

2 NOISE IMPACT STUDY

2.1 Introduction and Methodology

- 2.1.1 The purpose of this section is to identify potential noise impacts on the existing and future developments during the operational phase, based on traffic modelling and prepare mitigation measures to overcome any unacceptable impacts. At this stage the precise alignments and traffic flows are well established and the assessment is based on reliable assumptions, which are indicated below.
- 2.1.2 With regard to the proposed alignment and the traffic data, there are several areas of major concern for both the operational and construction stages. The key noise issues are potential noise nuisances associated with the construction of the Project and the operational road traffic noise. Noise emitted from the smoke ventilation system for the Nam Wan Tunnel may pose an additional constraint, however at this stage there is no requirement for traffic exhaust ventilation shafts on air quality grounds. This is subject to a detailed review in Section 3 with regard to land use implication.
- 2.1.3 Potential noise problems associated with the proposed elements of the Project are identified. Noise mitigation measures are recommended taking account of the Technical Memorandum of the EIAO, which will facilitate the detailed design of the Project and improve environmental performance with respect to noise.
- 2.1.4 The noise sensitive receivers are described below. The traffic noise impacts are assessed and mitigation measures are proposed based on the traffic data from the transportation workstream, which has been reported independently. The impact of traffic noise on existing developments is also reassessed and the effectiveness of any direct mitigation measures already provided (such as noise barriers or low-noise surface friction course) are also included. The potential impact of road traffic noise on future noise sensitive developments is also assessed. At this stage there are planning options for the WKR. These have been developed in the Final Report for the “West Kowloon Reclamation Comprehensive Traffic Analysis Review and Environmental Impact Assessment Review of Land Use in the Northern Part of the West Kowloon Reclamation”. For Site 10, the Housing Department layout has been adopted. Construction phase noise impacts are included in Section 7.
- 2.1.5 Noise impacts and predicted future noise levels at the Noise Sensitive Receivers (NSRs) are assessed based on an inventory of the noise sources. Appropriate new and existing road sections, for the purpose of traffic noise impact assessment, have been included. At present it is not expected that any existing road sections will undergo major modification (i.e., resulting in 25% increase in lanes or substantial changes in alignment).
- 2.1.6 Further assessments have been made and road traffic noise has been calculated using roadNoise by WS Atkins, which is in full compliance with the U.K. Department of Transport’s “Calculation of Road Traffic Noise” (1988) (CRTN). Road traffic noise has been based on the maximum peak hour traffic within 15 years of commencement of the Project. The maximum traffic scenario has been calculated to occur in 2021. In 2021 Route 9 will effectively be operating at capacity. The assumed traffic data, used in the calculation, has been justified through studies acceptable to the Commissioner for Transport. New and existing road sections are included. Sample listings are presented in Appendix 1.

- 2.1.7 The output from the model is presented as future traffic noise levels in L10 (1hour) at the NSRs at various representative floor levels. Tables and plans of suitable scale are presented. Quantitative assessment for the proposed road alignment has been carried out and compared against the criteria for NSRs in the Technical Memorandum of the EIAO. The potential noise impact is quantified by estimating the numbers of dwellings, classrooms and other noise sensitive elements that will be exposed to noise above the Technical Memorandum of the EIAO criteria.
- 2.1.8 In all situations where the predicted traffic noise level exceeds the Technical Memorandum of the EIAO criteria by 1 dB(A) or more, direct technical remedies are proposed wherever practicable. Specific reasons for not adopting certain direct technical remedies in the design to reduce the traffic noise to a level meeting the Technical Memorandum of the EIAO criteria or to maximise the protection for the NSRs as far as possible are clearly indicated. The dwellings, classrooms and other noise sensitive elements that will still be exposed to noise above the Technical Memorandum of the EIAO criteria with the implementation of all recommended direct technical remedies are quantified as far as possible.
- 2.1.9 In cases where all NSRs cannot be protected by the recommended direct technical remedies, indirect technical remedies are identified. Estimates are made of the total number of existing dwellings, classrooms and other noise sensitive elements which may qualify for indirect technical remedies under the ExCo Directive “Equitable Redress for Persons Exposed to Increased Noise Resulting from the Use of New Roads”. The associated costs and any implications for such implementation will be produced. For the purpose of determining the eligibility of the affected premises (including institutional buildings) for indirect technical remedies, reference has been made to the following three criteria:
- (a) the predicted overall noise level from the new road together with other traffic in the vicinity must be above a specified noise level (e.g. 70 dB(A) for domestic premises and 65 dB(A) for educational institutions, all in L10(1hour));
 - (b) the predicted overall noise level is at least 1.0 dB(A) more than the prevailing noise level, i.e. the total traffic noise level existing before the works to construct the road were begun; and
 - (c) the contribution to the increase in the predicted overall noise level from the new road must be at least 1.0 dB(A).
- 2.1.10 Means to minimise any side effects and to resolve any potential constraints due to the inclusion of the recommended direct technical remedies will be identified as necessary. Planned developments which will be subject to residual impacts, even with all practicable direct technical remedies in place, the Consultants will evaluate and confirm the practicality of additional measures. The agreed environmental requirements / constraints identified by the EIA study will also be taken into account when assessing development potential of sites near to the alignment.

2.2 Background Conditions and Potential Impacts

- 2.2.1 Background noise sources in the study area are currently dominated by industrial activity, construction and traffic. To the Eastern and Western extremities of the study area traffic noise on the developing road network is also a significant source. Background noise in many parts of the study area, especially around the major roads bordering the hinterland,

is characterised typically by L90 values in excess of 70 dB(A) in many areas during peak traffic hours day, although the night time period is much quieter.

- 2.2.2 Noise levels around the study area are high due to the air traffic, major roads, public utilities and industrial buildings. In the built up areas in the northern West Kowloon area and on Tsing Yi, road traffic is the dominant noise source.
- 2.2.3 At the existing roads of Tsing Yi, Mei Foo and Northern West Kowloon bordering the study area, background noise along many roads is high and is dominated by road traffic. Typically background levels (based on information from the West Kowloon Reclamation Studies) are high, even in what would be regarded as the less busy streets. Along the main thoroughfares noise levels are even higher and dominated by the numerous heavy vehicles, especially container lorries. Low noise pervious macadam surfaces have been or are scheduled to be laid on all expressways such as WKH, P1 and Route 3. Reduced traffic noise is therefore assumed for these sources. At present Tsing Yi is less noisy at night. This will change in the near future if container related activities and terminals, including CT9, are operated at night.

2.3 Evaluation Criteria and Assumptions Used In Assessment of Noise Impacts

- 2.3.1 The statutory instrument for the noise control is the Noise Control Ordinance (NCO) (Cap. 400) and its regulations. Table 2.1 indicates the relevant noise legislation and planning guidelines which will guide the noise assessment for this Project. Noise assessments will make reference to this legislation and associated guidelines. Acceptable noise criteria for various sources are recommended in the Technical Memorandum of the EIAO for various NSRs (Table 2.2). The criterion which is referred to most often in this study has been the L10 (1 hour) of 70 dB(A) for road traffic noise affecting residential developments.
- 2.3.2 The assessment of noise impacts presented here is based on standard acoustic principles and has analysed the noise environment around the sections of R9 which border the existing and intensified planned residential development areas. Traffic modelling studies have provided traffic flows as input to the noise model. Nearby building locations and heights are used as a template from which to draw assumptions in noise modelling. The main focus of the performance measures was the interface between the noise sensitive receivers (NSRs) and the R9 transport links. The total extent of transport/residential interface is not large since the alignment of this major transport artery has been chosen to avoid many of the NSRs.

Fixed Plant Noise

- 2.3.3 There is no anticipated requirement for ventilation buildings.

Traffic Data

- 2.3.4 Two-way traffic flows were obtained from the traffic modelling workstream. The proportions of heavy vehicles, light goods and private vehicles were also provided. At this stage a reasonably detailed breakdown was provided. The proportion of heavy vehicles, includes all vehicles over 1,525 kg unladen weight (i.e. heavy goods vehicles, buses, container lorries, public light buses and coaches). Sample listings for the traffic are included in Appendix 1

Table 2.1 : Noise Control Legislation and Guidelines

Major Project Elements / Activities	Legislation / Guidelines	Description of Control
General Construction Work during Restricted Hours	Noise Control Ordinance (Cap. 400); Noise Control (General) Regulation; Noise Control (Appeal Board) Regulation; Noise Control (Construction Work) Regulation; Noise Control (Designated Area) Notice	To control construction noise from the use of powered mechanical equipment; and the carrying out of certain noisy works in designated areas, between 7 p.m. and 7 a.m. and on general holidays by Construction Noise Permits. CNPs will be issued in accordance with two relevant statutory Technical Memorandum.
General Construction Work outside Restricted Hours	EPD's Practice Note (ProPECC PN2/93) on Noise from Construction Activities - Non-statutory	To recommend the maximum construction noise levels at facades of dwellings and schools are $L_{eq(30\text{ mins})}$ 75 dB(A) and 70 dB(A) respectively during the non-restricted period. A further reduction of 5 dB(A) is required during school examinations.
Percussive Piling	Noise Control Ordinance (Cap. 400); Noise Control (General) Regulation; Noise Control (Appeal Board) Regulation	To prohibits percussive piling between 7 p.m. and 7 a.m. and on general holidays; and to restrict the working hours of percussive piling at other times by construction noise permits. Noise permit will be issued in accordance with a relevant statutory Technical Memorandum.
Hand-held Percussive Breakers and Air Compressors	Noise Control Ordinance (Cap.400); Noise Control (Hand Held Percussive Breakers) Regulation; Noise Control (Air Compressors) Regulation	To control noisy construction equipment, the hand-held percussive breakers and air compressors by the issue of "Noise Emission Label".
Ventilation System	Noise Control Ordinance (Cap. 400); Noise Control (General) Regulation; Noise Control (Appeal Board) Regulation	To control noise from industrial and commercial activities, including ventilation noise, through Noise Abatement Notices. The notices will be issued in accordance with a relevant statutory Technical Memorandum.
Road Traffic Noise	TM of the EIAO	For planning purpose, the maximum allowable noise levels are $L_{10(1\text{-hour})}$ 70 dB(A) and 65 dB(A) for dwelling and school uses respectively.

Table 2.2 : Summary of Noise Standards

Uses	Noise Source		Helicopter Noise L_{max} dB(A)	Road Traffic Noise L_{10} (1 hour) dB(A)	Rail Traffic Noise	Fixed Noise Source
	Aircraft Noise (Noise Exposure Forecast: NEF)					
	Kai Tak Airport	New Chek Lap Kok Airport				
All domestic premises including temporary housing accommodation	N/A	25	85	70	(a) (See Note 3) The appropriate Acceptable Noise Levels shown in Table 3 of the Technical Memorandum for the Assessment of Noise from Places Other than Domestic Premises, Public Places or construction sites and	(a) 5dB(A) below the appropriate Acceptable Noise Levels shown in Table 3 of the Technical Memorandum for the Assessment of noise from Places Other than Domestic Premises, Public Places or Construction Sites and
Hotels and hostels	N/A	25	85	70	(b) L_{max} (2300 – 0700) = 85 dB(A)	(b) the prevailing background noise level
Offices	N/A	30	90	70		(For quiet areas
Educational institutions including kindergartens, nurseries and all others where unaided voice communication is required	N/A	25	85	65		With level 5 dB(A) below the ANL)
Places of public worship and courts of law	N/A	25	85	65		
Hospitals, clinics, convalescences and homes for the aged diagnostic rooms wards	N/A	25	85	55		

Notes: The above standards apply to uses which rely on opened windows for ventilation

The above standards should be viewed as the maximum permissible noise levels assessed at 1m from the external façade

Rail noise is under the control of the Noise Control Ordinance and shall comply with the acceptable Noise Levels laid down in the TM for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites.

Fixed Plant Noise

- 2.3.5 At this stage of the proposed tunnel design there are no details of design. Noise from the ventilation plant is assumed to be mitigated as necessary under the provisions of the NCO. Plant will be separated from NSRs by large distances such that noise will be significantly attenuated. If not, it is envisaged that adequate attenuation can be included in the design to achieve the required noise level in the relevant Technical Memorandum and the Technical Memorandum of the EIAO, at the nearest NSR facades.

Noise Sensitive Receivers

- 2.3.6 The Hong Kong Planning Standards and Guidelines describe the type of landuses which are sensitive to the different noise sources. With reference to such guidelines, representative Noise Sensitive Receivers (NSRs) have been identified in the Study Area. Tables 2.3 and 2.5 summarise the existing and likely future NSRs for the purpose of noise assessment. These are shown in Figures 1.3-1.5.

Table 2.3 : Existing Noise Sensitive Receivers

ID	Description	Approximate Building Height
TYTC	Hong Kong Technical College (Tsing Yi)	6 storeys
QTC	Visiting Staff Quarters TYTC	3 storeys
MAY	Mayfair Garden	28 storeys
SC	Dwellings at Stonecutters Base	up to 3 Storeys
MF	Mei Foo Sun Chuen	21 storeys
CC	Cheung Ching Estate 1	31 storeys

Note :

- 1 One block at Cheung Ching Estate falls within 300m of the R9/CT9 slip road but is unaffected by the main section of Route 9.

Table 2.4 : Potential Future Noise Sensitive Receivers

ID	Description	Approximate Building Height
T01/5/6_1	Site 10 Residences	40storeys
SS2	Site 10 Schools	6 storeys
S6_A	Site 6 Residences	30 storeys
PS1_C	Site 6 School	6 storeys
KMB1/2	Residential	30-40 storeys

- 2.3.7 Most of the R9 carriageways will be located on viaduct and therefore conventional concrete parapet safety barriers (0.8m) would give rise to some noise screening to the surroundings, particularly those NSRs lower than the viaduct structure.

2.4 Operational Noise Impact Assessment.

- 2.4.1 The results for the noise predictions indicate that significant noise exposure would be expected at some of the nearest NSRs to R9. For those problem areas, a further detailed breakdown of the noise contribution from the existing road network and the Route 9 roads has been completed, and qualification for the three criteria (para 2.1.9) for noise insulation work have also been checked. Tables 2.5, 2.6 and 2.7 summarise the findings of the above exercise.

Western Portal, Ramps to North West Tsing Yi Interchange

Emission Inventory

- 2.4.2 The nearest NSRs in the vicinity are the residences of Ching Wah Court and the school at Ching Hong Rd / Tsing Yi Rd which are outside the study area boundary for noise assessment.

Eastern Portal and CT9 Slip Roads

Emission Inventory

- 2.4.3 The NSRs in the vicinity are the residences at Mayfair Gardens (MAY) and Vocational Training College at Tsing Yi Rd / Sai Shan Road (TYTC). Cheung Ching Estate is further to the North, and will be shielded from R9 slip roads to CT9 by a commercial development acting as a noise shield (Figure 1.3). A new residential block (QTC) consisting of about 32 flats was completed in March 1998 is included in the assessment. The predicted traffic noise levels at this sensitive location have been examined.
- 2.4.4 The main carriageway of R9 is located at about 900m away and is unlikely to be the major traffic noise contributor. The R9 slip road to CT9 and the Tsing Yi Road were therefore identified as the major noise sources in this zone.
- 2.4.5 Although much of the CT9 ramps are more than 300m from Mayfair Gardens the nearest point of the curve will be approximately 200m from the nearest corner and only 110m from the VTC and directly in front and below the recently completed visiting staff quarters. The land use plan for the existing area is unlikely to change in the near future therefore building layout and heights will remain as presently configured.
- 2.4.6 A noise model was developed to predict traffic noise level due to the road network in this zone. Current information indicates that traffic on Tsing Yi Rd and Ching Hong Rd will increase in the years up to the construction of R9. With R9 in place there will clearly be additional traffic noise from the CT9 ramps which will carry mostly heavy goods vehicles.

Assessment and Discussion

- 2.4.7 The results of noise modelling are summarised in Table 2.5. Current figures indicate that the overall noise exposure at Mayfair Gardens is acceptable at the first three modelling facades.
- 2.4.8 A noise exceedance of up to 8 dB(A) may occur at the worst-affected (facade 4) location of Mayfair Garden. However, the major noise contributor is the existing Tsing Yi Road rather than the R9 slip road. Noise levels at Cheung Ching Estate are over 70 dB(A) but are

dominated by the existing roads with a minimal contribution of 1 dB (A) from the Route 9 slip road.

- 2.4.9 The Tsing Yi Technical College (TYTC) and the associated staff quarters (QTC) are likely to be impacted by the road traffic noise. The college teaching buildings would exceed the noise standard of 65 dB(A) by up to 8dB(A) at TYTC facade 2. Both the existing Tsing Yi Road and the ramp of the Route 9 are considered roughly equivalent noise contributors with respect to TYTC, with the R9 slip roads slightly the greater.
- 2.4.10 The overall noise exposure at the TYTC staff quarters buildings (QTC) would exceed the noise standard of 70 dB(A) by up to 4dB(A) at the upper floors. The ramp of the R9 slip road is considered a major noise contributor with respect to QTC. Therefore the teaching rooms and facades of staff quarters at TYTC facing R9 are considered as the critical constraint to the Project in this part of Study Area.

Table 2.5 : Predicted Noise Levels in dB(A) for the Year 2021 at NSRs in the CT9 Terminal Zone

Prediction Point	Floor	2021 Tsing Yi Road	2021 R9 Slip Road	Total PNL dB(A)
MAY①	25	61	65	66
	17	61	65	67
	9	62	65	67
	1	62	64	66
MAY②	25	66	60	67
	17	66	60	67
	9	67	60	68
	1	67	58	68
MAY③	25	60	64	65
	17	61	64	65
	9	61	63	65
	1	61	62	65
MAY④	25	74		74
	17	75		75
	9	77		77
	1	78		78
TYTC①	5	63	63	66
	3	63	63	66
	1	63	62	66
TYTC②	5	69	69	72
	3	70	69	72
	1	71	69	73
QTC①	3	67	73	74
	1	64	70	71
CC	25	74	64	75
	17	75	63	75
	9	73	63	73
	1	71	62	71

Note : MAY denotes Mayfair Garden, TYTC denotes Tsing Yi Technical College, QTC denotes Visiting Staff Quarters of Tsing Yi Technical College, CC denotes Cheung Ching Estate, No noise contribution from the slip road at MAY-4

Mitigation

- 2.4.11 It was anticipated at the initial assessment stage that if further increases are predicted in the proportion of heavy vehicles circulating locally it would be likely that direct mitigation to protect the TYTC such as roadside barriers would be necessary.

- 2.4.12 The traffic noise is slightly less than originally anticipated, although high traffic noise levels would be expected at the most exposed facades of TYTC and QTC.
- 2.4.13 Site observation indicated that the TYTC has incorporated well gasketed good-quality windows plus air-conditioning, at the worst affected sensitive rooms. However, all direct practical mitigation measures require consideration.
- 2.4.14 The results in Table 2.5 show that noise exceedance up to 4dB(A) would be expected at the staff quarters. A 5m barrier would be considered the maximum practical height as this link would be considered as a district distributor. Due to high elevation of the NSRs and their close proximity to the R9 slip road, a 300m length of 5m roadside barrier would not help to significantly attenuate the noise levels. Noise levels are provided in Table 2.6

Table 2.6 : Predicted Noise Levels in dB(A) for the Year 2021 at NSRs in the CT9 Terminal Zone with a 5m High Barrier

Prediction Point	Floor	2021 Tsing Yi Road	2021 R9 Slip Road	Total PNL dB(A)
MAY①	25	61	63	65
	17	61	63	65
	9	62	62	65
	1	62	60	64
MAY②	25	66	59	67
	17	66	59	67
	9	67	59	68
	1	67	57	68
MAY③	25	60	62	64
	17	61	62	64
	9	61	61	64
	1	61	59	63
MAY④	25	74	-	74
	17	75	-	75
	9	77	-	77
	1	78	-	78
TYTC①	5	63	58	64
	3	63	58	64
	1	63	57	64
TYTC②	5	69	67	71
	3	70	66	71
	1	71	64	71
QTC①	3	67	72	73
	1	64	69	70
CC	25	74	63	75
	17	75	62	75
	9	73	62	73
	1	71	60	71

- 2.4.15 If a cantilever barrier used, noise levels can be reduced to within 70 dB(A) at the Technical College Staff Quarters. This would have vertical dimensions of 5.1m, with a 2.8m cantilever over the road at an angle of 45°. Noise levels with this option are given in Table 2.7. A typical cross section is provided in Figure 2.3, Figure 2.1 illustrates the scale and length of the proposed cantilevered barrier.

Table 2.7 : Noise Levels at Tsing Yi Receivers with a 5.1m High Barrier with 2.8m Cantilever

Prediction Point	Floor	2021 Tsing Yi Road	2021 R9 Slip Road	Total PNL dB(A)
MAY①	25	61	61	64
	17	61	60	64
	9	62	60	64
	1	62	59	64
MAY②	25	66	59	67
	17	66	59	67
	9	67	59	68
	1	67	57	68
MAY③	25	60	61	64
	17	61	61	64
	9	61	61	64
	1	61	59	63
MAY④	25	74	-	74
	17	75	-	75
	9	77	-	77
	1	78	-	78
TYTC①	5	63	57	64
	3	63	57	64
	1	63	56	64
TYTC②	5	69	62	70
	3	70	62	70
	1	71	61	71
QTC①	3	67	66	69
	1	64	65	67
CC	25	74	62	75
	17	75	61	75
	9	73	60	73
	1	71	59	71

2.4.16 The mitigation required to reduce noise levels below the 70 dB(A) criterion at the Tsing Yi Technical College Staff Quarters is extensive, 300m of 5.1m high barrier with 2.8m cantilever would be required. The maximum noise reduction would be less than 5 dB(A). In terms of noise reduction the provision of this structure can be justified on the grounds that it reduces noise levels at the Tsing Yi Technical College Staff Quarters below the Technical Memorandum of the EIAO criteria.

Stonecutters Island and Bridge

2.4.17 The noise sensitive receivers are scattered on the northern sloping face of the Stonecutters Island. These NSRs includes lowrise buildings, one, two or three storeys high. The proposed Route 9 runs along the viaduct at a level (59mPD) about 20~30 m above these NSRs. There are no NSRs in the vicinity of the bridge. Three representative NSRs were selected on the Island and are shown in Figure 1.4.

2.4.18 Ray tracing methods indicated that all of the three representative NSRs are located within the shadow zone as viewed from the line source on the viaduct. There are no NSRs which are more elevated with a greater view to the Ngong Shuen Chau viaducts. The parapet wall along the edge of elevated road will give significant attenuation to the traffic noise. Table 2.8 presents the predicted noise levels at the representative NSRs. The

modelling results indicate that no exceedance over the noise standard of 70dB(A) would result at the representative NSRs.

Table 2.8 : Predicted Noise Levels at NSRs in the Stonecutter Island Zone

Prediction Point	Floor	Predicted Noise Level, L10(1-hr), dB(A)
SC ①	2	68
	1	67
SC ②	2	70
	1	69
SC ③	2	65
	1	65

2.4.19 The criterion is not exceeded and road traffic on the bridge will contribute to background noise but will not be a direct impact source at these sensitive receivers.

Lai Wan Interchange, Mei Foo and Northern WKR Developments

Emission Inventory

2.4.20 The residential blocks at Mei Foo Sun Chuen were identified as the existing NSRs in the Lai Wan Interchange Zone. These NSRs are fronting a complex road network consisting of major trunk roads (Route 3 and WKH) and the Lai Wan Interchange.

2.4.21 There is a proposed residential development on the existing KMB Bus Depot Site adjacent to Mei Foo (referred to as the KMB site). Current approved plans were used to identify the block locations and sensitive locations. This development will provide screening to the east facing buildings at Mei Foo.

2.4.22 At the Lai Wan Interchange direct connections between R9/R16; R9/WKH are expected. The link from R9 eastbound to the WKH has been proposed to pass closer to Mei Foo Sun Chuen than the other roads in the interchange. The nearest NSRs in the vicinity are currently the residences at Mei Foo Sun Chuen which would be approximately 250m to 300m from the nearest ramp.

2.4.23 Further south, at the eastern side of the West Kowloon Highway (WKH), West Rail and LAR, several sites in the northern area of the West Kowloon Reclamation are zoned residential. The nearest of these (referred to as Site 6 and Site 10) would be adjacent to eastbound ramp and the link from R9 eastbound to the WKH will pass closer to these sites than the WKH. The buildings on these sites will form a virtual noise wall to the developments further away from the WKH.

Assessment and Discussion

2.4.24 The current calculations (Table 2.9) indicate that, despite the existing mitigation measures, road traffic noise would exceed the criterion of 70 dB(A) at Mei Foo Sun Chuen and the KMB site. The existing road network is the major contributor. Mitigation in the form of low noise surfacing on the new roads was assumed as the minimum standard of mitigation.

2.4.25 For the future development in Site 10 on the WKR, the predicted noise levels indicate that levels up to 82 dB(A) would be expected at the most exposed facades of residential

blocks in the preliminary layouts so far examined and some significant exceedance can also be expected at the schools.

- 2.4.26 At Site 6 noise levels up to 78 dB(A) would be expected at the most exposed facades of residential blocks. Significant noise exceedance of up to 11 dB(A) over the noise standard would also be expected at the school facades.

Mitigation

- 2.4.27 Traffic noise will increase after the opening of R16, therefore mitigation needs to be considered. Examination of the data indicates that the main noise contribution comes from the existing roads and Route 16. The new R9 causes an insignificant increase in noise levels.
- 2.4.28 Mitigation options for consideration include low noise road surfacing to the main carriageways and ramps. In accordance with the Technical Memorandum of the EIAO, the effectiveness of barriers was tested on the R9 link roads and the main carriageway of R9/R16. The introduction of low noise road surfacing on Route 9 would reduce the noise exceedance at many of the receivers but would leave the top floors in the vicinity of Mei Foo and the KMB site with residual impacts.
- 2.4.29 The maximum practical height for noise barriers on Trunk Routes is 8m, and is 6m on Primary Distributors. It is assumed that the link from R9 to the WKH has the latter classification. 8m and 6m barriers were tested, and then the height of the barrier was reduced in the assessment model to determine whether there would be any significant difference. As a result of the contribution from the existing roads, it was found that the barrier could be reduced to 3m without significant difference in noise attenuation at the affected receivers (taken as a 1dB(A) difference in noise attenuation at the affected receivers in comparison with a higher barrier). Therefore the recommended mitigation would be low noise surfacing and 3m barriers. Table 2.10 shows the noise levels with this mitigation in place.

Table 2.9 : Predicted Noise Levels in dB(A) L10 (1-hour) at NSRs

Receiver	Floor	R9 Contribution	R16 Contribution	Existing Road Contribution	Total
MF1	1	61	40	67	68
	4	62	44	68	69
	7	63	47	69	70
	10	64	49	70	71
	13	65	51	71	72
	16	65	52	72	73
	19	66	54	72	73
KMB1	1	64	62	71	73
	5	66	63	73	74
	9	67	65	74	75
	13	67	66	75	76
	17	68	67	75	76
	21	68	67	75	76
	25	69	68	75	77
	29	69	68	75	77
KMB2	1	33	59	74	74
	5	34	64	74	74
	9	35	67	75	76
	13	36	68	76	76
	17	37	69	76	76
	21	37	70	75	76
	25	38	70	75	76
Site 6					
S6_A	1	65	-	72	73
	5	69	-	76	77
	9	70	-	77	77
	13	70	-	77	78
	17	70	-	77	77
	21	70	-	76	77
	25	69	-	76	77
	27	69	-	76	76
Site 10					
T06_1	1	66	69	71	74
	9	69	78	78	81
	17	71	79	79	82
	25	71	78	78	81
	33	70	77	77	80
	41	70	76	76	79
T05_1	1	63	63	77	77
	8	65	70	76	77
	15	73	71	77	79
	22	74	71	77	79
	29	73	71	76	79
	36	73	70	76	78
T01_1	1	56	-	75	75
	9	62	-	71	72
	17	68	-	72	73
	25	68	-	72	73
	33	68	-	71	73
	41	67	-	71	72

Receiver	Floor	R9 Contribution	R16 Contribution	Existing Road Contribution	Total
SS2_1	1	53	-	52	56
	2	54	-	53	56
	3	54	-	54	57
	4	55	-	54	58
	5	56	-	55	59
	6	57	-	56	59
	7	58	-	57	60
SS2_2	1	62	62	68	70
	2	62	63	68	70
	3	63	63	69	70
	4	63	64	69	71
	5	64	64	69	71
	6	65	65	69	71
	7	65	65	70	72

Table 2.10 : Low Noise Road Surface (LNS) on all roads of Route 9 & Route 16, plus 3m high barrier along Route 16/Route 9 Main Carriageway and the Route 9 WKE Link Roads

Receiver	Floor	R9 Contribution	R16 Contribution	Existing Road Contribution	Total
MF1	1	55	38	67	67
	4	56	41	68	69
	7	58	43	69	70
	10	59	44	70	70
	13	60	45	71	71
	16	60	47	72	72
	19	61	48	72	73
KMB1	1	59	58	71	72
	5	60	59	73	73
	9	61	60	74	74
	13	63	62	75	75
	17	64	63	75	75
	21	64	64	75	76
	25	65	65	75	76
	29	65	65	75	76
KMB2	1	23	55	74	74
	5	26	59	74	74
	9	27	62	75	75
	13	27	64	76	76
	17	28	65	76	76
	21	29	67	75	76
	25	29	67	75	76
Site6					
S6_A	1	55	-	72	72
	5	58	-	76	76
	9	61	-	77	77
	13	63	-	77	77
	17	66	-	77	77
	21	66	-	76	77
	25	66	-	76	76
	27	66	-	76	76
Site 10					
T06_1	1	64	66	71	72
	9	66	75	78	80
	17	68	75	79	80
	25	68	75	78	80
	33	67	74	77	79
	41	67	74	76	78
T05_1	1	60	62	77	77
	8	62	68	76	76
	15	68	69	77	78
	22	70	68	77	78
	29	70	68	76	78
	36	70	68	76	77
T01_1	1	49	-	75	75
	9	53	-	71	71
	17	59	-	72	72
	25	62	-	72	72
	33	64	-	71	72

Receiver	Floor	R9 Contribution	R16 Contribution	Existing Road Contribution	Total
	41	64	-	71	71
SS2_1	1	46	-	52	53
	2	46	-	53	54
	3	47	-	54	54
	4	48	-	54	55
	5	48	-	55	56
	6	49	-	56	57
	7	50	-	57	58
SS2_2	1	54	60	68	69
	2	55	61	68	69
	3	56	61	69	69
	4	57	62	69	70
	5	58	62	69	70
	6	58	62	69	70
	7	59	63	70	71

2.5 Summary

2.5.1 The recommended noise mitigation is:

- Provision of Low Noise Surfacing on all the new roads except the Route 9 slip road to CT9
- Provision of a 3m high barrier along the main carriageways of Route9/Route 16 near the Lai Wan Interchange
- Provision of a 3m high barrier on the Route 9/WKH link road east bound
- Provision of a 5.1m high barrier with 2.8m cantilever on the CT9 slip road at Tsing Yi.

2.5.2 Implementation of the above measures will result in compliance with the Technical Memorandum of the EIAO criteria at Tsing Yi Technical College Staff Quarters. For receivers (existing and future) at West Kowloon, it is not possible to reduce noise levels to below 70 dB(A) in all cases because of the contribution from the existing roads. Noise mitigation measures are recommended taking account of the Technical Memorandum of the EIAO, which will facilitate the detailed design of the Project and improve environmental performance with respect to noise.

2.5.3 All recommended mitigation measures should be implemented as identified in the Environmental Schedule.

Residual Noise Levels and ExCo Eligibility

2.5.4 At the eastern area of Mei Foo within the 300m Study area, it is estimated that approximately 40 flats will be subject to noise levels exceeding 70 dB(A). The major traffic noise contribution is from existing roads. These properties would not be eligible for indirect remedies under the ExCo criteria (Clause 3).

2.5.5 The Tsing Yi Technical College Staff Quarters will be within 70 dB(A) if direct mitigation is provided. The Technical College will experience noise levels over 65 dB(A) with or without direct mitigation. However, as this already has good quality windows and AC, it will be less susceptible to residual impacts. All class rooms experience a noise

reduction of >1 dB(A) with mitigation. The major contribution is from Tsing Yi Road. At Mayfair Gardens there are some flats which exceed 70 dB(A), however the contribution from the Route 9 slip road is small. No flats would be eligible for indirect remedies under the ExCo criteria (Clause 3). Approximately 150 flats experience a noise level reduction of >1 dB(A) with mitigation.

- 2.5.6 For planned receivers at WKR, ie. the KMB site, Area 10 and Area 6, there will be flats exceeding the 70dB(A) criterion. The numbers can only be estimated on the basis of the most up to date plans (not finalised). It is estimated that up to 1260 flats exposed to noise levels over 70 dB(A) at Site 10 and 1120 at Site 6. An estimated 600 flats will exceed the criteria for the KMB site. These figures assume that there is no on site mitigation within these development areas. Approximately 30 flats in Areas 10 and 6 will experience a noise level reduction of >1 dB(A) with mitigation. Although the maximum practical mitigation measures have been provided for Route 9, further environmental assessment should be undertaken during the development and design of layouts for Sites 6 and 10 should these change from those used for the Route 9 noise impact assessment. The noise impact of Route 9 on Site 10 is based on an agreed assumption of 61m setback distance from the edge of the slip road connecting to the West Kowloon Highway for the residential portion. However, further assessment should be allowed to determine the appropriate levels of on-site mitigation and indirect remedies. As the sites are zoned CDA, environmental assessment of the MLP will be required for planning approval.
- 2.5.7 Mitigated noise levels from Route 9 will not contribute more than 1 dB(A) to total noise levels for these receivers, which would be subject to noise levels over 70 dB(A) even without the construction of Route 9. However, as recommended direct technical mitigation measures will reduce noise contributions from new road sections below the criteria and that from existing road sections, on-site mitigation or indirect measures will need to be considered in the designs. The Route 9 project has provided the maximum practical and effective mitigation to minimise future constraints.