1 INTRODUCTION

1.1 Background

1.1.1 West Rail Line (WRL) is running across the HSKNDA starting from Tin Shui Wai to the Castle Peak Road. Rail noise impact assessment has been conducted to evaluate the noise impact to the planned noise sensitive receivers in the development area.

1.1.2 This paper supplement the WRL viaduct design and the noise propagation model adopted in the EIA report.

2 WEST RAIL VIADUCT

2.1 Viaduct Structure

2.1.1 The WRL section running across HSKNDA is a double tracks viaduct section from Tin Shui Wai to Siu Hong. The viaduct is supported by columns with 1.2m two sides parapet wall above rail track. The schematic layout of the viaduct is shown in Figure 1.

2.2 Multi Plenum System

2.2.1 The multi plenum system was designed and adopted during the EIA stage of West Rail. The multi plenum system are sound absorbing lining in the following components as shown in Figure 1:

- Train vehicle skirt
- Under train absorbing plenum
- Parapet wall facing the train
- Under side walkway

3 RAIL NOISE PROPAGATION

3.1 Rail Noise Source Characteristics

3.1.1 The source term of the WRL for this assessment has been extracted from the West Rail Operational Train Noise Assessment Report prepared by MTRC in July 2015. The source term was measured from the running of WR train at Yick Yuen (in Hung Shui Kiu) which was a viaduct structure constructed with the multi plenum system. Therefore the multi plenum effect has been included in the measured source term and would not further account in the rail noise model.

3.1.2 Three measures source terms including rolling noise, air condition noise and structure re-radiated noise were adopted in this assessment and their respective propagation path is shown in Figure 1.

3.2 Rolling Noise

3.2.1 The track was divided into segments and two track directions are calculated separately. For each segment, correction would be applied to calculate the contribution to the NSRs. Total noise level would be the sum of all calculated segments. The noise source was originated from the gap between the side walkway and the train. All corrections are summarized in Table 3.1.

Description	Assumptions / Remarks	Ref.
Train frequency correction	+10 log10 (N) where N = Train frequency per 30 min per Direction	A
Train speed for correction	+20 log10 (V/Vref) where V = Train speed, Vref = Reference train speed	A
Distance correction	-10 log10 (d'/dref) where d' = Slant distance from track to NSR and dref = Reference distance	A
Angle of view correction	+10 log10 ($\pi\theta/180 - \cos 2\alpha \sin\theta$) -5 where θ= Angle of View and α= Acute angle between a line drawn through the NSR, parallel to the track, and the line bisecting the angle of view, θ	A
Façade Correction	+2.5 dB(A)	A
Track Wear Correction	+3 dB(A)	A
Joint/Turnout Correction	With conservative assumption, +7.0dB(A) for a representative 20m segment	A

Description	Assumptions / Remarks	Ref.
Barrier Correction	Shadow Zone: -21dB(A) for δ > 2.5 m where δ is the Path Difference in metre -7.75 log10 (5.2 + 203 δ) dB(A) for 0≤ δ <2.5 m Illuminated Zone: 0dB(A) for δ > 0.4 m 0.88 + 2.14 log10 (10-3 + δ) dB(A) for 0≤ δ <0.4 m	Chart 6(a) of A
Diffracted Path Correction	-10log(3+20N) Where N=(D2+D3-D1)/(λ/2) and λ is the wave length of assumed 500Hz conservatively	
Calculate the Lmax	SEL = Lmax + 10log(L/V) +10.5 – 10log[(4D/(4D2+1)) + 2tan-1(1/(2D))]	Equation 15.21 of D
Calculate the Leq, 24hr	Standard acoustic principal	-

Reference:

A - Calculation of Railway Noise (1995)

B - "West Rail Operation Noise Assessment Report" prepared by MTR Corporation Limited in July 2015.

C - "Light Rail Transit (LRT) works for Tin Shui Wai Reserve Zone and Grade Separation of the LRT with Pui To Road and Tsing Lun Road in Tuen Mun" under a EIA Study Brief No: ESB-027/1999.

D - Transportation Noise Reference Book

3.3 Air Condition Noise

3.3.1 The measures air condition noise is regarded as line source and located on top of the trains. The propagation is the same as rolling noise.

3.4 Structure Re-radiated Noise

3.4.1 Vibration is generated during the train passby. The vibration of the viaduct structure would generated noise and propagate to the NSRs.

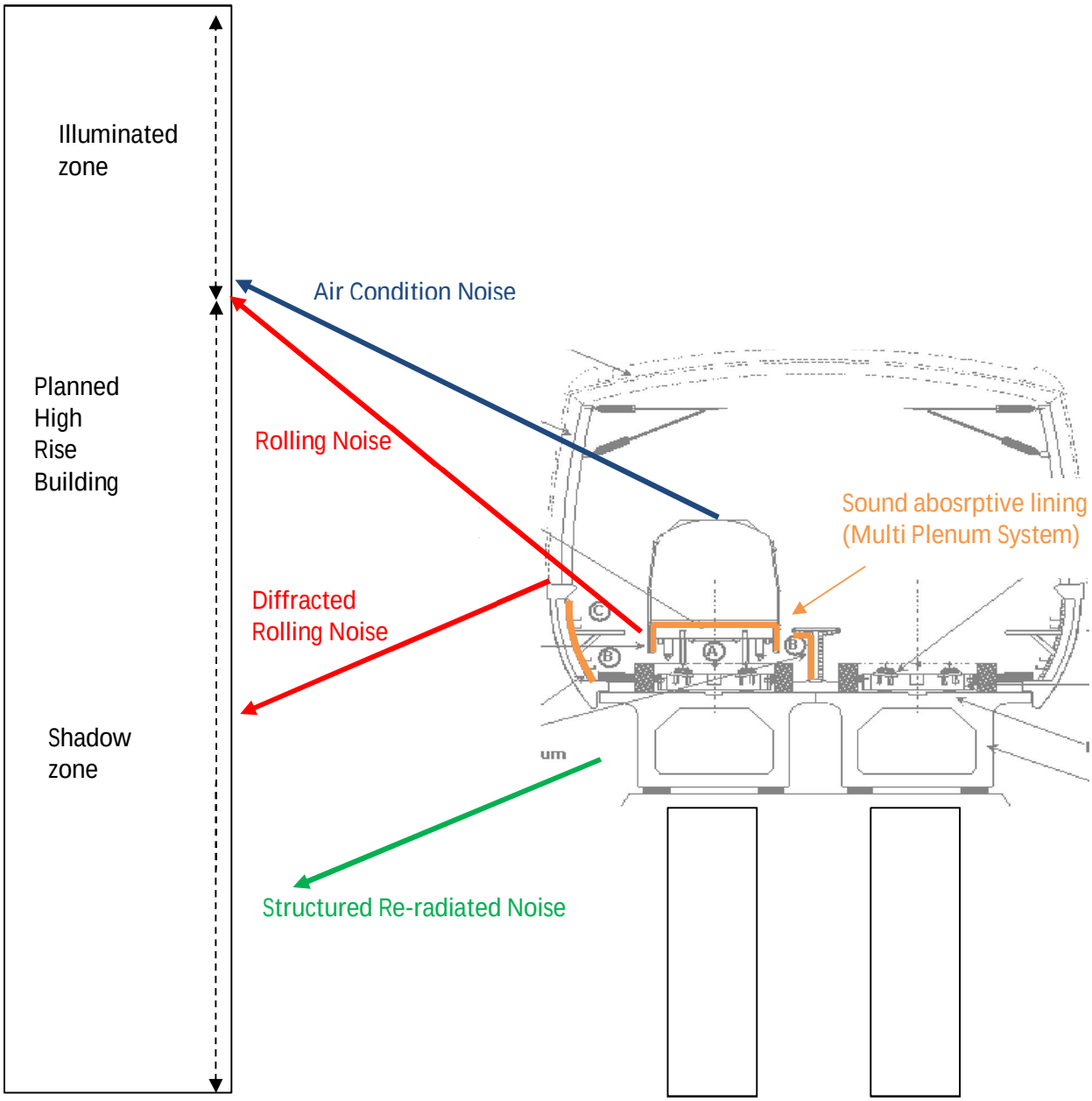

Figure 1. Rail Noise Propagation Path for West Rail Viaduct Structure with Multi Plenum System