

**Operation of the Shenzhen Section of Shenzhen Bay Bridge
Environmental Monitoring and Audit Manual**



January 2008

Rev. 1

Major Works Project Management Project

Highways Department

Contents	Highways Department	Page
1	Environmental Monitoring and Audit Manual for the Operation of Shenzhen Section of Shenzhen Bay Bridge	
1.1	Objectives	1
1.2	Monitoring and Audit (EM&A)	1
1.3	Purpose of the Manual	1
1.3	Background of the Project	2
1.4	Environmental Monitoring and Audit Requirements	2
1.5	EM&A Organisation	2
2	Water Quality	5
2.1	Introduction	5
2.2	Bridge Run-off	6
2.2.1	Monitoring Locations	6
2.2.2	Monitoring Frequency	7
2.2.3	Monitoring Equipment	7
2.2.4	Monitoring Methodology	8
2.2.5	Laboratory Measurement / Analysis	8
2.2.6	Operational Phase Impact Monitoring	10
2.2.7	Mitigation measures	12
3	Ecology	13
3.1	Birds	13
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4	Landscape and Visual	13
5	Site Environmental Audit	14
6	Compliance with Legal and Contractual Requirements	14
7	Environmental Complaint	15
8	Reporting	16
9	EM&A Reports	17
9.1	Monthly EM&A Reports	17
9.2	Quarterly EM&A Reports	19
9.3	Final EM&A Summary Report	20
9.4	Review Reports for Bridge Run-off Monitoring	22

Contents		Page
1	Introduction	1
1.1	Objectives of Environmental Monitoring and Audit (EM&A)	1
1.2	Purpose of the Manual	1
1.3	Background of the Project	2
1.4	Environmental Monitoring and Audit Requirements	2
1.5	EM&A Organisation	2
2	Water Quality	5
2.1	Introduction	5
2.2	Bridge Run-off	6
2.2.1	Monitoring Location	6
2.2.2	Monitoring Frequency	7
2.2.3	Monitoring Equipment	7
2.2.4	Monitoring Methodology	8
2.2.5	Laboratory Measurement / Analysis	8
2.2.6	Operational Phase Impact Monitoring	10
2.2.7	Mitigation measures	12
3	Ecology	13
3.1	Bird Lighting Scheme and Bird Collision Monitoring	13
4	Landscape and Visual	13
5	Site Environmental Audit	14
6	Compliance with Legal and Contractual Requirements	14
7	Environmental Complaint	15
8	Reporting	16
9	EM&A Reports	17
9.1	Monthly EM&A Reports	17
9.2	Quarterly EM&A Reports	19
9.3	Final EM&A Summary Report	20
9.4	Review Reports for Bridge Run-off Monitoring	22

10	Documentation	24
11	Interim Notifications of Environmental Quality Limit Exceedances	24

1. INTRODUCTION

1.1 Objectives of Environmental Monitoring and Audit (EM&A)

1.1.1 The objectives of carrying out EM&A for the Shenzhen section of Shenzhen Bay Bridge which is also known Shenzhen section of Shenzhen Western Corridor (SSWC) are:

- To provide a database against which any short or long term environmental impacts of the Project can be determined;
- To provide an early indication should any of the environmental control measures or practices fail to achieve acceptable standards;
- To monitor the performance of the Project and the effectiveness of mitigation measures;
- To verify the environmental impacts predicted in the Project Profile of the Operation of Shenzhen Section of Shenzhen Bay Bridge (Registered No.: PP-325/2007 held in the EIAO Registry, hereinafter referred to as the Project Profile);
- To determine project compliance with regulatory requirements, standards and government policies;
- To take remedial action if unexpected problems or unacceptable impacts arise; and
- To provide data to enable an environmental audit.

To facilitate public inspection, the monitoring data will be uploaded to a dedicated internet website.

1.2 Purpose of the Manual

1.2.1 The purpose of this EM&A Manual is to provide guideline to setup an EM&A programme. The implementation of EM&A aims to ensure that the operation of the SSWC is in compliance with the recommendation in the Project Profile; to assess the effectiveness of the recommended mitigation measures; and to identify any further need for additional mitigation measures or remedial action. This manual outlines the monitoring and audit programme to be undertaken for the operation of the SSWC.

1.3 Background of the Project

The planning and construction of the SSWC was under the management of the Shenzhen Western Corridor Project Office which was appointed by the Shenzhen Municipal People's Government. The SSWC is operated by Highways Department of Hong Kong SAR Government since its opening on 1 July 2007.

The SSWC is a dual 3-lane elevated highway and the total length is approximately 2 km. The whole of SSWC lies within Mainland boundary and is connected with the Hong Kong section of the SWC on the southern end. At the north, it connects with the Hong Kong Port Area situated at Dongjiaotou. The construction of the SSWC commenced in December 2003 and was completed in March 2007. A general layout plan of the SSWC is attached at **Appendix A**.

1.4 Environmental Monitoring & Audit Requirements

The operational phase impacts of the project have been assessed in the Project Profile which indicated that the impacts from fisheries, hazard to life, cultural heritage, air, noise and waste would be acceptable and EM&A of such impacts are not required. Pursuant to the Environmental Permit (EP No. EP-290/2007) issued by the Director of Environmental Protection on 20 November 2007, the following areas will require EM&A:

- Monitoring of Surface Runoff from the Carriageway
- Monitoring of Bridge Lighting Scheme and Bird Collisions

1.5 EM&A Organisation

1.5.1 The EM&A organization chart is shown in **Appendix B**. The roles and responsibilities of the various parties involved are described in the following sections:

Environmental Team (ET)

1.5.2 The ET leader and the ET should not be in any way an associated body of the Contractor. The ET should be led and managed by the ET leader. The ET leader shall be the person who has at least 7 years' experience in EM&A or environmental management.

1.5.3 Suitably qualified staff should be included in the ET, and resources for the

implementation of the EM&A programme should be allocated in time under the Contract, to enable fulfillment of the project's EM&A requirements as specified in the EM&A Manual during operation.

1.5.4 The ET leader and the ET are employed to conduct the EM&A programme and ensure the Contractor's compliance with the project's environmental performance requirements during operation. The duties are:

- a) sampling, analysis and statistical evaluation of monitoring parameters with reference to the Project Profile, and recommendation and requirements;
- b) environmental site surveillance;
- c) audit of compliance with environmental protection, and pollution prevention and control regulations;
- d) monitoring the implementation of environmental mitigation measures;
- e) monitoring compliance with Conditions in the relevant Environmental Permit (EP) and compliance with Specifications in the Contract;
- f) review operation programme and comment as necessary;
- g) review operation methodology and comment as necessary;
- h) complaint investigation, evaluation and identification of corrective measures;
- i) liaison with Independent Environmental Checker (IEC) on all environmental performance matters, and timely submission of all relevant EM&A proforma for the approval by IEC;
- j) advice to the Contractor on environment improvement, awareness, enhancement matters, etc., on site and
- k) timely submission of the EM&A report to HyD and DEP.

1.5.5 Site inspections should be carried out by the ET at least once per week. Ad hoc site inspections should also be carried out if significant environmental problems are identified.

Contractor

1.5.6 The term "Contractor" should be taken to mean all operators during the operational phase of the SSWC and their contractors, working on site at any one time. Besides reporting to the HyD, the Contractor should:

- a) work within the scope of the relevant contract and other tender conditions;
- b) participate in the site inspections undertaken by the ET, as required, and undertake any correction actions instructed by the HyD;
- c) provide information / advice to the ET regarding works activities which

- may contribute, or be continuing to the generation of adverse environmental conditions;
- d) implement measures to reduce impact whenever Action and Limit Levels are exceeded; and
 - e) take responsibility and strictly adhere to the guidelines of the EM&A programme and complementary protocols developed by their project staff.

Highways Department (HyD)

1.5.7 HyD is responsible for the operation of the SSWC and monitoring the maintenance works undertaken by various contractors, and for ensuring that they are undertaken by the contractors in accordance with the specification and contractual requirements. HyD should:

- a) monitor the contractor's compliance with contract specifications, including the implementation and operation of environmental mitigation measures and ensure their effectiveness, and other aspects of the EM&A programme;
- b) comply with the agreed Event and Action Plan in the event of any exceedance;
- c) provide assistance to the ET as necessary in the implementation of the environmental monitoring and auditing programme; and
- d) instruct the contractors to follow the agreed protocols or those in the Contract Specifications in the event of exceedances or complaints.

Independent Environmental Checker (IEC)

1.5.8 The IEC should not be in any way an associated body of the contractor or the ET for the Project.

1.5.9 The IEC should advise HyD on the environmental issues related to the project. The role of the IEC should be independent from the management of operation works, but the IEC should be empowered to audit the environmental performance of operation.

1.5.10 The IEC should have at least 7 years experience in EM&A or environmental management. The appointment of the IEC is subject to the approval of the Engineer.

1.5.12 The IEC should audit the overall EM&A programme including the implementation of all environmental mitigation measures, submissions relating to EM&A, and any other submission required under this Manual.

1.5.13 In addition, the IEC should be responsible for verifying the

environmental acceptability of permanent and temporary works, and relevant design plans and submissions under this Manual.

1.5.14 The IEC should arrange and conduct at least monthly general site inspection of the SSWC during operational period. Ad hoc site inspections should also be carried out if significant environmental problems are identified.

1.5.15 The IEC should ensure the impact monitoring is conducted according to the prescribed schedule at the correct locations.

1.5.16 The IEC should report the findings of the site inspections and other environmental performance reviews to HyD and EPD.

1.5.17 Appropriate resources should also be allocated under the contractor and HyD to fulfil their duties specified in this Manual.

1.5.18 The main duty of the IEC is to carry out environmental audit of the operation of the SSWC; this should include, inter alia, the following:

- a) review and audit all aspects of the EM&A programme;
- b) advise on proactive actions;
- c) validate and confirm the accuracy of monitoring results, monitoring equipment, monitoring locations, monitoring procedures and locations of sensitive receivers, if any;
- d) carry out random sample check and audit on monitoring data and sampling procedures, etc;
- e) conduct random site inspection;
- f) audit the recommendations and requirements in the Project Profile against the status of implementation of environmental protection measures on site;
- g) review the effectiveness of environmental mitigation measures and project environmental performance;
- h) check complaint cases and the effectiveness of corrective measures;
- i) review accuracy of environmental monitoring section of EM&A reports;
- j) verify EM&A reports submitted by the ET leader;
- k) feedback audit results to ET by signing off relevant EM&A proformas.

2 Water Quality

2.1 Introduction

Pollutants generated from vehicles, which use the Shenzhen Western Corridor, would enter the Deep Bay waters and the mudflats through road drainage systems when a rainstorm occurs. Pollutants that are harmful to birds and the other organisms living on the mudflats would have detrimental effects to

the environment in Deep Bay.

It has been recommended in the Project Profile that HyD should undertake the task to clean the road twice a week (each of the cleaning events should not be separated by more than four days) using a vacuum air sweeper / truck to remove the pollutants at source and to prevent build-up of the pollutants on the road surface. In order to ensure that the bridge runoff after the cleaning operation would not be heavily polluted, monitoring of bridge runoff during the operational phase of the SSWC project is included as part of the environmental monitoring and audit programme.

The purposes of the monitoring are to determine the characteristics of bridge runoff and to review the frequency of road cleaning.

2.2 Bridge Run-off

The operational phase monitoring of bridge run-off shall be carried out by the ET to ensure that any deterioration of bridge run-off quality could be readily detected and action be taken in time to rectify the situation.

Water samples shall be collected and analysed for the following most commonly found pollutant in highway runoff:

- Total suspended solids
- Total organic carbon
- Chemical oxygen demand
- Nitrate
- Nitrite
- Total Kjeldahl Nitrogen
- Total phosphorus
- Copper
- Lead
- Zinc

2.2.1 Monitoring Location

In general, one monitoring gully located at each bound of the carriageway will be sampled to cater for the possible different types of fuel used by the

vehicles for in-bound and out-bound journeys. This total number of monitoring gullies may vary depending on the circumstances but the total number of monitoring gullies on the whole bridge will be maintained at 6 with 3 sampling gullies shall be allocated on each side of the carriageways. The exact locations of the sampling gullies will be selected before the monitoring event for random checking. The monitoring gullies will be separated at least 200m away from one another. A typical monitoring location plan is attached in **Appendix C**.

2.2.2 Monitoring Frequency

The road cleaning frequency proposed in the Project Profile is twice weekly with each of the cleaning events should not be separated by more than four days.

Since the initial traffic flow in HK-SWC would be low, two periods of monitoring which have been set at from September 2007 to November 2007 and from January 2008 to March 2008. The monitoring shall include in total of 12 sampling events (12 sets of data) covering the Hong Kong section of the Shenzhen Bay Bridge, and cover dry season period. A total of 6 sets of sampling data should be collected during the first 3-month period and the other 6 sets of sampling data shall be collected from the second 3-month period.

2.2.3 Monitoring Equipment

A water tanker with sprinklers shall be deployed to spray water on the road surface and round the catchment area of the monitoring gullies to simulate an artificial rain and to provide a washing effect on the road surface similar to rainstorm condition. The capacity of the tanker shall be of sufficient size in order to provide adequate washing effect for at least one monitoring gully each time. The sprinkler shall be installed to provide a rainfall effect on the road surface. A portable automatic sampler of non-contact type, equipped with a suction pipe, shall be used for sampling at the monitoring gullies. The pump flow rate shall be adjustable and the water spraying rate of the sprinkler would be obtained prior to the operation. The quantity of water discharge at each monitoring gully would then be estimated by timing the spraying operation of the sprinkler. This information shall be used to review the carriageway cleaning frequency.

2.2.4 Monitoring Methodology

A water tanker with sprinklers would be deployed to spray water on the road surface around the catchment area of the monitoring gully. It simulates an artificial rain and provides a washing effect on the road surface under rainstorm event.

At each monitoring location, the water tanker would stop on the hard shoulder near the monitoring gully and spray water with the sprinklers to the right lane within the catchment area. Following the fall of the bridge deck from right lane to hard shoulder, water sprayed onto the deck will wash the road surface from right lane to hard shoulder, and hence monitoring gully. The position of the tanker and spraying angle of the sprinkler would be adjusted in order to achieve the best washing effect. The water tanker shall be of sufficient size in order to provide water spraying.

During each monitoring event, at least two technical staff would be responsible for the sampling works. The technical staff would wear waterproof raincoats to prevent any unwanted input to the water by washing through the body.

A portable automatic sampler would be used for sampling. The suction tube inlet would be placed at the mid level of the sedimentation pond inside the monitoring gully. The sampling works would start once bridge runoff discharge is observed from the gully to the connected down pipe. The suction pump rate would be adjusted to about 0.3 – 0.4 L/min such that the required sampling volume (4 L) could be collected within the first 15 minutes after commencement of water spraying.

2.2.5 Laboratory Measurement / Analysis

Each water sample collected shall be one litre in volume and a total of 24 samples shall be collected in conjunction with the sampling conducted at the Hong Kong section. Four composite samples with each of 6 litres shall be prepared from the 24 samples for laboratory analysis. The first composite sample is a mixture of the first water sample collected from each monitoring gully and similar preparation procedure applies to the remaining composite samples. One composite sample to be prepared by mixing the samples taken

from the water tanker before and after the monitoring for reference purpose. In the event that the water tanker is refilled, additional water samples should be collected for each additional refill to monitor the quality of the water inside the tanker.

Upon mixing, the composite samples shall be stored in purpose made containers and cooled to 4° C without being frozen and delivered to a HOKLAS laboratory within 24 hours for analysis for the parameters as listed below:

Parameter	Recommended Method	Detection Limit (mg/L)
Total suspended solids	APHA 2540D	0.5
Total organic carbon	APHA 5310 B	1
Chemical oxygen demand	APHA 5220 C&D	2
Nitrate	APHA 4500-NO ₃ ⁻	0.01
Nitrite	APHA 4500-NO ₂ ⁻	0.01
Total Kjeldahl Nitrogen	ASTM D3590-89B	0.1
Total phosphorus	ASTM D515-88B	0.1
Cooper	APHA 3120B	0.006
Lead	APHA 3120B	0.04
Zinc	APHA 3120B	0.002

Notes:

1. APHA: American Public Health Association, Standard Methods for the Examination of Water and Wastewater Ed19
2. ASTM: Annual Book of American Society for Testing and Materials Standards, Vol 11.01 & 11.02

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

For the testing methods of other parameters as recommended by the Project Profile or required by DEP, detailed testing methods, pre-treatment procedures, instruments use, Quality Assurance / Quality Control (QA/QC) details (such as blank, spike recovery, number of duplicate samples per batch, etc.), detection limits and accuracy should be submitted to DEP for approval prior to commencement of monitoring programme. The QA/QC

results shall be in accordance with the requirement of HOKLAS or international accredited scheme. The QA/QC results shall be reported. EPD may also request the laboratory to carry out analysis of known standards provided by EPD for quality assurance. Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis shall be kept by the laboratory for 3 months in case repeat analysis is required. If in-house or non-standard methods are proposed, details of the method verification may also be required to submit to DEP. In any circumstance, the sample testing shall have comprehensive quality assurance and quality control programmes. The laboratory shall prepare to demonstrate the programmes to DEP or his representatives when requested.

2.2.6 Operational Phase Impact Monitoring

There is no existing guideline for controlling the discharge of road runoff into the Hong Kong waters. Since the main objective of implementing frequent cleaning of vehicle-generated pollutants from the HK-SWC is to prevent the pollutants from entering the Deep Bay waters and the mudflats, the pollution level of the bridge runoff with frequent cleaning shall be lower than that of the normal road runoff from highways and expressways. With the implementation of road cleaning twice a week on the HK-SWC, it is anticipated that the pollutant concentration of the bridge runoff would be low.

There is no information to establish the baseline pollutant concentrations of the bridge runoff for the case without road cleaning. It is difficult to know whether the pollution levels of the bridge runoff with road cleaning have been reduced. It is proposed to use relevant overseas highway runoff data to form a set of reference criteria for comparison with the future monitoring data and to determine whether the runoff generated from the HK-SWC bridge is within acceptable levels. In this regard, it is proposed to conduct regular water sampling for bridge runoff with reference criteria as described below.

Based on the method described above, the monitoring results of each sampling event shall be submitted to EPD for information once the data is available. If the monitoring results trigger the proposed action level, the cleaning frequency shall be increased. In view of lack of established local criteria for baseline pollutant concentrations for bridge runoff, it is proposed to

adopt the overseas highway runoff data, which are the same as those being adopted in the SWC EM&A Manual, as shown below:

Parameter	Reference Criteria for Determination of Cleaning Frequency	Action Level	Action
Total suspended solids (mg/L)	81	3 consecutive monitoring with the same parameter (1 or more than 1 parameter) exceeded the criteria	Increase 1 cleaning event per week
Total organic carbon (mg/L)	25		
Chemical oxygen demand (mg/L)	90		
Nitrate and Nitrite (mg/L)	0.72		
Total Kjeldahl Nitrogen (mg/L)	6.4		
Total phosphorus (mg/L)	0.95		
Cooper (mg/L)	0.174		
Lead (mg/L)	0.31		
Zinc (mg/L)	0.94		

A review report shall be prepared by the ET after each monitoring period that includes 6 sets of data to evaluate the road runoff quality and to determine if the proposed cleaning frequency is adequate to remove pollutants from the road section. The average daily number of vehicles using the northbound and southbound carriageways based on the traffic data published in the "Transport Monthly Digest" by Transport Department or to be obtained directly from relevant government departments should be reported to give an indication of the effectiveness of road cleaning to different levels of traffic flows. All the monitoring results shall also be included in the EM&A report. The bridge runoff monitoring programme will also be reviewed after the completion of the 12 sampling / simulated rainstorm events for the two periods to determine whether the monitoring programme needs to be extended.

2.2.7 Mitigation measures

Cleaning of Carriageway: Vehicle-generated pollutants should be removed from the road surface prior to the occurrence of a rainstorm to prevent them from entering the Deep Bay waters and to Deep Bay mudflat. HyD should undertake the task to clean the road twice a week (each of the cleaning events should not be separated by more than four days) during low traffic flow period using vacuum air sweeper/truck equipped with side broom, which is to sweep road sludge and debris into the suction nozzle to increase the removal efficiency of pollutants. Vacuum air sweeper /truck is commercially available. One of the types of vehicles available is Johnston Vacuum Suction Sweeper. This operation would prevent build-up of the pollutant load on the road surface. After the removal of the pollutants, the pollution levels in storm runoff would be much reduced. The collected pollutants would be tinkered away for off site disposal at landfill sites. There is a need to monitor the bridge runoff quality during the operational phase of the Project.

Monitoring of bridge runoff during the operational phase of the Project is recommended to determine the effectiveness of the vacuum cleaning operation. If required, the cleaning frequency would be increased.

For general vehicle accidents, emergency response actions should be undertaken by relevant government departments to control the spreading of oil spill on the road surface and release of spill into Deep Bay, and clean up the spill.

For vehicle accidents involving chemical spillage, the risk might be minimized through:

- Implementation of the revised regulations of FSD to minimize the risk of accidental spillage of chemicals as a result of vehicle accidents on the bridge.
- Development of a detailed Emergency Response Plan to enhance the established response actions in order to take due consideration of the need to protect the ecologically sensitive Deep Bay environment.
- Implementation of the detailed Emergency Response Plan with the support from relevant government departments to deal with any spill incidents;
- Quick response to vehicle accident, which involves chemical spillage on SWC; and

- Storage of clean up materials at HKPF's weigh-station near Ha Tsuen Interchange for use in controlling the spreading of spill.

3 Ecology

3.1 Bridge Lighting Scheme and Bird Collision Monitoring

Specific types of bridge lighting were recommended to minimize the probability of bird collisions with the bridge and associated structures. The focus of the lighting scheme was to protect birds during inclement weather (mist, fog, rain). The recommendation was made that bridge lighting schemes be designed such that flood lights that would be suitable during clear weather could be considered to be supplemented by special lighting during inclement weather, subject to review during detailed design stage. The design and operation of this lighting scheme, together with its performance in terms of bird mortality, should be monitored during the first 3 years of the operation of the bridge.

The types of illumination used should be recorded for all weather conditions, and records of any bird fatalities should be documented by date, time, location, weather conditions, type of illumination, number of dead birds by species, and estimated cause of death. Sea surface will be scanned for any floating dead birds. Results of the monitoring study should be used to guide illumination of the bridge in future. Monitoring effort should be concentrated in autumn migration, winter, and spring migration seasons (particularly due to higher frequency of misty weather), because these are the time of year when most birds are moving through or residing in Deep Bay. Various combinations of illumination scheme, weather condition, season of year, and time of day should be monitored. The study should be quantitative and designed to enable robust statistical analyses. Monthly surveys are recommended. However, additional surveys will be carried out after days of inclement weather (e.g. misty days, very cold days).

4 Landscape and Visual

It is recommended that EM&A during the operational stage is undertaken. The operational stage EM&A will comprise audit of the Project Profile recommendations which will be undertaken for one year during the maintenance period. To mitigate the landscape and visual impacts arising from the operation of the Project, all mitigation measures shall be fully and properly implemented in

accordance with details as set out in Appendix A of the Environmental Permit No. EP-290/2007. These include:

- Sensitive architectural design of engineering and other built structures, including form and finishes, this will include but not limited to: paved surfaces, retaining walls, walls, columns, buildings, and other structures, light standards, etc, shall be used.
- Lighting of road and bridge shall be designed to minimize glare to all receivers. Poles and fittings shall be designed to conform with the bridge design.

The Monthly Report shall provide a statement on the general state of the landscape and visual aspects in the area and confirm that required mitigation measures are being implemented.

5 Site Environmental Audit

Regular site inspection should be carried out at least once per week during the operational phase. The inspections should cover the environmental situation, pollution control and mitigation measures within the site. They should also review the environmental situation outside the site area which is likely to be affected, directly or indirectly, due to the normal operational activities. The ET Leader should make reference to the following information in conducting the inspection:

- Recommendations and requirements on environmental protection and pollution control mitigation measures provided in the Project Profile;
- Maintenance progress / programme, site photos / plans etc;
- Relevant contract specifications on environmental protection and pollution prevention control for operation of the project;
- Relevant environmental protection and pollution control laws, ProPECC Notes; and
- Previous site inspection results.

Inspections may 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 Compliance with Legal and Contractual Requirements

There are contractual environmental protection and pollution control requirements as well as environmental protection and pollution prevent and control laws in Hong Kong that the operation of the SSWC should comply with.

The ET Leader should review the day-to-day operation and maintenance works to check that relevant environmental laws have not been violated, and that any foreseeable potential for violating the laws can be prevented. The ET Leader should then advise the maintenance Contractor of any non-compliance with the environmental regulations for them take follow-up remedial action.

Upon receipt of the advice, the maintenance Contractor should undertake immediate action to remedy the situation. The managing department responsible for the day-to-day maintenance and operation of the project should follow up to ensure that appropriate action has been taken by the maintenance Contractor in order that the project's environmental protection and pollution control requirements are fulfilled.

7 Environmental Complaints

Complaints should be referred to the ET Leader for carrying out complaint investigation procedures. The ET Leader should undertake the following procedures upon receipt of the complaints:

- (a) log complaint and date of receipt onto the complaint database and inform the IEC immediately;
- (b) investigate the complaint to determine its validity, and to assess whether the source of the problem is due to operation and / or maintenance of project;
- (c) if a complaint is valid and due to operation and / or maintenance of the project, identify mitigation measures in consultation with the IEC;
- (d) if mitigation measures are required, advise Highways Department accordingly;
- (e) review Highways Department's maintenance contractor's implementation of the identified and required mitigation measures, and the current situation;
- (f) if the complaint is transferred from EPD, submit interim report to EPD on status of the complaint investigation and follow-up action within the time frame assigned by EPD;
- (g) undertake additional monitoring and audit to verify the complaint if necessary, and ensure that any valid reason for complaint does not recur through proposed amendments to work methods, procedures, machines and /or equipment, etc;
- (h) report the investigation results and the subsequent actions to the complainant (if the source of complaint is identified through EPD, the results should be reported within the time frame assigned by EPD); and

- (i) log a record of the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports. If the source is identified through HyD, the "HyD's Public Complaints and Enquires Handling Procedures should be referred to (**Appendix D**).

During the complaint investigation work, the maintenance contractor and Highways Department should cooperate with the ET leader in providing all the necessary information and assistance for completion of the investigation. If mitigation measures (in consultation with IEC) are required following the investigation, the maintenance contractor should promptly carry out the measures. Highways Department should ensure that the measures would be carried out by the maintenance contractor.

A flow chart of the complaint response procedures is shown in **Appendix E** and a sample complaint log is shown in **Appendix F**.

8 Reporting

The reporting requirement of EM&A information are based upon a paper-documented approach. However, the same information shall be provided in an electronic medium with format approved by EPD. All monitoring data shall be submitted in an approved format.

To facilitate public inspection of the monthly EM&A Reports, via the EIAO Internet Website and at the EIAO Register Office, electronic copies of these Reports shall be prepared in Hyper Text Markup Language (HTML) (version 4.0 or later) and in Portable Document Format (PDF version 4.0 or later), unless otherwise agreed by EPD and shall be submitted at the same time as the hard copies. For the HTML version, a content page capable of providing hyperlink to each section and sub-section of the EM&A reports shall be included in the beginning of the document. Hyperlinks to all figures, drawings and tables in the EM&A Reports shall be provided in the main text from where the respective references are made. All graphics in the report shall be in interlaced GIF format unless otherwise agreed by EPD. The content of the electronic copies of the EM&A Reports must be the same as the hard copies.

All environmental monitoring data as described in this EM&A Manual shall be made available to the public via internet access in the form of a website, in the shortest possible time and in no event later than 2 weeks after the relevant

monitoring data are collected or become available, unless otherwise agreed with EPD. As soon as it becomes available, EPD shall be notified in writing the Internet address where the environmental data are to be placed.

The internet website as described above shall enable user friendly public access to the monitoring data and with features capable of:

- Providing access to all environmental monitoring data collected since the commencement of operation;
- Searching by data;
- Searching by types of monitoring data; and
- Hyperlinks to relevant monitoring data after searching or otherwise agreed by EPD.

9 EM&A Reports

The results and findings of all EM&A required in this Manual should be recorded in the monthly EM&A reports prepared by the ET leader. The EM&A report should be prepared by the ET and endorsed by the IEC and submitted within 10 working days of the end of each reporting month. A maximum of 4 copies of each monthly EM&A report should be submitted to each of the parties: IEC, HyD, AFCD, and EPD. The ET leader shall ascertain with these parties on the exact number of copies and format of the monthly reports in both hard copy and electronic medium requirement.

9.1 Monthly EM&A Reports

9.1.1 The monthly EM&A reports should include the following:

- (a) Executive summary (1-2 pages)
 - Breaches of AL levels;
 - Complaint log;
 - Notifications of any summons and successful prosecutions;
 - Reporting changes; and
 - Future key issues.
- (b) Environmental status
 - Operation programme with fine tuning of operation activities showing the interrelationship with environmental protection / mitigation

measures for the month;

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

(c) Implementation status

Advice on the implementation status of environmental protection and pollution control / mitigation measures as recommended in the Project Profile, summarised in the updated implementation schedule.

(d) Monitoring results

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

- Monitoring methodology;
- Name of laboratory and types of equipment used and calibration details
- Parameters monitored;
- Monitoring locations;
- Monitoring date, time, frequency and duration;
- Weather conditions during the period;
- Graphical plots of the monitored parameters in the month annotated against:
 - i) the major activities being carried out on site during the period;
 - ii) weather conditions that may affect the results;
 - iii) other factors which might affect the monitoring results.

(e) Report on non-compliance, complaints, notifications of summons and successful prosecutions

- record of all non-compliance (exceedances) of the environmental quality performance limits (Action and Limit Levels);
- record of all complaints received (written or verbal) for each media, including locations and nature of complaints investigations, liaison and consultation undertaken, actions and follow-up procedures taken, results and summary;
- record of all notifications of summons and successful prosecutions for breaches of the current environmental protection / pollution control

legislations, including locations and nature of breaches, investigation, follow-up actions taken, results and summary;

- review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- a description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

(f) Others

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

(g) Appendix

- AL levels
- Graphical plots of trends of monitored parameters at key stations over the past four reporting periods for representative monitoring stations against the following:
 - i) major activities being carried out on site during the period;
 - ii) weather conditions during the period; and
 - iii) any other factors which might affect the monitoring results

9.2 Quarterly EM&A Reports

9.2.1 The quarterly EM&A summary reports should be around 5 pages (including about 3 pages of text and tables and 2 pages of figures) should contain at least the following listed information. Apart from these, the first quarterly summary report should also confirm that the monitoring work is proving effective and that it is generating data with the necessary statistical power to categorically identify or confirm the absence of impact attributable to the day-to-day operation:

- a) up to half a page executive summary;
- b) basic project information including a synopsis of the project organization, programme, contacts of key management, and a synopsis of work undertaken during the quarter;
- c) a brief summary of EM&A requirement including monitoring parameters, environmental quality performance limits (Action and Limit levels), and environmental mitigation measures as recommended in the Project Profile.

- d) Advice on the implementation status of environmental protection and pollution control / mitigation measures, as recommended in the Project Profile, summarized in the updated implementation schedule;
- e) Drawings showing the project data area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- f) Graphical plots of the trends of monitored parameters over the past 4 months (the last month of the previous quarter and the present quarter) for representative monitoring stations annotated against:
 - The major activities being carried out on site during the period;
 - Weather conditions during the period; and
 - Any other factors which might affect the monitoring results;
- g) a summary of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- h) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- i) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- j) a summary record of all complaints received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- k) a summary record of notifications of summons and successful prosecutions for breaches of the current environment protection/pollution control legislations, locations and nature of the breaches, investigation, follow-up actions taken and results;
- l) comments (e.g. effectiveness and efficiency of the mitigation measures), recommendations (e.g. any improvement in the EM&A programme) and conclusions for the quarter; and
- m) proponents' contacts and any hotline telephone number for the public to make enquires.

9.3 Final EM&A Summary Report

9.3.1 A final EM&A report should be prepared upon termination of the EM&A programme.

9.3.2 The termination of EM&A programme should be determined on the following basis:

- a) On advice by EPD based on the EM&A findings during the initial stated periods (i.e. 1 year for bridge runoff and 3 years for bridge lighting scheme and bird collisions); and
- b) no environmental complaint and prosecution involved.

9.3.3 The proposed termination may be required to consult related local community such as village representative / committee and / or District Board and the proposal should be endorsed by the IEC, and Highways Department prior to final approval from the Director of Environmental Protection.

9.3.4 The Final EM&A summary report should include, inter alia, the following:

- a) an executive summary;
- b) basic project information including a synopsis of the project organization, programme, contacts of key management, and a synopsis of work undertaken during the monitored period;
- c) a brief summary of EM&A requirement including:
 - monitoring parameters
 - environmental quality performance limits (Action and Limit levels); and
 - environmental mitigation measures as recommended in the Project Profile;
- d) advice on the implementation status of environmental protection and pollution control/mitigation measures, as recommended in the Project Profile, summarized in the updated implementation status proforma;
- e) drawings showing the project area, any environmental sensitive receivers and the locations of the monitoring and control stations;
- f) graphical plots of the trends of monitored parameters over the operation period for representative monitoring stations annotated against:
 - major activities carried out on site during the period;
 - weather conditions during the period; and
 - any other factors which might affect the monitoring results;
- g) compare and contrast the EM&A data with the Project Profile prediction, and annotate with explanation for any discrepancies;

- h) provide clear cut decisions on the environmental acceptability of the project with reference to the specific impact hypothesis;
- i) a summary of non-compliance (exceedances) of the environmental quality performance limit (Action and Limit levels);
- j) a brief review of non-compliance (exceedances) of the environmental quality performance limits (Action and Limit levels);
- k) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures;
- l) a summary description of the actions taken in the event of non-compliance and any follow-up procedures related to earlier non-compliance;
- m) a summary record of all complaint received (written or verbal) for each media, liaison and consultation undertaken, actions and follow-up procedures taken;
- n) review the monitoring methodology adopted and with the benefit of hindsight, comment on its effectiveness (including cost effectiveness);
- o) a summary record of notifications of summons and successful prosecutions for breaches of the current environment protection / pollution control legislations, locations and nature of breaches, investigation, follow-up actions taken and results;
- p) review the practicality and effectiveness of the recommendations in the Project Profile and EM&A programme (e.g. effectiveness and efficiency of mitigation measures), recommend any improvement in the EM&A programme; and
- q) a conclusion to state the return of ambient and / or the predicted scenario as per the Project Profile.

9.4 Review Reports for Bridge Runoff Monitoring

The results and findings of the bridge runoff monitoring work for operational phase should be recorded in the review reports prepared by the ET leader. The review reports should be prepared by ER and endorsed by the IEC and submitted within 2 working weeks after the last data set of each monitoring period is collected. The first review report should be submitted after the collection of the first 6 sets of sampling data and the second review report should be submitted after the collection of another 6 sets of sampling data as stated in 2.4 above. With the advice of IEC, Highways Department shall suggest whether the monitoring programme needs to be extended after the completion of sampling 12 simulated rainstorm events for AFCD and EPD's comment.

A maximum of 4 copies of each review report should be submitted to each of the parties: the IEC, Highways Department, the AFCD and EPD. Before submission of

the first review report, the ET leader should liaise with the parties on the exact number of copies and format of the reports in both hard copy and electronic medium requirement.

The review reports should include the following:

- a) Executive summary (1-2 pages)
 - breaches of Action / Limit levels;
 - key issues and findings; and
 - reporting changes.
- b) Environmental status
 - average daily number of vehicles using the northbound and southbound carriageways, i.e. data from Transport Department's Transport Monthly Digest or data provided by relevant government departments;
 - road cleaning frequency;
 - drawing showing the project area, any environmental sensitive receivers and the locations of the bridge runoff monitoring stations.
- c) Implementation status

Advice on the implementation status of road cleaning using vacuum air sweeper / truck as recommended in the Project Profile.
- d) Bridge runoff monitoring results

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

 - monitoring methodology;
 - name of laboratory and types of equipment used and calibration details;
 - parameters monitored
 - monitoring locations;
 - monitoring date, time, frequency, and duration;
 - weather conditions during the period;
 - QA/QC results and detection limits;
 - graphical plots of the monitored parameters in the months annotated against:
 - i) average daily number of vehicles during the period
 - ii) average flow rate of runoff passing through the drainage down pipe
 - iii) simulated rainfall intensity and duration
 - iv) weather conditions that may affect the results
 - v) other factors which might affect the monitoring results

- e) Report on exceedance of AL levels
 - record of all exceedances of the Action and Limit levels for bridge runoff monitoring;
 - review of the reasons for and the implications of exceedance including review of traffic data, pollution sources, AL levels and road cleaning frequency; and
 - a description of the action taken in the event of exceedance and any follow-up procedures related to the earlier exceedance.
- f) Appendix
 - AL levels
 - Graphical plots of trends of monitored parameter at all monitoring stations over the reporting period annotated against the following:
 - i) average daily number of vehicles during the monitoring period
 - ii) average flow rate of runoff passing through the drainage down pipe
 - iii) simulated rainfall intensity and duration
 - iv) weather conditions that may affect the results
 - v) other factors which might affect the monitoring results

10 Documentation

All documentation is required to be filed in a traceable and systematically manner. Site document, such as, monitoring field records, laboratory analysis records, meeting minutes, correspondences etc, should be cross-referenced by the ET leader and be ready for inspection upon request. All EM&A results and findings should be documented in the EM&A reports prepared by the ET and endorsed by the IEC prior to dissemination.

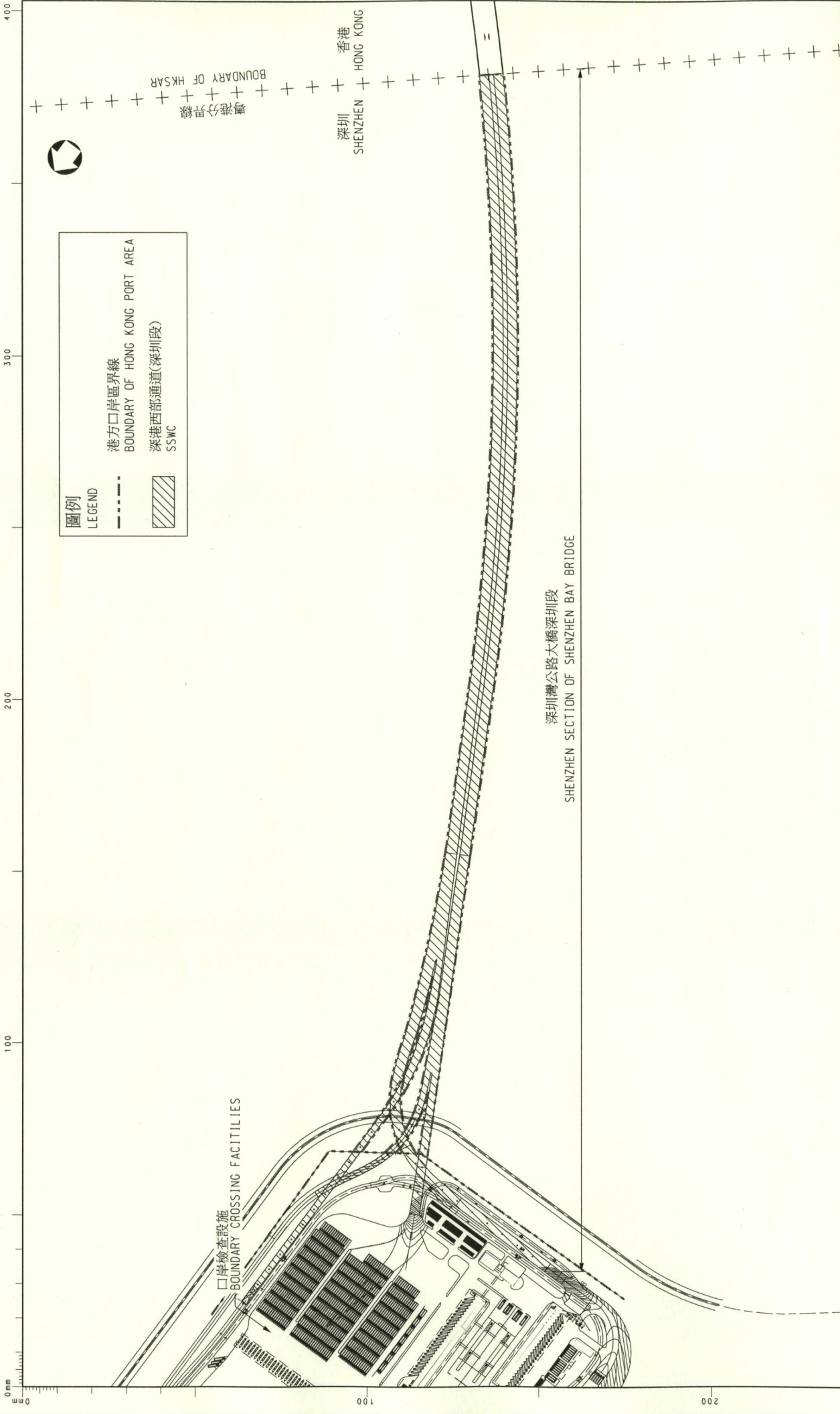
All documentation to the DEP should be in paper form and / or electronic form (in the format agreed by DEP) upon request. All submissions namely reports, data, and correspondences, etc., to DEP should be liable to use freely for the purposes of communicating environmental data and the owner of information shall claim no copyright. Any request to treat all or part of a submission in confidence would be respected, but if no such request is made, it would be assumed that the submission is not intended to be confidential.

11 Interim Notifications of Environmental Quality Limit Exceedances

With reference to Event/Action Plans in this Manual, when the environmental

quality limits are exceeded, the ET leader should immediately notify Highways Department, the AFCD and EPD, as appropriate. The notification should be followed up with advice to EPD and AFCD on the results of the investigation, proposed action and success of the action taken, with any necessary follow-up proposals. A sample template for the interim notifications is shown in **Appendix G**

Appendix A



圖例
LEGEND

港方口岸區界線
 BOUNDARY OF HONG KONG PORT AREA

深港西部通道(深圳段)
 SSWC

深圳灣公路大橋深圳段
 SHENZHEN SECTION OF SHENZHEN BAY BRIDGE

圖則名稱 drawing title 深圳灣公路大橋深圳段 SHENZHEN SECTION OF SHENZHEN BAY BRIDGE		設計 designed C.F. KU 27/06/07	繪圖 drawn L.B. LEUNG 27/06/07	圖則編號 drawing no. HWMG759TH-SK0156	比例 scale NTS
圖則名稱 drawing title SHENZHEN SECTION OF SHENZHEN BAY BRIDGE		覆核 checked	批准 approved	© 版權所有 COPYRIGHT RESERVED	
MAJOR WORKS PROJECT MANAGEMENT OFFICE 主要工程管理處		HONG KONG DEPARTMENT OF HIGHWAYS			

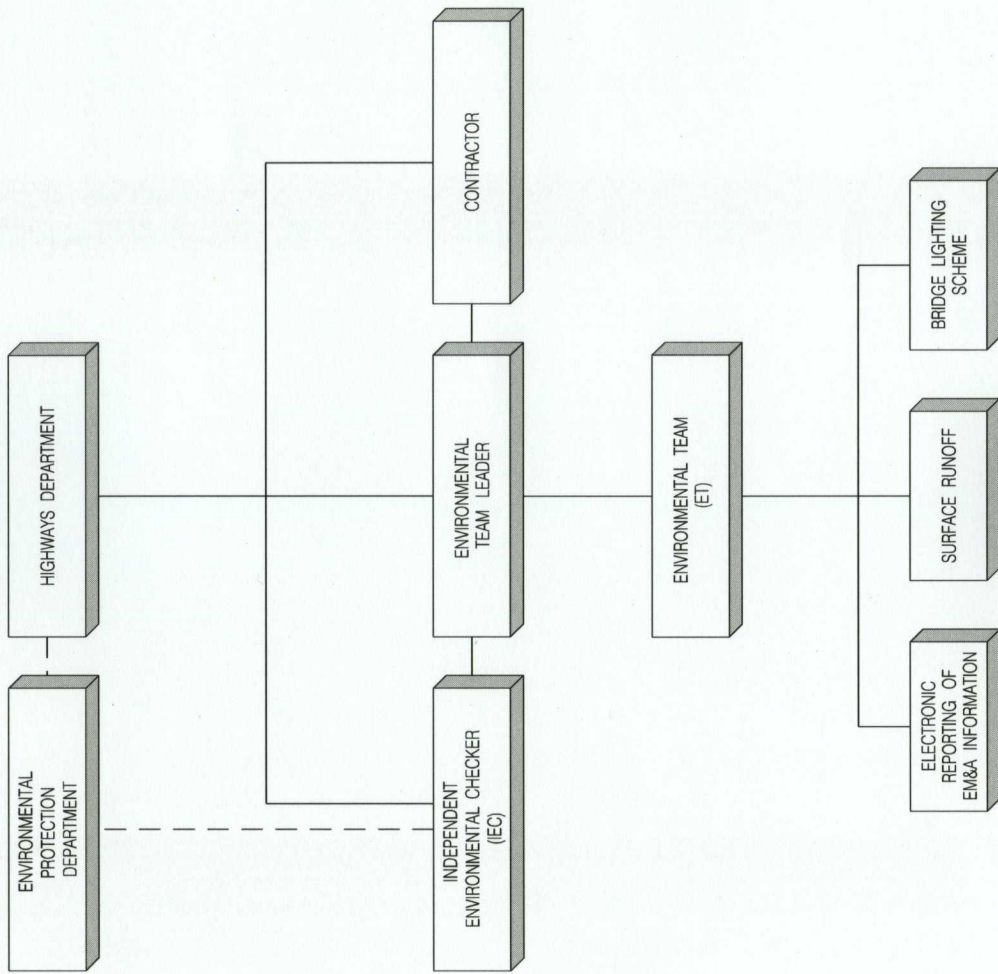
Appendix B

0 mm

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200

Appendix



LEGEND:

--- COMMUNICATION

drawing title

EM & A ORGANIZATION CHART

designed

C.F.KU 21/01/08 H.Y.YIP 21/01/08

checked approved

C.F.KU 21/01/08

MAJOR WORKS PROJECT MANAGEMENT OFFICE

drawing no.

HMW6759TH-SK0161

scale

N.T.S.

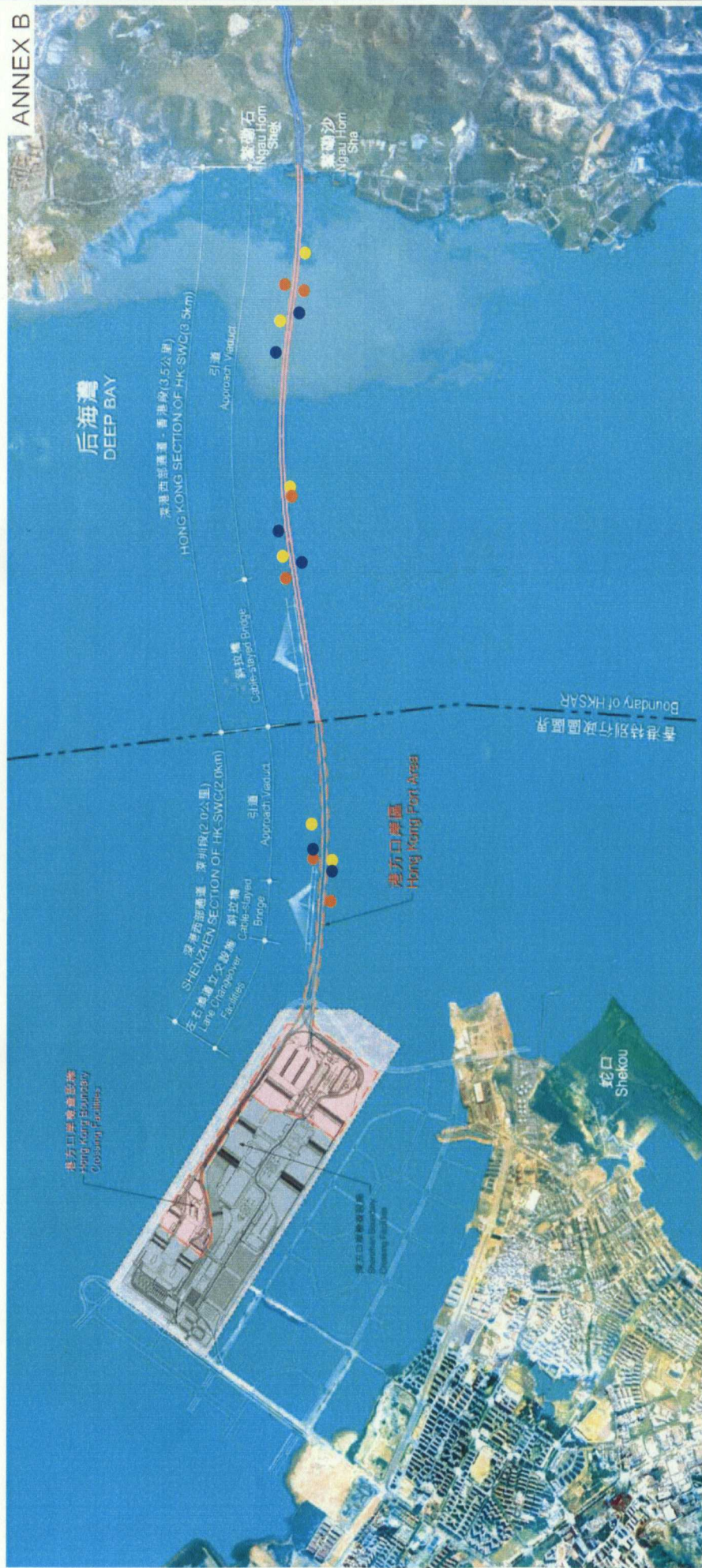
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HIGHWAYS DEPARTMENT HONG KONG

Appendix C

ANNEX B



Legend:

- Monitoring Location on 6 Oct 07
- Monitoring Location on 13 Oct 07
- Monitoring Location on 27 Oct 07

Contract No. HY/2007/04

Hong Kong - Shenzhen Western Corridor

Road Surface Runoff from Carriageway Monitoring Locations

Appendix D

9 March 2001

Highways Department General Circular No. 1/2001

Public Complaints & Enquiries Handling Procedure

This circular sets out guidelines and procedures to be followed on receipt of complaints/enquiries directly from members of the public or through other Government departments or agencies. The circular should be re-circulated every six months and staff who regularly deal with complaints/enquiries should be given personal copies. It supersedes Highways Department General Circular No. 1/98 which is hereby cancelled.

2. Scope of the Procedure

This procedure is applicable to all public complaints and enquiries addressed to Highways Department (HyD) from different sources including telephone, fax, letters, in-person, e-mail, media, and other public complaints and enquiries referred by other Government departments or agencies.

3. Attitude to Complaints/Enquiries

The response to complaints/enquiries is an important interface between the general public and HyD. The manner of handling complaints/enquiries contributes greatly to our public image and credibility. The essence is to try to mitigate any dissatisfaction. So be pleasant and helpful and, as far as possible, be positive and constructive.

Replies to complaints/enquiries should be accurate, clear, concise and expressed in layman term and in a courteous manner.

4. Complaints/Enquiries Direct from the Public

4.1 Telephone Complaints/Enquiries

Telephone complaints/enquiries from the public should be recorded with all details necessary for an investigation together with the name and telephone number of the complainant. The recipient of the complaint/enquiry should give an assurance that the query will be answered as soon as possible. If the recipient is not the one responsible for handling the complaint/enquiry, the recorded information should be passed to the responsible officer immediately for action. The latter should inform the complainant on the progress of the matter until action is completed. If the complainant requests a written reply, this should be arranged.

4.2 Written Complaints/Enquiries

On receipt of a complaint/enquiry letter, the General Registry of the office concerned should immediately acknowledge receipt by issuing a GF 17 receipt card.

The letter should be referred to the responsible officer or section as soon as possible for investigation, remedial action and reply.

Anonymous letters from the public should not be disregarded but should be dealt with in a similar manner as above although written replies are not possible.

4.3 Complaints/Enquiries in Person

Counter staff should always show courtesy to the public, particularly the complainant. They should either refer the complainant to the responsible officer or give him/her the address and telephone number if the officer is not accommodated in the same office building. If the complainant is willing to give details, the counter staff should record these together with the name, contact telephone number and address of the complainant. The case should then be referred to the responsible officer for remedial action and reply.

4.4 Complaints/Enquiries on Site

Site staff sometimes receive complaints/enquiries on site. Depending on the circumstances, they should explain the situation to the complainant and assure that remedial action will be taken promptly.

If the complainant is still not satisfied, the site staff should advise him/her that the Government would explore all possible measures to make good the situation and he/she will be informed of the outcome in due course. The names and telephone numbers of both parties should be exchanged. The site staff should then discuss the matter with their supervisors. The level of supervisor to be alerted will depend on the nature and seriousness of the complaint. If there is uncertainty, the next rank up should be consulted.

4.5 Complaints/Enquiries through e-mail

Complaints/enquiries received through e-mail should be handled similarly with written complaints/enquiries. The e-mail should be forwarded to the responsible officer or section as soon as possible for investigation, remedial action and reply.

4.6 Complaints/Enquiries using standard report form

Complaints/enquiries using standard report forms, such as "Damage or Defects Report", "Fault Report on Traffic Signs/Road Markings" or other standard report forms, should be handled promptly. Reply to these complaints/enquiries should be made in accordance with the above procedures depending on the contact information left, such as telephone number, fax number, address or e-mail address.

5. Complaints/Enquiries Referred by other Government Departments or Agencies

These complaints/enquiries should be processed in a similar manner as those

complaints/enquiries from the public. Replies should either be sent to complainants direct or to the Government departments from whom the complaints were referred.

6. Complaints/Enquiries from the News Media

The key to good news media relations is a speedy reply. However, it should not override normal precautions concerning the accuracy of information to be given. The draft reply should be passed to Senior Engineer/Highways Complaints (SE/HC) for final vetting before issue. Please also refer to Highways Departmental General Circular 1/99 "Guidance to Media Contact" on detail procedure.

6.1 Complaints/Enquiries through Telephone or FAX Message

Complaints/enquiries through telephone or fax message from the mass media (newspaper, radio and television) are normally directed to SE/HC. These complaints/enquiries are referred to the action officer for investigation and remedial action, who should give feedback to SE/HC on the same day or the following day, and should keep him/her informed of the progress until remedial works have been completed.

6.2 Letters/Articles of Complaint/Enquiry Published in Newspapers

It is Government policy that whenever possible queries or adverse comments contained in letters/articles published in newspapers should be answered. Opportunity should be taken to give factual replies and explain Government policies and actions.

Letters or articles published concerning HyD will normally be referred by SE/HC to the relevant Head of Office for action and reply. However, action on these letters or articles need not be held up until a formal referral is received from SE/HC but should begin at once aiming at the reply being published as soon as possible. Replies to newspapers should normally be submitted through SE/HC.

7. Complaints/Enquiries Relating to other Departments

If a complaint/enquiry relates to another Government department or party, it should be referred to that department or party in writing with the consent of the complainant for action immediately. In all cases, written records of such referral and reply shall be maintained.

8. Communication with Complainant

Written and verbal communications in connection with a complaint/enquiry should be in the language of the complainant.

9. Priorities

Top priority should be given to complaints involving public safety. Immediate action should be taken to rectify the situation to avoid further accidents. Priority should also be given to complaints/enquiries affecting a large population of the community.

10. Replies

Replies to complaints/enquiries should be made in accordance with the manner described in the above paragraphs and within the time limit as stated in the latest HyD Performance Pledge. If not possible, interim replies should be sent within this period stating that full replies will be given as soon as possible and explaining briefly the reasons for the delay.

Replies to complaints/enquiries should contain all details necessary to satisfy the complainants that the complaints/enquiries have been properly dealt with, particularly if the outcomes do not meet their expectation.

For written/e-mail replies, signing/issuing officers should be at least at Senior Professional level. Copies of e-mail correspondence for public complaints/enquiries should be kept in appropriate files for record.

Written replies to news media should be issued by SE/HC in accordance with Highways Departmental General Circular 1/99 "Guidance to Media Contact".

11. Supervision and Clearance of Replies

All HyD offices handling complaints should each set up a Bring Up System to enable supervision of complaints/enquiries by the respective Head of Office and to ensure public complaints/enquiries are handled systematically and promptly.

Some complaints/enquiries received by the Headquarters are referred to the responsible offices for action. Their replies should be copied to SE/HC for information and record.

For complaint/enquiry which touches on sensitive policy matters or may provoke adverse political sentiment, the responsible officer should bring up the issue to the Division Head immediately. The Division Head shall assess the implication of the issue and seek advice from the Head of Office, DDHy or DHy if necessary on a line-to-take for the reply. A draft reply shall then be sent to the D3 officer for clearance before it is dispatched.

If a draft reply is required to be signed by DHy for a very significant issue, the Head of Office should send his draft reply to DDHy for vetting before passing to DHy for signature.

Head of Office should exercise his judgement whether a particular issue is important enough for DHy's personal attention. In case of doubt, they should always seek DHy's verbal advice.

12. Appeals

An appeal lodged by a complainant about a decision should be considered by an officer senior to the one who made the decision and refer to SE/HC for coordination purpose.

13. Confidentiality of the Complainant's Personal Data

All personal information of the complainant should be kept strictly confidential in accordance with the Personal Data (Privacy) Ordinance. Without the complainant's consent, his/her personal information should not be disclosed to any other parties.

14. Remarks

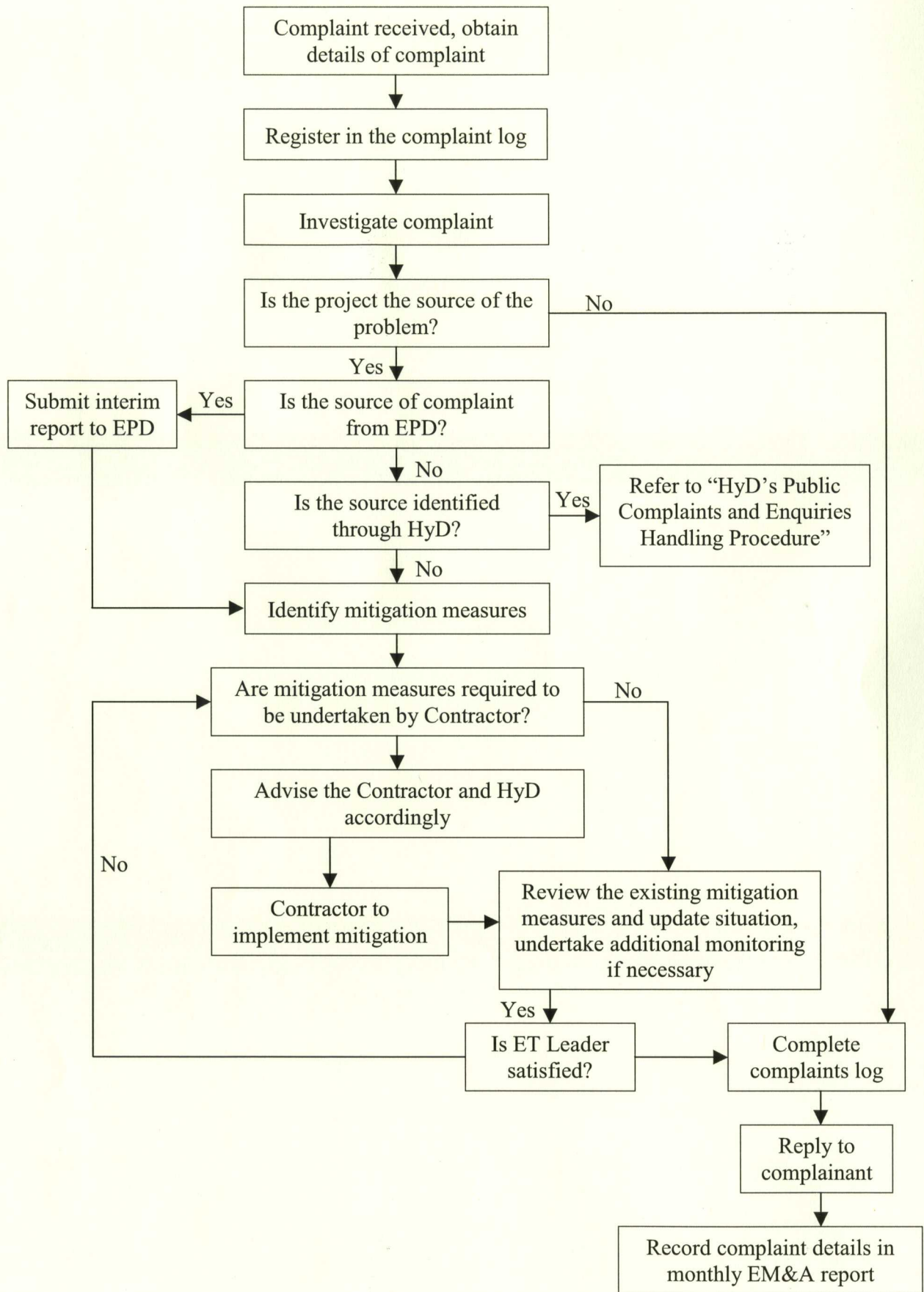
Any queries should be addressed to SE/HC on tel. no. 2762 3305.



(Y C Lo)
Director of Highways

c.c. HYD 4/1/11(A)(II)

Appendix E



Complaint Response Procedure

Appendix F

Appendix B-7 Complaint Log

Ref: _____

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

Filed by Environmental Team Leader:

Date: _____

Appendix G

Sample Template for Interim Notifications of Environmental Quality Limits Exceedances

Incident Report on Action Level or Limit Level Non-compliance

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

Location Plan

Prepared by: _____

Designation: _____

Signature: _____

Date: _____

