

3.1 INTRODUCTION

The majority of the noise sensitive receivers (NSRs) are found to be located near the southern section of the Eastern MDC, which as concluded in the EIA Report, are unlikely to be subjected to adverse noise impacts during both construction and operational phases. However, since this area will be exposed to daytime, and possibly restricted-hour construction noise during the construction phase, a noise monitoring programme shall be developed to include daytime and restricted-hour (if necessary) noise measurement.

Operational noise monitoring will be required during commissioning of the pumping station.

The programme shall be carried out by the ET Leader to ensure that the noise level of both construction and operational works complies with the criteria of the Noise Control Ordinance (NCO) and other adopted noise criteria.

3.2 NOISE PARAMETERS

The construction and operational noise levels shall be measured in term of the A-weighted equivalent continuous sound pressure level (L_{eq}). The measurement methods and procedures should be based on that given in the GW-TM and IND-TM.

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

3.3 MONITORING EQUIPMENT

As referred to in 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 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 1.0 dB(A).

Noise measurements shall be made in accordance with standard acoustical principles and practices in relation to weather conditions.

The ET Leader is responsible for the provision and maintenance of the monitoring equipment. He shall 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 shall be clearly labelled.

The noise monitoring locations are shown in *Figure 3.4a* and summarised in *Table 3.4a*. As mitigation measures are likely to be required in the northern part of the MDC only, monitoring locations are proposed to be located around this part of the channel. The status and locations of noise sensitive receivers may change after issuing this Manual. If such cases exist, the ET Leader shall propose updated monitoring locations and seek approval from ER, and agreement from the IC(E) and EPD of the proposal.

Table 3.4a *Noise Monitoring Stations*

Noise Monitoring Station	Noise Monitoring Location	Limit Level
NM1	Tung Chan Wai	75 dB(A) ⁽²⁾
NM2	1m from louvre of pumping station	75 dB(A) ⁽¹⁾

Notes:

- (1) Free field measurement
 (2) Facade measurement

When alternative monitoring locations are proposed, the monitoring locations shall be selected using the following criteria:

- (a) The locations shall be close to the major site activities which are likely to generate noise impacts;
- (b) The location shall be close to the noise sensitive receivers⁽¹⁾ (N.B. For the purposes of this section, any domestic premises, hotel, hostel, temporary housing accommodation, hospital, medical clinic, educational institution, place of public worship, library, court of law, performing art centre shall be considered as a noise sensitive receiver); and
- (c) Care shall be taken to select monitoring locations which will cause minimal disturbance to the occupants during monitoring.

For monitoring station (NM1) the measurement point shall 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 position may be chosen, and a correction to the measurements shall be made if necessary.

For monitoring station NM2, the measurements made will be free field (ie. away from any buildings or any other large reflecting structures). Since the criteria of 54 dB(A) 100 m from construction site and 75 dB(A) 1 m from pumping station louvre, specified in the EIA refers to free-field conditions, it will not be necessary to include any facade correction.

The ET Leader shall agree with the IC(E) on the monitoring position and the corrections adopted. Once the positions for the monitoring stations are chosen, the baseline monitoring and the impact monitoring shall be carried out at the same positions.

⁽¹⁾ This criteria applies for construction and maintenance drainage phases only.

3.5

BASELINE MONITORING

The ET Leader shall carry out baseline noise monitoring prior to the commencement of the construction works. The baseline monitoring shall be carried out daily for a period of at least two weeks. A schedule on the baseline monitoring shall be submitted to the ER for approval before the monitoring starts.

There shall not be any construction activities in the vicinity of the stations during the baseline monitoring. Baseline monitoring measurements shall be evenly spread throughout the assessment period to be conducted at the some frequency and duration throughout all periods of the day for which works are anticipated to be constructed (eg. daytime, evening and nighttime).

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

3.6

IMPACT MONITORING

Noise monitoring shall 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:

- (a) one set of measurements between 0700-1900 hours on normal weekdays;
- (b) one set of measurements between 1900-2300 hours;
- (c) one set of measurements between 2300-0700 hours of next day; and
- (d) one set of measurements between 0700-1900 hours on holidays.

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

For the measurements (b), (c) and (d) above, one set of measurements shall at least include 3 consecutive $L_{eq(5 \text{ min})}$ results.

Noise monitoring shall be carried out for the pumping station on two occasions; day 1 and day 60 of the commissioning stage. Noise measurements shall be made in accordance with the procedures outlined in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places and Construction Sites (IND-TM) and shall be conducted at a time when the pumping station is operating at its maximum capacity.

In case of non-compliance with the construction and/or operational noise criteria, more frequent monitoring as specified in the Action Plan in *Section 3.7* shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be irrelevant to the activities.

The Action and Limit (AL) levels for construction and operational noise are defined in *Table 3.7a* to *Table 3.7b* respectively. Should non-compliance of the criteria occurs, action in accordance with the Action Plan in *Table 3.7c* and *Table 3.7d*, shall be carried out.

Table 3.7a *Action and Limit Levels of Noise from Construction*

Time Period	Action Level	Limit Level ⁽¹⁾
0700-1900 hrs		75 dB(A)
0700-2300 hrs on holidays; and 1900-2300 hrs on all other days	When one documented complaint is received	70 dB(A)
2300-0700 hrs		55 dB(A)

Note:

(1) Facade measurement

Table 3.7b *Action and Limit Levels of Pumping Station Noise at NM2*

Time Period	Action Level	Limit Level ⁽¹⁾
0700-1900 hrs		75 dB(A) at 1m from louvre
1900-2300 hrs	When one documented complaint is received	
2300-0700 hrs		

Note:

(1) Free field measurement

Table 3.7c Event/Action Plan for Construction Noise

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

Table 3.7d Event/Action Plan for Pumping Station Noise During Commissioning

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

3.8 NOISE MITIGATION MEASURES

3.8.1 Construction Phase

The EIA Report has recommended construction noise control and mitigation measures. The Contractor shall be responsible for the design and implementation of these measures.

Recommended Mitigation Measures

Mitigation measures for the construction of the MDC, where necessary, shall be applied for the sites to ensure that the noise criteria will be satisfied at the NSRs, and in accordance with the Deep Bay Guidelines, at 100 m from the boundary of the construction works within the Buffer Zones. They are:

- good site practice;
- use of quiet plant;
- constructing noise barriers around noisy plant; and
- reducing number of plant concurrently operating.

Eastern Main Drainage Channel (Southern Section)

Mitigation measures are unlikely to be necessary for the construction works of southern part of Eastern MDC to meet the daytime construction noise criteria with respect to ProPECC and EIAO-TM. However, good site practices are recommended to minimise the construction noise emissions.

Good site practice and noise management will considerably reduce noise impacts arising from construction activities on the NSRs. These good site practice and nuisance avoidance measures include the following:

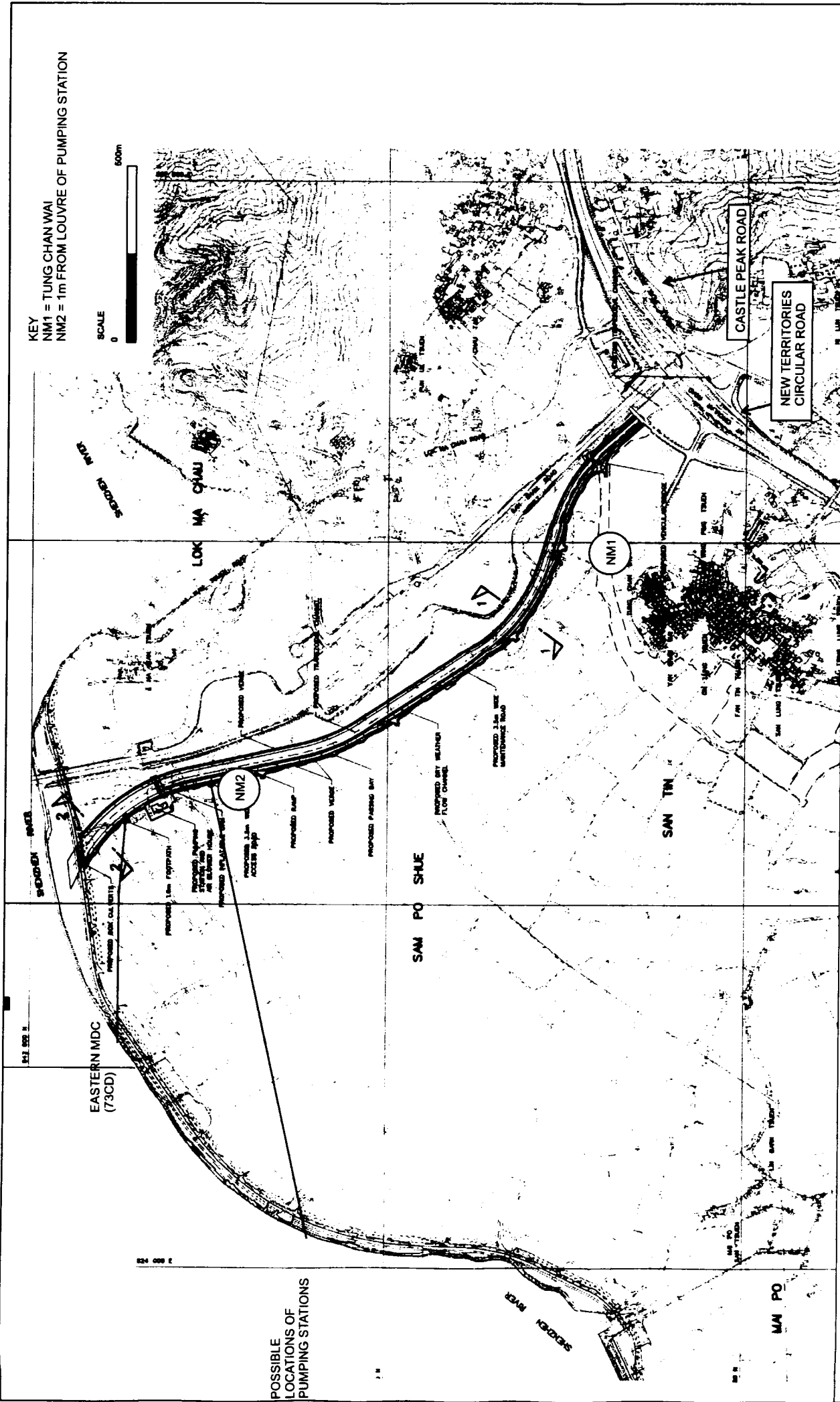
- only well-maintained plant shall be operated on-site and plant will be serviced regularly during the re-profiling works;
- plant and mobile plant (ie trucks) that may be in intermittent use will be shut down between work periods or shall be throttled down to a minimum;
- plant known to emit noise strongly in one direction, will, where possible, be orientated so that the noise is directed away from the NSRs;
- silencers or mufflers on construction equipment will be utilised and shall be properly maintained during the re-profiling works;
- all plant will be sited as far as practicable from the NSRs;
- material stockpiles and other structures will be utilised, where practicable, to screen noise from on-site construction activities; and
- Contractor shall select the models of PME's that are quieter than standard types given in GW-TM.

The EIA Report has identified that the main potential operational noise source will be associated with the pumping station. The report has also recommended operational control measures as presented below. The works agent shall be responsible for the design and implementation of the mitigation measures.

Recommended Mitigation Measures

Limiting the noise emissions from the pumping station to $L_{eq, 5min}$ 90 dB(A) at 1 m from the louvre (SWL=98 dB(A)) will prevent unacceptable noise impacts to all NSRs. However, considering sensitivity of the Deep Bay buffer zone area, it is recommended that a maximum noise level of $L_{eq, 5min}$ 75 dB(A) be achieved at 1m from the louvre. This could be achieved by good engineering design such as quiet plant and silencer, to be developed at the detailed engineering design stage.

Monitoring of the pumping station noise shall be undertaken during the commissioning stage to ensure that the noise specification is met. If the above measures are not sufficient to restore the noise emissions to acceptable levels upon the advice of the ET Leader, the Contractor shall liaise with the ET Leader on some other mitigation measures, propose to the ER for approval, and carry out the mitigation measures.



LOCATIONS OF NOISE MONITORING STATIONS

FIGURE 3.4a