methodologies							
S4.3.3		1) The proposed spoil transfer system uses liquid to transport the excavated material inside pipelines from the bottom of the launching shaft to ground level treatment plant near Area A7 should have the following features as standard good practices: - Spoil transfer system should be fully enclosed to suppress dust emission - Spoil transfer points and hopper discharge areas will be enclosed to control dust emission - At the fixed transfer point, a three-sided roofed enclosure with a flexible curtain the entry should be provided. Exhaust fans shall be provided for this enclosure and vented to a suitable fabric filter system	To protect sensitive receivers in vicinity of the launching shaft from dust and noise nuisance due to operation of spoil transfer system	Link 200 Joint Venture	Spoil transfer system inside launching shaft near West Kowloon Station	Construction stage	Air Pollution Control (Construction Dust) Control dust impact to within HKAQO and TM-EIA criteria (Ref. 1-hr and 24-hr total suspended particulates levels are 500 μgm^{-3} and 260 μgm^{-3}, respectively) Noise Control Ordinance and its Technical Memoranda
S4.3.3		2) To apply separate application of Construction Noise Permit for bored tunnelling works during restricted hours	To protect sensitive receivers in vicinity of launching shaft from noise impacts due to overnight operation	Link 200 Joint Venture	Construction Noise Permit for overnight operation of launching shaft near West Kowloon Station	Construction stage	• Noise Control Ordinance and its Technical Memoranda

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
Construction Dust							

S5.6		1) The Link 200 Joint Venture shall follow the procedures and requirements given in the Air Pollution Control (Construction Dust) Regulation
		- Proper watering of exposed spoil should be undertaken throughout the construction phase:
		  - at least four times a day for the West Kowloon Station during excavation;
		  - at least twice a day for other sections;
		- Any excavated or stockpile of dusty material should be covered entirely by impervious sheeting or sprayed with water to maintain the entire surface wet and then removed or back-filled or reinstated when practicable within 24 hours of the excavation or unloading;
		- Any dusty material remaining after a stockpile is removed should be wetted with water and cleared from the surface of roads or streets
		- A stockpile of dusty material should not be extend beyond the pedestrian barriers, fencing or traffic cones;
		- The load of dusty material on a vehicle leaving a construction site should be covered entirely by impervious sheeting to ensure that the dusty material does not leak from the vehicle;
		- When practicable, vehicle washing facilities with high-pressure water jet should be provided at every discernible or designated vehicle exit point. The area where vehicle washing takes place and the road section between the washing facilities and the exit point should be paved with concrete, bituminous materials or hardcore;
		- When there are open excavation and reinstatement works, hoarding of not less than
			Good construction site practices to control dust impact at nearby sensitive receivers to within relevant criteria
			Specifically, watering at least 4 times a day is required for the West Kowloon Station in order to mitigate dust impact at Man King Building, Lai Chack School, Canton Road Government School, etc, during excavation for West Kowloon Station
				Link 200 Joint Venture	All construction sites
					See Figure A14-1 for watering frequency
						Construction stage	To control dust impact to within HKAQO and TM-EIA criteria (Ref. 1-hr and 24-hr total suspended particulates levels are 500 μgm^{-3} and 260 μgm^{-3}, respectively)

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		2.4 m high should be provided as far as practicable along the site boundary with provision for public crossing; - All main haul roads should be paved with concrete, bituminous material, hardcore or metal plates, and kept clear of dusty material; or sprayed with water or a dust suppression chemical so as to maintain the entire road surface wet; - The portion of any road leading only to construction site that is within 30 m of a vehicle entrance or exit should be kept clear of dusty material; - Surfaces where any pneumatic or power-driven drilling, cutting, - polishing or other mechanical breaking operation takes place should be sprayed with water or a dust suppression chemical continuously; - Any area that involves demolition activities should be sprayed with water or a dust suppression chemical immediately prior to during and immediately after the activities so as to maintain the entire surface wet; - Where a scaffolding is erected around the perimeter of a building under construction, effective dust screens, sheeting or netting should be provided to enclose the scaffolding from the ground floor level of the building, or a canopy should be provided from the first-floor level up to the highest level of the scaffolding; - Any skip hoist for material transport should be totally enclosed by impervious sheeting; - Every stock of more than 20 bags of cement or					

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		dry pulverized fuel ash should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides; - Cement or dry pulverized fly ash delivered in bulk should be stored in a closed silo fitted with an audible high-level alarm that is interlocked with the material filling line and no overfilling is allowed; - Loading, unloading, transfer, handling or storage of bulk cement or dry pulverized fly ash should be carried out in a totally-enclosed system or facility, and any vent or exhaust should be fitted with an effective fabric filter or equivalent air-pollution control system;					
S4.4.2, S5.3 & S5.6		2) Design the barging facility in a way similar to the one being used in the East Rail Extension Project in Hung Horn Bay with the following features: - All road surfaces within the barging facility will be paved; - Dust enclosures will be provided along the loading ramps to avoid dust dispersion; - Vehicles will be required to pass through designated wheel washing facilities before leaving the barging facility All exposed areas within barging point should be wetted with water twice a day	Control construction dust at barging facility and avoid dust dispersion during transportation and loading/ unloading of construction and demolition material within barging facility	Link 200 Joint Venture	Barging point	Construction stage	Air Pollution Control (Construction Dust) Regulation Ref. TM-EIA criteria for 1-hr and 24-hr total suspended particulates levels are 500 μgm^{-3} and 260 μgm^{-3}, respectively
S5.6		3) Scheme designers to incorporate the controlled measures into the Particular Specification for the civil work. The Particular Specification should also draw the Link 200 Joint Venture 's attention to the relevant latest Practice Notes issued by the Environmental Protection Department	Control construction dust	Scheme designers	All construction sites	Design stage	Air Pollution Control (Construction Regulation Dust)
S5.6		4) Implement regular dust monitoring under the environmental monitoring and audit programme	Monitor 24-hr and 1-hr total suspended particulates	Link 200 Joint Venture	Selected representative	Construction stage	Air Pollution Control

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		during the construction stage	levels at representative dust-monitoring stations to ensure compliance with relevant criteria throughout construction period		dust-monitoring station (ie, Hong Kong Cultural Centre, 4-8 Canton Road, Lai Chack Middle School, Man King Building, see Fig 5.1.1-5.1.3 of EM&A)		(Construction Dust) Regulation To control dust impact to within HKAQO and TM-EIA criteria (Ref. 1-hr and 24-hr total suspended particulates levels are 500μgm^{-3} and 260 μgm^{-3}, respectively)
Construction Noise (Air borne)							
S6.1.2.7		1) Implement the following measures for the operation of launching shaft near the West Kowloon Station: - Ventilation fan shall be installed with an sound attenuator to reduce noise impacts by 15 dB(A); - Enclosures with 10 dB(A) reduction shall be installed for conveyor belt and water pump; - Motor of the gantry shall be screened to provide a noise reduction of 5 dB(A); - Use of quieter plant to alleviate the noise impacts at the launching shaft; - Noise insulating cover (with 22 dB(A) noise reduction) for launching shaft shall be closed during night time	Control construction airborne noise caused by operation of launching shaft	Link 200 Joint Venture	Launching shaft and associated conveyor-belt system	Construction stage	Noise Control Ordinance and its Technical Memoranda Annex 5 of TM-EIA 75 dB(A) for residential premises and 70 dB(A) for schools during daytime 50 dB(A) for Area Sensitivity Rating B for night-time work
S6.1.4		2) Use of good site practices to limit noise emissions by considering the following: - Only well-maintained plant should be operated on-site and plant should be serviced regularly during the construction programme; - Machines and plant (such as trucks, cranes) that	Control construction airborne noise by means of good site practices	Link 200 Joint Venture	All construction sites	Construction stage	Noise Control Ordinance

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		may be in intermittent use should be shut down between work periods or should be throttled down to a minimum; - Plant known to emit noise strongly in one direction, when practicable, be orientated so that the noise is directed away from nearby noise-sensitive receivers; - Silencers or mufflers on construction equipment should be properly fitted and maintained during the construction works; - Mobile plant should be sited as far away from noise-sensitive receivers as practicable; - Material stockpiles, mobile container site officer and other structures should be effectively utilised, when practicable, to screen noise from on-site construction activities					
S6.1.4		3) Install temporary hoarding of 2.4 m high located on the site boundaries between noisy construction activities and noise-sensitive receivers. The conditions of the hoardings shall be properly maintained throughout the construction period	Reduce construction noise levels at low-level zone of noise-sensitive receivers through partial screening	Link 200 Joint Venture	All construction sites	Construction stage	Noise Control Ordinance Annex 5, TM-EIA Hoarding should have no openings and a superficial surface density of at least 14 kg/m^2
S6.1.4		4) Install movable noise barriers (typically density 14 kg/m^2), acoustic mat or full enclosure close to noisy plants, including air compressor, generators, hand-held breakers, circular saw, crawler drill, grout pump, drill-hole machine, grout mixers, water pump, bentonite filtering and mixing plant, pipe-pile rigs, down-the-hole rig, oscillator rig, reverse-circulation drill, chisel and auger	Screen noisy plant items to be used at all construction sites	Link 200 Joint Venture	For plant items listed in 3.4 of Environmental Permit at West Kowloon Station	Construction stage	Noise Control Ordinance Annex 5, TM-EIA 75 dB(A) for residential premises and 70 dB(A) for schools during daytime The movable

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
							barrier should achieve at least 5 dB(A) and the full enclosure should be designed to achieve 10 dB(A)
S6.1.4		5) Liaise with the school representative(s), including Lai Chak Middle School, and planned schools that would receive student intake during the construction of the Kowloon Southern Link (eg, secondary school at junction of Hoi Wang Road and post-secondary college at junction of Hoi Ting Road and Hoi Wang Road), to obtain the examination schedule and avoid noisy construction activities during school examination period	Schedule construction works outside school examination periods to less intrusive periods	Link 200 Joint Venture	Construction sites near schools such as Lai Chak Middle School, Canton Road Government School	Construction stage	Noise Control Ordinance Annex 5, TM-EIA To comply with the daytime construction noise criterion of 65 dB(A) at school during examination periods
S6.1.4		6) Select "quiet plant" that comply with the BS 5228 Part 1 or Technical Memorandum standards	Reduce noise levels of plant items	Link 200 Joint Venture	For plant items listed in 3.5 of Environmental Permit at West Kowloon Station	Construction stage	Noise Control Ordinance 8 its Technical Memorandum Annex 5, TM-EIA
S6.1.4		7) Sequencing operation of construction plants when practicable	Operate sequentially within same work site to reduce construction airborne noise	Link 200 Joint Venture	All construction sites when practicable	Construction stage	Noise Control Ordinance Annex 5, TM-EIA
S6.1.6		8) Install temporary noise barriers for specific plant items, including dump truck/lorries, concrete lorry mixers, concrete pump trucks, etc. (see Figure A14-2)	Screen noisy plant items to be used at specific locations where noise exceedance is found	Link 200 Joint Venture	Near to Man King Building	Construction stage	Noise Control Ordinance Annex 5, TM-EIA
S6.1.6		9) Review the need of ground treatment for the section along Canton Road, taking into account any specific	Revisit and reduce construction airborne noise	Link 200 Joint Venture	Bored tunnelling section along	Construction stage	Noise Control Ordinance

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		construction methodology for bored tunnelling	impacts identified at Canton Road Government School and Lai Chack Middle School		Canton Road outside two schools		Annex 5, TM-EIA
S6.1.6		10) Consult with the school representatives to confirm the practicability of scheduling the ground-treatment work along Canton Road to tie in with long school vacations and the arrangement of summer courses during this period	Schedule noisy construction activities to tie in with long school vacation to avoid noise exceedance	Link 200 Joint Venture	Bored tunnelling section along Canton Road outside two schools	Construction stage	Noise Control Ordinance Annex 5, TM-EIA
S6.1.6		11) Schedule the tunnel section (about 100 m) to be constructed in 2 shorter sections (about 50 m) sequentially	Reduce total amount of plant items to be operated within work sites immediately in front of Man King Buildings and hence construction noise impacts	Link 200 Joint Venture	Near to Man King Building (see Figure A14-2)	Construction stage	Noise Control Ordinance Annex 5, TM-EIA
S6.1.2.7 & S6.1.9		12) Install a noise-insulating cover for the launching shaft. This cover should be shut during night time. The insulating cover should achieve an overall noise reduction of 22 dB(A). Typical configuration of acoustic panels that can achieve the insulation requirement is 1.5-mm galvanized-steel outer skin, 100-mm acoustic infill with 80 kg/m^3, and an inner perforated sheet	Control construction airborne noise caused by operation of launching shaft during restricted hours	Link 200 Joint Venture	Launching shaft	Construction stage	Noise Control Ordinance Annex 5, TM-EIA
S6.1.10		13) Implement a real-time continuous noise monitoring under environmental monitoring and audit programme	Continuously monitor construction noise levels at selected representative locations	Link 200 Joint Venture	Lai Chack Middle School and Man King Building	Construction stage	Noise Control Ordinance Annex 5, TM-EIA 75 dB(A) for residential premises and 70 dB(A) for schools during daytime 50 dB(A) for Sensitivity Rating B for night-time

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
							work
Construction Groundborne Noise							
S7.2.6		1) The Link 200 Joint Venture shall maintain a hotline communication with the Hong Kong Cultural Centre and the Hong Kong Space Museum operator during the construction period	Control groundborne noise	Link 200 Joint Venture	Hong Kong Cultural Centre and Hong Kong Space Museum	Construction stage	
S7.2.6		2) Groundborne noise monitoring at the Hong Kong Cultural Centre and the Hong Kong Space Museum for rock breaking activities introduced at the worksite in front of the Hong Kong Cultural Centre and the Hong Kong Space Museum	Assurance checking on groundborne noise	Link 200 Joint Venture	Hong Kong Cultural Centre and Hong Kong Space Museum	Tunnelling in front of Salisbury Road	60 dB(A) for daytime (except general holidays and Sunday) 55 dB(A) for daytime during general holidays and Sundays and all days during evening
Construction Water							
S8.4.2		1) Follow the site practices outlined in ProPECC PN 1/94 as far as practicable in order to minimize surface run-off and the chance of erosion, and to reduce any suspended solids prior to discharge	Good. site practice to control construction water quality	Link 200 Joint Venture	All construction sites	Construction stage	Requirements laid down in ProPECC PN 1/94
S8.4.2		Construction Run-off and Site Drainage: - At the start of site establishment (including the barging facility), perimeter cut-off drains to direct off-site water around the site should be constructed with internal drainage works and erosion and sedimentation control facilities implemented. Channels (both temporary and permanent drainage pipes and culverts), earth bunds or sand bag barriers should be provided on site to direct storm water to silt removal facilities; - The dikes or embankments for flood protection should be implemented around the boundaries of earthwork areas. Temporary ditches should be	Control construction run-off and erosion from site surface, drainage channel, stockpiles, barging facility, wheel-washing facilities, etc, to minimize water quality during construction stage	Link 200 Joint Venture	All construction sites	Construction stage	ProPECC PN 1/94 Water Pollution Control Ordinance

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		provided to facilitate the run-off discharge into an appropriate watercourse, through a site/sediment trap. The sediment/silt traps should be incorporated in the permanent drainage channels to enhance deposition rates; - The design of efficient silt removal facilities should be based on the guidelines in Appendix Al of ProPECC PN 1/94, which states that the retention time for silt/sand traps should be 5 minutes under maximum flow conditions; - Construction works should be programmed to minimize surface excavation works during the rainy seasons (April to September). All exposed earth areas should be completed and vegetated as soon as possible after earthworks have been completed, or alternatively, within 14 days of the cessation of earthworks when practicable. If excavation of soil cannot be avoided during the rainy season, or at any time of year when rainstorms are likely, exposed slope surfaces should be covered by tarpaulin or other means; - The overall slope of the site should be kept to a minimum to reduce the erosive potential of surface water flows, and all trafficked areas and access roads protected by coarse stone ballast. An additional advantage accruing from the use of crushed stone is the positive traction gained during prolonged periods of inclement weather and the reduction of surface sheet flows; - All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times and particularly following rainstorms. Deposited silt and grit should be removed regularly and disposed of by spreading evenly over stable,					

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		vegetated areas; - Measures should be taken to minimize the ingress of site drainage into excavations. If the excavation of trenches in wet periods is necessary, they should be dug and back-filled in short sections whenever practicable. Water pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities; - Open stockpiles of construction material (for example, aggregates, sand and fill material) of more than 50 m^3 should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent the washing away of construction material, soil, silt or debris into any drainage system; - Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris being washed into the drainage system and storm runoff being directed into foul sewers; - Precautions to be taken at any time of year when rainstorms are likely, actions to be taken when a rainstorm is imminent or forecasted, and actions to be taken during or after rainstorms are summarized in Appendix A2 of ProPECC PN 1194. Particular attention should be paid to the control of silty surface run-off during storm events, especially for areas located near steep slopes; - All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris and the like is deposited by them on roads. An adequately designed and sited wheel-washing bay should be provided at every construction site exit. Wash water should have sand and silt settled out and removed at least on a weekly basis to ensure					

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient back-fall toward the wheel-wash bay to prevent vehicle tracking of soil and silty water to public roads and drains; - Oil interceptors should be provided in the site drainage system downstream of any oil/fuel pollution sources. The oil interceptors should be emptied and cleaned regularly to prevent the release of oil and grease into the storm-water drainage system after accidental spillage. A bypass should be provided for the oil interceptors to prevent flushing during heavy rain; - Construction solid waste, debris and rubbish on site should be collected, handled and disposed of properly to avoid water-quality impacts. Requirements for solid-waste management are detailed in Section 9 of this Report; - All fuel tanks and storage areas should be provided with locks and sited on sealed areas, within bunds of a capacity equal to 110% of the storage capacity of the largest tank to prevent spilled fuel oils from reaching water sensitive receivers nearby					
S8.4.2		Tunnelling Works: - The cut-and-cover tunnelling work should be conducted incrementally to limit the amount of construction run-off generated from exposed areas during the wet season (April to September); - Pumped discharge, including groundwater seepage pumped out of tunnels, should pass through settlement tanks prior to off-site discharge; - The waste water from tunnelling work will also contain a high concentration of SS and hence would require treatment (Intl settlement in tanks with	Control surface run-off and groundwater seepage pumped out from tunnels during tunnelling works	Link 200 Joint Venture	All construction sites for tunnel	Construction stage	ProPECC PN 1/94 Water Pollution Control Ordinance

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		sufficient retention time) before discharge. Oil interceptors would also be required to remove the oil, lubricants and grease from the waste water; - Direct discharge of the bentonite slurry is not allowed. It should be reconditioned and re-used whenever practicable. Temporary storage locations (typically a properly-closed warehouse) should be provided on site for any unused bentonite that needs to be transported away after all the related construction activities are completed. The requirements in ProPECC PN 1/94 should be adhered to in the handling and disposal of bentonite slurries; - For the drill-and-blast tunnelling technique, sections of rock tunnel will be constructed and waste water laden with suspended solids, grouting derivates, lubricants and oils will be generated. Sufficient space should be provided for treatment of waste water, including settlement of suspended solids and grease removal, prior discharge					
S8.4.2		Sewage Effluent: 1) Portable chemical toilets and sewage holding tanks are recommended for handling the construction sewage generated by the workforce. A licensed contractor should be employed to provide appropriate and adequate portable toilets and be responsible for appropriate disposal and maintenance	Control sewage effluent arising from sanitary facilities provided for on-site construction workforce	Link 200 Joint Venture	On-site sanitary facilities	Construction stage	ProPECC PN 1/94 Water Pollution Control Ordinance Waste Disposal Ordinance
S8.4.2		Groundwater from Contaminated Areas: - Process should be contaminated ground water from dewatering recharged back into the ground at the discharge wells; - Before excavation, the Link 200 Joint Venture shall	Avoid direct discharge of contaminated ground water from tunnels and minimize release of contaminants	Link 200 Joint Venture	West Kowloon Station see Figure A14-3	Construction stage	TM-Water Water Pollution Control Ordinance The reporting limit mentioned in Table

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		update the extent of potential groundwater contamination by collecting more groundwater samples along the alignment; - Free products shall be removed by installing the petrol interceptor prior to recharge; - Ambient measurements on the groundwater quality at the West Kowloon Station and the cut-and-cover tunnel to the north of the West Kowloon Station shall be performed with reference to ProPECC PN3/94 "Contaminated Land Assessment and Remediation", prior to the selection of the recharge wells; and submit a working plan to the Environmental Protection Department for agreement; - The groundwater recharging wells should. be selected at those places where groundwater quality will not be affected by the recharge operation. The ambient groundwater quality shall be measured to serve as the baseline and the pollutant levels of the ground water to be recharged shall be measured and not be higher than the baseline measurement; - Groundwater monitoring wells shall be installed to monitor the effectiveness of the recharge wells; - During the recharge period, the groundwater level at the monitoring well shall be monitored to ensure that there is no likelihood of locally risen groundwater level and transfer of pollutants beyond the site boundary; - The ground water shall be treated to the baseline level or lower if the pollutants of the recharging ground water (after petrol interceptor) exceed the baseline limit. Appropriate treatment will include chemical precipitation and activated-carbon adsorption; - The extent of potential groundwater contamination					8-3 of the Environmental Impact Assessment Report

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		shall be updated by collecting more groundwater samples along the alignment. The reporting limits as stated in the Environmental Impact Assessment Report shall be used for the testing; - A discharge license shall be applied under the Water Pollution Control Ordinance through the Local Control Office of the Environmental Protection Department for groundwater recharge operation					
S8.4.2		Scheme designers to incorporate the controlled measures into the Particular Specification for the civil work. The Particular Specification should also draw the Link 200 Joint Venture's attention to the relevant latest Practice Notes issued by the Environmental Protection Department	Ensure compliance of water quality	Scheme designers	All construction sites	Design stage	ProPECC PN 1/94 TM-Water Water Pollution Control Ordinance
Waste Management (Construction Waste)							
S9.2.10		1) The requirements as recommended in ETWB TC 15/2003 Waste Management on Construction Sites and its latest version, and other relevant guidelines, should be included in the Particular Specification as appropriate	Develop waste-management strategies and minimize construction waste disposal	Scheme designer	All construction sites	Design stage	Waste Disposal Ordinance ETWB TC 15/2003
S9.2.10		2) Prior to the start of construction work, the Link 200 Joint Venture should prepare a Waste Management Plan to provide an overall framework for waste management and reduction	Develop waste management and reduction strategies	Link 200 Joint Venture	All construction sites	Construction stage	Waste Disposal Ordinance ETWB TC 15/2003 Wste Disposal (Chemical Waste) (General) Regulation ETWBTC 34/2002
S 9.2.10		2) The following waste management hierarchy should be considered in general: - Avoidance and minimization (not generating waste through changing or improving practices and design);	Minimize construction waste disposal by means of waste-management hierarchy	Link 200 Joint Venture	All construction sites	Construction stage	Waste Disposal Ordinance ETWB TC 15/2003

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		- Re-use of material, thus avoiding disposal (generally with only limited reprocessing); - Recovery and recycling, thus avoiding disposal (although reprocessing may be required); - Treatment and disposal, according to relevant regulations, guidelines and good practice					
S9.2.10		3) Storage, Collection and Transportation - Handle and store waste in a manner that ensures that it is held securely without loss or leakage, thereby minimizing the potential for pollution; - Use waste collectors authorized or licensed to collect the specific. category of waste; - Remove waste in a timely manner; - Maintain and clean waste storage areas regularly; - Minimize windblown litter and dust during transportation by either covering trucks or transporting waste in an enclosed container; - Obtain the necessary Waste Disposal Permits from the appropriate authorities, if they are required, in accordance with the Waste Disposal Ordinance (Cap 354), Waste Disposal (Chemical Waste) (General) Regulation (Cap 354) and the Land (Miscellaneous Provisions) Ordinance (Cap 28); - Dispose of waste at licensed sites; - Develop procedures such as a ticketing system to facilities, tracking of loads, particularly for chemical waste, and to ensure that illegal disposal of waste does not occur; - Maintain records of the quantities of waste generated, recycled and disposed	Minimize construction waste disposal by proper handling of waste	Link 200 Joint Venture	All construction sites	Construction stage	Waste Disposal Ordinance Waste Disposal (Chemical Waste) (General) Regulation Land (Miscellaneous Provisions) Ordinance ETWB TC 15/2003
S9.2.10		Contaminated Soil and Marine Deposit:	Proper handling of	Link 200 Joint	All worksites	Construction	ETWBTC 34/2002

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& S9.2.3.4		- Contaminated soil shall be disposed in landfill site;
		- Uncontaminated marine deposits should require open sea disposal;
		- Non-contaminated alluvial and marine deposits will be transported by leach proof trucks to ensure that any water will not be leaked during the transportation to the barging facility for open sea disposal. The trucks should also be covered with Impervious sheeting to prevent any dust emissions;
		- Contaminated marine deposit shall be disposed in confined mud pits. Possible mitigation measures to handle the contaminated/uncontaminated alluvial/marine sediment are summarized as:
		  - all construction plant and equipment shall be designed and maintained to minimize the risk of silt, sediments, contaminants or other pollutants being released into the water column or deposited in the locations other than designated location;
		  - all vessels shall be sized such that adequate draft 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;
		  - before moving the vessels that are used for transporting dredged material, excess material shall be cleaned from the decks and exposed fittings of vessels and the excess material shall never be dumped into the sea except at the approved locations;
		  - adequate freeboard shall be maintained on barges to ensure that decks are not washed by wave action;
		  - the Link 200 Joint Venture shall monitor all
			contaminated soil and contaminated/ uncontaminated alluvial/ marine sediment	Venture		stage	

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		vessels transporting material to ensure that no dumping outside the approved location takes place. The Link 200 Joint Venture shall keep and produce logs and other records to demonstrate compliance and that journeys are consistent with designated locations and copies of such records shall be submitted to the Engineer's Representative; - The Link 200 Joint Venture shall comply with the conditions in the dumping licence; - All bottom-dumping vessels (hopper barges) shall be fitted with tight fittings seals to their bottom openings to prevent leakage of material; - The material shall be placed into the disposal pit by bottom dumping; - Contaminated marine mud shall be transported by split barge of not less than 750 m^3 capacity and capable of rapid opening and discharge at the disposal site; - Discharge shall be undertaken rapidly and the hoppers shall be closed immediately. Material adhering to the sides of the hopper shall not be washed out of the hopper and the hopper shall remain closed until the barge returns to the disposal site.					
S9.2.10		Construction and Demolition Material: - Opportunity for re-using of fill material for back-filling should be optimized; - Excavated material that cannot be recycled should be transported to public-filling areas; - Careful design, planning and good site management can minimize over-ordering and waste material such as concrete, mortars and cement grouts. The design of formwork should maximize the use of standard	Good site practice to minimize waste generation and recycle construction and demolition material as far as practicable so as to reduce the amount for final disposal	Link 200 Joint Venture	All construction sites	Construction stage	Land (Miscellaneous Provisions) Ordinance Waste Disposal Ordinance ETWB TC 15/2003

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		wooden panels so that high re-use levels can be achieved. Alternatives such as steel formwork or plastic fencing should be considered to increase the potential for re-use; - The Link 200 Joint Venture should recycle as much as possible of the construction waste on-site. Proper segregation of waste on site will increase the feasibility of recycling certain components of the waste stream by recycling contractors. Concrete and masonry can be used as general fill and steel reinforcement bars can be used by scrap steel mills. Different areas should be designated for such segregation and storage whenever site conditions permit; - Maintain temporary stockpiles and re-use excavated fill material for back-filling and reinstatement; - For cut-and-cover tunnel section, stockpile excavated construction and demolition material adjacent to its source for immediate back-fill once the tunnel section is completed; - Surplus artificial hard material should be delivered to Tuen Mun Area 38 recycling plant or its successor for recycling into subsequent useful products; - Existing bituminous pavement should be used for paving construction access and temporary holding/parking areas; - On-site sorting and segregation facility of all types of waste is considered as one of the best practices in waste management and, hence, should be implemented in all projects generating construction waste. The sorted public fill and construction and demolition waste should be disposed to public-filling areas and landfills, respectively; - Make provisions in the Contract documents to allow					

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		and promote the use of recycled aggregates when appropriate; - Adopt selective demolition technique to demolish the existing structures and facilities with a view to recovering broken concrete effectively for recycling purpose, when practicable; - Implement a trip-ticket system for each works contract to ensure that the disposal of construction and demolition material is properly documented and verified; - Implement an enhanced Waste Management Plan similar to ETWB TC(W) No. 15/2003, Waste Management on Construction Sites, to encourage on-sitting sorting of construction and demolition material and to minimize its generation during the course of construction; - Disposal of construction and demolition material onto any sensitive locations, such as agricultural lands, shall be avoided. The Link 200 Joint Venture shall propose the final disposal sites to the KCR Corporation and get its approval before implementation					
S9.2.10		Chemical Waste: - Chemical waste that is produced, as defined by Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation, should be handled in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes; - Containers used for the storage of chemical waste should be suitable for the substance they are holding, resistant to corrosion, maintained in a good condition, and securely closed; have a capacity of less than 450 ℓ unless the specification has been approved by the Environmental Protection	Control chemical waste and ensure proper storage, handing and disposal	Link 200 Joint Venture	All construction sites	Construction stage	Waste Disposal (Chemical Waste) General) Regulation Code of Practice on the Packaging, Labelling and Storage of Chemical Waste

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		Department; and display a label in English and traditional Chinese characters in accordance with instructions prescribed in Schedule 2 of the regulation; - The storage area for chemical waste should be clearly labelled and used solely for the storage of chemical waste; enclosed on at least 3 sides; have an impermeable floor and bunding of sufficient capacity to accommodate 110% of the volume of the largest container or 20% of the total volume of waste stored in that area, whichever is the greatest; have adequate ventilation; covered to prevent rainfall entering; and arranged so that incompatible material is adequately separated; - Disposal of chemical waste should be via a licensed waste collector; be to a facility licensed to receive chemical waste, such as the Chemical Waste Treatment Centre, which also offers a chemical waste collection service and can supply the necessary storage containers; or be to a re-user of the waste, under approval from the Environmental Protection Department					
S9.2.10		Sewage: - Adequate numbers of portable toilets should be provided for the workers. The portable toilets should be maintained in a state that will not deter the workers from utilizing them. Night soil should be collected by licensed collectors regularly	Proper handling of sewage from worker to avoid odour, pest and litter impacts	Link 200 Joint Venture	All construction sites	Construction stage	Waste Disposal Ordinance
S9.2.10		General Refuse: - General refuse generated on-site should be stored in enclosed bins or compaction units separately from construction and chemical waste; - A reputable waste collector should be employed by the Link 200 Joint Venture to remove general refuse from the site, separately from construction and	Minimize production of general refuse and avoid odour, pest and litter impacts	Link 200 Joint Venture	All construction sites	Construction stage	Waste Disposal Ordinance

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		chemical waste, on a daily basis to minimize odour, pest and litter impacts. Burning of refuse on construction sites is prohibited by law; - Aluminium cans are often recovered from the waste stream by individual collectors if they are segregated and made easily accessible. Separate labelled bins for their deposit should be provided if feasible; - Office waste can be reduced through the recycling of paper if volumes are large enough to warrant collection. Participation in a local collection scheme should be considered by the Link 200 Joint Venture. In addition, waste separation facilities for paper, aluminium cans, plastic bottles, etc., should be provided; - Training should be provided to workers about the concepts of site cleanliness and appropriate waste-management procedure, including reduction, re-use and recycling of waste					
Land Contamination							
S10.10		1) Implement Excavation and Landfill Disposal remediation method by Link 200 Joint Venture 2) Excavated contaminated soils should not be stockpiled on site, but should immediately be loaded onto trucks and taken to the chosen landfill site 3) All trucks carrying contaminated material should be adequately sheet covered to prevent dispersion of contamination on the way to the landfill site 4) The Link 200 Joint Venture should pose a valid Water Pollution Control Ordinance discharge license from the Environmental Protection Department when applicable 5) The remediation programme should be supervised	Proper disposal of contaminated soils to ensure environmental and health safety	Link 200 Joint Venture	Near drill hole KSD/DH063 See Figure 6-1 for location of contaminated soil	Construction stage	ProPECC PN 3/94 Guidance Notes for investigation & Remediation of Contaminated Sites of Petrol Filling Stations, Boatyards & Car Repair/ Dismantling Workshops

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		by the on-site geotechnical engineer (to be appointed by the Link 200 Joint Venture) with at least 7-years' experience in contamination assessment or decontamination. All relevant method statements prepared by the Link 200 Joint Venture should be reviewed and approved by the geotechnical engineer before proceeding with the works 6) Should the event of the soil contamination following excavation be more extensive than envisaged by the CAP, CAR, Remediation Assessment Plan, a confirmatory testing will be carried out: - A confirmatory testing will be carried out following excavation at each location, in order to confirm that all contaminated material has been removed - The confirmatory testing will consist of five samples in each location, situated immediately to the north, south, east and west of each location, and at the base of the excavation - If the results of analysis are less than the Dutch B Levels, no further excavation will be required - If the concentrations exceed the Dutch B Level, the area of excavation should be extended, and further confirmatory testing should be carried out following this excavation. In this event, the area of excavation should be extended by a further 5-m radius In the quadrant where the contaminated sample is encountered, or by a further 0.5-m depth if the contaminated sample is from the base of the excavation. This procedure should be followed until no further contamination is encountered					
Landscape and Visual (Construction Phase)							
S11.5.4		1) Ref. CM1 - The construction area and the Link 200	Minimize landscape and	Link 200 Joint	All construction	Construction	EIAO TM

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
& S11.6.2 & S11.8.1		Joint Venture's temporary works areas shall be minimized to avoid impacts on adjacent landscape. Existing trees within the Link 200 Joint Venture's temporary works areas should be retained and protected when practical (see also CM5 and CM6).	visual impacts during construction phase	Venture	sites	stage	ETWBC 14/2002 LAOI D12
S11.5.4 & S11.6.2 & S11.8.1		2) Ref. CM2 - Regular checks shall be carried out to ensure that the work site boundaries are not transgressed, hoarding is properly maintained and that no damage is being caused to the surrounding landscape areas	Minimize landscape and visual impacts during construction phase	Link 200 Joint Venture	All construction sites	Construction stage	EIAO TM
511.5.4 & S11.8.1		3) Ref. CM3 - Topsoil, where identified, shall be stripped and stored for re-use in the construction of the soft landscape works, when practical. The Contract Specifications shall include identification, storage and re-use of topsoil as appropriate. Under the Specification, the Link 200 Joint Venture shall be required to identify at the start of the Contract any existing topsoil for preservation, storage and re-use, for comment and approval by the Engineer.	Minimize landscape and visual impacts during construction phase	Link 200 Joint Venture	All construction sites	Construction stage	EIAO TM
S11.5.4 & S11.6.2 & S11.7.1		4) Ref. CM4 - The potential for soil erosion shall be reduced by minimizing the extent of vegetation disturbance on site and by providing a protective cover (eg, plastic sheeting or a grass cover established by hydroseeding) over newly exposed soil	Minimize landscape and visual impacts during construction phase	Link 200 Joint Venture	All construction sites	Construction stage	EIAO TM
S11.5.4 & S11.7.1		5) Ref. CM5 - All works shall be carefully designed to minimize impacts on existing trees. All retained trees shall be recorded photographically at the start of the Contract, and carefully protected during construction by fencing them off from the rest of the works. A detailed Tree Protection Specification shall be provided in the Contract Specifications. Under that specification, the Link 200 Joint Venture shall be required to submit, for approval, a detailed working method statement for the protection of trees	Minimize landscape and visual impacts during construction phase	Designer to prepare Contract Specification Link 200 Joint Venture to implement	All construction sites	Construction stage	EIAO TM ETWBC 14/2002 ETWBTC 2/2004 LAOI D12

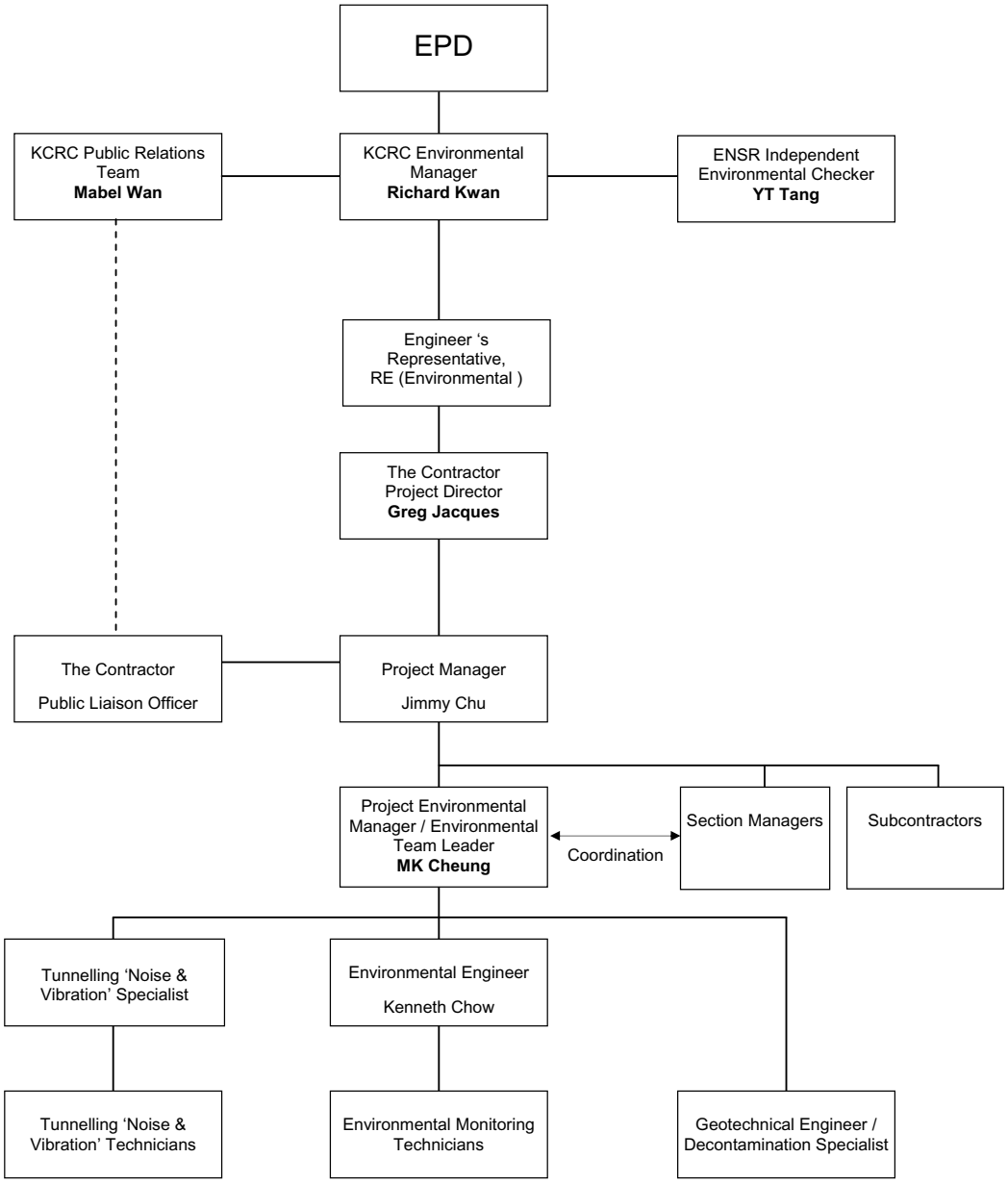
EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		prior to undertaking any works adjacent to all retained trees, including trees in the Link 200 Joint Venture's works areas. The project proponent shall review the site works in order to maximize the preservation of the trees of high amenity value in situ. A total of no more than 1,200 trees shall be affected (ie, felled or transplanted) by the works, of which no more than 105 shall be of high-amenity value					
S11.5.4 & S11.7.1		6) Ref. CM6 – The project proponent shall maximize the transplantation of trees of high-amenity value if preservation in situ is not feasible. A detailed Tree Transplanting Specification shall be provided in the Contract Specifications, if applicable. Sufficient time for necessary tree root and crown preparation periods prior to moving the trees shall be allowed in the project programme. Precise numbers of trees to be retained, transplanted and felled shall be determined and agreed separately with the government during the Tree Felling Application process under ETWBTC 14/2002. (See also OM2 and OM3). However, a minimum of 80% of the affected trees of high-amenity value shall be transplanted. Destination locations for the transplants and arrangement for transplantation shall be resolved and agreed with relevant departments in advance. Potential destination locations include: - roadside landscape areas in West Kowloon - vacant lots in West Kowloon zoned for development as public open space - existing public open spaces If potential destination locations cannot be found by the time the trees are removed from site, they will be located to a holding nursery until destination locations are found. If no locations outside the	Minimize landscape and visual impacts during construction phase	Designer to prepare Contract Specification Link 200 Joint Venture to implement	All construction sites	Construction stage	EIAO TM ETWBC 14/2002 ETWBTC 2/2004 LAO1 D12

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		project area can be found, they will be stored in the holding nursery for the duration of the Contract and transplanted back into the project area at the end of the project					
S11.5.4 & S11.6.2 & S11.7.1		7) Ref CM7 - Large temporary stockpiles of excavated material shall be covered with visually unobtrusive sheeting (in subdued 'camouflage' colour tone) to prevent dust and dirt spreading to adjacent landscape areas and vegetation, and to create a neat and tidy visual appearance	Minimize landscape and visual impacts during construction phase	Link 200 Joint Venture	Stockpiles of excavated material	Construction stage	EIAO TM
511.6.2 & S11.7.1		8) Ref. CM8 – Control night lighting and prevent glare to surrounding visual-sensitive receivers by directing all security lighting downward into works sites and works areas	Minimize landscape and visual impacts during construction phase	Link 200 Joint Venture	All construction sites	Construction stage	EIAO TM
S11.6.2 & S11.7.1		9) Ref. CM9 — Clean and tidy hoardings shall be provided. Good site practice will be adopted by the Link 200 Joint Venture to ensure the conditions of the hoardings are properly maintained throughout the construction period	Minimize landscape and visual impacts during construction phase	Link 200 Joint Venture	All construction sites	Construction stage	EIAO TM
S11.6. & S11.7.1		10) Ref CM10 - Temporary noise barriers shall be designed to minimize adverse visual impacts on adjacent visual-sensitive receivers	Minimize landscape and visual Impacts during construction phase	Link 200 Joint Venture	All construction sites	Construction stage	EIAO TM
Cultural Heritage							
S12.6.1		1) Before starting the construction work, the Link 200 Joint Venture shall consult the Antiquities and Monuments Office on any other mitigation measures that would be required administratively or under the Antiquities and Monuments Ordinance. The Link 200 Joint Venture shall implement those requirements during the construction period	Ensure there is no potential archaeology underneath the tunnel to be disturbed during the tunnel excavation	Link 200 Joint Venture	All construction sites	Construction stage	Requirements from Antiquities and Monuments Office
S12.6.3		1) Precautions should be taken during bored tunnelling to prevent any damage to the historic buildings. Structural monitoring system should be designed and supervised by a registered structural engineer	Ensure construction activities will not adversely affect the Former Marine Police Headquarters, tunnel	Link 200 Joint Venture	Former Marine Police Headquarters, old fire-station	Construction stage	Requirements from Mines Division of Civil Engineering & Development

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		from the Link 200 Joint Venture during the period for mined tunnelling to ensure compliance with the Buildings Ordinance 2) Conduct structural monitoring on the Former Marine Police Headquarters and the old fire-station buildings. Liaison with the Former Marine Police Headquarters developer has indicated that it is prepared to conduct the condition and impact monitoring during the construction period that overlaps with the Kowloon Southern Link construction 3) Details of the monitoring system, including the coordination with the Former Marine Police Headquarters developer, shall be submitted to the Antiquities and Monuments Office for approval before the mined tunnelling starts 4) Any proposed site works (including ground-investigation and tunnelling work) and structural-monitoring measures within the boundary of the declared monument would need to comply with the requirements under Section 6 of the Antiquities and Monument Ordinance	and old fire-station buildings		buildings and tunnel		Department Buildings Ordinance Comply with requirements under Section 6 of Antiquities and Monument Ordinance
Hazard							
S13		No mitigation measures required					
Environmental Monitoring & Audit							
514.2 & S14.7		1) An independent environmental checker needs to be employed as per the Environmental Monitoring & Audit Manual 2) Establish a Community Liaison Office with a telephone action line that enables the public to raise any matters of concern regarding the project, such as complaints, comments, suggestions or requests for information	Control environmental monitoring and audit performance	Project Proponent	All construction sites	Construction stage	EIAO Guidance Note No.4/2002 TM-EIAO
S14.4		1) An environmental team needs to be employed as per	Perform environmental	Link 200 Joint	All construction	Construction	EIAO Guidance

EIA Ref.	EM&A Log Ref	Recommended Mitigation Measures	Objectives of Recommended Measures and Main Concerns to Address	Who to Implement Measures?	Location of Measures	When to Implement Measures?	What Requirements or Standards for Measures to Achieve?
		the Environmental Monitoring & Audit Manual. 2) Prepare a systematic Environmental Management Plan to ensure effective implementation of the mitigation measures 3) An environmental impact monitoring needs to be implementing by the environmental team to ensure all the requirements given in the Environmental Monitoring & Audit Manual are fully complied with	monitoring and auditing	Venture	sites	stage	Note No.4/2002 TM-EIAO

Appendix 3-1
Project Organization



Project Organization

Contact Telephone List (Environmental)

Position	Name	Telephone	Fax
KCRC			
Environmental Manager	KWAN Richard	2688 1179	2145 4269
Senior Environmental Specialist	TONG Viola	2688 1027	2145 4269
Environmental Specialist	WONG Enoch	2688 1134	2145 4269
Public Affairs Manager	WAN Mabel	2688 1685	2690 4997
KCRC (ER)			
Construction Manager	KEENAN Thomas	3575 1378	3580 1952
Senior Resident Engineer	CHAU Ivan	3575 1378	3580 1952
Resident Engineer	YEUNG Charles	3575 1339	3580 1952
Resident Engineer	WONG Danny	3575 5615	3580 1939
Resident Engineer -Env	POON Lisa	3575 5653	3580 1943
Resident Engineer -Env	TSANG Jennifer	3575 5654	3580 1943
Maunsell (IEC)			
Associate Director	TANG YT	3105 8537	2891 0305
Link 200 Joint Venture (Contractor)			
Contractor's Representative	JACQUES Greg	2737 6000	2736 0611
Project Manager	CHU Jimmy	2737 6090	2736 0611
Section Manager - Station	MCLEOD John	2737 9234	2736 0611
Section Manager - Cut and Cover	GUNNING Phil	2737 6078	2736 0611
Section Manager - TBM	HAKE David	2737 6037	2736 0611
Section Manager - External Works	GOWRAN Brian	2737 9232	2737 0611
Public Relations Officer	TSE Kid	2737 6016	2736 0611
Contractor's Environmental Team			
Project Environmental Manager / Environmental Team Leader	CHEUNG MK	2737 9398	2736 0611
Environmental Engineer	CHOW Kenneth	2737 9209	2736 0611

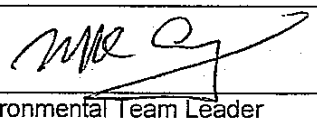
Appendix 5-1
Groundborne Noise Monitoring Working Plan

KCRC KOWLOON SOUTHERN LINK

CONTRACT KDB200

Groundborne Noise Monitoring Working Plan

SEPTEMBER 2007

Certified By :	M.K. Cheung
Signed :	
Position :	Environmental Team Leader
Date :	11-Sep -07

Contract KDB200 – Kowloon Southern Link

Environmental Monitoring and Audit

Groundborne Noise Monitoring

Working Plan

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1 INTRODUCTION

This Groundborne Noise Monitoring Working Plan applies to tunnelling and surface works associated with the Kowloon Southern Link. In particular, it applies to operation of the Tunnel Boring Machines (TBM) and also rock breaking and piling at the Salisbury Road construction site.

The monitoring is required in response to Section 5.3 of the Environmental Monitoring & Audit Manual.

Operation of the TBM will generate vibration in the ground which may be transmitted through the ground into the structure of nearby buildings. Vibration within the building structure can radiate as groundborne noise into spaces of the building, with the higher noise levels being generated at the lower floors of the building. As the TBM approaches a particular building, groundborne noise levels within the building will gradually increase, with the highest level being generated when the TBM head is at the closest point to the foundations of the building. After that, groundborne noise levels will reduce as the TBM head moves away.

Rock breaking using a hydraulic breaker at the Salisbury Road site will generate vibration in the ground which also may be transmitted through the ground into the structure of nearby buildings. This vibration will in turn result in groundborne noise in the spaces. These groundborne noise levels are likely to occur (at varying levels) during rock breaking.

Groundborne vibration levels are also expected during piling. The main vibration will result when the piles are seated onto the rock. This vibration will also in turn result in some level of groundborne noise.

It should be stressed that the construction works along Salisbury Road will be mostly above the rockhead and the section outside HKSM is soft ground only. The noise and vibration induced in soft ground would be much less than in rock and would be insignificant.

Monitoring of groundborne noise is proposed at a number of noise sensitive locations along the route of the tunnel and near the Salisbury Road site primarily for the purpose of checking compliance of groundborne noise levels with the groundborne noise criteria set for the project. The monitoring will also allow progressive derivation of rock vibration characteristics and this information is to be used to update the prediction of groundborne noise levels at locations in front of the TBM.

According to the endorsed EIA report (January 2005), *"prediction of construction groundborne noise indicates the criteria will be achieved and mitigation measures are not required. In order to ensure proper control of groundborne noise is executed by the contractor, a monitoring requirement is recommended at the worksites in front of the Hong Kong Cultural Centre (HKCC) and Hong Kong Space Museum (HKSM) for assurance checking. Rock breaking activities will be subject to an assurance groundborne noise measurement at one selected location each inside HKCC and HKSM to be agreed with their respective operators. If groundborne noise criterion is exceeded, the monitoring shall continue daily until acceptance has been restored against the criterion. Otherwise the monitoring can be discontinued."*

2 MONITORING OF TUNNELLING

Groundborne noise monitoring will be used to check and manage compliance with the groundborne noise limits specified in the EIA. The monitoring, particularly during the early stages of tunnelling, will also be used to update predictions of groundborne noise levels to allow noise impact management processes to be put in place as early as possible.

2.1 Monitoring Locations and Noise Limits

Groundborne noise monitoring will be carried out at the locations shown in **Table 2-1** and **Appendix B**.

Table 2-1 Groundborne Noise Monitoring Locations & Associated Noise Limits

ID No.		Description	Noise Limits $Leq_{(30mins)}$ [3], dB(A)		
			Daytime (except General Holidays & Sunday)	Daytime during general holidays and Sundays and all days during Evening (1900 to 2300 hrs)	Night-time (2300 to 0700 hrs)
G1[1]	a	Hong Kong Space Museum – Planetarium	60	55	-
	b	Hong Kong Space Museum – Recording Room	60	55	-
G2[1]	a	Hong Kong Cultural Centre – Studio Theatre	60	55	-
	b	Hong Kong Cultural Centre – Grand Theatre	60	55	-
	c	Hong Kong Cultural Centre – Concert Hall	60	55	-
G3 [2]		Former Marine Police Headquarters building	65	55	40

Notes: (1) Noise limits for HKCC (G1) and HKSM (G2) are with A/C switched on. Also, there will not be any operation during night-time and hence the HKCC and HKSM are only NSR during daytime and evening periods.
(2) Monitoring at the FMPHQ shall commence when it is occupied.
(3) The noise limits were set forth in the endorsed EIA report (AEIAR-083/2005).

Monitoring is to commence as the TBM head approaches within 100m from the monitoring location and monitoring is to cease when the noise level has reduced to below the lowest criterion after the maximum level has been reached. According to the endorsed EIA report (AEIAR-083/2005), the predicted construction groundborne noise levels due to tunnelling works are well below the criteria. Mitigation measures are thus not required and 100m monitoring distance is considered to be sufficient for assurance checking.

For the redeveloped hotel at FMPHQ, monitoring shall commence when it is occupied and a quiet guest room will be selected for the monitoring subject to the agreement with relevant parties. The room will be selected on the lowest guest room level and on the side of the building closest to the tunnelling operations.

Monitoring will be carried out at one selected location each inside Hong Kong Cultural Centre and Hong Kong Space Museum in the special spaces as follows:

- **HKCC Studio Theatre** – Above seat CQ7.
- **HKCC Grand Theatre** – Below seat E23 of Level 3.

- **HKCC Concert Hall** – Above seat O121.
- **HKSM Planetarium** – On the small stage (shown in **Appendix B**)
- **HKSM Recording Room** – In the centre of the room.

2.2 Monitoring Procedure

The duration of monitoring at each location will depend upon the noise criterion applying to each location. Monitoring will commence once the TBM head approaches within 100m from the monitoring locations and cease when the groundborne noise level monitored falls below the lowest criterion applying to the monitoring location (mostly night time criterion) after the maximum level has been reached.

The instrumentation to use is discussed in detail in Section 4.

After liaison with the management of HKCC, it was agreed that groundborne noise monitoring at the Studio Theatre, Grand Theatre and Concert Hall will be carried out daily between 0900 and 2300.

For HKSM, measurement at the Planetarium will be carried out daily during the monitoring period when TBM is in operation between 7:00am and 9:00am to avoid interference with regular activities of the premises. Monitoring at the recording room will be carried out once a week.

The monitoring is to determine the L_{Aeq} noise levels (where practicable above ambient noise) during each 30 minutes period. The two hour monitoring period may be split between the monitoring spaces so that each space is monitored at least 30minutes during each day.

For the FMPHQ, noise monitoring will be carried out for 24 hours per day during the monitoring period when TBM is in operation using sound level meters with logging function. The monitoring is to determine the L_{Aeq} noise levels (where practicable above ambient noise) during each 30 minute period and the noise data will be downloaded daily. A 24-hour graph of L_{Aeq} noise level vs. time will be prepared for each day. Emphasis will be placed on the measured L_{Aeq} noise levels during the night time when ambient noise levels are at their lowest. Where TBM groundborne noise levels exceed ambient noise levels, then the levels of TBM noise can be obtained by reference to site records indicating TBM operational times to ensure there is a correlation between the elevated noise level and the TBM operation.

Table 2-2 summarises the tentative monitoring programme for TBM tunnelling.

Table 2-2 Summary of Groundborne Noise Monitoring for TBM Tunnelling

ID No.		Description	Monitoring Frequency	Tentative Monitoring Period	Maximum Duration for Each Monitoring Period*
G1(1)	a	Hong Kong Space Museum – Planetarium	Leq(30mins) Daily 7:00am-9:00am	Late May 2007 – Mid Jun 2007 Early Jan 2008 – Late Jan 2008	0.5 – 1 month

ID No.		Description	Monitoring Frequency	Tentative Monitoring Period	Maximum Duration for Each Monitoring Period*
	b	Hong Kong Space Museum – Recording Room	Leq(30mins) Once a week	Late May 2007 – Mid Jun 2007 Early Jan 2008 – Late Jan 2008	0.5 – 1 month
G2(1)	a	Hong Kong Cultural Centre – Studio Theatre	Leq(30mins) Daily 09:00 – 23:00	Late Apr 2007 – Mid Jun 2007 Early Dec 2007 – Mid Jan 2008	1.5 month
	b	Hong Kong Cultural Centre – Grand Theatre	Leq(30mins) Daily 09:00 – 23:00	Late Apr 2007 – Mid Jun 2007 Early Dec 2007 – Mid Jan 2008	1.5 month
	c	Hong Kong Cultural Centre – Concert Hall	Leq(30mins) Daily 09:00 – 23:00	Late Apr 2007 – Mid Jun 2007 Early Dec 2007 – Mid Jan 2008	1.5 month
G3 (2)		Former Marine Police Headquarters building	Continuous	TBC	TBC

Note:
* The duration is for indication only. The exact monitoring schedule/arrangements shall be confirmed with HKSM, HKCC and the future occupier of FMPHQ. The monitoring can be discontinued if the measured noise level is reduced to below the associated lowest criterion stated in Table 2-1.

3 MONITORING OF SALISBURY ROAD SITE

Groundborne noise monitoring will be carried out during the relevant works at the Salisbury Road site to check compliance with the noise limits.

3.1 Monitoring Locations

Monitoring of groundborne noise from works at the Salisbury Road site will be carried out within the following spaces:

- Hong Kong Space Museum – Planetarium (Space Theatre)
- Hong Kong Space Museum – Recording Room

The proposed measurement locations within the HKSM are described in Section 2.1 for tunnelling which shall be confirmed and agreed with LCSD.

3.2 Monitoring Procedure

In accordance with the EIA report (AEIAR-083/2005), prediction of construction groundborne noise indicates the criteria will be achieved and mitigation measures are not required. It was recommended that rock breaking activities will be subject to an assurance groundborne noise measurement. As mentioned however it is soft ground outside HKSM and the rock breaking would only take place at the deep end (at about -15mPD below).

Monitoring will be carried out at the HKSM – Planetarium continuously on a daily basis when there are rock breaking activities. The groundborne noise measurements will be in terms of L_{Aeq} 5 minutes and results will be presented in terms of L_{Aeq} 30 minutes. Emphasis will be placed on the measured $L_{Aeq(30mins)}$ noise levels between 7:00am and 9:00am when ambient noise levels are at their lowest and less interference with activities within the spaces is expected in this period.

For the monitoring location at HKSM – Recording Room, assurance checking will be carried out once a week when the recording room is not in use. The groundborne noise measurement will be at least 30 minutes in each checking.

Baseline monitoring will be conducted for at least a week before the commencement of rock breaking activities (pipe piling along Salisbury Road) following the above procedure. **Table 3-1** summarises the monitoring at HKSM for pipe piling works at Salisbury Road site. A monthly monitoring programme shall be provided in the Monthly Impact Monitoring Report and the tentative master construction programme is shown in **Appendix C** for reference.

Table 3-1 Summary of Groundborne Noise Monitoring at HKSM for Works at the Salisbury Road Site

ID No.	Description	Monitoring Frequency	Monitoring Period / Date	Duration for Each Measurement
Baseline Monitoring				
G1a	Hong Kong Space Museum – Planetarium	Continuous	20 – 28 Dec. 05	1 week
G1b	Hong Kong Space Museum – Recording Room	Once a week	28 Dec. 05	30 minutes
Impact Monitoring				
G1a	Hong Kong Space Museum – Planetarium	Continuous	27 Feb. 06 – 1 Apr. 06	1 month
G1b	Hong Kong Space Museum – Recording Room	Once a week	27 Feb. 06 – 1 Apr. 06	30 minutes

There will be no rock breaking activities outside/near HKCC. The instrumentation to be used is discussed in detail in Section 4.

4 MONITORING INSTRUMENTATION, PARAMETERS & PROCEDURES

The monitoring instrumentation is to comply with the Annex of *Technical Memorandum on Noise from Construction Work other than Percussive Piling*, March 1996.

4.1 Instrumentation

The sound level meters with logging function (e.g. B&K 2238 or Svantek 959 or equivalent) to be used shall comply with International Electro Technical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1).

4.2 Calibration Procedures

All instrumentation to be used will have been calibrated within 24 months of the date of use and the calibration certificate is available. Immediately prior to and following each episode of noise monitoring, the accuracy of the sound level meter shall be

checked using an acoustic calibrator generating a known sound pressure level of a known frequency. Measurements will be accepted as valid only if the calibration levels from before and after the monitoring agree to within 1.0dB.

4.3 Assessment Point

Unless otherwise indicated, monitoring is to be carried out in a central section of the room monitored. The exact location of the monitoring point will be liaised with the premises management.

4.4 Noise Units and Descriptors

Any noise measurements shall be made in terms of the A-weighted equivalent continuous sound pressure level (L_{Aeq}) measured with an integrating monitor. Such measurements shall be made over any 5 minutes period. Results shall be presented in terms of Leq(30min) to assess against the regulatory requirements.

5 ASSESSMENT & REPORTING

The groundborne noise data shall be submitted to the Engineer's Representative (ER) in the format and within a timeframe as agreed with the ER. A groundborne noise monitoring report will be prepared every month during periods of monitoring and will be submitted to ER.

The TBM or work site groundborne noise levels measured will be compared with the noise limits set by the EIA report and tabulated in **Table 2-1**.

Where the measured noise levels exceed the limits (Action Level – when one documented complaint is received; Limit Level – noise limit stated in **Table 2-1**), the Action Plan presented in **Table 5-1** shall be followed and a noise monitoring report will be prepared each day in addition, giving the results of the measurements on the previous day.

Each groundborne noise monitoring report will include the following:

- Building in which monitoring was carried out;
- Location of room where monitoring was carried out;
- Noise monitoring instrumentation used;
- Position of TBM during monitoring or current site works;
- Measured TBM or worksite L_{Aeq} noise level;
- Relevant noise limits as stated in **Table 2-1**;
- Whether groundborne noise levels comply with the appropriate limit;
- Description of actions taken in the event of non-compliance;
- Monitoring time, frequency and duration;
- Graphical plots of trends of monitored parameters; and
- A summary of non-compliance (exceedances) of the environmental quality performance limits.

Table 5-1 Event and Action Plan

Event	Action			
	ET Leader	**IEC**	**ER**	**Contractor**
Action Level[1]	1. Notify IEC and the Contractor. 2. Carry out investigation. 3. Report the results of investigation to IEC and the Contractor. 4. Discuss with the Contractor and formulate remedial measures. 5. Increase reporting frequency to check mitigation measures.	1. Review with analysed results submitted by ET. 2. Review the proposed remedial measures by the Contractor and advise ER accordingly. 3. Supervise the implement of remedial measures.	1. Confirm receipt of notification of exceedance 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.	1. Submit noise mitigation proposals to IEC. 2. Implement noise mitigation proposals.
Limit Level[2]	1. Identify the source. 2. Notify IEC, ER, EPD and the Contractor. 3. Repeat measurement to confirm findings. 4. Increase reporting frequency. 5. Carry out analysis of Contractor's working procedures to determine possible mitigation to be implemented. 6. Inform IEC, ER, and EPD the causes & actions taken for the exceedances. 7. Assess effectiveness of the Contractor's remedial actions and keep IEC, EPD and ER informed of the results.	1. Discuss amongst ER, ET Leader and the Contractor on the potential remedial actions. 2. Review the Contractor's remedial actions whenever necessary to assure their effectiveness and advise ER accordingly. 3. Supervise the implementation of remedial measures.	1. Confirm receipt of notification of exceedance 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.	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.

Notes:
1 Action level is when one documented complaint is received.
2 Limit level is as stated in **Table 2-1**.

6 BASELINE NOISE LEVELS

Prior to commencement of tunnelling and commencement of rock breaking or piling at the Salisbury Road site, baseline noise levels are required at the monitoring locations.

Baseline (ambient) noise levels at HKCC and HKSM were determined during preparation of the EIA. The baseline results were presented in the EIA Report.

More ambient results would be obtained at HKCC and HKSM prior to the start of tunnelling works in order to obtain the latest information and comprehensive noise patterns. After liaison with the respective property management, a baseline period of 7 days and 2 days at HKSM and HKCC was agreed respectively.

Baseline (ambient) noise levels will also be measured in FMPHQ. The procedures to be adopted and the noise descriptors will be as indicated in Sections 2 and 3 of this Plan.

Baseline monitoring is suggested to be carried out over three working days and the log average $L_{Aeq(30mins)}$ levels for the daytime, evening and night time periods will be determined.

Where measured levels exceed the baseline levels by less than 10dB, adjustments to the measured levels will be made to establish the contribution of noise levels from the works. The adjusted results shall be checked against the relevant noise limits stated in **Table 2-1**.

APPENDIX A NOISE DESCRIPTORS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as over 5 minutes and six consecutive 5 minutes Leq will be measured to obtain $Leq_{(30mins)}$ for comparison with regulatory noise limits. These descriptors, which are demonstrated in the graph overleaf, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

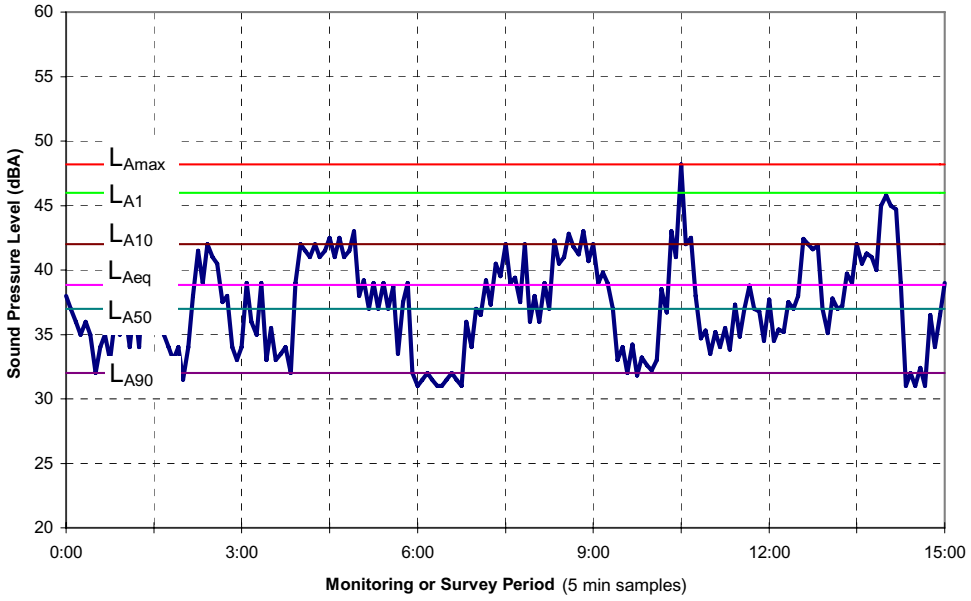
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

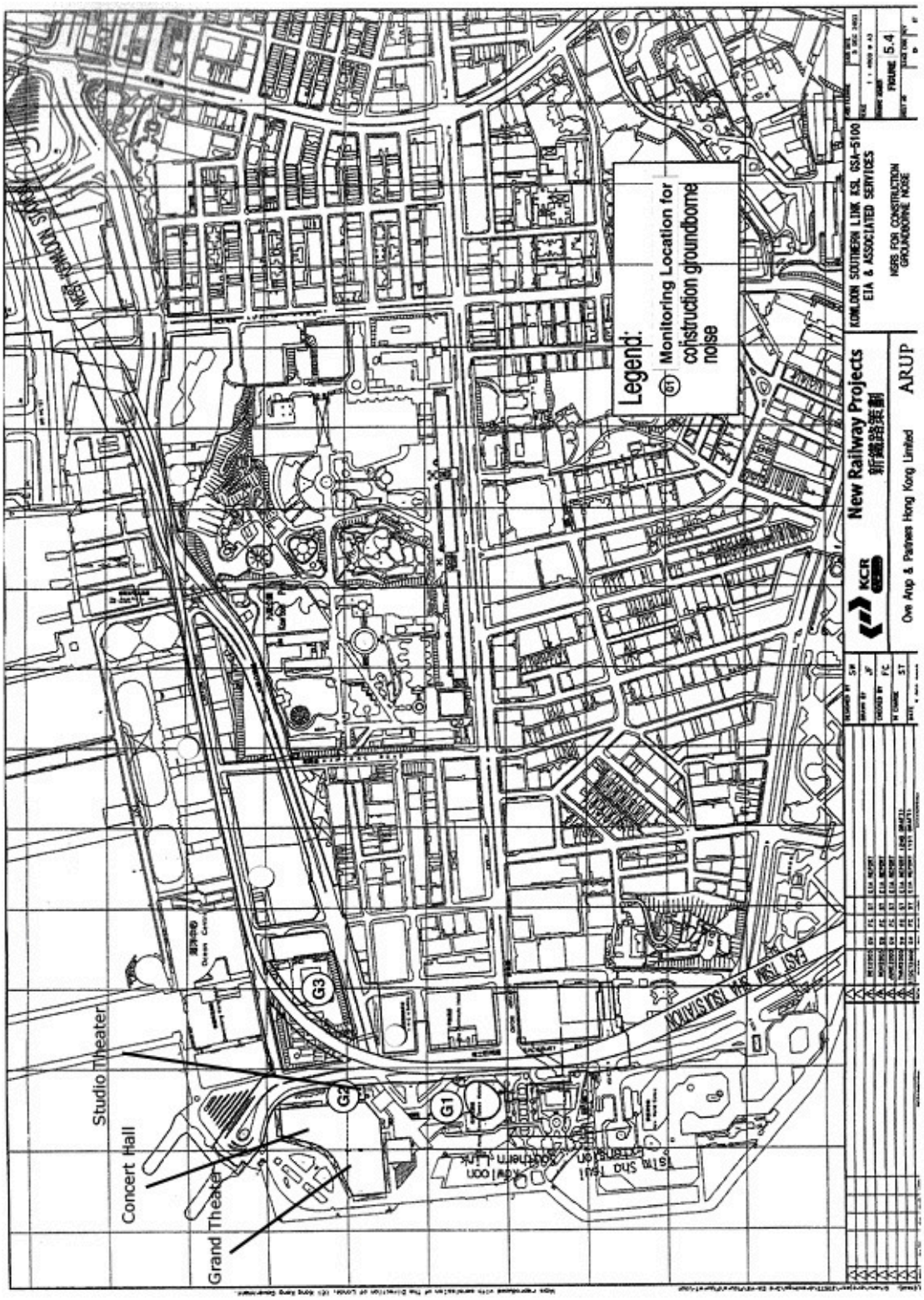
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

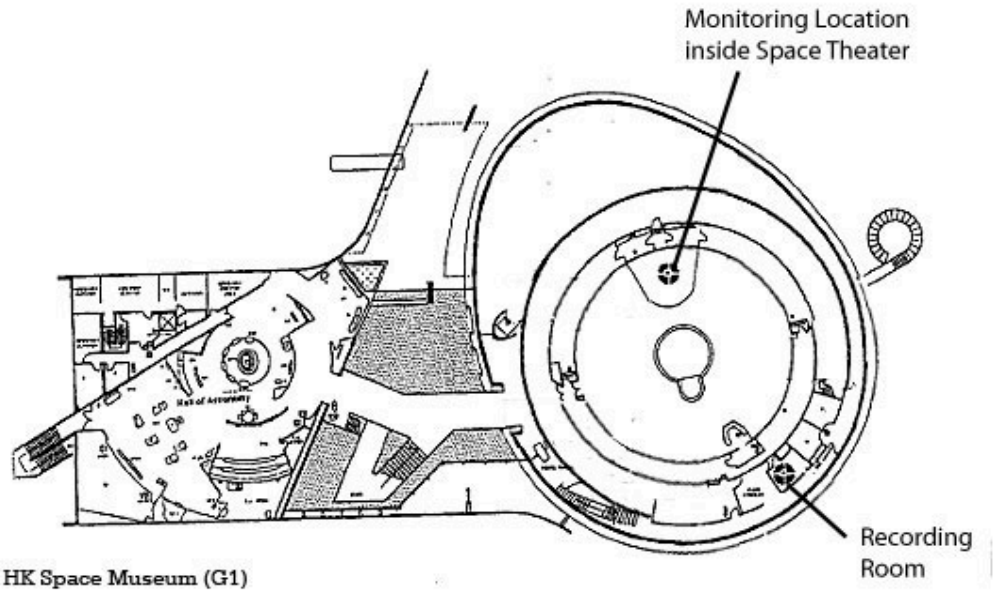
ABL – The Assessment Background Level is the single figure background level representing each assessment period (day, evening and night) for each day. It is determined by calculating the 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period, day, evening and night.

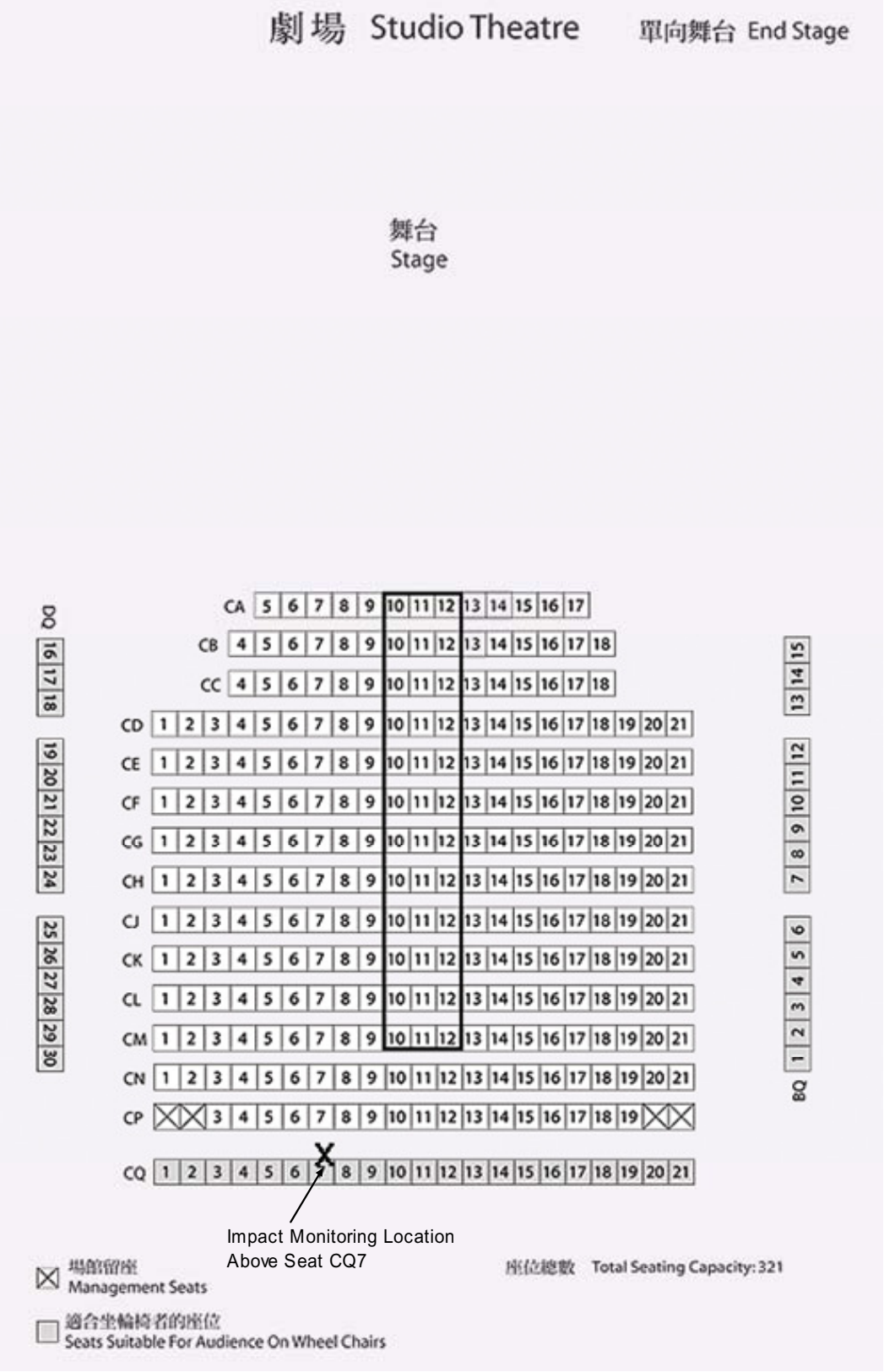

60
55
50
45
40
35
30
25
20
Sound Pressure Level (dBA)
LAmax
LA1
LA10
LAeq
LA50
LA90
0:00
3:00
6:00
9:00
12:00
15:00
Monitoring or Survey Period (5 min samples)

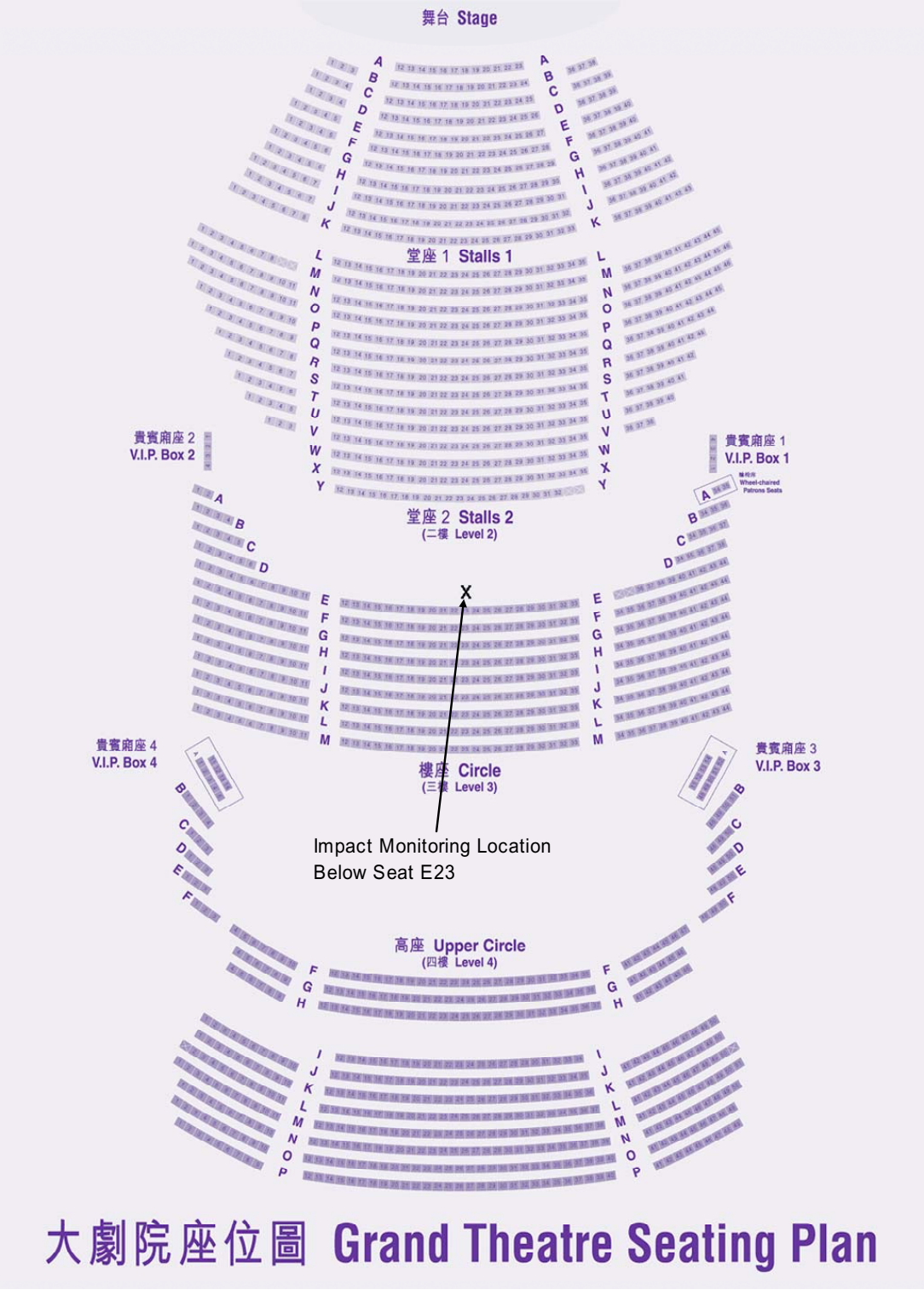
APPENDIX B GROUNDBORNE NOISE MONITORING LOCATIONS

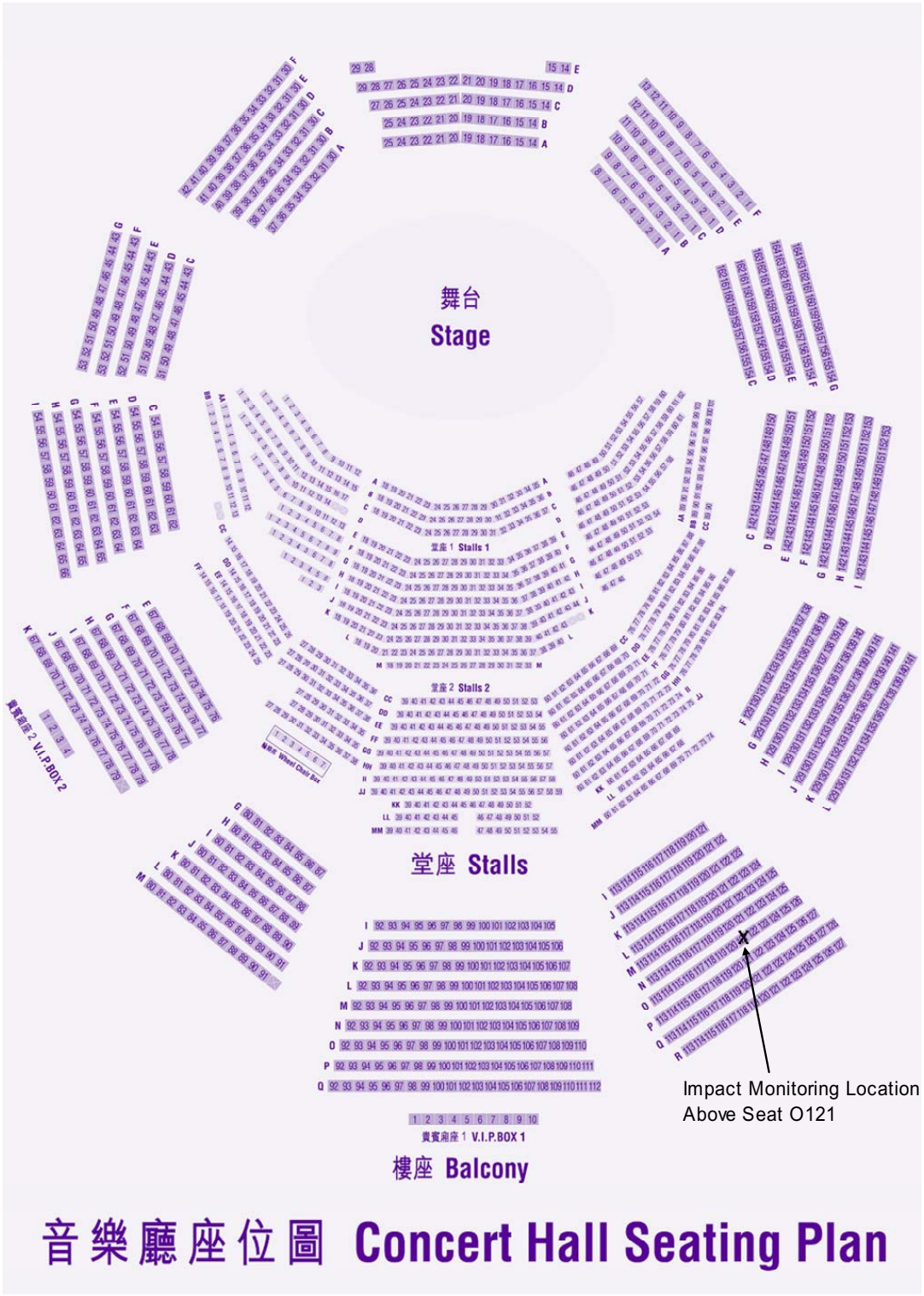




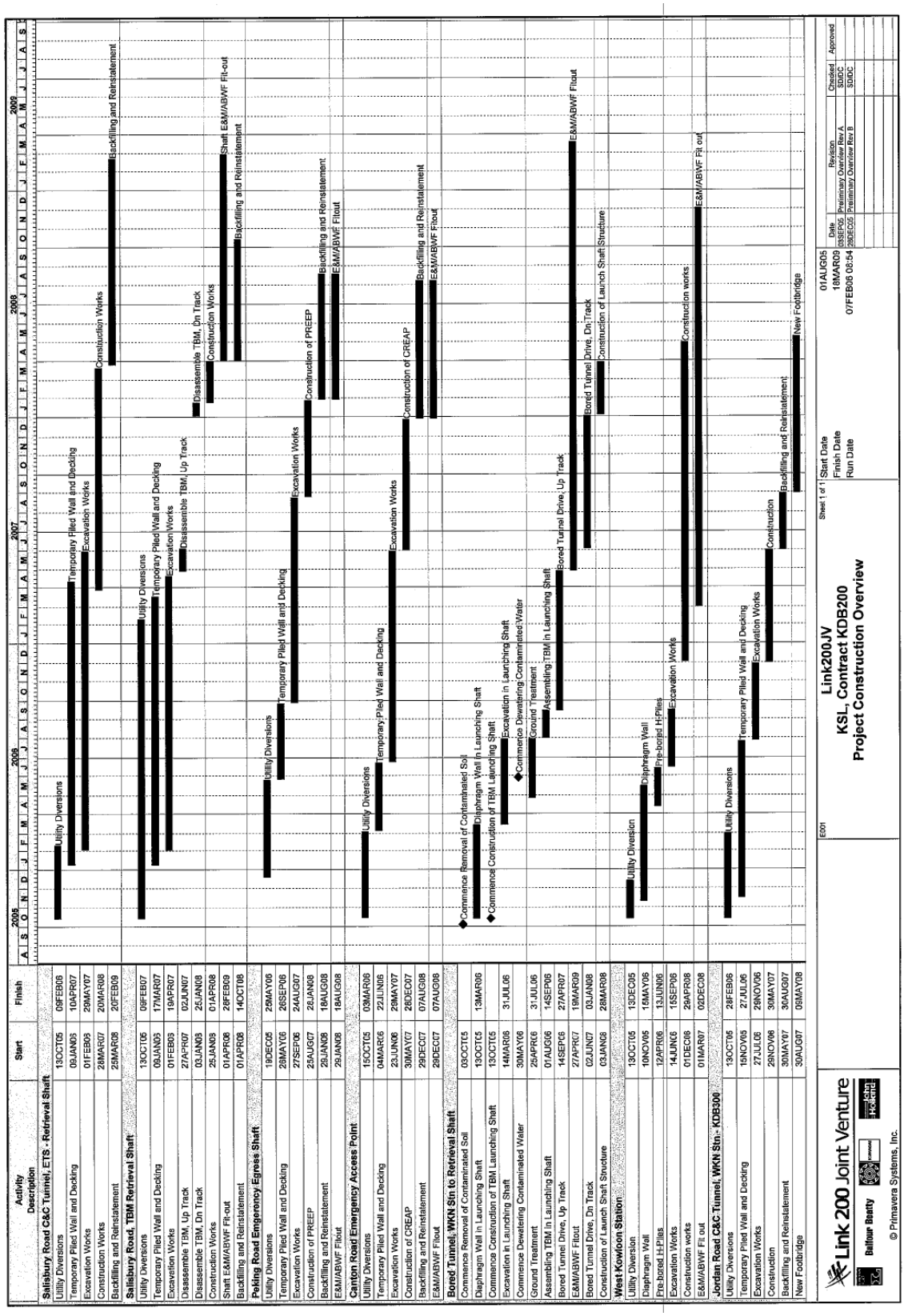
HK Space Museum (G1)


劇場 Studio Theatre
單向舞台 End Stage
舞台
Stage
CA 5 6 7 8 9 10 11 12 13 14 15 16 17
CB 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
CC 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
CD 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CE 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CF 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CG 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CH 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CJ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CK 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CL 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CM 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CN 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
CP 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
CQ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
DQ 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
BQ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Impact Monitoring Location
Above Seat CQ7
場館留座
Management Seats
適合坐輪椅者的座位
Seats Suitable For Audience On Wheel Chairs
座位總數 Total Seating Capacity: 321


舞台 Stage
堂座 1 Stalls 1
貴賓廂座 2
V.I.P. Box 2
貴賓廂座 1
V.I.P. Box 1
堂座 2 Stalls 2
(二樓 Level 2)
X
Impact Monitoring Location
Below Seat E23
貴賓廂座 4
V.I.P. Box 4
貴賓廂座 3
V.I.P. Box 3
樓座 Circle
(三樓 Level 3)
高座 Upper Circle
(四樓 Level 4)
大劇院座位圖 Grand Theatre Seating Plan


舞台
Stage
堂座 Stalls
樓座 Balcony
Impact Monitoring Location
Above Seat O121
音樂廳座位圖 Concert Hall Seating Plan

APPENDIX C MASTER CONSTRUCTION PROGRAMME



Appendix 5-2
Groundwater Monitoring Working Plan

KCRC KOWLOON SOUTHERN LINK

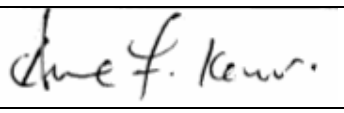
CONTRACT KDB200

ENVIRONMENTAL MONITORING AND AUDIT

GROUNDWATER MONITORING

WORKING PLAN

JULY 2006

Certified By :	Dr. Anne F Kerr
Signed :	
Position :	Environmental Team Leader
Date :	28th July 2006.

Contract KDB200 – Kowloon Southern Link

Environmental Monitoring and Audit

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1 INTRODUCTION

Based on the Environmental Impact Assessment (EIA) report for the Kowloon Southern Link, the following findings were reported with regard to the groundwater tested (for the sampling points under the KDB200 Contract):

(i) Exceedances in cadmium and mercury over the TM-Water limits for locations KSD100/DHEPZ052 (Fire Station in Canton Road) and KSD100/DHE053 (West Kowloon Reclamation);

(ii) Occasional exceedances in copper, lead and mercury over the Dutch C Levels for locations KSD100/DHEPZ052, KSD100/DHE053 and KSD100/DHE063 (industrial activities west Canton Road).

(iii) No exceedance in Risk Based Screening Levels (to assess impact on health of construction workers) for all samples tested; remedial action of groundwater not considered necessary.

According to the requirements of the EIA Report and its subsequent Environmental Permit and Link 200 JV's Further Environmental Permit, and its pursuant Environmental Monitoring and Audit (EM&A) Manual under the KDB200 Contract, a Working Plan for the monitoring and treatment of groundwater (if groundwater quality levels are found to be above the ambient levels as defined by the Limit Levels during the dewatering process) from the dewatering processes shall be submitted to EPD for agreement.

The purpose of this Working Plan is to update groundwater quality information in the related works areas that have not been sampled before. As such, the proposed groundwater sampling points have been selected to be more focused at areas with potential groundwater intrusion during construction and close to the contaminated sites previously identified in section 8.4.1.6 of the EIA report (refer to **Appendix D**). Additionally, discussions were also provided for the proposed monitoring parameters, collection methods, and proposed mitigation measures (including number of treatment facilities, use of individual treatment facilities and their capacities).

This Working Plan sets forth the proposed procedures for baseline and impact monitoring of the groundwater for KDB200 Contract, as well as the respective well locations, and contains the following sections:

Section 2: Background Information - relating to groundwater, with selected relevant sections extracted from the EIA report;

Section 3: Baseline Monitoring – including monitoring parameters, collection methods, proposed monitoring locations and baseline results

Section 4: Impact Monitoring – including monitoring parameters, procedures, proposed well locations and proposed mitigation measures (including number of treatment facilities, use of individual treatment facilities and their capacities).

Section 5: Conclusion

The groundwater monitoring of KDB300&400 would be detailed in a separate Working Plan (to be submitted by others and not under this Contract).

2 BACKGROUND INFORMATION

The following sections are extracted from the EIA report with reference to information specific to groundwater pollution and monitoring.

"8.4 Construction Water Quality Impact

The site will be maintained by good site practices and there will be no direct discharge of wastewater into the Victoria Harbour during the construction phase. Hence, quantitative water quality dispersion modelling is considered not necessary. Other water quality issues relevant to the construction phase are described in the following sections.

8.4.1.5 Groundwater Seepage

The WKN and the tunnels from WKN to NAC will be constructed by cut and cover using D-wall technique (see Chapter 4). This construction methodology can minimise the intrusion of groundwater during excavation. D-wall technique involves excavation of a narrow trench that is kept full of slurry, which exerts hydraulic pressure against the trench walls and acts as a shoring to prevent collapse. Slurry trench excavations can be performed in all types of soil, even below the ground water table.

The construction usually begins with the excavation of discontinuous primary panels of typically up to 6m long and down to the rockhead. In order to provide an effective cut-off to ground water flow, the walls will need to be toe grouted. Once the excavation of a panel is completed, a steel reinforcement cage will be placed in the centre of the panel. Concrete is then poured in one continuous operation. Once the primary panels are set, secondary panels will be constructed between the primary panels and the process then repeats to create a continuous wall. It should be noted that this slurry trench method will reduce the gap between the panels to the practicable minimum. After this, soil excavation will be commenced. The intrusion of groundwater through D-wall panels during soil excavation is therefore considered insignificant.

For the tunnels to the south of WKN, bored tunnelling will be adopted along Canton Road, except for some locations (e.g. TBM launching / construction access shaft, CRPB, tunnel section along Salisbury Road, etc as described in Chapter 4) which will be constructed by cut-&-cover. Ground treatment (e.g. grouting) will be carried out along Canton Road prior to bored tunnelling. The intrusion of groundwater during bored tunnelling would therefore be insignificant.

***8.4.1.6** Groundwater from Contaminated Area*

Potential land contamination areas are identified in the vicinity of the study area including the TST Fire Station, the former shipyard sites within the West Kowloon Reclamation, Canton Road Government Office, Tai Kok Tsui petrol filling station at Skyway House and the factory building at Shum Mong Road.

Site investigations were conducted between Oct 2002 and Feb 2003. Ground water table was found at about 1-2m below the ground level. The locations of the collected groundwater samples are shown in Figure 8-2. Some of the water samples show certain degree of contamination as described in the following sections.

(a) Groundwater Analytical Results

Table 8-3 shows the measurement results for the groundwater samples taken from 5 drillholes. Heavy metals (including Cd, Cr, Cu, Ni, Pb, Zn, Hg, As, Ba, Co, Mo and Sn), BTEX, cyanide, PAH, Total Petroleum Hydrocarbon (TPH) and dioxin were tested.

Estimation indicates that the amount of groundwater generated during dewatering will be around 580m^3 per day, which is corresponding to the flow band of 400 – 600m^3 / day listed in the TM-Water.

Table 8-3 : *Comparison between contaminants and TM-Water effluent discharge criteria*

Parameters	***Maximum Concentration[1] (mg/L) (unless specified)***					***TM-Water Effluent limit for inshore waters of VHWCZ (mg/L)***	***Reporting Limit (μg/L)[5]***
	KSD100/DHE063	***KSD100/DHEPZ052***	***KSD100/DHEPZ113***	***KSD100/DHE053***	***KSD100/DHE120[3]***	***400 – 600 m³ / day***	
pH	*7.89*	*8*	*7.4*	*7.2*	*7.7*	*6-9*	
Temperature ℃	*22.4*	*20.4*	*19.1*	*19.8*	*26.9*	*< 40℃*	*20 –25*
TPH C6 – C9	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*<0.020*	*---*	
TPH C10–C14	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*---*	
TPH C15 – C28	*0.115*	*<0.1*	*0.13*	*<0.1*	*0.11*	*---*	
TPH C29 – C36	*<0.050*	*<0.050*	*<0.050*	*<0.050*	*0.321*	*---*	
Dioxin (pg/L)	*0.04*	*---*	*---*	*---*	*0.019*	*---*	*10 pgL*
Cd	*< 0.0002*	***0.0013***	*0.0005*	*<0.0002*	*0.0005*	*0.001*	
Cr	*0.006*	*0.043*	*0.051*	*0.0071*	*0.0043*	*0.7*	
Cu	*0.4*	*0.230*	*0.330*	*0.340*	*0.055*	*0.7*	
Ni	*0.0035*	*0.023*	*0.027*	*0.0057*	*0.0081*	*0.7*	
Pb	*0.013*	*0.210*	*0.210*	*0.0051*	*0.061*	*0.7*	
Zn	*0.130*	*0.270*	*0.29*	*0.053*	*0.037*	*0.7*	
Hg	*< 0.0005*	*0.0016*	***0.0029***	***0.0025***	*<0.0005*	*0.001*	
As	*<0.010*	*0.021*	*0.015*	*<0.010*	*<0.010*	*0.7*	
Ba	*0.130*	*0.35*	*0.35*	*0.110*	*0.120*	*2.7*	
Co	*0.0045*	*0.016*	*0.017*	*0.0048*	*<0.001*	*---*	
Mo	*0.015*	*0.019*	*0.017*	*0.026*	*0.0079*	*---*	
Sn	*0.0053*	*0.124*	*0.074*	*0.0074*	*0.011*	*---*	
Total Cyanide (μg/L)	*< 0.05*	*< 0.05*	*< 0.05*	*< 0.05*	*< 0.05*	*---*	
PAH[8] (μg/L)	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	*< 0.5*	*---*	*0.1 – 1 (Low molecular weight) 0.02 – 0.1 (High molecular weight)*

Parameters	Maximum Concentration[1] (mg/L) (unless specified)					TM-Water Effluent limit for inshore waters of VHWCZ (mg/L)	Reporting Limit (μg/L)[5]
	KSD100/DHE063	KSD100/DHEPZ052	KSD100/DHEPZ113	KSD100/DHE053	KSD100/DHE120[3]	400 – 600 m^3 / day	
Benzene (μg/L)	< 2	< 2	< 2	< 2	< 2	---	1
Ethylbenzene (μg/L)	< 2	< 2	< 2	< 2	< 2	---	
Toluene (μg/L)	< 2	< 2	< 2	< 2	< 2	---	
Meta- & Para Xylene (μg/L)	< 4	< 4	< 4	< 4	< 4	---	
Ortho Xylene (μg/L)	< 2	< 2	< 2	< 2	< 2	---	

Note *[1]: Bolded letters indicate exceedance in discharge limits at flow band of 400 –600m^3 /day.*
[2]: KSD100/DHEPZ052: Fire Station in Canton Road;
KSD100/DHE053: West Kowloon Reclamation (replaced adjacent drillhole KSD100/DHE056); KSD100/DHEPZ113: Petrol station in Skyway House;
KSD100/DHE120: Former shipyard site in West Kowloon Reclamation Area; KSD100/DHE063: industrial activities west Canton Road
[3]:There will be no groundwater discharge from DHE120 as there will only be at-grade rail works
[4]: ProPECC Note 3/94: Contaminated Land Assessment and Remediation
[5]: According to TM-Water, the chemicals concentration for TPH, dioxin, BTEX and PAH should be below the Reporting limit. Discharges of PCB, PAHs, petroleum oil, pesticide and toxicant into foul sewers, inland waters and coastal waters are prohibited. As the presence of these chemicals is not known at this stage, the groundwater cannot be discharged to the stormwater or foul sewer directly.

It can be seen from the above table that the maximum temperature of the samples are less than 40℃ and the pH of the samples are in the range of 6-9, which comply with the standards stipulated in TM-Water. In addition, the concentration of Cr, Ni, As, Cu, Pb, Zn, and Ba are well below the TM-Water limits. However, exceedances in heavy metals (Cd and Hg) contents are observed at locations KSD100 / DHEPZ052 (Fire Station in Canton Road), KSD100 / DHE053 (West Kowloon Reclamation), and KSD100/DHEPZ113 (Petrol station in Skyhouse).

(b) Impact on health of construction workers

The Dutch ABC Values for groundwater are based on the use of groundwater for potable supply. As this is rarely the case in Hong Kong, the Dutch B Values are not necessarily appropriate for assessing the requirement of groundwater remediation, particularly within urban areas where there may be numerous diffuse sources of historical contamination within the vicinity. Hence, the Dutch C values are used for assessment.

When comparing the groundwater with the Dutch levels, 4 groundwater samples exceed the Dutch C Levels. The analytical results exceeding the Dutch C Levels are given in Table 8-4.

Table 8-4 : *Summary of groundwater samples exceeding Dutch C Level*

Drillhole reference	Depth (mbgl)	Contaminant	Concentration (μg/L)	Dutch C Limit (μg/L)
KSD100/DHEPZ052	8.0m	Copper Lead	230 210	200 200
KSD100/DHE053[1]	6.5m	Copper Mercury	340 2.5	200 2
KSD100/DHE063	3.0m	Copper	400	200
KSD100/DHEPZ113	6.5m	Copper Lead Mercury	330 210 2.9	200 200 2

Notes:

[1] According to the record for Drillhole KSD100/DHE056 (see Figure 2 of Appendix 10-2), there is distributed marine deposit starting from approximately 5.8m deep. The on-site Contamination Specialist decided to take soil samples at 0.5, 1 and 3m deep. This drillhole was backfilled after sampling. However, the amount of groundwater collected before backfilling of the borehole was found to be insufficient for the required analytical testing. As such, groundwater was collected at an adjacent Drillhole KSD100/DHE053 (835327m easting and 818111m northing) as determined by the on-site Contamination Specialist.

The groundwater analytical results indicate occasionally elevated concentrations over the Dutch C level of metals including copper, lead and mercury. Such results are not considered unusual for groundwater in urban areas, where there are numerous potential diffuse sources of contamination. Free product was not observed in any of the samples or drillholes.

The impact of groundwater on the health of construction workers is based on the Dutch C Value as a screening tool, followed by a risk assessment approach where elevated concentrations of contaminants are present. The assessment methodology is given in the Contamination Assessment Report in Appendix 10-2. Table 8-5 below summarizes the Risk Based Screening Levels (RBSL) for each contaminant. Specific values for the sources of reference for individual factors are given in Appendix 10-2.

Table 8-5 : *Risk Based Screening Levels for selected contaminants in groundwater*

Contaminants	THQ	Risk	RfD_o	SF_o	BW	AT_n	AT_c	IR	ED	EF	RBSL (μg/L)
Copper	1	--	0.005	--	60	5	--	0.02	5	312	17500
Lead	--	0.0004	--	0.28	60	--	70	0.02	5	312	70200
Mercury	1	--	0.0001	--	60	5	--	0.02	5	312	351

Note [1]: THQ-Taget Hazard Quotient for chemical
Risk- Taget excess individual lifetime cancer risk
RfD_o-Chronic Oral Reference dose
SF_o- Carcinogenic slope factor
BW-Body Weight
AT_n-Averaging time for non-carcinogens
AT_c-Averaging time for carcinogens
IR-Water Ingestion Rate
ED-Exposure Duration
EF-Exposure Frequency
RBSL-Risk-Based Screening Level for Groundwater

Although the contamination of groundwater exceeds Dutch C level, none of the samples exceed the calculated RBSL for construction workers. Hence, remedial action of groundwater is not considered necessary.

8.4.2.4 Groundwater from Contaminated Areas

Direct discharge of groundwater is not adopted. Contaminated groundwater from dewatering process should be recharged back into the ground at the discharged wells in the stockpile areas or temporary work areas as shown in Figure 8-3. The groundwater recharging wells will be selected at places where the groundwater quality will not be affected by the recharge operation as indicated in Section 2.3 of the TM-Water.

The Contractor shall perform ambient measurements on the groundwater quality at the WKN and the cut-&-cover tunnel to the north of WKN with reference to ProPECC PN3/94 "Contaminated Land Assessment and Remediation", prior to the selection of the recharge wells; and submit a working plan to EPD for agreement. The measurement data of the groundwater will serve as the baseline and the pollutant levels of the groundwater to be recharged shall be measured and not be higher than the baseline measurement at the recharge well.

Apart from the mitigation measures mentioned in S8.4.2.1 and S8.4.2.2, the following additional mitigation measures are proposed to minimize the release of contaminants:

- *Free products shall be removed by installing the petrol interceptor prior to recharge;*
- *Groundwater monitoring wells will be installed to monitor the effectiveness of the recharge wells. The locations of the monitoring wells will be near to the recharge points. During the recharge period, the groundwater level at the monitoring well shall be monitored to ensure that there is no likelihood of locally risen groundwater level and transfer of pollutants beyond the site boundary. Details of groundwater monitoring are given in the EM&A Manual.*

In addition, before excavation, the Contractor shall update the extent of potential groundwater contamination by collecting more groundwater samples along the alignment. The effluent limits and reporting limits are shown in Table 8-3. The Contractor should apply for a discharge licence under the WPCO through the Local Control Office of EPD for groundwater recharge operation.

3 BASELINE MONITORING

3.1 General

The requirements set forth in the EM&A Manual stated that:

- "Prior to construction, ambient ground water quality measurements will be conducted for the WKN and the cut-&-cover tunnel to the north of WKN. The parameters and the associated reporting limits/TM-Water limits as shown in **Table 3-1** should be adopted. Groundwater sampling will be undertaken daily for 7 days. Where the concentrations of parameters exceed the relevant limits, the groundwater should be recharged within the site (during the dewatering process).

- The locations of the recharge wells shall be determined on the basis that the pollutant levels of the groundwater to be recharged shall not be higher than the baseline at the recharge well. Monitoring wells shall be selected near to the recharge points and at site boundaries. A control well shall also be selected within the site.

- A working plan shall be submitted to EPD for agreement prior to selection of the recharge wells.

- A limit level shall be developed based on the ambient water quality measurements."

3.2 Monitoring Parameters

Per the EIA requirements, the chemical testing of groundwater should be carried out to update the groundwater quality. Following the principle adopted for land contamination of the EIA study, confirmatory testing for groundwater should only include chemical parameters that have previously been identified in the approved EIA Report. It has been noted that there was no land usage of the site area since the EIA study. Potential contamination activities at the site area have not been observed or reported.

The characteristics of groundwater identified in the EIA Report are summarized below:

- EIA sampling points KSD100/DHE052 and KSD100/DHE053
Cadmium (Cd) and mercury (Hg) levels exceeded the TM-Water Effluent discharge limits, whilst TPH results were not conclusive.

- EIA sampling points KSD100/DHE063
Cadmium (Cd) and mercury (Hg) levels exceeded the TM-Water Effluent discharge limits, whilst TPH results were not conclusive (It should be noted that the TM-Water does not provide effluent discharge limits for TPH).

Types of contamination recorded at all three sampling points confirmed that the characteristics of groundwater along the alignment was consistent. This justified the proposed testing for identified parameters to update the groundwater quality within the site areas.

The testing parameters and reporting limits are shown in **Table 3-1** (with reference to the Table 8-3 of the approved EIA report). Testing will be undertaken by a HOKLAS accredited laboratory with individual HOKLAS accredited methods. The reference methods are shown in **Appendix A**. The groundwater levels shall also be recorded.

Table 3.1 Groundwater Testing Parameters and Reporting Limits

Parameters	Reporting Limit (μg/L)
TPH C10 – C14	25
TPH C15 – C28	25
TPH C29 – C36	25
Cd	1
Cu	1
Hg	0.5

Note:
[1]: The effluent limits for inshore waters apply to the discharge of uncontaminated groundwater to storm drain only.

3.3 Collection of Samples

Groundwater samples at each monitoring location have been collected using either a Telfon bailer (disposable) or a PVC bailer (which will be decontaminated using non-phosphate detergent). The groundwater samples were transferred to clearly labelled and pre-cleaned sample containers with necessary preservatives immediately after collection. Sufficient quantity of samples has been collected for all laboratory analyses. After collection, the groundwater samples were stored at 0-4ºC and delivered to the laboratory within 24 hours under proper chain-of-custody system. There was zero headspace when sampling for volatile chemicals.

3.4 Baseline Monitoring Locations

As required in the Environmental Mitigation Implementation Schedule (Appendix to the EIA and the EM&A Manual) and in EIA Reference S.8.4.2.4, the groundwater samples should be taken at the West Kowloon Station, and to the north of the station in the cut and cover section. Furthermore, the groundwater quality will be defined along the alignment, along with a control station.

As stated in the EIA Report Section 8.4.1.5, diaphragm walls would be constructed either side of excavation along the alignment and would prevent migration of groundwater. Therefore, sampling locations would concentrate within the alignment. No excavation would be carried out outside either side of the diaphragm walls.

As shown in the Figure in **Appendix B**, previous groundwater results are currently available for three locations within the KDB200 project, namely KSD100/DHE052, KSD100/DHE053 and KSD100/DHE063, in which KSD100/DHE052 and KSD100/DHE053 were located around the launching shaft. To supplement the groundwater condition at TBM launching shaft, an additional sampling point (S1) in launching shaft which relates to DHE052 and DHE053 has been proposed. The testing parameters focused on cadmium, mercury and copper which were found to exceed or be close to the discharge limit in the EIA, as well as TPH (C10-C14, C15-C28 and C29-C36) which were not conclusive in the EIA report.

Similarly, for sampling points S2 and S3 (close to DHE063), cadmium, mercury, copper and TPH C10-C14, C15-C28 and C29-C36 were tested.

Moreover, to address the purpose of the Working Plan as mentioned in Section 1, more sampling points have been proposed to update the groundwater quality information in the related works areas that have not been sampled before. On this basis the following locations were considered for groundwater sampling, testing and defining the baseline (see **Appendix B**):

- 1 no. control point near the site boundary to determine the current site conditions and to act as a control if and when any recharging commences – Point C. Monitoring parameters included Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36).

- 1 location within the launching shaft area, adjacent to the previous locations of DHE52 and DHE53 in the EIA Report – Point S1. Monitoring parameters included Cd, Hg and Cu and TPH (C10-C14, C15-C28 and C29-C36). The purpose of this sampling point was to determine the groundwater quality within the area (Area 1) as shown in Appendix B.

- 2 locations in WKN (inside station), on either side of the previous location DHE063 in the EIA Report – Points S2 & S3. Monitoring parameters included Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36). The purpose of these sampling points was to determine the groundwater quality within Area 2 as shown in Appendix B.

- 1 location in the cut and cover section North of WKN (inside station) – Point S4. Monitoring parameters included Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36). The purpose of this sampling point was to determine the groundwater quality within Area 3 as shown in Appendix B.

- Baseline data was also undertaken at the recharge well, Point R, as shown in **Appendix B**. This recharge well has been chosen on the basis that contaminated soil was previously found at point KSD100/DHE063, and therefore, deemed appropriate to locate the recharging well as close as possible to this location. In addition, two monitoring wells M1 & M2 were also proposed as shown in **Appendix B**. Monitoring parameters included Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36).

It has been considered that the purpose of the Groundwater Monitoring Plan has been fulfilled by taking cognisance of the previous EIA results in combination with the additional sampling points provided above.

3.5 Baseline Monitoring Programme

Sampling at well points S1 – 4, M1 – 2, C and R was carried out for seven consecutive days.

3.6 Reporting

3.6.1 Collection of Samples

Ambient monitoring has been conducted at Point S1, S2, S3, S4, C, R, M1 and M2 for seven consecutive days (between February and May 2006).

Groundwater samples at these monitoring locations were collected using a PVC bailer. The groundwater samples were transferred to clearly labelled and pre-cleaned sample containers for immediate delivery to the laboratory within 24 hours under proper chain-of-custody system.

Table 3-2 summarises the range of ambient results for each monitoring point and the detailed results are shown in **Appendix E**.

Table 3.2 Ambient Results for Groundwater Monitoring

Monitoring Point	Coordinates	Water Level (range in mbgl)	Cd (range in µg/L)	Cu (range in µg/L)	Hg (range in µg/L)	TPH C10-14 (range in µg/L)	TPH C15-28 (range in µg/L)	TPH C29-36 (range in µg/L)
S1	835317, 818134	3 – 3.2	<1	1-2	<0.5	<25	<25 - 50	<25
S2	835273, 818236	2 – 2.4	<1	<1 -25	<0.5	<25	78 - 433	<25 - 277
S3	835243, 818296	1.1 – 1.7	<1	2 - 27	<0.5	<25 - 62	75 - 403	<25 - 316
S4	835140, 818513	1.2 – 1.7	<1	<1 - 3	<0.5	26 - 60	129 – 461	<25 – 857
C	835201, 818009	1.4 – 2.7	<1	<1 - 10	<0.5	<25	75 - 201	44 – 227
R	835240, 818240	1.2 – 2.7	<1	<1 - 2	<0.5	<25 - 60	86 - 237	25 – 120
M1	835194, 818192	2.4 – 2.5	<1	1 - 2	<0.5	<25	81 - 129	48 - 94
M2	835118, 818282	2.4 – 2.9	<1	<1 -1	<0.5	<25	107 - 252	28 – 115

Note:
*mbgl denotes for meter below ground level
The above ambient results show the range between the minimum and maximum values obtained in the seven consecutive days monitoring periods.

3.6.2 Groundwater Quality for Area 1

As discussed, previous groundwater results (EIA) are currently available for three locations within the KDB200 project, namely KSD100/DHE052, KSD100/DHE053 and KSD100/DHE063, in which KSD100/DHE052 and KSD100/DHE053 were located around the launching shaft. To supplement the information on groundwater conditions at the TBM launching shaft, an additional sampling point (S1) in the launching shaft which relates to DHE052 and DHE053 was proposed to update groundwater quality for Area 1 (see **Appendix B**). The testing parameters focused on cadmium, mercury and copper as well as TPH which either exceeded or were close to the discharge limit or were inconclusive in the EIA.

The results for the testing of the samples collected at Point S1 (presented in **Appendix E**) show that all the monitoring parameters including Cd, Hg, Cu and TPH (C10-C14, C15-C28 and C29-C36) are below or equal to the detection limits, and also comply with the TM-water effluent discharge limits.

The results for the heavy metals tested, i.e., Cd, Hg, and Cu, were also compared to the Dutch C levels, and all are reported to be below the stated levels (Cd {10 µg/L}, Hg {2 µg/L}, Cu {200 µg/L}).

3.6.3 Groundwater Quality for Area 2

The results for the testing of the samples collected at Point S2 (presented in **Appendix E**) show no exceedances in TM-Water discharge limits. Similarly, for Point S3, there are no exceedances in TM-Water discharge limits.

The results for the heavy metals tested, i.e., Cd, Hg, and Cu, were compared to the Dutch C levels, and all are reported to be below the stated levels (Cd {10 μg/L}, Hg {2 μg/L}, Cu {200 μg/L}).

3.6.4 Groundwater Quality for Area 3

The results for the testing of the samples collected at Point S4 (presented in **Appendix E**) show no exceedances in TM-Water discharge limits.

The results for the heavy metals tested, i.e., Cd, Hg, and Cu, were also compared to the Dutch C levels, and all are reported to be below the stated levels (Cd {10 μg/L}, Hg {2 μg/L}, Cu {200 μg/L}).

4 IMPACT MONITORING

4.1 Monitoring Parameters

The following parameters should be monitored during the re-charging of groundwater:

- water level at the monitoring wells and recharge wells;
- water quality (parameters would follow those for baseline monitoring) at the monitoring wells and control well, and
- water quality (parameters would include TPH (C10-C14, C15-C28 and C29-C36)) of the recharging groundwater.

4.2 Monitoring Procedure

The groundwater samples shall be collected following the procedure mentioned in *Section 3.3*. During the re-charging of groundwater, water level should be monitored on a daily basis, while water quality should be measured on a weekly basis to ensure that the water levels at the site boundary and the pollution levels will not increase significantly, and to ensure that there is no transfer of pollutants beyond the site boundary.

4.3 Suggestion for Well Locations

Control Well Locations

As stated in the EM&A Manual Reference S.5.6.3, a control well is required within the site. No guidance is given on the location. However, using the principle that the control station should not be directly influenced by the works, it is reasonable to suggest this well be located near the site boundary of KDB200 as shown in **Appendix B.**

As shown in **Appendix E**, the maximum values reported for TPH (C10-C14, C15-C28 and C29-C36) are <25 μg/L, 201 μg/L and 227 μg/L, respectively.

Recharge Well Locations

Contaminated groundwater from the dewatering processes will be recharged back into the ground via a series of recharge wells. The recharge wells are required to be located at places where the groundwater quality will not be affected by the recharge operation. In order to fulfill the requirements of the EIA and the EM&A Manual, a series of measurements will be taken at various key locations to determine groundwater quality, prior to the selection of the recharge wells. The data collected will serve as the baseline of the groundwater to be recharged. As mentioned previously in S3.4, the prevailing site conditions and work programme will also prevail in determining the locations.

Based on the existing results from the previous EIA report, a recharge well, Point R, has been proposed as shown in **Appendix B**. This recharge well has been chosen on the basis that contaminated soil was previously found near point KSD100/DHE063, and therefore it is deemed appropriate to locate the recharge well as close as possible to this location. Based on the baseline monitoring results in **Appendix E**, the maximum values reported for TPH (C10-C14, C15-C28 and C29-C36) are 60 μg/L, 237 μg/L and 120 μg/L, respectively.

Monitoring Well Locations

Groundwater monitoring wells will be installed to monitor the effectiveness of the recharge wells. The EIA Report and EM&A Manual state these should be located close to the recharge wells and at the site boundary. Works would dictate the practicability of the final locations. During the recharge period, the groundwater and the quality of groundwater at the monitoring wells shall be monitored to ensure that there is no likelihood of locally risen groundwater level and transfer of pollutants beyond the site boundary.

For the proposed recharge well, two monitoring wells, (Point M1 and M2) has been proposed and shown in **Appendix B**, with their respective baseline parameters reported in **Appendix E**.

4.4 Mitigation Measures

The associated limit levels – baseline levels are tabulated in **Table 4-1**. The amount of groundwater generated from the station area during dewatering will be up to 617m^3/day. The EIA has previously established that if groundwater is found to be uncontaminated, it could be subject to pretreatment via a sediment tank to remove excess silt and subsequently be discharged to the public drainage system. If disposed in this manner, the effluent limits shall be made reference to the limits for inshore waters of Victoria Harbour WCZ.

However, for the purposes of this Working Plan and based on the results obtained for the baseline samples in **Appendix E**, groundwater abstracted as part of the dewatering works will be required to be recharged within the site. For the groundwater from the KDB200 site, a comparison of the water quality results in **Appendix E** indicates that there are significant variances in the TPH readings (over the 7 sampling days), while no exceedances of the Dutch C and TM-Water discharge limits for heavy metals have been observed.

Baseline results have shown that trace levels of TPH have been observed, with variances in the daily readings as mentioned above and are not restricted or focussed in specific areas. It is suspected that these low levels of TPH, which are entirely consistent with expected background urban groundwater quality, may be caused by the presence of potential diffusing source(s) within the Tsim Sha Tsui/Jordan areas. Background information indicates a similar profile in variability of TPH in other parts of the site.

In line with the requirement of the EIA, the basis of employing treatment facilities will depend on the values of the baseline at the extraction wells and recharge wells. If any baseline values at the extraction wells exceed the proposed limit levels at the recharge well, it is conceded that the extracted groundwater will be subject to the appropriate treatment prior to recharging. Using the same principal, if the baseline values at the extraction wells do not exceed the proposed limit levels at the recharge well, then no treatment facilities will be provided. Based on the results of the baseline samples reported in **Appendix E**, groundwater from S1 will normally not need any treatment while groundwater from S2 to S4 will need to be subjected to treatment, i.e., silt removal and carbon filters, prior to being recharged into Recharge Point R. A carbon filter will be placed at the Recharge Point R, so all recharge water will be subjected to treatment even though it may not be required based on the aforesaid principal. As no "free products" were observed in the test results of the collected samples, no petrol interceptor is proposed. For the dewatering rate from the station area as mentioned above, one (1) unit of the activated carbon filter treatment system shall be provided, with a capacity of 40 cubic meter per hour. Specifications for this treatment unit are provided in **Appendix C**.

The Contractor's handling of groundwater during the dewatering and subsequent recharge will not introduce any additional chemical contamination into the groundwater. In case the water levels and the pollutant levels of groundwater increase significantly, the Event and Action Plan shown in **Table 4-2** should be implemented.

Table 4.1 Limit Levels for Recharging Groundwater

Parameters	Limit Levels (μg/L) for Groundwater Recharging to Recharge Well
TPH C10 -C14	56*
TPH C15 - C28	224*
TPH C29 - C36	110*
Cd#	1
Cu#	500
Hg#	1

* The limit levels for recharging groundwater would be the 95th percentile of the recorded baseline levels at recharge well.

\# The baseline levels of Cd, Cu & Hg at recharge well are below the TM-Water Effluent Limits, so the TM-Water Effluent limits are taken as limit levels.

Table 4.2 Event and Action Plan for Groundwater Recharging

Event	Action			
	ET Leader	IEC	ER	Contractor
Ground water level at recharge point exceeds 1m from baseline	1. Notify IEC and the Contractor. 2. Carry out investigation and repeat monitoring of the well to clarify the result.	1. Review with analysed results submitted by ET. 2. Review the proposed remedial measures by the Contractor and	1. Confirm receipt of notification of exceedance in writing. 2. Notify the Contractor. 3. Require the	1. Reduce the recharge rate AND / OR 2. Suspend the recharge until the groundwater level at recharge points

Event	Action			
	ET Leader	IEC	ER	Contractor
	3. Report the results of investigation to IEC and the Contractor. 4. Discuss with the Contractor and formulate remedial measures. 5. Increase monitoring frequency to check mitigation measures.	advise ER accordingly. 3. Supervise the implement of remedial measures.	Contractor to propose remedial measures for the analysed groundwater problem. 4. Ensure remedial measures are properly implemented.	falls back to less than 1m difference with the baseline
Pollution level of recharging groundwater exceed the baseline levels[1] / the pollution levels at the monitoring well	1. Notify IEC and the Contractor. 2. Carry out investigation and repeat monitoring for 3 consecutive days to clarify the result. 3. Review results of 3 consecutive days. 4. Report the results of investigation to IEC and the Contractor. 5. Discuss with the Contractor and formulate remedial measures. 6. Increase monitoring frequency to check mitigation measures.	1. Review with analysed results submitted by ET. 2. Review the proposed remedial measures by the Contractor and advise ER accordingly. 3. 3. Supervise the implement of remedial measures.	1. Confirm receipt of notification of exceedance in writing. 2. Notify the Contractor. 3. Require the Contractor to propose remedial measures for the analysed groundwater problem. 4. Ensure remedial measures are properly implemented.	If samples for 3 consecutive days indicate exceedance of baseline levels, then: 1. Suspend the recharge OR 2. Carry out maintenance on sedimentation tank and carbon filter.

Note:
[1]: The baseline levels (Limit Levels) for recharging water are presented in **Table 4-1**.

4.5 Contingency Measures

In this Working Plan, the recharging operation has been proposed to be undertaken at Recharge Point R. Due to the limited working space within the site, more recharging wells may be necessary to supplement and/or replace the currently proposed Recharge Point R as the work progresses. Should such circumstances occur, new baseline values will be obtained for the newly proposed recharge wells after suitable locations have been determined. Using the basis as discussed in Section 4.4, the use of treatment facilities will depend on the values of the baseline at the extraction wells and recharge wells. Accordingly, an updated Working Plan will be submitted for EPD's approval per the EP requirements.

5 CONCLUSION

This Working Plan sets forth the procedures for baseline and impact monitoring of the groundwater resulting from the dewatering processes for the KDB200 Contract. Sampling and testing requirements as recommended in the EIA have been adopted for the Plan. For the purposes of this Working Plan, extracted groundwater from Points S1, S2, S3 and S4 will be recharged into Recharge Point R within the site, subject to pretreatment via a sediment tank and an activated carbon filter system

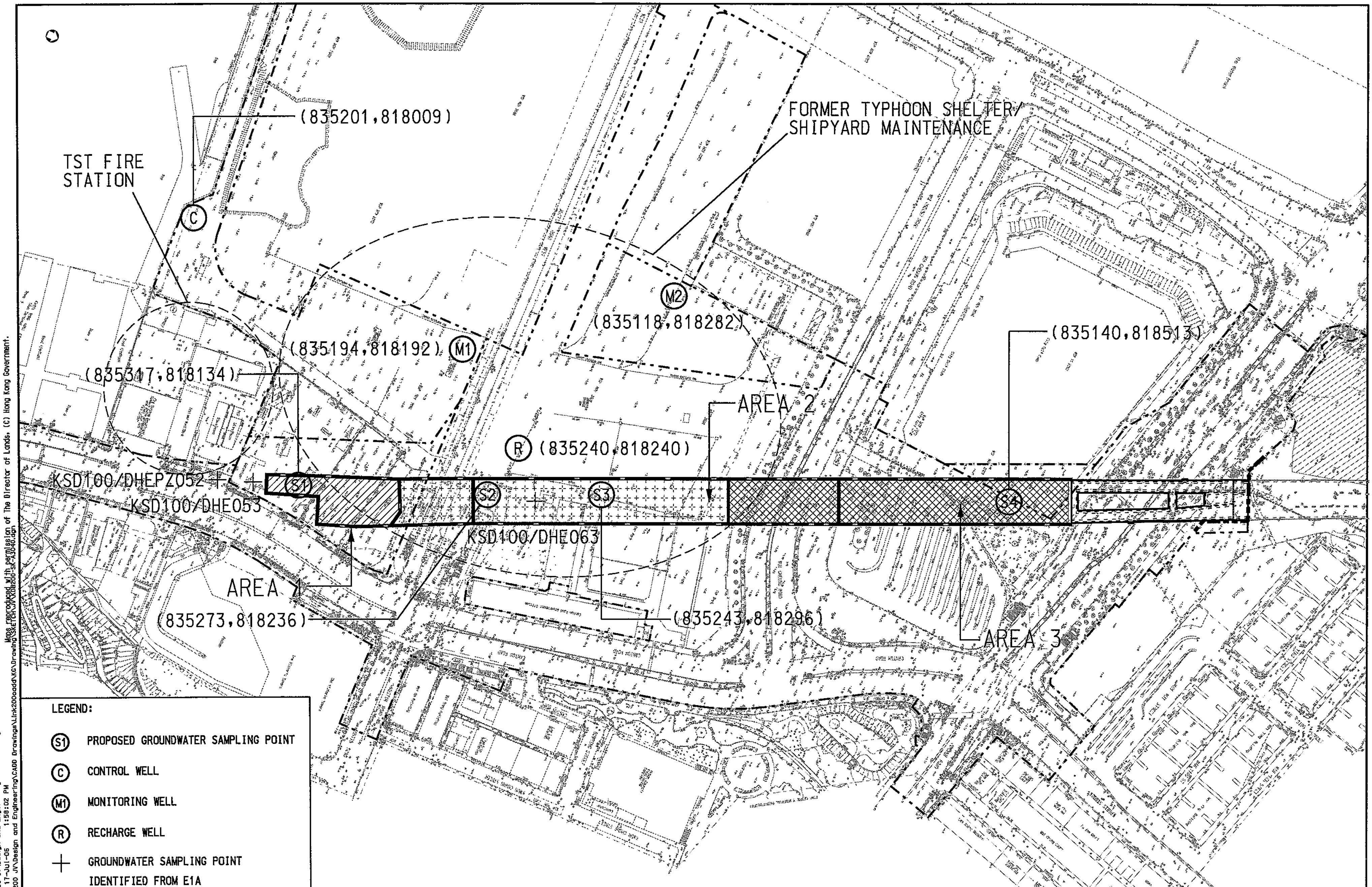
prior to recharge. Treatment of the groundwater will be subject to compliance with the Limit Levels and Event and Action Plan detailed in **Tables 4-1** and **4-2** respectively.

APPENDIX A

ANALYTICAL METHODS AND REPORTING LIMITS FOR GROUNDWATER SAMPLES

Analyse Description	Reference Method	Reporting Limit (µg/L)
Cadmium	USEPA 6020	1
Copper		1
Mercury	APHA 3112B	0.5
C10 – C14	USEPA 8015/ GCFID	25
C15 – C28	USEPA 8260/Purge & Trap GCMS	
C29 – C36		

APPENDIX B GROUNDWATER MONITORING LAYOUT PLAN



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A8	24/05/06	KC			LAYOUT UPDATED
A7	08/03/06	MK			LAYOUT UPDATED
A6	22/02/06	MK			LAYOUT UPDATED
A5	09/02/06	MK			LAYOUT UPDATED
A4	06/02/06	MK			LAYOUT UPDATED
A3	06/01/06	MK			LAYOUT UPDATED
A2	28/10/05	MK			LEGEND REVISED
A1	17/09/05	MK			PD043 DELETED, PD044 ADDED
A0	19/08/05	MK			

DESIGNED BY KC
DRAWN BY RC
CHECKED BY MC
IN CHARGE PW
DATE 28JUN2006

KCR 九廣鐵路 九龍南線 Kowloon Southern Link

Link 200 Joint Venture — Balfour Beatty — Mott Connell in association with MEINHARDT Aedas

TITLE

CONTRACT KDB200

GROUNDWATER MONITORING PLAN

SCALE	1 : 1000 @ A1		
ORIGINATOR LBBKJH	ORIGINATOR REFERENCE	REF NO	
DRAWING NUMBER KDB200 /SK/A3040			REV A9
RAILWAY KSL	LOCATION WKN	STAGE W	SHEET NO 1OF1

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PRINTED BY: RogerC 17-Jul-06 1:58:02 PM Maps reproduced with permission of The Director of Lands, (C) Hong Kong Government.
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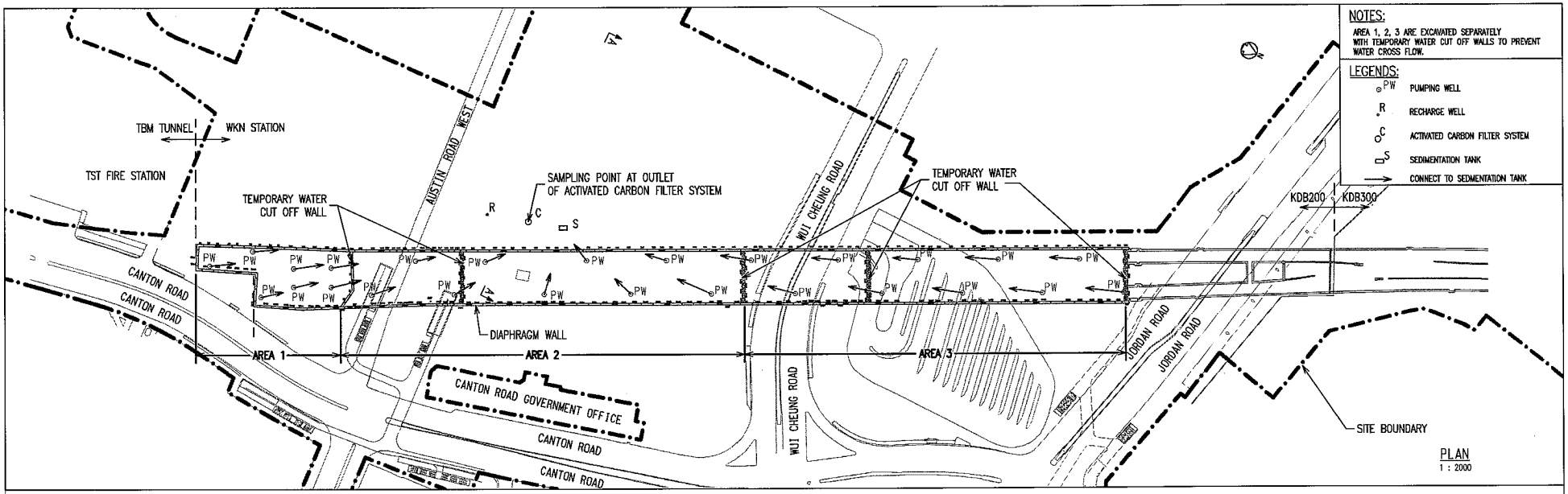
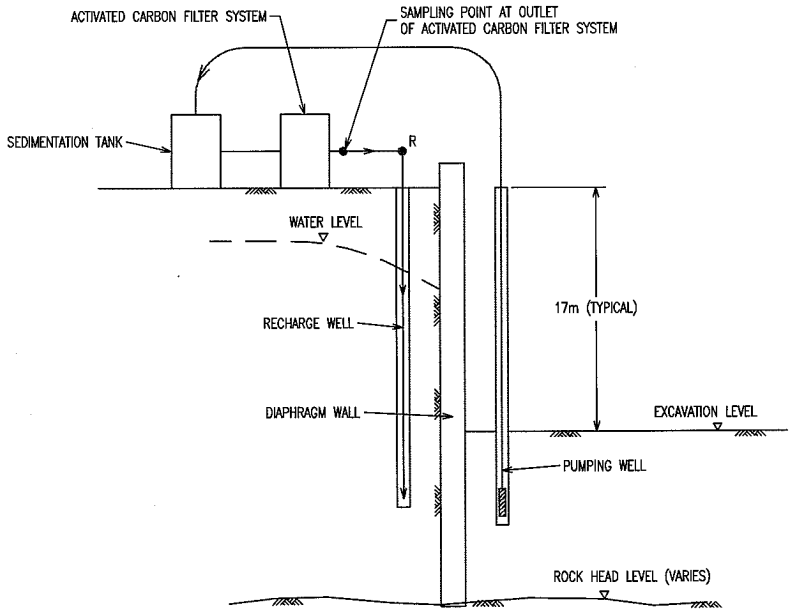




TYPICAL DETAIL
N.T.S.

REV	DATE	BY	SUB	APP	DESCRIPTION
A	14JUL06				FIFTH DRAFT FOR COMMENT
A	11JUL06				FOURTH DRAFT FOR COMMENT
A	09JUN06				THIRD DRAFT FOR COMMENT
A	25MAY06				SECOND DRAFT FOR COMMENT
A	10MAY06				FIRST DRAFT FOR COMMENT

DESIGNED BY J.W.
DRAWN BY K.K.MAK
CHECKED BY W.W.FUNG
IN CHARGE J.W.
DATE 10MAY06

KCR 九廣鐵路 九龍南線 Kowloon Southern Link

Link 200 JointVenture
Balfour Beatty
Mott Connell
MEINHARDT
Aedas

TITLE
CONTRACT KDB200
PROPOSED RECHARGING OPERATION FOR GROUND WATER

SCALE AS SHOWN
ORIGINATOR LBBKJH
ORIGINATOR REFERENCE
DRAWING NUMBER KDB200/SK/047
REV E
RAILWAY KSL
LOCATION WKN
STAGE Z
SHEET NO 1 OF 1

APPENDIX C Specifications of Activated Carbon Filter System

HYDREX

Waste & Water Treatment

TECHNICAL SPECIFICATION

NO. 1387

TO : Link 200 JV
HONG KONG

FOR : ACTIVATED CARBON FILTER SYSTEM

Hydrex offers to furnish, subject to terms and conditions contained herein, the equipment and materials described in this proposal which is based upon the specifications and information supplied by the Purchaser.

This proposal shall not become a contract or binding until its acceptance by the Purchaser and approval of an officer of Hydrex.

The information contained in this proposal is confidential and proprietary in nature and is transmitted to the Purchaser for its sole use. By accepting this proposal the Purchaser agrees not to disclose the contents to any unauthorized person without an approval from Hydrex.

HYDREX ASIA LTD.

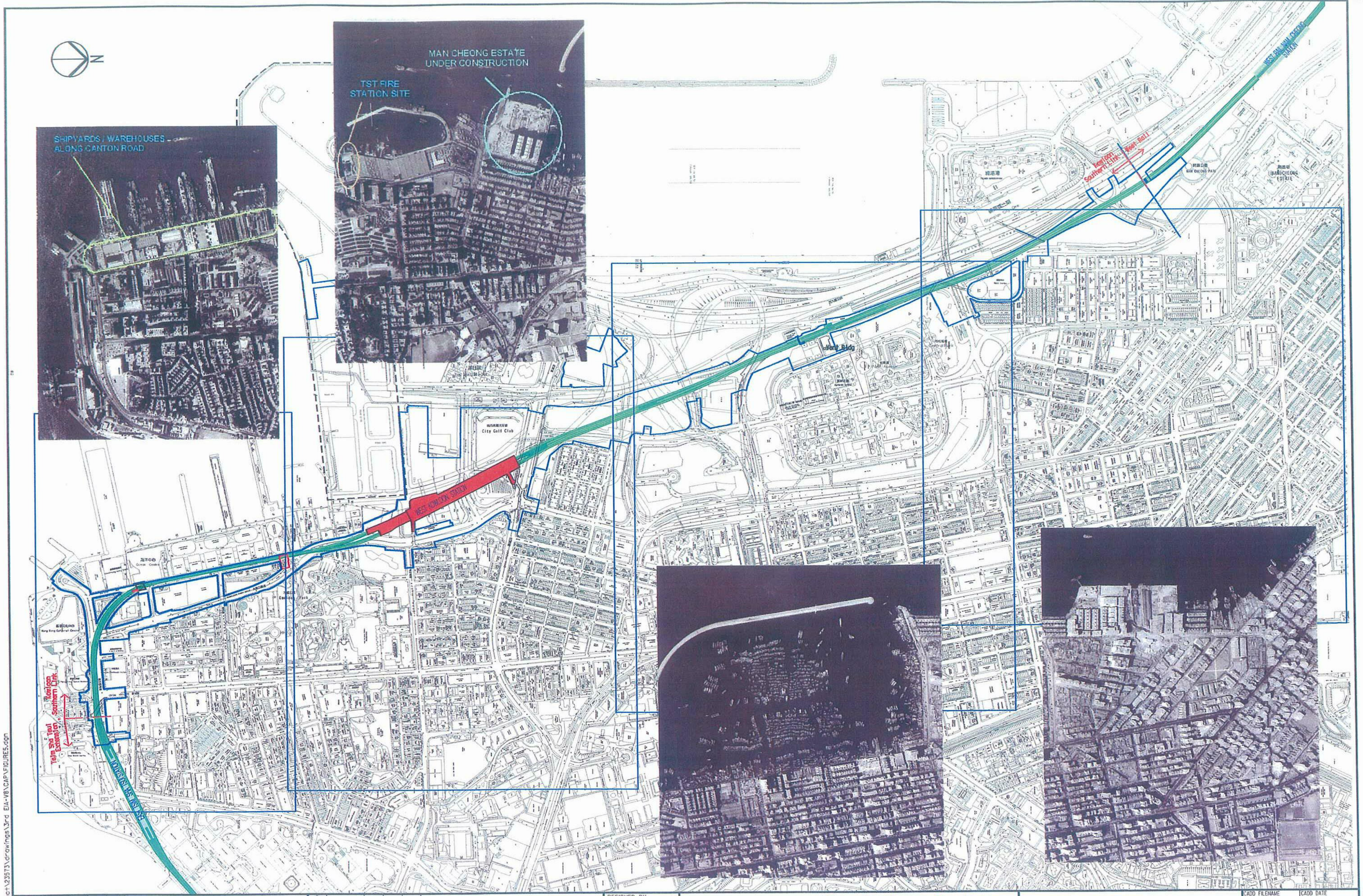
701 BEVERLEY COMMERCIAL CENTRE,
87-105 CHATHAM ROAD, KLN., HONG KONG
Phone: 2527-9544 & 2527-8291/Fax: (852) 2865-1533
E-Mail Address: hydrxasia@hknet.com

1. ACTIVATED CARBON FILTER

One activated carbon filters shall be provided for the removal of organics from the treated water. Each filter shall consist of a steel tank, internals (underdrain with strainers), rate of flow indicator, pressure gages, manhole, supporting legs, manual operating valves and granular activated carbon. All internal surfaces of the tanks will be lined with epoxy.

Number of Units	One (1)
Manufacturer	Hydrex design (locally fabricated)
Type	Vertical pressure type
Capacity per Unit	40 m^3/hr
Size, Dia x Str. Height	Ø 2400 x Str. Height 1,220 mm
Filtration Rate	8.84 m^3/m^2/hr
Backwash Flow	140 m^3/hr
Shell Thickness	6 mm, Q235A
Tank Head Thickness	8 mm, Q235A
Design/Test Pressure	5.0/ 7.5 bar
Valve & Main Pipe Sizes	
Service:	100 mm
Backwash	150 mm
Rinse	75 mm
Control Valve Type	Butterfly valves, manual operation
Underdrain	Header/ laterals with coarse sand subfill.
Interior Finishing	Sand blasted, coal tar epoxy painted
Exterior Finishing	Sand blasted, coal tar epoxy painted
Coarse Sand Volume	1.4 m3
Carbon Volume	3.15 m3
Strainer Material	PP

APPENDIX D Site History – The Potential Contaminated Sites



REV	DATE	BY	SUB	APP	DESCRIPTION	REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE

KCR 九廣鐵路

New Railway Projects 新鐵路策劃

AERIAL PHOTOGRAPHY FOR 1964

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SCALE 1 : 10000 in A3
DRAWING NUMBER 5
SHEET NO | STAGE CODE | REV

FULL SIZE A1

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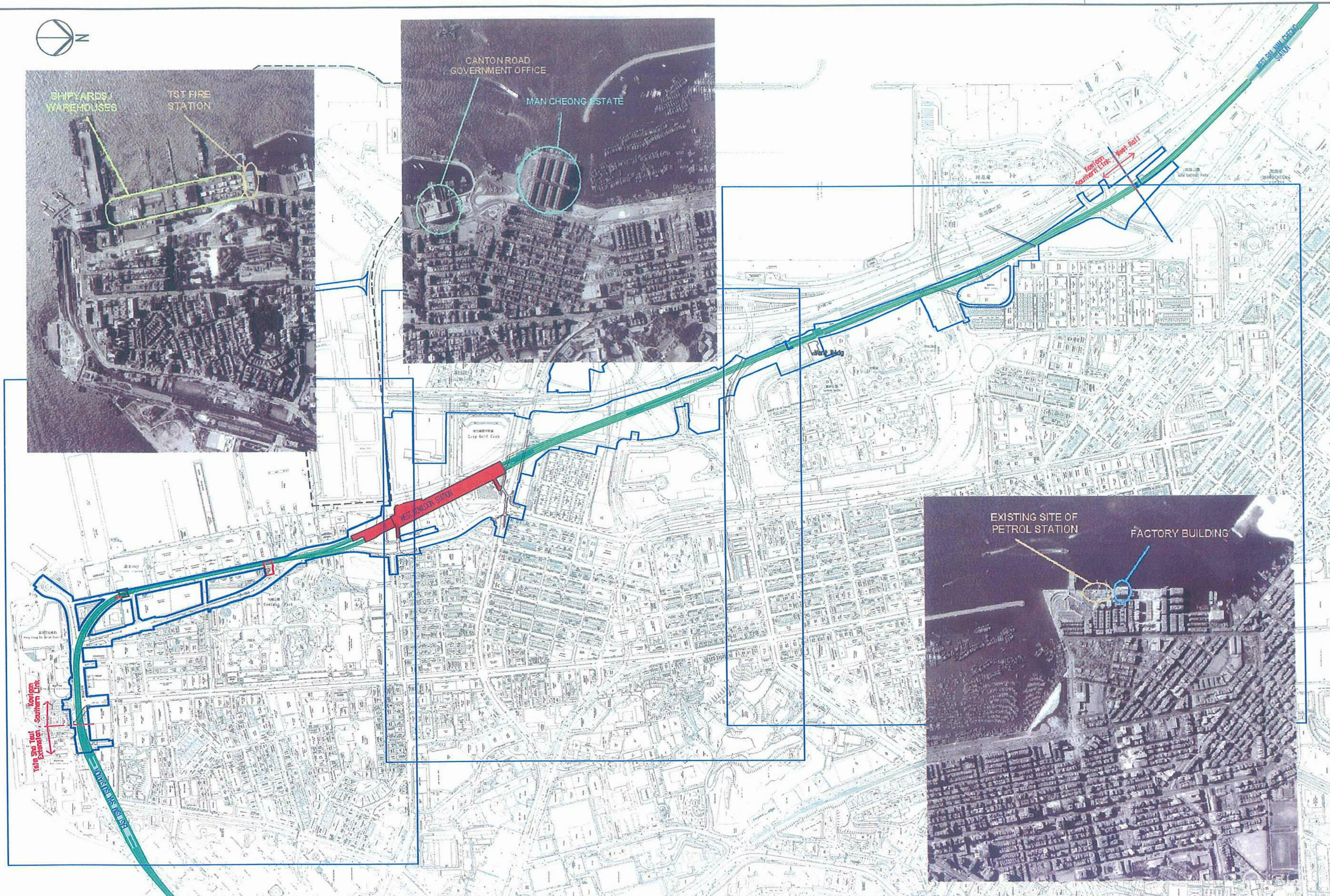

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DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE

KCR 九廣鐵路

New Railway Projects 新鐵路策劃

AERIAL PHOTOGRAPHY FOR 1974

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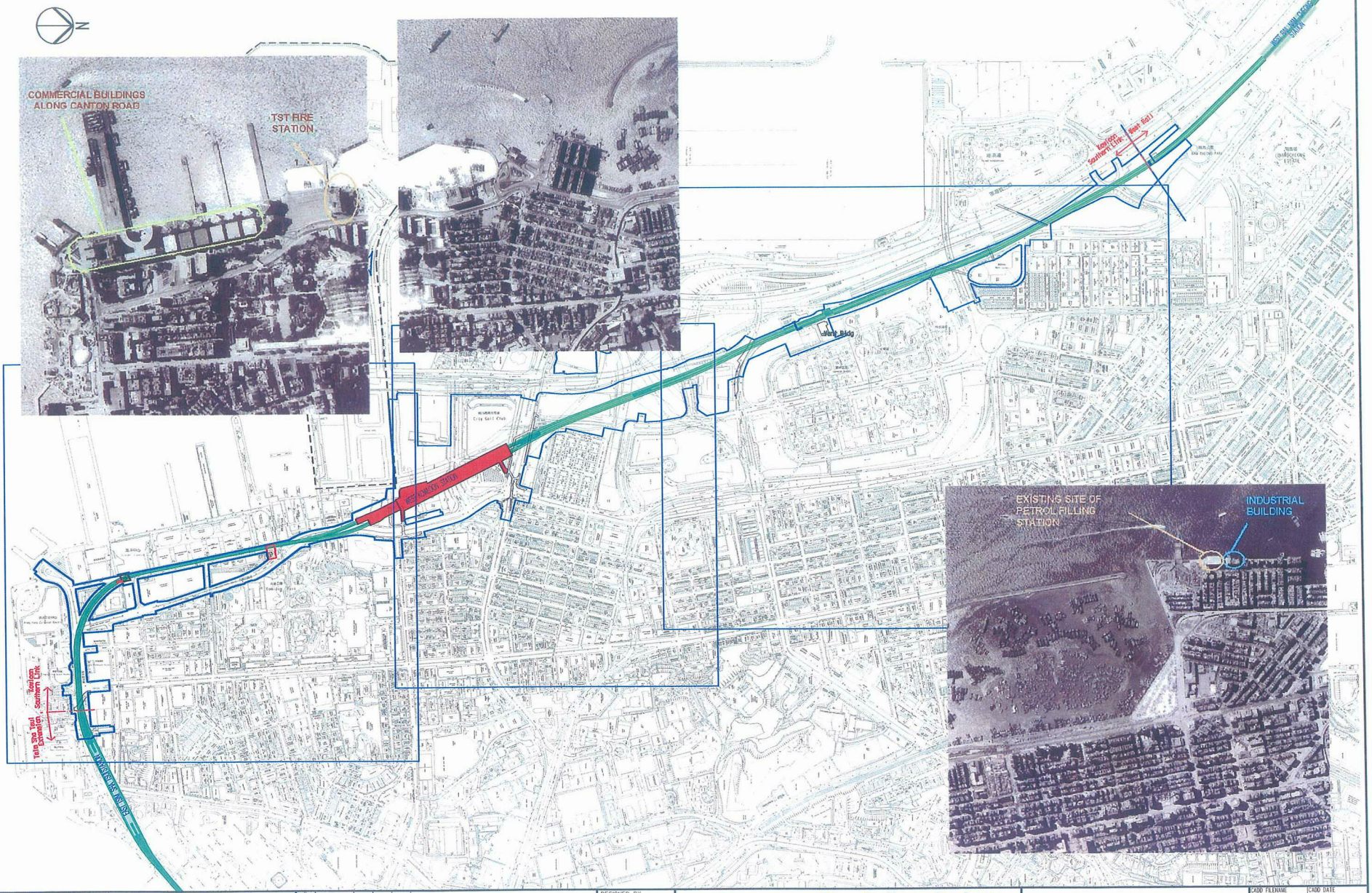
FULL SIZE A1

MATCH TEXT MATCH TEXT MATCH TEXT



REV	DATE	BY	SUB	APP	DESCRIPTION

REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY
DRAWN BY
CHECKED BY
IN CHARGE
DATE

KCR 九廣鐵路

New Railway Projects
新鐵路策劃

AERIAL PHOTOGRAPHY FOR 1985

CADD FILENAME | CADD DATE

SCALE 1 : 10000 @ A3

DRAWING NUMBER 7

SHEET NO | STAGE CODE | REV

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REV	DATE	BY	SUB	APP	DESCRIPTION

DESIGNED BY	
DRAWN BY	
CHECKED BY	
IN CHARGE	
DATE	

KCR 九廣鐵路

New Railway Projects
新鐵路策劃

AERIAL PHOTOGRAPHY FOR 1995

CADD FILENAME	CADD DATE
SCALE	1 : 10000 @ A3
DRAWING NUMBER	8
SHEET NO	STAGE CODE / REV

FULL SIZE A1

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APPENDIX E

AMBIENT BASELINE MONITORING RESULTS

Point S1 (25 February 2006 - 3 March 2006)

Monitoring Parameters	*Cadmium*	*Copper*	*Mercury*
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	0.001	0.5	0.001
Reporting Limit (μg/L)	1	1	0.5
Date	***Baseline Monitoring Results, (μg/L)***		
25/02/2006 (Sat)	<1	1	<0.5
26/02/2006 (Sun)	<1	<1	<0.5
27/02/2006 (Mon)	<1	1	<0.5
28/02/2006 (Tue)	<1	<1	<0.5
01/03/2006 (Wed)	<1	<1	<0.5
02/03/2006 (Thu)	<1	<1	<0.5
03/03/2006 (Fri)	<1	<1	<0.5

Point S1 (25 May 2006 - 31 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10-C14	*C15-C28*	*C29-C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (μg/L)***					
25/05/2006 (Thu)	<25	50	<25	<1	1	<0.5
26/05/2006 (Fri)	<25	26	<25	<1	1	<0.5
27/05/2006 (Sat)	<25	<25	<25	<1	1	<0.5
28/05/2006 (Sun)	<25	27	<25	<1	2	<0.5
29/05/2006 (Sun)	<25	<25	<25	<1	2	<0.5
30/05/2006 (Mon)	<25	<25	<25	<1	1	<0.5
31/05/2006 (Tue)	<25	<25	<25	<1	1	<0.5

Point S2 (27 April 2006 - 4 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (μg/L)***					
27/04/2006 (Thu)	<25	95	43	<1	1	<0.5
28/04/2006 (Fri)	<25	93	52	<1	<1	<0.5
29/04/2006 (Sat)	<25	433	277	<1	8	<0.5
30/04/2006 (Sun)	<25	87	<25	<1	25	<0.5
01/05/2006 (Mon)	<25	78	26	<1	<1	<0.5
02/05/2006 (Tue)	<25	219	143	<1	1	<0.5
04/05/2006 (Thu)	<25	128	42	<1	1	<0.5

Point S3 (27 April 2006 - 4 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (μg/L)***					
27/04/2006 (Thu)	<25	125	63	<1	2	<0.5
28/04/2006 (Fri)	36	247	200	<1	3	<0.5
29/04/2006 (Sat)	<25	246	172	<1	2	<0.5
30/04/2006 (Sun)	<25	83	<25	<1	10	<0.5
01/05/2006 (Mon)	<25	75	<25	<1	27	<0.5
02/05/2006 (Tue)	27	88	<25	<1	5	<0.5
04/05/2006 (Thu)	62	403	316	<1	2	<0.5

Point S4 (27 April 2006 - 4 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (μg/L)***					
27/04/2006 (Thu)	29	454	857	<1	2	<0.5
28/04/2006 (Fri)	45	435	279	<1	2	<0.5
29/04/2006 (Sat)	26	146	47	<1	2	<0.5
30/04/2006 (Sun)	60	461	240	<1	<1	<0.5
01/05/2006 (Mon)	31	129	<25	<1	3	<0.5
02/05/2006 (Tue)	34	131	<25	<1	<1	<0.5
04/05/2006 (Thu)	28	153	36	<1	2	<0.5

Point C (8 May 2006 - 14 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (μg/L)***					
08/05/2006 (Mon)	<25	201	227	<1	6	<0.5
09/05/2006 (Tue)	<25	75	50	<1	10	<0.5
10/05/2006 (Wed)	<25	94	44	<1	6	<0.5
11/05/2006 (Thu)	<25	87	69	<1	9	<0.5
12/05/2006 (Fri)	<25	87	62	<1	9	<0.5
13/05/2006 (Sat)	<25	89	57	<1	5	<0.5
14/05/2006 (Sun)	<25	137	176	<1	<1	<0.5

Point R (8 May 2006 - 14 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (μg/L)***					
08/05/2006 (Mon)	60	237	85	<1	<1	<0.5
09/05/2006 (Tue)	32	173	63	<1	2	<0.5
10/05/2006 (Wed)	<25	118	34	<1	2	<0.5
11/05/2006 (Thu)	<25	86	25	<1	2	<0.5
12/05/2006 (Fri)	<25	90	32	<1	2	<0.5
13/05/2006 (Sat)	25	110	42	<1	2	<0.5
14/05/2006 (Sun)	28	192	120	<1	2	<0.5

Point M1 (8 May 2006 - 14 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (μg/L)***					
08/05/2006 (Mon)	<25	120	79	<1	2	<0.5
09/05/2006 (Tue)	<25	129	94	<1	2	<0.5
10/05/2006 (Wed)	<25	104	77	<1	1	<0.5
11/05/2006 (Thu)	<25	97	71	<1	1	<0.5
12/05/2006 (Fri)	<25	81	48	<1	1	<0.5
13/05/2006 (Sat)	<25	104	83	<1	2	<0.5
14/05/2006 (Sun)	<25	96	62	<1	2	<0.5

Point M2 (8 May 2006 - 14 May 2006)

Monitoring Parameters	*Total Petroleum Hydrocarbons*			*Cadmium*	*Copper*	*Mercury*
	C10 -C14	*C15 - C28*	*C29 - C36*			
TM-Water Effluent Limit for inshore water of VHWCZ (mg/L)	---	---	---	0.001	0.5	0.001
Reporting Limit (μg/L)	25	25	25	*1*	*1*	*0.5*
Date	***Baseline Monitoring Results, (μg/L)***					
08/05/2006 (Mon)	<25	218	115	<1	1	<0.5
09/05/2006 (Tue)	<25	252	73	<1	<1	<0.5
10/05/2006 (Wed)	<25	158	50	<1	1	<0.5
11/05/2006 (Thu)	<25	173	59	<1	1	<0.5
12/05/2006 (Fri)	<25	107	28	<1	1	<0.5
13/05/2006 (Sat)	<25	107	52	<1	1	<0.5
14/05/2006 (Sun)	<25	167	51	<1	<1	<0.5

Appendix 5-3
Sample Data Sheet

Data Sheet for TSP Monitoring

Monitoring Location		
Details of Location		
Sampler Identification		
Date & Time of Sampling		
Elapsed-time Meter Reading	Start (min.)	
	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 ($\mu g/m^3$)		

	Name & Designation	Signature	Date
Field Operator :			
Laboratory Staff			
Checked by			

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		
Measured TSP Level ($\mu g/m^3$)		
Observations / Remarks		

Name & Designation **Signature** **Date**

Field Operator :

Laboratory Staff:

Checked by:

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		

Name & Designation Signature Date

Recorded By :

Checked By :

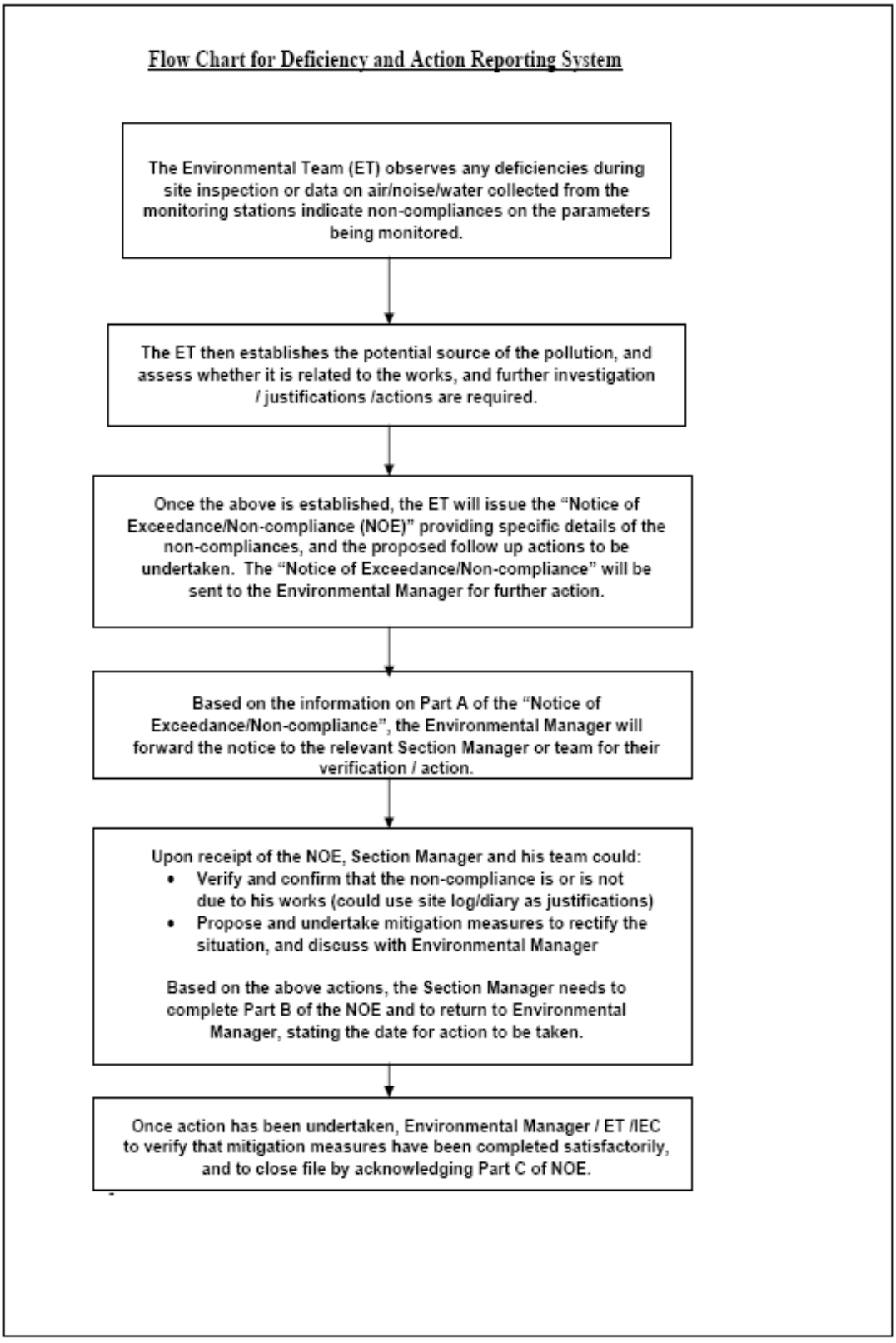
Appendix 5-4
Analytical Methods and Reporting Limits for Groundwater Samples

ANALYTICAL METHODS AND REPORTING LIMITS FOR GROUNDWATER SAMPLES

Analyse Description	Reference Method	Reporting Limit (mg/L)
Pollutant Metals		
Cadmium	USEPA 6020	1
Copper		1
Mercury	APHA 3112B	0.5
C10 -C14	USEPA 8015/ GCFID	25
C15 - C28	USEPA 8260/Purge & Trap GCMS	25
C29 - C36		25

Appendix 6-1
Deficiency and Action Reporting System

Flow Chart for Deficiency and Action Reporting System



Kowloon Southern Link - Contract No. KDB200
West Kowloon Station and Tunnels – Jordan Road to East Tsim Sha Tsui Station

Notice of Exceedance / Non-compliance (NOE) – Air Quality / Noise / Water*

Part A: Comment by ET (Link 200 JV) **Reference:**

NOE No.
Date:
Contract Packages:
Non-compliance / Action Level Exceedance / Limit Level Exceedance*
Date & Time of Recorded Non-compliance / Exceedance:
Non-compliance / Exceedance Details:

a) Non-compliance / Exceedance(s) is / are due to the works, therefore action plan-should be implemented Yes / No *

b) Non-compliance / Exceedance(s) could be due to the works, therefore further investigation/justification required Yes / No *

c) Non-compliance / Exceedance(s) is / are not due to the works, therefore no further action required Yes / No *

Additional comments:

Part B: Action

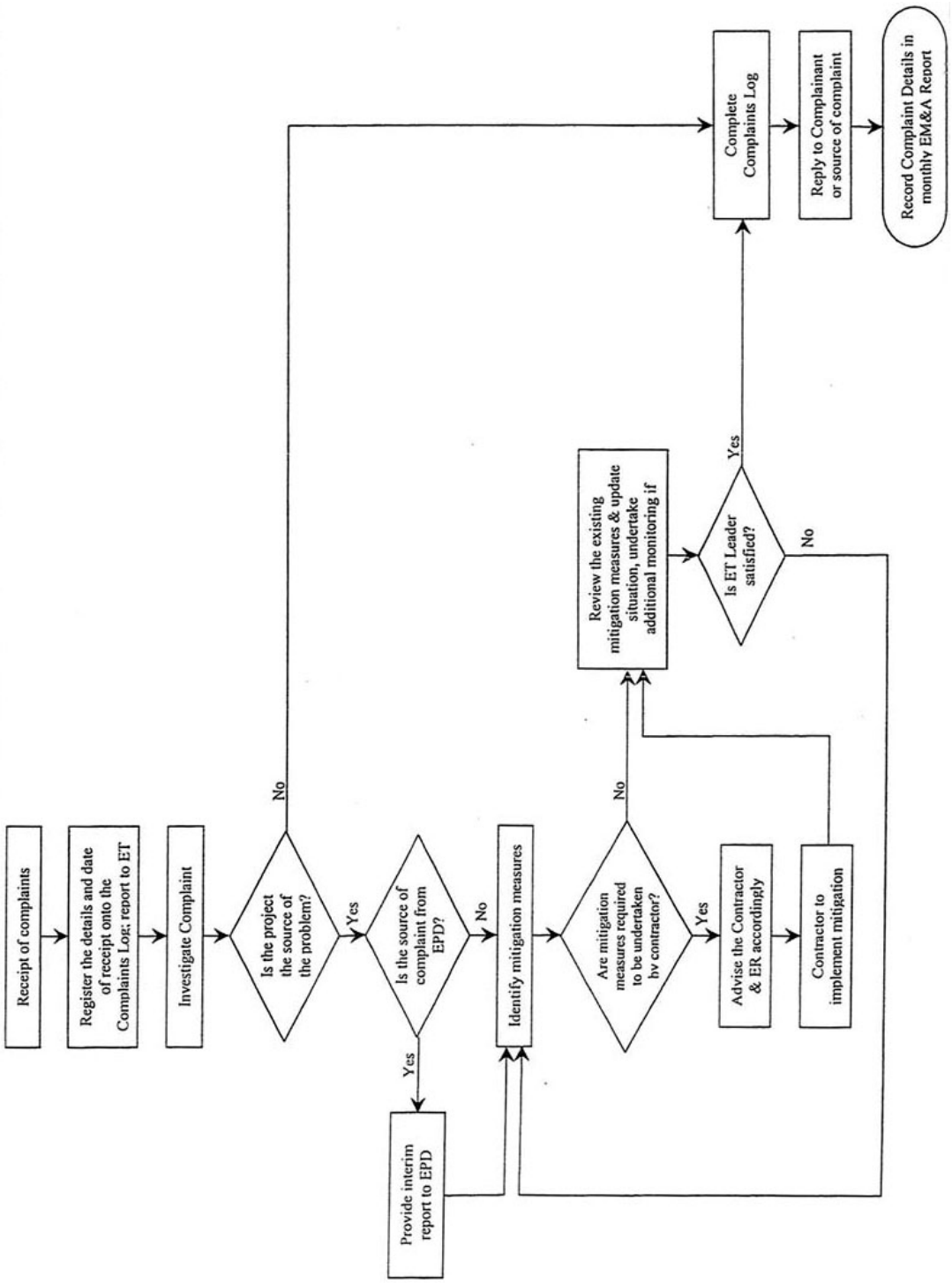
Part C: Action Plan Implemented / NOE closed

Signed _____ **Date** _____
ET (Link 200 JV)

Signed _____ **Date** _____
IEC

*Delete as appropriate.

Appendix 6-2
Flowchart of Complaint Response Procedures


Receipt of complaints
Register the details and date of receipt onto the Complaints Log; report to ET
Investigate Complaint
Is the project the source of the problem?
No
Yes
Is the source of complaint from EPD?
Yes
Provide interim report to EPD
No
Identify mitigation measures
Are mitigation measures required to be undertaken by contractor?
No
Review the existing mitigation measures & update situation, undertake additional monitoring if
Is ET Leader satisfied?
Yes
No
Yes
Advise the Contractor & ER accordingly
Contractor to implement mitigation
Complete Complaints Log
Reply to Complainant or source of complaint
Record Complaint Details in monthly EM&A Report

Appendix 6-3
Complaint Proforma

Complaint Proforma

Division/Department:	**Date:**	**Ref:**
Project:		**Job No.:**
COMPLAINANT		
Name: Tel: Fax:	Address:	
COMPLAINT INVESTIGATION		
Item	Description (cause of impact, type of impact and location, etc.)	
CORRECTIVE & PREVENTIVE ACTION(S)		
Action #	Proposed Action to be taken	To be completed by/on
Prepared by: Name:	Signature:	Date:
FOLLOW UP ACTION(S)		
Confirmed by: Name:	Signature:	Date:
ATTACHMENTS:		