

MTR Corporation Limited

**East Rail Extensions -  
Tai Wai to Ma On Shan**

Train Operational Noise Monitoring Plan for  
8-car Train Operation

(December 2016)

Verified by: Fredrick Leong



Position: Independent Environmental Checker

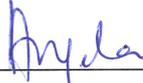
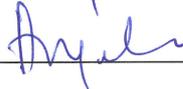
Date: 20 December 2016

MTR Corporation Limited

Consultancy Agreement No. C11033

**Ma On Shan Line****Train Operational Noise Monitoring  
Plan for 8-car Train Operation**

December 2016

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## **1 INTRODUCTION**

### **1.1 Background**

- 1.1.1 Ma On Shan Line (MOL), previously known as East Rail Extensions – Tai Wai to Ma On Shan (the Project), provides a railway system connecting Tai Wai and Ma On Shan. The Environmental Impact Assessment (EIA) Report (AEIAR-028/1999), which was prepared based upon the construction and operation of 8-car electric train mode, was approved by the Director of Environmental Protection (DEP) and the Environmental Permit (EP-039/2000) was granted to the Kowloon Canton Railway Corporation (KCRC) on 15 January 2000.
- 1.1.2 Subsequent to the issuance of the first EP, a number of Variation of Environmental Permits (VEPs) and Further Environmental Permits (FEPs) have been applied for and the latest Further Environmental Permit (FEP-05/039/2000/F) was granted on 1 June 2012 to transfer the responsibility of the MOL construction and operation from KCRC to MTR Corporation (MTRC).
- 1.1.3 MOL in 4-car train operation commenced in December 2004 and the Project Proponent conducted operational noise monitoring for 4-car train operation from December 2004 to July 2006. Monitoring results showed that the train operational noise continuously complies with the noise limit levels over the reporting period without any trend to cause exceedance. Field observations indicated that the major noise source contributed to the ambient noise were heavy vehicles (i.e. bus and public light bus) travelling along Sai Sha Road and Ma On Shan Road. Assessment and analysis of noise results collected throughout the operational noise monitoring periods also demonstrated the environmental acceptability of the Project. Therefore, the implemented mitigation measures were effective and efficient in controlling noise impacts during the train operation.
- 1.1.4 Modification works at MOL have been completed to allow the transition of current 4-car train operation to 8-car train operation. MOL will be joined with the Shatin to Central Link and West Rail Line to form the “East-West Corridor” in 8-car train operation. Beginning from early 2017, 4-car trains on the MOL will start being converted to 8-car trains by a mix of 4-car and 8-car trains in operation. The number of 8-car train will gradually increase and the conversion period is expected to last for around 9 months. It is therefore anticipated that the full 8-car train operation will be achieved in end 2017/early 2018.
- 1.1.5 Considering the conversion of 4-car trains to 8-car train operation, MTRC proposes to conduct additional operational noise monitoring for 8-car train configuration to demonstrate the environmental acceptability of the 8-car train operation.

### **1.2 Purpose of This Operational Noise Monitoring Plan**

- 1.2.1 This operation noise monitoring plan is prepared to present the proposed monitoring locations and methodology.

## 2 TRAIN OPERATIONAL NOISE MONITORING

### 2.1 Introduction

- 2.1.1 As discussed in **Section 1.1.3**, monitoring results conducted between 2004 and 2006 showed that the train operation noise continuously complies with the noise limit level over the reporting period without any trend to cause exceedance. Monitoring results demonstrated the environmental acceptability of the Project and the implemented mitigation measures were also effective and efficient in controlling noise impacts during the train operation.
- 2.1.2 The transition period of 4-car train operation to 8-car train operation would take place gradually with only 1 to 2 set of 8-car trains in operation each month from early 2017 until full 8-car operation in Quarter 4 (Q4) 2017. It is estimated that average 8-car train frequency would be approximately 2-3 trains per hour per direction from the first to third service month. Given that MOL train frequency will be dominated by 4-car train operation (around one 8-car train event in terms of Leq 30mins) and the transition nature of mixed fleet operation, it is therefore proposed to conduct additional 8-car train operational noise monitoring on a monthly basis as a continuation from the previous monitoring regime to verify the compliance of noise levels. However, weekly operational monitoring is proposed in the first and second service month and subject to review upon the completion of the second reporting month. The proposed monitoring period and frequency are summarised in **Tables 2.1** and **2.2**. The tentative 9-month monitoring period is considered adequate and compatible with previous monitoring regimes to verify the noise compliance of 8-car train operation. The proposed monitoring schedule will be prepared before commencement of monitoring for agreement with the Independent Environmental Checker (IEC).
- 2.1.3 The noise monitoring plan for 8-car train operation follows in general the principle of previous noise monitoring plans for 4-car train operation. It is proposed to conduct monitoring during night-time period considering that the night-time noise limit is more stringent than daytime noise limit and the background noise level during daytime would be high such that the noise monitoring results would not be representative for 8-car train operation. Nevertheless, daytime noise monitoring would also be conducted to verify the compliance of daytime operation. Details of train operational noise monitoring proposal is discussed below.

### 2.2 Monitoring Methodology

- 2.2.1 In accordance with *Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (TM)*, sound level meters in compliance with the International Electrotechnical Commission Publications 651: 1979 (Type 1) and 804: 1985 (Type 1) specifications will be used for carrying out the noise monitoring.
- 2.2.2 During the noise monitoring, the following procedures, which make reference to the previous 4-car train monitoring procedures, will be followed:
- All measurement should be made in facade type and the microphone of the sound level meter should be positioned 1m exterior of the identified noise sensitive receivers (NSRs) and lowered sufficiently so that the external wall of the building acts as a reflecting surface.
  - Parameter such as frequency weighting, the weighting and the duration of measurement should be set as follows:
    - Frequency weighting : A
    - Time weighting : Fast
    - Time measurement : Six consecutive five-minutes duration (with data being logged at every one second)
  - Prior to and after each noise measurement, the meter should be calibrated using the Calibrator for 94 dB at 1000 Hz. If the difference in the calibration level before and after

measurement is more than 1 dB(A), the measurement is considered invalid and repeat of noise measurement should be required after repair or re-calibration of the equipment.

- Details should be recorded when intrusive noise is observed. Noise sources and duration should also be recorded during the monitoring process.
- All the monitoring data within the sound level meter system should be downloaded through the computer software. All these data should then be checked and reviewed properly.
- The weather condition during the monitoring period should be recorded by the monitoring staff. Wind speed should be regularly checked using the anemometer.
- Noise monitoring should be suspended in the presence of fog, rain, and wind with a steady speed exceeding 5 m/s, or wind with gusts exceeding 10 m/s.

## 2.3 Monitoring Parameters, Frequency and Duration

2.3.1 Tables 2.1 and 2.2 summarizes the monitoring parameters, frequency and duration of operational noise monitoring.

**Table 2.1 Proposed 1<sup>st</sup> Month to 6<sup>th</sup> Month of Operational Noise Monitoring for 8-car Train Operation**

	Noise Monitoring of 8-car Train Operation					
	1 <sup>st</sup> Month (Feb 2017)	2 <sup>nd</sup> Month (Mar 2017)	3 <sup>rd</sup> Month (Apr 2017)	4 <sup>th</sup> Month (May 2017)	5 <sup>th</sup> Month (Jun 2017)	6 <sup>th</sup> Month (Jul 2017)
Maximum No. of 8-car trains in service <sup>(1)</sup>	2	2	4	4	6	6
Monitoring Period <sup>(2)</sup>	Day & Night	Day & Night	Night	Night	Night	Night <sup>(4)</sup>
Monitoring Parameter (in min)	L <sub>Aeq(30 min)</sub> (6 consecutive L <sub>Aeq(5-min)</sub> ), L <sub>max</sub>					
Monitoring Frequency	Weekly	Weekly <sup>(3)</sup>	Once every month	Once every month	Once every month	Once every month <sup>(4)</sup>

Notes:

- (1) The information is tentative only and will be subject to change as and when necessary during the service period. It is estimated that the average 8-car train frequency per day during service period will be approximately 2 to 3 trains per hour per direction (tphpd) from the 1<sup>st</sup> to 3<sup>rd</sup> service months upon 8-car operation.
- (2) "Day" means the time period between 0700 and 2300 hours, while "Night" means the time period between 2300 and 0700 hours.
- (3) Upon completion of 2<sup>nd</sup> monitoring month, monitoring period and frequency will be further reviewed where necessary. In the event that the daytime and/or night-time monitoring noise levels demonstrate exceedance with Noise Control Ordinance (NCO), daytime and/or night-time noise monitoring will be continued between 3<sup>rd</sup> and 6<sup>th</sup> month of monitoring or until no further exceedance.
- (4) Upon completion of 6<sup>th</sup> monitoring month, monitoring frequency and period for 7<sup>th</sup> to 8<sup>th</sup> month of monitoring will be further reviewed based on the monitoring results.

**Table 2.2 Proposed 7<sup>th</sup> Month to 9<sup>th</sup> Month of Operational Noise Monitoring for 8-car Train Operation**

	Noise Monitoring of 8-car Train Operation		
	7 <sup>th</sup> Month (Aug 2017)	8 <sup>th</sup> Month (Sept 2017)	9 <sup>th</sup> Month (Oct 2017)
Maximum No. of 8-car trains in service <sup>(1)</sup>	8	10	13 (full 8-car train operation)
Monitoring Period <sup>(2)</sup>	Night <sup>(3)</sup>	Night <sup>(3)</sup>	Night <sup>(3)</sup>
Monitoring Parameter (in min)	L <sub>Aeq(30 min)</sub> (6 consecutive L <sub>Aeq(5-min)</sub> ), L <sub>max</sub>		
Monitoring Frequency	Once every month <sup>(3)</sup>	Once every month <sup>(3)</sup>	Weekly <sup>(4)</sup>

Notes:

- (1) The information is tentative only and will be subject to change as and when necessary during the service period.
- (2) "Day" means the time period between 0700 and 2300 hours, while "Night" means the time period between 2300 and 0700 hours.

- (3) Upon completion of 6<sup>th</sup> monitoring month, monitoring frequency and period for 7<sup>th</sup> to 8<sup>th</sup> month of monitoring will be further reviewed based on the monitoring results.
- (4) Upon completion of 9<sup>th</sup> monitoring month, operational noise monitoring will be terminated on the basis of fulfilling the conditions stipulated in Section 3.1.2 of the approved EM&A Manual and subject to the approval by EPD, following similar approach as adopted in the train noise monitoring for 4-car train operation in 2006 (letter ref: ERE-06/MOS/MOS/ENV/EN106/E1-934137 dated 7 August 2006). The monitoring duration may be extended subject to an extended program of replacing all 4-car train into all 8-car train for full operation.

## 2.4 Proposed Operational Noise Monitoring Locations

- 2.4.1 With reference to the first year of operation phase (i.e. December 2004 to December 2005), Villa Athena Block 5 (rooftop) and Ma On Shan Centre Block 2 (rooftop) were selected as the monitoring locations. Upon completion of the first year operation noise monitoring, the monitoring was further extended until July 2006 with the noise monitoring at Ma On Shan Centre Block 2 changed to Man Lai Court Block 2. Given that Ma On Shan Centre Block 2 is located closer than MOL than Man Lai Court Block 2, monitoring of 8-car train operation is proposed to be conducted at Ma On Shan Centre Block 2.
- 2.4.2 The proposed operational noise monitoring locations are listed in **Table 2.3** and their locations are shown in **Figure No. C11033/C/SCL/ACM/M63/001**.

**Table 2.3 Train Operational Noise Monitoring Location**

Train Operational Noise Monitoring Location	Area Sensitivity Rating (ASR)	Noise Criterion/Limit Level, dB(A)		
		L <sub>eq, 30mins</sub>		L <sub>max</sub>
		Day (0700 – 2300 hrs)	Night (2300-0700 hrs)	Night (2300-0700 hrs)
Villa Athena Block 5, Rooftop	B	65	55	85
Man On Shan Centre Block 2, Rooftop	B	65	55	85

- 2.4.3 The status and location of noise sensitive receivers (NSRs) may change after approval of this monitoring plan. In such case, and if changes to the monitoring locations are considered necessary, the Environmental Team (ET) should propose alternative monitoring station(s) and seek agreement from the Independent Environmental Checker (IEC) and EPD on the proposal. If alternative monitoring stations are proposed, these stations should be chosen based on the following criteria:
- Monitoring at NSRs close to the major site activities of the Project that are likely to arise noise impacts;
  - Monitoring as close as possible to the NSRs as defined in the EIAO-TM; and
  - Assurance of minimal disturbance to the occupants and working under a safe condition during monitoring.
- 2.4.4 The monitoring station should normally be at a point 1m from the exterior of the noise sensitive facade and be at a position 1.2m above ground. If there is a problem with access to the normal monitoring position, an alternative position should be chosen, and a correction to the measurement results should be made. For reference, a correction of +3dB(A) should be made to free-field measurements. The ET should agree with the IEC on the monitoring position and the corrections adopted.

## 2.5 Data Analysis and Reporting

- 2.5.1 The noise level contributed by train pass-by, L<sub>Aeq 30mins (event)</sub> would be calculated by subtracting the ambient noise level L<sub>Aeq 30mins (ambient)</sub> from the overall noise level L<sub>Aeq 30 mins (overall)</sub> (average of six measured L<sub>Aeq 5mins</sub>).

- 2.5.2 Ambient noise levels will be evaluated by discarding logged data for the period when the train passed in front of the monitoring stations. The ambient noise level for each of the six five-minute noise data would be averaged to appraise the overall ambient noise level,  $L_{Aeq, 30 \text{ min}}$  (ambient).
- 2.5.3 In case of non-compliance with the noise criteria, additional monitoring as specified in the Event/Action Plans in **Appendix A** should be carried out until the recorded noise levels are rectified or proved to be irrelevant to the MOL operation. **Table 2.4** shows the established Action and Limit Levels for the noise monitoring. In the event that noise exceedances are continuously recorded during the 9-month monitoring period, the monitoring period would be extended until no noise exceedance is recorded.

**Table 2.4 Action and Limit Levels for Train Operational Noise Monitoring**

Time Period	Action Level	Limit Level <sup>(1)</sup>
Day (0700 to 2300 hours)	On receiving one documented valid complaint	$L_{eq, 30mins} = 65dB(A)$
Night (2300 to 0700 hours)		$L_{eq, 30mins} = 55 \text{ dB(A)}$ $L_{max} = 85 \text{ dB(A)}$

Note:

- (1) Rail Noise is under control of the Noise Control Ordinance and should comply with Acceptable Noise Levels laid down in the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites.

- 2.5.4 The monthly monitoring reports presenting the monitoring findings will be verified by the IEC. The verified copies of the report will be deposit to the DEP.

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**Figure**

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**Appendix A**

**Event/Action Plan for Train Operational Noise Monitoring**

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## Appendix A Event/Action Plans for Train Operational Noise

Event	Monitoring Team Action
Action Level - Complaint received <sup>(1)</sup>	<ol style="list-style-type: none"> <li>1) Inform MTRC and IEC;</li> <li>2) Conduct investigation to identify source(s) of Impact;</li> <li>3) Check monitoring data and determine the validity of complaint;</li> <li>4) Conduct follow up action if the complaint is confirmed to be valid. If not, record the investigation findings and close case.</li> </ol>
Action Level – Confirmed as Valid Complaint	<ol style="list-style-type: none"> <li>1) Conduct noise measurement where necessary;</li> <li>2) Check monitoring data;</li> <li>3) Investigate and discuss mitigation measures with MTRC;</li> <li>4) MTRC to implement mitigation measures as appropriate so as not to affect the train services and operation;</li> <li>5) Conduct noise measurement where necessary to review the adopted measures;</li> <li>6) Document the event/action and close case.</li> </ol>
Limit Level	<ol style="list-style-type: none"> <li>1) Identify source(s) of Impact;</li> <li>2) Inform MTRC, IEC and EPD;</li> <li>3) Repeat measurement to confirm findings;</li> <li>4) Check monitoring data;</li> <li>5) Investigate and discuss mitigation measures with MTRC;</li> <li>6) MTRC to implement mitigation measures as appropriate so as not to affect the train services and operation;</li> <li>7) Conduct noise measurement where necessary to review the adopted measures;</li> <li>8) Repeat Steps 3) to 7) if exceedance continues;</li> <li>9) Document the event/action if exceedance stops.</li> </ol>

Note:

- (1) Please refer to the MTR hotline and contact information via [http://www.mtr.com.hk/en/customer/main/contact\\_us.html](http://www.mtr.com.hk/en/customer/main/contact_us.html)