

11. ENVIRONMENTAL MONITORING & AUDIT

11.1 Introduction

This Section presents the Environmental Monitoring and Audit (EM&A) requirements that have been included into the EM&A Manual for Widening of Tolo Highway/Fanling Highway between Island House Interchange and Fanling. This Section describes the necessary EM&A requirements based on the findings of the assessment in the previous sections of this report. As discussed in *Sections 4 and 5*, construction noise and dust may lead to exceedance of environmental criteria and therefore EM&A at the affected sensitive receivers are recommended.

11.2 Objectives of Environmental Monitoring & Audit

The objectives of carrying out EM&A for the Widening of Tolo Highway/Fanling Highway between Island House Interchange and Fanling include the following:

- 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 the acceptable standards;
- to monitor the performance of the project and the effectiveness of mitigation measures;
- to verify the environmental impacts predicted in the EIA Study;
- 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.

The following sections summarise the recommended EM&A requirements proposed.

11.3 Construction Noise

Noise produced during the construction phase will impact upon nearby noise sensitive receivers (NSRs) as assessed in *Section 5*. The construction noise criteria of 75 dB(A) and 70dB(A) will be exceeded at some of the representative NSRs if construction noise is not mitigated.

11.3.1 Mitigation Measures

Noise mitigation measures have been recommended in the EIA report to reduce the noise impact to within the noise criteria and are presented in Section 5.4.4. It is anticipated that if the mitigation measures described in Section 5.4.4 can be successfully applied, the noise levels experienced by most affected receivers will be reduced to within the noise criteria.

11.3.2 Monitoring Locations

Noise monitoring requirements have been recommended in the EM&A Manual in order to ensure compliance with the criteria. Noise monitoring should be carried out at the monitoring locations, listed in *Table 11.1* and additional locations considered necessary, in agreement with the Environmental Protection Department (EPD). Details of the exact locations of the proposed monitoring locations will be given in the Environmental Monitoring and Audit Manual.

Table 11.1 Noise Monitoring Stations

Location	Monitoring Station	Description
Between Pak Wo Road and Hong Lok Yuen Road <ul style="list-style-type: none"> • Kui Tau • West Tai Wo • Fanling Government School 	M1 (SR 11) M2 (SR 13) M3 (SR 2)	Residential Residential School
Hong Lok Yuen Road to Tai Po Tai Wo Road <ul style="list-style-type: none"> • Tai Po Garden • Dynasty View 	M4 (SR 26) M5 (SR 55)	Residential Residential
Tai Po Tai Wo Road and Tat Wan Road <ul style="list-style-type: none"> • Wong Shui Chi Middle School • HK Teachers Association Secondary School 	M6 (SR 41) M7 (SR 45)	School School
Tat Wan Road and Island House Interchange <ul style="list-style-type: none"> • Grand Palisades • PLK Tin Ka Ping Primary School • River Rain Bayside 	M8 (SR 40) M9 (SR 66) M10 (SR 54)	Residential School Residential

11.3.4 Baseline Monitoring

Baseline noise monitoring should be carried out prior to the commencement of the construction works. The baseline monitoring should be carried out daily for a period of at least two weeks.

11.3.5 Impact Monitoring

Noise monitoring should be carried out at all the designated monitoring stations. The monitoring frequency shall depend on the scale of the construction activities. The following is an initial guide on the regular monitoring frequency for each station on a per week basis when noise generating activities are underway:

- one set of measurements between 07.00 - 19.00 hours on normal weekdays;
- one set of measurements between 19.00 - 23.00 hours;
- one set of measurements between 23.00 - 07.00 hours of next day; and
- one set of measurements between 07.00 - 19.00 hours on holidays.

General construction work carrying out during restricted hours is controlled by CNP system under the NCO.

The monitoring is required to ensure compliance with the EIAO in providing feedback to the Contractors for the management of their operations. The EM&A programme will be presented separately in the EM&A Manual.

11.4 Operational Noise

11.4.1 Noise Parameters

Traffic noise level shall be measured in terms of L_{10} (1 hour) dB(A) preferably during the rush hours. Other information such as traffic flow counts, % of heavy vehicles (all vehicles with an unladen weight exceeding 1525 kg) and average speed shall also be obtained during the same measurement period for both far side and near side respectively.

11.4.2 Monitoring Equipment

Sound level meters in compliance with the International Electrotechnical Commission Publications 651:1979 (Type 1) and 804:1985 (Type 1) specifications shall be used for carrying out the noise monitoring. Immediately prior to and following each noise measurement, the accuracy of the sound level meter shall be checked using an acoustic calibrator generating a known sound pressure level at a known frequency. Measurements may be accepted as valid only if the calibration level from before and after the noise measurement agree to within 1.0dB.

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

The ET is responsible for the provision of the monitoring equipment. He shall ensure that sufficient noise measuring equipment and associated instrumentation are available for carrying out the monitoring. All the equipment and associated instrumentation shall be clearly labelled.

11.4.3 Monitoring Locations

Three representative locations for traffic noise monitoring are proposed as summarised in Table 11.2 and shown in Drawings 551R/9004 (for SR58), 551/R/9012 (for SR20) and Drawings 551/R/9003 (for SR39).

Table 11.2 Operational Noise Monitoring Stations

Location	Monitoring Station	Description
(Kung Nga Court, King Yuet House 2)	SR58	Residential
(Hong Lok Yuen 2), 2/F	SR20	Residential
(The Paragon), 9/F	SR39	Residential

The status and locations of noise sensitive receivers may change after issuing this manual. If such cases exist, the ET shall proposed undated monitoring locations and seek approval from IC(E) and agreement from EPD of the proposal.

The monitoring location shall normally be at a point 1m from the exterior of the sensitive receivers building façade and be at a position 1.2m above the floor level. If there is problem with access to the normal monitoring position, an alternative position nearly with the same noise exposure characteristic may be chosen. The ET shall agree with the IC(E) on the monitoring position and the corrections adopted.

11.4.4 Comparison of Measured and Modelled Results

Three noise measurements for 30 minutes each shall be carried out by the ET at each selected representative noise monitoring point during peak hours (e.g. 08:00 to 09:30 and 17:30 to 18:00), so that there will not be a situation in which the flow is too low to enable a fair comparison.

Measured noise level should be compared with the predicted noise levels using the counted traffic data at the time of measurement.

The IC(E) shall comment on the discrepancies, if any, and report to EPD for reference.

There will be no Event and Action Plan applicable to traffic noise monitoring during the operational phase.

11.5 Construction Dust

The construction work will inevitably lead to dust emissions, mainly from demolition work including breaking concrete, earthworks including excavation and soil stripping and site clearance including removal of vegetation and topsoil. It is predicted that the dust generated will exceed the hourly criteria of 500 $\mu\text{g m}^{-3}$ respectively at the some ASRs.

11.5.1 Mitigation Measures

Mitigation measures are presented in *Section 4.5.3* and recommended to limit the dust emission and dispersion. With proper dust control measures in accordance with *Air Pollution Control (Construction Dust) Regulations*, the TSP levels at the affected air sensitive receivers will comply with the dust criteria.

11.5.2 Monitoring Locations

Dust monitoring requirements have been recommended in the EM&A Manual to ensure the efficacy of the control measures. Monitoring stations should be set up at five locations at M1, M3, M5, M7 and M10 as listed in *Table 11.3* below.

Table 11.3 Air Monitoring Locations

Location	Monitoring Station	Description
Kui Tau	M1	Residential
Fanling Government School	M3	School
Dynasty View	M5	Residential
HK Teachers Association Secondary School	M7	School
Riverrain Bayside	M10	Residential

11.5.3 Baseline Monitoring

Baseline monitoring should be carried out at all of the designated monitoring locations for at least 14 consecutive days prior to the commissioning of the construction works to obtain daily 24-hr TSP samples. 1-hr sampling shall also be done at least 3 times per day while the highest dust impact is expected.

11.5.4 Impact Monitoring

Impact monitoring should be carried out during the course of the Works. For regular impact monitoring, the sampling frequency of at least once in every six-days, shall be strictly observed at all the monitoring stations for 24-hr TSP monitoring. For 1-hr TSP monitoring, the sampling frequency of at least three times in every six-days should be undertaken when the highest dust impact occurs.

The monitoring is required to ensure compliance with the EIAO in providing feedback to the Contractors for the management of their operations. The EM&A programme will be presented separately in the EM&A Manual.

11.6 Waste Management

It has been recommended that auditing of each waste stream should be carried out periodically by the Widening of Tolo Highway/Fanling Highway between Island House Interchange and Fanling contractor to determine if wastes are being managed in accordance with approved procedures and the site waste management plan. The audits should look at all aspects of waste management including waste generation, storage, recycling, treatment, transport, and disposal. An appropriate audit programme would be to undertake a first audit at the commencement of the construction works, and then to audit quarterly thereafter.

11.7 Water Quality

Water quality impacts could result from work over stream courses and disposal of waste water including sewage from workers and discharge from any desilting pits.

Monitoring for dissolved oxygen (DO), turbidity and suspended solids (SS) should be undertaken at regular intervals. The purpose of the monitoring is to ensure that any deterioration in water quality can be readily determined and timely action can be taken to resolve any problems. DO, temperature, turbidity and pH should be measured in-situ and the remaining parameters assayed in a laboratory.

11.7.1 Baseline Monitoring

Baseline monitoring should be undertaken at all discharge points from the works area (outlets of desilting pits or package sewage treatment plants). The actual number of monitoring stations will depend on the actual number of discharge points and may vary as construction proceeds.

11.7.2 Impact Monitoring

During the course of the construction works water samples shall be collected at the discharge points three times per week and tested for pH and SS and sampled once per week for oil and grease.

11.8 Ecology

The mitigation measures should be included into contract clauses for the Widening of Tolo Highway/Fanling Highway between Island House Interchange and Fanling. The implementation of the measures should be checked as part of the environmental monitoring and audit procedures during the construction period, the procedures of which are presented in the EM&A Manual.

11.9 Cultural Heritage

On the basis of the information provided by the Antiquities and Monuments Office specification clauses will need to be included in the construction contract to ensure that: construction works in the proximity of Wun Yin Kiln and Yuen Chau Tsai is carried out as unobtrusively as possible to avoid any damage to and discourage visitors to the site.

Archaeological Monitoring works will also be required in areas defined in Figures 10.1 and 10.2. The scale of the monitoring/sampling procedures are presented in the EM&A Manual.

11.10 Landscape and Visual

The EIA has recommended the EM&A for landscape and visual resources is undertaken during both the construction and operational phases of the project. The implementation and maintenance of the landscape compensatory planting measures is a key aspect of this and should be checked to ensure that the proposals are fully realised. The mitigation measures are detailed in section 9.11 of the Landscape and Visual Impact Assessment Report.

Also any potential conflicts between the proposed landscape measures and any other project works and operational requirements should be resolved at the earliest possible date and without compromise to the intention of the mitigation measures. In addition, implementation of the mitigation measures recommended by the EIA will be monitored through the construction phase site audit programme.

Baseline Monitoring

Baseline monitoring for the landscape and visual resources will comprise a vegetation survey of the entire selected route undertaken on an 'area' basis. Representative vegetation types will be identified along with typical species composition. An assessment of landscape character will be made against which future change can be monitored. The landscape resources and elements of particular concern are to be noted.

The landscape and visual baseline will be determined with reference to the habitat maps included in the EIA Report.

Construction and Operational Phase Audit

The establishment works will be undertaken throughout the Contractor's one year maintenance period which will be within the first operational year of the project.

All measures undertaken by the Contractor during the construction phase and first year of the operational phase shall be audited by the Environmental Team. This will be completed on a regular basis to ensure compliance with the intended aims of the EIA. Operational phase auditing will be restricted to the 12 months establishment works of the landscaping proposals, with HyD / LCSD / AFCD as appropriate taking over the maintenance after this period.

In addition, audit of mitigation measures to avoid impacts on landscape and visual resources

will be required during the construction period, together with supervision of the compensatory planting. The audit of the compensatory planting will also extend through the Contractor's one year maintenance period, to ensure that the establishment of the planting. The maintenance of the planting will be responsibility of LCSD / AFCD.