

### **3.0 NOISE**

#### **3.1 Introduction**

- 3.1.1 Based upon the EIA report, it is recommended that EM&A procedures be carried out during the construction phase. However, operational noise monitoring is not considered to be necessary as no residual noise impacts are predicted.

#### **3.2 Noise Parameters**

- 3.2.1 The construction noise level shall be monitored by the Environmental Specialist and shall be measured in terms of the A-weighted equivalent continuous sound pressure level ( $L_{eq}$ ).  $L_{eq(30\text{ min})}$  shall be used as the monitoring parameter for the time period between 0700-1900 hours on normal weekdays. For all other time periods,  $L_{eq(5\text{ min})}$  shall be employed for comparison with the NCO criteria. A sample data record sheet is shown in Drawing 3.1 for reference.

#### **3.3 Monitoring Equipment**

- 3.3.1 As referred to in the Technical Memorandum (TM) issued under the Noise Control Ordinance (NCO), 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.
- 3.3.2 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.
- 3.3.3 Noise measurements shall not be made in fog, rain, wind with a steady speed exceeding  $5\text{ms}^{-1}$  or wind with gusts exceeding  $10\text{ms}^{-1}$ . The wind speed shall be checked with a portable wind speed meter capable of measuring the wind speed in m/s.
- 3.3.4 The Contractor will be responsible for the provision of the monitoring equipment. The Contractor 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.

#### **3.4 Monitoring Locations**

- 3.4.1 The areas for the recommended noise monitoring stations, same as the dust monitoring locations, are shown in Drawing 2.2a-h. The specific locations of the monitoring stations are to be determined by the Environmental Specialist and approved by DEP prior to monitoring. If the status or locations of noise sensitive receivers change after issuing this manual, the Environmental Specialist shall propose the updated monitoring locations and seek approval from the Engineer's Representative and agreement from IC(E) and DEP of the proposal to amend the monitoring locations.

- 3.4.2 When alternative monitoring locations are proposed, the monitoring locations shall be chosen based on the following criteria:
- (i) monitoring at sensitive receivers close to the major site activities which are likely to have noise impacts;
  - (ii) monitoring at the noise sensitive receivers as defined in the Technical Memorandum; and
  - (iii) assurance of minimal disturbance to the occupants during monitoring.
- 3.4.3 The monitoring station shall 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 problem with access to the normal monitoring position, an alternative position may be chosen and a correction to the measurements shall be made.
- 3.4.4 After carrying out noise measurements, noise levels shall be corrected in accordance with Section 2.10, 2.11 and 2.13 of the “Technical Memorandum on Noise From Construction Works Other Than Percussive Piling”. The Environmental Specialist shall agree with the Engineer’s Representative, IC(E) and DEP on the monitoring position and the corrections adopted.
- 3.4.5 The Contractor shall establish the construction equipment list and construction schedule which shall be checked and approved by the Engineer’s Representative and agreed by IC(E).
- 3.4.6 The timing of the noise impact monitoring work shall be developed by the Environmental Specialist and approved of by the Engineer’s Representative, IC(E) and DEP and shall be based on the Contractors construction schedule.

### **3.5 Baseline Monitoring**

- 3.5.1 The Environmental Specialist shall carry out baseline noise measurements prior to the commencement of the construction work over a 24 hour period. The baseline monitoring shall be carried out daily for a period of at least two weeks and shall be taken no earlier than three weeks prior to construction works being carried out. The baseline monitoring shall be undertaken at representative sensitive receivers as listed below:
- C C1, C2, TC8, TC9, TC15, TC18, WU2, LT6, LT1, LT3, WK2, TC21, P1, C3, LC6, LC9, ST18, ST5, ST9, ST15, SS3.
- 3.5.2 In no circumstance should construction works be carried out within the range of the monitoring stations during the two weeks of baseline monitoring.
- 3.5.3 Before commencing the baseline monitoring, the ET Leader shall submit the monitoring schedule to the Engineer’s Representative for approval and inform the IC(E) of the impact monitoring programme such that the IC(E) can conduct on-site audit to ensure accuracy of the

impact monitoring results.

- 3.5.4 Any non Project related construction activities in the vicinity of the stations during the baseline monitoring shall be noted and the source and location recorded.

### 3.6 Impact Monitoring

- 3.6.1 Noise monitoring shall be carried out at each of the designated monitoring stations closest to the areas of active construction works once every week.
- 3.6.2 During construction works, one set of measurements between 0700-1900 hours on normal weekdays shall be taken. If construction works are extended to include works during the hours of 1900-0700, additional weekly impact monitoring shall be carried out during evening and nighttime works and applicable permits under the NCO shall be obtained by the Contractor.
- 3.6.3 In case of non-compliance with the construction noise criteria, more frequent monitoring as specified in the Action Plan in Table 3.2 shall be carried out. This additional monitoring shall be continued until the recorded noise levels are rectified or proved to be unrelated to the construction activities.

### 3.7 Event and Action Plan for Noise

- 3.7.1 The Action and Limit levels for construction noise are defined in Table 3.1. Should non-compliance of the criteria occur, the Environmental Specialist, the Engineer's Representative and the Contractor shall undertake their specified actions in accordance with the Action Plan shown in Table 3.2.

**Table 3.1 Action and Limit Levels for Construction Noise**

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

\* reduce to 70 dB(A) for schools and 65 dB(A) during school examination periods.

### 3.8 Noise Mitigation Measures

- 3.8.1 The EIA report has recommended construction noise control and mitigation measures to reduce noise levels from the project construction.
- 3.8.2 As detailed in the EIA report, certain construction activities for the pumping stations and sewer alignment construction have the potential to create adverse daytime noise impacts at some of the NSRs and therefore, mitigation measures as summarised in the Environmental Mitigation Implementation Schedule in Appendix A will be required. The Contractor shall be responsible for the implementation of the measures below:
- (i) ensure that silencers are installed on the exhaust pipes of the trucks and excavators and the noise levels can be reduced by 5dB(A);

- (ii) mufflers should be installed on the breakers and the noise levels can be reduced by 5-7dB(A); and
- (iii) construction of either temporary noise barriers/enclosures along the site boundary of the proposed pumping stations such that the equipment will be totally screened. The barriers or enclosures should have no opening or gaps. Attenuation of 10dB(A) can be achieved.
- (iv) In order to further reduce the noise levels during sewer construction, a combination of mitigation measures would be appropriate and will include:
  - C ensuring that hand held breakers and portable air compressors not exceed 108 and 95 dB(A) respectively;
  - C manual breaking of concrete where concrete is sufficiently thin;
  - C use of alternative pavement removal methods/equipment such as electric breakers or the kick ripper (saw and lift) method on approval of the Engineer;
  - C use of acoustic enclosure in place of a barrier where sufficient space permits. Enclosures can give a noise attenuation of up to 20 dB(A);
  - C scheduling the numbers and operating times of equipment;
  - C restrict construction activities to the daytime period (08.00-16.00) only and exclude Sundays and public holidays;
  - C do not use powered mechanical equipment within 5m of an NSR without the permission of the Engineer;
  - C good site practice to limit noise emission at source;
  - C avoidance of simultaneous noisy activities, as far as practicable;
  - C selection of quiet plant and working methods;
  - C reduction in the numbers of noisy plant operating simultaneously in critical areas close to NSRs; and
  - C the Contractor should demonstrate that the noise levels are within the acceptable criteria at residential units during construction.

3.8.3 The design of the temporary noise enclosures will be the responsibility of the Contractor who will be required to submit his design to the ER for approval before carrying out the work.

- 3.8.4 If the above measures are not sufficient to restore the construction noise quality to an acceptable level, upon the advice of Environmental Specialist, the Contractor shall consult the IC(E), liaise and gain approval from the Engineer's Representative on other mitigation measures proposed to reduce noise levels to an acceptable level and carry out these measures.

**Drawing 3.1 Noise Monitoring Field Record Sheet**

Monitoring Location:	
Description of Location:	
Date of Monitoring:	
Measurement Start Time (hh:mm):	
Measurement Time Length (min.):	
Noise Meter Model/Identification:	
Calibrator Model/Identification:	
Measurement Result	Leq (dB(A)):
Major Construction Noise Source(s) During Monitoring:	
Other Noise Source(s) During Monitoring:	
Remarks:	

	<u>Name &amp; Designation</u>	<u>Signature</u>	<u>Date</u>
Recorded By : _____	_____	_____	_____
Checked By : _____	_____	_____	_____

**Table 3.2 Event / Action Plan for Construction Noise**

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