

**DD-901 West Rail  
Environmental Support Services**

Essential Public Infrastructure Works  
Yuen Long, Tin Shui Wai, Tuen Mun Centre and the Eastern Access Road

Final EIA Report

2 August 1999

**Section A**

<b>1. INTRODUCTION .....</b>	<b>A1</b>
1.1 Background of the Study.....	A1
1.2 Scope of the Environmental Impact Assessment .....	A1
1.3 Objectives of the Environmental Impact Assessment.....	A2
1.4 The Project Design Focus.....	A3
1.5 Compatibility with West Rail Phase I.....	A4
1.6 Requirements of the Study .....	A5
1.7 Data Sources.....	A5
1.8 Structure of EIA Report .....	A5
<b>2. PROJECT DESCRIPTION .....</b>	<b>A9</b>
2.1 Scope of Project.....	A9
2.2 Project Programme .....	A10
2.3 Consideration of Alternatives.....	A11
2.4 “Do Nothing” Scenarios.....	A12
<b>3. ENVIRONMENTAL LEGISLATION AND STANDARDS.....</b>	<b>A13</b>
3.1 Introduction .....	A13
3.2 Noise.....	A13
3.3 Air Quality.....	A18
3.4 Water Quality .....	A18
3.5 Landscape and Visual Impact.....	A20
3.6 Waste .....	A20
3.7 Land Contamination.....	A21
3.8 Ecology.....	A22
3.9 Archaeological and Cultural Resources .....	A24

**Section B**

<b>4. EXISTING ENVIRONMENT AND SENSITIVE RECEIVERS.....</b>	<b>B1</b>
4.1 Noise.....	B1
4.2 Air Quality.....	B5
4.3 Water Quality .....	B7
4.4 Landscape and Visual.....	B11

4.5 Cultural and Heritage .....	B21
<b>5. NOISE IMPACT ASSESSMENT .....</b>	<b>B23</b>
5.1 Introduction .....	B23
5.2 Construction Phase .....	B24
5.3 Operational Phase .....	B39
5.4 Conclusion .....	B54
<b>6. AIR QUALITY IMPACT ASSESSMENT .....</b>	<b>B57</b>
6.1 Introduction .....	B57
6.2 Construction Phase .....	B57
6.3 Operational Phase .....	B59
6.4 Conclusion .....	B66
<b>7. WATER QUALITY .....</b>	<b>B69</b>
7.1 Introduction .....	B69
7.2 Construction Phase .....	B69
7.3 Conclusion .....	B72
<b>8. LANDSCAPE AND VISUAL IMPACT ASSESSMENT .....</b>	<b>B75</b>
8.1 Introduction .....	B75
8.2 Prediction and Assessment Methodology .....	B75
8.3 Construction and Operation Phase Impacts at Yuen Long .....	B77
8.4 Construction and Operation Phase Impacts at Tin Shui Wai .....	B88
8.5 Construction and Operation Phase Impacts at Tuen Mun .....	B95
8.6 Conclusions .....	B102
<b>9. WASTE MANAGEMENT .....</b>	<b>B105</b>
9.1 Potential Sources of Impacts .....	B105
9.2 Evaluation of Impacts .....	B107
9.3 Residual Impacts .....	B110
9.4 Conclusion .....	B110
<b>10. CULTURAL AND HERITAGE .....</b>	<b>B113</b>
10.1 Potential Sources of Impact .....	B113
10.2 Prediction and Evaluation of Impacts .....	B113
10.3 Recommended Mitigation .....	B114

10.4 Residual Impacts .....	B114
10.5 Conclusions .....	B114
<b>11. ENVIRONMENTAL MONITORING AND AUDIT .....</b>	<b>B115</b>
11.1 Introduction .....	B115
11.2 Objectives of the Environmental Monitoring and Audit Programme .....	B115
11.3 Scope of Environmental Management .....	B115
11.4 Development of an Environmental Management System .....	B116
11.5 Environmental Management Plan .....	B116
11.6 EM&A Manual .....	B117
11.7 Noise .....	B118
11.8 Air Quality .....	B120
11.9 Water Quality .....	B121
11.10 Landscape and Visual .....	B121
11.11 Waste Management .....	B121
11.12 Cultural Heritage .....	B122
<b>12. IMPLEMENTATION SCHEDULE OF RECOMMENDED MITIGATION MEASURES .....</b>	<b>B123</b>
12.1 Construction Phase .....	B123
12.2 Operational Phase .....	B123
<b>13. CONCLUSION .....</b>	<b>B145</b>
13.1 Noise .....	B145
13.2 Air Quality .....	B146
13.3 Water Quality .....	B146
13.4 Landscape and Visual Impact .....	B146
13.5 Waste Management .....	B147
13.6 Cultural Heritage .....	B147
<b>Section C</b>	
<b>14. EXISTING ENVIRONMENT AND SENSITIVE RECEIVERS FOR KAM TIMCI</b>	
14.1 Noise .....	C1
14.2 Air Quality .....	C2
14.3 Water Quality .....	C4
14.4 Landscape and Visual .....	C5

14.5 Land Contamination ..... C9

14.6 Ecology ..... C9

14.7 Cultural and Heritage ..... C10

**15. NOISE IMPACT ASSESSMENT ..... C13**

15.1 Introduction ..... C13

15.2 Construction Phase ..... C14

15.3 Operational Phase ..... C25

15.4 Conclusions ..... C35

**16. AIR QUALITY IMPACT ASSESSMENT ..... C39**

16.1 Introduction ..... C39

16.2 Construction Phase ..... C39

16.3 Operational Phase ..... C40

16.4 Conclusion ..... C42

**17. WATER QUALITY ..... C45**

17.1 Introduction ..... C45

17.2 Potential Sources of Impact ..... C45

17.3 Operational Phase ..... C48

17.4 Conclusion ..... C48

**18. LANDSCAPE AND VISUAL IMPACT ASSESSMENT ..... C51**

18.1 Introduction ..... C51

18.2 Prediction and Assessment Methodology ..... C51

18.3 Construction and Operational Phase Impacts ..... C53

18.4 Conclusions ..... C58

**19. WASTE MANAGEMENT ..... C63**

19.1 Potential Sources of Impacts ..... C63

19.2 Evaluation of Impacts ..... C65

19.3 Recommended Mitigation ..... C66

19.4 Residual Impacts ..... C69

19.5 Operational Phase ..... C69

19.6 Conclusion ..... C69

**20. LAND CONTAMINATION ..... C71**

20.1 Introduction .....	C71
20.2 Assessment Methodology.....	C71
20.3 Findings .....	C72
20.4 Further Actions.....	C77
20.5 Conclusions .....	C77
<b>21. ECOLOGY .....</b>	<b>C79</b>
21.1 Introduction .....	C79
21.2 Assessment Methodology.....	C79
21.3 Baseline Conditions.....	C80
21.4 Ecological Significance of the Ecological Resources .....	C82
21.5 Impact Assessment.....	C83
21.6 Mitigation Measures.....	C85
21.7 Residual Impact.....	C85
21.8 Conclusion.....	C85
<b>22. CULTURAL AND HERITAGE.....</b>	<b>C87</b>
22.1 Introduction .....	C87
22.2 Potential Sources of Impact.....	C87
22.3 Cultural & Heritage Resources.....	C87
22.4 Prediction and Evaluation of Impacts .....	C88
22.5 Recommended Mitigation .....	C89
22.6 Conclusions .....	C89
<b>23. ENVIRONMENTAL MONITORING AND AUDIT .....</b>	<b>C91</b>
23.1 Introduction .....	C91
23.2 Objectives of the Environmental Monitoring and Audit Programme .....	C91
23.3 Scope of Environmental Management .....	C91
23.4 Development of an Environmental Management System .....	C92
23.5 Environmental Management Plan .....	C92
23.6 EM&A Manual.....	C93
23.7 Noise.....	C94
23.8 Air Quality.....	C96
23.9 Water Quality .....	C97
23.10 Landscape and Visual.....	C97

23.11 Waste Management .....	C97
23.12 Land Contamination .....	C98
23.13 Ecology .....	C98
23.14 Cultural Heritage .....	C98
<b>24. IMPLEMENTATION SCHEDULE OF RECOMMENDED MITIGATION MEASURES .....</b>	<b>C99</b>
24.1 Construction Phase .....	C99
24.2 Operational Phase .....	C99
<b>25. CONCLUSION .....</b>	<b>C119</b>
25.1 Introduction .....	C119
25.2 Noise .....	C119
25.3 Air Quality .....	C120
25.4 Water Quality .....	C120
25.5 Landscape and Visual Impact .....	C120
25.6 Waste Management .....	C121
25.7 Land Contamination .....	C121
25.8 Ecology .....	C122
25.9 Cultural Heritage .....	C122

## TABLES

Table 3.2a Permitted Hours of Operation for Percussive Piling (not involving the use of diesel, pneumatic and/or steam hammers) .....	A14
Table 3.2b EIA O TM Daytime Construction Noise Limit ( $L_{eq, 30 \text{ min}}$ dB(A)) .....	A15
Table 3.2c Acceptable Noise Levels (ANL, $L_{eq, 5 \text{ min}}$ dB(A)) .....	A15
Table 3.2d EIA O TM Road Traffic Noise Criteria .....	A16
Table 3.3a Hong Kong Air Quality Objectives ( $\mu\text{g m}^{-3}$ ) .....	A18
Table 4.1a - Identified Noise Sensitive Receivers in Yuen Long .....	B1
Table 4.1b - Identified Noise Sensitive Receivers in Tin Shui Wai .....	B3
Table 4.1c - Identified Noise Sensitive Receivers in Tuen Mun Centre .....	B4
Table 4.2a Background Air Quality of Yuen Long, Tin Shui Wai and Tuen Mun Centre ( $\mu\text{g m}^{-3}$ ) .....	B5
Table 4.2b Identified Representative Air Sensitive Receivers in Yuen Long .....	B6
Table 4.2c Identified Representative Air Sensitive Receivers in Tin Shui Wai .....	B6
Table 4.2d Identified Representative Air Sensitive Receivers in Tuen Mun Centre ...	B7
Table 4.3a Summary Statistics of 1997 Water Quality of Yuen Long Creek (YL) and Tin Shui Wai Nullah (TSR) .....	B8
Table 4.3b Summary Statistics of 1997 Water Quality of Tuen Mun River .....	B10
Table 5.2a Yuen Long EPIW - Predicted Construction Noise Levels (dB(A)) .....	B27
Table 5.2b Tin Shui Wai EPIW - Predicted Construction Noise Levels (dB(A)) .....	B28
Table 5.2c Tuen Mun Centre EPIW - Predicted Construction Noise Levels (dB(A)) .....	B29
Table 5.2d Sound Power Levels for Specific Silenced PME .....	B31
Table 5.2e Yuen Long EPIW - Mitigated Construction Noise Levels (dB(A)) .....	B34
Table 5.2f Tin Shui Wai EPIW - Mitigated Construction Noise Levels (dB(A)) .....	B35
Table 5.2g Tuen Mun Centre EPIW - Mitigated Construction Noise Levels (dB(A)) .....	B36
Table 5.3a Yuen Long EPIW - Predicted Noise Levels $L_{10, 1\text{hour}}$ (dB(A)) for the Prevailing Year and Future Year (1999 & 2018) .....	B41
Table 5.3b Tin Shui Wai EPIW - Predicted Noise Levels $L_{10, 1\text{hour}}$ (dB(A)) for the Prevailing Year and Future Year (1999 & 2018) .....	B43
Table 5.3c Tuen Mun Centre EPIW - Predicted Noise Levels $L_{10, 1\text{hour}}$ (dB(A)) for the Prevailing Year and Future Year (1999 & 2018) .....	B45
Table 5.3d Yuen Long EPIW - Mitigated Noise Levels $L_{10, 1\text{hour}}$ (dB(A)) for the Future Year (2018) .....	B47



Table 5.3e Tin Shui Wai EPIW - Mitigated Noise Levels $L_{10, 1\text{hour}}$ (dB(A)) for the Future Year (2018) .....	B51
Table 5.3f Noise Sensitive Receivers Eligible for Noise Insulation .....	B54
Table 5.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project .....	B55
Table 6.3a $\text{NO}_x$ Emission Rate from Castle Peak Road - Yuen Long.....	B60
Table 6.3b $\text{NO}_x$ Emission from Ping Ha Road of Tin Shui Wai .....	B60
Table 6.3c $\text{NO}_x$ Emission from Tuen Mun Heung Sze Wui Road at Year 2018 .....	B61
Table 6.3d Yuen Long EPIW - Predicted Hourly Concentration of Pollutants ( $\mu\text{gm}^{-3}$ ).....	B62
Table 6.3e Tin Shui Wai EPIW -Predicted Hourly Concentration of Pollutants( $\mu\text{gm}^{-3}$ ).....	B64
Table 6.3f Tuen Mun Centre EPIW - Predicted Hourly Concentration of Pollutants ( $\mu\text{gm}^{-3}$ ).....	B64
Table 6.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project .....	B66
Table 7.3a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project .....	B73
Table 8.2a The relationship between sensitivity and magnitude in defining significance thresholds.....	B77
Table 8.3a VISUAL IMPACT DURING THE CONSTRUCTION PHASE.....	B81
Table 8.3b VISUAL IMPACT DURING THE OPERATIONAL PHASE .....	B84
Table 8.4a VISUAL IMPACT DURING THE CONSTRUCTION PHASE.....	B91
Table 8.4b Visual Impact During the Operational Phase .....	B93
Table 8.5a VISUAL IMPACT DURING CONSTRUCTION PHASE .....	B98
Table 8.5b Visual Impact During the Operational Phase .....	B100
Table 9.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project .....	B111
Table 10.4a Summary of Recommended Mitigation Measures During Construction and Operation of the Project .....	B114
Table 11.7a Noise Monitoring Location .....	B119
Table 11.8a Dust Monitoring Location .....	B121
Table 12.1a Implementation Schedule for Construction Phase Environmental Mitigation Measures.....	B124
Table 12.2a Implementation Schedule for Operational Phase Environmental Mitigation Measures.....	B141
Table 14.1a - Identified Noise Sensitive Receivers in Kam Tin .....	C1

Table 14.2a Background Air Quality ( $\mu\text{gm}^{-3}$ ) .....	C3
Table 14.2 b Identified Representative Air Sensitive Receivers .....	C3
Table 14.3a Summary Statistics of 1996 and 1997 Water Quality for Kam Tin River	C4
Table 15.2a - Kam Tin Eastern Access Road, Predicted Construction Noise Levels (dB(A)) .....	C17
Table 15.2b Sound Power Levels for Specific Silenced PME .....	C19
Table 15.2c - Kam Tin Eastern Access Road, Mitigated Construction Noise Levels (dB(A)) .....	C22
Table 15.3a Kam Tin EAR - Predicted Noise Levels $L_{10, 1 \text{ hour}}$ (dB(A)) for the Prevailing Year and Future Year (1999 & 2018).....	C27
Table 15.3b - Details of Proposed Direct Mitigation Measures on Eastern Access Road	C31
Table 15.3c Kam Tin EAR - Mitigated Noise Levels $L_{10, 1 \text{ hour}}$ (dB(A)) for the Future Year 2018 .....	C32
Table 15.3d Noise Sensitive Receivers Eligible for Noise Insulation.....	C35
Table 15.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project.....	C36
Table 16.3a $\text{NO}_x$ Emission at Year 2018.....	C41
Table 16.3b Predicted Hourly Concentration of Pollutants ( $\mu\text{gm}^{-3}$ ) .....	C42
Table 16.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project.....	C43
Table 17.4a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project.....	C49
Table 18.2a The relationship between sensitivity and magnitude in defining significance thresholds. ....	C53
Table 18.3a VISUAL IMPACT During OPERATION PHASE at Kam Tin.....	C59
Table 19.6a - Summary of Recommended Mitigation Measures During Construction and Operation of the Project.....	C70
Table 21.4a Ecological Evaluation of the Habitat Found within the Study Area ....	C83
Table 22.5a Summary of Recommended Mitigation Measures During Construction and Operation of the Project .....	C89
Table 23.7a Noise Monitoring Location during the construction phase .....	C95
Table 23.7b Noise Monitoring Location during the operational phase.....	C96
Table 23.8a Dust Monitoring Location .....	C97
Table 24.1a Implementation Schedule for Construction Phase Environmental Mitigation Measures.....	C100

Table 24.2a Implementation Schedule for Operational Phase Environmental Mitigation Measures..... C116

**FIGURES**

Figure 2.1a Extent of Road Works Proposed for Yuen Long  
Figure 2.1b Extent of Road Works Proposed for Tin Shui Wai  
Figure 2.1c Extent of Road Works Proposed for Tuen Mun Centre  
Figure 2.1d Extent of Road Works Proposed for Kam Tin  
Figure 4.1a Location of Noise Sensitive Receivers in Yuen Long  
Figure 4.1b Location of Noise Sensitive Receivers in Tin Shui Wai  
Figure 4.1c Location of Noise Sensitive Receivers in Tuen Mun Centre  
Figure 4.2a Location of Air Sensitive Receivers in Yuen Long  
Figure 4.2b Location of Air Sensitive Receivers in Tin Shui Wai  
Figure 4.2c Location of Air Sensitive Receivers in Tuen Mun Centre  
Figure 4.4a Baseline Landscape Conditions  
Figure 4.4b Site Photographs  
Figure 4.4c Site Photographs  
Figure 4.4d Visually Sensitive Receivers at Yuen Long  
Figure 4.4e Baseline Landscape Conditions  
Figure 4.4f Site Photographs  
Figure 4.4g Site Photographs  
Figure 4.4h Visually Sensitive Receivers at Tin Shui Wai  
Figure 4.4i Baseline Landscape Conditions Plan  
Figure 4.4j Site Photographs  
Figure 4.4k Site Photographs  
Figure 4.4l Sensitive Visual Receivers  
Figure 5.3a Road Classified as “New” in Traffic Noise Assessment for Yuen Long  
Figure 5.3b Road Classified as “New” in Traffic Noise Assessment for Tin Shui Wai  
Figure 5.3c Road Classified as “New” in Traffic Noise Assessment for Tuen Mun Centre  
Figure 5.3d Digitised Road Scheme for Yuen Long  
Figure 5.3e Digitised Road Scheme for Tin Shui Wai

- Figure 5.3f Digitised Road Scheme for Tuen Mun Centre
- Figure 5.3g Proposed Direct Road Traffic Noise Mitigation Measures, Yuen Long
- Figure 5.3h Proposed Direct Road Traffic Noise Mitigation Measures on Ping Ha Road, Tin Shui Wai
- Figure 5.3i Proposed Direct Road Traffic Noise Mitigation Measures on Tin Fuk Road, Tin Shui Wai
- Figure 6.3a Isopleths of NO<sub>2</sub> at the Worst Affected Level (Ground Level) for Yuen Long
- Figure 6.3b Isopleths of NO<sub>2</sub> at the Worst Affected Level (Ground Level) for Tin Shui Wai
- Figure 6.3c Isopleths of NO<sub>2</sub> at the Worst Affected Level (Ground Level) for Tuen Mun Centre
- Figure 8.3a Sources of Landscape and Visual Impacts at Yuen Long Figure 8.3b Landscape Mitigation Measures
- Figure 8.3c Landscape and Visual Mitigation Measures for Proposed Noise Barriers
- Figure 8.3d Landscape and Visual Mitigation Measures for Proposed Noise Barriers
- Figure 8.3e Landscape and Visual Mitigation Measures for Proposed Noise Barriers
- Figure 8.4a Sources of Landscape and Visual Impacts at Tin Shui Wai
- Figure 8.4b Landscape Mitigation Measures
- Figure 8.4c Landscape and Visual Mitigation Measures for Proposed Noise Barriers
- Figure 8.4d Landscape and Visual Mitigation Measures for Proposed Noise Barriers
- Figure 8.4e Landscape and Visual Mitigation Measures for Proposed Noise Barriers
- Figure 8.4f Landscape and Visual Mitigation Measures for Proposed Noise Barriers
- Figure 8.4g Landscape and Visual Mitigation Measures for Proposed Noise Barriers
- Figure 8.5a Sources of Landscape and Visual Impacts at Tuen Mun Figure
- Figure 8.5b Landscape Mitigation Measures
- Figure 14.1a Location of Noise Sensitive Receivers in Kam Tin
- Figure 14.2a Location of Air Sensitive Receivers in Kam Tin
- Figure 14.5a Baseline Landscape Conditions
- Figure 14.5b Landscape Character Areas Views A and B
- Figure 14.5c Landscape Character Areas View C
- Figure 14.5d Construction and Operational Phase Visually Sensitive Receivers
- Figure 15.3a Road Classified as “New” in Traffic Noise Assessment for Kam Tin
- Figure 15.3b Digitised Road Scheme for Kam Tin

Figure 15.3c Proposed Direct Road Traffic Noise Mitigation Measures Kam Tin  
Figure 15.3d Proposed Direct Road Traffic Noise Mitigation Measures Kam Tin  
Figure 15.3e Proposed Direct Road Traffic Noise Mitigation Measures Kam Tin  
Figure 15.3f Proposed Direct Road Traffic Noise Mitigation Measures Kam Tin  
Figure 16.3a Isopleths of NO<sub>2</sub> at the Worst Affected Level for Kam Tin  
Figure 18.3a Sources of Landscape and Visual Impacts  
Figure 18.3b Landscape Mitigation Measures  
Figure 18.3c Landscape and Mitigation Measures for Proposed Road  
Figure 18.3d Landscape and Mitigation Measures for Proposed Road  
Figure 20.4a Contaminating Land Uses Map of the Proposed Eastern Access Road  
Figure 21.3a Habitat Map of the Proposed Eastern Access Road

## ANNEXES

Annex A Traffic Data  
Annex B Construction Plant Inventory and Sound Power Evaluation  
Annex C Construction Noise Calculations  
Annex D Sample HFA Noise Model Output  
Annex E Agreement on the Use of Low Noise Road Surfacing  
Annex F Noise Insulation Eligibility Assessment  
Annex G Previously Considered Noise Mitigation Options  
Annex H Air Quality Input Data  
Annex I Contaminated Assessment Plan (CAP)  
Annex J Plant Species Recorded Within the Study Area During the Study Period  
Annex K Bird Species Recorded Within the Study Area During the Study Period