Rail Airborne Noise Assessment

Model Validation

A.1.1.1.1 Two locations with a total of five measurement points in North Lantau (One in the reclamation area of Tung Chung East and the other between Ta Pang Po Offtake and Pigging Station and Sunny Bay Salt Water Pumping Station) have been selected for the model calibration. Table below summarizes the measurement and predicted results.

Table A1.1 Railway noise validation

Locations	Measurement[1]	Prediction	Difference, dB(A)
	$L_{eq\ 30\ mins}$, dB(A)[2]		
Reclamation Area at East of Tung Chung Town			
#1	70.7	74.8	4.1
#2	62.6	67.0	4.4
#3	63.9	69.5	5.6
#4	64.4	70.1	5.7

Note:

[1] The measurement in the reclamation area at east of Tung Chung Town has been taken in free field condition near a straight ballast track section whereas the measurements data include TCL trains running at about 100-110km/h. There is a 4.4m barrier between the track and the measurement locations.

[2] Both measurement and prediction are in free field condition.

A.1.1.1.2 It can therefore be seen from the above table that, the difference varies from 4 to 6 dB(A). A review has been conducted to establish the validation criteria and table below summarizes the differences between the prediction and measurements reported in various standards/ reports/ journals.

Table A1.2 Differences between Prediction and Measurement

Reference	Differences between Prediction and Measurement, dB(A)
Railway rolling noise prediction: field validation and sensitivity analysis[a]	< 2
Using the railway noise model (RWNM) for detailed noise analyses at some interesting receptor locations[b]	0.4 – 1.5
Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation[c]	< 1 for mean height of the source and receiver between 5m and 30m at a separation distance less than 100m < 3 for mean height of the source and receiver is less than 5m at all separation distance

Reference	Differences between Prediction and Measurement, dB(A)
Railway applications – Acoustics – Measurement of noise emitted by railbound vehicles[d]	< 2
Experimental validation of the TWINS prediction program for rolling noise, Part 2: Results[e]	< 2
Development of prediction model for environmental noise for Korean railway[f]	< 3
Additional railway noise source terms for "Calculation of Railway Noise 1995"[g]	< 3

Notes:

[a] S. Jiang, P.A. Meehan, D.J. Thompson & C.J.C. Jones. "Railway rolling noise prediction: field validation and sensitivity analysis", International journal of Rail Transportation, Vol. 1, pp. 109 – 127 (2013)

[b] W. Wu & S. Rosen. "Using the railway noise model (RWNM) for detailed noise analyses at some interesting receptor locations, Transportation Research Board, A1 f04 Summer Meeting (2000)

[c] "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation", International Standard ISO 9613-2 (1996)

[d] "Railway applications – Acoustics – Measurement of noise emitted by railbound vehicles", British Standards BS EN ISO 3095 (2005)

[e] D.J Thompson, P. Fodiman & H. Mahe. "Experimental validation of the TWINS prediction program for rolling noise, Part 2L Results", Journal of Sound and Vibration, Vol 193, pp. 137 – 147 (1996)

[f] J.H. Cho, J.C. Kim & H.I. Koh, "Development of prediction model for environmental noise of Korean railway", International Union of Railways (2006)

[g] A.E.J. Hardy, R.R.K. Jones & C.E. Wright, Additional railway noise source terms for "Calculation of Railway Noise 1995", Department for Environment Food and Rural Affairs (2007)

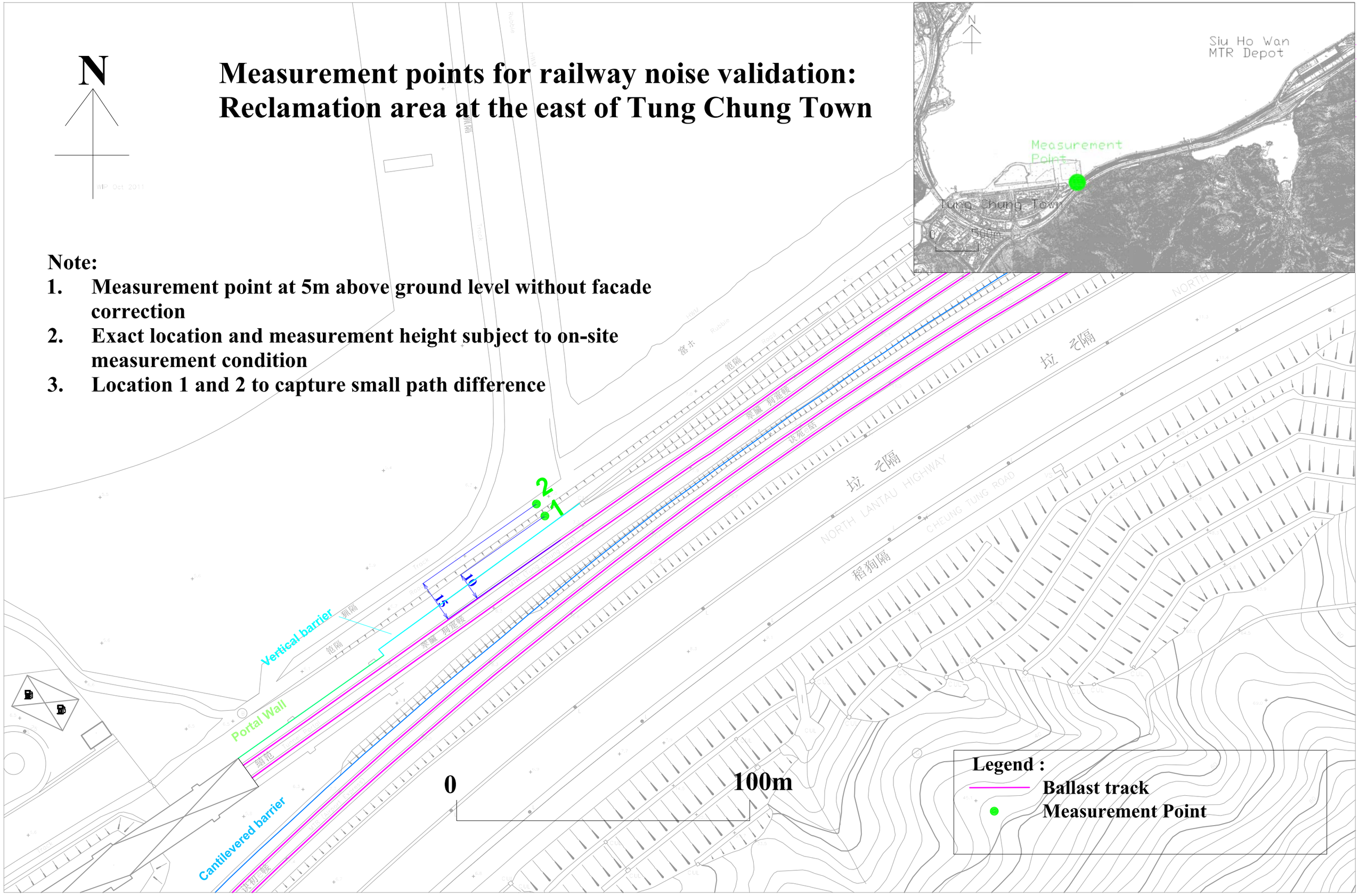
A.1.1.1.3 From **Table A1.2**, the difference between measurement and prediction is about 3dB(A) according to various international standards / reports / journals. As the current difference varies from 4 to 6dB(A), the train noise model is considered a conservative approach to predict train noise levels on NSRs as a larger noise source term has been adopted compared with the measured one.

Project: Tung Chung New Town Extension
Project no.: 219844-70
Title: Leq at measurement locations

Location ID	Location	Total Train Headway (Both direction)	Measurement Distance, m	Leq 30mins [1], dB(A)		
				Measured Railway Noise Level	Without Train [2]	With Train Only [3]
1	Tung Chung East	10	10	70.8	55.1	70.7
2			15	63.2	54.8	62.6
3		12	15	66.7	63.4	63.9
		13		66.8	63.6	63.9
4		12	20	66.9	63.4	64.4
		13		66.9	63.5	64.2

Note:
[1] Free-field measurement
[2] Recorded LAeq 30mins without train events.
[3] Background corrected.

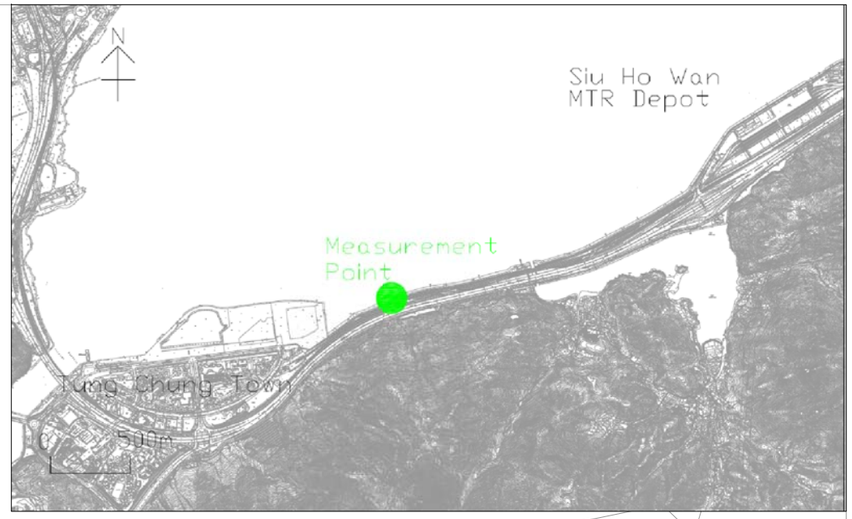
Measurement points for railway noise validation: Reclamation area at the east of Tung Chung Town



Note:

1. Measurement point at 5m above ground level without facade correction
2. Exact location and measurement height subject to on-site measurement condition
3. Location 1 and 2 to capture small path difference

Measurement points for railway noise validation: Reclamation area at the east of Tung Chung Town



Note:

1. **Measurement point at 5m above ground level without facade correction**
2. **Exact location and measurement height subject to on-site measurement condition**