Consultancy Agreement No. NEX/2301
South Island Line (East)
Environmental Impact Assessment

Environmental Monitoring and Audit Manual

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August 2010

MTR Corporation Limited

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1. Introduction

1.1 Purpose of the Manual

The purpose of this Environmental Monitoring and Audit (EM&A) Manual (hereafter referred to as the Manual) is to guide the setup of an EM&A programme to ensure compliance with the Environmental Impact Assessment (EIA) study recommendations, to assess the effectiveness of the recommended mitigation measures and to identify any further need for additional mitigation measures or remedial action. This Manual outlines the monitoring and audit programme proposed for the "South Island Line (East) SIL(E)" (The Project).

It should be noted that this EM&A Manual would be further reviewed and updated where necessary.

1.2 Project Background

The South Island Line (SIL) was originally proposed as part of the Second Railway Development Study (RDS-2) completed in May 2000 as an extension to the existing railway network to serve the Southern District of Hong Kong. In June 2002, MTRCL submitted a preliminary proposal for a medium-capacity SIL, which involved a monorail system looping from University Station of the planned West Island Line (WIL) to the southern part of Hong Kong Island and back to Wanchai Station of the existing Island Line (ISL). The study identified that SIL would not be commercially viable without Government's funding support.

Subsequently, MTRCL further developed the proposed SIL as part of a Feasibility Study (FS) entitled "West Island Line and South Island Line Feasibility Study" which was completed in March 2004. After an evaluation of various alternative options, the FS recommended the implementation of the proposed SIL(E) from South Horizons to Admiralty, via intermediate stations at Lei Tung, Wong Chuk Hang and Ocean Park, for serving the Southern District and provision of a necessary depot at Wong Chuk Hang to support the operation of SIL, amongst other recommendations related to WIL. The FS also evaluated the feasibility of providing additional intermediate stations at Happy Valley and Wanchai. In February 2005, MTRCL submitted a project proposal to the Government for phased implementation of the SIL and WIL.

In December 2007, the Executive Council gave the green light for MTRCL to proceed with preliminary planning and design of the SIL(E), which will be a medium capacity railway line running from Admiralty to South Horizons, with three intermediate stations at Ocean Park, Wong Chuk Hang and Lei Tung. In response to the Government's decision, MTRCL recruited an Engineering Design Consultant to undertake preliminary design for the SIL(E) in February 2008 and appointed separate Engineering Design Consultants to undertake scheme and detailed design in June 2009. The SIL(E) scheme was gazetted under the Railways Ordinance in July 2009.

1.3 Project Alignment

The proposed SIL(E) comprises a new medium-capacity railway system with an approximate total route length of 7km from Admiralty to South Horizons, via three intermediate stations at Ocean Park, Wong Chuk Hang and Lei Tung. General layout plan of the Project is shown in **Figure 1.1**. Location of works areas, barging facilities and magazine site are shown in **Figures 1.2.1 to 1.2.11**.

The proposed SIL(E) comprises:

- approximately 7km of partly underground and partly viaduct railway alignment from South Horizons via Lei Tung, Wong Chuk Hang and Ocean Park to Admiralty. This alignment will connect the existing Island Line (ISL) and future Shatin Central Link (SCL) alignments;
- construction of South Horizons (SOH), Lei Tung (LET), Wong Chuk Hang (WCH) and Ocean Park (OCP) stations as well as Admiralty (ADM) interchange station for SIL(E) and SCL. WCH and OCP Stations are designed to be elevated along the viaduct alignment, while SOH, LET and ADM Stations are designed to be underground associated with above-ground entrances and exits, ventilation shafts and plant buildings, and will be constructed by either drill-and-blast or cut-and-cover tunnelling method;
- construction of tunnels by drill-and-blast, mining and cut-and-cover method. Based on the current design, tunnel sections from Admiralty to Nam Fung Portal and from Yi Nam Road to Ap Lei Chau Drive will be constructed by drill-and-blast tunnelling method, whilst tunnel sections from Ap Lei Chau Drive to the portal at the southern side of Aberdeen Channel Bridge will be constructed by mining and cut and cover tunnelling method;
- construction of tunnel portals at southern side of Aberdeen Channel Bridge and Nam Fung Road at the ex-Canadian Hospital site;
- construction of ventilation shafts along the alignment associated with the proposed stations, at Hong Kong Park, Lee Wing Street and Nam Fung Road;
- construction of a railway depot at the ex-Wong Chuk Hang Estate site;
- construction of a viaduct section from Aberdeen Channel Bridge via Wong Chuk Hang and Ocean Park to the tunnel entrance adjacent to Nam Fung Portal including a proposed emergency access next to Ap Lei Chau Bridge Road;
- construction of a railway bridge alongside the existing Ap Lei Chau Bridge across the Aberdeen Channel;
- provision of site offices, areas for construction material storage, construction shafts, temporary barging points and temporary magazine site during construction; and
- operation of the railway system and the depot.

1.4 Tentative Construction Programme

Construction of the SIL(E) is expected to commence in 2011 for completion in 2015. The tentative construction programme is given in **Appendix 2.4** of the EIA Report.

1.5 Project Organisation

The proposed project organisation is shown in **Figure 1.3**. The roles of ET and ER will both be played by MTRCL like all other MTRCL projects. This organisation structure will allow optimal lines of communications between ET, ER and the Contractor and will ensure the Contractor to perform the implementation measures effectively and in a timely fashion. The responsibilities of respective parties are:

MTRCL

Project proponent proposing the development of the Project and would be responsible for liaison with EPD on environmental issues associated with the project.

Engineer's Representative (ER)

The ER is responsible for overseeing the construction works and for ensuring that the works are undertaken by the Contractor in accordance with the specification and contract requirements. The duties and responsibilities of the ER with respect to EM&A are:

- Supervise the Contractor's activities to ensure that environmental controls and mitigation measures as set out in the Environmental Permit (EP), EIA Report, EM&A Manual and other government's standards are fully complied with;
- Inform the Contractor when action is required to reduce impacts in accordance with the Event and Action Plans as specified in this Manual;
- Advise, co-ordinate and give instruction when appropriate for efficient implementation of any specific environmental mitigation measures identified by the Contractor,
- Participate in site inspections undertaken by the ET; and
- Co-operate with the ET in providing all the necessary information and assistance for completion of the complaint investigation works.

The Contractor

The Contractor should report to the ER. The duties and responsibilities of the Contractor are:

- Design and implement environmental controls and mitigation measures as set out in the EP, EIA Report, EM&A Manual and other government's standards;
- Participate in site inspections undertaken by the ET;
- Provide assistance to ET to carry out monitoring;
- Provide requested information to the ET in the event of any exceedance in the environmental criteria (Action/Limit levels) as specified in this Manual or other current environmental standards and to rectify unacceptable practices;
- Submit proposals on mitigation measures in case of exceedance in the environmental criteria (Action/Limit levels), in accordance with the Event and Action Plans as specified in this Manual; and
- Co-operate with the ET in providing all the necessary information and assistance for completion of the complaint investigation works. If mitigation measures are required following the investigation, the Contractor should promptly carry out these measures.

Environmental Team (ET)

The ET should conduct the EM&A programme and ensure the Contractor's compliance with the project's environmental performance requirements during construction. The ET should plan, organise and manage the implementation of the EM&A programme and ensure that the EM&A works are undertaken to the required standards.

The ET should be led and managed by the ET Leader. The ET Leader should have relevant professional qualifications in environmental control and possess at least 7 years experience in EM&A. The ET Leader should be responsible for the implementation of the EM&A programme in accordance with the EM&A requirements specified in this Manual and the EP. The duties and responsibilities of the ET are:

- Sampling, analysis and statistical evaluation of monitoring parameters with reference to the EIA study recommendations and requirements;
- Environmental site surveillance;

- Inspection and audit of compliance with environmental protection, and pollution prevention and control regulations;
- Assess the effectiveness of the environmental mitigation measures implemented;
- Review work methodologies which may affect the extent of environmental impact during the construction phase and comment as necessary;
- Complaint investigation, evaluation and identification of corrective measures;
- Liaison with the IEC on all environmental performance matters, and timely submission of all relevant EM&A proforma for IEC's approval; and
- Advice to the Contractor on environmental improvement, awareness and enhancement matters, etc.

Independent Environmental Checker (IEC)

The IEC should advise the ET and ER on environmental issues related to the project. The IEC should audit from an independent viewpoint on the environmental performance during the construction of the project. The IEC should be a person who has relevant professional qualifications in environmental control and at least 7 years experience in EM&A and environmental management. The duties and responsibilities of the IEC are:

- Review and audit in an independent, objective and professional manner in all aspects of the EM&A programme;
- Validate and confirm the accuracy of monitoring results, appropriateness of monitoring equipment, monitoring locations with reference to the locations of the nearby sensitive receivers, and monitoring procedures;
- Carry out random sample check and audit on monitoring data and sampling procedures, etc;
- Conduct random site inspection;
- Audit the EIA recommendations and EP requirements against the status of implementation of environmental protection measures on site;
- Review the effectiveness of environmental mitigation measures and project environmental performance;
- On an as-need basis, verify and certify the environmental acceptability of the construction methodology (both temporary and permanent works), relevant design plans and submissions under the environmental permit. Where necessary, the IEC should agree in consultation with the ET and the Contractor the least impact alternative;
- Check complaint cases and the effectiveness of corrective measures;
- Verify EM&A report certified by the ET Leader; and
- Feedback audit results to the ER/ET according to the Event/Action Plans specified in this EM&A Manual.

2. Noise Impact

2.1 Introduction

As EIA Report indicated that residual noise impact is predicted during the construction phase at Wong Chuk Hang Depot, Wong Chuk Hang Nullah, Entrance A of LET Station and South Horizons, the mitigation measures stated in the EIA Report are recommended to be implemented in order to reduce the noise impact to the nearby NSRs. The monitoring programme should be carried out by the ET.

Commissioning test should be conducted by the ET in order to verify the compliance of the operational air-borne noise levels in accordance with the EIA Report/NCO criterion.

The implementation schedule of the recommended noise mitigation measures is presented in **Appendix A**. The monitoring requirements and methodology for monitoring of noise impacts are provided below.

2.2 Construction Noise Impact

2.2.1 Airborne Noise

2.2.1.1 Monitoring Requirements

The construction noise level should be measured in terms of the A-weighted equivalent continuous sound pressure level (L_{eq}). $L_{eq(30\ minutes)}$ should be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays.

Supplementary information for statistical results such as L_{10} and L_{90} may also be obtained for reference. A sample data record sheet is shown in **Appendix B** for reference. The ET may develop project specific data record sheet to suit this EM&A programme.

2.2.1.2 Monitoring Equipment

As refer to the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), sound level metres in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications should be used for carrying out the noise monitoring. The calibration of the sound level meters and their respective calibrators should be carried out in accordance with the manufacturer's requirements.

Noise measurements should not be made in the presence of fog, rain, wind with a steady speed exceeding 5 ms^{-1} or wind with gusts exceeding 10 ms^{-1}.

The ET is responsible for the provision and maintenance of the monitoring equipment. The ET should ensure that sufficient noise measuring 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 should be clearly labelled.

2.2.1.3 Monitoring Locations

The noise monitoring locations (Refer to **Figures 2.1.1** and **2.1.2**) are summarised in **Table 2.1**. The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET should propose updated monitoring locations and seek agreement from EPD.

Table 2.1: Construction Noise Monitoring Stations

ID	ID adopted in EIA	Description	Works Area
CN1	CPS	San Wui Commercial Society of HK Chan Pak Sha School (Educational Institution)	Wong Chuk Hang Depot
CN2	HSS2	Holy Spirit Seminary (Education Institution)	Viaduct section along Wong Chuk Hang Nullah (west of Wong Chuk Hang Depot)
CN3	YCB	Yen Ching Building (Residential)	LET Station Entrance A
CN4	SOH5	South Horizons Phase III (Residential)	SOH Station

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

- at locations close to the major site activities which are likely to have noise impacts;
- close to the noise sensitive receivers (any domestic premises, temporary housing accommodation, educational institution, place of public worship, should be considered as a noise sensitive receiver); and
- for monitoring locations located in the vicinity of the sensitive receivers, care should be taken to cause minimal disturbance to the occupants during monitoring.

The monitoring station should normally be at a point 1m from the exterior of the sensitive receivers building facade and be at a position 1.2m above the ground. If there is a problem with access to the normal monitoring position, an alternative nearby position may be chosen, and a correction to the measurements should be made. For reference, a correction of +3dB(A) should be made to the free field measurements. The ET should agree with the EPD on the correction adopted.

2.2.1.4 Baseline Monitoring

The ET should carry out baseline noise monitoring prior to the commencement of the construction works. There should not be any construction activities in the vicinity of the stations during the baseline monitoring.

Baseline noise monitoring for the A-weighted levels LA_{eq}, LA_{10} and LA_{90} should be carried out daily for a period of at least two weeks at a minimum logging interval of 30 minutes between 0700 and 1900.

In exceptional case, when insufficient baseline monitoring data or questionable results are obtained, the ET should liaise with EPD to agree on an appropriate set of data to be used as a baseline reference.

2.2.1.5 Impact Monitoring

During normal construction working hour (0700-1900 Monday to Saturday), monitoring of $LA_{eq,\ 30min}$ noise levels should be carried out at the agreed monitoring locations once every week in accordance with the methodology in the TM.

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

General construction work carrying out during restricted hours is controlled by Construction Noise Permit (CNP) under the NCO.

In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Event and Action Plan in **Table 2.3** should be carried out. This additional monitoring should be continued until the recorded noise levels are rectified or proved to be irrelevant to the construction activities.

2.2.1.6 Event and Action Plan

The Action and Limit (AL) Levels for construction noise are defined in **Table 2.2**. Should non-compliance of the criteria occurs, action in accordance with the Event and Action Plan in **Table 2.3**, should be carried out.

Table 2.2 : Typical Action and Limit Levels for Construction Noise

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

Note: *70 dB(A) for schools and 65 dB(A) during school examination periods.

If works are to be carried out during restricted hours, the conditions stipulated in the Construction Noise Permit (CNP) issued by the Noise Control Authority have to be followed.

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

Table 2.3: Event and Action Plan for Construction Noise

Event	Action			
	ET	IEC	ER	Contractor
Action Level	1. Undertake investigation to establish validity of exceedence. Undertake measurement to establish validity of complaint. 2. Identify source(s) of complaint. 3. If valid,notify IEC, ER and Contractor and follow other actions 4. Discuss jointly with the ER and Contractor and formulate remedial measures 5. Increase monitoring frequency if necessary	1. Review the proposed remedial measures by the Contractor and advise the ET accordingly	1. Confirm receipt of notification of exceedance 2. Notify Contractor 3. Require Contractor to propose remedial measures for the analysed noise problem 4. Ensure remedial measures are properly implemented	1. Submit noise mitigation proposals to ER with copy to ET 2. Implement noise mitigation proposals

Event	ET	IEC	ER	Action Contractor
	to check mitigation effectiveness			
Limit Level	1. Identify source 2. Repeat measurement to confirm findings 3. If valid, notify IEC, ER, and Contractor and follow other actions 4. Increase monitoring frequency if necessary 5. Check Contractor's working procedures to determine possible mitigation to be implemented 6. Discuss jointly with the ER and Contractor and formulate remedial measures 7. Assess effectiveness of Contractor's remedial actions and keep IEC, and ER informed of the results 8. If exceedance stops, cease additional monitoring	1. Discuss amongst ER, ET and Contractor on the potential remedial actions 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ET accordingly	1. Confirm receipt of notification of exceedances 2. Notify Contractor 3. Require Contractor to propose remedial measures 4. Ensure remedial measures are properly implemented 5. Assess the efficiency of remedial actions and keep the Contractor informed. 6. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated	1. Take immediate action to avoid further exceedance 2. Submit proposals for remedial actions to ER with copy to ET 3. Implement the agreed proposals 4. Liaise with ER to optimize the effectiveness of the agreed mitigation. 5. Revise and resubmit proposals if problem still not under control 6. Stop the relevant portion of works as determined by the ER until the exceedance is abated

2.3 Commissioning Test

2.3.1 Airborne Noise

Mitigation measures to alleviate the airborne railway noise impact are recommended in the EIA and presented in **Appendix A**. In order to ensure the operational airborne noise levels would comply with the noise standards as stipulated in the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) and NCO, the ET should carry out a noise commissioning test before operation of the Project.

2.3.2 Ground-borne Noise

Trackform mitigation is recommended in the operation ground borne noise assessment. In order to ensure no adverse impact from the operation of train, it is recommended the ET should perform a noise commissioning test at selected key noise sensitive receivers, say YOC4 (Yue On Court) and SOH8 (South Horizons Dover Court).

3. Ecological Impact

3.1 Introduction

The ecological impact assessment in the EIA Report has evaluated the ecological consequences of the proposed Project and concluded that the overall impacts would be of minor significance with the implementation of mitigation measures.

The proposed ecological mitigation measures to avoid, minimize and compensate the identified impacts arising from the proposed project should be checked as part of the environmental monitoring and audit programme during the construction phase.

3.2 Ecological Mitigation Measures

Mitigation measures were designed in accordance with Annex 16 of the EIAO-TM which states the general policy and guidance in planning of ecological measures. The implementation schedule of the recommended mitigation measures is presented in **Appendix A**.

3.2.1 Audit Requirements

It is recommended that auditing of these recommended mitigation measures should be carried out periodically and recorded in EM&A reports. The ardeid night roost location should be monitored monthly by qualified ecologist during the construction phase to check the status. The survey should be conducted using point count method at evening time from 5:30p.m., approximately an hour before sunset, and last until the nightfall, when the sky turns dark totally. Direct observation should be made from a vantage point which enables an unobstructed view over the area. Heung Yip Road should be taken as first priority of the vantage point but should the view be obstructed due to the construction activities, the Ap Lei Chau Bridge can be taken as an optional vantage point. Any aggregation of night roosting ardeid in the woodland or adjacent area should be located and counted. Restriction on working hour can be ceased if the night roost is relocated to an unaffected area. The ecological mitigation implementation schedule is presented in **Section 14**.

4. Water Quality Impact

4.1 Introduction

As indicated in the EIA Report, adverse water quality impact was not predicted during the construction and operation phase of the Project. Nevertheless, appropriate mitigation measures are recommended to minimize potential water quality impacts.

4.2 Construction Water Quality Impact

Water quality monitoring is recommended during the course of marine construction works at Aberdeen Channel to obtain a robust, defensible database of baseline information of marine water quality before construction, and thereafter, to monitor any variation of water quality from the baseline conditions and exceedances of WQOs at sensitive receivers during construction and to ensure the recommended mitigation measures are properly implemented.

Regular audit of the implementation of the recommended mitigation measures during the construction phase at the work areas should also be undertaken during the construction phase to ensure the recommended mitigation measures are properly implemented.

Details of the water quality monitoring and audit programme and the Event and Action Plan are provided below.

4.2.1 Water Quality Parameter

Monitoring for Dissolved Oxygen (DO), Dissolved Oxygen Saturation (DO%), temperature, pH, turbidity, salinity, suspended solid (SS) and water depth should be undertaken at designated monitoring locations. All parameters should be measured in-situ whereas SS should be determined by the laboratory. DO should be presented in mg/L and in % saturation.

Other relevant data should also be recorded, including monitoring location / position, time, tidal stages, weather conditions and any special phenomena or work underway at the construction site.

4.2.2 Sampling Procedure and Monitoring Equipment

Water samples for all monitoring parameters should be collected, stored, preserved and analyzed according to Standard Methods, APHA 21st ed. and/or methods agreed by EPD. A sample data record sheet is shown in **Appendix B** for reference.

The following equipment and facilities should be provided by the ET and used for the monitoring of water quality impacts:

4.2.2.1 Dissolved Oxygen and Temperature Measuring Equipment

DO and water temperature should be measured in-situ by a DO/ temperature meter. The instrument should be portable and weatherproof using a DC power source. It should have a membrane electrode with automatic temperature compensation complete with a cable. The equipment should be capable of measuring:

- a DO level in the range of 0-20 mg/l and 0-200% saturation; and

- a temperature of between 0 and 45 degree Celsius.

4.2.2.2 pH Measuring Instrument

A portable pH meter capable of measuring a range between 0.0 and 14.0 should be provided to measure pH under the specified conditions accordingly to the Standard Methods, APHA.

4.2.2.3 Turbidity Measurement Instrument

The instrument should be portable and weatherproof using a DC power source. It should have a photoelectric sensor capable of measuring turbidity between 0-1000 NTU.

4.2.2.4 Salinity

A portable salinometer with measuring range of 0-40 mg/L should be used to determine the salinity of the water.

4.2.2.5 Water Depth Detector

A portable, battery-operated echo sounder would be used for the measurement of water depth at each designated monitoring station. The unit would be either handheld or affixed to the bottom of the work boat, if the same vessel is to be used throughout the monitoring programme.

4.2.2.6 Positioning Device

A digital Global Positioning System (GPS) should be used during monitoring to ensure the monitoring vessel is at the correct location before taking measurements.

4.2.2.7 Calibration of In-Situ Instruments

All in-situ monitoring instruments would be calibrated and certified by a laboratory accredited under HOKLAS or any other international accreditation scheme before use, and subsequently re-calibrated at 3 monthly intervals throughout all stages of the water quality monitoring programme. Responses of sensors and electrodes should be checked with certified standard solutions before each use.

Wet bulb calibration for a DO probe should be carried out at least once per monitoring day. A zero check in distilled water should be performed with the turbidity probe at least once per monitoring day. The probe should then be calibrated with a solution of known NTU. In addition, the turbidity probe should be calibrated at least twice per month to establish the relationship between turbidity readings (in NTU) and levels of suspended solids (in mg/L).

For the on-site calibration of field equipment, the BS 127: 1993, Guide to Field and On-Site Test Methods for the Analysis of Waters should be observed.

Sufficient stocks of spare parts should be maintained for replacements when necessary. Backup monitoring equipment should also be made available so that monitoring could proceed uninterrupted even when some equipment is under maintenance, calibration etc.

4.2.2.8 Water Sampling Equipment

A water sampler comprises a transparent PVC cylinder, with a capacity of not less than 2 litres, and could be effectively sealed with latex cups at both ends should be used. The sampler should have a positive latching system to keep it open and prevent premature closure until released by a messenger when the sampler is at the selected water depth (Kahlsico Water Sampler or an approved similar instrument).

4.2.2.9 Storage

Water samples for suspended solids measurement should be collected in high density polythene bottles, packed in ice (cooled to 4°C without being frozen), and delivered to the laboratory as soon as possible after collection.

4.2.2.10 Laboratory Measurement/Analysis

Analysis of suspended solids should be carried out in a HOKLAS or other accredited laboratory. Water samples of about 1L should be collected at the monitoring stations for carrying out the laboratory suspended solids determination. The SS determination work should start within 24 hours after collection of the water samples. The SS analyses should follow the standard method APHA 2540D with a detection limit of 1mg/L as described in APHA Standard Methods for the Examination of Water and Wastewater, 21st Edition, unless otherwise specified.

If in-house or non-standard methods are proposed, details of the method verification should, if required, be submitted to EPD. In any circumstances, the sample testing should have comprehensive quality assurance and quality control programmes. The laboratory should be prepared to demonstrate the quality control programmes to EPD or their representative if and when required.

Additional duplicate samples may be required by EPD for inter laboratory calibration. Remaining samples after analysis should be kept by the laboratory for 3 months in case repeat analysis is required.

4.2.3 Monitoring Locations

The proposed water quality monitoring stations are shown in **Table 4.1** and **Figure 4.1**. The monitoring stations proposed in this section are indicative subject to further review before construction phase. The status and locations of water sensitive receivers and the marine activities may change after issuing this Manual. If such case exists, the ET should propose updated monitoring locations and seek approval from EPD.

It is proposed to monitor the water quality at four locations closest to the marine construction works at Aberdeen Channel. It is recommended to conduct the monitoring at the appropriate vertical levels of the abstraction points of the seawater intake to collect information on the mitigated water quality condition if practicable. Two Control Stations are proposed to represent the project site in its undisturbed condition and their respective positions are also shown in **Table 4.1** and **Figure 4.1**.

Table 4.1: Construction Water Quality Monitoring Stations

ID	Description	Easting	Northing
WM1	Sensitive Receiver (Aberdeen West Typhoon Shelter)	833953	811923

ID	Description	Easting	Northing
WM2	Sensitive Receiver (Wong Chuk Hang Nullah)	834547	811966
WM3	Sensitive Receiver (WSD Brick Hill Seawater Intake)	834896	811567
WM4	Sensitive Receiver (Aberdeen South Typhoon Shelter)	834761	811292
C1	Control Station	832689	811967
C2	Control Station	834852	810689

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

- at locations close to and preferably at the boundary of the mixing zone of the major site activities as indicated in the EIA report, which are likely to have water quality impacts;
- close to the sensitive receptors which are directly or likely to be affected;
- for monitoring locations located in the vicinity of the sensitive receptors, care should be taken to cause minimal disturbance during monitoring;
- two or more control stations which should be at locations representative of the project site in its undisturbed condition. Control stations should be located, as far as is practicable, both upstream and down stream of the works area.

Measurement should be taken at 3 water depths, namely, 1m below water surface, mid-depth and 1m above sea bed, except where the water depth less that 6m, the mid-depth station may be omitted. Should the water depth be less than 3m, only the mid-depth station will be monitored. The ET should agree with EPD on all the monitoring stations.

Duplicate in-situ measurements and samples collected from each independent monitoring event are required for all parameters to ensure a robust statistically interpretable dataset.

4.2.4 Baseline Monitoring

The purpose of the baseline monitoring is to establish ambient conditions prior to the commencement of marine construction works and to demonstrate the suitability of the proposed monitoring stations. The measurements should be taken at all designated monitoring stations, 3-days per week, at mid-flood and mid-ebb tides, for at least 4 consecutive weeks prior to the commencement of marine construction works.

Two consecutive measurements of DO concentration (mgL^{-1}), DO saturation (%) and turbidity (NTU) should be taken in-situ according to the stated sampling method. Where the difference in value between the first and second measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading should be discarded and further readings should be taken. Water samples for SS (mgL^{-1}) measurements should be collected at the same depths.

In addition to the above in-situ measurements, water temperature, pH and salinity should be determined at all monitoring stations at the same depths, as specified above. Note that in addition to the water depth, monitoring location/position, time, weather conditions, sea conditions (where appropriate), tidal stage (where appropriate), and any special phenomena should be recorded.

The baseline monitoring campaign should be executed prior to commencement of marine construction works. In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET should liaise with EPD to agree on an appropriate set of data to be used as a baseline reference.

The interval between two sets of monitoring would not be less than 36 hours.

4.2.5 Impact Monitoring

During the course of the marine construction works at Aberdeen Channel, impact monitoring should be undertaken at all monitoring stations three working days per week, at mid-ebb and mid-flood tides, with sampling /measurement. The interval between two sets of monitoring should not be less than 36 hours except where the Action and/or Limit levels is/are exceeded, in which case the monitoring frequency should be increased.

Two consecutive measurements of DO concentration (mgL^{-1}), DO saturation (%) and turbidity (NTU) should be taken in-situ according to the stated sampling method. Where the difference in value between the first and second measurement of DO or turbidity parameters is more than 25% of the value of the first reading, the reading should be discarded and further readings would be taken. Water samples for SS (mgL^{-1}) measurements should be collected at the same depths. Duplicate water samples should be taken and analyzed.

In addition to the above in-situ measurements, water temperature, pH and salinity should be determined at all monitoring stations at the same depths, as specified above. Note that in addition to the water depth, monitoring location/position, time, weather conditions, sea conditions (where appropriate), tidal stage (where appropriate), and any special phenomena should be recorded.

4.2.6 Post-Construction Monitoring

A post project water quality monitoring exercise should be carried out for four weeks upon completion of marine construction works at Aberdeen Channel, in the same manner as the impact monitoring.

4.2.7 Event and Action Plan

The Action and Limit (AL) Levels for water quality are defined in **Table 4.2**. The actions in accordance with the Event and Action Plan in **Table 4.3** should be carried out if the water quality assessment criteria are exceeded at any designated monitoring points.

Table 4.2: Typical Action and Limit Levels for Water Quality

Parameters	Action Level	Limit Level
DO in mg/l (Surface, Middle & Bottom)	5 percentile of baseline data	Surface and Middle 4 mg/L or 1 percentile of baseline data Bottom 2 mg/L or 1 percentile of baseline data
SS in mg/l (depth-averaged)	95 percentile of baseline data or 120% of upstream control station of the same day	99 percentile of baseline data or 130% of upstream control station of the same day
Turbidity in NTU (depth-averaged)	95 percentile of baseline data or 120% of upstream control station of the same day	99 percentile of baseline data or 130% of upstream control station of the same day

Notes: 1. "Depth-averaged" is calculated by taking the arithmetic means of the readings of the three depths.

2. For DO measurement, non-compliance occurs when monitoring result is lower than the limits.

3. For SS and turbidity, non-compliance of water quality results when monitoring results is higher than the limits.
4. All the figures given in the table are used for reference only and the EPD may amend the figures whenever necessary.

Table 4.3: Event and Action Plan for Water Quality

EVENT	ACTION			
	ET	IEC	ER	CONTRACTOR
Action level being exceeded by one sampling day	1. Repeat measurement to confirm findings; 2. Identify source(s) of impact; 3. If valid, inform IEC, Contractor, and ER and follow other actions; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor;	1. Check Contractor's working methods. 2. Discuss with ET and Contractor on possible mitigation measures; 3. Review the proposed mitigation measures submitted by Contractor and advise the ET accordingly;	1. Confirm receipt of notification 2. Discuss with ET and Contractor on the proposed mitigation. 3. Request Contractor to review the working methods. 4. Ensure mitigation measures are properly implemented.	1. Rectify unacceptable practice; 2 Check all plant and equipment and consider changes of working methods; 3. Discuss with ET and ER and propose mitigation measures to ET and ER within 3 working days; 4. Implement the agreed mitigation measures.
Limit level being exceeded by more than one consecutive sampling days	1. Repeat measurement to confirm findings; 2. Identify source(s) of impact; 3. If valid, inform IEC, Contractor, and ER and follow other actions; 4. Check monitoring data, all plant, equipment and Contractor's working methods; 5. Discuss mitigation measures with IEC, ER and Contractor; 6. Ensure mitigation measures are implemented; 7. Increase the monitoring frequency until no exceedance of Limit level for two consecutive days.	1. Check Contractor's working methods. 2. Discuss with ET and Contractor on possible mitigation measures; 3. Review the proposed mitigation measures submitted by Contractor and advise the ET accordingly.	1. Confirm receipt of notification of exceedances; 2. Discuss with ET and Contractor on the proposed mitigation measures; 3. Request Contractor to critically review the working methods; 4. Ensure mitigation measures are properly implemented 5. Make agreement on the mitigation measures to be implemented; 6. Assess the efficiency of mitigation measures and keep Contractor informed; 7. Consider and instruct, if necessary, the Contractor to slow down or to stop all or part of the construction activities until no exceedance of Limit level.	1. Take immediate action to avoid further exceedance 2. Discuss with ET and ER and propose mitigation measures to ET and ER; 3. Implement the agreed mitigation measures; 4. Liaise with ER to Optimise the effectiveness of the agreed mitigation. 5. Resubmit proposals of mitigation measures if problem still not under control; 6. As directed by the Engineer, to slow down or to stop all or part of the construction activities until no exceedance of Limit level.

5. Landscape and Visual Impact

5.1 Introduction

In accordance with the EIAO-TM, the hierarchy for landscape and visual impact mitigation is first avoidance of impact, then minimisation of impact and finally compensation of impact. The EIA Report provided recommendation of landscape and visual mitigation measures for both construction and operation phases so as to minimise predicted landscape and visual impacts, and to compensate for lost landscape resources as far as possible.

5.2 Mitigation Measures

The landscape and visual mitigation measures described in the EIA report are at a level which both demonstrates their ability to alleviate the potential landscape and visual impacts identified in the landscape and visual impact assessment and also to allow the proposals to be carried forward during the detailed design stage. The measures are designed to address both the construction and operational phases of the project. More detailed landscape and compensatory planting proposals would be developed by the Detailed Engineering Design Consultant at a later stage during design and construction phase of this project. Following the completion of the detailed Tree Survey Report, a Tree Removal Application would be submitted to the relevant departments for their approval.

The implementation, funding, and management and maintenance for the amenity areas and landscape works associated with the proposed works would be undertaken by MTRCL or relevant government departments. The landscape works would follow completion of the construction of individual stations and section of alignment. The design year is for the purposes of this study taken as approximately 10 – 15 years after the railway operating when the proposed soft landscape mitigation is mature. The landscape works would be implemented at the earliest possible time in the planting season following the sectional completion of the construction works or after the operation of the railway. The implementation schedule of landscape works is presented in **Appendix A** of in this EM&A Manual.

5.3 Construction and Operation Phase Audit

A registered landscape architect should be employed by the Contractor for the implementation of landscape works and subsequent maintenance during the 12-month after works completion.

All measures undertaken by both the Contractor and the specialist Landscape Sub-Contractor during the construction phase and first year of the operational phase should be audited by the ET on a regular basis to ensure compliance with the recommended mitigation measures in the EIA Report.

Site Inspection should be undertaken at least once every two weeks throughout the construction period and once every two months during operation phase. Operation phase auditing would be restricted to the 12 months of the establishment works of the landscape proposals. Ad-hoc site inspection should also be carried out if significant environmental problems are identified.

6. Hazard to Life

6.1 Introduction

Blasting activities regarding the storage and transport of explosives should be supervised and audited by the competent site staff to ensure strict compliance with the blasting permit conditions.

6.2 Mitigation Measures

The implementation schedule of the recommended hazard to life mitigation measures is presented in **Appendix A** of this EM&A Manual should be implemented to meet the EIAO-TM requirements.

7. Waste Management Implications

7.1 Introduction

Waste management would be the contractor's responsibility to ensure that all wastes produced during the construction of the Project are handled, stored and disposed of in accordance with good waste management practices and EPD's regulations and requirements. The recommended mitigation measures should form the basis of the site Waste Management Plan to be developed by the Contractor in the construction phase.

7.2 Construction Waste Management Implications

During construction phase, regular site inspection as part of the EM&A procedures should be carried out to determine if wastes are being managed in accordance with approved procedures and the site Waste Management Plan. It should look at different aspects of waste management including waste generation, storage, recycling, treatment, transport and disposal.

7.2.1 Mitigation Measures

The implementation schedule of the recommended waste management mitigation measures is presented in **Appendix A**.

8. Land Contamination

8.1.1 Introduction

Desktop study and site appraisal have been conducted during EIA study and potential land contamination hotspots was not identified in the Study Area.

8.1.2 Construction Phase Land Contamination

In view of the desktop review results and the Site Investigation Results, bulk excavation of soil for land remediation is not expected. As such, any environmental monitoring in relation to land remediation is not required.

On the other hand during construction phase, land contamination monitoring could be carried out in the form of regular site inspection. All related procedures and facilities in handling or storage of chemicals and chemical wastes should be audited regularly to make sure they are in order and intact and, reported in the EM&A reports as such.

8.1.3 Mitigation Measures

The implementation schedule of the recommended land contamination mitigation measures is presented in **Appendix A**.

9. Air Quality Impact

9.1 Introduction

The Contractor should follow the Air Pollution Control (Construction Dust) Regulation to implement dust mitigation measures during construction to minimise the dust impact to the nearby air sensitive receivers and to ensure the effectiveness of the implementation of dust mitigation measures recommended in the EIA report.

It is recommended that regular site inspections should be carried out by the ET to ensure that the recommended mitigation measures are carried out by the Contractor. Special attention should be paid to the enforcement of dust control measures during construction process. The ET should consider the programme and site for construction works in determining the location to carry out the site inspection.

9.2 Construction Air Quality Impact

Dust monitoring is considered necessary during the construction phase and regular site inspections are required to ensure that the dust control measures are properly implemented.

9.2.1 Monitoring Requirements

Monitoring and audit of the Total Suspended Particulate (TSP) levels should be carried out by the ET to ensure that any deteriorating air quality could be readily detected and timely actions taken to rectify the situation.

1 hour or 24-hour TSP levels should be measured to indicate the impacts of construction dust on air quality. The TSP levels should be measured by following the standard high volume sampling method as set out in the Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B or be measured by direct reading methods which are capable of producing comparable results as that by the high volume sampling method.

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, other special phenomena and work progress of the concerned project area etc. should be recorded. A sample data sheet is shown in **Appendix B**. The ET may develop project specific data record sheet to suit this EM&A programme.

9.2.2 Monitoring Equipment

The ET is responsible for provision of the monitoring equipment. He should ensure that sufficient number of equipment with appropriate calibration kits are available for carrying out the baseline monitoring, regular impact monitoring and ad hoc monitoring. All the equipment should be clearly labelled.

HVS in compliance with the following specifications should be used for carrying out the 1-hour or 24-hour TSP monitoring:

- 0.6 - 1.7 m^3/min (20 - 60 standard cubic feet per minute) adjustable flow range;
- equipped with a timing / control device for 24 hours operation;

- installed with elapsed-time meter for 24 hours operation;
- capable of providing a minimum exposed area of 406 cm^2 (63 in^2);
- 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;
- incorporated with a manometer;
- able to hold and seal the filter paper to the sampler housing at horizontal position;
- easy to change the filter, and
- capable of operating continuously for 24-hour period.

Calibration of dust monitoring equipment should be conducted as specified by the manufacturer. Initial calibration of the dust monitoring equipment should be conducted upon installation and thereafter at bi-annual intervals. The calibration data should be properly documented for future reference. All the data should be converted into standard temperature and pressure condition.

The ET should obtain representative wind data near the dust monitoring locations for reference.

9.2.3 Monitoring Locations

Five air quality monitoring locations are proposed and summarised in **Table 9.1** as shown in **Figures 9.1.1** to **9.1.4**. As approval is needed from the premises landlord for dust monitoring equipment installation, it is not certain that a suitable location would be approved. The status and locations of dust sensitive receivers may change after issuing this manual. If such cases exist, the ET should propose updated monitoring locations and seek agreement from EPD.

Table 9.1: Construction Air Quality Monitoring Stations

ID	ID adopted in EIA	Description	Works Area
CD1	NFP6	Wong Chuk Hang San Wai – No.4C (Residential)	Nam Fung Portal
CD2	WCH2	Police College – Police Quarters (Residential)	Wong Chuk Hang
CD3	WCH3	San Wui Commercial Society of HK Chan Pak Sha School (Educational)	Wong Chuk Hang
CD4	LET5	Sham On House (Residential)	Lei Tung
CD5	SOH3	South Horizons Phase 3 – Block 20 Mei Cheung Court (Residential)	South Horizons

When alternative monitoring locations are proposed, the following criteria, as far as practicable, should be followed:

- at the project area boundary or such locations close to the major dust emission source;
- close to the sensitive receptors; and
- take into account the prevailing meteorological conditions.

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

- 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 where possible;
- no furnace or incinerator flue or building vent is nearby;
- airflow around the sampler is unrestricted;
- any wire fence and gate, to protect the sampler, should not cause any obstruction during monitoring;

9.2.4 Baseline Monitoring

The ET should carry out baseline monitoring at all designated monitoring locations for at least 14 days prior to the commencement of the construction works to obtain daily 24-hr TSP samples. 1-hour sampling should also be done at least 3 times per day while the highest dust impact is expected.

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

In case the baseline monitoring cannot be carried out at the designated monitoring locations during the baseline monitoring period, the ET should carry out the monitoring at alternative locations which can effectively represent the baseline conditions at the impact monitoring locations. The alternative baseline monitoring locations should be agreed with EPD prior to commencement of baseline monitoring.

In exceptional cases, when insufficient baseline monitoring data or questionable results are obtained, the ET should liaise with EPD to agree on an appropriate set of data to be used as a baseline reference.

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

9.2.5 Impact Monitoring

The ET is responsible for impact monitoring during the course of the works. For regular impact monitoring, 24-hr TSP monitoring should be in the sampling frequency of at least once every week. In case of non-compliance with the air quality criteria, more frequent monitoring exercise adopting 1-hr TSP monitoring undertaken when the highest dust impact occur, as specified in the Event and Action Plan in **Table 9.3**, should be conducted within 24 hours after the result is obtained. This additional monitoring should be continued until the excessive dust emission or the deterioration in air quality is rectified.

9.2.6 Event and Action Plan

The baseline monitoring results form the basis for determining the air quality criteria for the impact monitoring. The ET should compare the impact monitoring results with air quality criteria set up for 24-hour TSP and 1-hour TSP level. **Table 9.2** shows the air quality criteria, namely Action and Limit (AL) Levels to be used. Should non-compliance of the air quality criteria occurs, actions in accordance with the Event and Action Plan in **Table 9.3** should be carried out.

Table 9.2: Typical Action and Limit Levels for Air Quality

Parameters	Action Level	Limit Level
24-hr TSP Level in µg/m³	For baseline level ≤ 200 µg/m³, Action level = (130% of baseline level + Limit level)/2 For baseline level > 200 µg/m³, Action level = Limit Level	260
1-hour TSP Level in µg/m³	For baseline level ≤ 384 µg/m³, Action level = (130% of baseline level + Limit level)/2 For baseline level > 384 µg/m³, Action level = Limit Level	500

Table 9.3: Event and Action Plan for Air Quality

Event	ET	IEC	ER	Action Contractor
Action Level				
1. Exceedance for one sample	1. Undertake investigation to establish validity of exceedence. Identify source and investigate the causes of impact exceedence; 2. If valid, inform IEC and ER and propose remedial measures and follow other actions; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency.	1. Check Contractor's working method.	1. Notify Contractor.	1. Rectify any unacceptable practice; 2. Amend working methods if appropriate.
2. Exceedance for two or more consecutive samples	1. Undertake investigation to establish validity of exceedence.Identify source and investigate the causes of impact; 2. If valid, inform IEC and ER and follow other actions; 3. Advise the ER on the effectiveness of the proposed remedial measures; 4. Repeat measurements to confirm findings; 5. Increase monitoring frequency; 6. Discuss with IEC and ER (together with the Contractor) on remedial actions required; 7. If exceedance continues, arrange meeting with IEC and ER; 8. If exceedance stops, cease additional monitoring.	1. Check Contractor's working method; 2. Discuss with ET and ER (together with the Contractor) on possible remedial measures; 3. Advise the ET on the effectiveness of the proposed remedial measures;	1. Confirm receipt of notification of exceedance; 2. Notify Contractor; 3. Ensure remedial measures properly implemented.	1. Submit proposals for remedial to ER within three working days of notification; 2. Implement the agreed proposals; 3. Amend proposal if appropriate.
Limit Level				
1.Exceedance for one sample	1. Identify source and, investigate the causes of exceedance; 2. If valid, inform IEC, ER,	1. Check Contractor's working method; 2. Discuss with ET and ER (together with the	1. Confirm receipt of notification of exceedance; 2. Notify Contractor;	1. Take immediate action to avoid further exceedance;

Event	ET	IEC	ER	Action Contractor
	and Contractor and follow other actions; 3. Repeat measurement to confirm finding; 4. Increase monitoring frequency; 5. Assess effectiveness of Contractor's remedial actions and keep IEC, and ER informed of the results.	Contractor) on possible remedial measures; 3. Advise the ET on the effectiveness of the proposed remedial measures;	3. Ensure remedial measures properly implemented.	2. Submit proposals for remedial actions to ER with a copy to ET within three working days of notification; 3. Implement the agreed proposals; 4. Amend proposal if appropriate.
2. Exceedance for two or more consecutive samples	1. Identify source and, investigate the causes of exceedance; 2. If valid, notify IEC, ER, Contractor and EPD and follow other actions; 3. Repeat measurement to confirm findings; 4. Increase monitoring frequency; 5. Check Contractor's working procedures to determine possible mitigation to be implemented; 6. Arrange meeting with IEC and ER to discuss the remedial actions to be taken; 7. Assess effectiveness of Contractor's remedial actions and keep IEC , EPD and ER informed of the results; 8. If exceedance stops, cease additional monitoring.	1. Discuss amongst ER, ET, and Contractor on the potential remedial actions; 2. Review Contractor's remedial actions whenever necessary to assure their effectiveness and advise the ET accordingly;	1. Confirm receipt of notification of exceedance; 2. Notify Contractor; 3. Agree with the Contractor on the remedial measures to be implemented; 4. Ensure remedial measures properly implemented; 5. Assess the efficiency of remedial measures and keep the Contractor informed; 6. If exceedance continues, consider what portion of the work is responsible and instruct the Contractor to stop that portion of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance; 2. Submit proposals for remedial actions to ER with a copy to ET within three working days of notification; 3. Implement the agreed proposals; 4. Liaise with ER to optimize the effectiveness of agreed mitigation 5. Revise and resubmit proposals if problem still not under control; 6. Stop the relevant portion of works as determined by the ER until the exceedance is abated.

9.2.7 Mitigation Measures

Appropriate dust suppression measures should be adopted as required under the Air Pollution Control (Construction Dust) Regulation. A control programme can be instigated to monitor the construction process in order to enforce dust controls and modify methods of works where feasible to reduce the dust emission down to acceptable levels. The implementation schedule of the recommended air quality mitigation measures is presented in **Appendix A**.

10. Cultural Heritage Impact

10.1 Introduction

The cultural heritage resources that would be impacted by the project have been highlighted in the EIA Report and the recommended mitigation measures are presented below. The following mitigation measures would be undertaken by the project proponent. It should be noted that the above mitigation on built heritage will not fall under the EIAO requirements, the details of implementation including responsible parties and the programme will therefore be implemented under a separate mechanism to be agreed with relevant government departments and the AMO.

10.2 Construction Cultural Heritage Impact

10.2.1 Preservation by Record of Shrine (WCH-19)

The project proponent should ensure that a full cartographic and photographic survey and record be undertaken before the shrine is demolished.

10.2.2 Protective Covering and Safe Public Access of Tai Wong Temple (WCH-1)

The project proponent should ensure that protective covering in the form of plastic sheeting should be provided for the exterior walls of the Tai Wong Ye Temple (WCH-1) in the vicinity of the construction works, subject to the agreement with the premise landlord. Safe public access should be provided to the temple, separated from the works area by temporary fencing.

10.2.3 Buffer Zone Provision for Shrine (WCH-17)

The project proponent should ensure that a buffer zone (minimum of 5m or if this is not possible as large as site restrictions allow) should be provided for the shrine (WCH-17). The buffer zone should be marked by temporary fencing.

10.2.4 Vibration Monitoring for Historical Buildings

The appropriate vibration monitoring on the affected built heritage resources will be agreed with BD/ GEO under the requirement of the Building Ordinance. The project proponent should ensure that vibration levels are controlled to levels not exceeding 25mm/s or other appropriate level. Vibration monitoring should be carried out by the contractor. The following structures would require monitoring during the construction phase; , Old Victoria Barrack Former Explosive Magazine (GB-6), Old Victoria Barracks Montgomery Block (GB-7), Old Victoria Barracks Roberts Block (GB-8), Old British Military Hospital Main Building and Annex (GB-5), Hung Shing Temple on Ap Lei Chau (GB-1), Old Victoria Barracks Block GG (ADM-1), Earth God Shrine on Ap Lei Chau (ALC-2) and Remains of the former Aberdeen Barracks on Ap Lei Chau (ALC-3).

10.2.5 Archaeological Watching Brief

Based on the EIA study Archaeological Watching Brief would be required for the identification of archaeological material at the following Works Sites which have highlighted as having archaeological potential:

- Harcourt Garden (Harcourt Garden Works Site) as shown on **Figure 11.22** in the EIA report

- Southwest of Wong Chuk Hang Tsuen (Works Sites S7c, d and e) as shown on **Figure 11.28** in the EIA report
- West of Wong Chuk Hang Tsuen (Works Site S7) as shown on **Figure 11.28** in the EIA report
- Wong Chuk Hang San Wai (Pier columns within Works Site S10) as shown on **Figure 11.35** in the EIA report

The archaeological watching brief must be undertaken by a qualified archaeologist who should apply for and obtain a licence to conduct the watching brief for the project (as required under section 12 of the Antiquities and Monuments Ordinance Cap.53). It should be noted that processing of the licence application may take up to 8 weeks after submission. Details of the scope and methodology including monitoring frequency will be submitted to the AMO for review and approval prior to submission of the licence application.

In addition, the mitigation measures as recommended in the implementation schedule as presented in **Appendix A** should be conducted.

11. Environmental Auditing

11.1 Site Inspection

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

The ET is responsible for formulation of the environmental site inspection, deficiency and action reporting system, and for carrying out the site inspection works. The proposal for rectification, if any, should be prepared and submitted to the ET by the Contractor.

Regular site inspections should be carried out by the ET. The areas of inspection should not be limited to the pollution control and mitigation measures within the site; the environmental situation outside the site area which is likely to be affected, directly or indirectly, by the site activities should be reviewed. The ET should make reference to the following information when conducting the inspection:

- the EIA recommendations on environmental protection and pollution control mitigation measures;
- works progress and programme;
- individual works methodology proposals (which should include proposal on associated pollution control measures);
- the contract specifications on environmental protection;
- the relevant environmental protection and pollution control laws; and
- previous site inspection results.

The Contractor should update the ET 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 should be passed to the ER and the Contractor, for reference and for taking immediate action. The Contractor should follow the procedures and time-frame as stipulated in the environmental site inspection, deficiency and action reporting system formulated by the ET to report on any remedial measures subsequent to the site inspections.

Ad hoc site inspections should 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.

11.2 Compliance with Legal Requirements

There are environmental protection and pollution control laws in Hong Kong which the construction activities should comply with.

In order that the works are in compliance with the requirements, relevant works method statements submitted by the Contractor to the ER for approval should also be sent to the ET for information to see

whether sufficient environmental protection and pollution control measures have been included. The implementation schedule of mitigation measures is summarised in **Appendix A**.

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

After reviewing the document, the ET will advise the ER and the Contractor of any non-compliance with the legislative requirements on environmental protection and pollution control for them to take follow-up actions. If the ET's review concludes that the current status on license/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, the ET will advise the Contractor and the ER accordingly.

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

11.3 Environmental Complaints

Complaints should be referred to the ET for action. The ET should undertake the following procedures upon receipt of any valid complaint:

- Investigate the complaint to determine its validity, and assess whether the source of the problem is due to works activities;
- Log complaint and date of receipt onto the complaint database and inform the ER and IEC if valid;
- Identify mitigation measures if a complaint is valid and due to the works of the Project;
- Advise the Contractor if mitigation measures are required;
- Review the Contractor's response to identified mitigation measures, and the updated situation;
- Undertake additional monitoring and audit to verify the situation if necessary, and review that circumstances leading to the complaint do not recur;
- If the complaint is referred by EPD, keep EPD informed on the status of the complaint investigation and follow-up action and report to EPD upon completion of the investigation; and
- Record the complaint, investigation, the subsequent actions and the results in the monthly EM&A reports.

During the complaint investigation work, the Contractor and ER should cooperate with the ET in providing all the necessary information and assistance for completion of the investigation. If mitigation measures are identified in the investigation, the Contractor should promptly carry out the mitigation. The ER should ensure that the measures have been carried out by the Contractor. A flow chart of the complaint response procedures is shown in **Figure 11.1**. Sample of the complaint log is shown in **Appendix C**.

12. Reporting

12.1 Introduction

A Computer-based environmental monitoring and audit software operated by MTRCL in various recent MTRCL projects such as Tseung Kwan O Line, Tung Chung Cable Car, Penny's Bay Rail Link and West Island Line would be applied for data recording and reporting.

Types of reports that the ET should prepare and submit include baseline monitoring report, monthly EM&A report and final EM&A review report. In accordance with Annex 21 of the EIAO-TM, a copy of the monthly and the final EM&A reports should be made available to the Director of Environmental Protection.

To facilitate the public inspection of the Baseline Monitoring Report and monthly EM&A Reports, via the EIAO Internet Website and at the EIAO Register Office, electronic copies of these Reports should be prepared in Portable Document Format (PDF version 4.0 or later), unless otherwise agreed by EPD and should be submitted at the same time as the hard copies. The content of the electronic copies of the EM&A Reports must be the same as the hard copies.

12.2 Baseline Monitoring Report

The ET should prepare and submit to EPD a Baseline Environmental Monitoring Report two weeks prior to the commencement of construction.

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

a) executive summary

b) brief project background information;

c) drawings showing locations of the baseline monitoring stations;

d) monitoring results together with the following information:

- monitoring methodology;
- types of equipment used and calibration dates;
- parameters monitored;
- monitoring locations;
- monitoring date, time, frequency and duration;

e) details on influencing factors, including

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

f) determination of the Action and Limit Levels (AL Levels) for each monitoring parameter and statistical analysis of the baseline data;

g) graphical plots of monitored parameters;

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

i) comments and conclusions.

12.3 Monthly EM&A Reports

The results and findings of all construction phase EM&A work required in the Manual should be recorded in the monthly EM&A reports prepared by the ET. The EM&A report should be endorsed by IEC and submitted within 10 working days of the end of each reporting period, with the first report due in one month after construction commences.

12.3.1 First Monthly EM&A Report

The First Monthly EM&A Report should include at least the following:

a) Executive summary;

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

b) Basic Project Information

- Project organisations including key personnel contact names and telephone numbers;
- Programme;
- Management structure; and
- Works undertaken during the month and coming month.

c) Environmental Status

- Drawing showing the project area, any key environmental sensitive receivers and the locations of the monitoring and control stations.
- Advice on the status of compliance with the Environmental Permit (EP), and submission status under the EP

d) A brief summary of EM&A requirements

- Monitoring parameters;
- AL Levels;
- Event-Action Plans;

e) Monitoring Results

- Monitoring methodology;
- Types of equipment used and calibration dates;
- Parameters monitored;
- Monitoring locations;
- Monitoring date, time, and duration;
- Weather conditions;
- Any factors which might affect the monitoring results; and
- Graphical plots of monitored parameters in the month.

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

- Record of all non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
- Record of all complaints received, including locations and nature of complaints investigation, 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 the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- Description of the actions taken in the event of non-compliance and deficiency reporting and any follow-up procedures related to earlier non-compliance.

g) Others

- An account of the future key issues
- Advice on the solid and liquid waste management status during the month

12.3.2 Subsequent Monthly EM&A Reports

The subsequent Monthly EM&A Reports should include the following:

a) Executive Summary

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

b) Environmental Status

- Works undertaken during the month and coming month;
- Drawing showing the project area and the locations of the monitoring and control stations.

c) Implementation Status

Advice on the status of compliance with the Environmental Permit (EP), submission status under the EP and, the implementation status of environmental protection and pollution control/mitigation measures including measures for air, noise, water quality and ecological impacts etc, as recommended in the EIA Report.

d) Monitoring Results

- Monitoring methodology;
- Types of equipment used and calibration dates;
- Parameters monitored;
- Monitoring locations;
- Monitoring date, time, and duration;
- Weather conditions;
- Any factors which might affect the monitoring results;
- Graphical plots of monitored parameters.

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

- Record of all non-compliance (exceedances) of the environmental quality performance limits (AL Levels);
- Record of all complaints received, including locations and nature of complaints investigation, 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 the breaches, investigation, follow-up actions taken, results and summary;
- Review of the reasons for and the implications of non-compliance, complaints, summons and prosecutions including review of pollution sources and working procedures; and
- 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; and

- Advice on the solid and liquid waste management status during the month.
- Outstanding issues and deficiencies

12.4 Final EM&A Review Report

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

The Final EM&A Report should contain at least the following information:

a) Executive Summary;

b) drawings showing the project area, and the locations of the monitoring and control stations;

c) basic project information including a synopsis of work undertaken during the course of the project or past twelve months;

d) a brief summary of EM&A requirements including:

(i) AL Levels;
(ii) monitoring parameters; and
(iii) Event-Action Plans;

e) advice on the implementation status of environmental protection and pollution control/mitigation measures;

f) graphical plots and the statistical analysis of the trends of monitored parameters over the course of the project EM&A, :

g) a summary of non-compliance (exceedances) of the environmental quality performance limits (AL Levels);

h) a brief review of the reasons for and the implications of non-compliance including review of pollution sources and working procedures as appropriate;

i) a description of the actions taken in the event of non-compliance;

j) a summary record of all complaints received and consultation undertaken, action and follow-up procedures taken;

k) a summary record of notifications of summons and successful prosecutions for breaches of the current environmental protection pollution control legislations locations and nature of the breaches, investigation, follow-up actions taken and results;

l) a review of the effectiveness and efficiency of the mitigation measures; and

m) a review of success of the EM&A programme to cost effectively identify deterioration and to initiate prompt effective mitigatory action when necessary.

12.5 Data Keeping

All site document such as the monitoring field records, laboratory analysis records, site inspection forms, calibration certificates, etc. are not required to be included in the monthly EM&A reports for submission. However, the document should be well kept by the ET and be ready for inspection upon request. Soft

copies of all the documents and data should be kept for at least six months after completion of the construction phase EM&A.

12.6 Interim Notifications of Environmental Quality Limit Exceedances

With reference to Event/Action Plans in **Tables 2.3, Table 4.3** and **9.3**, when the environmental quality limits are exceeded, the ET should immediately notify the ER and EPD, as appropriate. The notification should be followed up with advice to EPD 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 D**.